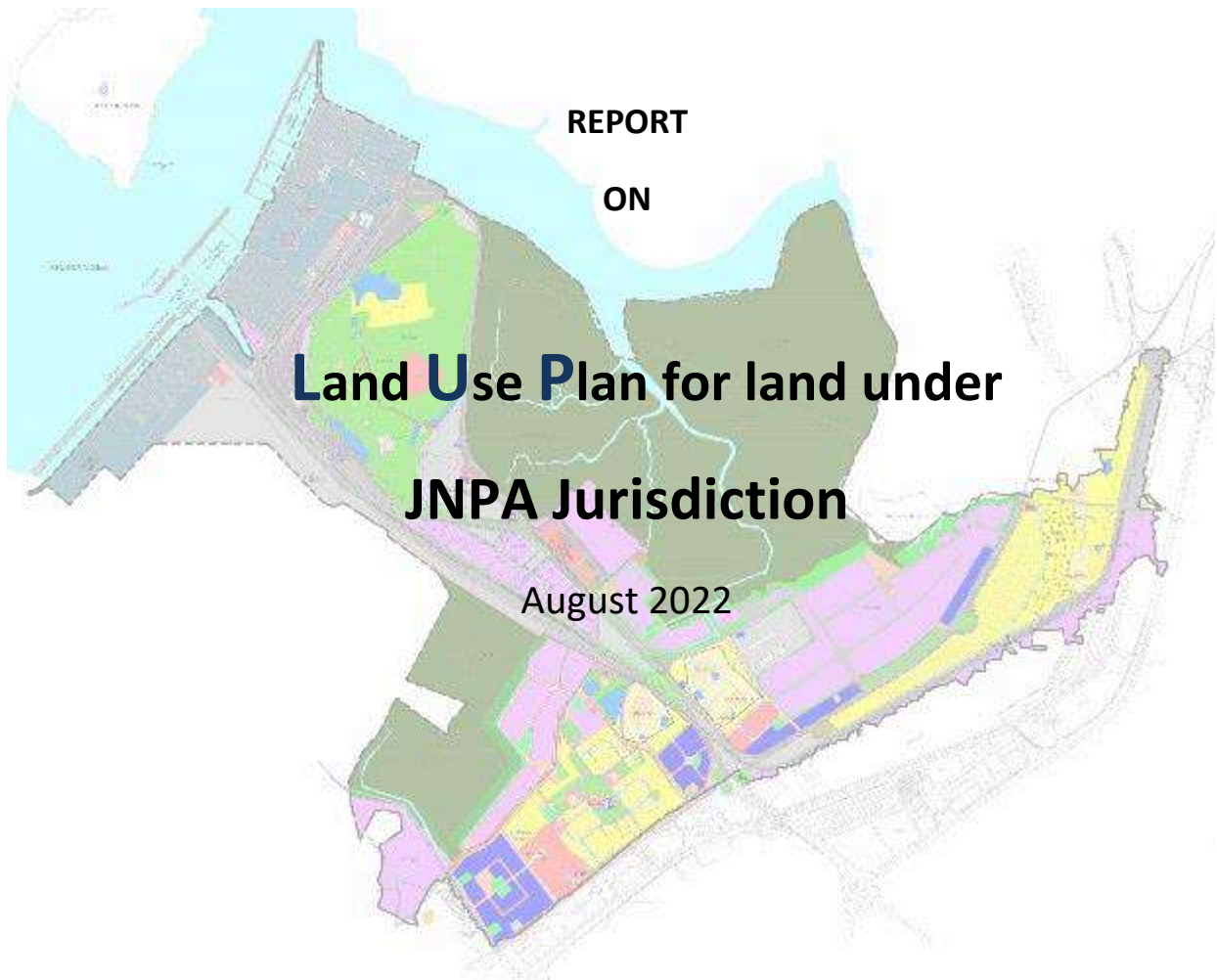




JAWAHARLAL NEHRU PORT AUTHORITY (JNPA)

(Port Planning and Development Department)



Prepared by

Voyants Solutions Private Ltd (VSPL)




**REPORT ON LAND USE PLAN
FOR LAND UNDER JAWAHARLAL NEHRU PORT AUTHORITY JURISDICTION**


August 2022




JAWAHARLAL NEHRU PORT AUTHORITY (JNPA)

(Port Planning and Development Department)


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Note: The Existing Land Use Map, Land Use Plan, Zone Plan and Report on Land Use plan for JNPA, is as approved in the 3rd meeting of 1st Board (Item No 17) of Jawaharlal Nehru Port Authority, by Resolution No. JNPA – 045 dated 18th August 2022.

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FOREWORD



Shri. Sanjay Sethi, IAS
Chairman



Jawaharlal Nehru Port Authority

The Jawaharlal Nehru Port Authority (JNPA) at Navi Mumbai (formerly known as the Jawaharlal Nehru Port Trust) is the premier container handling port in India, accounting for around 50% of the total containerized cargo volume, across the major ports of India. Commissioned on 26th May 1989, JNPA occupies a prominent place among the most modern ports in India and is ranked 26th among the top 100 container Ports in the world. Initially, JN Port was planned to be a ‘satellite port’ to the Mumbai Port with a purpose to decongest traffic. Over three decades JNPA has systematically evolved its operational efficiency and improved its capacity handling to transform itself into a Port at par with global standards.

JNPA has been expanding beyond its traditional role and assisting trade both nationally and globally. JNPA earlier referred as JNPT has become Authority for its jurisdiction vide “The Major Ports Authorities Act, 2021” which came in force from 23rd November 2021. JNPA is now empowered to prepare and sanction the proposals for development within its jurisdiction. JNPA appointed M/s Voyants Solutions Pvt. Ltd. for preparation, validation and updation of proposed Land Use plan for JNPA. The proposal includes preparation of GIS based Existing Land Use Map, Proposed Zone Plan and Proposed Land Use Plan.

The proposed Land Use plan has been prepared with a vision of a globally recognized modern port city. The plan is prepared for 20 years horizon period which will be a reviewed every 10 years. The assessment of infrastructure requirement of a “Port – city” was carried out with rigorous coordination and study of previous efforts. The Team’s efforts have been fortified from time to time with the able guidance received from various experts in the industry.

I appreciate and acclaim the tenacity and inner resolve with which the project team has prepared the proposal in stipulated time frame and in conformity with the standards and guidelines.

Sanjay Sethi

Chairman

Jawaharlal Nehru Port Authority



EXECUTIVE SUMMARY

India is one of the fastest growing large economies in the world with a GDP growth rate of 7.4 % in 2022 and ports play an important role in the overall economic development of the country. Around 95% of India's trading by volume and 70% by value is done through maritime transport. Many ports in India are evolving into specialized centers of economic activities and services and are vital to sustain future economic growth of the country such as JNPA, Mundra Port, Sikka Port, Hazira Port etc.

JN Port is the premier container handling port in India handling more than half of the container cargo across all major ports in India. JNPA has been expanding beyond its traditional role and assisting trade both nationally and globally. JNPA has been developing its infrastructure based on an initiative under “Sagarmala” National flagship policy of Ministry of Ports Shipping and Waterways aiming to strengthen the port connectivity, infrastructure and accelerate port-linked industrialization. JNPA is the Special Planning Authority for a multi services SEZ located in close proximity to JN Port with developed infrastructure and operational status. JNPA SEZ aims to set a new benchmark in port-led industrialization, and thus play a key role in Ministry of Ports, Shipping and Waterways Sagarmala vision. JNPA is having possession of 3370 Ha land area including SEZ, which is currently under part of Navi Mumbai being developed by CIDCO. As per the Policy Guidelines for Land Management 2014 (PGLM), issued to all major ports for implementation, every major port shall have a Land use plan covering all the land owned and/or managed by the Port. JNPA earlier referred as JNPT has become Authority for its jurisdiction vide The Major Ports Authorities Act, 2021 which came in force from 3rd November 2021. JNPA is now empowered to prepare and sanction the proposals for development within its jurisdiction. Previous efforts have been made to prepare land use plans which were not endorsed by the board. There is a need to update the land use plan. JNPA appointed M/s Voyants Solutions Pvt. Ltd. for preparation, validation and updating of proposed land use plan for JNPA. The proposal includes preparation of Existing Land Use Map, Proposed Zone Plan and Proposed Land Use Plan. The proposed land Use Plan will serve as a framework along with Unified Development Control and Promotion Regulations for optimum and planned utilization of land under jurisdiction of JNPA for 20 years horizon period with a review of every 10 years keeping a vision of developing JNPA area as a globally recognized modern port city.

JNPA is strategically located in terms of accessibility to hinterland by road, rail, air and sea. The intervention area consists of 12 villages, Taluka. Uran, District Raigad of Maharashtra. The total area falling under JNPA Boundary is 3370 Ha out of which 277.38 Ha is notified as JNPA SEZ. For SEZ, JNPA is the SPA. The Zone Plan for SEZ is prepared and sanctioned by Government of Maharashtra vide notification dated 21st September 2021. Thus, the net land area remaining for planning is 3092.62 Ha. The total area of the village

that comes under the JNPA boundary is 2933.39 Ha in which 62Ha has settlements and the area of reclaimed land for port activity is 400 Ha.

According to the 2011 census, the resident population of goathan in JNPA is 8288, which has increased to 13371 in 2021 (Source: Primary survey). The total population in 2021 of JNPA jurisdiction is 20961 which includes the goathan, JNPA Township, and Air force. Six villages make up the 64% of the Total residential population of the JNPA area followed by Township and Air Force with 33% and 3% respectively. The population density in the goathans is more than that in the JNPA township due to the nature of development. The population in township is static and decreasing. The Goathan Population density has increased marginally from the last decade.

The existing Land Use map consist of 2.31% Residential, Commercial and Public Semi-Public accounts to 0.08% and 1.30%. Transportation and communication Land Use covering about 18.99% which includes roads, rail and parking areas. Around 22.84 % land area is vacant which excludes SEZ and the rest is in utilities, port and area under Arabian sea planned to be reclaimed for port use. Majority of the vacant land is free of encumbrances and can be approached by existing and proposed roads. Total 365 ha of vacant land (10.75%) is available for development free of CRZ and excluding 12.5% R&R scheme. Almost 1194.80 Ha land under the CRZ out of which 884.66 Ha is mangroves and 53.46 Ha under Arabian sea planned to be reclaimed for port use.

The planning strategy for Land Use allocation is based on the concept of port city. Develop JNPA as hub for port related activities and a port city at par with Navi Mumbai having required high-end facilities. Reduce the dependence on Navi Mumbai for social and commercial facilities. Developments such as 12.5% scheme and redevelopment of Township will demand facilities similar to any city, such as malls, multiplexes, high end retail, IT&ITES park, transport facility etc. Thus, tapping the potential of the land as a resource by appropriate allocation of land use. The Zone Plan is prepared based on the principle of 'Broad Zoning' and permissible land uses/activities allowing built-in flexibility in Land Use Plan. CIDCO has adopted same approach for Navi Mumbai.

Eight broad zones are planned in proposed zone plan. **Predominantly Residential zone:** which includes Individual Housing / Apartments, Hotel/ Rest room /Hostel, Dormitories, Guest house, Service apartments, Govt./Port operation staff quarters and common facilities. **Predominantly Commercial zone:** which includes Banks, ATMs, Departmental stores, Convenience shops, High end commercial, business offices, Fuel filling stations, Vehicle repair, Servicing garages, Govt/ Semi-Govt/SPA offices etc. **Industrial zone:** Manufacturing units, warehousing, data centers, supporting infrastructure facilities and utility services etc. **Amenity zone:** includes health care facilities, government/semi-government /SPA offices, utility services, hotel, lower order commercial

like convenience shops, banks, etc. **Port operational zone:** Port container terminals, Berths, storage yards, Port operator offices, Jetty, RO-RO service, Facility building, utility etc. **Transport and communication zone:** includes roads, rotaries, footpaths, bridges, parking areas, CFS, logistics, transport terminus, supporting infrastructure and utility services. **Green Zone:** includes open spaces, green belts, natural drains, water bodies, landscaped areas, supporting infrastructure facilities and utility services. **Natural and Protective Zone:** ecologically sensitive areas, CRZ areas, natural drains, Parks, garden, open spaces, playground, green belt, nursery, etc .

Out of 3414.28 ha of total land area, 8.49% is planned as Residential, 10.75% as Industrial zone and remaining 45% for amenity, commercial, green and transportation zone. Remaining 35% falls in CRZ and mangroves which is under natural and protective zone. Additional area of terminal 4 phase II and shallow terminal reclamation adds to 3414.28 Ha of total future area by 2041. with an estimated resident population of 1.8 lakhs and 2.5 lakhs employment proposed.

The growth in the region due to employment generating proposed activities and facilities it is expected that the region will envisage a resident population of 1.8 Lakh by the year 2041 and an employment of 2.5 lakhs Including floating population. Total 20 Km of road improvement works is proposed which includes 9.3 Km widening of existing road and 10.7 Km new road links. Trunk Infrastructure for which is estimated to cost 1000 crores. Industrial development envisaged in JNPA is of Manufacturing, Tank farms and warehousing category.

The preparation of independent development regulations for JNPA is under process, till then the guidelines from Unified DCPR will be taken. Industrial area outside JNPT SEZ will follow regulations given in Unified DCPR. For area other than industrial, references from UDCPR will be taken. For all macro level control regulations such as FSI , Building height, Ground coverage, road width, parking UDCPR will be referred.

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LIST OF ABBREVIATIONS

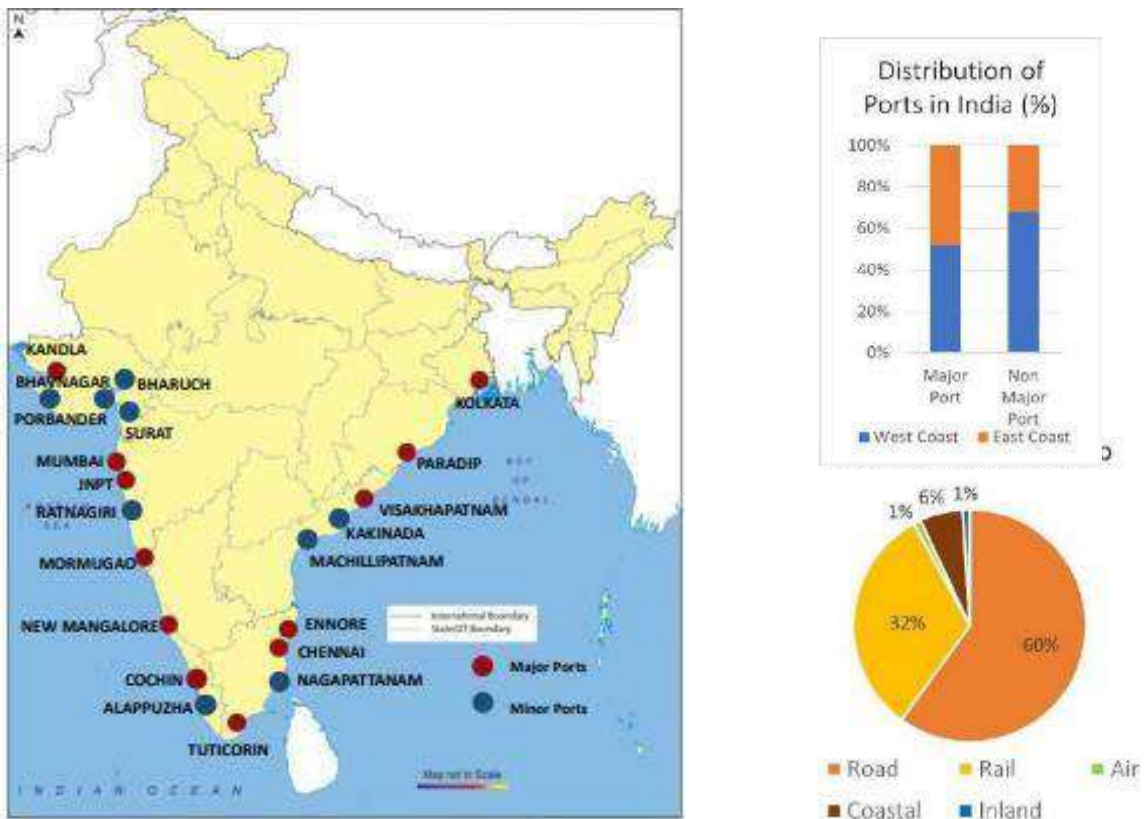
APMT	: APM Terminal
BMCT	: Bharat Mumbai Container Terminal
CIDCO	: City and Industrial Development Corporation
CRZ	: Coastal Regulation Zone
CPHEEO	: Central Public Health and Environmental Engineering Organization
DFC	: Dedicated Freight Corridor
DMIC	: Delhi-Mumbai Industrial Corridor
DCR	: Development Control Regulations
DCPR	: Development Control and Promotion Regulations
EIA	: Environment Impact Assessment
FTWZ	: Free Trade Warehousing Zone
Ha	: Hectare
ILP	: Integrated Logistics Park
JNPA	: Jawaharlal Nehru Port Authority
JNPCT	: Jawaharlal Nehru Port Container Terminal
JNPASEZ	: Jawaharlal Nehru Port Authority Special Economic Zone
Km	: Kilometer
KLD	: Kilo Litre per day
KPO	: Knowledge Process Outsourcing
KVA	: Kilo -volt-ampere
KV	: Kilo-Volt
LMV	: Light Motor Vehicle
MERC	: Maharashtra Electricity Regulatory Commission
MoEF&CC	: Ministry of Environment, Forest and Climate Change
MTHL	: Mumbai Trans Harbor Link
MJP	: Maharashtra Jeevan Pradhikaran
MSEDCL	: Maharashtra State Electricity Distribution Company Limited
MAV	: Multi Axle Vehicle
MbPT	: Mumbai Port Authority
MPCB	: Maharashtra Pollution Control Board

MLD	: Million liters Per Day
NH	: National Highway
NHAI	: National Highway Authority of India
NMPT	: New Mangalore Port Authority
NMT	: Non-Motorized Transport
NSICT	: Nhava Sheva International Container Terminal
NSIGT	: Nhava Sheva India Gateway Terminal
PPD	: Port Planning and Development Department
PVC	: Polyvinyl Chloride
RMU	: Ring Main Unit
SCADA	: Supervisory control and data acquisition
SEZ	: Special Economic Zone
SH	: State Highway
SPA	: Special Planning Authority
STP	: Sewage Treatment Plant
TPD	: Tonnes per day
TEU	: Twenty Foot Equivalent Unit

CHAPTER 1 – INTRODUCTION

1.1 Indian Port Scenario

According to the Ministry of Ports Shipping and Waterways, around 95 per cent of India’s trading by volume and 70 per cent by value (EXIM) is done through maritime transport. India is the 16th largest maritime country in the world with a coastline spanning 7500 kilometers, forming one of the biggest peninsulas in the world. Indian ports are broadly classified as Major ports and Minor ports. The distinction does not have a strict association with traffic volumes, the classification has more of an administrative significance. India has 12 major ports, which handle about 58% of sea borne traffic and around 200 non major ports, which handle about 42% of sea borne traffic. Most ports in India are wholly government owned under the Ministry of ports, shipping and waterways. Individual terminals and facilities may be operated by private organizations. Major ports area Kolkata, Paradip, Vishakhapatnam, Ennore, Chennai, Tuticorin, Kandla, Cochin, New Manglore, Mormugoa, MbPT, JNPA and Kandla as shown in Figure 1. Amongst these Paradip, JNPA, Vishakhapatnam and Kandla which handle major cargo traffic. Figure 2 shows total cargo handled by major ports in last two years.



Source: report on Indian shipping industry

Figure 1: Map showing major and non-major ports in India

Source: Indian Ports Association

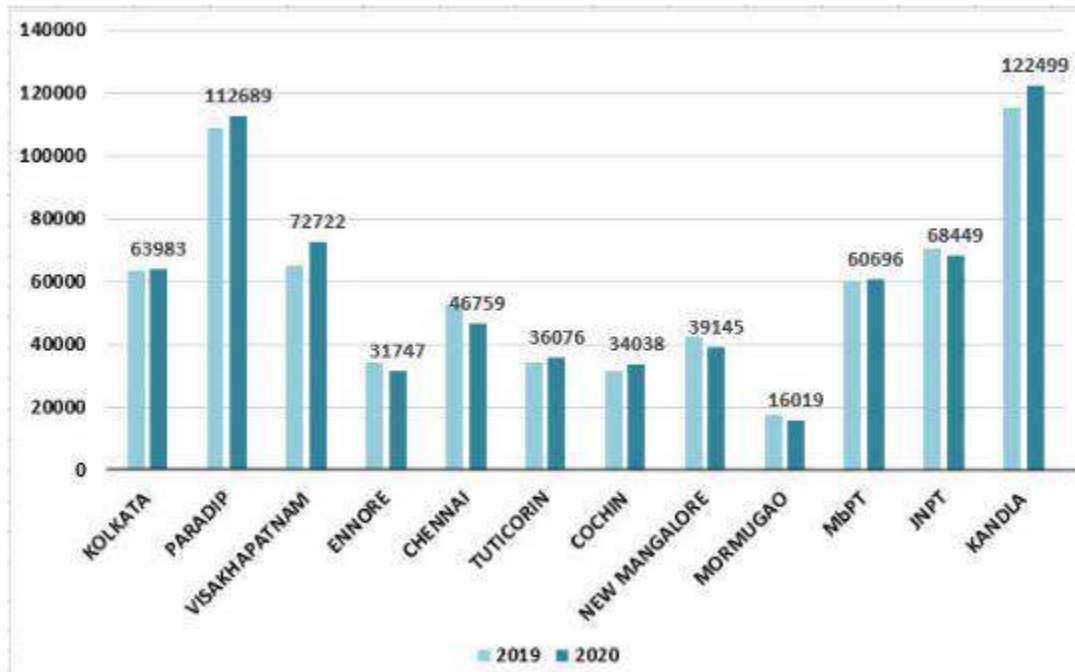


Figure 2: Total Cargo handled (in '000 tonnes) in FY 21 – 22 at major ports in India

Amongst the 12 major ports, Kandla Port handled the maximum cargo traffic of 12.24 million tonnes with a share of 17.8% in the total cargo handled at major ports followed by Paradip Port (15.9%), Vishakhapatnam Port (10.3%), JNPA (9.7%), Kolkata (9.08%), Mumbai Port (8.6%), Chennai Port (6.6%), New Mangalore (5.5%), Tuticorin port (5.12%), Cochin Port (4.8%), Ennore (4.5%) and Mormugao Port (2.2%). JNPA ranks fourth amongst Indian major ports with regard to total cargo handled in 2020.

The fall in economic activity and global trade has had a direct bearing on the cargo traffic handled at the Indian ports. After the sharp decline during April-August 20 due to pandemic, there has been a progressive improvement in the volume of cargo traffic at the major and non-major ports of the country. This corresponds with the recovery in economic activity and trade being witnessed domestically and globally.

1.2 JNPA Context

The Jawaharlal Nehru Port Authority (JNPA) located in Navi Mumbai is the largest container port in India. It handles more than half of the container cargo across all major ports in India with a present market share of 52% of major port container traffic. With 8 million TEU capacity, the port is ranked 26th amongst the top 100 container terminals of the world. Capacity expansion to 10 million TEU is planned by 2022 to make JNPA amongst the top 18 ports of the world. JNPA endeavors to achieve its mission to be equipped with state-of-the-art technology, efficiency and manpower which are at par with international standards. JNPA envisions conforming to international standards and offering cost-effective integrated

logistics solutions. Ensure security and safety of life, equipment, and cargo. Pursuing the principles of eco-friendly sustainable development.

Jawaharlal Nehru Port Authority has been expanding beyond its traditional role and assisting trade both nationally and globally. JNPA is under possession of 3414.28 Hectare of land area, out of which 400 Ha is port area. JN port is the nucleus of development within JNPA and surrounding area. To build on its infrastructure growth and accelerate nationwide industrial development, JNPA is engaged in the development, based on port led industrialization and is currently the developer and Special Planning Authority for the multi-sector Special Economic Zone (SEZ) of 277.38 hectare. The SEZ Development Proposal consisting of Zone plan and Development Control and Promotion Regulations are sanctioned by the Directorate of Town Planning, Pune vide notification dated 23rd September 2021. The remaining area under JNPA jurisdiction other than the SEZ is under statutory control of CIDCO.

Recently, The Major Port Authorities Act, 2021 published on 18th February 2021 vide clause no. 25 and rule no. 8 of the said Act, gives necessary powers to JNPA Board, with respect to Planning and Development. The board is entitled to create specific land Use plan in respect of any development or infrastructure established or proposed to be established within the port limits and the land appurtenant thereto, subject to the rules made under the said Act. Such Land Use plan shall be independent of any Local or state government regulations of any authority whatsoever. In case of conflict between the regulations made by the local authority and those made by Board, the Land Use plan created by the board shall prevail.

1.3 JNPA- Port Led development

JNPA falls under the ambit of “Sagarmala” National flagship policy of Ministry of Shipping. Sagarmala is a National Perspective Plan for the comprehensive development of India’s 7,500km coastline, 14,500 km of potentially navigable waterways and maritime sector focusing on Port-led development in logistics intensive industries.

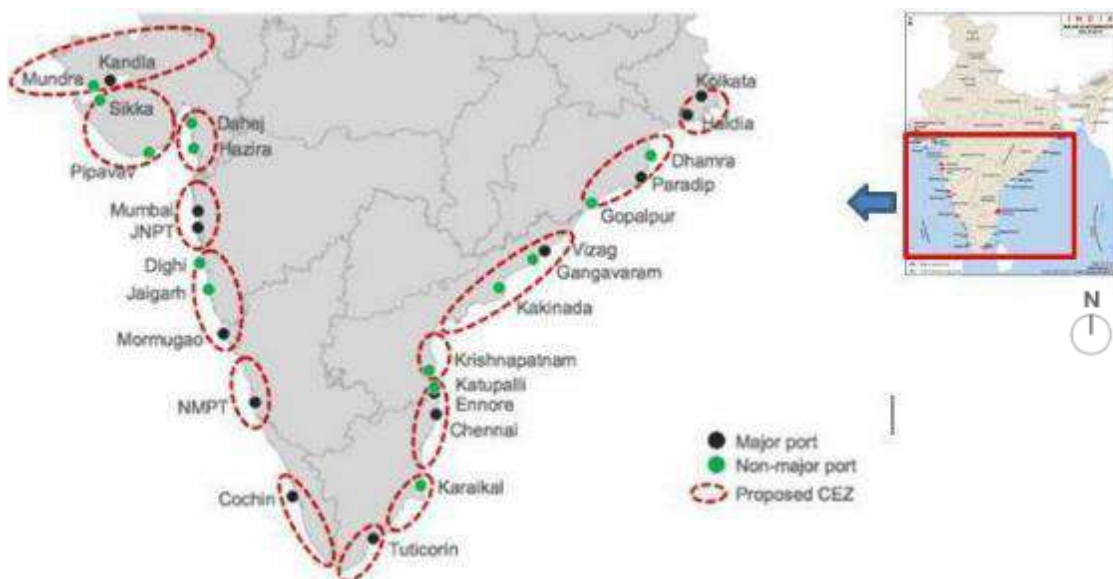


Figure 3: Sagarmala map showing coastal economic zones of India

The vision of Sagarmala is to reduce logistics cost for both domestic and export-import cargo with optimized infrastructure investment. The policy aims to strengthen the port connectivity, infrastructure and accelerate port-linked industrialization. This will help in enhancing the global competitiveness in India and in the reduction of the cost incurred in logistics. The key objective of the policy is to form coastal economic zones (CEZ) comprising of a group of coastal districts with a strong linkage to the ports. In November 2017, Union Government approved 14 CEZs of which CEZ comprising of Jawaharlal Nehru Port (JNPA) is of significant importance in Maharashtra. JNPA is the first Indian port to have implemented a logistics data bank tagging system of containers. It has been launched as a part of 'Ease of Doing Business'. It focuses on cost reduction, time, and documentation for the benefits of trade.

1.4 Historical Evolution of JN Port

All the previous old studies by various government agencies and committees had emphasized the need for the new port. After the working group on Nhava Sheva Port project submitted its report in March 1980. The first detailed project report for JNPA port was prepared by Howe (India) Pvt Ltd in 1981 in which alternative sites for JN Port were studied. Various possible alternative sites were examined like the area immediately south of Ballard Pier, Apollo Bunder to Pilot Bunder, Panvel-Thane creek, and Dharmater creek for location of the new port, but due to lack of adequate backup area, deep water facilities, Inshore activities these areas were not suitable for siting the new port. The sea bed between Elephanta Island and Nhava Sheva had a considerable natural depth of about 9 M to 12M and could be developed to provide new deep-water port facilities. It had the potential to develop a sufficient backup area to provide for a container terminal and for storage and handling of bulk materials. Also, adequate road and rail connections were feasible. Therefore, Nhava Sheva was confirmed as a more appropriate site for major port development. JNPA was planned to be a 'satellite port' to the Mumbai Port Authority (MbPT) with a purpose to decongest port led activities. JNPA was commissioned in May 1989 as a result of Mumbai Port Authority (MbPT) being incapable of handling the expanding volume of modern cargo directed to the west coast including limitations in road and rail connectivity with the hinterland. Figure 4 shows the location of Jawaharlal Nehru Port and Mumbai port.

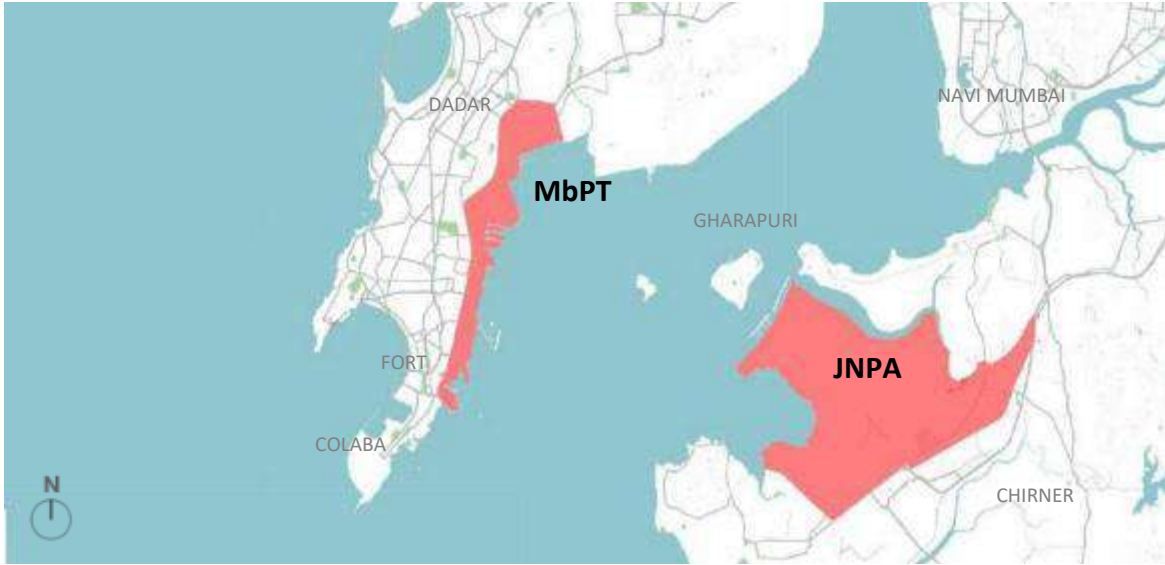
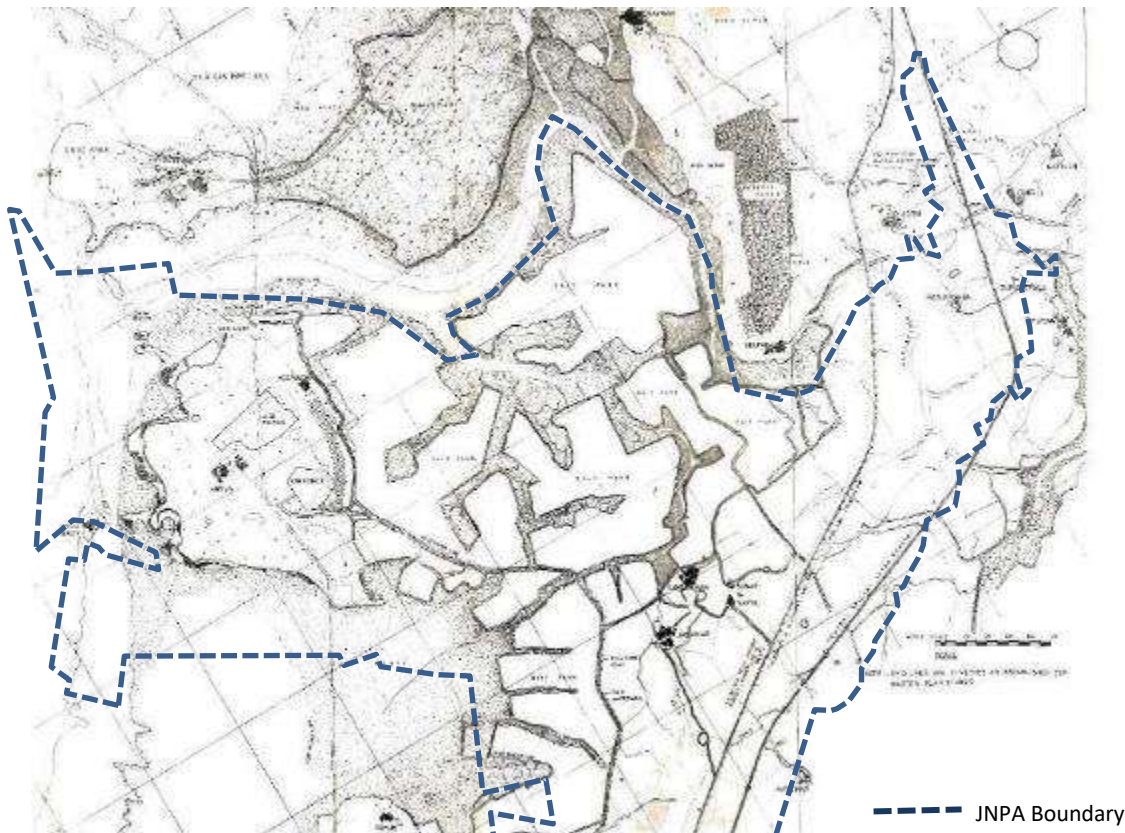


Figure 4: Location of JNPA and MbPT

Nhava and Sheva were originally islands that were connected to the mainland by roads across the mudflats that serve the Oil & Natural Gas Commission’s (ONGC) facilities located at the North-Western tip of the island. It was home to extensive salt pans, Fishing and agriculture were primary occupations. Figure 5 shows old map (1981) of Nhava sheva area.



Source: DPR prepared by Howe (India) Pvt Ltd in 1981

Figure 5: Map showing Nhava and Sheva islands with village settlements (1981)



1985



2005



2015



2020

Figure 6 Map showing historic evolution of JNPA

The state government had acquired land from about 95 villages in District Raigad & Thane and handed over to CIDCO for setting of New Town to be known as 'New Bombay'. Further for setting up of Nhava Sheva Port in the year 1983-84, Government of India directed to state government to hand over land from 12 villages from Uran Taluka to JNPA. Two villages on Sheva hill the 'Sheva village' and 'Koliwada' village got rehabilitated to newly formed Navin Sheva and Hanuman Koliwada villages south of JNPA jurisdiction, approved by Raigad's collector. Figure 6 shows existing Gaathan prevalent in JNPA in 1981.

Government of India set up JN Port (Previously known as Nhava Sheva Port) on 2933 hectares of land and JNPA commenced operations from 26th May 1989. The state government had handed over the entire land to the Nhava Sheva port Authority (JNPA) including private lands, salt pan land and government land through CIDCO in 1984. JNPA has acquired private land through CIDCO.

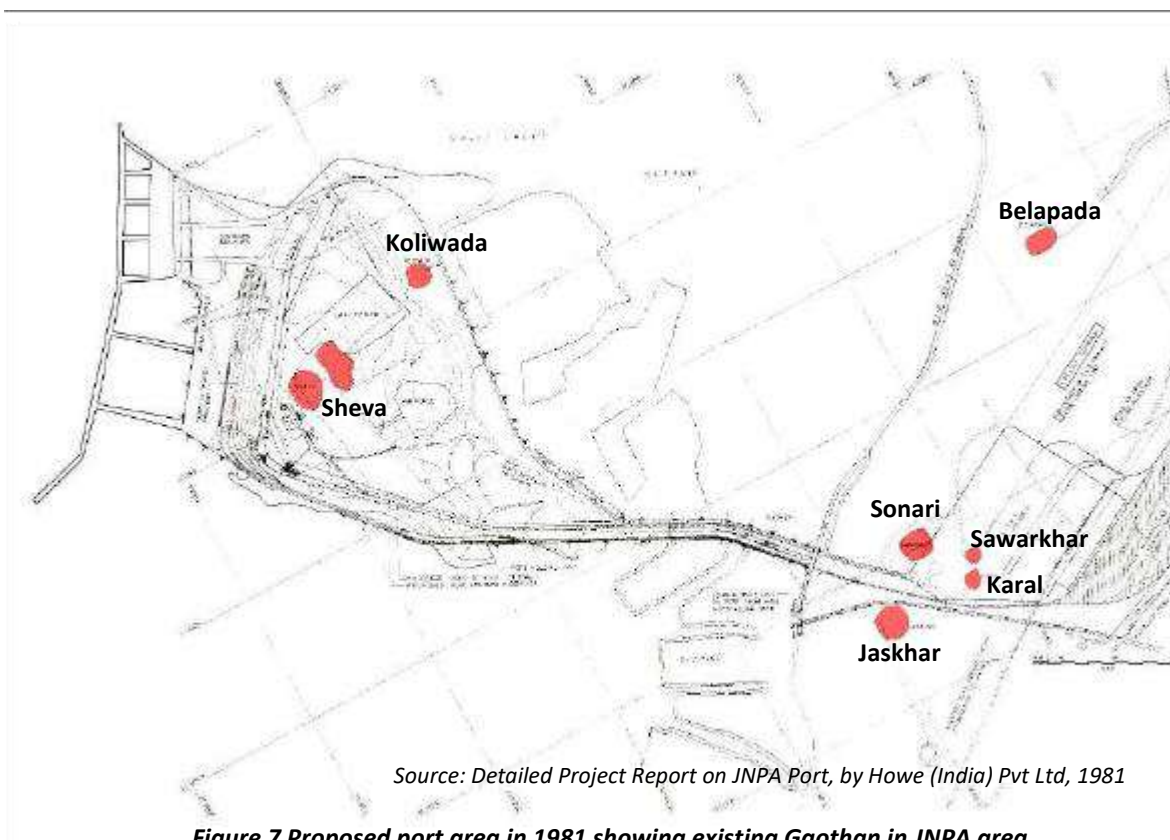


Figure 7 Proposed port area in 1981 showing existing Gaathan in JNPA area

Piling work started for Jetty construction in 1986. Subsequently, the port was inaugurated by the then Chief Minister of Maharashtra, and the Former Prime Minister of India in 1989. Over three decades, JNPA has evolved its operational efficiency and improved its capacity handling to transform itself into a Port at par with global standards. Nhava Sheva International Container Terminal (NSICT) India's first privatized container terminal was commissioned in April 1999. In the year 2002 Twin-berth Liquid Cargo Terminal, jointly developed by BPCL and IOC on a BOT basis is commissioned. GTICT the third container terminal developed in 2006 by Gateway Terminals of India Pvt. Ltd. Nhava Sheva (India) Gateway Terminal (NSIGT), the second facility run by global port operator DP World in July 2016. The first phase of Bharat Mumbai Container Terminal (BMCT) – PSA Singapore Terminal was inaugurated by the Hon'ble Prime Minister at JN Port in 2018. Phase 2 of 4th

Terminal is being implemented. Representative images and locations of terminals are shown in Figure no 8.



1- JNPCT (1.5 M TEUs), May 1989



2- NSICT –DP World (1.2 M TEUs), April 1999



3- APMT-Maersk & CONCOR (1.8 M TEUs), Mar 2006



4- NSICT –DP World (0.8 M TEUs), Jul 2016



5- BMCT-PSA Singapore (2.4 M TEUs)-1stPhase, Feb 2018

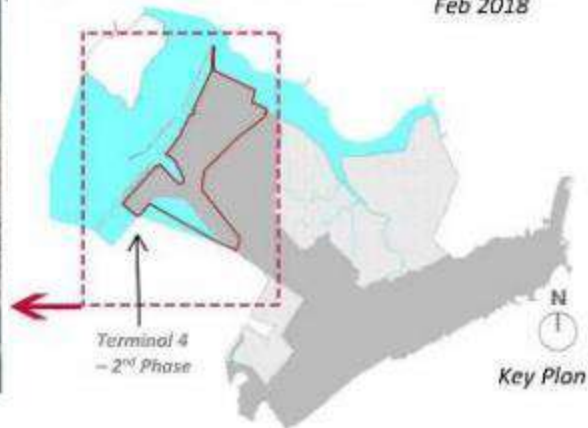


Figure 8 Map showing JN port terminals and representative images

1.5 Need for Land Use Zone Plan of JNPA

1) PGLM Guideline

As per the Policy Guidelines for Land Management 2014 (PGLM), issued to all major ports for implementation, every major port shall have a Land use plan covering all the land owned and/or managed by the Port. Such plans shall be approved by the Board and a copy would be forwarded to the Government. Any proposal for revision of land use plan shall be finalized by the Board only after considering the objections and suggestions received from the various stakeholders. Land use plan of major ports shall be reviewed by the Board at least once in every five years. In the competitive environment that the ports operate, continuous review of these guidelines is imperative.

2) Major Port Authorities Act, 2021

Recently, The Major Port Authorities Act, 2021 was published on 18th February 2021. The clause no. 25 and rule no. 8 of the said Act, gives necessary powers to JNPA Board, with respect to Planning and Development of port area and appurtenant land. The board is entitled to create specific land Use Plan in respect of any development or infrastructure established or proposed to be established within the port limits and the land appurtenant thereto, subject to the rules made under the said Act. Such Land Use plan shall be independent of any Local or state government regulations of any authority whatsoever. In case of conflict between the regulations made by the local authority and those made by Board, the Land Use plan created by the board shall prevail.

Land is one of the important resources with the Port Authorities to promote their business and accommodate the increasing traffic at the ports. As per the provisions contained in Sub-Section (1) of Section 34 of the Major Port Authorities Act, 1963, Ports are empowered to lease out land for a period up to 30 years and in case the period of lease is for more than 30 years, prior approval of the Central Government is necessary. To regulate allotment of land, the Ministry of Shipping has been issuing guidelines from time to time. The Land Policy Guidelines are applicable for all purposes provided under MPT Act 1963. Guidelines of Major Port Authority Act, 1963 and guidelines by central government specify the need for a GIS based land use plan.

2) Special Planning Authority status

At present CIDCO is the Planning Authority and Development Plan for Navi Mumbai is applicable to entire JNPA area except JNPA SEZ Area (277.38 ha) which is declared as a SPA by Maharashtra Govt by notification no. TPS-1717/612/CR-219/17/UD-12 dated 20/12/2017. JNPA area is not detailed out in Navi Mumbai Development Plan.

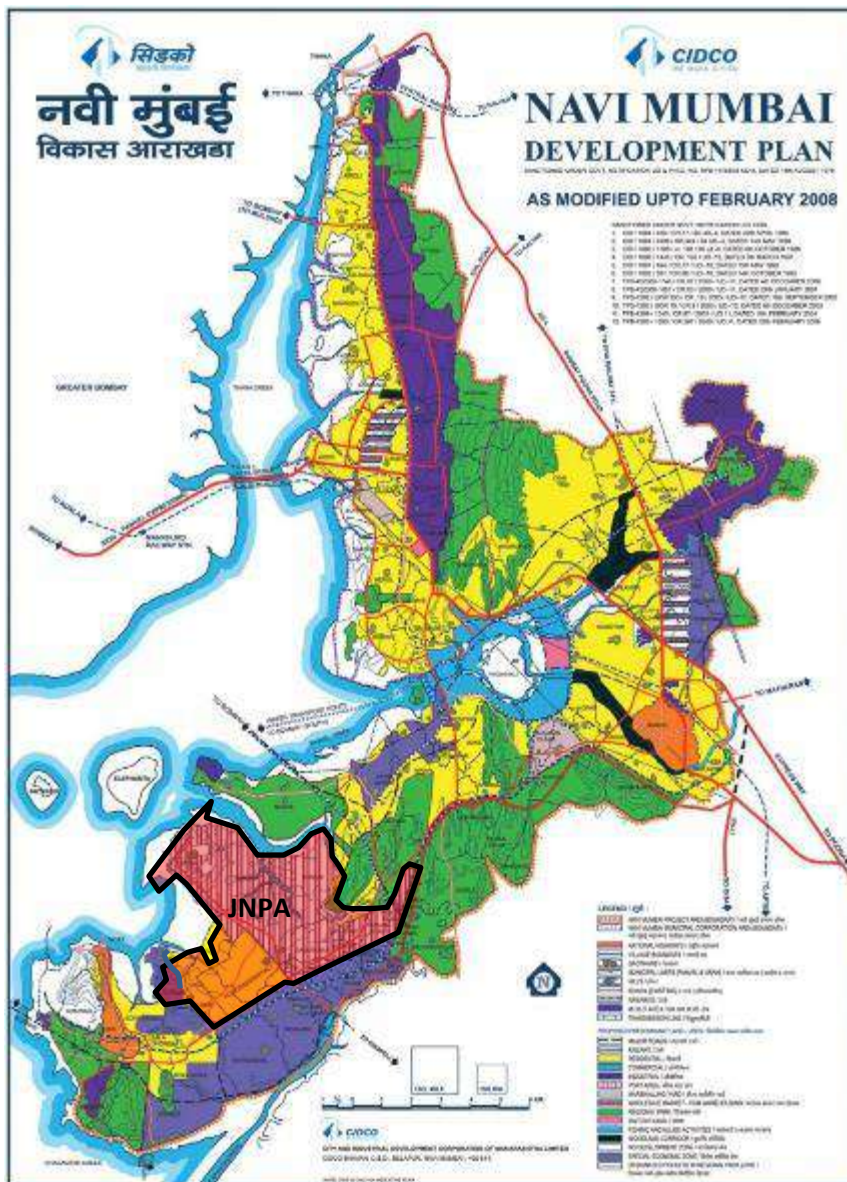


Figure 9 JNPA area in Development plan of Navi Mumbai

CIDCO is a planning authority for areas which are leased by CIDCO. JNPA land acquisition is exception to above as JNPA land is not leased by CIDCO. JNPA had requested to Urban Development department, Govt of Maharashtra for 'Special Planning Authority' under sub section (1B) of section 40 of MR & TP Act 1966 for the area under its jurisdiction vide letter dated April 15th ,2019. JNPA earlier referred as JNPT is termed as 'Authority' for its jurisdiction vide The Major Ports Authorities Act, 2021 which came in force from 3rd November 2021. JNPA is now empowered to prepare and sanction the proposals for development within its jurisdiction.

3) Independent DCPR

As per notification dated 02/12/2020, JNPA is excluded from Unified Development Control Regulations (UDCR), thus there is a need to prepare a separate regulatory framework supported by an independent DCPR and Zone Plan for JNPA. For development of vacant lands and redevelopment of JNPA Township and Business centers there is a need of

independent regulations with an aim to pave path for guided development. An independent legal plan and DCPR will facilitate sale and development of land parcels in JNPA. As per sub section (1B) of section 40 of MR & TP Act 1966, the existing planning authority's (CIDCO) DCR are applicable till JNPA becomes a SPA.

1.6 Vision, Aim and Objectives

VISION

To develop JNPA as a globally recognized modern port city.

This can be achieved by promoting industries, tourism and economic activities, preserving natural environment and promoting quality urban space, all to provide an even better quality of life to the residents of the region. Fundamentally, there are three working components of the above vision statement:

1. Economic development
2. Environmental conservation
3. Development of quality urban space

The vision statement provides a sound basis for formulation of goals and objectives which provide a framework for the Land-use Plan.

AIM

To develop JNPA area in a planned, integrated and sustainable manner, using planning authority status with an independent DCPR.

OBJECTIVES

- 1) To prepare GIS Based Land Use plan for the next 20 years horizon for optimum utilization of land within JNPA area, reviewed every 10 years.
- 2) To assess the infrastructure requirement of “ port-city” and prepare a plan which is equitable, sustainable and includes public participatory planning approach.
- 3) To efficiently integrate transportation network with land Use Planning.
- 4) To integrate ecologically sensitive areas in the proposed planning.
- 5) To create an image of a “port city” by incorporating Urban Design guidelines.

1.7 Scope and Approach

JNPA appointed Voyants Solution Private Ltd for Updation and validation of Existing Land Use map, Proposed Land Use plan and for preparation of independent Development Control Promotion and Regulations for JNPA entire area under its jurisdiction. The approach adopted for the study is as under -

Step 1: Preparation of GIS Based Existing Land Use map

Base Map was prepared on the basis of encroachment drawing data provided by JNPA with delineated Boundary. In addition to it, Cadastral maps, Revenue records, Plans from NHAI, railways and CIDCO were obtained. All the base layers of road, rail, bridges, culverts, natural drains, surface water bodies, Transport nodes, ecologically fragile areas, water supply lines, drainage lines, bus stops parking, DFC rail track, Central parking plaza, petrol pump, gas

pipes, High tension lines, Gaothan boundary, existing buildings and port area, were included in the Base Map. Administrative layers showing SEZ boundary and village boundaries are included in the existing Land Use map. Data collection through primary source such as visual survey, Inspection, personal interview/dialogue and ground truthing was carried out. The draft Existing Land Use map incorporating the Land Use features from satellite interpretation and revenue records were taken up for ground verification.

Step 2: Existing situation study and analysis

Determining the key indicators for Land suitability analysis, by evaluating and grouping of particular land areas based on their suitability for a defined use.

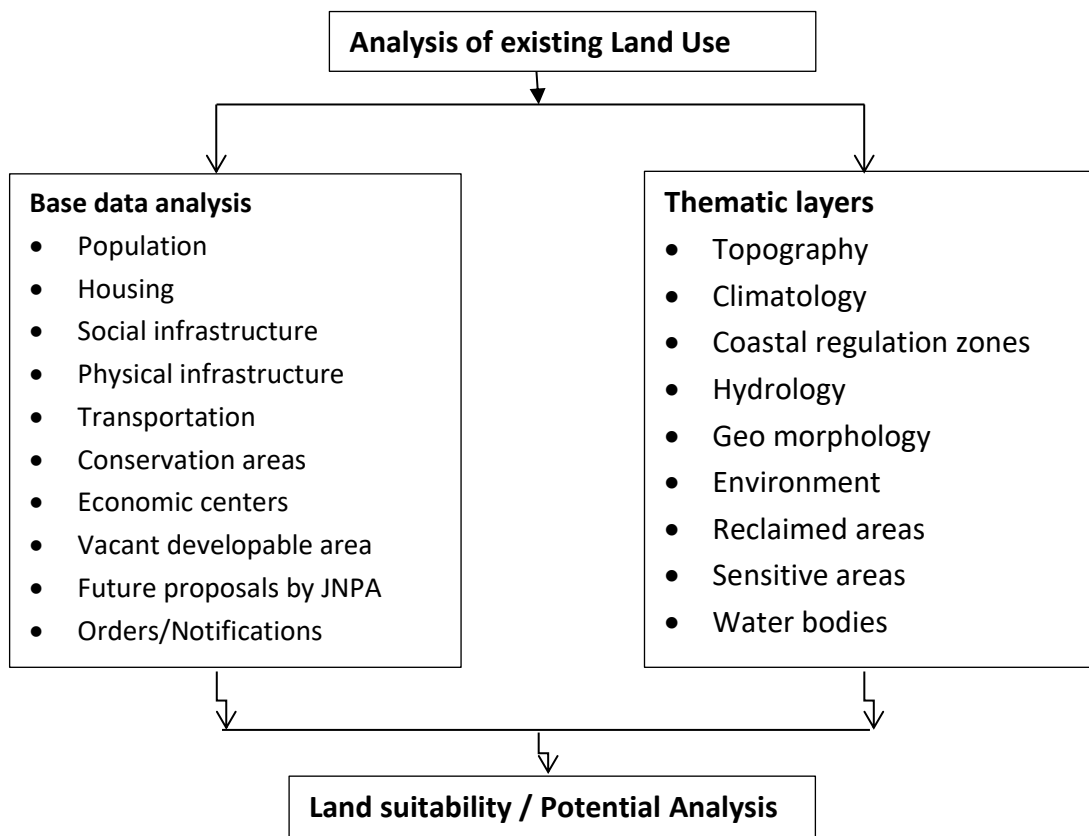


Figure 10 Indicators for land suitability analysis

Step 3: Gap assessment

Estimation of the carrying capacity of each of the indicator such as social infrastructure, physical infrastructure, transportation, environment in terms of existing population verses the capacity required as per standards has been identified. Also considering the Land Use % breakup for a port town as per URDPFI, the gap assessment for existing Land Use is carried out.

Step 4: Projections

Projections based on the proposed resident and working population have been made for 20 years including projections for every five years. Analysis and projections of future requirements have been carried with respect to various activities. Most of the important decisions about land uses and services such as housing, open spaces, education, healthcare, commercial, traffic, demand for water, power and waste

disposal facilities and possible recreational demands, have been derived from projected population estimates.

Step 5: Proposed Land Use plan strategy

The land suitability analysis has been used to identify the most appropriate spatial pattern for future land uses according to specific requirements and preferences of some activity. Development strategy is prepared from the analysis of the situation, focusing on nodes development, key infrastructure, transport links, industrial development and conservation of ecologically fragile areas and restoration of other natural features. Devising institutional mechanisms for implementation of the plan in phased manner.

Step 6: Meeting with key stakeholders

Conducted consultation meetings and presentation with JNPA officials and stakeholders.

1.8 Previous efforts

- 1) The first detailed project report for JNPA port was prepared by Howe (India) Pvt Ltd in 1981 in which alternative sites for JN Port were studied and finally project study was narrowed down to the current location at Sheva. The port developed based on the master plan and traffic projections done in the report. The consultants submitted report indicating traffic forecast upto year 1993.
- 2) JNPA had appointed consortium Ernst & Young LLP (E&Y) and Tata Consulting Engineers Limited (TCE), Mumbai as Advisors in 2012 to assist them in implementation of the proposed SEZ in the port vicinity on EPC mode. The project advisors revalidated the market demand projected in 2008-2009 and also prepared a Conceptual Master plan. Subsequently JNPA prepared Detailed Master plan along with Engineering Design in 2015.
- 3) Recently as part of augmentation the port's handling capacity and improve its efficiency, AECOM was appointed and they prepared a master plan in August 2016 to be implemented in three phases with deadlines of 2020, 2025 and 2030 respectively.

Phase 1 till 2020: Restricting the JNPA yard for optimal yard utilization, integrated common rail yard, deepening and widening of JNPA -Mumbai channel and infrastructure for JNPA Special Economic Zone.

Phase 2 till 2025: The second phase involves completing the second of the fourth container terminal on public private partnership (PPP) model. Currently this project is under construction.

Phase 3 till 2035: Phase three aims to having a new multipurpose cargo terminal on Uran mudflats, terminals in Nhava creek, the second phase of additional liquid bulk terminal and setting up a fifth container terminal at panvel creek. All of them are under PPP model. If these three phases are completed, JN port, India's second largest container port in terms of volumes handled would add 66.3 million tonnes per annum.

- 4) Subsequently a comprehensive Land Use plan report was prepared by Alia Consulting solutions Pvt Ltd in 2017, which did not go to the JNPA board.

- 5) Latest, M/s Team One Architects India Pvt Ltd was appointed as Master planning consultants to prepare Land Use Plan for JNPA in December 2019. The Land Use plan was presented to the JNPA management and HOD's in November 2021. The same was not placed to the board. It was advised to get the Land Use plan validated and reviewed from other Master Planning consultants. Also, it was felt advisable to synchronize the proposed Land Use plan with GIS based mapping being done by MRSAC for JNPA.

1.9 Benchmarking case study of port cities

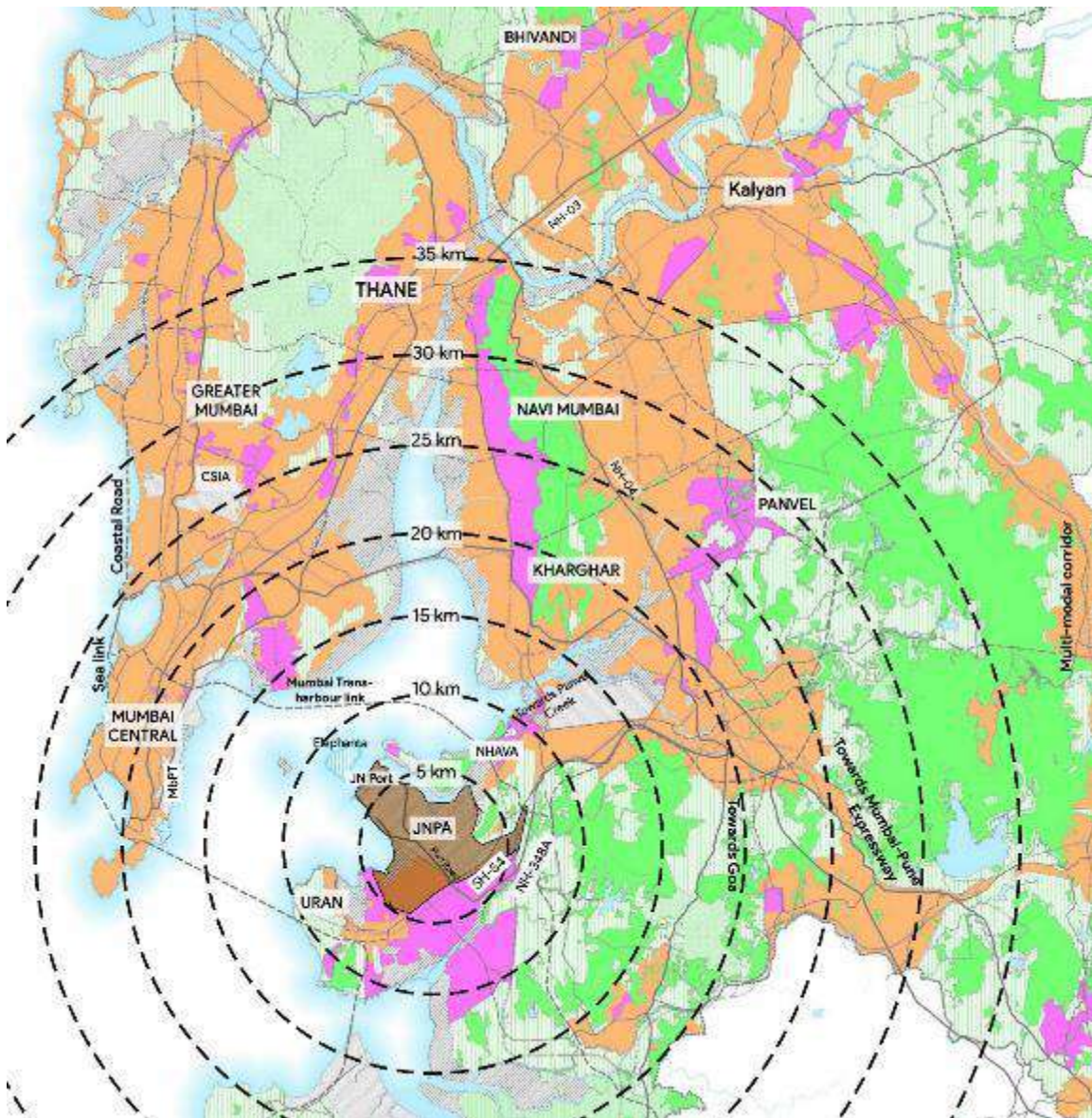
To evaluate best practices of national and international port cities, case study report was prepared. The same is enclosed as Annexure I. The matrix would help to understand the positioning of different ports and short list the best practices suits to the requirements of the proposed project. It would behave as an analytical tool following parameters such as -

General, Economy, Port Planning and Land Use, environment, and public facilities. Macro and micro level strategies adapted by these international or national ports can be used as models that can be implemented or looked upon.

CHAPTER 2 –PROJECT PROFILE

2.1 Regional Context

JNPA is part of Navi Mumbai and well connected by roadways. It is approachable from various regions in Mumbai Metropolitan Region, such as Mumbai suburban, Thane, Kalyan, Panvel and Khopoli etc by well-developed road network. It is accessible to Mumbai Island city through seaways too. JNPA is around 15 km from Navi Mumbai and 35 km from Mumbai city by road. Upcoming proposals like suburban Nerul – Uran rail link, Mumbai Trans Harbour Link (MTHL) and Navi Mumbai International Airport will reinforce accessibility to the site in coming years. Figure 11 shows the radial distances of various regions from JNPA.



Source: Proposed Land use, Draft Mumbai Metropolitan Regional Plan 2016-36

Figure 11 Map showing regional connectivity with respect to JNPA area

2.2 Connectivity

The JNPA is strategically located in terms of accessibility to hinterland by road, rail, air and sea. Figure 12 shows the hinterland connectivity to JNPA site.

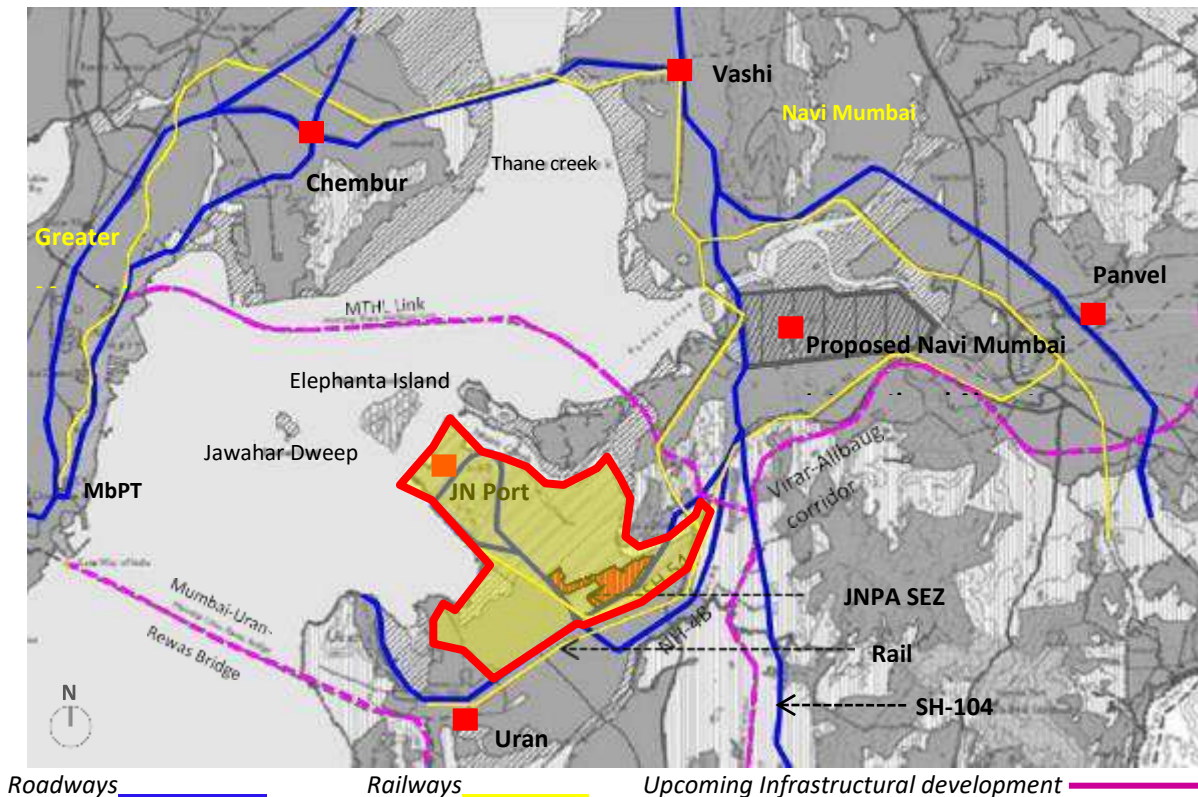


Figure 12 Map showing connectivity to JNPA Area

2.2.1 Road

- Site is accessible from Belapur, Navi Mumbai via NH-348 A (old SH 54) and from Panvel via NH – 348 (old NH-4B). From Uran, site is accessible via Uran-Panvel highway. JNPA is well connected to Sion-Panvel highway, Mumbai – Pune Expressway NH 4 & Thane.
- The port is approximately 7 km from NH-348 and NH-348A junction and is directly accessible via NH-348 .
- Proposed Mumbai Trans harbor Link (MTHL) across the Thane Creek, starting from Sewri in Mumbai, terminates at Chirle village on NH-348.

2.2.2 Rail

- The site is in close proximity to the proposed Seawoods Darave - Uran railway link. Proposed Uran railway station is at 4 km from the site. The nearest proposed suburban station Dronagiri is at 600m from JNPA Township main gate.
- JNPA rail siding is located south of SEZ across NH-348 A. Nearest rail head is Jasai which is 2 km from the site. Jasai station yard deals with all container traffic to and fro from JN port.

- The Dedicated Freight rail corridor (DFC) is planned along Delhi Mumbai Industrial Corridor and is terminating at JN Port. This will help to reduce total logistic cost to the hinterlands in Northern part of India and expand the capacity and reduce traffic at JNPA.

2.2.3 Water

- JNPA is approachable by sea through regular ferry services from Gateway of India jetty and Dockyard Road jetty of Greater Mumbai.

2.2.4 Air

- At present, the site can be reached by air through Mumbai International Airport, which is at approximately 45 km distance from the site.
- The proposed Navi Mumbai International Airport is in vicinity of approximately 12-15 km. JNPA will have advantage of speedy movement of airborne cargo through proposed airport.

2.1 Land Availability

Land was acquired for port from 12 villages. It included private, government and salt pan lands. The Government of Maharashtra through the Government Gazette dated 24th May 1971, 28th Dec 1972, 4th Jan 1973, 11th Jan 1973, 28th Sep 1972 and 24th Aug 1972 acquired land of the villages Sonari, Jaskhar, Sawarkhar and Karal in Uran taluka and handed over to CIDCO. Thereafter, CIDCO handed over the land in these villages to JNPA on 16th Jan 1984. Therefore, JNPA is the absolute owner and possessor of the vacant land. The issues related to rehabilitation and resettlement of the project affected persons are dealt by JNPA for total land of the project. Therefore, JNPA is absolutely seized and possessed of and is well and sufficiently entitled to develop the Area.

2.4 Area of Intervention

The intervention area consists of 12 villages, Taluka.Uran, District Raigad. Figure no 13 shows villages in JNPA area. The total area falling under JNPA Boundary is 3370.64 Ha out of which 277.38 Ha is notified and sanctioned as JNPA SEZ. Thus, the net land area remaining for development is 3093.26 Ha. The total area of the village that comes under the JNPA boundary is 2933.39 Ha in which 58 Ha has settlements and the area of reclaimed land for port activity is 400 Ha. Table no 1 shows detail breakup of land area within JNPA jurisdiction. Table No 2 shows the land area break up of Gaothans within village boundaries. Detailed description of Gaothans is given in chapter 3.

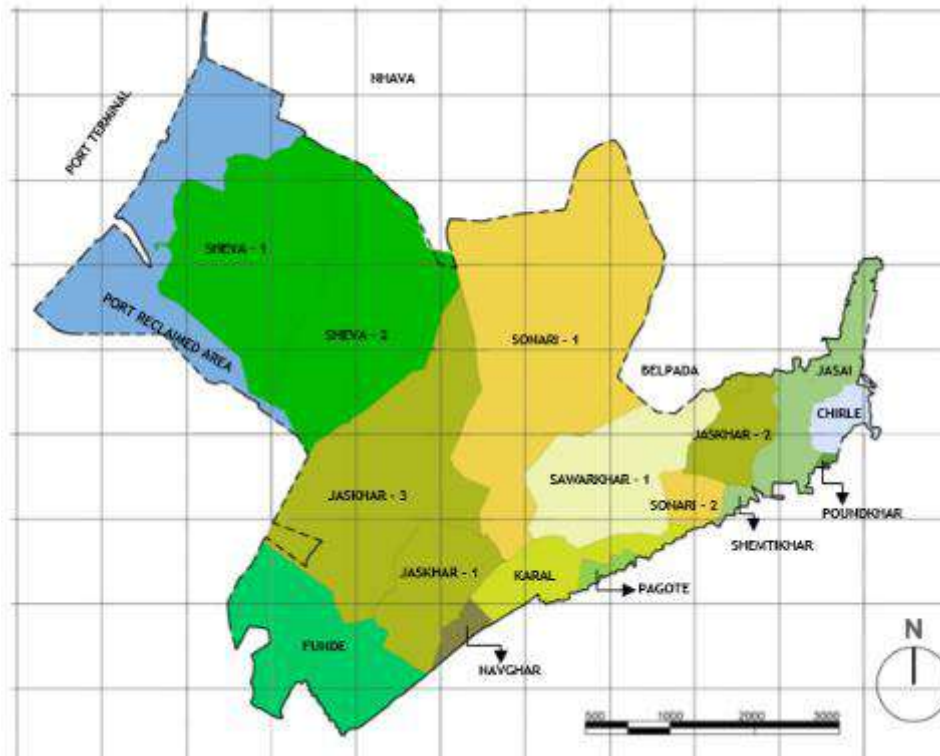


Figure 13 Map showing Twelve village boundaries and reclaimed port land

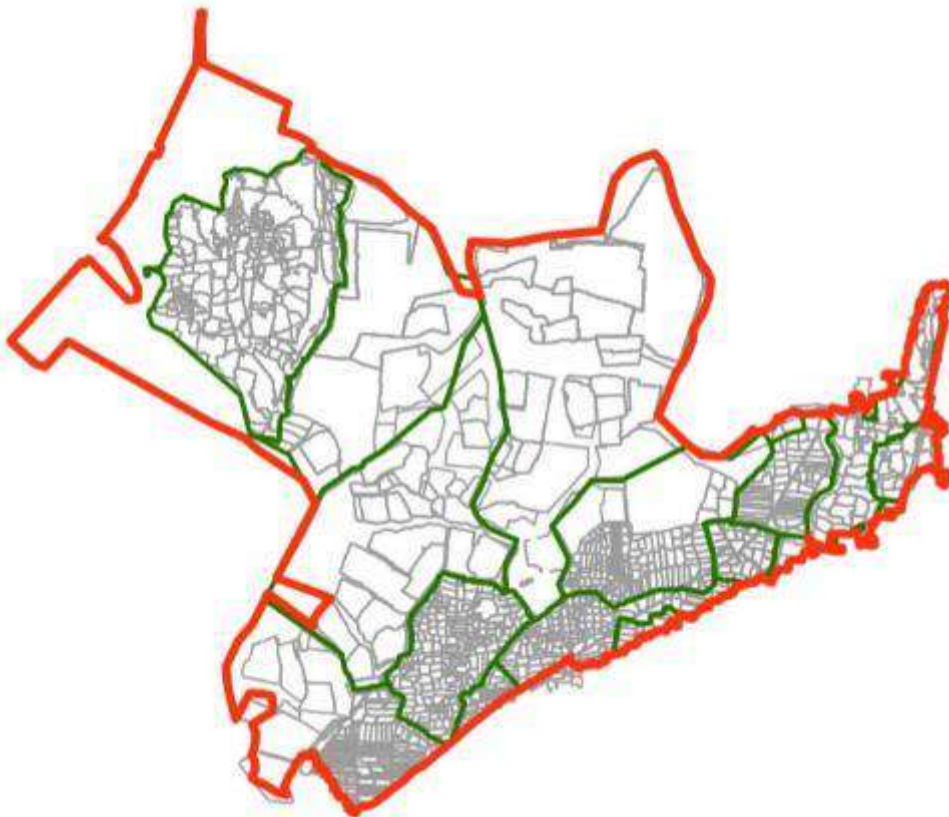


Figure 14 Map showing village survey boundaries within JNPA

Table 1 Land area breakup of areas within JNPA

S.No	Village	Area (In Ha)
1	Sheva	711.11
2	Funde	240.17
3	Jaskhar	684.15
4	Sawarkhar	267.21
5	Sonari	724.50
6	Karal	103.65
7	Pagote	13.73
8	Jasai	134.92
9	Poundkhar	36.10
10	Navghar	13.79
11	Chirle	3.21
12	Shemtikhar	0.79
	Total area in villages	2933.39
	Reclaimed land	400
	Area within Jurisdiction of JNPA	3370.64
	Notified JNPA SEZ SPA	277.38
	To be notified for SPA	3093.26

Table 2 Gaathan wise land area statement

Sr No	Gaathan	Original Boundary (in Ha)	Extended Boundary (in Ha)
1	Jaskhar	4.78	20.46
2	Karal	1.22	30.85
3	Sawarkhar	1.59	
4	Sonari	2.06	
5	Jasai	1.82	10.79
6	Ranjanpada Village	0.59	
7	Ekatghar	0.08	
	Total	12.16	62.10

2.5 Site Characteristics

2.5.1 Topography

The highest level of the site is at 45m above the sea level, on Sheva hill. Overall, the site is predominantly flat land with natural drainage is towards north west and north east as seen in Figure 15. Site snapshots showing nature of topography is seen in Figure 16.

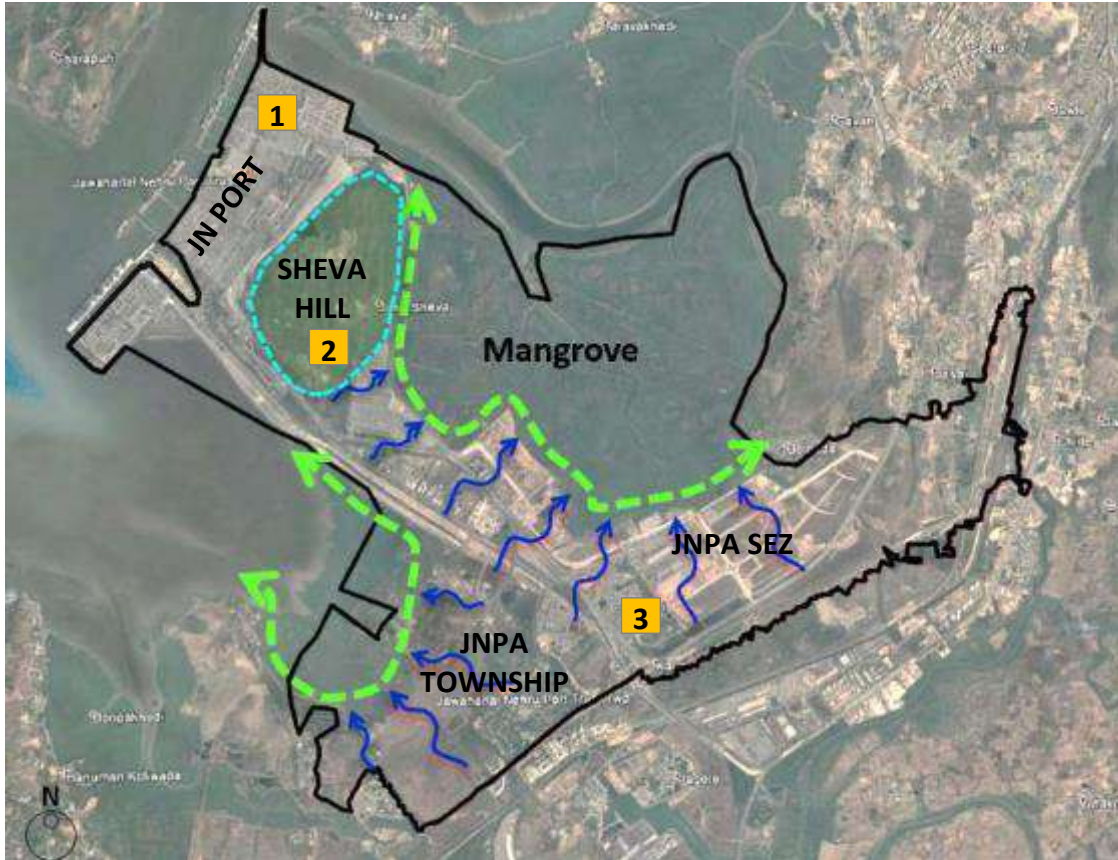


Figure 15 Map showing site topography and natural discharge



Figure 16 Site section showing general topography



1. Port area



2, Sheva hill



3. Flat land

Figure 17 Snap shots of topography within JNPA area

2.5.2 Soil conditions

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 with thickness varying from 2 m to 7 m, the same in the Uran mudflat area is much higher at about 15 to 20 m. (Source: AECOM 2016 Report on JNPA Master plan).

2.5.3 Climate

The region experiences a tropical monsoon climate with regular seasonal rains and has four distinct seasons as follows:

- Monsoon season (June to September) - This is the main rainy season with the highest number of rainy days. The main features of this season are very high humidity, low clouds and several spells of moderate to heavy rains.
- Post-monsoon season (October to November) - The frequency of severe cyclonic storms is the highest during this season.
- Winter season (December to February) - The main features of this season are fine weather and occasional morning mist or fog.
- Summer season (March to May) - This season is also referred to as the “pre-monsoon” season. During this season the sea level atmospheric pressure and wind systems gradually get disrupted prior to the setting-in of the south west monsoon. A rise in air temperature with incidence of thunderstorms and cyclonic storms during the latter part of the season are the main features.

a) Temperature

The site falls under tropical climate. Due to influence of sea, the temperature undergoes little seasonal fluctuation. May is the warmest month of the year. On an average, the temperature during summer varies from 23.4°C to 34.7°C. Although temperature as high as 40°C can be reached occasionally. January is the coldest month, and on average varies from 18°C to 24°C. The humidity is often high in the months when the temperature is at its peak. The sea water surface temperature ranges from 24°C in the coldest month (January) to 29°C in the hottest month (May).

b) Rainfall

The average rainfall in season months (June to September) for last 10 years (2010-2020) is 1265 mm. The highest monthly rainfall recorded in 2020 was 1175 mm in the month of August, while lowest was 1.8 mm in the month of March. Figure 18 shows average rainfall on season months. The maximum relative humidity was 86% during August, while the minimum is 44% during February.

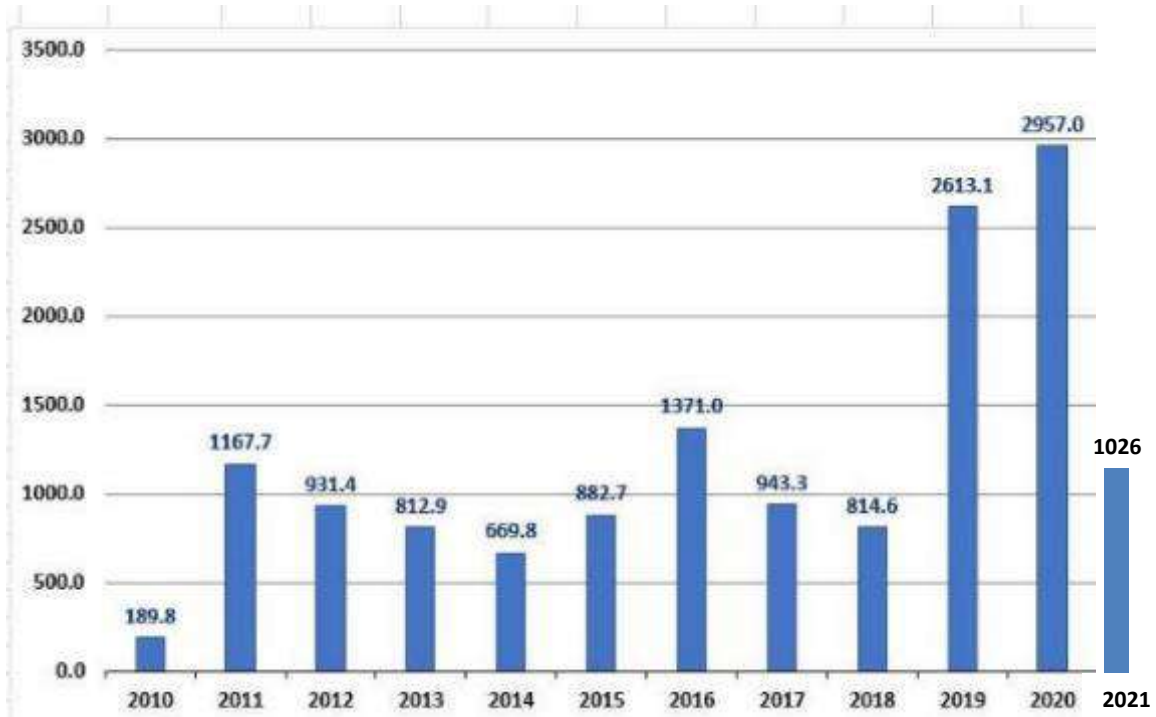


Figure 18 Average rainfall in season months

c) Wind

The region generally experiences a regular seasonal variation and is predominantly subject to the influence of the south-west monsoon winds lasting from the middle of June till about the end of September. Where after fair weather sets in. The prevalent direction of wind is from the North West to SW direction during May to September months and from North East to South West during October to March. Winds are generally moderate, but there is an increase in wind speed during monsoon months. Maximum wind speed recorded was 16.1 km/hr in July and minimum was 6.6 km/hr in December. (Source: Sagarmala final report vol 4).

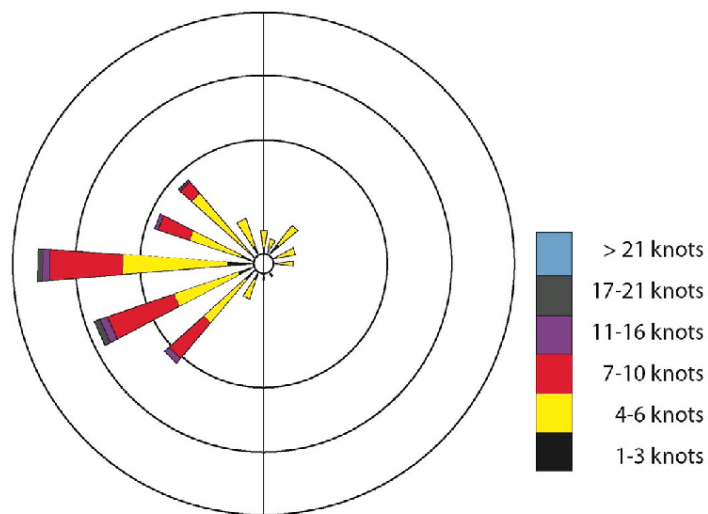


Figure 19 Wind Rose diagram

d) Cyclone

The cyclones generally occur in the period of May/June or October/November. The last severe cyclonic storm was experienced in 1982 at the port location. Occasionally, sudden high winds also occur during the fine weather period from northeast. (Source: Sagarmala final report volume 4).

2.5.4 Natural features



Figure 20 Map showing natural areas in JNPA

JN port's ecosystem consists of rich and diversified flora and fauna. Out of the total land available with JNPA around 34% is under green cover including mangroves. JNPA has a network of natural drains and ponds. The drains are connected to the adjoining creeks. Due to urbanization and general growth in surroundings the drains have been encroached and few of them run through the settlements. Water natural collection ponds are present on Sheva hill and surrounding area. Manmade ponds are present in most of the goathans. The Sheva hill is the largest natural and manmade green open space available in JNPA. Rest of the natural areas are covered with mangroves and fall in coastal regulation zone. Figure 20 shows the nature of natural area in JNPA.



Creeks and mangroves



Natural area around Sheva hill near JN Port



Natural water collection pond

Figure 21 Snapshots of natural areas in JNPA

2.6 Demographic Profile

2.6.1 Population

The residential area in JNPA comprises of - Five gaothans viz: Sonari, Karal, Sawarkhar, Jashkhar and Ranjanpada , JNPA township and Airforce township. Paundkhar has a group gram panchayat of padas named as Ekatghar, Ranjanpada and Surgpada. Figure 22 shows the existing residential settlements in JNPA.

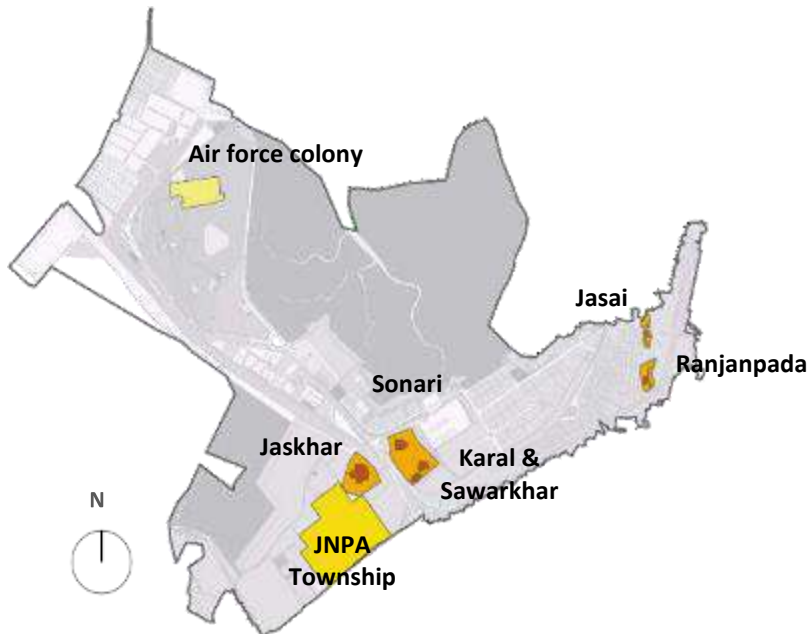
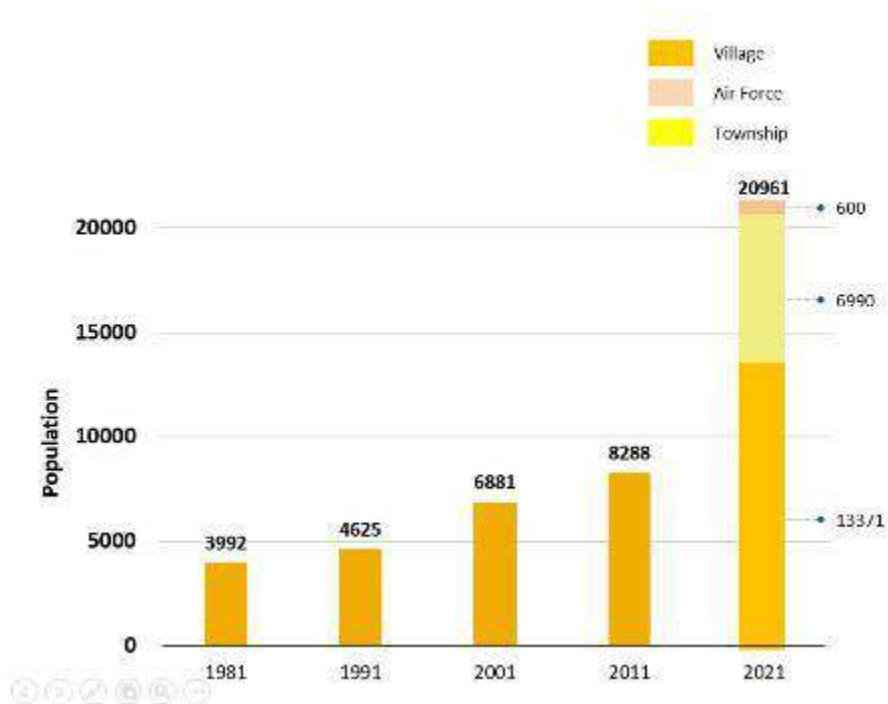


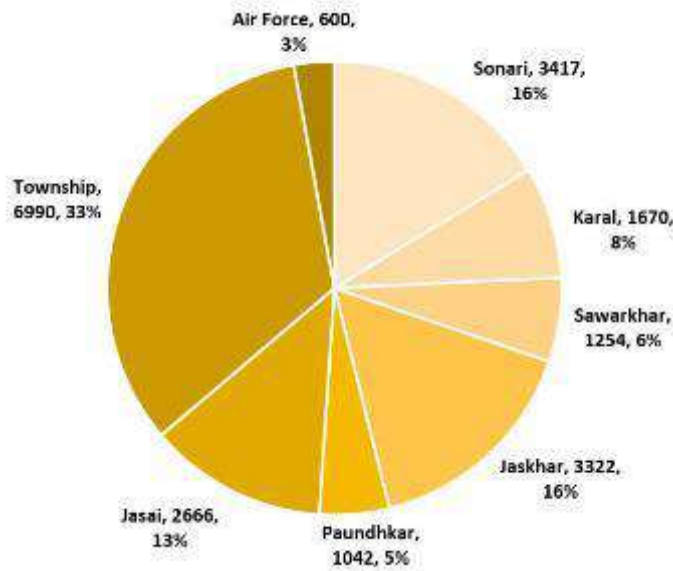
Figure 22 Key map showing existing residential settlements



Source: Census (1981 – 2011) and Anganwadi (2021)

Figure 23 Existing resident population growth in JNPA

According to the 2011 census, the resident population of goathan in JNPA is 8288, which has increased to 13371 in 2021 (Source: Primary survey). Thus the total residential population in 2021 of JNPA jurisdiction is 20961 i.e 21000, which includes the goathan, JNPA Township, and Air force. Six villages make up the 64% of the Total residential population of the JNPA area followed by Township and Air Force with 33% and 3% respectively. Figure 24 shows village wise decadal population growth of goathans in JNPA.



Source: Anganwadi, Township office, and Air Force official.
Source: Census (1981 – 2011) and Anganwadi (2021)

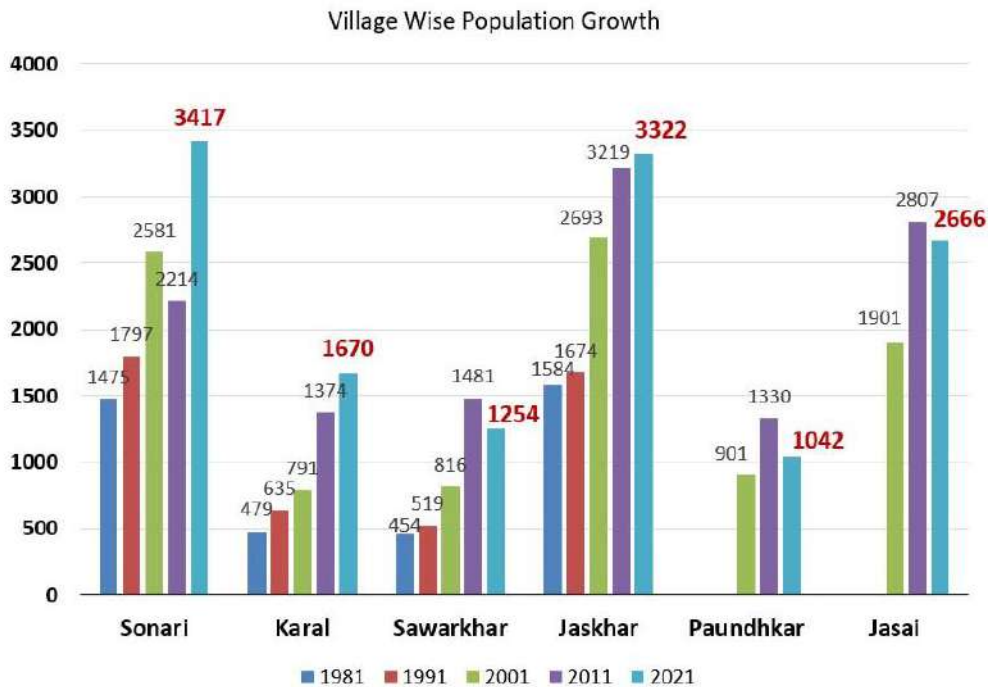


Figure 24 Village wise Goathan population (1981 – 2021)

2.6.2 Population Growth

The decadal growth rate of the JNPA gaathan has increased in 2011-2021 from 20% to 61% due to the Covid-19 pandemic. The following chart shows the trend of the decadal growth rate of gaathan.

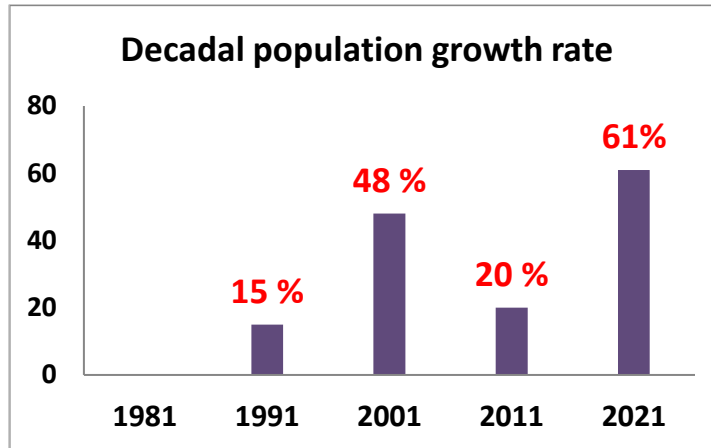


Figure 25 Decadal growth rate of Gaathan

It is observed that the decadal growth rate of villages from 1991 to 2021, Karal, Jaskhar and Sonari have shown a positive growth rate. Whereas Sawarkhar & Ranjanpada has experienced reverse migration.

2.6.3 Population Density

The population density in the goathans is more than that in the JNPA township due to the nature of development. The population in township is static and decreasing. The Goathan Population density has increased marginally from the last decade as seen in Figure 26. Village wise number of households as per 2011 census are given in Figure 27. It is observed that Jashkhar (832) has the highest number of households among all the goathan followed by Sonari (510).

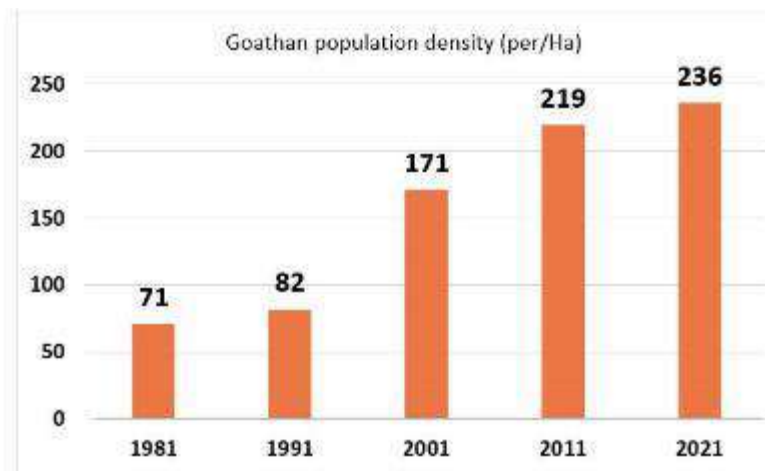


Figure 26 Population density trend in per/Ha

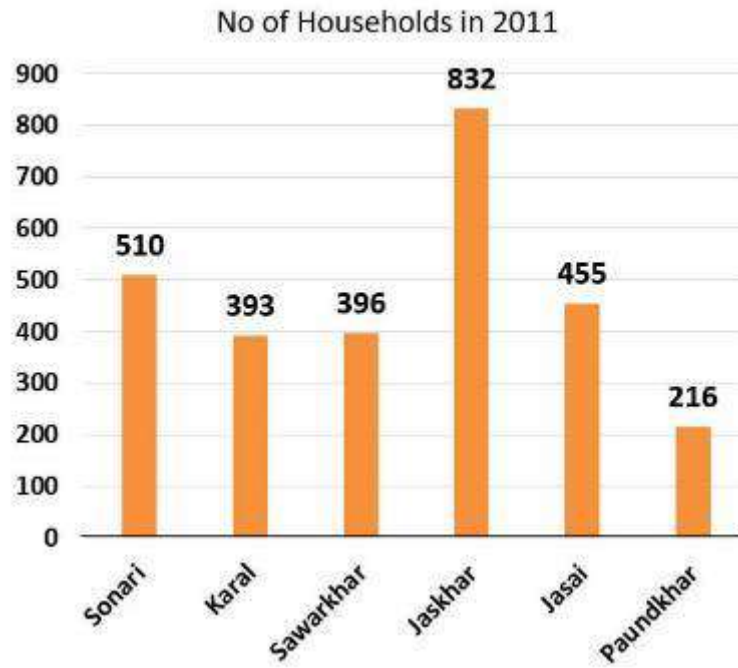


Figure 27 Village wise number of Households in 2011

2.5.4 Sex Ratio

The average Sex ratio of State and National level for 2011 census, is 909 and 902 respectively. Sonari has the highest sex ratio of 959 which is higher than the state averages as well as the national average. Karla, Sawarkhar and Jashkhar, goathan Sex ratio is lower than the national and state average as shown in Figure 28.

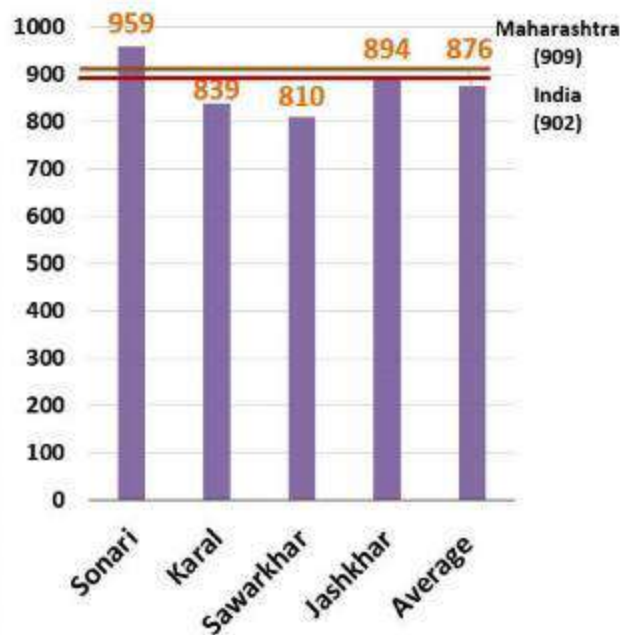


Figure 28 Sex ratio of Goathan

2.5.5 Literacy Rate

The average Literacy rate of the JNPA Goathan is 77.2% which is lower than the Maharashtra state average i.e., 80%. The literacy rate of the Sonari (80.4%) is higher than both the average i.e., State average, and the national average (69.3%). Karal, Sawarkhar, Jashkhar's literacy rate is lower than the state average as shown in Figure 29.

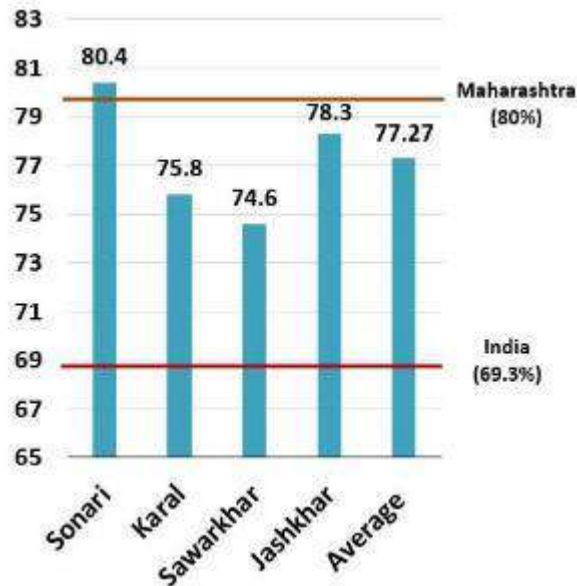


Figure 29 Literacy rate of Goathan

2.5.6 Working Population

According to 2011 census, Figure 30 shows the working and non-working population as per 2011 census. Sonari has the maximum working population of all the Gaathan.

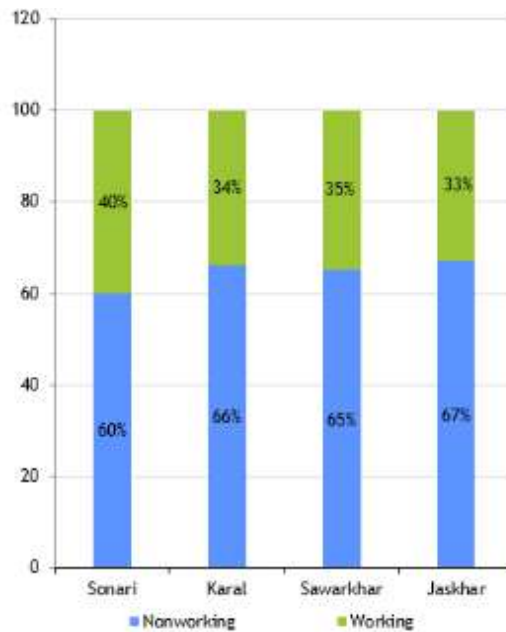


Figure 30 Village wise working and non-working population, 2011

The existing employment within JNPA is 10025 which includes Port terminal workforce, JNPA Administration and Training center, CISF, Custom, PUB and tank farms staff. Table No 3 shows existing employment breakup in JNPA.

Table 3 Existing employment in JNPA

Working areas	Occupants
CISF	500
Custom	50
Admin + TC	1500
Custom + PUB	500
2 terminals	1500
2 terminals	1500
CPP	4075
Tank Farms	400
TOTAL	10025

2.7 Development around JNPA

The Jawaharlal Nehru Port Authority (JNPA) is primely located in and around upcoming development projects. The upcoming infrastructure development projects around JNPA will serve an ease in getting both skilled and unskilled work force from Mumbai and Navi Mumbai. Systematic planning, integration, and development of new employment centers within JNPA with the upcoming development will play a vital role in utilizing maximum potential of available land for development.

JNPA development will have access to the following up-coming multi-modal infrastructure projects thus adding a greater value to JNPA including port area. Refer Figure no 31 showing upcoming projects around JNPA and representative images of the same.

- Navi Mumbai International airport,
- Dedicated Freight Corridor (DFC) rail corridor,
- Mumbai Trans-harbor road link(MTHL),
- Virar-Alibaug Multimodal corridor,
- Navi Mumbai Coastal Road by CIDCO,
- Seawoods Darave to Uran Railway connectivity,
- Development of Dronagiri node by CIDCO,
- Integrated Logistics Park by CIDCO
- Mumbai Uran Rewas sea Bridge (Ref: Mumbai Metropolitan Regional plan 2036)

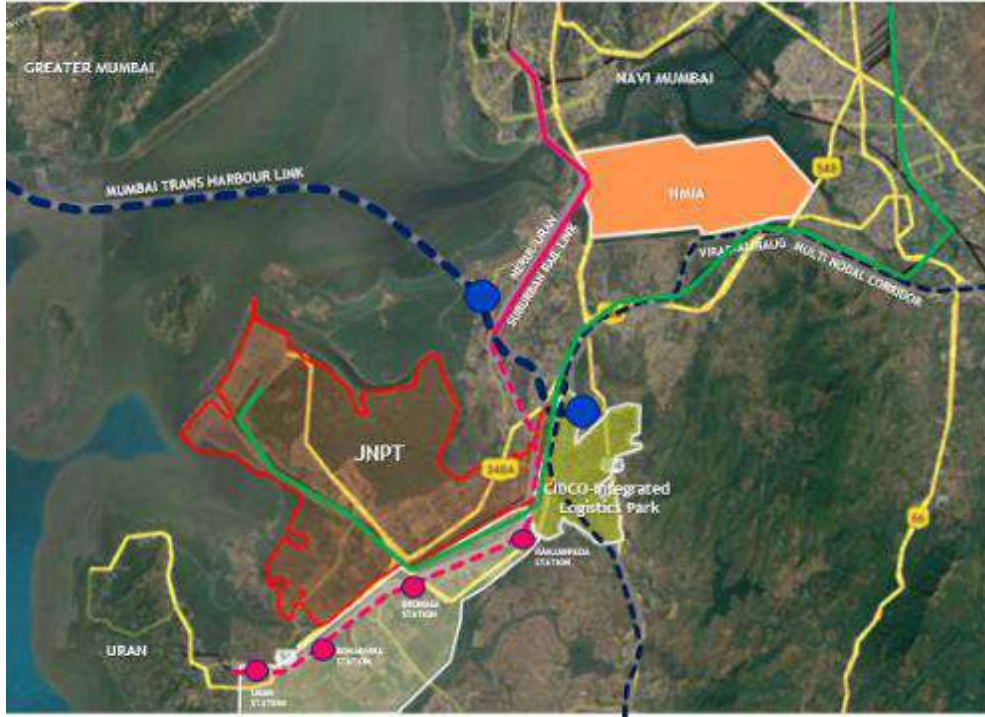


Figure 31 Map showing upcoming projects around JNPA



Navi Mumbai International airport



Dedicated Freight Corridor (DFC) rail corridor



Mumbai Trans-harbor road link(MTHL)



Virar-Alibaug Multi modal corridor



Seawoods Darave to Uran Railway connectivity



Navi Mumbai Coastal Road by CIDCO



Development of Dronagiri node by CIDCO



Development of Ulwe node by CIDCO

Source: Secondary Source.

CHAPTER 3 –EXISTING SITUATION ANALYSIS

3.1 GIS Base Map preparation and Data Collection

Methodology adopted to achieve the GIS based Land Use Plan for JNPA is as under:

Procurement of Data and Maps-

Procured cadastral data from Uran Tahshil such as village maps. Drawings such as project boundary, existing structures survey including utility network, port area and CRZ data was provided by JNPA. Necessary Maps/ drawings for other areas in JNPA was collected from CIDCO and NHAI.

Create a digital basemap-

Relevant necessary information was collected and stitched together. Base map included of Base layers: road, rail, transportation nodes, drainage and drains, surface water bodies, existing vegetation and administrative boundaries: Village boundary, Port boundary, Airforce boundary, SEZ boundary and whole JNPA boundary. A georeferenced up-to-date basemap was prepared and cross verified through overlay of satellite image and cadastral map as shown in Figure 32

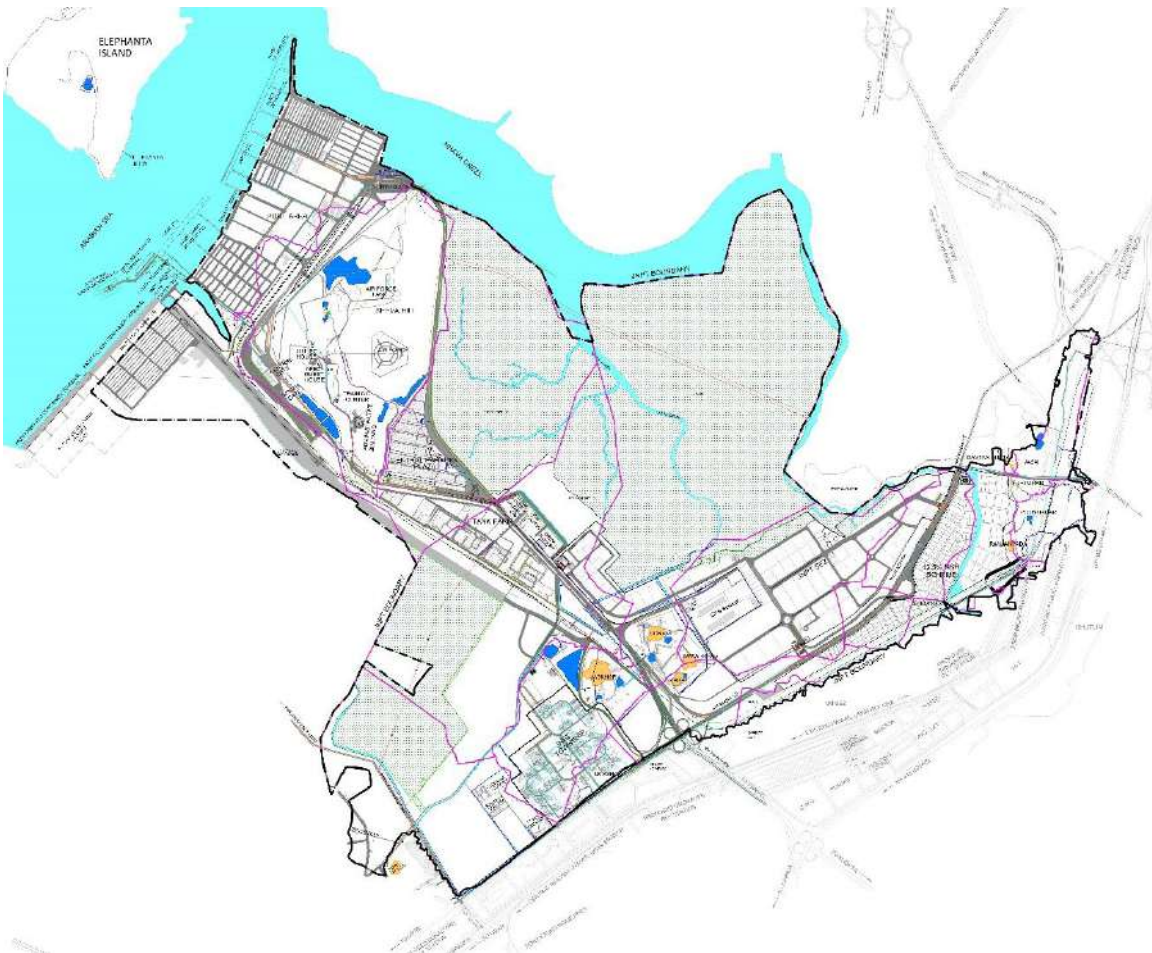


Figure 32 Base map for JNPA planning

Base Map 2021 consists of following features –

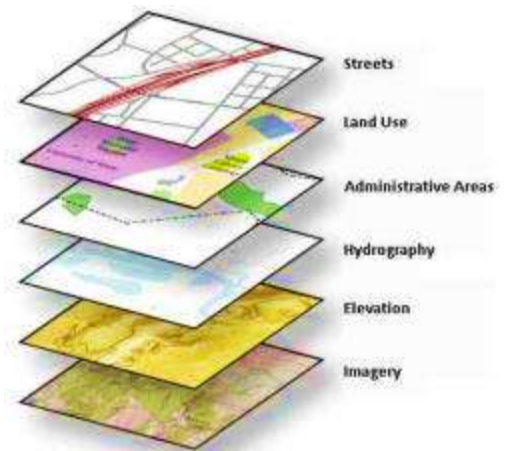
- JNPA Boundary
- Village Boundary
- Existing road and rail linkages
- Gaothan boundary with settlements
- Existing buildings and structures
- JNPA Township
- 12.5% R&R scheme
- SEZ area
- Creeks
- Natural drains
- Existing lakes
- Mangrove
- Port area
- Central Parking Plaza
- CFS - speedy
- Road junctions and islands
- Bridges and culverts
- Petrol pump, Public toilets
- Gas pipelines, oil pipelines, Water pipelines, HT lines, storm water drains

Research and field work-

The team carried field verification to gather additional data and for ground trothing of data and actual existing land uses on site.

Create thematic maps-

Combining data gathered in the field with other data, able to generate two thematic maps consisting of existing Land Use.



3.2 Existing Land Use Map

The Existing Land Use map is shown in Figure 33, which incorporates existing structures, JN Port area, JNPA township, Tank farms, road-rail transportation, parking areas, gaothans, air-force area, utility areas, natural drains, mangroves and barren land. Figure 33 shows the percentage Land Use break-up.

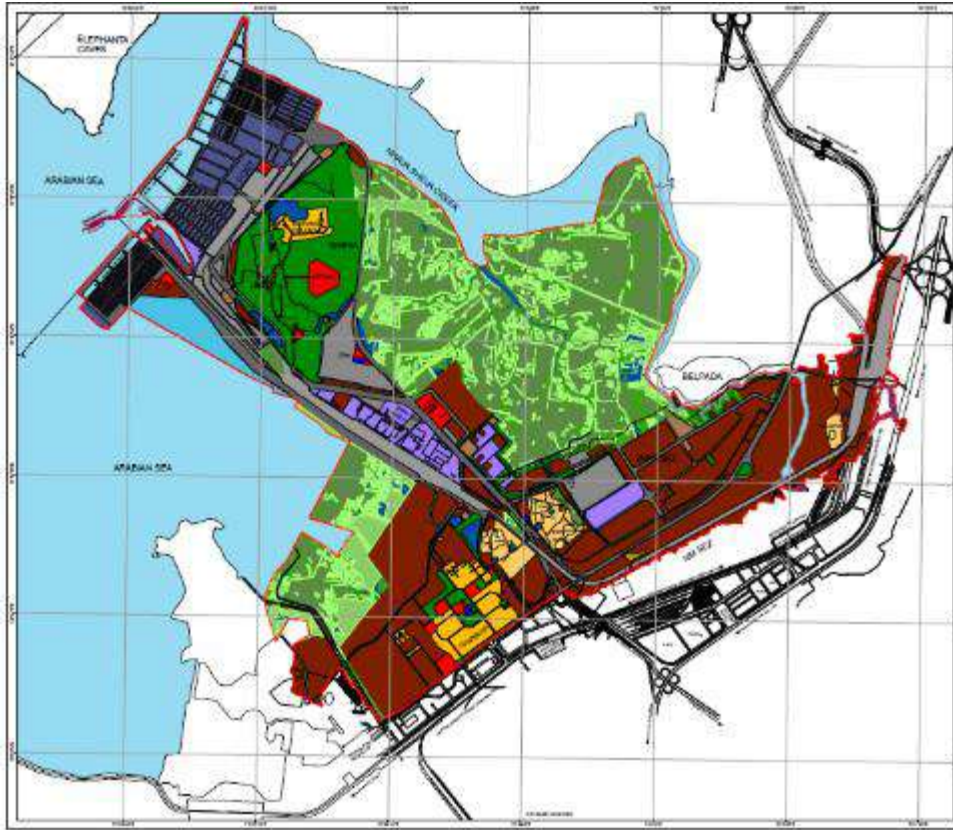


Figure 33 Existing Land Use map of JNPA

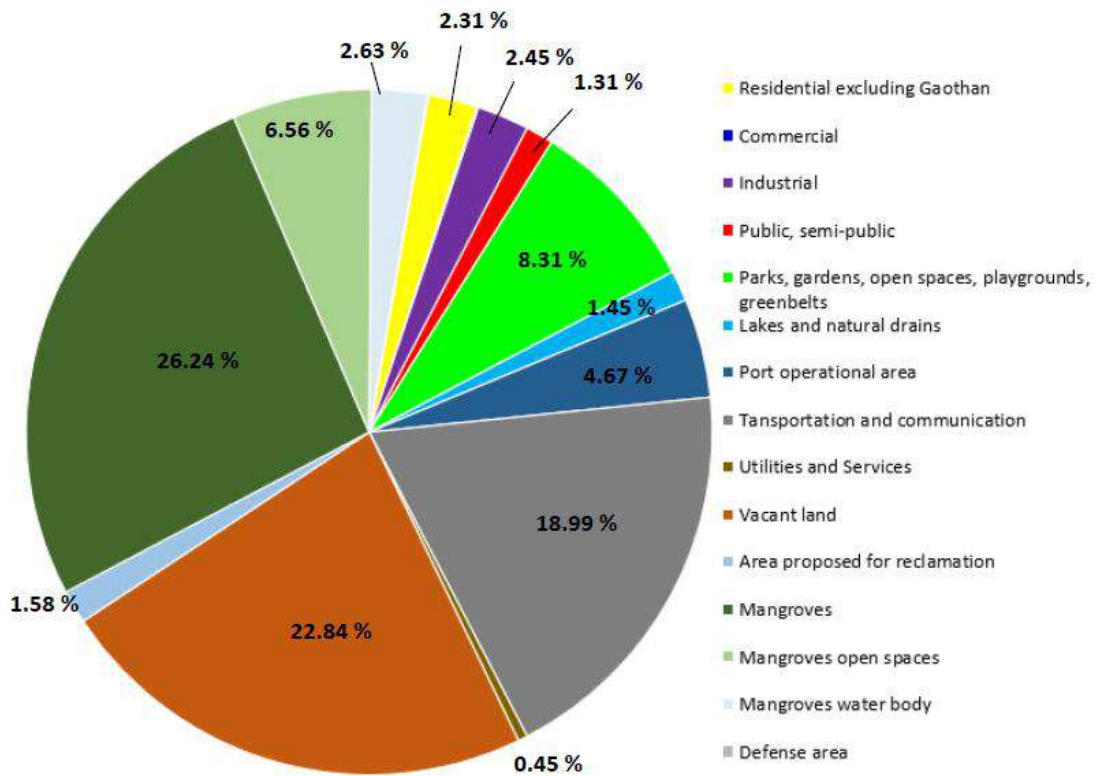


Figure 34 Pie chart showing percentage existing Land Use break up

Table 4 Existing Land Use area statement

Land Use	Area (in ha)	Total %
Residential excluding goathan	78.10	2.31
Commercial	2.87	0.80
Industrial	82.72	2.45
Public Semi-public	44.49	1.31
Parks, garden, open space, playground and green belt	280.17	8.31
Lakes and Natural drain	49.12	1.45
Port Operational area	157.55	4.67
Transportation and Communication	640.31	18.99
Utilities & Services	15.21	0.45
Vacant Land	770.17	22.84
Area under water body	53.48	1.58
Mangroves	884.66	26.24
Mangroves-Open Space	221.21	6.56
Mangroves-Water Body	88.93	2.63
Defense Area	1.65	0.04
TOTAL	3370.64	100

Commercial and Public Semi-Public accounts to 0.09% and 1.35% which compared to URDPFI Norms for the port city is too less and should be 3% and 6% respectively. Transportation and communication Land Use have an adequate area considering parking plots as well. Around 10.38 % land area is Vacant which excludes SEZ and 12.5% area, having potential for future planning and development. Almost 1194 Ha land under CRZ 1 out of which 884.66 Ha is under mangroves and 53.48Ha under Arabian sea which are non-developable. Existing Land Use Map is attached as Annexure II.

The various components of existing land use are categorized and described in brief as under -

3.2.1 JNPA Port

The existing Port Area of JNPA is 400 Ha. This zone includes Berthing area, container yards, container railway yards and Line, connectivity roads, liquid terminal and passenger Jetty. Major exports from Jawaharlal Nehru Port are textiles, sporting goods, carpets, textile machinery, boneless meat, chemicals and pharmaceuticals. The main imports are chemicals, machinery, plastics, electrical machinery, vegetable oils and aluminum and other non-ferrous metals. The port has four container terminals:

- 1) JNPCT operated by the JNPA port with a quay length of 680 m
- 2) NSICT operated on BOT basis by DP World with a quay length of 600 m and NSIGT operated on BOT basis by DP World with a quay length of 330 m
- 3) GTICT operated on BOT basis by a consortium of Maersk and CONCOR with a quay length of 712 m.
- 4) BMCT-PSA (1st phase) operated by PSA Singapore with a quay length of 2000m
- 5) JNPA Liquid Terminal operated by BPCL with a quay length of 300 m



Figure 35 JN Port area plan

Liquid bulk jetty is built and operated on BOT basis by BPCL on the southern side of GTICT. It is a twin berthing jetty with a 390 m berthing face on one side and 310 m berthing face at the rear. It can handle 85,000 DWT tankers at the front side and 30,000 DWT tankers at the rear. The locations of these berths along with their back-up areas are shown in the following Figure 35. Table no 5 provides details of various berths.

Table 5 JN Port terminal wise details

Source: JNPA

Terminal	Operator/ Terminal	Capacity (Million TEUs)	Number of Berths	Quay Length (m)	Container yard (in Ha)
JNPCT	JNPA	1.5	3	680	61.49
NSICT	DP World	1.2	2	600	25.84
NSIGT	DP World	0.8	1	330	27
GTIPL	APM	1.8	3	712	54.57
BMCT – Phase 1 & 2	PSA Singapore	4.8	6	2000	200
Liquid cargo Terminal	BPCL	7.2	2	300	-

**JNPCT Container Terminal**



NSICT



NSIGT



GTIPL



BMCT – Phase 1



Liquid cargo Terminal



Berth Terminal

Cargo yards

3.2.2 JNPA Township

JNPA township houses employee from Port and allied facilities having an area of 102 Ha. It is designed with wide roads, green open spaces and support facilities. It is located along Uran - Panvel road and is in close proximity to karal junction. It has two entry gates and is also accessible from north side through Uran-Sheva road. The township is planned with amenities like commercial plaza, Parks, Auditorium, Hospital, schools, etc. It consists of total 2019 residential units out of which 1300 are currently occupied. Present day population is 6692 with 66 persons/ha gross population density. The existing Land Use breakup of township area is given in Table No 6

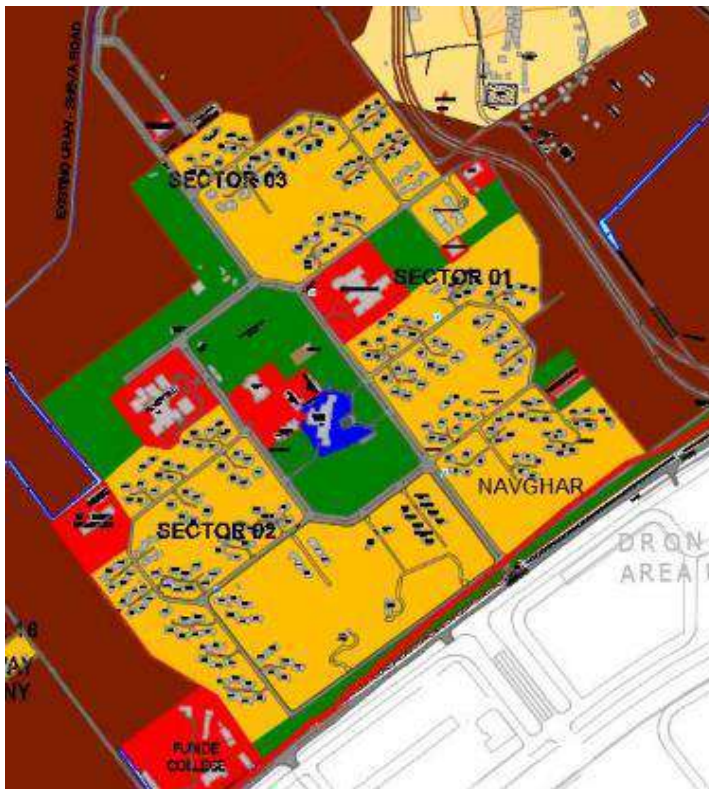


Figure 36 Existing Land Use map of JNPA Township

Table 6 JNPA Township Break up of Existing Land Use area statement

Sr. No.	Land Use	Area (in sq. mt.)	Area (in ha.)	%
1	Residential	539493	53.95	53
2	Commercial	9625	0.96	0.9
3	Open Space	186068	18.61	18
4	Public Semi- Public	83519	8.35	8
5	Barren Land	130142	13.01	13
6	Utilities	1003	0.10	0.1
7	Transportation	70691	7.07	7
	Total	1020542	102.05	100



Housing



Main Roads



Main entry gate



multi-Purpose Hall



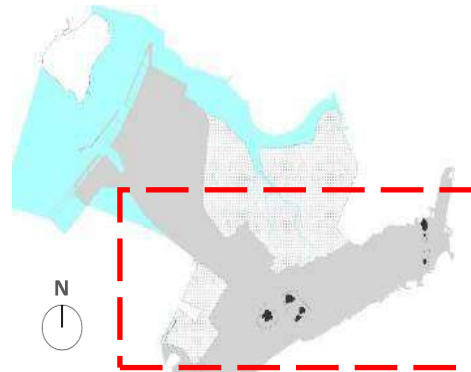
Open green area



Township Hospital

3.2.3 Goathan

JNPA comprises of six Gaothans viz Sonari, Karal, Sawarkhar, Jashkhar, Paundkhar, and part of Jasai. JNPA jurisdiction does not include goathan administrative area. Sonari, Karal, and Sawarkhar have a common extended boundary with social amenities like schools, temples, clinics. Jashkhar is located near the JNPA Township and has a nearby police station. Paundkhar is group grampanchayat which includes Ekatghar, Ranjanpada and Surgpada. Part of Jasai which falls in JNPA boundary consist of administrative buildings and few settlements. For social infrastructural facilities, people who stay in Ranjanpada and Ekatghar are dependent on Jasai village.



Key Plan showing goathans in JNPA

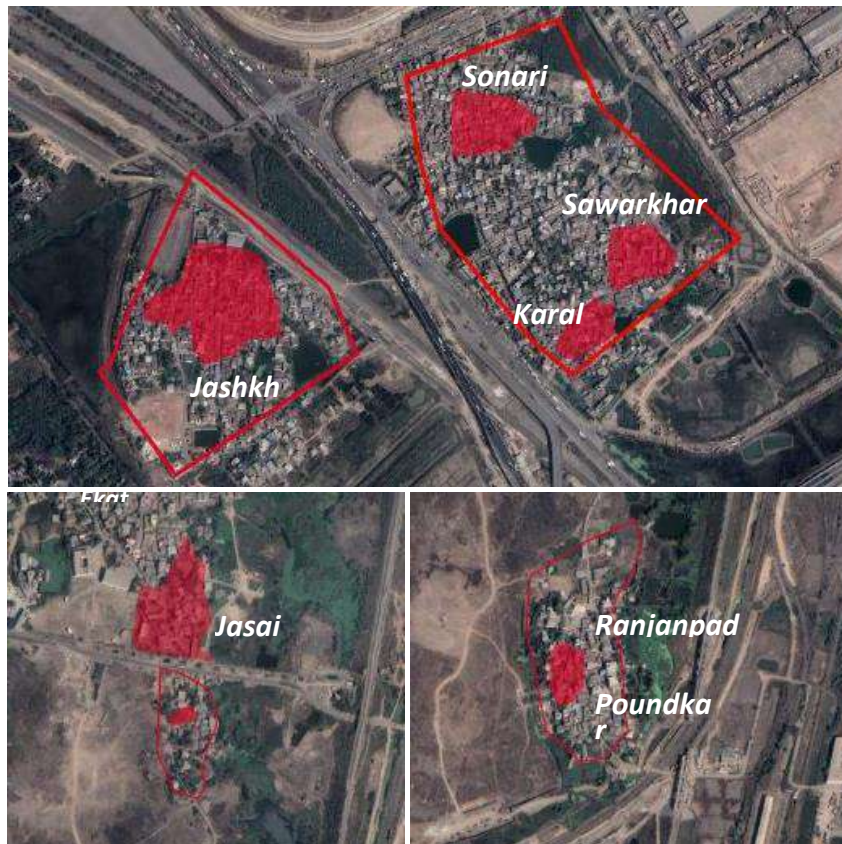


Figure 37 Goathans original boundary superimposed on present day expanse



Jasai



Jashkhar



Ranjanpada



Sawarkhar



Sonari

Figure 38 Site images of JNPA Goathans

3.2.4 JNPA SEZ

Jawaharlal Nehru Port Authority Special Economic Zone (JNPA SEZ) is the first of its kind major port-led industrial development project conceptualized by JNPA. It is an operational SEZ and it has received operational status from MoC&I on 24th June 2020. It is an initiative under “Sagarmala” National flagship policy of Ministry of Shipping aiming to strengthen the port connectivity, infrastructure and accelerate port-linked industrialization.

Admeasuring an area of 277.39 Ha, SEZ is located in Navi Mumbai and is at a distance of six kilometers from Jawaharlal Nehru Port. Being adjacent to a major resourceful port, this SEZ is expected to attract global majors and become a game changer for this region. The SEZ is situated in four revenue villages viz Sawarkhar, Karal, Sonari and Jaskhar, Taluka Uran, District Raigad. It is strategically located in terms of accessibility to hinterland by road, rail, air and sea. The site is approachable from various regions across Mumbai by well-developed road network. The site is about 15 kilometers from Navi Mumbai and 35 kilometers from Mumbai city by road. The major roads connecting site are SH 54 (old), NH 348A (new) and NH 4B (old), NH 348 (new). SH-54 serves direct access to the site. SEZ being located in close proximity to the upcoming infrastructure projects and growth centers with strong multi-modal connectivity. Thus, attracting skilled and unskilled labor from the hinterland.

Ministry of Commerce & Industry (MOC&I), Government of India granted formal approval for setting up a Multi-Product SEZ, in July 2014. JNPA has been declared as the developer of the same. Government of Maharashtra, Urban Development Department has appointed JNPA as the Special Planning Authority for the notified SEZ in December 2017. Necessary approvals such as Environment Clearance and Consent to Establish have been obtained. JNPA has received Electricity Distribution License from MERC.

Vide Government of Maharashtra notification dated 20th December 2017, JNPA was directed to prepare and publish the draft development proposal including the draft development control regulations for the said notified area and to submit the same to the state government for sanction after following due procedure prescribed under MR and TP Act, 1966. Thus, JNPA prepared the Draft Development Proposal for JNPA's SEZ under section 40 (3) (d) read with section 115 of the MR and TP Act, 1966, in consultation with a consortium of Master Planning Consultants M/s. Team ONE Architects India Pvt. Ltd. and Planitech Consultants. The draft development proposal was submitted to Director Town Planning, Pune in March 2021, along with hearing committee report for sanction. The Draft Development Proposal of JNPA SEZ which includes Existing Land Use Map, Proposed Zone Plan, Draft Development Control and Promotion Regulations and Draft Development Proposal Report is sanctioned by GOM vide notification No MAHBIL/2009/35529 dated 23rd

September 2021. SEZ is envisaged to generate an employment of 72,000 skilled and unskilled workers.

Notified Existing Land Use map of JNPA SEZ

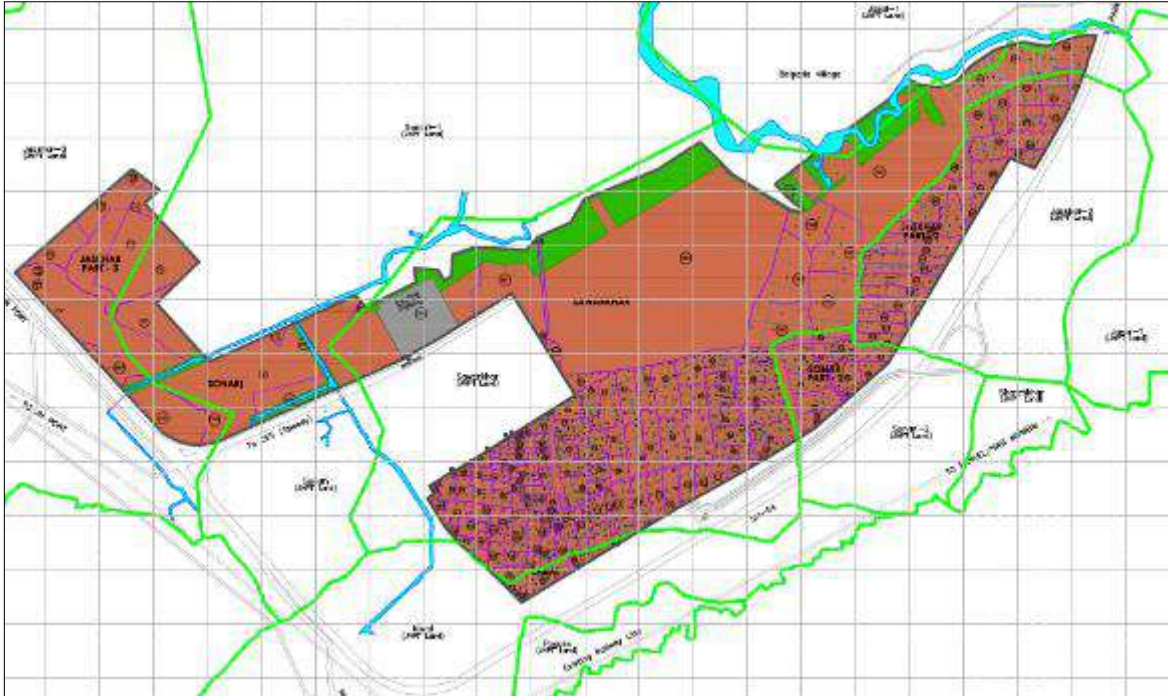
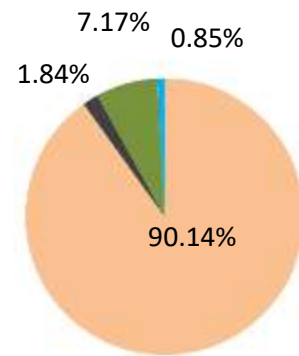


Figure 39 Existing Land Use Map of JNPA SEZ

Table 7 Existing Land Use area breakup

Sr no	Land Use component	Area (ha)	% of total area
1	Barren Land	250.02	90.14
2	Transportation (Parking)	5.10	1.84
3	Green	19.89	7.17
4	Drain	2.37	0.85
	TOTAL	277.38	100



The sanctioned Existing Land Use (ELU) map as seen in Figure 39 is prepared on the basis of available data with SPA and in conformity with revenue maps. The survey carried out by JNPA has been revalidated and used for documenting the existing features. The ELU consist of four uses viz, barren land, existing parking (Transportation), green and storm water drain. The land is predominantly barren. Existing truck parking is on the Northwest side, which is marked as Transportation use. The ecologically fragile areas and vegetation are shown in green use. Out of total 277.38 ha, 90 % of land is

barren and the remaining land falls under existing vegetation, storm water drain and parking use. The break-up of Land Use area is given in Table 7.

3.2.5 Central Parking Plaza

JNPA has constructed a centralized parking plaza (CPP) for tractor trailers as part of its efforts to promote ease of doing business. The parking plaza spread across 45 Ha and has a capacity to park 2,800 container trailers at a time. CPP commissioned in Jan 2020. JNPA is the only port in India which has planned for a facility of this scale and CPP is a key initiative to streamline the traffic movement and improve the port efficiencies using IT services, at the same time provide convenience facilities and amenities at very nominal rates to truck drivers who travel long distances to reach the Port. The plaza is managed using Real Time Parking Management system and has a Wi Fi provision within the premises. It has a dormitory for truck drivers to stay, canteen for providing food to truck drivers, well-maintained toilets, area for vehicle repair and maintenance, customs office and commercial building. There are three gates to the complex, manned with guards. The staff at each entry gate and entry lane guides the container trailers to respective lanes for entry formalities thus ensuring that the trailers don't have to wait in queue for entry.

There is a total footfall of 2200 drivers/day. An average per truck consists of driver mostly without a helper. An approximate distribution of parking spaces for each terminal is as JNPCT - 400, NSICT- 700, NSIGT- 280, GIT - 950 and BMCT - 500



Figure 40 View of central parking plaza

3.2.6 Tank Farm

The tank farm areas within JNPA are run by various operators. They have a storage capacity of 750,000 tones storing various liquid bulk products like POL, edible oil, and chemicals. It covers an area of approximately 57 ha including parking areas.



Figure 41 Tank farm area within JNPA

3.2.7 Green Area and water bodies

The viewing deck near Sheva hill is one of the attractive tourist points in Uran. The recently

constructed Shiv Samarth Memorial and Museum near Uran-Dastan phata will create a public space marker. Dhobi ghat in Ranjanpada village is an existing social gathering space that has chances to enhance and make it a transitional public place.



Sheva Hill



Salt water lake near STP



Dhobi Ghat, Ranjanpada



Sheva hill surrounding area

3.2.8 Vacant land

The vacant land in JNPA constitutes of 22.84% of total land area. Majority of the vacant land is free of encumbrances and can be approached by existing and proposed roads. They vary from sizes from minimum 2 Ha to 100 Ha. Majority of the vacant land is free of encumbrances and can be approached by existing and proposed roads. Total 365 ha of vacant land (10.38%) is available for development free of CRZ and excluding 12.5% R&R scheme and SEZ land. Figure 42 shows a map covering all available vacant lands. Table 8 gives the total land area break up which includes area

falling in CRZ and available area free of CRZ. The optimum use of vacant land in the proposed Land Use plan is crucial for overall development of the JNPA.

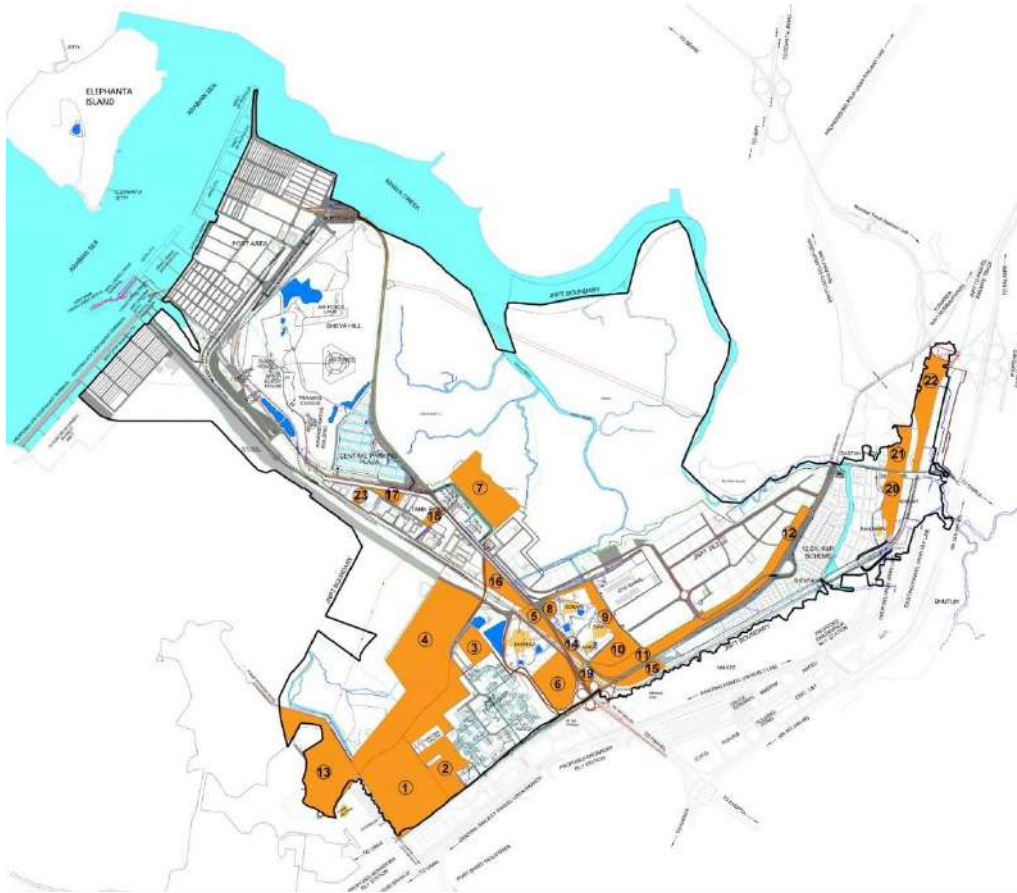


Figure 42 JNPA map showing vacant land parcels

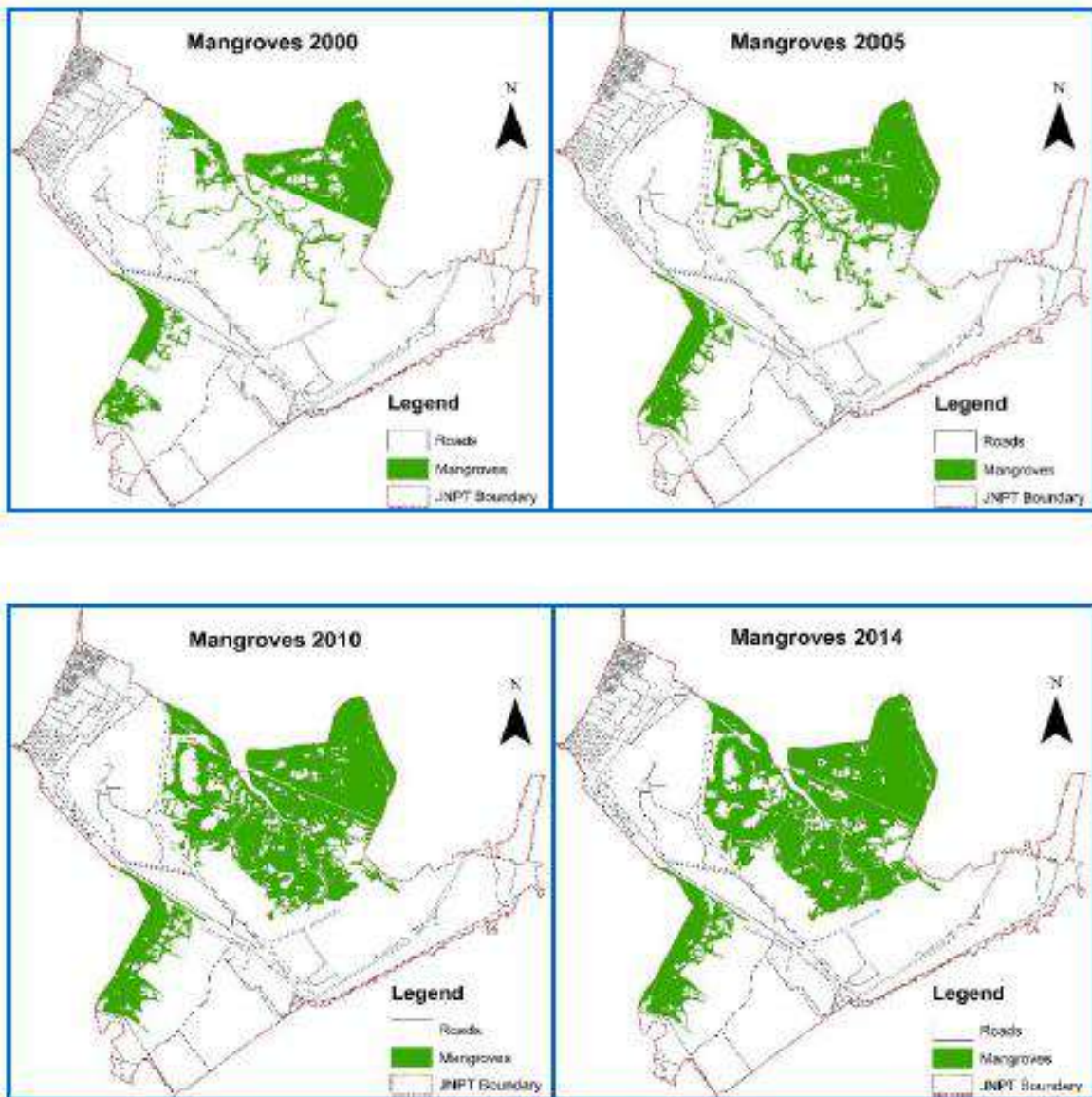
Table 8 List of Vacant land parcels in JNPA

Vacant Parcel ID	Description	CRZ Category(In Ha)			Vacant Land Area In Ha (Free of CRZ category)	Total Parcel Area(In Ha)
		CRZ IA (50 Mtr Mangrove Buffer Zone)	CRZ IB	CRZ II		
1	Near Funde	N.A	6.41	3.5	52.3	62.21
2	Near Customs & Railway Quarters	N.A	5.08	N.A	37.18	42.26
3	Behind SWM facility	N.A	N.A	N.A	9.7	9.7
4	Along Uran Sheva Road	N.A	1.06	24.21	78.07	103.34
5	Near Karal village	N.A	2.87	0.75	1.55	5.17
6	At clover leaf junction	N.A	4.82	N.A	15.52	20.34
7	PUB	5.06	N.A	10.03	20.5	35.59
8	Near sonari Village corner	N.A	0.72	2.1	0.56	3.38

9	Near Speedy CFS	N.A	2.82	5.75	0.53	9.1
10	Near Karal internal road	N.A	0.84	2.48	7.63	10.95
11	Strip along SH54	N.A	N.A	N.A	20.01	20.01
12	Strip between SEZ and SH54	N.A	N.A	N.A	12.28	12.28
13	NMISEZ panje	N.A	N.A	8.27	40.16	48.43
14	Karal parking	N.A	N.A	N.A	2.44	2.44
15	Parking SH54	N.A	N.A	N.A	6.51	6.51
16	Triangle near tank farm	N.A	N.A	N.A	8.79	8.79
17	parking tank farm1	N.A	N.A	N.A	2.84	2.84
18	parking tank farm2	N.A	N.A	N.A	2.28	2.28
19	Karal adjoining clover leaf	N.A	N.A	N.A	1.74	1.74
20	Ranjanpada	N.A	N.A	N.A	11.24	11.24
21	Jasai	N.A	N.A	N.A	9.59	9.59
22	Jasai tip of JNPA boundary	N.A	N.A	N.A	21.47	21.47
23	Tank Farm plot no 4	N.A	N.A	N.A	1.66	1.66
	TOTAL	5.06	24.62	57.09	364.55	451.32

3.2.8 Mangroves

Within JNPA boundary there are significant number of Mangroves. These mangroves have grown in due course of time in the past decade. There are 2 types of mangroves that have been observed and categorized them as per their density. One is dense mangroves that are there for more than past 2 decades and are of significant ecological importance. The other ones are sparse mangroves which came up later and have unfilled vacant land parcels in between them. Figure 43 shows growth of the same over a period of time.



Source: Allia Consultants Proposed Landuse Master plan report

Figure 43 Status of Mangroves from 2000

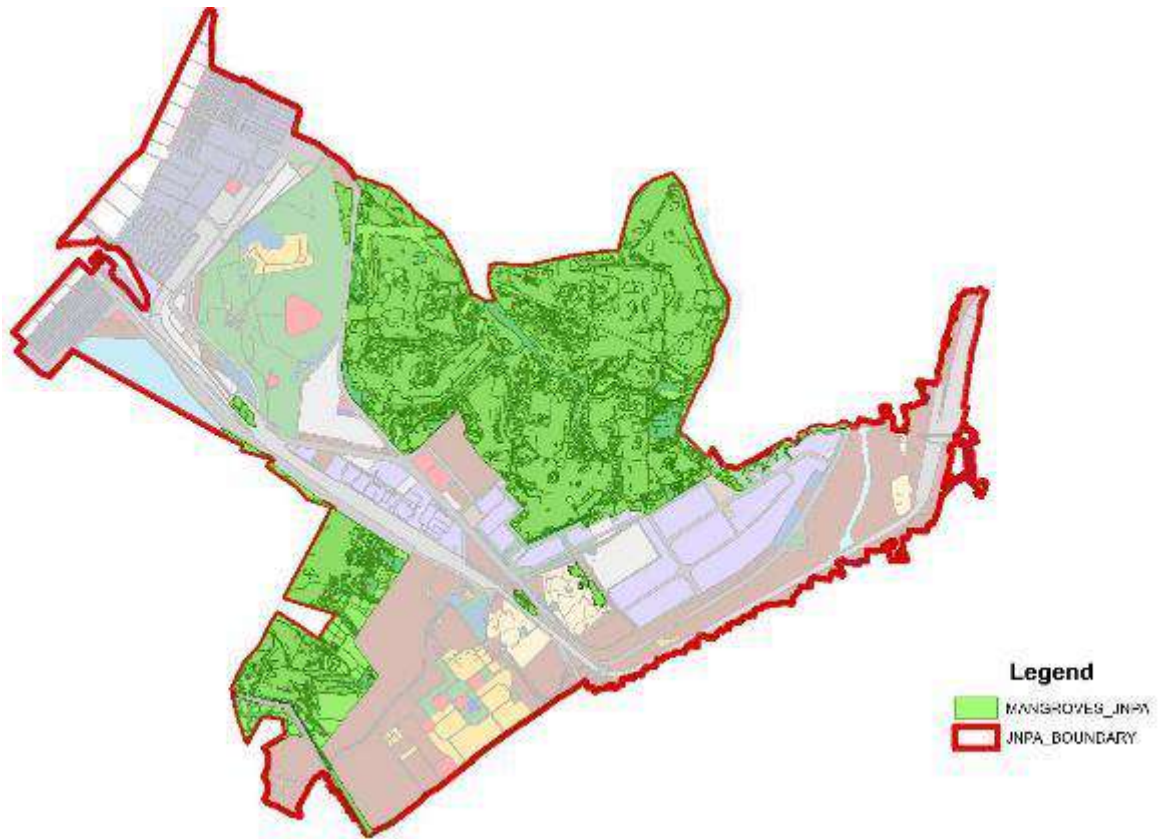


Figure 44 Status of Mangroves 2022 as per MRSAC mapping

In the year 2000 the total mangrove area within JNPA was around 406 hectares and the same grew to 885 hectares by 2014. By 2016 the cover grew up to 916 hectares due to a breach in the bund which was abutting the dense mangroves on the Nhava creek side. This breach in the bund caused sea water to come into previously dry areas and caused the mangroves to sustain in the previously developable land.



Source: Report on Comprehensive Land Use plan for JNPA, by Alia consulting Pvt Ltd

Figure 45 Picture showing mangrove cover behind Sheva hill

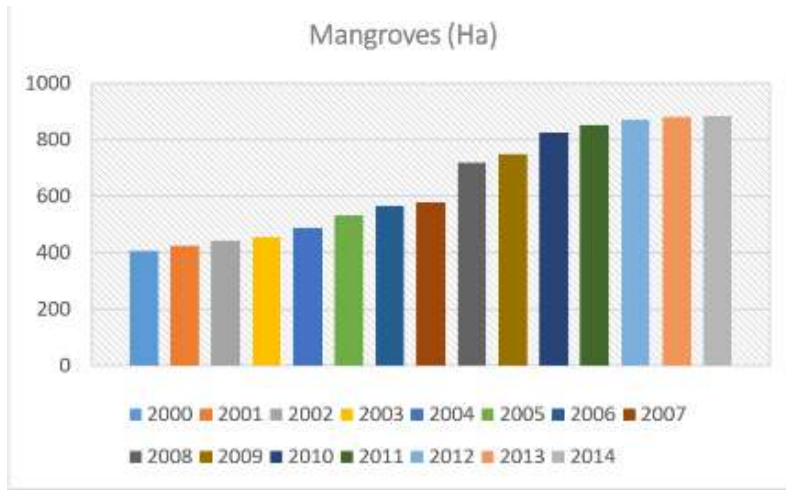


Figure 46 Graph showing increase in mangrove cover

JNPA had appointed MRSAC, GoM for GIS based Mangrove mapping using High Resolution Satellite data in JNPA jurisdiction area. MRSAC have submitted there report dated 13th April, 2022 in which Mangrove area of JNPA have been mapped. The total cover of ecologically sensitive area including mangroves, mudflats, bund, water body, saltpans etc is 1194 Ha. Figure 44 shows the status of mangrove cover by 2022. The statement of the mangrove mapping village wise is as shown in Table no 9

Table 9 Village wise Mangrove area as on April 2022

Village Name	Categories /Areas (in ha.)			Total Area (ha)
	Mangrove Dense	Mangrove Sparse	Mudflat	
Jaskhar 1	44.13	12.52	--	56.65
Jaskhar 3	1.63	0.22	--	1.85
Sawarkhar	20.49	2.89	--	130.87
Sheva 1	5.67	0.68	--	23.38
Sheva 2	151.31	48.00	--	6.35
Sheva 3	3.17	1.50	1.87	199.31
Sonari 1	382.19	77.54	--	459.73
GRAND TOTAL	723.11	159.68	1.87	884.66

In recent past, the port has already obtained approval from Forest Department & MOEF&CC under Forest (Conservation) Act 1980 for proposal of diversion of total 70.33 Ha of Mangrove. Thus the total area of Mangroves is 814.33 Ha which is proposed to be handed over to Mangrove Cell, Forest Department, Govt of Maharashtra through Collector Raigad.

3.3 Social Infrastructure

3.3.1 Educational facilities

As per census 2011 data on various educational facilities such as pre-primary schools, primary schools, senior secondary schools, colleges and professional institutes are assessed. It is observed that each village has a government primary school, either up to class 4th or class 7th. The JNPA Township has primary and secondary schools. Map showing location of schools is shown in Figure 47 The Veer Wajekar Junior College, commonly known as Phunde College, is the only junior college in the JNPA area. Facilities for higher education such as colleges, engineering, medical and management institutes are not available in the area and the people are dependent on nearby urban centres of Panvel, Thane, Khopoli, Uran and Pen for these facilities.

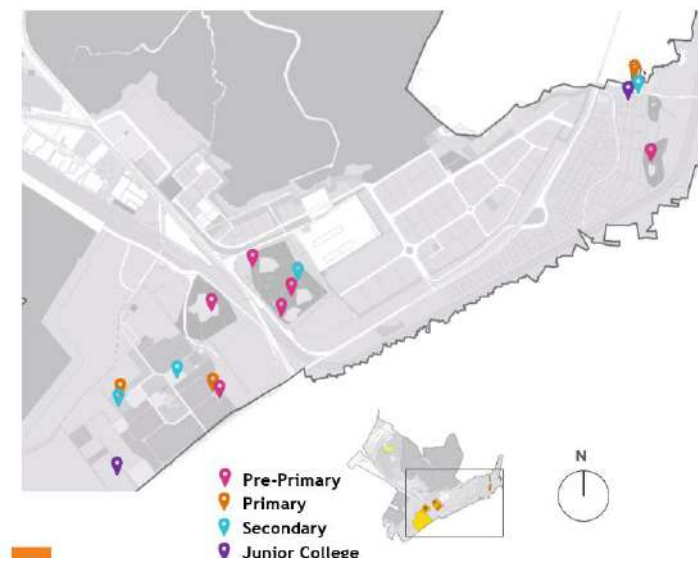


Figure 47 Location of educational facilities in JNPA





Figure 48 Primary schools in Sawarkhar, Jaskhar, Jasai and junior college

The list of all educational facilities can be found in Table no 10

Table 10 List of Educational facilities in JNPA

Sr No	Educational facility	Villages in JNPA					JNPA Township	Funde	TOTAL
		Sawarkhar , Karal, Sonari	Jaskhar	Jasai	Ranjanpada	Ekatghar			
1	Pre-Primary school	2	1	1	1	-	1	-	6
2	Primary school	-	-	1	-	-	2	-	3
3	Secondary school	-	-	1	-	-	2	1	4
4	Junior college	-	-	1	-	-	-	1	2
5	Engineering college	-	-	-	-	-	-	-	0
6	Medical collage	-	-	-	-	-	-	-	0
7	Management institute	-	-	-	-	-	-	-	0
8	Polytechnic	-	-	-	-	-	-	-	0
9	Vocal training institute	-	-	-	-	-	-	-	0
10	School for disabled	-	-	-	-	-	-	-	0

- There is a deficit in primary school and higher secondary schools in Gaothan area
- All hierarchy of schools are present in JNPA township
- Absence of professional/ vocational training institute
- As per planning norms 15% of population is school going. i.e 3000, schools are adequate

3.3.2 Healthcare facilities

- The primary healthcare provider in JNPA is the JNPA hospital. Jasai has a government polyclinic and a private hospital. There are number of local private clinics and medical stores in Gaothans. JNPA hospital is the main hospital for the JNPA area. Map showing location of hospitals is given in Figure 49. The list of major healthcare facilities is given in table no 11.

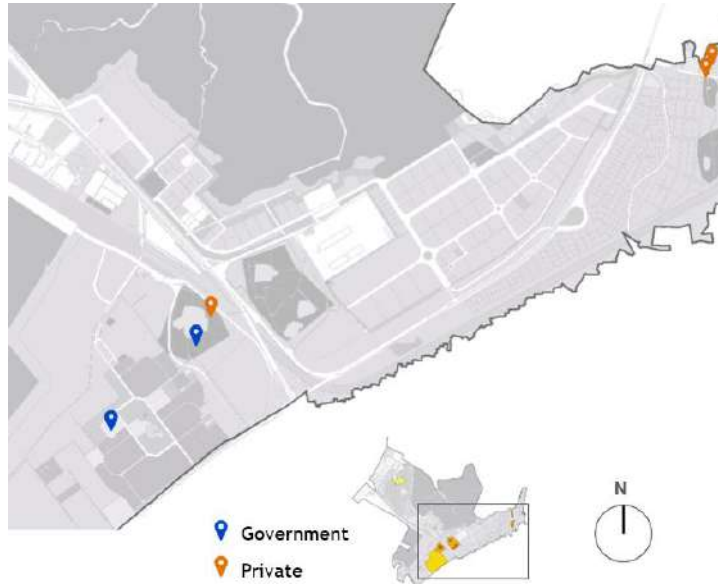


Figure 49 Location map showing hospitals in JNPA



Figure 50 JNPA hospital, Jijamata Hospital and Raighad district polyclinic

- As per planning norms 3 beds/1000 population. i.e 63 beds are required
- Current requirement for hospital is adequate

Table 11 List of healthcare facilities

Name Of the Healthcare organisation	Location	Type	No of Beds
JNPA Hospital	JNPA Township	Government Hospital	200
Jijamata Hospital	Jasai	Private Hospital	20
Raighad Zilla Parishad Clinic	Jasai	Government Polyclinic	2

3.3.3 Commercial

The nature of commercial areas are small scale retail, eateries and shopping centre in JNPA township. Large scale business center and mercantile is not prevalent. The Central parking Plaza has commercial offices for the JNPA employees. It also provides facilities for the truck drivers, that park there. The fuel stations are __in number. The Gaothans have commercial activities on a smaller scale. Figure 51 shows nature of commercial activities in JNPA.



Figure 51 Nature of commercial facilities in JNPA

3.3.4 Socio-Cultural

Majority of the socio-cultural infrastructure is concentrated in the residential area of JNPA, which includes the township and the *Gaothans*. The villages have community centers, *anganwadis* and panchayats that take care of day-to-day activities and larger community gatherings. The predominant religion of the population residing in the JNPA is Hinduism, hence there are number of temples and shrines of various deities present. Every village has

a crematorium and is located at the village periphery. Figure 52 & 53 shows location of socio-cultural facilities in JNPA.

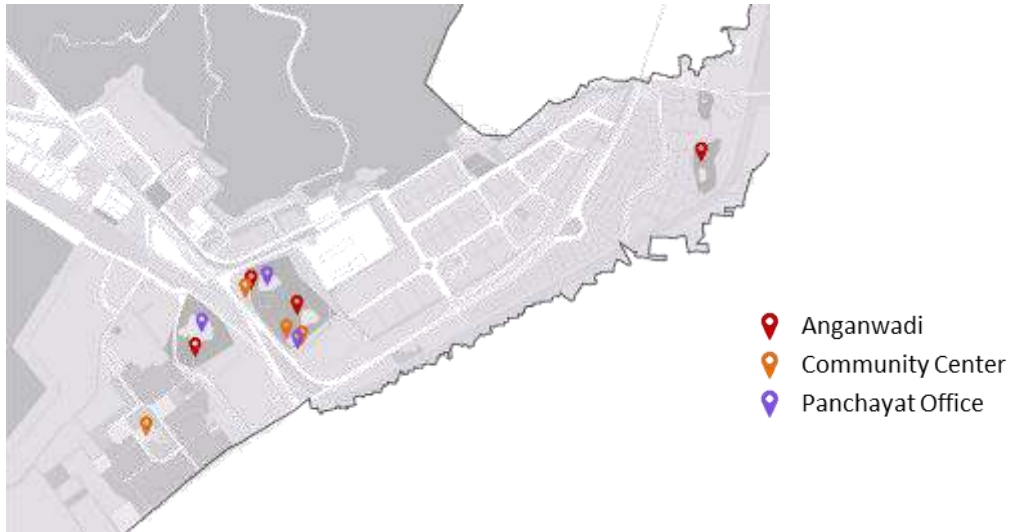


Figure 52 Location map showing socio-cultural facilities in JNPA



Figure 53 Location map showing temples and crematorium in JNPA



Community centers at Sonari and Karal respectively



Anganwadi at Sonari



Group Gram Panchayat at Karal



Crematorium at Jaskhar



Crematorium at Sonari



Shree Maheshwar temple at Karal



Shree Ratneshwari Devi Mandir, Jaskhar

Figure 54 Snapshots of socio-cultural facilities in JNPA

3.3.5 Recreational facilities

The JNPA Township has multiple open spaces, playgrounds, and a tennis hall. The viewpoint at Sheva hill is a popular among locals and visitors. Sonari and Jasai villages have large grounds which are used regularly as playing areas and also host fairs and festivals. There are many lakes in JNPA area whose edges can be developed for recreational activities.



Lake at Jaskhar



Lake at Sonari



Ground at Jasai



Ground at Sonari

Figure 55 Snapshots of recreational facilities in JNPA

3.3.6 Lakes in JNPA

There are 15 lakes that comprises of natural as well as man-made water bodies that exist in & around JNPA at present as shown in Figure 56. Natural lakes have formed due to the rain water accumulating in inlands & depressions in land. These lakes have constantly standing water throughout the year or scarce out during summers. Whereas man-made lakes are mostly in Goathan areas functioning as a reservoir for the domestic purposes. These lakes have traditionally served the function of meeting water requirements of the people for drinking, household uses like washing, for agriculture, fishing & also for religious & cultural purposes. Apart from these functions which involve direct use of lake water, they also recharge ground water, channelize water flow to prevent water logging & flooding. They also host to a wide variety of flora & fauna influencing the micro-climate as well as

enhancing the aesthetic beauty of the landscape & offer various recreational opportunities. Hence, restoration & rejuvenation of lakes is important.

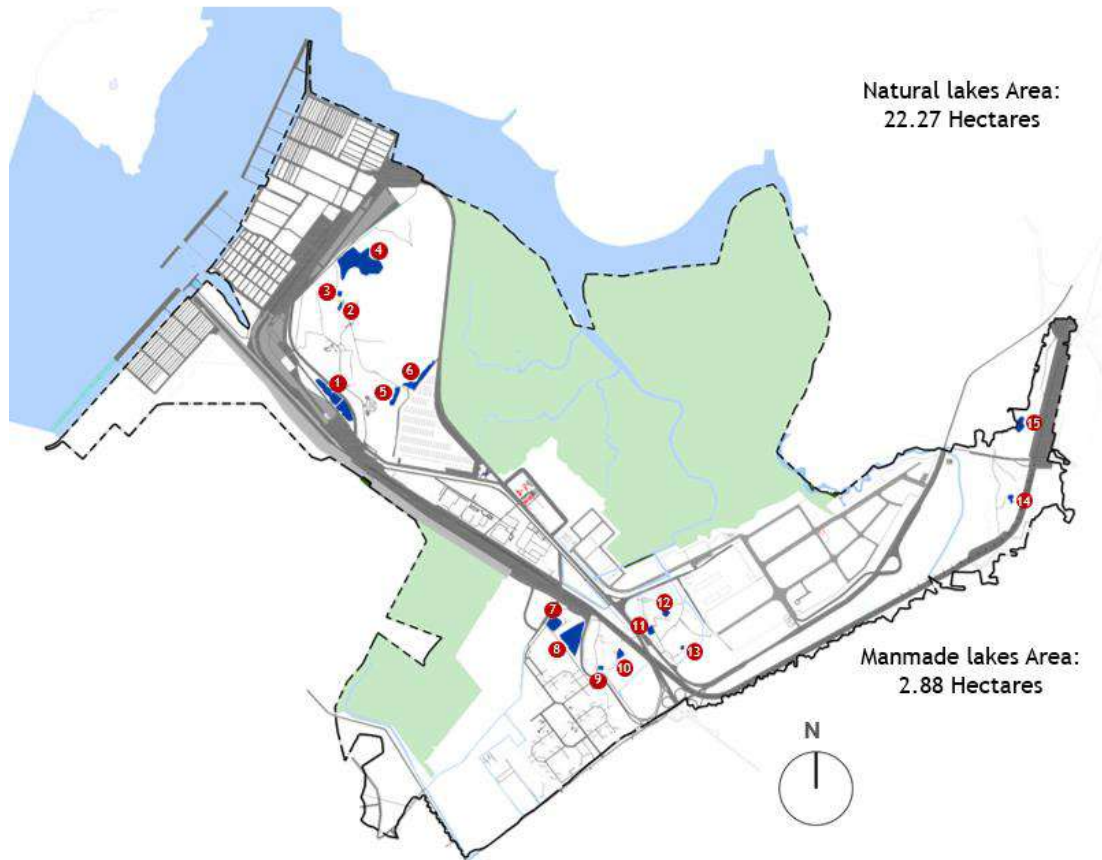


Figure 56 Key map showing lakes in JNPA

Table 12 List of lakes in JNPA

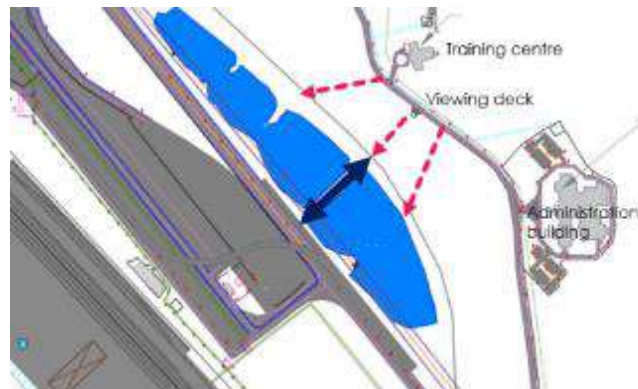
Sr no.	Natural lakes	Apprx Area (in ha)
1	Admin building lake	4.13 Ha
2	Shiva temple lake (Sheva)	0.21 Ha
3	Sheva village lake	0.22 Ha
4	Air Force colony lake	8.71 Ha
5	CPP upper lake	0.87 Ha
6	CPP lower lake	1.72 Ha
7	Near police station	1.45 Ha
8	Adjoining STP (right)	4.96 Ha

Sr No.	Gaothan lakes	Apprx Area (in ha)
9	Ratneshwari (Jaskhar)	0.20 Ha
10	Jaskhar lake 2	0.51 Ha
11	Shree Siddhivinayak (Sonari)	0.50 Ha
12	Sonari lake 2	0.38 Ha
13	Karal lake	0.11 Ha
14	Ranjanada	0.32 Ha
15	Jasai	0.86 Ha

The brief description of lakes in JNPA is as under:

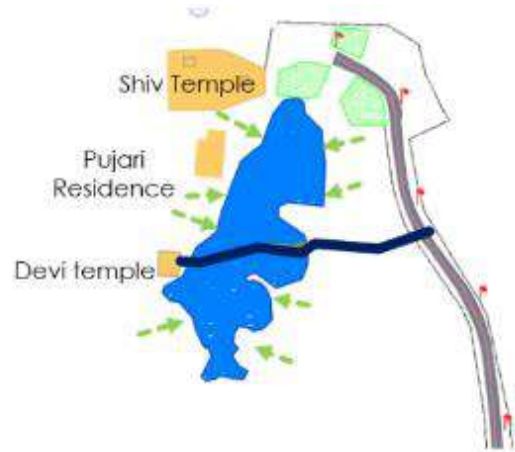
NATURAL LAKES:

1) Admin Building Lake



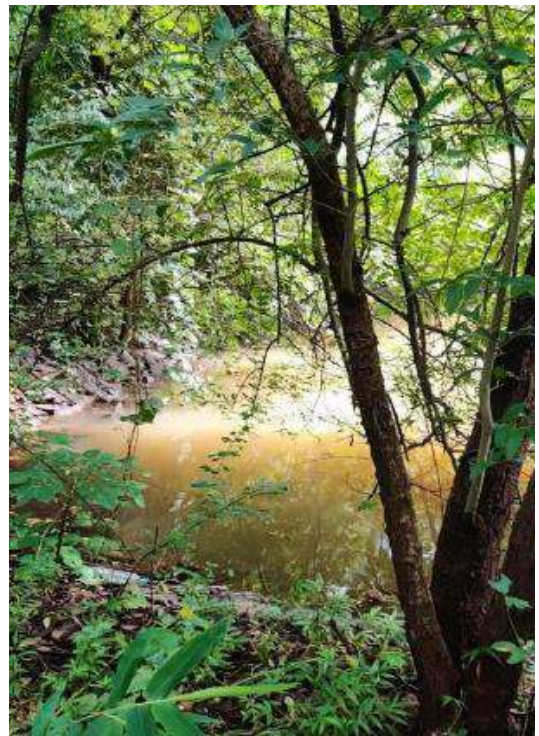
POTENTIALS:

- Potential for developing as a visual experience from Sheva hill and the port surroundings
- The existing trail can be redefined and developed for public access

2) Shiva temple lake

Shiva Temple lake is located at Sheva, Navi Mumbai, adjacent to Aai Shanteshwari Mandir, Juna Sheva that falls 1Kms towards North of JNPA Administrative Building. As per survey the existing lake is 0.26412 Ha in area surrounded by dense green vegetation, majorly bamboo plantation, along with two more adjoining religious structure, pathways & a spreading green coverage in it's immediate vicinity. Existing loose stone basalt pitching can be observed around its edges.

This lake is a natural, shallow organic water body with a depth of about 10M severed by a 1.5M narrow rammed earth natural pathway connecting to the main approach road. The space has a serene feel to it as the it is enveloped inside the greenery, visually separated from direct vehicular approach

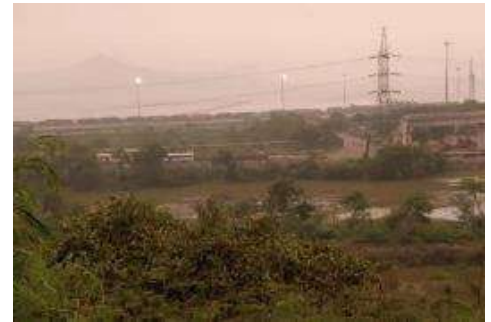
**POTENTIALS:**

- Potential for developing as a green temple complex with revival of lake
- Creating pedestrian link between the Devi temple and main road

3) Air force colony lake



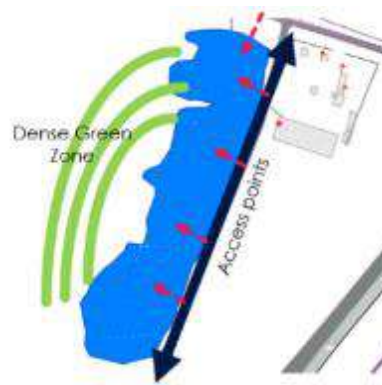
Since this lake is located in the premises of Air Force Colony, Old Sheva, the site is restricted under Air Force security and civilians are not allowed to access this part of JNPA. It is (AREA) and is surrounded by 2-3 watchtowers with a concrete and steel fencing dividing the area of JNPA and Air Force. The lake is loaded with uncontrolled growth of hydrilla and hyacinth that are a genus of aquatic plants.



POTENTIALS:

- To be cleaned and used for rain water harvesting

4) CPP Upper lake

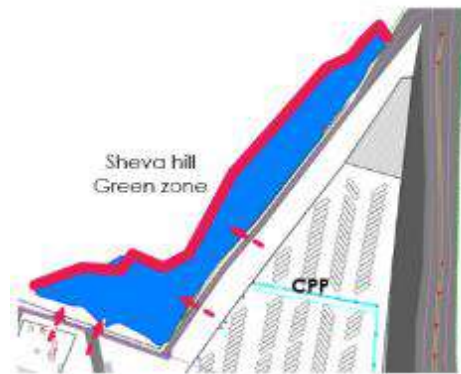




POTENTIALS:

- Picnic spot
- Pedal boating
- Can be developed as green public space
- Explore rich flora and fauna

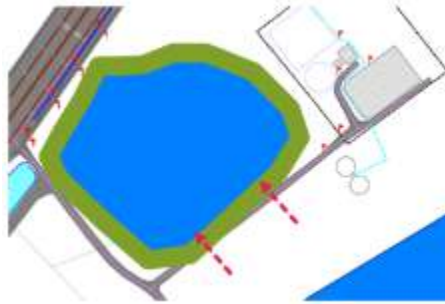
5) CPP lower lake



POTENTIALS:

- Natural trail around lake
- Lake Edge along the access road can be developed and opened for visual experience

6) Near police station



POTENTIALS:

- Jogging track around lake
- Green public space with pathway, benches and art installations
- Bird watching points can be explored

7) Adjoining STP (right)



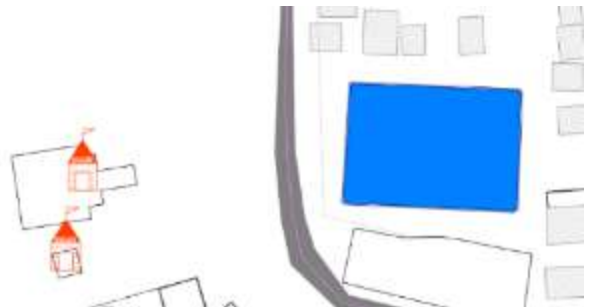


POTENTIALS:

- Pedal boating
- Lake Edge along the access road can be developed
- Walkway, benches and art installations
- Bird watching can be explored

GAOTHAN LAKES:

8) Ratneshwari (Jaskhar) lake



Ratneshwari Talav is located at Jaskar village. This water body happens to be a manmade pond, with an area of 0.20 Ha, built as a religious significance right opposite to Ratneshwari Temple where people of the village dedicatedly participate in religious activities. It also serves as a source of water for domestic purposes. Locals also have the benefit of fishing from the pond as small fishes are being bred in it.



The pond is protected by metal fencing & green buffer with steps on one edge. It is surrounded by narrow streets from three sides with residential buildings present along the edge of these streets who have an advantage of a beautiful view of the pond along with village temple standing tall.

Since approach to the pond is very simple & not difficult to access due to being surrounded by streets, it becomes easy for passers by to dump handheld waste like empty bottles, wrappers, plastic bags, etc. A small cluster of waste materials accumulating can be witnessed at site.



POTENTIALS:

- Lake edge development with walkways and benches
- Installation of musical water fountain in the lake
- Initiative can be taken as part of CSR

9) Shree siddhivinayak (Sonari)



Shree Siddhivinayak Talav is located at Sonari village. This water body is a manmade pond having an area of 0.50 Ha, built as a religious significance close to Sai Temple which is used by the people of village for religious activities. Locals also have the benefit of fishing from the pond as small fishes are being bred in it. The water body is deep enough for a fishing boat to be rowed.

This lake is surrounded by 6M roads on its north & east faces whereas on the west & south faces is a pavement corridor for pedestrians. The surrounding residents have an advantage of the pond view as well as easy access along with sheds provided on either sides of the lake entrance for public seating.

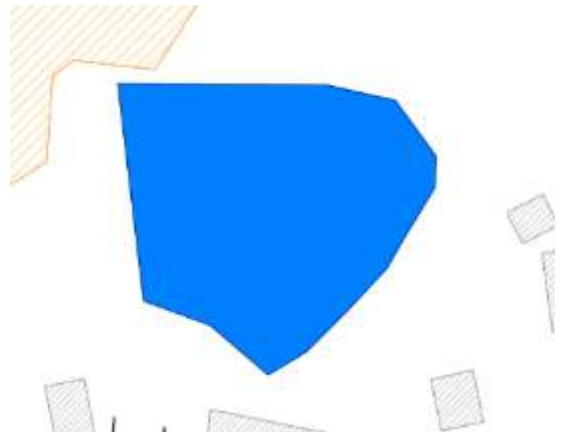


Deposits of nirmalya can be found near the entrance behind sheds provided for seating.

POTENTIALS:

- Lake edge development with walkways and benches
- Installation of musical water fountain in the lake
- Initiative can be taken as part of CSR

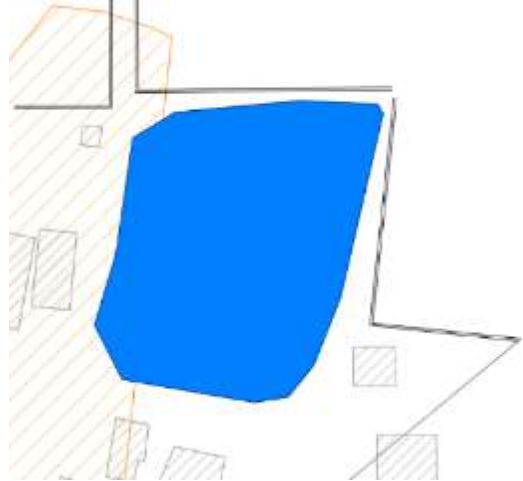
10) Sonari lake 2



- Area=0.38 Ha
- Natural water body
- Holding pond created due to seasonal flow of water
- Sea water deposits
- Sewerage deposit on water due to lack of well planned sanitary system.

Karal lake





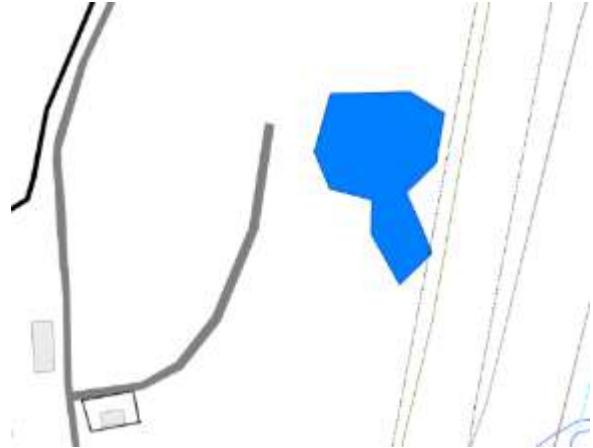
- Area=0.11 Ha
- Manmade pond
- Bad maintenance hence contamination of water can be witnessed
- Debris & waste deposits found on water
- Fishing & festive activities stopped since 2019 due to improper management of waste
- Stagnant water due to clogging of pipe



POTENTIALS:

- Lake edge development as public space
- Installation of street furniture

11) Ranjanpada lake



POTENTIALS:

- Develop the ghats
- Develop as green open space for

3.4 Traffic and Transportation

3.4.1 Various reports studied

With a view to understand the status of existing Port, the transportation networks the works under development, Land use planning in surrounding areas various reports and studies done in the past were examined. These are listed below.

- a) New Airport Report by LEA associates for CIDCO- Oct. 2019
- b) JNPA Report by AECOM- July 2016 for Min. Of Transport, GOI.
- c) JNPA Comprehensive L U Plan Report by Alia Consultants Pvt. Ltd.
- d) MTNL –DPR
- e) CTS by MMRDA- final report 2006 by LEA Associates Pvt Ltd
- f) CTS revision by MMRDA- Draft Report.
- g) Virar- Alibaug Multi Modal Corridor Feasibility Report.
- h) NAINA phase 1 draft plan report.

3.4.2 Transport connectivity of JNPA

a) Road Connectivity

The major road linkages connecting JNPA with hinterland road network are NH4B, NH4, NH17, NH 3 & 8 and a State Highway 54.

National Highway 4B – This road connects JNPA with Mumbai and other important cities of Maharashtra and Gujarat. The road mainly serves the heavy traffic of containerized vehicles to and fro JNPA. It has a length of 26.43 km and branches at km 108/800 of NH4.

National Highway 4 (4 lanes) - The port is connected through National Highway number 4 through NH 4B. The linkage to NH 4 provides connectivity to Pune and southern states of India.

National Highway 17 - The State Highway number 66 links port to National Highway number 17 (2 lanes) which provide connectivity to Goa.

National Highway 3 and 8 - National Highway Number 4 (2 lanes with portion of highway being 4 lane) links port to NH 3 and NH 8 (2 lanes with portion of highway being 4 lane) which provides connectivity to Nashik and Ahmedabad region.

State Highway 54 - This State Highway stretch connects Uran to Panvel. It runs more or less parallel to NH 4B. SH54 meets NH 4B at km 6/000 on Uran side and km 21/000 on Panvel side A number of container yards are located abutting SH54 and majority of traffic on this road is due to the JNPA.

Aamra Marg- It 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. All-important destinations in India whether on the North, West or East could be accessed through any one of these three National Highways.

The existing regional transport connectivity to NMIA is shown in figure 57 and detail road connectivity around JNPA is shown in figure 58.



Figure 57 The existing regional transport connectivity to NMIA



Figure 58 Detail Road connectivity around the JNPA

a) Rail connectivity

JNPA is linked with the Indian Railways through a lead line connecting the port with its 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, has 8 full length railway lines serving the three existing container terminals. Besides these, there is 4-line intermediate holding yard between Jasai and the port. The Jasai station yard deals with all traffic between JNPA and the Indian Oil Tank Farm Ltd. The 4-line 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. Below Figure shows JNPA rail connectivity to hinterland.

- Northern Corridor from JNPA up to Ludhiana via Diva, Vasai road, Vadodara, Ratlam, Kota, Bayana, Mathura junction, Tughlaqabad and Delhi.
- North Western Corridor from JNPA to Rewari via Vadodra-Ahmedabad, Sabarmati Palanpur, Marwar Jn. Jodhpur, Jaipur.
- Central corridor from Diva via Nagpur
- South East corridor from Kalyan via Pune

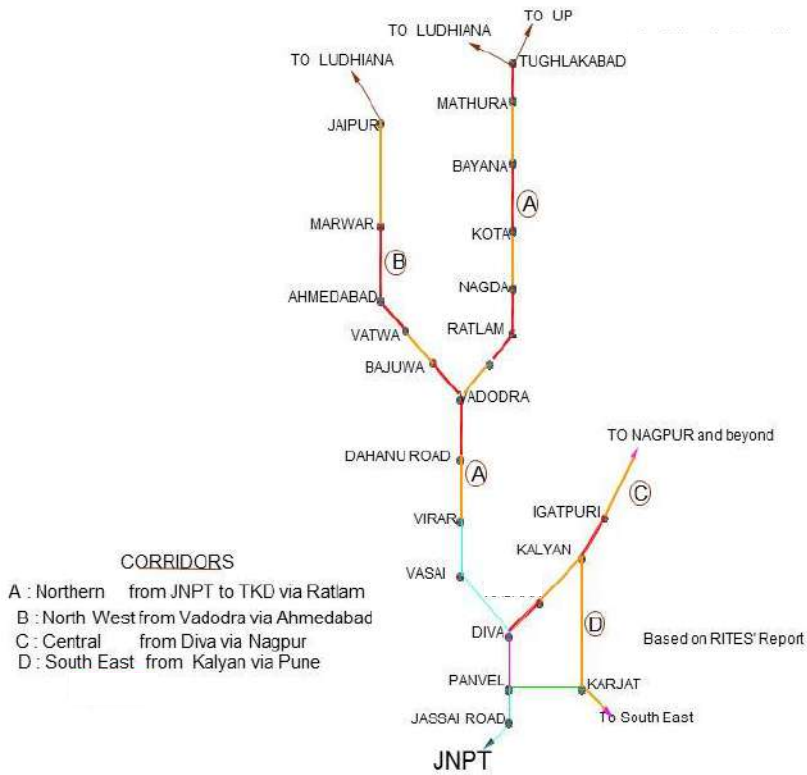


Figure 59 JNPA Rail Connectivity to Hinterland

3.4.3 Connectivity with Ongoing projects



Figure 60 Connectivity of JNPA with ongoing projects

- a) Ulwe
 - Important upcoming residential hub

- Due to the commissioning of Nerul - Kharkopar section of suburban rail and location of new Airport nearby the development potential has increased.
- b) Navi Mumbai Coastal road**
- The total length of 10.1 km with additional 1.2 Km airport road .
 - Start at Amara Marg and end at Belpada near JNPA
 - Will serve as second link to JNPA
- c) MTHL**
- The total length of 22 km consists of approach roads, viaducts on inter-tidal zone, bridge across the Harbour and interchanges at Sewri and Chirle
 - 3.6 km-long viaduct and interchanges are planned to connect SH52 and 54 and NH4B at Chirle, Navi Mumbai
- d) Multimodal corridor**
- Virar-Alibaug Multi Modal Corridor (126 km) will connect NH-8, Bhiwandi bypass, NH-3, NH-4 and NH-4B, Mumbai-Pune Expressway, NH-17, etc
 - Influence development of NMIA, JNPA Port, MTHL and Dedicated Freight Corridor (DFC)
 - This Corridor will carry all the traffic from JNPA towards Navi Mumbai and Thane outside the city and will help reduce traffic congestion within the city
- e) Nerul Uran rail link**
- Total length 27 km with 7 stations
 - Initial portion of 7km completed upto Kharkopar
 - Link from new Ranjanpada to Uran will be converted into suburban
- f) Dronagiri node**
- Adjacent node to JNPA area
 - Under construction Dronagiri railway station is Major common station both for Dronagiri Node and JNPA area
- g) Integrated Logistic Park**
- Approximately 640 hectare land near Ranjanpada- Jasai planned by CIDCO for ILP
 - Based on Maharashtra Logistics Parks Policy, 2018
 - Consist of Large and medium warehousing, Logistic parks , storage, parking, workshops, offices and all support infrastructure. Below Figure shows the location of ILP in relation to JNPA.

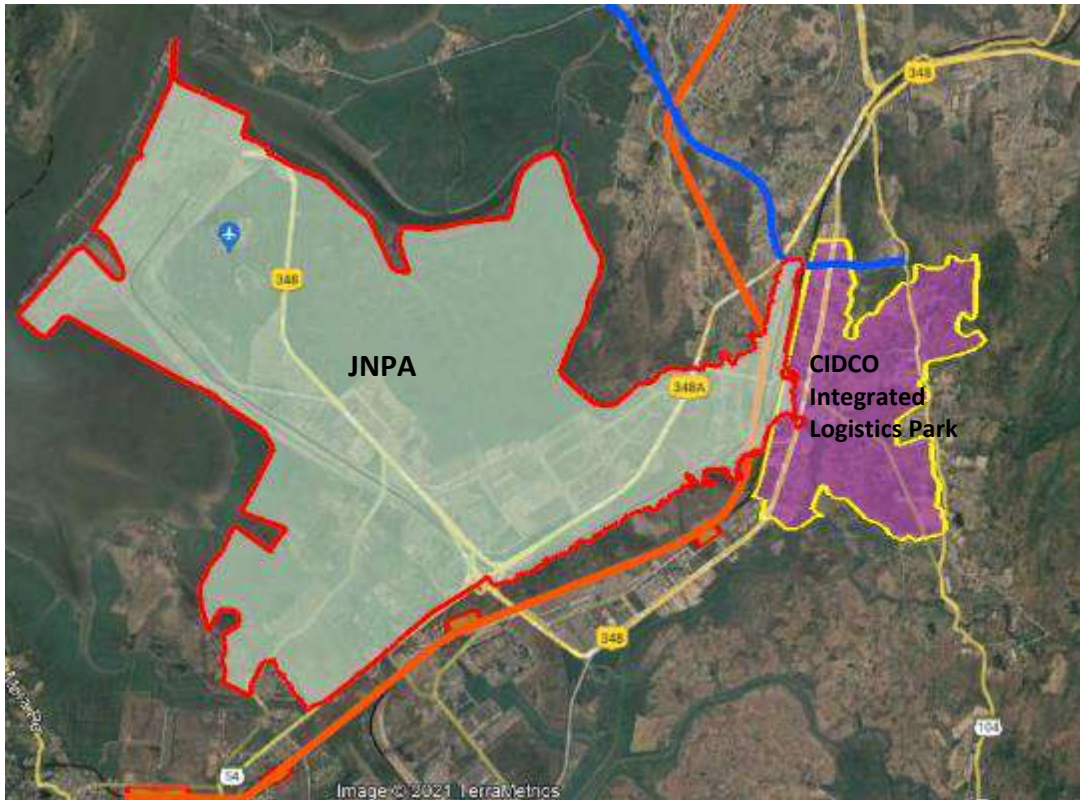


Figure 61 Location of Integrated Logistics Park adjoining JNPA boundary

h) NAINA

- Potential area for future development NAINA (Navi Mumbai Airport Influence Notified Area).
- CIDCO has been appointed as planning authority for NAINA
- The part of phase 1 and New Khopta town is located very close and to the east of JNPA.
- Estimated population of NAINA is likely to concentrate in the proximity to three major economic inputs viz. Taloja Industrial Area, NMIA at Panvel, an emerging rail link at Panvel and warehousing activities at Kalamboli and JNPA.

3.4.4 Internal road and rail network

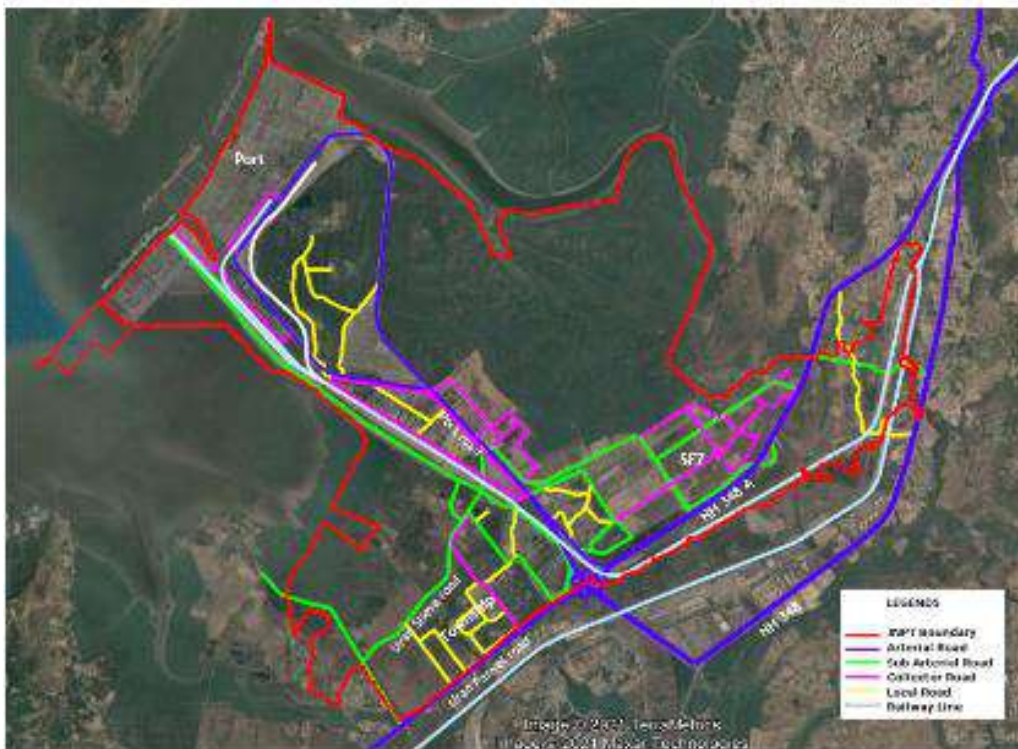


Figure 62 JNPA map showing existing road and rail network

- Arterial Roads



NH 348 A (SH-54)



NH 348 – PORT ROAD



NH 348 TOWARDS PANVEL (NH – 4B)



URAN PANVEL HIGHWAY

- **Sub-arterial and collector roads**



ROAD TO FOURTH TERMINAL



URAN – SHEVA ROAD



PORT USER BUILDING ROAD



TOWNSHIP MAIN ROAD

3.4.5 Forecast of port traffic

The principal traffic in JN Port as of now comprises of containers and liquid bulk. With the fast-growing industrial development in the hinterland, it is the intention of the port to develop facilities for handling dry bulk, break bulk, project cargo, and automobiles for export etc. Port has taken up several steps towards augmenting the road infrastructure and linkages in order to meet the increasing traffic.

- a) JNPCT operated by the JNPA port with a quay length of 680 m;
- b) NSICT operated on BOT basis by DP World with a quay length of 600 m;
- c) GTIPL operated on BOT basis by a consortium of Maersk and CONCOR with a quay length of 712 m.
- d) NSIGT operated on BOT basis by DP World with a quay length of 330 m.
- e) BMCT – Phase 1 & 2 operated by PSA Singapore with quay length of 2000m

Liquid bulk jetty built and operated on BOT basis by BPCL on the southern side of GTICT. It is a twin berthing jetty with a 390 m berthing face on one side and 310 m berthing face at the rear. It can handle 85,000 DWT tankers at the front side and 30,000 DWT tankers at the rear. The locations of these berths along with their back-up areas are shown in the following Figure and Table 13 provides details of various berths. The information in this section has been obtained from JNPA. △

Table 13 JNPA terminal wise details

Terminal	Operator/ Terminal	Number of Berths	Length (m)	Design Draft(m)
JNP Container Terminal	JNPA	3	680	14
NSICT	DP World	2	600	14
NSIGT– 330m	DP World	1	330	14
GTIPL	APM	3	712	14
BMCT-Phase 1 and 2	PSA Singapore	6	2000	14
JNPA Liquid Terminal	BPCL	2	390+310	14OuterBerth ,10InnerBerth

- **The present and forecast port traffic**

Assessment of traffic has been done based on analysis of past traffic at JNPA, interviews with Port authorities, Maharashtra Maritime Board and Maharashtra Industrial Development Corporation (MIDC) as well as several stakeholders in the shipping and user industries. A summary of traffic projections for all commodities at JN Port is given in Table 14.

Table 14 Traffic projections for all commodities at JN Port

Units: MMTPA (Except Containers)							
JNPA - Traffic Projections			Base Scenario				Optimistic Scenario
Commodity	2014-15	2020	2025		2035		Remarks
Liquid Cargo							
POL	4.1	5.5	7	8.1	9.1	10.3	
Vegetable Oil	1.0	1.3	1.7	1.8	2.9	3.3	
Chemicals	0.8	1.1	1.4	1.5	2.4	2.7	
Dry and Break Bulk Cargo							
Thermal Coal (Loading)	0.0	0.0	0.0	0.0	0.0	0.0	
Thermal Coal (Unloading)	0.0	0.0	0.0	0.0	0.0	0.0	
Coking Coal	0.0	0.0	0.0	0.0	0.0	0.0	
Iron Ore	0.0	0.0	0.0	0.0	0.0	0.0	
Cement	0.7	0.9	1.2	1.3	2.0	2.3	
Fertilizers	0.0	0.0	0.0	0.0	0.0	0.0	
Containers and Other Cargo							
Containers (Mn TEU)	4.5	6.8	8.8	10.2	14.6	18.3	
Others	0.2	0.3	0.4	0.4	0.6	0.7	
Total (MMTPA)	64.4	96.1	124.5	143.9	203.9	253.5	
Conversion Factor used for Containers Projections: 1 TEU = 12.8 Tons							

Source: AECOM report on Master plan for JN Port, 2016

- **Road Improvements**

- a. Initiative by JNPA**

This is the first initiative in the Port Sector to infuse capital investment in the Port Road Connectivity Project to the extent of Rs.3300 Crores. Once the project is completed, the travel time between the National Highway and the Port will significantly reduce thus saving time and Trade cost, it will also mitigate congestion on the port connecting roads and at the same time commuters will also be able to use this state of the art infrastructure. To enhance the existing road network connecting JNPA, we have initiated a massive Infrastructural development project which includes:

- 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.

- b. Initiatives by Other Agencies**

A fairly large number of proposals have been made by different implementing agencies towards improving the transport system in MMR. The likelihood of them coming through is not known. A number of proposals have been taken up more seriously by the implementing agencies, and the merit in having these projects in reality has found ground. Therefore, these projects have been taken up for implementation with commitment from the government in terms of budget allocation or otherwise. All these projects, improve the transport connectivity to the NMIA to quite an extent. However, much has to be still done, to further improve the transport corridors leading to the proposed airport, both at the regional and local level.

3.4.6 Existing transportation facilities

In JNPA area the parking is of two types- On-Street and Off street. Similarly parking vehicles are of two Categories-Trailers with containers (Mostly Empty) and trailers without containers. The parking of other vehicles is rare such as Two Wheelers, Cars, Autos. With strict vigilance and enforcement, the on-street parking is drastically reduced and is concentrated on road leading to CFS. The loaded container trailers seen "parked" on SH54 are mainly those either waiting for customs clearance or entry in the respective Gates delivering Export cargo.

Figure 63 shows existing parking in JNPA and outside JNPA.

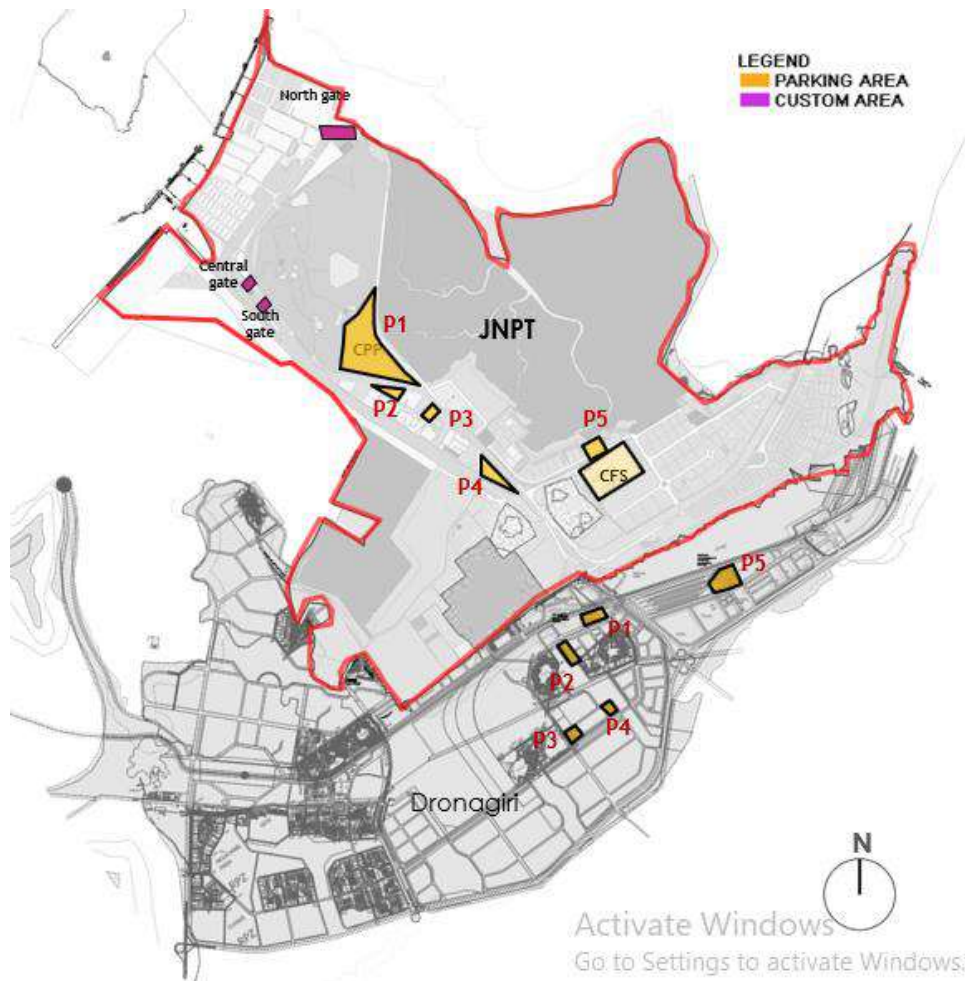


Figure 63 Map showing existing parking areas and custom gate in JNPA

- Refer below table no 15 and 16 existing Parking areas within JNPA and outside JNPA

Table 15 Existing parking areas within JNPA

Sr No	Location code	Plot area appx (in ha)	Capacity of truck parking appx
1	P1	45	2800
2	P2	2.8	100
3	P3	3.5	120
4	P4	7.8	300
5	P5	4.0	150
	TOTAL	63	3470

Table 16 Existing parking outside JNPA

S N	Location code	Plot area appx (in ha)	Capacity of truck parking appx
1	P1	2.57	95
2	P2	2.08	80
3	P3	1.87	82
4	P4	1.08	40
5	P5	8.07	488
	TOTAL	63	785

- **Existing Custom areas**

In the process of transporting Export cargo through containers and carrying it to Port areas, each container has to obtain Customs clearance. There will also be security check. This process takes some time. Though JNPA and Customs authority has introduced on-line systems to reduce paper work. Still each trailer has to wait some time. In the peak export operation long queues are formed which lead to congestion on approach roads. JNPA has therefore created Customs areas for waiting of such Trailers.

- **Existing Rail sidings**

As mentioned before large percentage of containers are transported by rail. Therefore, dedicated rail corridor is provided to connect port to Panvel-Uran goods line, which meets near Jasai Rail container sidings area developed near Port area and it is proposed to be augmented by Common rail yard within the port for three terminals & separate station for the terminals with Single operator for ICD container handling and shared yard for ICD import & export buffer.

3.4.7 Specific proposals

Specific proposals to improve transportation accessibility and mobility within JNPA are given as under-

1) Connectivity to future suburban stations

The Suburban Rail Network is planned to connect Nerul/Belapur on Vashi-Panvel route with Uran. The total length of this route will be 27 Km. Out of the total length, a portion measuring 7 Km has already been constructed from Nerul up to Kharkopar station. It has 10 stations and consist of bridge over Panvel creek. The train operations have also been started. It is proposed that from kharkopar station, the alignment will turn to the east and will connect to the existing Panvel-Uran goods rail line. The land acquisition has been completed and work will start very soon. A new Ranjanpada station will be developed on this line. From Ranjanpada up to Uran the existing tracks will be upgraded with separate rails for suburban trains operation. Two new railway stations, namely Nhava-Sheva and Dronagiri are being developed. Thus the JNPA area will have access to 4 suburban stations namely kharkopar (existing) and Ranjanpada, Nhava Sheva and Dronagiri. The table below indicate the distances from various prominent land-use /activity areas in JNPA up to the new suburban Railway stations.

Distances from areas in JNPT up to the new suburban Railway stations -

Railway Station JNPT Nodes	Distance in Kms				
	Kharkopar station	Ranjanpada station	Dronagiri station	Bokadvira station	Uran station
Y Junction	11.0	7.9	4.2	6.6	6.8
JNPT Township	9.2	5.7	1.0	3.0	4.0
Sawarkhar CFS	8.6	8.6	4.6	7.3	7.5
JNPT SEZ main gate	7.0	6.9	2.7	5.5	6.5
JNPT Sheva hill office	13	9.7	6.5	8.5	9.0



Dronagiri railway station is the most conveniently located from JNPT. It is recommended to plan and design these stations with adequate facilities within and outside station area, particularly on west side.

Figure 64 Nerul – Uran railway link station distances from areas around JNPA

It can be observed that with few exceptions, the Dronagiri railway station is the most conveniently located from JNPA, followed by Nhava-Sheva. Therefore, it is recommended to plan and design these stations with adequate facilities within and outside station area, particularly on west side. The facilities within should include adequate number of FOBs with escalators, wide platforms, passenger facilities like seating, toilets, ticket booking, signage’s and indicators, lighting, drinking water, kiosks, security etc.

The external facility will include adequate area for parking of bicycles, two-wheelers, cars, adequate parking stands for autos, taxis, ola-Uber, a well planned for bus station for local bus services, wide access roads with wide footpaths for pedestrian movements, proper landscaping, concrete and qualitative pavements, proper drainage, security posts etc. Roughly an area ranging from 20-50 acres should be acquired and developed at these railway stations.

2) Introduction of JNPA Bus System (Identify Lands for Bus terminals / Depots)

At present the JNPA area does not have rail based public transport connection either suburban rail or metro rail. Suburban services have just been started upto kharkopar station. Therefore, only public transport connection is via bus. The bus service is in operation from Vashi, Panvel and Uran. However, these are not adequate in terms of frequency and connectivity. These routes also do not serve all parts of JNPA. With the proposed planned development of JNPA, large workforce is expected to travel to JNPA. There will also be demand to connect internal nodes of JNPA with bus.

It is therefore recommended that JNPA authority should start their own public bus transport system. The main emphasis will be interconnecting all trip generation points in JNPA, existing as well as future, such as Port, Residential Colony, CFS, Custom area, Railway stations, office complex. The system should also provide connectivity to surrounding nodes such as Vashi, Nerul, Panvel, Palaspe, Pen and Uran. Such a system will require a detailed study to identify the routes, Bus fleet -type and number -, organization, ticket fares, recruitment of staff, development of Bus Station and depot etc. As a first step it is necessary to identify land and location for central bus station and depot. The site for bus station and depot is shown in proposed Land Use plan kept in Annexure IV.

3) Organize NMT track system

The JNPA total area is about 3444 Hectares. The main trip production and attraction centres will be JNPA port, SEZ, Residential complexes, custom area, office complexes as well as proposed suburban railway stations. The average trip length among these centres will be around 4 to 5 Km. Taking advantage of this scenario, there is a strong case to encourage and popularize the use of NMT especially bicycles. This mode can very well be used by children in the 10-16 age group and all adult workers up to 45 years. However, in order to make the use of NMT safe, it



is necessary to reserve cycle only lanes along major arterial roads as well as to plan exclusive cycle tracks. It is therefore recommended to initiate a feasibility study for 'Introduction of NMT' in JNPA. Study should aim to identify the cycle lanes, cycle tracks, cycle hiring schemes, involvement of NGO's and private sector, media campaign, location for parking and exchange of bicycles etc.

4) Inland Passengers water transport terminal and road connectivity

The JNPA port is served by the main sea channel of Mumbai which is ultimately connected to Thane creek and Panvel Creek. The actual separation between main island of Mumbai and JNPA coast varies from 12 Km to 15 Km. However, the present distance by existing road network is about 100 to 130 Km. As the JNPA provides the large number of jobs at the port, the future jobs are going to increase multi-fold due to development of SEZ and expansion of jetties. Thus the trips, particularly work trips, will rise significantly. And also advisable to introduce inland water transport service connecting JNPA with other main jetties on the main land such as Apollo Bunder, Ferry wart (Bhaucha Dhakka), BARC jetty, Vashi, Nerul, Mora, Rewas etc. It is therefore necessary to plan and develop an inland water transport jetty at JNPA end. Some studies have already been done in the part and it is advisable to accept and implement their recommendations.

Accordingly, a land/location is identified for such a jetty along the Nhava Creek. It is necessary to connect the jetty with well-planned road connection, provision for parking, provisions for IPT stands, local bus stations, security arrangements, pedestrian access etc. The operation of jetty and water transport vessels can be handed over to private sector agencies through BOOT basis.

5) Junction and Interchange Improvements

As reported before, many important junctions located on crossings of National and state Highway in the vicinity of JNPA were identified in various studies in the past. A proper study was undertaken and junction improvement schemes prepared. Most of them are completed and some are under development. Thus all junctions falling on NH 4A, 4B, 4C and SH54 are being improved. In addition, some more junctions falling in the alignment of MTHL east end and the proposed Virar -Alibag multi-modal corridor will become critical. Proper interchange schemes are prepared for such junctions and will be implemented as part of the respective project.

In addition to above and due to future master plan of JNPA and development of SEZ and port expansion some more junctions will become critical in future and will need proper junction improvement schemes. It is recommended that a proper feasibility study be undertaken through consultant and junction improvement schemes be prepared. The required land be reserved and programme for implementation of schemes put in place.

6) Policy for New CFS

The JNPA for last several years is handling mainly container traffic. In the process of export and import trade the containers need to be either brought to port area in time or need to be taken away from port area as quickly as possible. The proper handling of containers improves the efficiency of the port and relieves the port yard from congestion. Part of these containers are moved or transported through rail. For them adequate and well planned railway yard is necessary.

For the containers which are transported by road on container trolley's, large space is required where these containers are stored temporarily, they are destuffed and stuffed according to origin/destination points, empty containers are stacked, custom inspections are carried out etc. All these operations are done at Container Freight Station (CFS). Thus the CFS are very important links in the trade of road based movement. With the ever increasing container traffic, the number of containers in operation are increasing creating large demand for CFS. Many times such CFS are either owned/operated by shipping companies. Also port operators develop the CFS and provide services to shippers. Normally CFS requires huge land area and proper access on arterial road. Most of them will prefer locations as near as possible to the port. Many such large CFS have come up on SH54 and NH4C as well as on Panvel Goa road. The developers have purchased lands and developed them.

Since the CFS handles huge container traffic they attract large container trolleys. It has been observed that these container trellis have to wait outside CFS for entry. Many times empty trolley wait outside CFS to get business. No parking is provided for them inside the CFS. Even minor repairs are carried out on road. Thus most of the access roads get congested. Even there will be spill over of these trucks on major highways. The entry/exit manoeuvres also create problems of accidents. They tend to take right turn and 'U' turns in front of the entry/exit points and over the central medians. Considering all these issues and requirements of huge land it is recommended that JNPA need not develop any CFS within the JNPA area. But JNPA can assist in identifying suitable land, transfer of land, access development etc.

7) Suggestions for on-street and off street parking lots for container trolley's

The JNPA area, in-spite of some land reserved as off street parking, large custom area, experiences some amount of on street parking especially on roads leading to CFS. Similarly, large queues are formed, even in 2 to 3 rows of container trailer, waiting for entry to port or custom clearance. These instances led to congestion on otherwise wider roads. Valuable road carriage way space is lost and underutilised. It is therefore suggested that additional off street parking lots be created and on-street parking be regulated by earmarking few stretches for parking.

3.5 Physical infrastructure

Existing Infrastructure Situation Analysis, projection study and identification of issues was carried out from the available data of JNPA physical study and Population projection. Estimation of Infrastructure demand & gap analysis.

3.5.1 Water Supply

Supply of water to JNPA is from Maharashtra Jeevan Pradhikaran (MJP) and CIDCO. Water is drawn from Gavhan water tank located 5km from JNPA boundary. Tap water is the only source for drinking as underground water cannot be used due to high salt content.

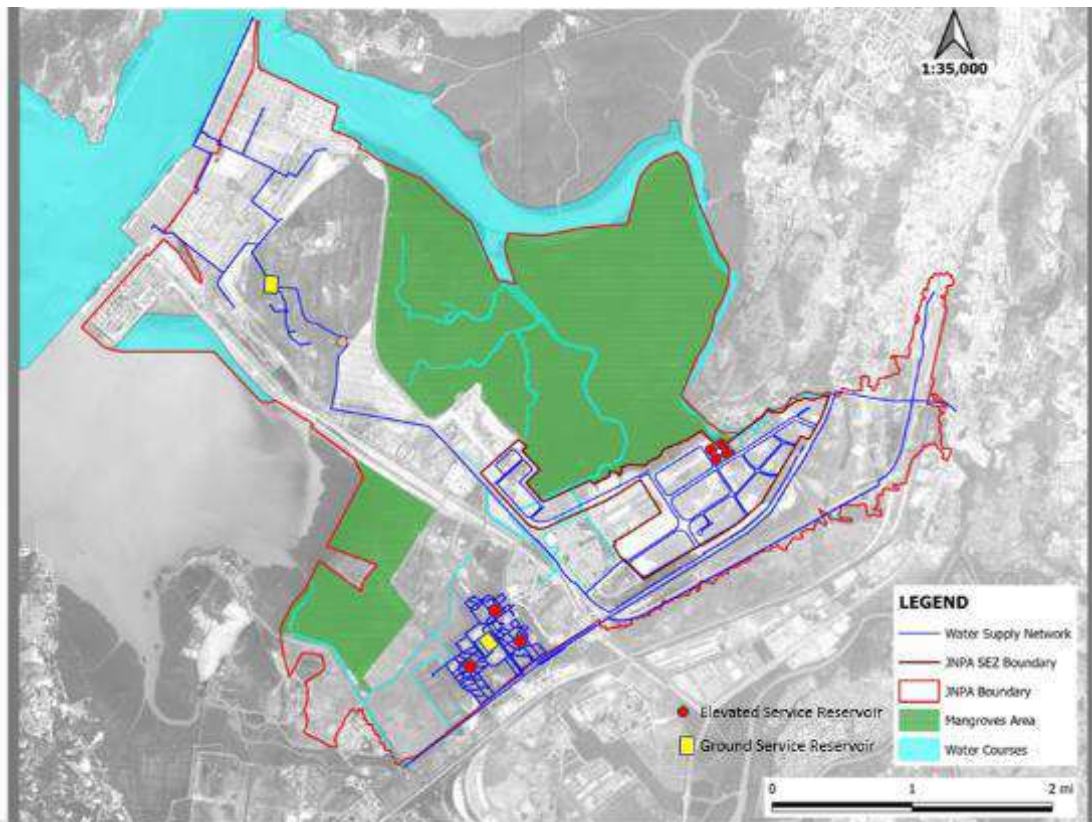


Figure 65 Existing water supply network in JNPA area

Township: The water is distributed to JNPA township, non-port area and port area. In JNPA township currently 2 MLD of water is received in 4ML capacity Ground service reservoir located in JNPA township. Further the water is pumped in 3 Overhead service reservoirs located in JNPA Township. The morning hours water is received from CIDCO pipeline and evening hours is received by MJP pipeline. The current consumption of portable water is 2 MLD.

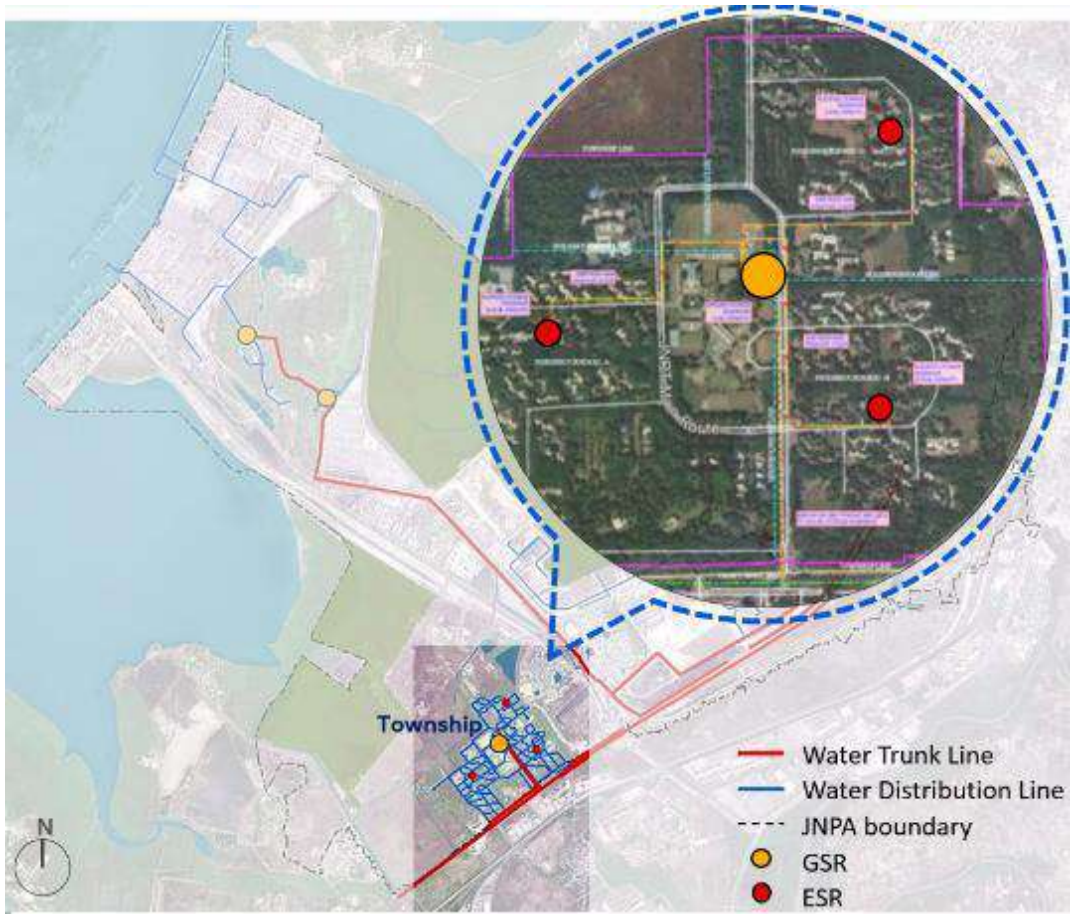


Figure 66 Existing water network in JNPA township area



Figure 67 Three ESR of 0.35 MLD capacity each in JNPA township area

Non-port area and port area: Currently 8 MLD / day is received in ground service reservoir located near CPP Sheva hill. The water is pumped in the GSR located near guesthouse on Sheva hill and supplied to port & Non port area based on gravity.



Figure 68 Existing Water Network in the JNPA Port and Non-port area



Figure 69 GSR on Sheva Hill



Figure 70 Pumping station



Figure 71 GSR on Sheva Hill

JNPA SEZ: SEZ area mainly comprises of Industrial development. The water consumption in the processing zone will be based on industry demand. Currently the total water supplied at JNPT SEZ is 0.2 MLD. The Total water demand estimated for fully operational JNPA SEZ is 13.9 MLD. Out of which 6.93 MLD is freshwater demand, 2.55 MLD is for flushing (recycled), 2.0 MLD for gardening and firefighting. There are

four ESR (out of which three are 1500 m³ and one is of 2000 m³ capacity) and one GSR (6500m³) is planned in the SEZ. Clear water from GSR shall be pumped to overhead reservoirs out of which one ESR is for recycled water. The clear water from the ESR shall be distributed to individual plots through gravity ensuring tail end pressure.



Figure 72 Existing Water Network in the JNPA SEZ area



Figure 73 Existing ESR in the JNPA SEZ area



Figure 74 Under Construction Water Reservoirs in the JNPA SEZ area

Gaothan areas:

90% of Houses in Gaothan have CIDCO water supply connection.

As per Table No. 17 on existing demand & supply as per data received from JNPA, the gap on existing demand is coming 4 MLD.

Table 17 Existing water supply in JNPA

S. No.	Description	Existing Demand & Supply (2021)		
		Demand as per JNPA Data (2021)	Supply as per JNPA Data (2021)	Gap on Existing Demand & Supply
1	JNPA Township	4.00	2.00	2.00
2	JNPA SEZ	0.20	0.20	0.00
3	Non-Port	5.80	4.80	1.00
4	Port operational	2.00	1.00	1.00
	Total	12.00	8.00	4.00

3.5.2 Power

JNPA receives electric supply from Maharashtra State Electricity Distribution Company Ltd. (MSEDCL) of 220KV from two independent express feeders at Master Unit Sub Station (MUSS) of the Port with 3 transformers. The supply is sufficient to cater to the existing population.

JNPA is the power distribution agency for SEZ. The power is made available from nearby 220Kv substation. Three 33/11 kV switching stations are located in SEZ , for 55MVA power capacity for SEZ. As green port initiative, with total 822.6 kW of rooftop solar panels are

installed at various public buildings of JNPA with generation capacity of approximately 10,00,000 units per year.

3.5.3 Sewerage

In JNPA except for township & SEZ there is no sewerage system. Generally, the toilets are connected to individual septic tanks and the effluent is disposed-off in the nearby drains, water bodies or open areas. The current sewage system is dependent on 72% of septic tanks and 28% of sewerage network. Currently Sewerage is generated from Goathans, township, non-port and port areas. 32% of the Gaothan Population is catered by public toilets with one unit having 12 toilets. Public toilet is free of cost with poor infrastructure and low maintenance. E-Toilet unit are provided in port berth areas.

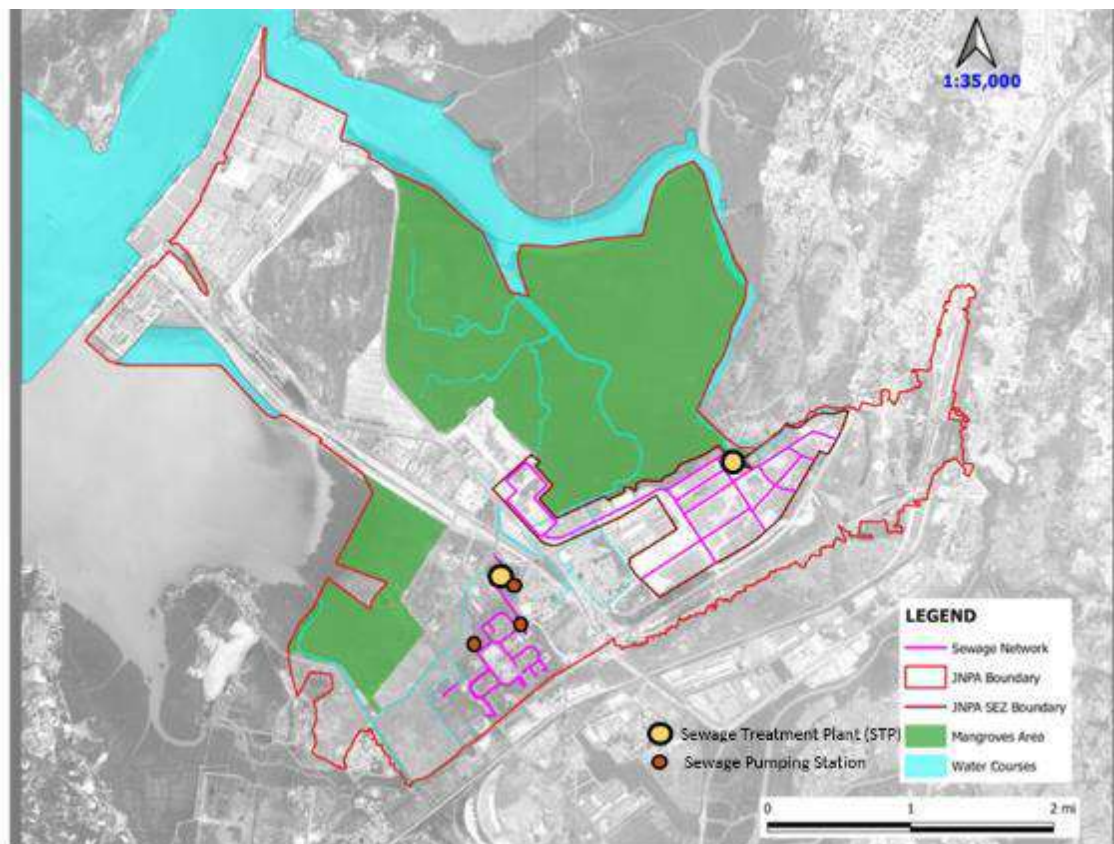


Figure 75 Existing Sewerage Network in JNPA area

One STP has been constructed in JNPA of 3.50 MLD with SBR technology for JNPA Township area and one STP is under construction at SEZ of 6.50 MLD with Sequential Batch Reactor technology for Non-port & SEZ area. 3 pumping stations are located in Township for channelizing sewage to STP. Average 0.12 MLD recycled water is generated from the STP which is planned to be utilized for gardening purposes in JNPA Township and Tank farm

area through piped network. At Port area, there are two small package types STP treated the sewage collected from Port area of 0.20 MLD & 0.30 MLD.



Figure 76 STP in SEZ area



Figure 77 STP in Non SEZ area

As per CPHEEO guidelines the sewage generated is considered as 80% of the potable water & 60% of process water. Demand and Gap assessment with the village area is as under-

Table 18 Demand & Gap assessment for Sewerage

Particulars	Existing (2022)
Total Water Demand	12.00
Potable Water Demand	12.00
Process Water Demand	
Total Recycled Water Required	0.15
Total Waste Water Generated	9.60
Total Recycled Water Generated (90% of Total W/w Generated)	8.64
Proposed STP Capacity required	10.56
Existing & Under Construction STP Capacity	10.50
Augmentation of STP is required	0.06

3.5.4 Storm water drainage

Except for SEZ, storm water drain open network is existing in JNPA. Discharge is usually in natural drains or sea. Issues of water logging are present in the Gaothans because of low lying area, whereas the township doesn't have any water logging.

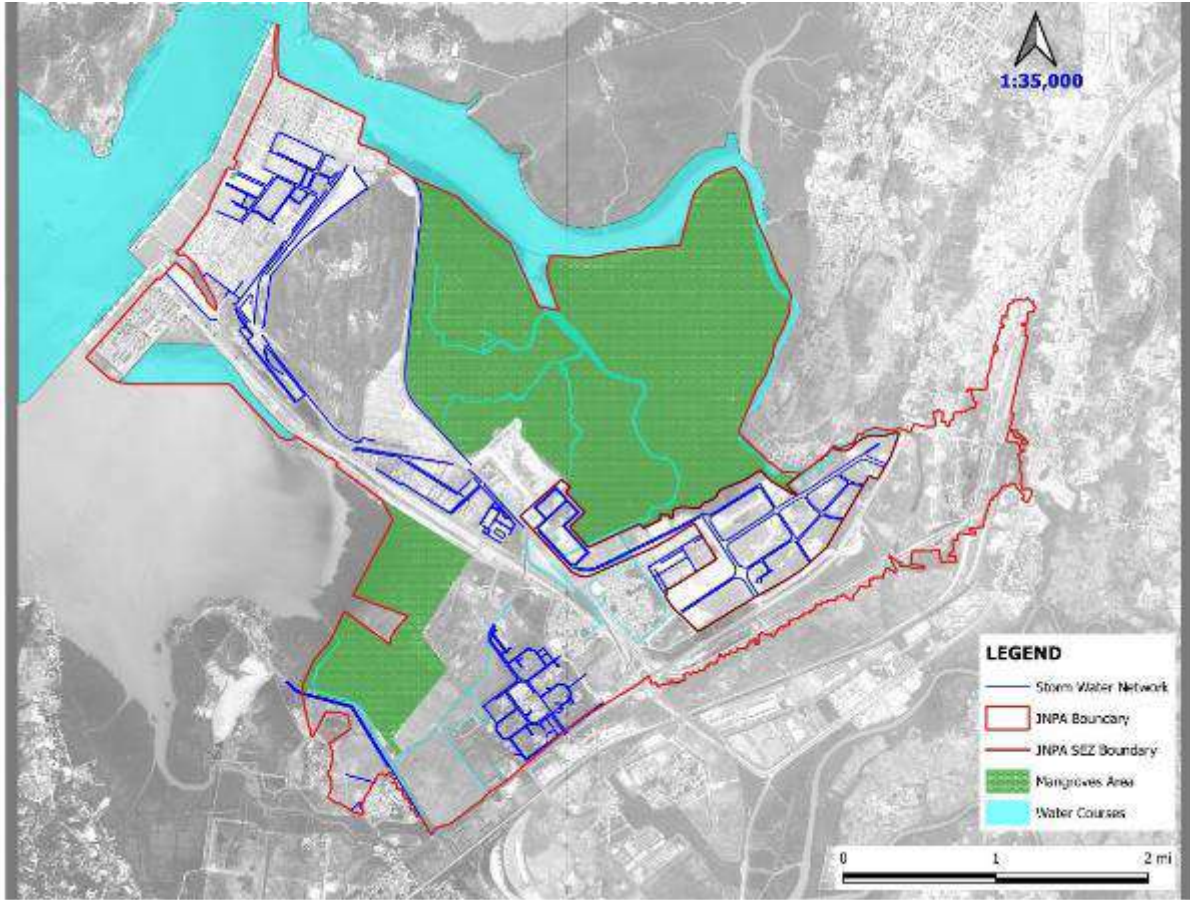


Figure 78 Storm Water Network in JNPA area

Service level benchmarking have been formulated by the MoUD with a view to achieving all-round sustainability including environmental sustainability.

Table 19 Service level benchmark for storm water Drainage system

Sl. No.	Services	Ultimate Benchmark as per MoUD, GoI Guidelines (%)	Present Status (%)
1	Coverage of storm water drainage network	100%	95%
2	Cleaning of drains twice in a year	100%	NA
3	Extent of rain water harvesting	100%	NA

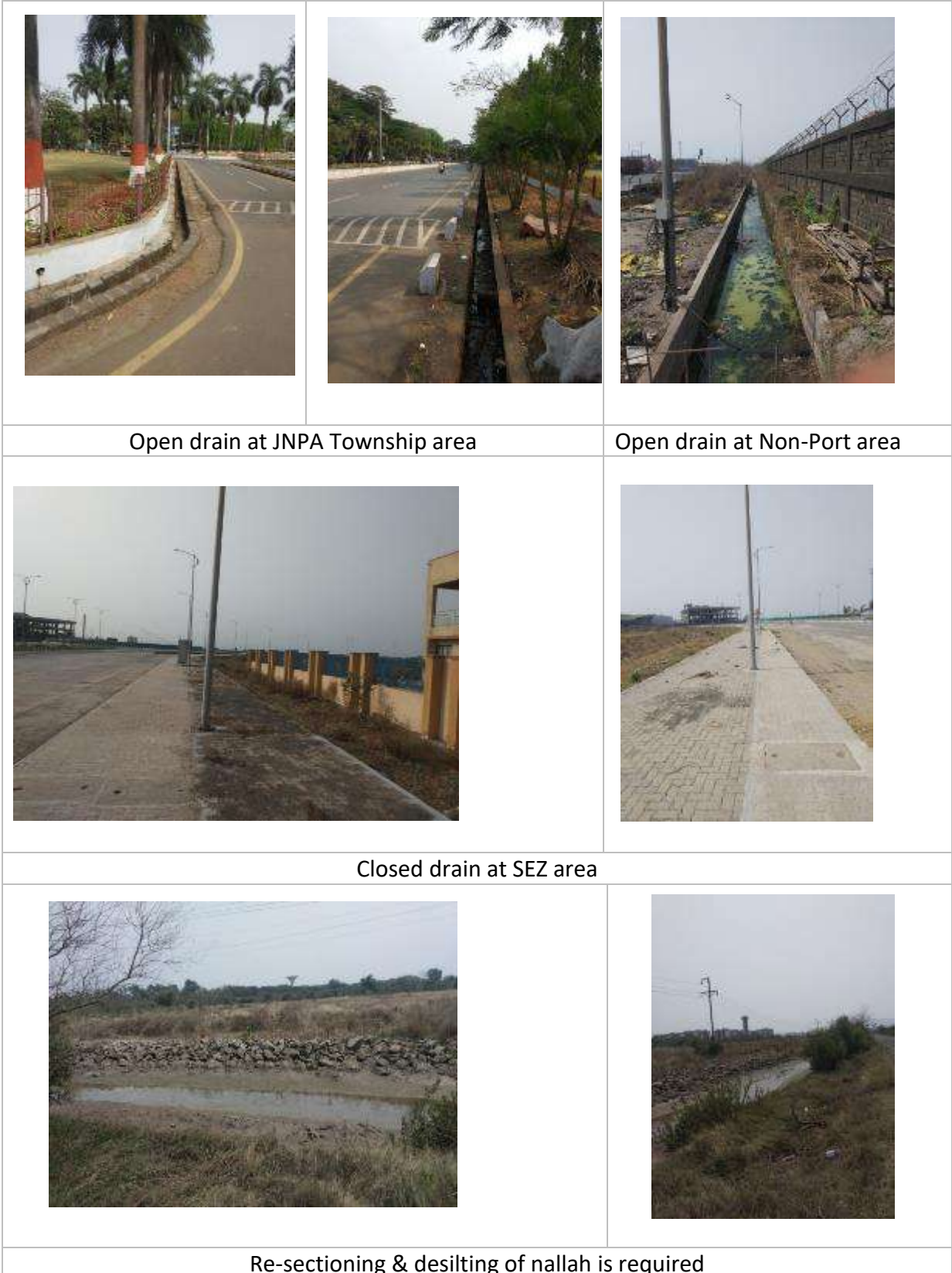


Figure 79 Pictorial view of existing situation of storm water drain in JNPA

3.5.5 Rain water harvesting

As part of Corporate Environmental Responsibility (CER) JNPA has created water holding lake on the Sheva hill for rain water harvesting measure. Estimated 275 MLD of rain water could be captured for the season. Water conservation initiative like the Jalyukta Shivar yojana includes activities like desilting, deep continuous contour trenching (CCT), widening and deepening of nalas/rivers.

3.5.6 Solid waste management

JNPA is first major port to initiate Solid waste processing facility of 10 MT/day capacity with surplus 2.6MT/day. The Bio Medical waste generated is 606kg/day.

The process for Solid Waste Management in JNPA is as per below -

- **Waste Generation** – Solid waste generated from Township, SEZ, Port & Non Port Areas.
- **Primary Collection** - Door to Door collection and collection from Terminals by Ghanta Gadi, Mini & Big lorry with wet and dry waste separately.
- **Process/Treatment** - Aerobic Treatment of Solid waste; hydraulic balling press machine for processing plastic bottles, paper, card board, wrappers, pouches of eatables, polyethylene bags, blisters multi-layered bags, etc. Waste processing will separate sludge and water.
- **Disposal of waste** - Sludge is used as compost.



Figure 80 Existing Solid waste plant in JNPA

As per the field survey carried out, total waste generation in 2021 was 10.0 TPD.

3.6 Environment

3.6.1 Economy and Environment

The World Commission on Environment and Development, the Brundtland Commission was convened by the United Nations in 1983 to examine issues relating to economic development, labor practices and environmental protection. The Brundtland Commission, which was made up of representatives of twenty-one nations (Algeria, Brazil, Canada, China, Columbia, Guyana, Hungary, India, Indonesia, Italy, Ivory Coast, Japan, Nigeria, Norway, Saudi Arabia, Soviet Union, Sudan, United States of America, West Germany, Yugoslavia, and Zimbabwe), was tasked with reaching common economic development strategies.

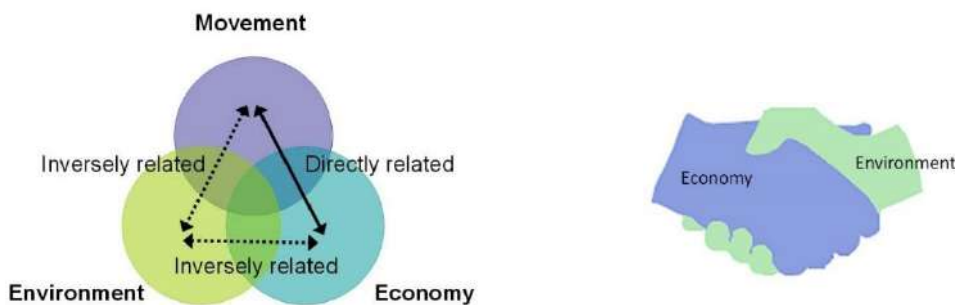


Figure 81 Relationship between economy and environment

The Commission introduced the concept of sustainable development, which is based on the idea that the environment (where we live) and development (how we attempt to improve our lives) are intertwined and that all people should work towards improving our common situation, and not just that of our home territory. Development of the worldwide human

condition must be accomplished in a manner that does not compromise the ability of future generations to meet their needs.

For a sustainable development 'Economy' and 'Environment' should go hand in hand.

- An increase in Movement will result in increase in Economy.
- A haphazard Movement will result in degrading the Environmental quality.
- An insensitive Economical investment will lead to Environmental hazards.

3.6.2 Methodology

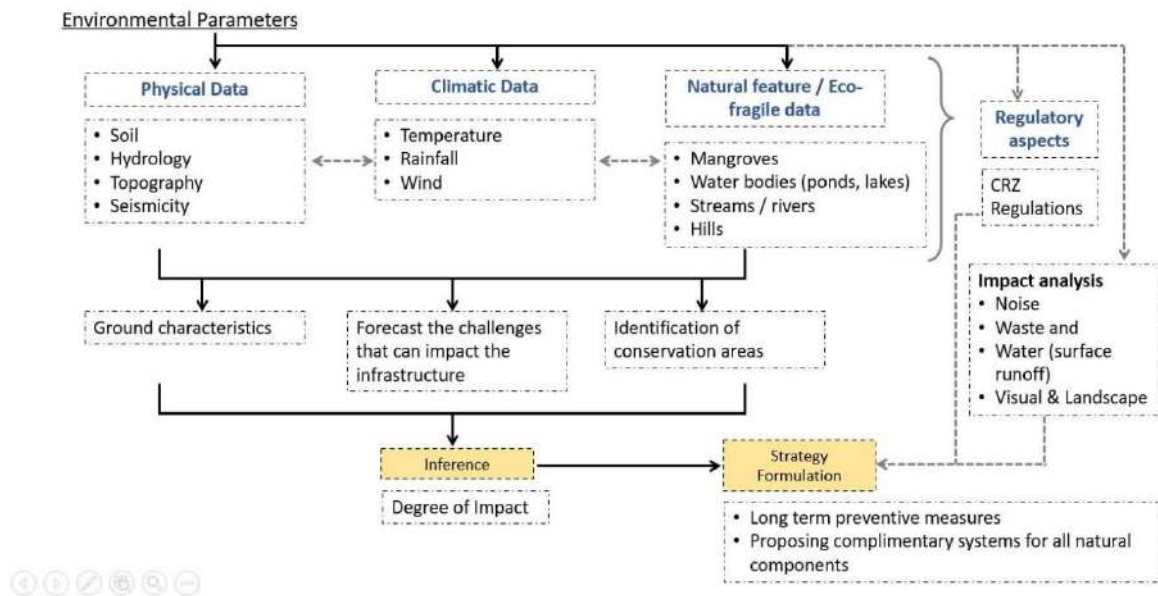


Figure 82 Chart showing Environmental parameters

3.6.3 Coastal Regulation Zone

Areas within JNPA falls in CRZ IA, IB and II zone. Vide MOEF & CC notification dated 18th January, 2019 permissible activities in the respective CRZ zones are as under:

CRZ–IA: These areas are ecologically most sensitive and generally no activities shall be permitted to be carried out in the CRZ-I A area, with following exceptions:-

- Eco-tourism activities such as mangrove walks, tree huts, nature trails, etc.
- In the mangrove buffer, activities like laying of pipelines, transmission lines, conveyance systems or mechanisms and construction of road on stilts, etc. that are required for public utilities.
- In case construction of such roads passes through mangrove areas or is likely to damage the mangroves, a minimum three times the mangrove area affected or destroyed or cut during the construction process shall be taken up for compensatory plantation of mangroves.

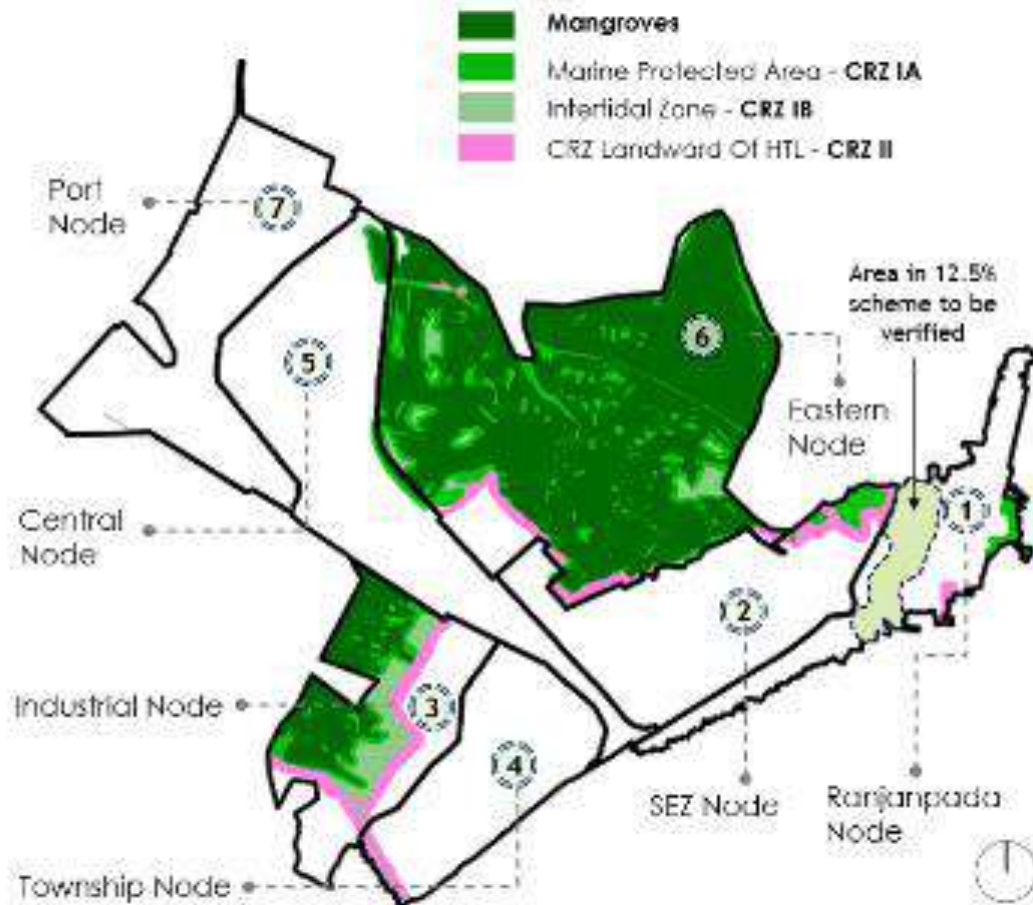


Figure 83 Coastal Regulation Zone map for JNPA

CRZ - IB - Activities shall be regulated or permissible in the CRZ-I B areas as under:-

Land reclamation, bunding, etc. shall be permitted only for activities such as-

- Foreshore facilities like ports, harbors, Jetties, wharves, quays, slipway, bridges, hover ports for coast guard, sea links, etc.;
- Projects for defense, strategic and security purposes;
- Road on stilts, authorized for permitting development on the landward side of such roads, till the existing High Tide Line: Provided that the use of reclaimed land may be permitted only for public utilities
- Measures for control of erosion;
- Maintenance and clearing of waterways, channels, ports and hover ports for coast guard;
- Measures to prevent sand bars, installation of tidal regulators, laying of storm water drains or for structure for prevention of salinity ingress and freshwater recharge.
- Activities related to waterfront or directly needing foreshore facilities such as ports and harbors, jetties, quays, etc.

- Power by non-conventional energy sources and associated facilities.
- Transfer of hazardous substances from ships to Ports, terminals and refineries and vice versa.
- Facilities for receipt and storage of petroleum products and liquefied natural gas
- Storage of non-hazardous cargo i.e. edible oil, fertilizers and food grains in notified Ports.
- Hatchery and natural fish drying.
- Existing fish processing units may utilize 25% additional plinth area for modernization purposes (only for additional equipment and pollution control measures)
- Treatment facilities for waste and effluents and conveyance of treated effluents.
- Storm water drains.
- Projects classified as strategic, defense related projects and projects of the Department of Atomic Energy, Government of India.
- Manual mining of atomic mineral(s)
- Exploration and extraction of oil and natural gas and all associated activities and facilities thereto;
- Foreshore requiring facilities for transport of raw materials, facilities for intake of cooling water, intake water for desalination plants, etc., and outfall for discharge of treated wastewater or cooling water from thermal power.
- Pipelines, conveying systems including transmission lines.
- Weather radar for monitoring of cyclones prediction, ocean observation platforms, movement, and associated activities.
- Salt harvesting and associated facilities.
- Desalination plants and associated facilities.

CRZ - II:-

Activities as permitted in CRZ-I B, shall also be permissible in CRZ-II:-

- (Construction of buildings for residential purposes, schools, hospitals, institutions, offices, public places, etc. shall be permitted only on the landward side of the existing road, or on the landward side of existing authorized fixed structures.
- (Buildings permitted as in (ii) above, shall be subject to the local town and country planning regulations as applicable from time to time.
- Reconstruction of authorized buildings shall be permitted, without change in present land use, subject to the local town and country planning regulations as applicable from time to time.

- Development of vacant plots in designated areas for construction of beach resorts or hotels or tourism development projects subject to the conditions laid in the said notification.
- Temporary tourism facilities shall be permissible in the beaches which shall only include shacks, toilets or washrooms, change rooms, shower panels; walkways constructed using interlocking paver blocks, etc., however, a minimum distance of 10 meter from HTL shall be maintained for setting up of such facilities.

3.6.4 Assessment of environmental pressures

1) Current edge condition of mangrove forest



Figure 84 Edge condition of mangrove forest

The road from the container parking at the foot of Juna Sheva going towards the Nhava Sheva International Container Terminal cuts two environmentally sensitive areas, i.e., the mangrove and the Juna Sheva hill. This barren road corridor has resulted into discontinuity of two ecologically sensitive areas. Though a study has not been carried out, but an assumption can be made that during monsoon season the oil spill on the road might runoff to the mangrove area. This might reduce in the quality and health of the mangrove in that area. The air and noise pollution will also have an effect on the quality of environment. This affect is detrimental to the flora and fauna.

It is suggested that evaluation of exiting underground storm water drain connection between western and eastern side of the road has to be made based on the topography of the area, the quantum of surface runoff.

2) Identification of environmental pressures on mangrove area along the development edge

The edge along the mangrove on the northern side is transparent, in short absence of an 'Ecotone'. The ecotones is a sensitive and important areas that acts as a transition between two different types of environments and offer a buffer between the two. In technical terms the mangrove forests represents an ecotone between marine and terrestrial ecosystem. The term ecotone is a contextual term, here in case of JNPA precinct, there has to be an ecotone between the mangrove and the developed area, where intense urban activities are performed.

The ecotone can offer a protection of the flora and fauna by reducing the negative impact of noise, air and water pollution.

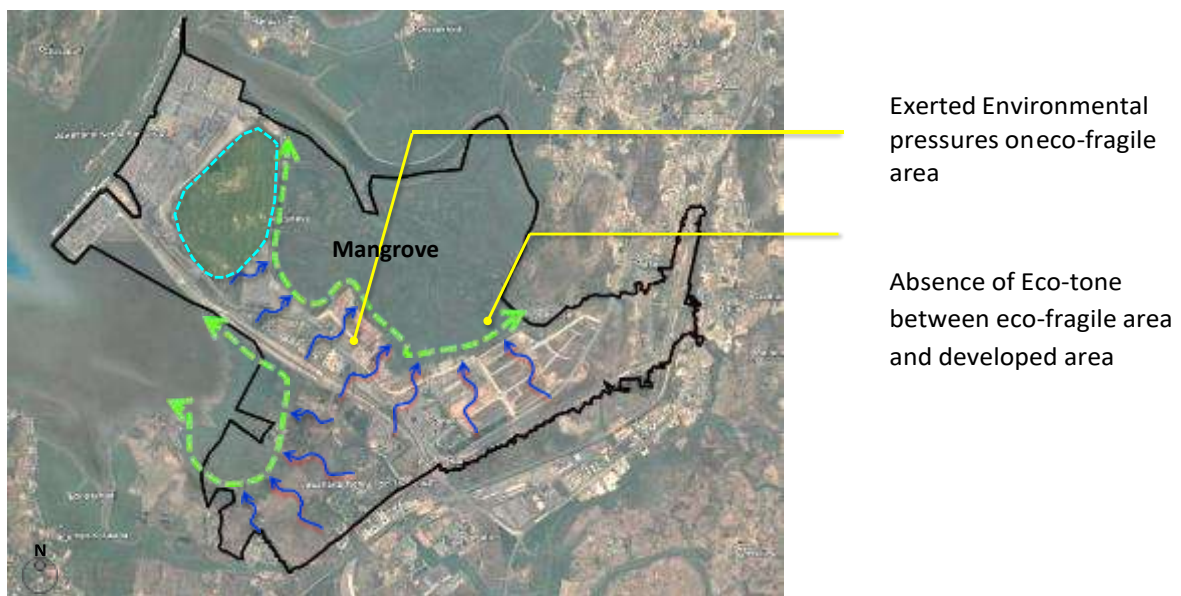


Figure 85 Marking of edge of environmentally sensitive area

3) Road edge condition

- Absence of Eco-tone between eco-fragile area and developed area Mangrove
- Exerted Environmental pressures on eco-fragile area N
- Undefined and dead edge along the roads (highways)
- This can also give rise to heat-island affect, increase the discomfort level
- Construction activity should ensure that the exposed surface is continuously sprinkled with water or should have protective enclosure.
- During heavy traffic and high wind, the possibility of dusty air can create problem and thereby have an adverse effect on public health.



Figure 86 Photos showing road edge condition

4) Edge condition of Goathans

Sonari and Jaskhar are two villages are now islands between the large scale development, especially the highways and roads running from all sides. The CRZ regulation has imposed certain restrictions in development of these villages on the peripheral area i.e. CRZ – II category.

Due to this isolation there is a threat of the villages losing their identity and also environmentally getting disconnected.

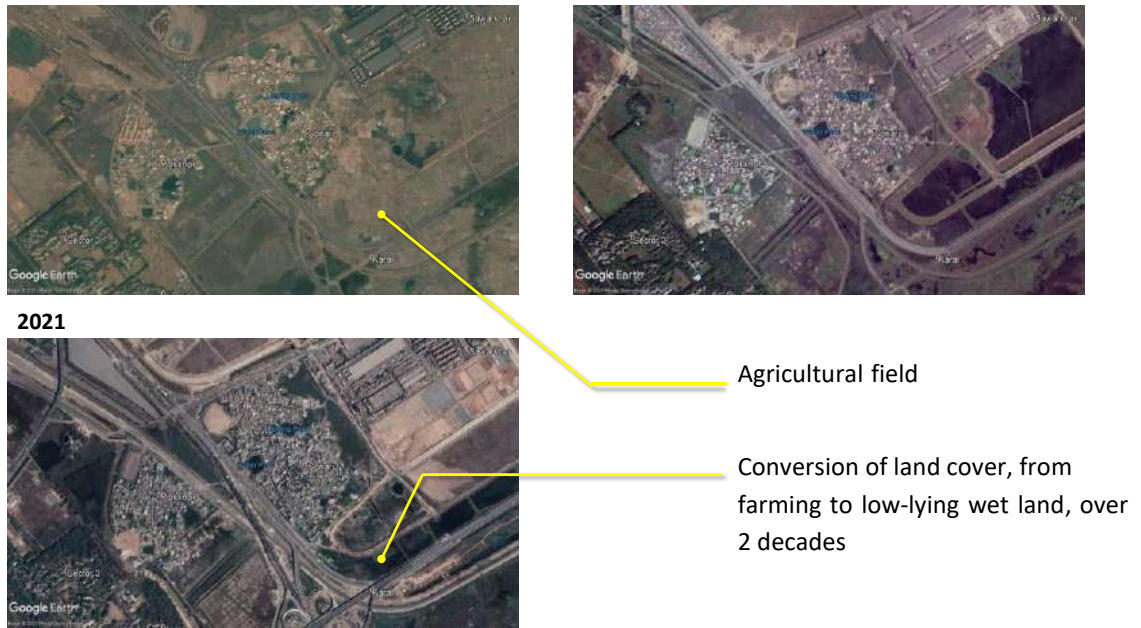


Figure 87 Artificial formation of low-lying area between village and highway



Formation of low-lying area in between roads, especially along Uran-Panvel road.

- These low lying areas are artificially created and many a times get flooded during monsoon or high tides.
- A proper networking system of the same is necessary.

5) Potential Pollution impact in JNPA precinct

A. Potential Noise impact:

- Traffic noise
- Fixed plant noise sources and noise associated with various logistics activities and movement of containers and marine cargoes

B. Potential Water impact:

- Surface runoff

- Impact on ecological sensitive areas due to diversion of natural storm water outfall
- Sewerage generation

C. Visual Impact:

- Visual impact due to Port & other development
- Landscape impact on any loss of natural vegetation

3.6.5 Environmental mitigation strategies

1. Buffer along highway 348



Figure 88 Introduction of Buffer (Ecotone) along edges

Fragile edge between the mangrove and highway 348 (leading to Nhava Sheva International Container Terminal) has to be made softer, by introducing a buffer of 50 to 100m. (Like the one shown in the right image of Fig. 14 above). Where ever possible 100m. buffer should be provided, especially along the road going to the port.

- The pollution impact will be absorbed by the buffer / ecotone and improve the environmental quality of ecologically fragile area.
- This buffer should be planted with native plants that will enhance the local biodiversity.
- The buffer should have a mix of big trees, small trees and bushes, as different typologies of vegetation are required to nurture bird habitat. Some bird species nest on big trees, while some nest in bushes, based on their feeding habits.

2. Swales along highway

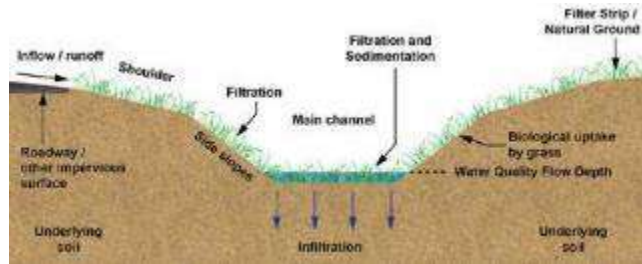


Figure 89 Diagram showing concept of Bio-swale

Swales have been used in Europe and US along highways to convey runoff. Swales not only convey storm water but also help to treat runoff to reduce pollutants. Like ditches, swales collect storm water from roads, driveways, parking lots and other hard surfaces.

How does swale work?

- **Swales** follow the contours around the base of a natural or created slope, redirecting storm water and filtering runoff as it sinks into the soil, instead of keeping it in one place, like a rain garden.
- Plants suck up the water along a **swale's** gently sloping banks and sometimes down the center of the channel.
- Swales trap and remove sediments and other pollutants and thus improve water quality.
- Reduce peak runoff velocity and promote infiltration.
- Reduce erosion.
- Provide for some groundwater recharge if correctly designed.

Maintenance of swales

o Monthly

- Inspect your swale during and after storms to make sure that rainwater has drained and there is no erosion.
- Remove sediment and debris from in and around the swale.
- Remove weeds and plants that do not belong.
- Check for any obstruction or blockage of flow along inflow areas or pipes, including trash, debris, or sediment.

o Seasonally

- Mow grass no shorter than 3 to 6 inches. Remove and compost all grass clippings.
- Adjust mower height to avoid scalping the edges of the side slopes.

Remove and compost leaves in the fall and spring. Leaves may smother the grass and block the flow of rainwater.

o **As needed**

- Reseed bare areas to avoid erosion.
- Be sure to water during the initial establishment period.
- Inspect and maintain or repair components.
- After rainfall, check the swale to ensure the water does not pond longer than 2 or 3 days after a rain storm.

o **Do not**

- Use fertilizer or pesticides in your swale.
- Remove or alter your grass swale. If you claimed your grass swale for the Storm water Credit Program, removing or modifying it can result in loss of credit.

Why it's important to maintain your grass drainage swale

An unmaintained grass drainage swale area may:

- Stop filtering the rainwater and allow trash and pollutants to enter into our local streams.
- Block the flow of rainwater and cause local flooding.
- Allow water to pool on the surface long enough to allow mosquitoes or other insects to breed (longer than 3 days).

3. Development of green corridors



Figure 90 Representative images of developing green corridors

Current situation:

- Dead edge along the road.
- Due to undefined / untreated edge there is lot of dust, having an adverse effect on the health.

- Absence of vegetation also increases the possibility of heat island affect.

Suggestion:

- Having soft edge (noise barrier) of plantation up to 15m. along the highway edge.
- The primary function of noise barriers is to shield receivers from excessive noise generated by road traffic.
- Noise barriers are considered the most reasonable noise mitigation measures available.

Plantation along roads



Bhokar



Kadu neem



Palash



Sonmohor

Figure 91 General plant species that can be planted along Highway

Advantages:

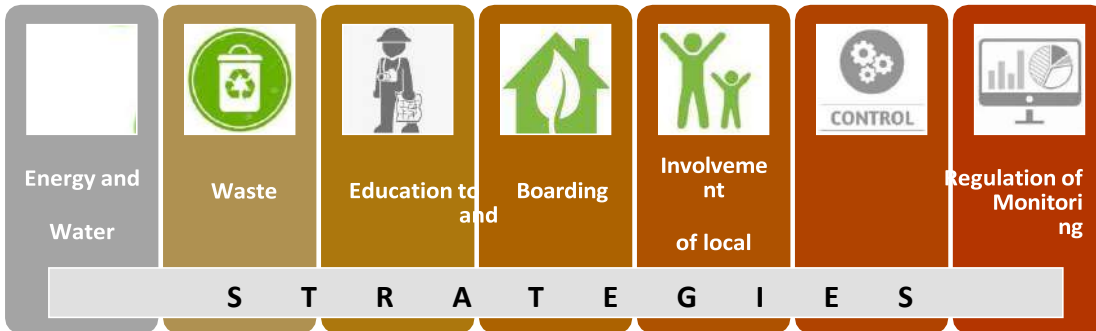
- Reduction in resource consumption
- Helps in reducing heat island affect
- Plantation of native plants, helps in absorption of CO2 there by reducing the pollution, also helps to enhance local biodiversity
- Reduce environmental impact and carbon foot print

- Meeting sustainability demand of better environmental quality

Suggestions:

- A mix of shrubs, small trees and big trees should be planted
- The plantation should be done after the swales

4. Tourism development



Design strategies:

1. Use of shipping container for developing **Tourist Village** west of Jaskar village
2. Elevated bridge to access the village
3. The tourist village will be serviced by the local population
4. *Online portal to book the accommodation should be made*

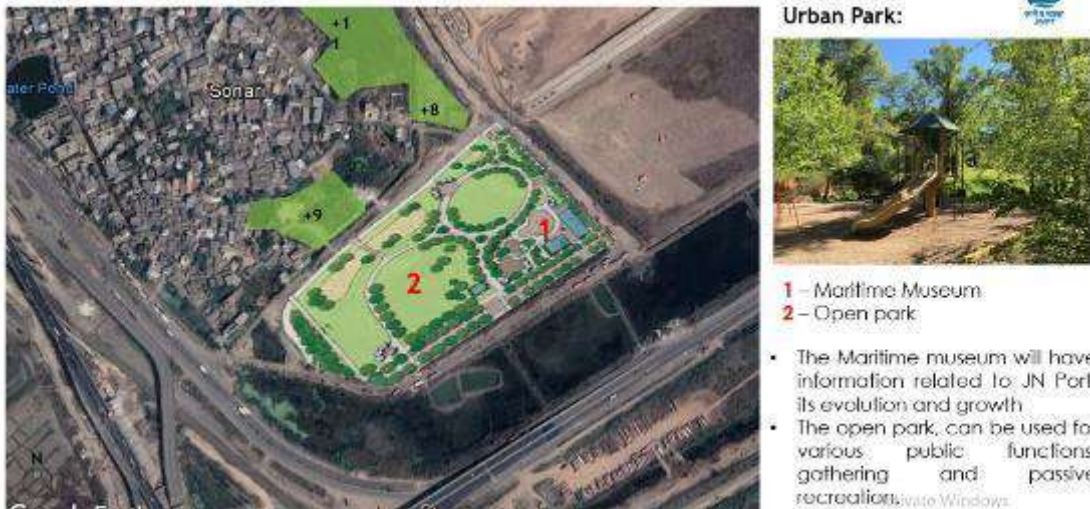


Figure 92 Ecotourism concept for promoting tourism

5. Urban Park

- This Park will be a good economic booster for the local village. The villagers can be trained in hospitality and other maintenance work like housekeeping, gardening, drivers, etc.
- The museum will have information related to local biodiversity and various habitat.
- It can also be a museum related to the transportation history of Indian.
- The museum should be built in ecofriendly material and should generate zero waste.
- All the waste generated on site should be recycled and reused on site itself.

- The open park, can be used for various public functions, gathering and passive recreation for tourist and local villagers.



3.6.6 General Recommendations

Biodiversity and Bird Friendly Design

- Open spaces should be connected through a green network, to form an open space system.
- Urban landscaped spaces like parks, campuses, large gardens, road side avenues and medians should follow a semi rustic pattern.
- All new buildings and old buildings during retrofitting is possible, should have roof gardens which follow a semi rustic environment.
- Compound walls, Balconies, verandahs and sit outs can be provided with holes for cavity nests or hooks for pendant nests.
- Courtyards and atria with greenery can be given in buildings which are accessible to birds.
- Use of plain transparent and reflective glass should be avoided. They can be used with narrow patterns, netting etc.
- Artificial lighting in open spaces should be just enough for use, avoid light spilling, and preferably use down lighting

Preventive measures for Noise pollution

- Along the Heavy Traffic Corridors, plantation and soft landscape should be developed, such that it helps to restrict the sound pollution
- Providing appropriate Buffer to the various activity area .

Preventive measures for Water Pollution

- Construction of well networked storm water drains, linked to purification plant

- Analyzing the potential impact on ecology, through EIA
- Construction of a separate sewerage treatment plant, for all the generated waste
- Assessment for future needs of waste water treatment

Preventive measures for Waste management

- Assessment of existing segregation of SW, before disposing to exiting collection system,
- Deriving methodology to recycle some of the waste generated on site

Preventive measures for visual landscape

- Development of industrial or any establishment with minimum visual impact
- Conserving existing natural vegetation area

CHAPTER 4 –PROJECTIONS AND DEMAND FORECAST

4.1 Population projection

JNPA residential area consist of existing four goothans, JNPA township, 12.5% R&R scheme and air force colony. Major green field development is on the land earmarked for 12.5 % Rehabilitation and resettlement scheme. Arithmetic method of population projection is used for population projection of Goathans. Whereas in other areas population is estimated based on average dwelling unit size and proposed population density for the horizon year 2041

The three critical scenarios possible for the growth of JNPA residential area are:

Low growth scenario: The natural growth phenomenon where neither any infrastructure provisions nor economic activities are induced due to which the population grows at slow and natural pace. This is the trend if area is allowed to grow on its own with provision of infrastructure as and when the need arises.

Medium growth scenario: The growth in population is expected due to induced external forces which are basically provision of infrastructures like roads, suburban rail link, social infrastructure, water supply, sewerage, drainage, etc. Further, induced population is due to planned activities within the zone. Infrastructure and economic activities on one hand induce or attract population to in-migrate but also control the phenomenon by the planned and controlled approach.

High growth scenario: It is the result of uncontrolled and unplanned growth due to economic activity in nearby area. Population growth in this scenario is due to the inflow of heavy economic activities. In such situation, the zone attracts people from different areas including adjoining ones.

To be rational in terms of efficient and planned development the medium growth population growth scenario has been taken into consideration. The assumptions for population projection of goathan, JNPA Township, 12.5% R&R land and new proposed areas in given as under –

1) Gaothan

- Existing population - 13,371
- Projected population (Arithmetic Method) – **23,500**

2) 12.5% R&R Scheme

• Introduction

Jawaharlal Nehru Port Authority (JNPA), has signed a Memorandum of Understanding (MoU) with City and Industrial Development Corporation (CIDCO) for allotment of land

under the 12.5% scheme to JNPA Project Affected Persons (PAP's). The land admeasures 111 hectare area.

- **Projected population**

The resident population of 85,700 is proposed with a population density of 772 pph. Assumptions are based on average dwelling unit size with a family size of 4. The average dwelling size is derived as 67 sq.mt . Detailed working is given in Table no 20. For the family size an average of district family size i.e. 4.2 and CIDCO i.e. 3.8 was considered. Thus average of both the sizes was considered as 4.

Table 20 Average dwelling unit size derived for 12.5% allotment scheme

Proposed average dwelling unit					
Type of Apartment	Factor	Carpet Area in sq. ft.	Carpet Area in sq. mt.	Built - Up Area in sq.mt.	Average unit size (in sq.mt) based on Factor
Type I - 1 BHK	0.2	484.38	45.00	51.75	10.35
Type II- 1 BHK	0.4	522.16	48.51	63.60	25.44
2 BHK	0.4	731.84	67.99	78.19	31.28
Average DU Area					67
Estimated population					
Total land area	111 ha				
Net residential area	71.87ha				
FSI	2				
Built-up area in Sq.mt	1437400				
Dwelling Units	21433				
Total population	85700				

As per the MoU, JNPA will transfer over 111 hectares of JNPA land to the State Government for allotment of land to the project affected persons and CIDCO has agreed for the PMC charges at 5% of the project cost. The MoU states that JNPA would pay CIDCO, the actual amount incurred by CIDCO towards cost of development of the said land.

In addition to transferring the said 111 hectares of the JNPA land, CIDCO will develop the required amenities and infrastructure as per the finalized layout which will be allotted to the JNPA PAPs. JNPA will release the funds in installments based on the actual utilization certificate issued by CIDCO from time to time. It has also been agreed that till the infrastructure is handed over to local authority, CIDCO will be special planning authority for the area and the cost of maintenance of the infrastructure will be borne by CIDCO. Since

the project is being funded by JNPA, the Government of Maharashtra has authorized CIDCO to execute this MoU and CIDCO shall pass on the development charges from the PAPs to JNPA.

The allotment of land has been made transparent where CIDCO in coordination with JNPA has conducted five draws of lots through a computerized lottery system and so far 52% PAPs have been issued a letter of intent by CIDCO. JNPA firmly believes, the remaining 48% PAPs will soon participate in the transformation.

3) JNPA Township Redevelopment

- Total land area – 102 ha
- Net residential area – 42 ha
- FSI – 2.5
- Average dwelling unit size – 67 sqm
- Total DU proposed - 15000
- Family size – 4
- Estimated Population – **60,000**

4) Proposed new residential area

Proposed residential area above township is expected to house 18800 population considering planning norm of @ 250 Persons / Ha.

JNPA total Population forecast

Thus total resident population estimated till 2041 is 1,88,600.

Table 21 Population projection every five year breakup

Sr No	JNPA area	Resident Population				
		2021	2026	2031	2036	2041
1	Villages (Goathans)	13371	15395	17726	20410	23500
2	12.5% R&R scheme	0	8570	25710	51420	85700
3	JNPT Township	6990	11965	20479	35054	60000
4	Air force township	600	600	600	600	600
5	New Residential Development	0	1880	5640	11280	18800
	TOTAL	20961	38410	70155	118764	188600

4.2 Employment projection

The growth in the region due to employment generating proposed activities and facilities it is expected that the region will envisage an employment of 1.8 lakhs, appx 2lakhs. Including floating population of 20% is 2.47 lakh.

4.3 Social infrastructure required

1) Education

Demand estimation was carried out for educational facilities which include balwadi/ creche, primary & secondary schools, colleges and professional institution/ technical colleges. It is estimated that, by the year 2034, about 10 schools would be needed to cater to the basic educational requirement. One technical or vocational institute is required.

2) Healthcare

One Government hospital is required. Total requirement of 500 beds including township hospital.

4.4 Physical Infrastructure required

4.4.1 Water Supply Demand Projection

Option-1: Considering Dual Plumbing System

Water supply demand is estimated based on the proposed land use, built-up area and the population densities in the JNPA area. The estimated water demand is segregated into potable, flushing and horticulture water demand. The wastewater generated from the development shall be treated and reused for non-potable purposes. The total non-potable water demand includes flushing of toilets, Horticulture, and Washing/ Cleaning shall be met from the recycled wastewater.

While estimating the water demand, following are assumed:

- For the JNPA Residential area, an assumption for water demand as per Table No 4.4 of Detailed Project Report for Upgradation of Existing Infrastructure for JNPA Township Prepared by IIT, Madras, i.e. for potable water demand @ 105 lpcd and for flushing water demand @ 30 lpcd
- For potable water at proposed residential area and non-port area @ 105 lpcd and for flushing water demand @ 30 lpcd considered.
- Potable water demands for other areas like commercial, Public-Semi-public, etc. are t @ 30 lpcd and 15 lpcd for flushing water demand as per guideline of IS 9668: 1981

Table 22 Option 1- Water Demand Assessment for JNPA Area - Proposed (2026)

S. No.	Description	Potable Water	Fire Water	Potable & Fire Water	Process Water	Total Potable Water Demand	Flushing Water	Horticulture Demand
1	JNPA SEZ	0.23	0.30	0.52	0.56	1.08	0.12	4.52
2	Non-Port area	0.29	0.18	0.47		0.47	0.09	0.84
3	Transportation	0.05	0.26	0.31		0.31	0.07	
4	Port operational	0.27	0.24	0.51		0.51		
4A	Liquid Berth	0.01		0.01		0.01		
4B	Terminal 4	0.68		0.68		0.68		
5	12.5% R&R scheme	0.31	0.34	0.65		0.65	0.17	0.11
6	Residential	0.24	0.16	0.40		0.40	0.07	0.02
7	Industrial	0.21	0.30	0.52		0.52	0.13	0.09
8	Commercial	0.22	0.31	0.53		0.53	0.13	0.06
9	Public-Semi public	0.11	0.21	0.32		0.32	0.06	0.02
10	JNPT Township	4.29	1.66	5.94		5.94	2.09	0.27
11	Road at Proposed Area							0.20
	Total	6.90	3.96	10.86	0.56	11.42	2.92	6.13
	15% losses	1.03	0.59	1.63	0.08	1.71	0.44	0.92
	Total including losses	7.93	4.55	12.48	0.65	13.13	3.36	7.05

Table 23 Option 1- Water Demand Assessment for JNPA Area - Proposed (2031)

S. No.	Description	Potable Water	Fire Water	Potable & Fire Water	Process Water	Total Potable Water Demand	Flushing Water	Horticulture Demand
1	JNPT SEZ	0.68	0.72	1.40	0.56	1.96	0.39	6.88
2	Non-Port	0.29	0.18	0.47		0.47	0.03	1.20
3	Transportation	0.05	0.26	0.31		0.31	0.10	
4	Port operational	0.27	0.24	0.51		0.51		
4A	Liquid Berth	0.01		0.01		0.01		
4B	Terminal 4	0.68		0.68		0.68		
5	12.5% R&R scheme	0.63	0.60	1.23		1.23	0.53	0.42
6	Residential	2.44	0.34	2.79		2.79	0.28	0.05
7	Industrial	0.16	0.53	0.69	0.28	0.97	0.38	0.36
8	Commercial	0.30	0.54	0.84		0.84	0.40	0.12
9	Public-Semi public	3.90	0.25	4.15		4.15	0.09	0.03
10	JNPT Township	5.04	1.85	6.89		6.89	0.77	0.27
11	Road at Proposed Area							0.20
	Total	14.45	5.51	19.96	0.84	20.80	2.97	9.53
	15% losses	2.17	0.83	2.99	0.13	3.12	0.45	1.43
	Total including losses	16.61	6.34	22.95	0.97	23.92	3.42	10.96

Table 24 Demand Assessment for JNPA Area - Proposed (2036)

S. No.	Description	Potable Water	Fire Water	Potable & Fire Water	Process Water	Total Potable Water Demand	Flushing Water	Horticulture Demand
1	JNPT SEZ	1.35	0.72	2.07	0.75	2.82	0.74	6.88
2	Non-Port	0.29	0.18	0.47		0.47	0.09	1.20
3	Transportation	0.05	0.27	0.32		0.32	0.08	
4	Port operational	0.27	0.24	0.51		0.51	0.08	
4A	Liquid Berth	0.01		0.01		0.01		
4B	Terminal 4	0.68		0.68		0.68		
5	12.5% R&R scheme	1.27	0.84	2.11		2.11	0.75	0.53
6	Residential	4.89	0.51	5.40		5.40	1.50	0.14
7	Industrial	0.23	0.74	0.97	0.37	1.35	0.13	0.45
8	Commercial	0.37	0.76	1.14		1.14	0.20	0.12
9	Public-Semi public	7.32	0.30	7.62		7.62	4.19	0.03
10	JNPT Township	6.05	2.07	8.12		8.12	0.89	0.27
11	Road at Proposed Area							0.20
	Total	22.77	6.65	29.42	1.12	30.54	8.63	9.82
	15% losses	3.42	1.00	4.41	0.17	4.58	1.29	1.47
	Total including losses	26.19	7.65	33.83	1.29	35.12	9.92	11.29

Table 25 Option 1- Water Demand Assessment for JNPA Area - Proposed (2041)

S. No.	Description	Potable Water	Fire Water	Potable & Fire Water	Process Water	Total Potable Water Demand	Flushing Water	Horticulture Demand
1	JNPT SEZ	2.25	0.93	3.18	0.38	3.56	1.23	6.88
2	Non-Port	0.29	0.18	0.47		0.47	0.09	1.20
3	Transportation	0.06	0.28	0.33		0.33	0.08	
4	Port operational	0.11	0.24	0.35		0.35	0.08	
4A	Liquid Berth	3.06		3.06		3.06		
4B	Terminal 4	0.79		0.79		0.79		
5	12.5% R&R scheme	3.06	1.09	4.14		4.14	0.11	0.53
6	Residential	2.83	0.55	3.38		3.38	0.84	0.02
7	Industrial	2.11	0.96	3.07	0.28	3.35	1.25	0.45
8	Commercial	2.23	0.99	3.21		3.21	1.32	0.12
9	Public-Semi public	0.33	0.36	0.69		0.69	0.18	0.03
10	JNPT Township	7.32	2.31	9.63		9.63	1.03	0.54
11	Road at Proposed Area							0.20
	Total	24.42	7.88	32.30	0.65	32.95	6.21	9.97
	15% losses	3.66	1.18	4.84	0.10	4.94	0.93	1.50
	Total including losses	28.08	9.06	37.14	0.75	37.89	7.14	11.47

Water Supply Projection Option-2: Considering Combined Plumbing System

Water supply demand is estimated based on the proposed land use, built-up area and the population densities in the JNPA area. The estimated water demand is segregated into potable, flushing and horticulture water demand. The wastewater generated from the development shall be treated and reused for non-potable purposes. The total non-potable water demand includes flushing of toilets, Horticulture, and Washing/ Cleaning shall be met from the recycled wastewater.

While estimating the water demand, following are assumed:

- For the JNPA Residential area, an assumption for water demand as per Table No 4.4 of Detailed Project Report for Upgradation of Existing Infrastructure for JNPA Township Prepared by IIT, Madras, i.e. for potable water demand @ 135 lpcd
- For potable water at proposed residential area and non-port area @ 135 lpcd considered.
- Potable water demands for other areas like commercial, Public-Semi-public, etc. are calculated considering @ 45 lpcd as per guideline of IS 9668: 1981
- Assumption considered for Fire water demand is 100vP

Table 26 Option 2- Water Demand Assessment for JNPA Area - Proposed (2026)

S. No.	Description	Potable Water	Fire Water	Potable & Fire Water	Process Water	Total Potable Water Demand	Horticulture Demand
1	JNPT SEZ	0.35	0.30	0.64	0.56	1.21	4.52
2	Non-Port	0.37	0.18	0.55		0.55	0.84
3	Transportation	0.12	0.26	0.37		0.37	
4	Port operational	0.18	0.24	0.42		0.42	
4A	Liquid Berth	0.01		0.01		0.01	
4B	Terminal 4	0.68		0.68		0.68	
5	12.5% R&R scheme	0.47	0.34	0.82		0.82	0.11
6	Residential	0.31	0.16	0.47		0.47	0.02
7	Industrial	0.34	0.30	0.64		0.64	0.09
8	Commercial	0.36	0.31	0.67		0.67	0.06
9	Public-Semi public	0.17	0.21	0.38		0.38	0.02
10	JNPT Township	4.29	1.66	5.94		5.94	0.27
11	Road at Proposed Area						0.20
	Total	7.64	3.96	11.60	0.56	12.16	6.13
	15% losses	1.15	0.59	1.74	0.08	1.82	0.92
	Total including losses	8.79	4.55	13.34	0.65	13.99	7.05

Table 27 Option 2- Water Demand Assessment for JNPA Area - Proposed (2031)

S. No.	Description	Potable Water	Fire Water	Potable & Fire Water	Process Water	Total Potable Water Demand	Horticulture Demand
1	JNPT SEZ	1.05	0.72	1.77	0.56	2.33	6.88
2	Non-Port	0.37	0.18	0.55		0.55	1.20
3	Transportation	0.12	0.26	0.39		0.39	
4	Port operational	0.18	0.24	0.42		0.42	
4A	Liquid Berth	0.01		0.01		0.01	
4B	Terminal 4	0.68		0.68		0.68	
5	12.5% R&R scheme	1.01	0.60	1.61		1.61	0.42
6	Residential	3.20	0.34	3.54		3.54	0.05
7	Industrial	0.25	0.53	0.78	0.28	1.05	0.36
8	Commercial	0.46	0.54	1.00		1.00	0.12
9	Public-Semi public	6.16	0.25	6.41		6.41	0.03
10	JNPT Township	5.04	1.85	6.89		6.89	0.27
11	Road at Proposed Area						0.20
	Total	18.52	5.51	24.03	0.84	24.87	9.53
	15% losses	2.78	0.83	3.60	0.13	3.73	1.43
	Total including losses	21.30	6.34	27.64	0.97	28.60	10.96

Table 28 Option 2- Water Demand Assessment for JNPA Area - Proposed (2036)

S. No.	Description	Potable Water	Fire Water	Potable & Fire Water	Process Water	Total Potable Water Demand	Flushing Water	Horticulture Demand
1	JNPT SEZ	2.00	0.72	2.73	0.75	3.48		6.88
2	Non-Port	0.37	0.18	0.55		0.55		1.20
3	Transportation	0.07	0.27	0.33		0.33		
4	Port operational	0.15	0.24	0.39		0.39		
4A	Liquid Berth	0.01		0.01		0.01		
4B	Terminal 4	0.68		0.68		0.68		
5	12.5% R&R scheme	2.02	0.84	2.86		2.86		0.53
6	Residential	6.39	0.51	6.90		6.90		0.14
7	Industrial	0.36	0.74	1.10	0.37	1.47		0.45
8	Commercial	0.57	0.76	1.33		1.33		0.12
9	Public-Semi public	11.50	0.30	11.80		11.80		0.03
10	JNPT Township	6.05	2.07	8.12		8.12		0.27
11	Road at Proposed Area							0.20
	Total	30.17	6.65	36.82	1.12	37.94		9.82
	15% losses	4.53	1.00	5.52	0.17	5.69		1.47
	Total including losses	34.69	7.65	42.34	1.29	43.63		11.29

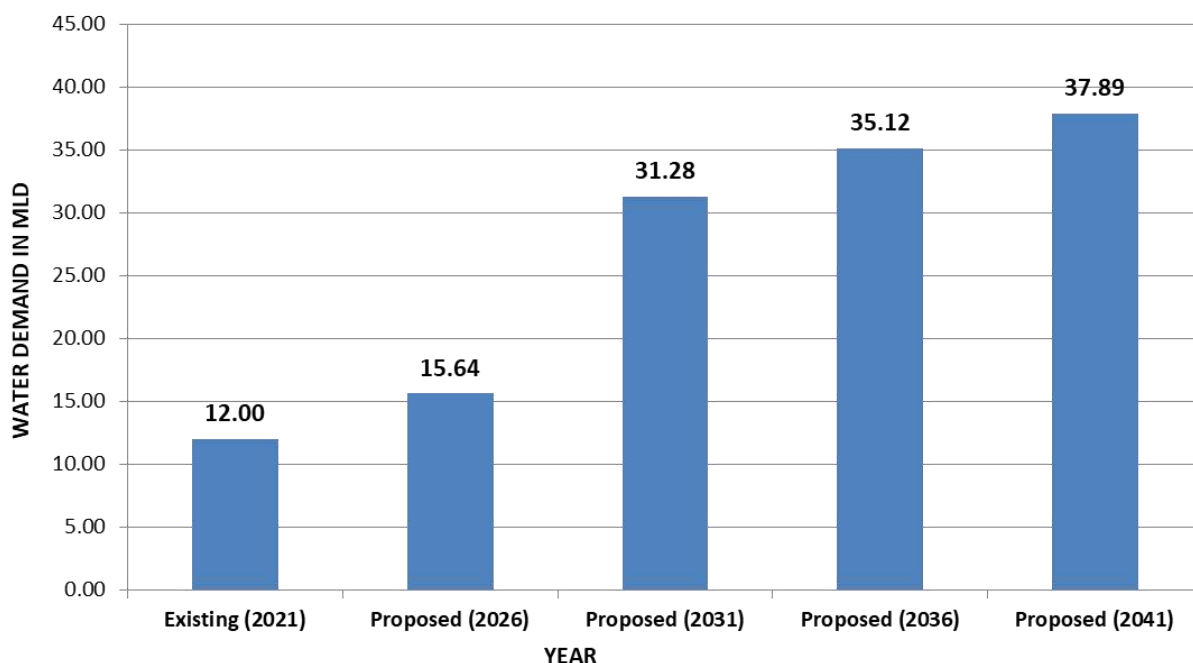
Table 29 Option 2- Water Demand Assessment for JNPA Area - Proposed (2041)

S. No.	Description	Potable Water	Fire Water	Potable & Fire Water	Process Water	Total Potable Water Demand	Horticulture Demand
1	JNPT SEZ	3.48	0.93	4.42	0.38	4.79	6.88
2	Non-Port	0.37	0.18	0.55		0.55	1.20
3	Transportation	0.14	0.28	0.41		0.41	
4	Port operational	0.18	0.24	0.42		0.42	
4A	Liquid Berth	3.06		3.06		3.06	
4B	Terminal 4	0.79		0.79		0.79	
5	12.5% R&R scheme	4.73	1.09	5.82		5.82	0.53
6	Residential	3.66	0.55	4.21		4.21	0.02
7	Industrial	3.37	0.96	4.33	0.28	4.60	0.45
8	Commercial	3.55	0.99	4.54		4.54	0.12
9	Public-Semi public	0.51	0.36	0.87		0.87	0.03
10	JNPT Township	7.32	2.31	9.63		9.63	0.54
11	Road at Proposed Area						0.20
	Total	31.16	7.88	39.04	0.65	39.70	9.97
	15% losses	4.67	1.18	5.86	0.10	5.95	1.50
	Total including losses	35.84	9.06	44.90	0.75	45.65	11.47

Gap Assessment:**Water Supply Projection****Table 30 Option-1: Considering recycled water for flushing purpose**

Sl. No.	Particulars	Unit	Existing (2021)	Proposed (2026)	Proposed (2031)	Proposed (2036)	Proposed (2041)
A	Total Water Demand	MLD	12.00	15.64	24.77	35.12	37.89
B = D+F	Potable Water Demand (excluding fire water demand)	MLD	12.00	8.58	17.58	27.48	28.83
C = D+E+F	Potable Water Demand (including fire water demand)	MLD	12.00	13.13	23.92	35.12	37.89
D	Potable Water Demand	MLD	12.00	7.93	16.61	26.19	28.08
E	Fire Water Demand	MLD		4.55	6.34	7.65	9.06
F	Process Water Demand	MLD		0.65	0.97	1.29	0.75
G	Flushing Water Demand	MLD		3.36	3.42	9.92	15.18
H	Horticulture Demand	MLD		7.05	10.96	11.29	11.47
I = G+H	Recycled Water Required	MLD	7.80	10.40	14.38	21.22	26.65
J	Total Waste Water Generated	MLD	1.42	8.78	15.03	27.52	33.13
K	Recycled Water Generated (90% of Total W/w Generated)	MLD	1.28	7.90	13.53	24.77	29.82
L = K-I	Water Required from Potable Water	MLD	6.52	2.50	0.85	0.00	0.00
M	Existing Water Supply	MLD	8.00	8.00	8.00	8.00	8.00
N = A-M	Potable Water Gap	MLD	4.00	7.64	16.77	27.12	29.89
O	Existing Water Reservoir Capacity (ESR/ GLSR) as on June 2022	ML	8.63	8.63	8.63	8.63	8.63

P	Required capacity of Water Reservoir (ESR/ GLSR)	ML	0.00	0.00	1.80	1.28	0.92
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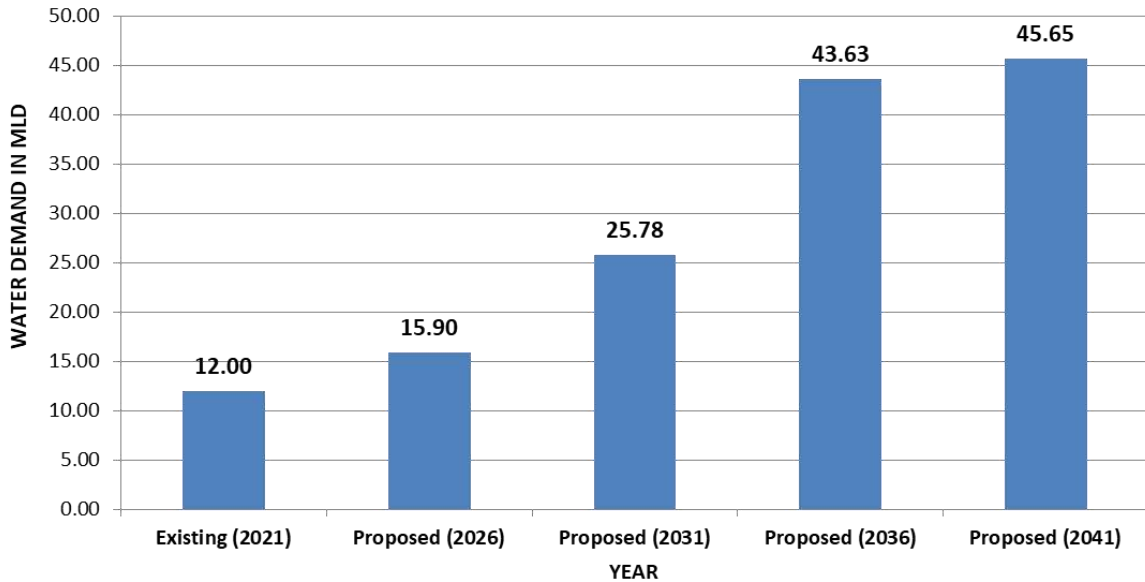


Total water demand including Fire estimated for JNPA (2041): 37.89 MLD if we consider the dual plumbing system. Total water potable demand in JNPA area is 28.08 MLD in 2041. 37.89 MLD water supply requirement will be one time requirement (including fire demand water supply).

Table 31 Water Supply Projection Option-2: Considering Combined Plumbing System

Sl. No.	Particulars	Unit	Existing (2021)	Proposed (2026)	Proposed (2031)	Proposed (2036)	Proposed (2041)
A	Total Water Demand	MLD	12.00	15.90	25.78	43.63	45.65
B = D+F	Potable Water Demand (excluding fire water demand)	MLD	12.00	9.44	22.26	35.98	36.59
C = D+E+F	Potable Water Demand (including fire water demand)	MLD	12.00	13.99	28.60	43.63	45.65
D	Potable Water Demand	MLD		8.79	21.30	34.69	35.84
E	Fire Water Demand	MLD		4.55	6.34	7.65	9.06
F	Process Water Demand	MLD	12.00	0.65	0.97	1.29	0.75
G	Flushing Water Demand	MLD		3.08	0.00	0.00	0.00
H	Horticulture Demand	MLD		7.05	10.96	11.29	11.47
I = G+H	Recycled Water Required	MLD	1.59	10.13	10.96	11.29	11.47
J	Total Waste Water Generated	MLD	9.60	9.13	15.32	24.81	25.32
K	Recycled Water Generated (90% of Total W/w Generated)	MLD	8.64	8.22	13.79	22.33	22.79
	Surplus/ Deficit of Recycled Water required	MLD	7.05	-1.91	2.83	11.03	11.32
L = K-I	Water Required from Potable Water	MLD	-	1.91	-	-	-
M	Existing Water Supply	MLD	8.00	8.00	8.00	8.00	8.00

Sl. No.	Particulars	Unit	Existing (2021)	Proposed (2026)	Proposed (2031)	Proposed (2036)	Proposed (2041)
N = A-M	Potable Water Gap	MLD	4.00	7.90	17.78	35.63	37.65
O	Existing Water Reservoir Capacity (ESR/ GLSR) as on June 2022	ML	8.63	8.63	8.63	8.63	8.63
P	Required capacity of Water Reservoir (ESR/ GLSR)	ML	-	-	-	5.92	6.59



Total water demand including Fire estimated for JNPA (2041) is 45.65 MLD if we consider the dual plumbing system. Total water potable demand in JNPA area is 36.59 MLD in 2041. 45.65 MLD water supply requirement will be one time requirement (including fire demand water supply).

b) Development Strategies

The present water supply system in the project area is intermittent i.e. 12 hours, which is proposed to be developed on a 24x7 basis. Each distribution area will have its separate network served by the elevated and/or ground level service reservoirs. The service reservoirs will be provided at the highest elevation of the distribution zone, so that the water can be supplied by gravity for a majority of the demand area.

The total required storage capacity of service reservoirs is 5000 KL for the target year based on a 24x7 water supply system. At present, 12000 KL capacity service reservoirs are feeding water at various zone of JNPA Township & Non-port areas. 3 nos. 1500KL ESR(s) are ready to feed water to the SEZ area. An additional 6300 KL capacity elevated water reservoir is required to distribute potable water to plots not connected with the existing/ under-construction ESR(s). **From the Gap assessment of water supply for the year 2041, following are the development strategies**

- **Augmentation in water supply from MJP**

- **Desalination Plant**

The following development strategies may also be included alongside:

- Water supply must be on 24x7 for equity, effective metering and for the best hygiene model of supply. Leakage detection and thefts can easily be revealed only with a 24x7 supply pattern.
- As per JNPA data, water from MJP is supplied to various zones such as township area, SEZ area, non-port area & port area. There is no single window supply system is present. This system needs to discontinue. For a proper water supply system, the points below must be followed
 - Proper single Water works, consist of GLSR including pumping system with smart water level indicator & smart water meter at inlet point, elevated service reservoir
 - Potable water must be supplied to every zone from this water works.
 - Decentralized water distribution network(s)
- Implementation of 100% smart water metering system at water works to receive the inlet water quantity and at consumer level to ensure the quantity of water supplied to them.
- Implementation of smart water indicators unit(s) for all water reservoirs. This smart water indicator must be used for at least 10 tank, monitored via one Display Unit
- Detailed Operation and Maintenance Programme
- Replacement the old/defunct system
- Use of Recycled water for meeting horticulture and other non-potable uses.

c) Desalination Plant

- d) JNPA has mandated MJP for **augmentation in water supply**. In case water supply is not available from MJP, then JNPA may explore setting up of desalination plant. Desalination is a process that takes away mineral components from saline water. More generally, desalination refers to the removal of salts and minerals from a target substance, Saltwater (especially sea water) is desalinated to produce water suitable for human consumption or irrigation. The by-product of the desalination process is brine. Desalination is used on many seagoing ships and submarines. Most of the modern interest in desalination is focused on cost-effective provision of fresh water for human use. Along with recycled wastewater, it is one of the few rainfall-independent water resources. Desalination process detailed below.

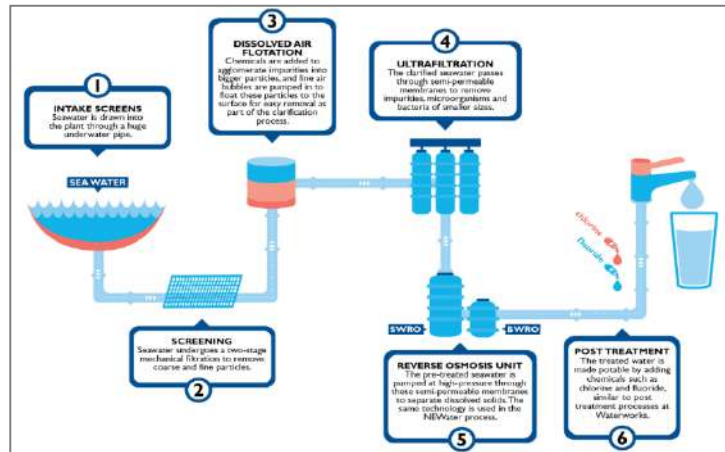


Figure 93 Process of Desalination Plant

The major benefit of desalination is that it can continue to deliver high quality drinking water for consumption, even during periods of drought. It also provides an alternative source of water that will make our overall supply more diverse and less vulnerable to interruption.

Desalination is an artificial process by which saline water (generally sea water) is converted to freshwater. The most common desalination processes are distillation and reverse osmosis.

There are several methods. Each has advantages and disadvantages but all are useful. The methods can be divided into membrane-based (e.g., reverse osmosis) and thermal-based methods. The traditional process of desalination is distillation, i.e. boiling and re-condensation of seawater to leave salt and impurities behind.

Currently there are two technologies with more desalination capacity in the world, multi-stage flash distillation and reverse osmosis.

Sewage Generation

Option-1: Waste-water Estimation considering Dual Plumbing System

The wastewater generations are taken as 80% of the per capita potable water consumption as per CPHEEO guidelines, 100% of flushing water consumption & 60% of process water consumption.

Table 32 Option 1 Sewage Demand Assessment of JNPA Area- Proposed (2026)

S. No.	Description	Potable Water	Process Water	Flushing Water	Total Waste Water Generated
1	JNPT SEZ	0.23	0.56	0.12	0.64
2	Non-Port	0.29		0.09	0.32
3	Transportation	0.05		0.07	0.11
4	Port operational	0.27			0.22

S. No.	Description	Potable Water	Process Water	Flushing Water	Total Waste Water Generated
4A	Liquid Berth	0.01			0.01
4B	Terminal 4	0.68			0.54
5	12.5% R&R scheme	0.31		0.17	0.41
6	Residential	0.24		0.07	0.26
7	Industrial	0.21		0.13	0.29
8	Commercial	0.22		0.13	0.31
9	Public-Semi public	0.11		0.06	0.15
10	JNPT Township	4.29		2.09	5.52
	Total	6.90	0.56	2.92	8.78

Table 33 Option 1 Sewage Demand Assessment for JNPA Area - Proposed (2031)

S. No.	Description	Potable Water	Process Water	Flushing Water	Total Waste Water Generated
1	JNPT SEZ	0.68	0.56	0.39	1.27
2	Non-Port	0.29		0.03	0.26
3	Transportation	0.05		0.10	0.15
4	Port operational	0.27			0.22
4A	Liquid Berth	0.01			0.01
4B	Terminal 4	0.68			0.54
5	12.5% R&R scheme	0.63		0.53	1.04
6	Residential	2.44		0.28	2.24
7	Industrial	0.16	0.28	0.38	0.67
8	Commercial	0.30		0.40	0.64
9	Public-Semi public	3.90		0.09	3.21
10	JNPT Township	5.04		0.77	4.80
	Total	14.45	0.84	2.97	15.03

Table 34 Option 1 Sewage Demand Assessment for JNPA Area - Proposed (2036)

S. No.	Description	Potable Water	Process Water	Flushing Water	Total Waste Water Generated
1	JNPT SEZ	1.35	0.75	0.74	2.27
2	Non-Port	0.29		0.09	0.32
3	Transportation	0.05		0.08	0.12
4	Port operational	0.27		0.08	0.29
4A	Liquid Berth	0.01			0.01
4B	Terminal 4	0.68			0.54
5	12.5% R&R scheme	1.27		0.75	1.77
6	Residential	4.89		1.50	5.41
7	Industrial	0.23	0.37	0.13	0.53
8	Commercial	0.37		0.20	0.50
9	Public-Semi public	7.32		4.19	10.04
10	JNPT Township	6.05		0.89	5.73

S. No.	Description	Potable Water	Process Water	Flushing Water	Total Waste Water Generated
Total		22.77	1.12	8.63	27.52

Table 35 Option 1 Sewage Demand Assessment for JNPA Area - Proposed (2041)

S. No.	Description	Potable Water	Process Water	Flushing Water	Total Waste Water Generated
1	JNPT SEZ	2.25	0.38	1.23	3.26
2	Non-Port	0.29		0.09	0.32
3	Transportation	0.06		0.08	0.13
4	Port operational	0.11		0.08	0.16
4A	Liquid Berth	3.06			2.44
4B	Terminal 4	0.79			0.63
5	12.5% R&R scheme	3.06		0.11	2.55
6	Residential	2.83		0.84	3.10
7	Industrial	2.11	0.28	1.25	3.11
8	Commercial	2.23		1.32	3.10
9	Public-Semi public	0.33		0.18	0.44
10	JNPT Township	7.32		1.03	6.89
Total		24.42	0.65	6.21	26.13

Option-2: Waste-water estimation considering Combined Plumbing System

The wastewater generations are taken as 80% of the per capita potable water consumption as per CPHEEO guidelines & 60% of process water consumption.

Table 36 Option 2 Sewage Demand Assessment for JNPA Area - Proposed (2026)

S. No.	Description	Potable Water	Process Water	Total Waste Water Generated
1	JNPT SEZ	0.35	0.56	0.62
2	Non-Port	0.37		0.30
3	Transportation	0.12		0.10
4	Port operational	0.18		0.14
4A	Liquid Berth	0.01		0.01
4B	Terminal 4	0.68		0.54
5	12.5% R&R scheme	0.47		0.38
6	Residential	0.31		0.25
7	Industrial	0.34		0.27
8	Commercial	0.36		0.28
9	Public-Semi public	0.17		0.14
10	JNPT Township	4.29		3.43
Total		7.64	0.56	6.45

Table 37 Option 2 Sewage Demand Assessment for JNPA Area - Proposed (2031)

S. No.	Description	Potable Water	Process Water	Total Waste Water Generated
1	JNPT SEZ	1.05	0.56	1.17
2	Non-Port	0.37		0.30
3	Transportation	0.12		0.10
4	Port operational	0.18		0.14
4A	Liquid Berth	0.01		0.01
4B	Terminal 4	0.68		0.54
5	12.5% R&R scheme	1.01		0.81
6	Residential	3.20		2.56
7	Industrial	0.25	0.28	0.37
8	Commercial	0.46		0.37
9	Public-Semi public	6.16		4.92
10	JNPT Township	5.04		4.03
	Total	18.52	0.84	15.32

Table 38 Option 2 Sewage Demand Assessment for JNPA Area - Proposed (2036)

S. No.	Description	Potable Water	Process Water	Total Waste Water Generated
1	JNPT SEZ	2.00	0.75	2.05
2	Non-Port	0.37		0.30
3	Transportation	0.07		0.05
4	Port operational	0.15		0.12
4A	Liquid Berth	0.01		0.01
4B	Terminal 4	0.68		0.54
5	12.5% R&R scheme	2.02		1.62
6	Residential	6.39		5.11
7	Industrial	0.36	0.37	0.51
8	Commercial	0.57		0.46
9	Public-Semi public	11.50		9.20
10	JNPT Township	6.05		4.84
	Total	30.17	1.12	24.81

Table 39 Option 2 Sewage Demand Assessment for JNPA Area - Proposed (2041)

S. No.	Description	Potable Water	Process Water	Total Waste Water Generated
1	JNPT SEZ	3.48	0.38	3.01
2	Non-Port	0.37		0.30
3	Transportation	0.14		0.11
4	Port operational	0.18		0.14
4A	Liquid Berth	3.06		2.44
4B	Terminal 4	0.79		0.63
5	12.5% R&R scheme	4.73		3.78
6	Residential	3.66		2.93

S. No.	Description	Potable Water	Process Water	Total Waste Water Generated
7	Industrial	3.37	0.28	2.86
8	Commercial	3.55		2.84
9	Public-Semi public	0.51		0.41
10	JNPT Township	7.32		5.85
	Total	31.16	0.65	25.32

Gap Assessment

Table 40 Wastewater Projections – Option 1

Sl. No.	Particulars	Unit	Existing (2021)	Proposed (2026)	Proposed (2031)	Proposed (2036)	Proposed (2041)
A	Total Waste Water Generated	MLD	9.60	8.78	15.03	27.52	26.13
B	Total Recycled Water Generated (90% of Total W/w Generated)	MLD	8.64	7.90	13.53	24.77	23.52
C	Proposed STP Capacity required	MLD	10.56	9.66	16.54	30.27	28.75
D	Existing STP Capacity (Cumulative)	MLD	12.00	12.00	12.00	16.54	28.75
E = D-C	Augmentation of STP is required (Cumulative)	MLD	0.00	0.00	4.54	13.95	0.00

As per the above table, total waste water generated currently is 9.60 MLD. Total wastewater generated on vision year (2041) is 26.13 MLD. Adding 10% infiltration, as per CPHEEO Manual, the total capacity of STP is required 28.75 MLD. Currently, 12.00 MLD capacity STP is present at JNPA area. Additional 4.54 MLD capacity STP is required at 2031 and 13.95 MLD capacity STP is required at 2036.

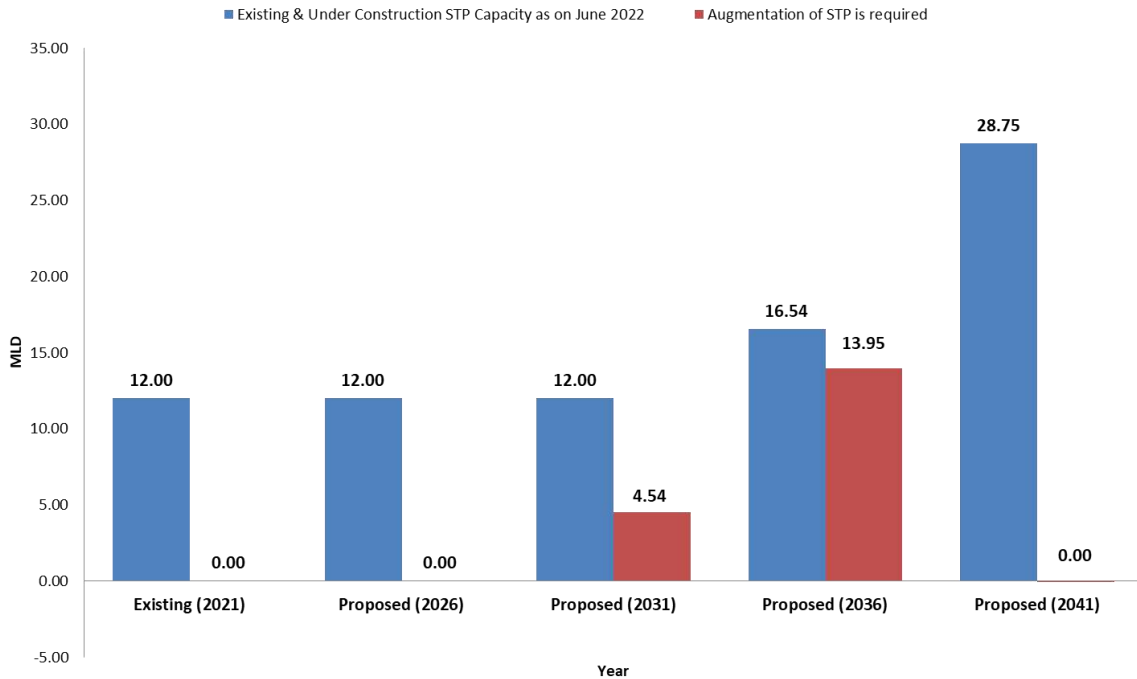
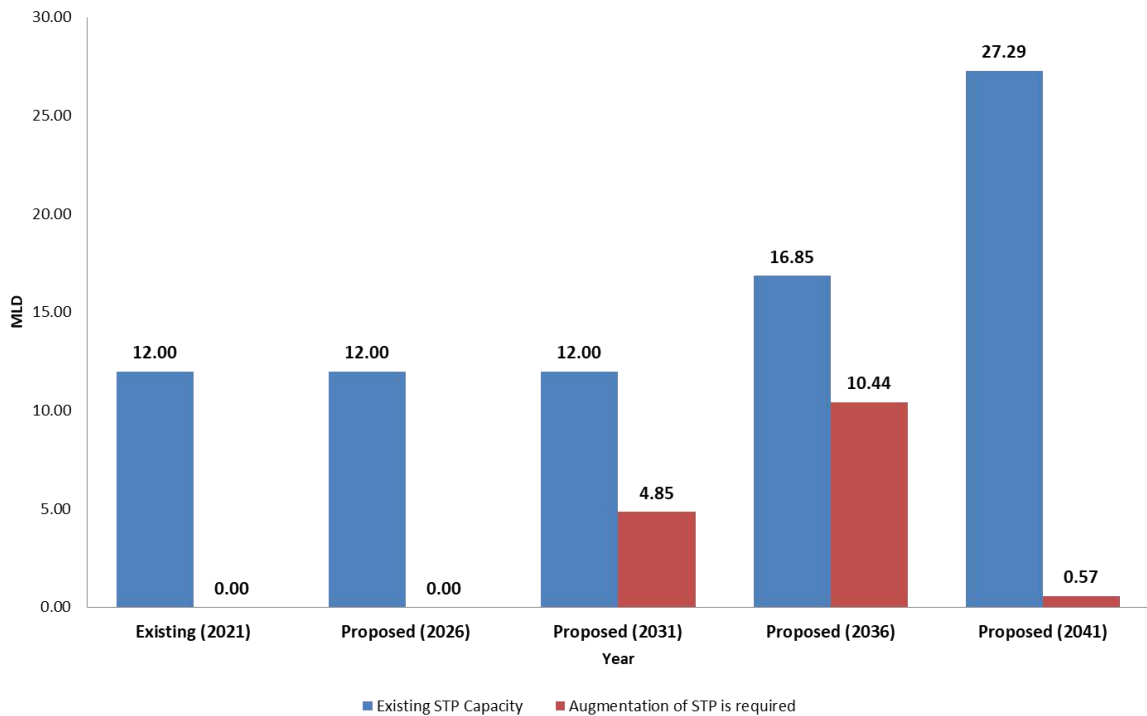


Table 41 Option-2: Considering Combined Plumbing System

Sl. No.	Particulars	Unit	Existing (2021)	Proposed (2026)	Proposed (2031)	Proposed (2036)	Proposed (2041)
A	Total Waste Water Generated	MLD	9.60	9.13	15.32	24.81	25.32
B	Total Recycled Water Generated (90% of Total W/w Generated)	MLD	8.64	8.22	13.79	22.33	22.79
C	Proposed STP Capacity required	MLD	10.56	10.05	16.85	27.29	27.85
D	Existing STP Capacity (Cumulative)	MLD	12.00	12.00	12.00	16.85	27.29
E = D-C	Augmentation of STP is required (Cumulative)	MLD	0.00	0.00	4.85	10.44	0.57

As per the above table, total waste water generated currently is 9.60 MLD. Total wastewater generated on vision year (2041) is 25.32 MLD. Adding 10% infiltration, as per CPHEEO Manual, the total capacity of STP is required 27.85 MLD. Currently, 12.00 MLD capacity STP is present at JNPA area. Additional 4.85 MLD capacity STP is required at 2031, 10.44 MLD capacity STP is required at 2036 and 0.57 MLD capacity STP is required at 2041.



a) Development Strategies

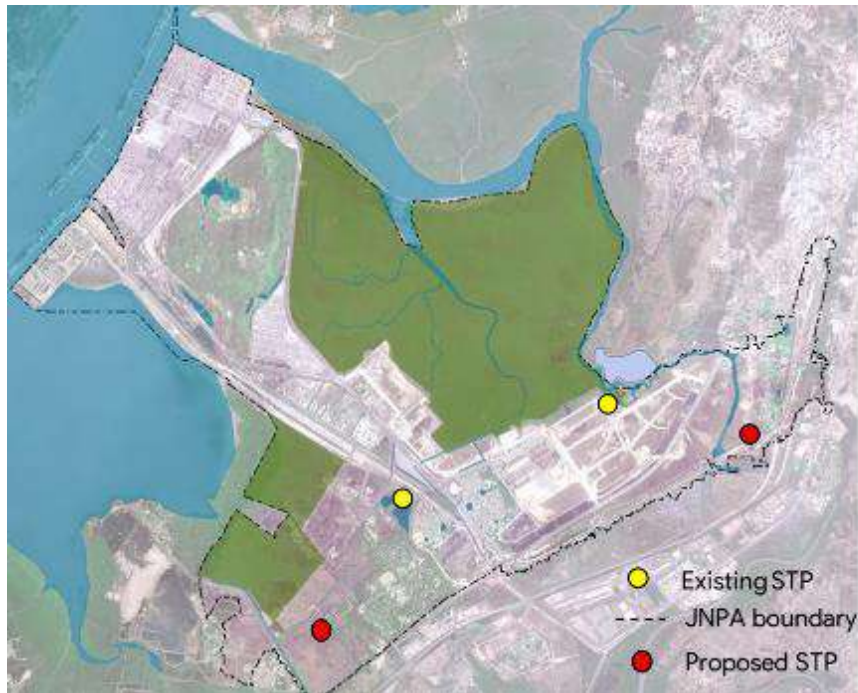


Figure 94 Proposed STP in JNPA

- JNPA SEZ has STP of **6.5 MLD** capacity based on **SBR** technology.
- Currently the STP is **underutilised** since SEZ is only partially occupied and only about 0.15 MLD* sewage is generated.
- Connecting the sewer line of Custom House and P.U.B to STP of SEZ could be considered for improving the capacity utilisation of the STP

The project area needs to develop integrated decentralized sewage collection and treatment method. Possibilities of recycle/ reuse of waste water shall be incorporated in the development plan to reduce the burden on water supply system. All the septic tanks inside the JNPA area should be connected to the sewer network.

It is to be ensured that Sewage flows by gravity, minimizing the use of energy for pumping. An efficient sewerage and wastewater disposal system is of critical importance with respect to maintaining high standards of health and hygiene in the JNPA Area.

b) Service Level Benchmarking

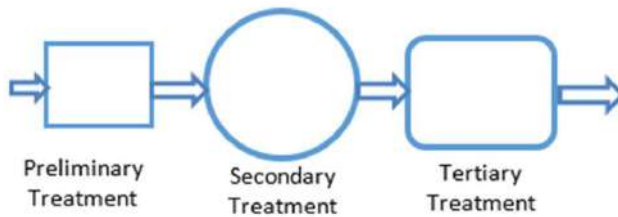
The following table explains the impact of the implementation of the above-mentioned measures on the service level benchmarks of Sewerage and Sanitation of the Planning Area.

Table 42 Service Level Benchmarking for Sewerage and Sanitation

Sl. No.	Services	Ultimate Benchmark as per MoHUA	Present Status	Aim to be achieved in Long Term
1	Coverage of Sewerage Network Services	100	30	100

e) Process flow of sewage treatment plant

The treatment plant consists of three stage process in broadly as follows:



The Moving Bed Bio-reactor (MBBR) is an aerobic process with attached growth which uses cylindrical shaped polyethylene carrier elements for biological growth. The moving media increases the contact time between the bacteria and the organics. Since the media has high porosity it provides large surface area for bacteria to attach and grow. MBBR does not require any return activated sludge flow or backwashing. It has excellent characteristics for BOD/COD removal and nitrification in all types of wastewaters. It is compact and requires comparatively lesser space than the conventional system. Typical diagram of MBBR process is shown in below figure.

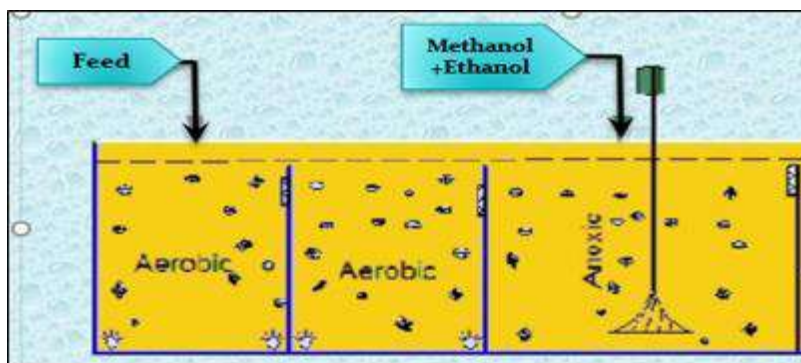


Figure 95 Diagram of MBBR process

- **Salient features of MBBR :**
 - Compact Footprint
 - Expandable
 - Durable non-clogging media
 - Stable Process
 - Lower sludge volume

- Ease of operation
- **Advantages of MBRB over conventional system :**
 - Consistently excellent effluent quality.
 - Compact and small foot print and about 40 to 50 % less land requirement.
 - Suitable for modular expansion and enhancement of capacity of existing plant.
 - Simple to operate, requiring significantly less operator attention and time.

f) Tertiary treatment – Ultrafiltration:

Ultra-filtration treatment is a conditioning treatment given to clarified water from aerobic treated sewage to remove the suspended solids, colloidal matter, bacteria & viruses. The UF treatment technology provides effluent of low TSS & Turbidity and can be used as pre-treatment for RO (Reverse Osmosis). The UF treatment facility can remove the turbidity up to less than 1.0 NTU. Ultra-filtration is a physical separation process using membranes with pore sizes in the range of 0.1 to 0.001 micron.

UF membranes are porous and allow only coarser solutes (macromolecules) to be rejected. All types of microorganisms as viruses and bacteria and all types of particles can be removed by this process. Since, the low molecular solutes are not retained by UF, osmotic back pressure can be neglected and operating pressure is kept low as 50-500 KPa.



Figure 96 Ultrafiltration Membrane System

- **Recycled Water Supply System**

Water Balance is achieved considering that Re-cycled water demand comprising horticulture demand and Washing/ Cleaning will be met from the re-cycled water generated from Treatment Plant (STP). Waste water generation from various sources

has been identified and estimated. Based on the treated water available from the STPs the recycling water deficit has been calculated and furnished above.

Availability of re-cycled water is estimated based on the assumption that, about 90% of the wastewater generated from the plots.

- **Reuse options for treated wastewater:**

The outlet water quality parameters after treatment should be in accordance with IS:10500. Possibilities of reuse of wastewater must be incorporated in the proposed plan for sewerage system to reduce the demand on water supply system. Treated water from STP shall be recycled as per CPHEEO Guidelines and sludge can be used as manure for agriculture and plantation.

4.4.2. Storm Water Management Strategies

The sustainable steps for stormwater management are as under:

- Drain the rainwater efficiently from the site and avoid local water clogging
- Maximize natural permeable surfaces within the individual plots and in common green areas.
- Minimize runoff by rainwater harvesting measures.
- Re-sectioning, re-channeling, and desilting of nallah to avoid the free flow towards the outfall during peak monsoon.
- Chain link fencing with the green belt at both sides of nallah for beautification as well as protection from waste disposal at nallah.
- Conformity with road layouts, grading, and landscape intent.

Service Level Benchmarking:

Service level benchmarking have been formulated by the MoUD with a view to achieving all-round sustainability including environmental sustainability

Table 43 Service Level Benchmarking for Storm Water Drainage System

Sl. No.	Services	Ultimate Benchmark as per MoUD, GoI Guidelines (%)	Present Status (%)
1	Coverage of storm water drainage network	100%	95%
2	Cleaning of drains twice in a year	100%	NA
3	Extent of rain water harvesting	100%	NA

Source: Projections based on NMSH, MoUD, GoI, 2014

a) Development Strategies:

Wherever the drain proposed to be closed, it will be necessary to provide a horizontal/vertical entry into the drain at the same time not obstructing free passage for the pedestrians or vehicles. All the primary and secondary drains should be

covered. These covers will protect the storm drains from disposal of garbage, debris, etc. and also may serve as walkway for pedestrian in narrow roads. Natural storm water should not have mixed with sewage/sullage and garbage.

Storm water drains inside each plot will be constructed strictly in accordance to norms of planning authority. Storm water from the entire plot will be collected through network of storm drains. The storm water drains within the individual plot must be designed peak rainfall. The overflow of RWH tanks to be discharged in the storm water drains.

The sustainable steps for storm water management are as under-

- Drain the rainwater efficiently from site and avoid local water clogging
- Maximize natural permeable surfaces within the individual plots and in common green areas.
- Minimize runoff by rain water harvesting measures.
- Re-sectioning, re-channeling, desilting of nallah to avoid the free flow towards the outfall during peak monsoon.
- Chain link fencing with green belt at both sides of nallah for beautification as well as protection from waste disposal at nallah.
- Conformity with road layouts, grading and landscape intent.

b) Rainwater harvesting

Long term water level declines as a result of injudicious exploitation of groundwater resource has led to several vexing problems. Some of these problems are reduced well yields, low water level and leakage into the aquifer of highly mineralised water. In order to over-come these serious environmental implications, the recharge potential of groundwater resource has to be given utmost importance.

Rainwater harvesting is the technique of collection and storage of rain water at surface or in sub-surface aquifers, before it is lost as surface run-off. The augmented resource can be harvested in the time of need. Artificial recharge to ground water is a process by which the ground water reservoir is augmented at rate exceeding that under natural conditions of replenishment. For the economic design of drains, it is necessary to trap the rainwater by rain water harvesting structures.

As part of Corporate Environmental Responsibility (CER) JNPA has created water holding lake on the Sheva hill for rainwater harvesting measure. Estimated 275 MLD of rainwater could be captured for the season. Water conservation initiative like the Jalyukta Shivar yojana includes activities like desilting, deep continuous contour trenching (CCT), widening and deepening of nalas/rivers.

Development Proposals:

- Minor tanks within the project area must be connected through open nallas
- Existing nallahs running through the JNPA area should be improved to increase the efficiency of natural channels. Improvement works shall consist of desilting of channel, development of banks, improvement of side slopes and development of green belt around the nallahs
- The open nallahs are getting silted up frequently. This results in the growth of weeds, shrubs, water hyacinth and other plants, which make these nallahs non-functional. inadequate space for periodic cleaning, maintenance and repair, construction of structures like bridges, culverts etc. are found affecting the efficiency of the drainage system. Immediate actions have to be taken in this regard.
- Detailed hydrology investigation on existing water bodies & nallahs is required to finalize the capacity
- Rainwater harvesting through
 - Recharged pond/ Water body
 - Recharge Well till deep aquifer

4.4.3. Solid Waste Management Projected Generation**a) Projected SWM Generation and Gap Assessment**

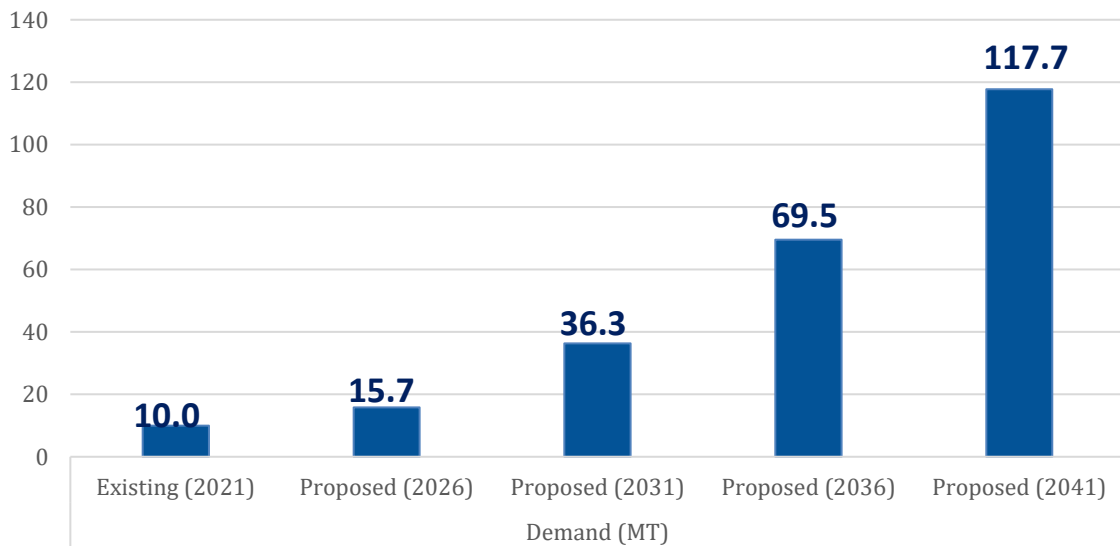
As per the field survey carried out, total waste generation in 2021 was 10.0 TPD. Existing population at JNPA area in 2021 is 24898, considering fixed & floating. The present average per capita solid waste generation is 0.32kg. Considering solid waste growth factor, 1.33 per cent per annum (ministry of urban development standard), and 0.05kg per capita per day for the floating population, the total solid waste generated for the year 2042 is around 185.81 tons per day. The Existing capacity is 10 TPD. A solid waste management system for 161.72 TPD need to be designed for the year of 2041. The waste generated does not include medical waste, concrete and debris.

Table 44 Solid Waste Generation at JNPA

S. No.	Description	Demand (MT)				
		Existing (2021)	Proposed (2026)	Proposed (2031)	Proposed (2036)	Proposed (2041)
1	JNPA Township	10.00	3.81	4.58	5.51	6.63
2	JNPA SEZ		2.68	8.58	18.26	32.41

3	Non-Port		0.22	0.24	0.25	0.27
4	Transportation		0.54	0.58	0.63	0.68
5	Port operational		1.23	1.30	1.38	1.46
7	Residential		0.80	2.55	5.42	9.62
8	Industrial		2.51	7.99	17.00	30.13
9	Commercial		2.64	8.43	17.93	31.78
10	Public-Semi public		1.35	2.05	3.12	4.74
	Total	10.00	15.78	36.30	69.50	117.72
11	12.5% scheme R&R		3.64	11.64	24.79	44.00
	Total	10.00	19.42	47.94	94.29	161.72

Solid waste management Demand Assesment

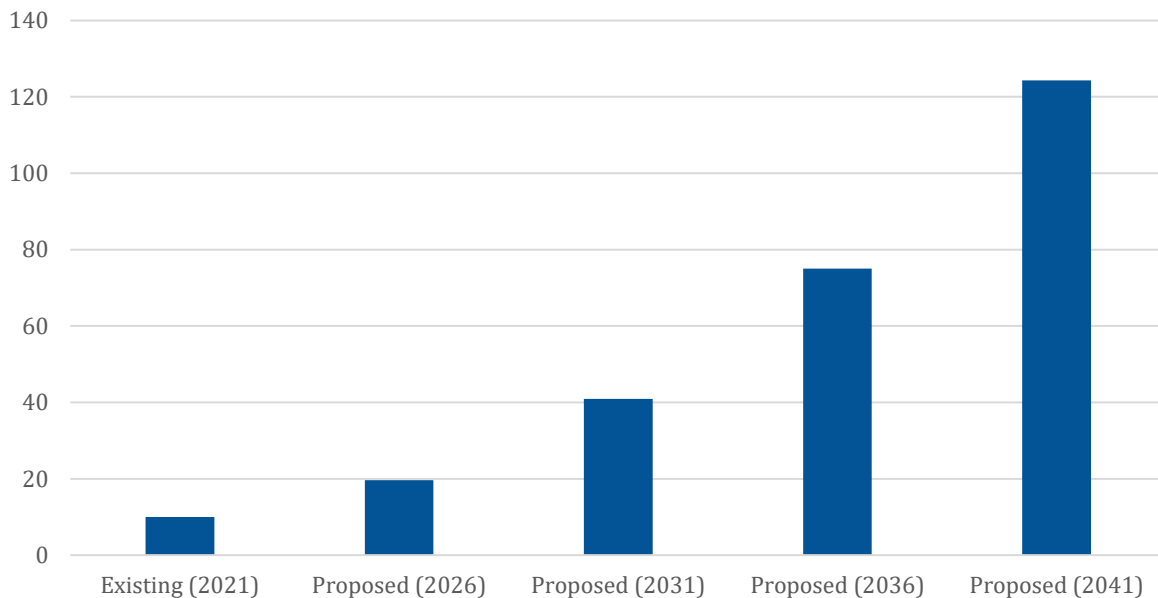


Option 2 (including Gaothan area)

S. No.	Description	Demand (MT)				
		Existing (2021)	Proposed (2026)	Proposed (2031)	Proposed (2036)	Proposed (2041)
1	Villages (Goathans)	10.00				
1	JNPT Township		3.81	4.58	5.51	6.63
2	JNPT SEZ		2.68	8.58	18.26	32.41
3	Non-Port		0.22	0.24	0.25	0.27

4	Transportation		0.54	0.58	0.63	0.68
5	Port operational		1.23	1.30	1.38	1.46
6	Residential		0.80	2.55	5.42	9.62
7	Industrial		2.51	7.99	17.00	30.13
8	Commercial		2.64	8.43	17.93	31.78
9	Public-Semi public		1.35	2.05	3.12	4.74
10	Gaothan areas		3.81	4.58	5.51	6.63
	Total (excluding R&R Area)	10.00	19.59	40.88	75.01	124.35
11	12.5% R&R scheme		3.64	11.64	24.79	44.00
	Total (including R&R Area)	10.00	23.23	52.52	99.80	168.35

Solid waste management Demand Assessment



b) Development Strategies

- **Solid Waste Management Proposals for Municipal and Domestic Waste**

Solid waste management is proposed to aim at promoting clean environmental conditions by minimizing pollution (including water, air, soil and cross media pollution), ensuring the sustainability of ecosystems in the project area. A reliable municipal solid waste collection and transportation system is a cornerstone for good quality waste management services. The key mechanisms of waste management are collection, segregation, storage, transportation, treatment and disposal. In the JNPA, the management of solid waste shall consider all stages of collection, transfer, treatment, recycling, resource recovery and disposal of solid waste. Handling and disposal provision of hazardous waste must be done according to respective applicable

laws and environmental formalities. The solid waste generated from the JNPA area, both during the construction as well as during the operation will be collected from the respective plot owners and is transported to a designated place earmarked for the purpose. From this place the waste is then sent to a transfer station for proper segregation by the proponent.

There will be provision for setting up Waste to energy plants with techniques to reduce emission of pollutants in air and utilizing its end products efficiently.

Better transport facilities for carrying waste are proposed. Balers are proposed for compaction of the inert waste and thereby increasing the density of waste and reducing the area and cover for landfill sites.

- **Transfer Stations**

Transfer station(s) are also proposed. Locations for solid waste transfer stations should be along the main transportation corridors in the JNPA area. To have a cost-effective model, the waste collected from the sources of generation is stored at a temporarily place termed as “Transfer Stations” and then from here it can be transported in bulk to the processing or disposal sites. A well-designed transfer station reduces the cost of transporting waste to disposal facilities. This also reduces fuel consumption and collection vehicle maintenance costs, plus produces less overall traffic, air emissions, and road wear.

Segregation of waste at source level is proposed and recyclable material will be collected from source points and to be transferred to the Mechanical Compost Plant. If segregation of waste at source level not possible, then mechanical waste segregation need to be installed to reduce the time & manpower for segregation of solid waste.

- **Mechanical / Automated Waste Segregation System:**

Segregation, transport, handling and disposal of waste must be managed properly to minimize the risks of the public and environment. When mixed dry and wet waste breaks down, it creates nasty greenhouse gases. Segregation makes it attainable to utilize and recycle the waste effectively. The waste segregator system can easily segregate waste with sensor. The sensor will sense the waste and segregate.

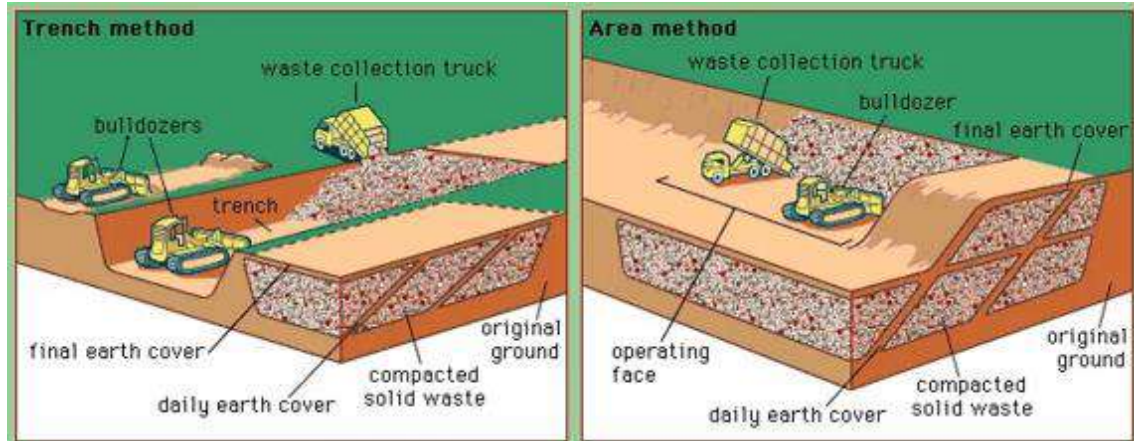
Centralized anaerobic digestion plant with hydraulic balling press machine for processing plastic bottles, paper, card board, wrappers, pouches of eatables, polyethylene bags, blisters multi-layered bags, etc. may be planned. The total area required for anaerobic digestion plant is 15 acre with green buffer.

- **Sanitary Landfill**

In communities where appropriate sites are available, sanitary landfills usually provide the most economical option for disposal of non-recyclable refuse. Landfills will always play a key role in solid-waste management. It is not possible to recycle all components of solid waste, and there will always be residues from incineration and other treatment processes that will eventually require disposal underground.

Land disposal is the most common management strategy for municipal solid waste. Refuse can be safely deposited in a sanitary landfill, a disposal site that is carefully selected, designed, constructed, and operated to protect the environment and public health. One of the most important factors relating to landfilling is that the buried waste never comes in contact with surface water or groundwater. Engineering design requirements include a minimum distance between the bottom of the landfill and the seasonally high groundwater table. Most new landfills are required to have an impermeable liner or barrier at the bottom, as well as a system of groundwater-monitoring wells. Completed landfill sections must be capped with an impermeable cover to keep precipitation or surface runoff away from the buried waste. Bottom and cap liners may be made of flexible plastic membranes, layers of clay soil, or a combination of both.

The basic element of a sanitary landfill is the refuse cell. This is a confined portion of the site in which refuse is spread and compacted in thin layers. Several layers may be compacted on top of one another to a maximum depth of about 3 metres (10 feet). The compacted refuse occupies about one-quarter of its original loose volume. At the end of each day's operation, the refuse is covered with a layer of soil to eliminate windblown litter, odours, and insect or rodent problems. One refuse cell thus contains the daily volume of compacted refuse and soil cover. Several adjacent refuse cells make up a lift, and eventually a landfill may comprise two or more lifts stacked one on top of the other. The final cap for a completed landfill may also be covered with a layer of topsoil that can support vegetative growth.

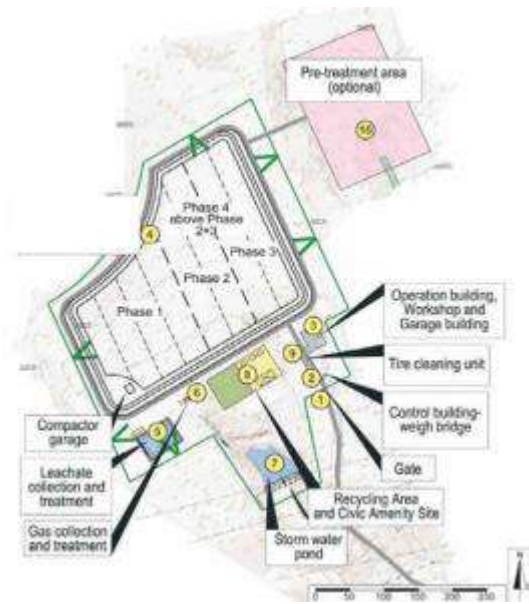


Organic material buried in a landfill decomposes by anaerobic microbial action. Complete decomposition usually takes more than 20 years. One of the by-products of this decomposition is methane gas. Methane is poisonous and explosive when diluted in the air, and it is a potent greenhouse gas. In modern landfills, methane movement is controlled by impermeable barriers and by gas-venting systems. In some landfills the methane gas is collected and recovered for use as a fuel, either directly or as a component of biogas. A highly contaminated liquid called leachate is another by-product of decomposition in sanitary landfills. Most leachate is the result of runoff that infiltrates the refuse cells and comes in contact with decomposing garbage. If leachate reaches the groundwater or seeps out onto the ground surface, serious environmental pollution problems can occur. Methods of controlling leachate include the interception of surface water in order to prevent it from entering the landfill and the use of impermeable liners or barriers between the waste and the groundwater. New landfill sites should also be provided with groundwater-monitoring wells and leachate-collection and treatment systems.

One Landfill site (Solid Waste Management Centre) of 2.0 Ha for vision year is proposed depending on around 36 MT/ day inert waste demand considering waste to be collected from villages also. Based on the norms established by the CPHEEO and MoEF, the landfill sites should include a buffer around each. The buffer area will be under thick vegetation. The following facilities must be located in the sanitary landfill site:

- access roads,
- equipment shelters,
- weighing scales,

- office space,
- location of waste inspection and transfer station (if used),
- temporary waste storage or disposal sites for special waste including domestic hazardous waste,
- areas to be used for waste processing (e.g., shredding),
- demarcation of the sanitary landfill areas and areas for stockpiling cover material and liner material,
- drainage facilities,
- location of sanitary landfill gas management facilities,
- location of leachate treatment facilities,
- location of monitoring wells, and
- tyre cleaning unit.



For sanitary landfill site, has to be designed incorporating all the above facilities. The layout will be governed by the shape of the sanitary landfill area.

For achieving the goal and implementing the strategies various projects need to be undertaken. Some of the proposed projects are-

An integrated cluster based solid waste management to be developed for Aizawl and surrounding towns and villages.

100% door to door waste collection.

- Waste transfer stations which will include the following:
 - Decentralized compost plants
 - Sorting and recycling yards
- Proper Waste collection and transportation.
- Segregation of biodegradable and non-biodegradable at source
- Resource recovery through sorting and recycling of materials.
- Resource recovery through waste processing by using composting or waste to energy approaches.
- Waste minimization by reducing volume, toxicity or other physical/chemical properties of waste to make it safe for final disposal.
- Disposal of waste in an environmentally safe and sustainable manner through land filling.
- Recycling of Solid waste
- Commissioning of landfilling site.
- Integrated management of Solid waste.

- Awareness generation for reduce, reuse and recycling of Solid waste
- Waste treatment facility Sanitary landfill.
- Incineration for treatment of biomedical waste
- Information Communication Education (ICE) for solid waste management.
- People Participation and awareness
- Enhancement of Collection facilities

Apart from the sanitary landfill site, one site is located near highway for dumping the construction debris, etc.



Figure 97 Proposed Sanitary land fill ground area

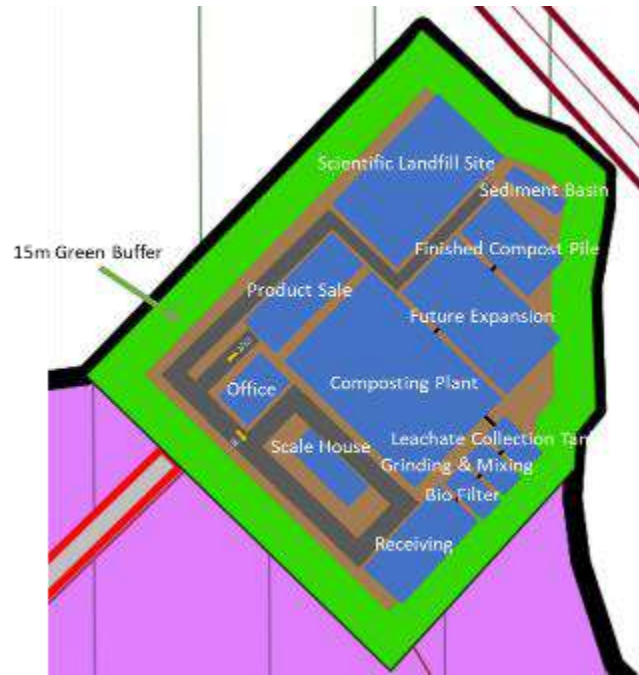


Figure 98 Conceptual layout of Sanitary Landfill site

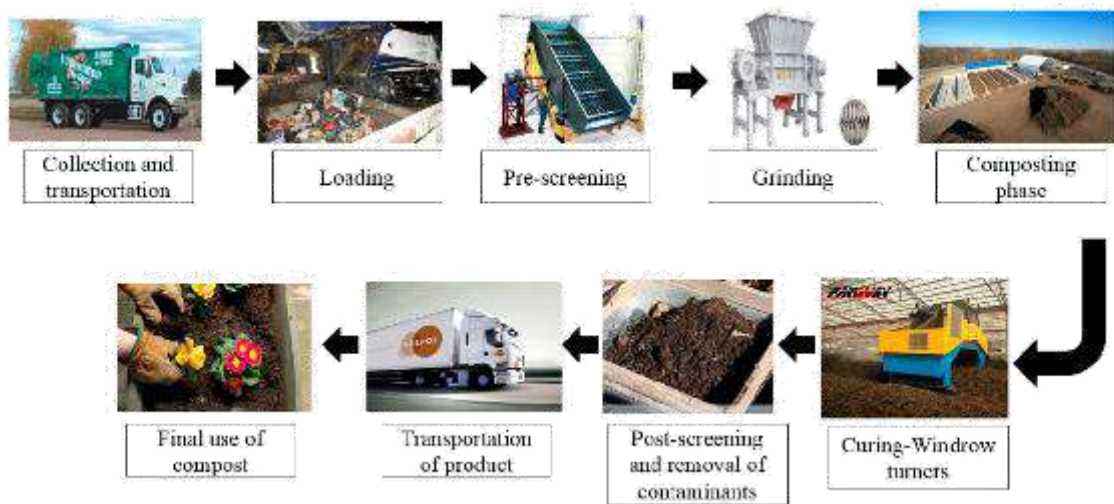


Figure 99 Process flow of solid waste management

- **Action Plan for Sustainable SWM Program:**
 - **Need for a centralized solid waste treatment system**

The developmental pattern of all the areas, demands the implementation of an integrated solid waste treatment system. It is felt that only a centralized MSWM System could help solve the seemingly intractable problem of solid waste treatment in this area in an economically viable, socially desirable and environmentally sound manner.

- **Enhancement of collection facilities**

- Old dustbins may be replaced with different types of covered dustbins made out of cast iron/ PVC, which reduces the time of pickup and improves the process of primary collection of wastes.
- The sweepers may be provided with handcarts and detachable containers and be allotted a fixed area or number of plots for collection. They should also be provided with safety gears and proper uniforms.
- The collection service can be provided on a full-cost recovery basis using contractor services on a day-to-day basis from individual plots.
- Sweeping of all public roads, streets, lanes, by-lanes should be done daily
- As the road area are quite big at Non-Port, Township & SEZ area, Vacuum Technologies Road Sweeping Machine may introduce for hassle free sweeping.

Provision of storage facilities

One of the immediate measures to revamp the existing collection services structure would involve provision of covered waste bins at proper distances for the people to deposit waste. This is the first step that will ensure that people do not throw their garbage on the roads and hence do not create open dump sites. This will enable the sanitation workers to transfer waste to the transportation vehicle quickly and efficiently with minimum health risk which will help to maintain aesthetics of surroundings.

- **Segregation of Solid Waste**

Segregation of waste at the source itself is extremely important as municipal solid waste, which is otherwise environmentally benign on getting mixed with hazardous waste like paints, dyes, batteries, human excrete turns hazardous. The recyclables like paper and plastic etc. become unsuitable for recycling as these get soiled by the organic matter. Although, it would be more fruitful to sort and place different kinds of recyclables in separate receptacles, the waste could be segregated into at least two categories of biodegradable and non-biodegradable initially.

The recyclables obtained through segregation could be straightway transported to recycling units. This would help in formalizing the existing informal set up of recycling units, and this formalization in turn could lead to multi-advantages. The biodegradable matter could be disposed off by aerobic composting, anaerobic digestion.

- **Wastes that should go into Green Bin meant for Bio-degradable Wastes**

- Food waste of all kinds, cooked and uncooked, including egg shells, bones
- Flower and fruit wastes including juice peels and house-plant wastes

- **Wastes that should go into Blue Bin meant for Recyclable wastes**

- All kinds of paper, plastics
- Cardboard, cartons

- Glass
- Metal
- Rags, rubber, wood
- **Wastes that should go into Yellow Bin meant for Non-Biodegradable & Inert wastes**
 - Foils, wrappings, pouches, sachets and tetrapaks (rinsed)
 - Cassettes, computer diskettes, printer cartridges and electronic parts
 - Discarded clothing, furniture and equipment
 - House sweepings
 - House hold inert (sweepings/ashes)
- **Reuse and recycling**

The concepts of reuse and recycling can well be applied in solid waste management as solid waste is basically a heterogeneous mixture. In typical Indian municipal solid wastes, there is a small percentage of recyclable material and more of compostable and inert materials like ash and road dust. There is a very large informal sector of rag pickers, who can collect recyclable wastes (paper, plastic, metal, glass, rubber, etc) from the streets, bins and disposal sites for their livelihood. Thus, the rag pickers can be effectively used for the collection of reusable materials especially because the use of non-recyclable packaging materials like PET bottles for soft drinks, mineral wastes, and soft –foam products and metalised plastic film coated food packing materials are on the rise. During recycling, many of which will release toxic gases and ozone depleting products. So it is advisable to educate people to replace these items with eco- friendly packaging materials. The desirable home sorting mechanisms includes dry recyclable materials (e.g. glass, paper, plastic, cans etc.), kitchen and garden wastes, bulky wastes, hazardous wastes, construction and demolition wastes. Sorting can also be done just prior to waste processing or land filling.

- **Waste to energy strategy**

Electricity can be produced by burning MSW as a fuel. MSW power plants, also called waste to energy (WTE) plants, are designed to dispose of MSW and to produce electricity as a by-product of the incinerator operation. Mass Burn is the most common waste-to-energy technology, in which MSW is combusted directly in much the same way as fossil fuels are used in other direct combustion technologies. Burning MSW converts water to steam to drive a turbine connected to an electricity generator. Burning MSW can generate energy while reducing the volume of waste by up to 90 percent, an environmental benefit. However, this burning MSW in WTE plants produces comparatively high carbon dioxide emissions, a contributor to global climate change. The

net climate change impact of these emissions is lessened because a major component of trash is wood, paper and food wastes that would decompose if not burned. If left to decompose in a solid waste landfill, the material produces methane, a potent greenhouse gas. The concept of producing energy from MSW derives significance as it is given high priority by the Ministry of Non-conventional Energy sources (MNES), Government of India.

- **Treatment options**

The biodegradable portion of the waste is considerably high in APA. So, aerobic composting of SW after proper segregation will be more appropriate. In selected locations especially in rural areas, Vermi-Composting can also be recommended. The manure obtained by these methods can be sold to the local public as fertilizer. Though costly, sanitary land filling can also be practiced at selected urban locations where the recovery from the waste will be very high, serving minimum ecological damage. It appears that the aerobic composting by WINDROW method may be a desirable option for the management of the solid waste. The possibilities of generating energy from SW could be looked into on an experimental basis

4.4.4. Power

a) Development Strategies

For estimating the power supply demand, the assumption of 24 hours' power supply has been taken into consideration. The average demand for electricity as per the URDPFI guideline is 2.74 kWh/cap/day and 7.50 % AT&C losses, the electricity demand is 182 MW or 109 MVA assuming demand factor of 0.6, by the horizon year 2040.

b) Future Plans for Augmentation:

In JNPA area, there is huge potential for power generation from renewable energy sources, such as wind, biomass and solar energy. Special emphasis is to be given for the generation of grid quality power from renewable sources of energy. The renewable energy power sector includes:

- Wind Energy
- Solar Energy
- Biomass Energy
- Biomass Gasifier
- Energy from waste



Figure 100 Tentative location for windmill

Development Proposals:

- To reduce the energy consumptions from Grid/ Sub-stations, need to switched to renewable energy to meet the entire power requirements
- Standard of Voltage level must be followed
- Installation of proper transformer rating must be follows to avoid the energy losses.
- Replacing the existing streetlights with Timer based LED lights.



Solar Panels at JNPA



Windmills proposal at JNPA

Development Proposals

- Wind turbines manufactured today have power ratings ranging from 250 watts to 7 MW.
- An onshore wind turbine with a capacity of 2.5–3 MW can produce more than 6 million kWh in a year – enough to supply 1,500 average EU households with electricity.
- Most studies take a value of 5-9 MW/sq km as the land requirement for wind farms in India.

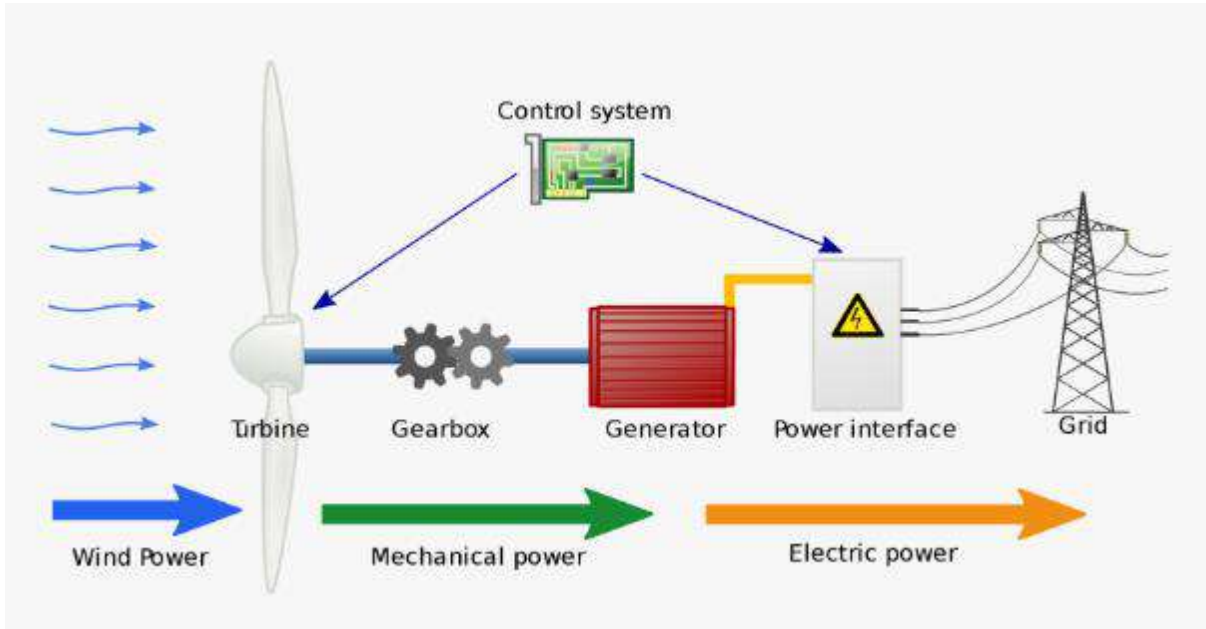
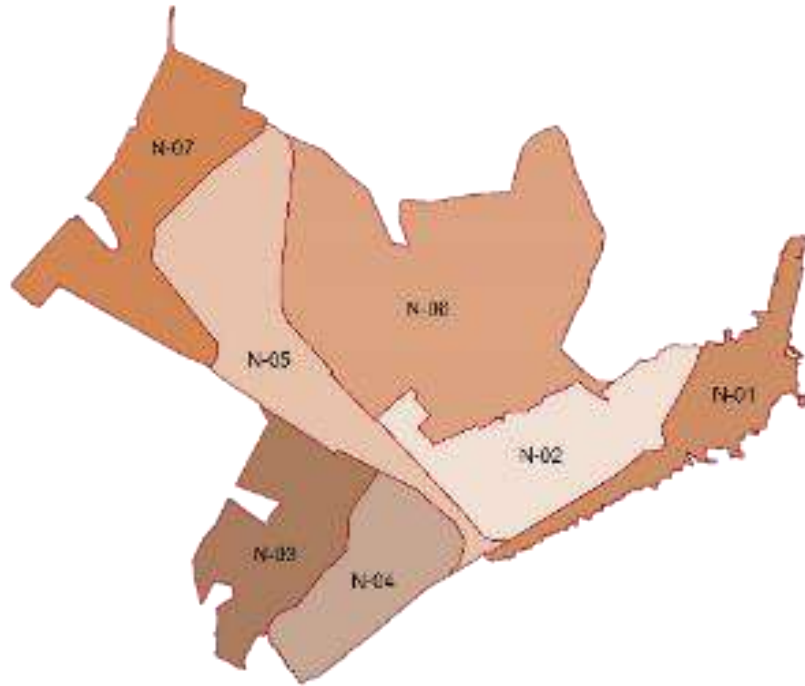


Figure 101 Energy generation process from windmill



A field of wind turbines near the Port of Rotterdam in The Netherlands

4.5 Traffic projection



Residential and Employment Trips generated nodewise are given in Table 45 -

Table 45 Total trips estimated in JNPA by 2041

Sr No	Node	Residential Trips			Employment Trips		
		Two way daily persons trips by mode	Two way daily trips in vehicles	Two way daily trips in PCUs	Two way daily persons trips by mode	Two way daily trips in vehicles	Two way daily trips in PCUs
1	Node 01	3,35,515	99,735	79,989	37,794	9,259	7,181
2	Node 02	30,660	9114	7,310	2,58,488	64,397	50,503
3	Node 03	3,465	1030	826	1,51,492	37,112	29,253
4	Node 04	2,85,283	84,803	68,014	2,44,403	60,888	47,163
5	Node 05	2,079	618	496	12,633	3,095	2,628
6	Node 06	3,465	1030	826	31,508	7,719	6,079
7	Node 07	1,733	515	413	8,820	2,161	1,676
	TOTAL	6,62,200	1,96,845	1,57,874	7,45,138	1,84,631	1,44,483
		(6.62 lakhs)	(1.96 lakhs)	(1.57 lakhs)	(7.45 lakhs)	(1.84 lakhs)	(1.44 lakhs)

CHAPTER 5 – PLANNING STRATEGY AND DEVELOPMENT

ALTERNATIVES

- Develop JNPA as hub for port related activities and a port city at par with Navi Mumbai having required high-end facilities
- Reduce the dependence on Navi Mumbai for social and commercial facilities
- Developments such as 12.5% scheme and redevelopment of Township will demand facilities similar to any city, such as malls, multiplexes, high end retail, IT&ITES park , transport facility etc
- Tapping the potential of the land as a resource by appropriate allocation of land use

The planning principles adopted for development of JN Port area are based on holistic and sustainable development concepts. Considering that the existing use and requirement, a desirable percentage of residential and industrial area are planned in an integrated manner. Broad zones are proposed, based on the requirement, accessibility and permissible use, with an aim to create built-in flexibility in the Land Use plan. Some of the key planning principles are integrated infrastructure, flexibility, optimum utilization of available land including natural resources, traffic and transportation management, image building through urban design interventions and appropriate landscaping. The future development of JN Port Area is planned with specific focus on industrial zone. The industrial zone will be permitted for various processing activities such as engineering, process allied activity, warehousing, FTWZ, food processing, IT & ITES and multi services.

A Principles covering the master planning concept points is given as under-

Planning Principles	Use of 'Broad Zoning' and permissible land uses/activities concept for built-in flexibility in Master Plan
	Focus on Integrated Infrastructure
	Long term vision with focus on flexibility
	Optimum utilization of available land
	Optimum use of natural resources
	Traffic and Transportation management
	Consideration of operation & management of services/utilities aspects

A larger share of total vacant land in JNPA lies in the proposed industrial and township node. Although major portion of existing land on the north side falls in CRZ II and CRZ I, the remaining vacant land has high potential for development.

CHAPTER 6 – PROPOSED ZONE PLAN

6.1 Proposed zones

The planning principles adopted for development of JNPA are based on holistic and sustainable integrated development concepts. Considering that the predominated use is industrial, a desirable percentage for residential, commercial, transport and support infrastructure is planned to achieve the vision of a port city. Eight broad zones are proposed based on the existing uses and compatible activities. Each zone comprises of one predominant use along with support activities. Utilities are mostly common in majority of the zones. Broad permissible and nature of uses zone wise is given in table 46

Table 46 List of proposed zones in JNPA

Zone	Broad uses permissible
PREDOMINANTLY RESIDENTIAL	Individual housing/Apartments, Govt/Port operation staff quarters, service apartments, JNPA Township, 12.5% scheme area, Gaothan
PREDOMINANTLY COMMERCIAL	Bank, ATM, Departmental Store, Low and higher order commercial, Business offices, hotels, restaurants, cinema, petrol pumps, other assembly uses etc
INDUSTRIAL	Non-polluting manufacturing industry, warehousing, tank farms, container yard, repair workshops, service industry etc
AMENITY	Educational institutes, health care centers, Govt/SPA offices, Police station, assembly buildings, museum, parks etc
PORT OPERATIONAL	port container terminals, berths, port operator offices, jetty, RO-RO service facility, allied port activities etc
TRANSPORTATION AND COMMUNICATION	Roads, Bridges, culverts, walkways, Foot over bridge, pathway, Public parking, Bus stop, Bus bays, Auto-stand, Utilities etc
GREEN	parks, gardens, open spaces, playground, green belt, plant nursery, open air theatre, amphitheatre etc
NATURAL AND PROTECTIVE	Open spaces, CRZ areas, Mangroves

6.1.1 Predominantly Residential zone



Figure 102 Land Use plan showing Predominantly Residential Zone

Intent

- a) To include existing residential areas in synergy with the proposed residential development adding to better facilities and utilities.
- b) Redevelopment of Township will release maximum land for future mixed residential use , thus using existing land to maximum potential.
- c) 12.5% land is a large scale development envisaged adding value to JNPA

Uses permitted

Uses permitted in residential zone apart from residences are staff quarters, hostel, dormitories, crèche, club houses, gymkhanas, primary health care unit, clinic, hospital, dispensary and casualty/ emergency ward, pre-primary, primary school, senior secondary school, integrated school with/without hostel facility, college, landscaping and horticulture, parks, gardens, open space, playground, green belt, nursery, open air theatre, amphitheatre, swimming pool, govt./ semi-govt. /SPA offices (police station, telephone exchange, sub offices of electric supply company, post office, customer care centers, banks, ATM, departmental stores, convenience shops /lower order commercial, restaurants, eating houses, cafeteria, ice-cream and milk parlours, business offices/ private offices, travel agencies, ticket booking and selling agencies, florists, bakery shops, café, vehicles

repair/ servicing garages, retail trade and shops/stores or shops for conduct of retail business,

electricity distribution/receiving stations/distribution sub stations/ energy power generator supply units, D.G units, pumping station, sewage disposal work, water supply installation & ancillary structures (STP, WTP, ESR, GSR, septic tanks, CETP, ETP etc.), rain water harvesting structure, public toilet, common taps, collection waste bins and transfer stations, solid waste disposal methods (organic waste), composting plants, solid waste disposal methods (inorganic waste), incinerators, telecom, gas and petroleum pipelines with a necessary sub stations of appropriate capacity, optic fiber cables, mobile towers, and communication tower, filling stations of petrol, diesel, compressed natural gas or any other motor vehicle fuel, libraries, reading halls, creative arts and other cultural activities, places of worship, religious buildings, meditation centre, multipurpose community halls, welfare centres, museum, exhibition halls, swimming pool, auditorium, clubs, assembly halls, training centre, gymnasiums, open air theatre (amphitheatre) spiritual center, meditation hall, yoga hall, bus stop / bus bay, taxi stands, auto- rickshaw stand, public parking areas including multi-storeyed parking, canteen, roads, bridge culverts, walkways, foot over bridge, median pathway, footpath, entrance gate complex, security offices, watchman rooms, etc. . For detail list refer Table no 47

6.1.2 Predominantly Commercial zone



Figure 103 Land Use plan showing Predominantly Commercial zone

Intent

- a) To develop high-end and low-end commercial areas within JNPA which will serve the need for office spaces, hotels, malls, restaurants, markets etc.
- b) Identifying the commercial zones having road and suburban rail connectivity, with an aim to increasing the land value of the vacant land parcels.
- c) On the basis of potential of the location, creating financial small-scale districts in large area of land available.

Uses permitted

Uses permitted in commercial Zone are banks, ATM, departmental stores, convenience shops /lower order commercial , restaurants, business offices/ private offices, travel agencies, vehicles repair/ servicing garages, retail trade and shops/stores or shops for conduct of retail business, hotels, restroom, hostel, crèche, parks, gardens, open space, playground, first aid post, Utility such as sub stations, pumping station, sewage disposal work, water supply installation & ancillary structures (STP, WTP, ESR, GSR, septic tanks, CETP, ETP etc.), rain water harvesting structure, transfer stations, telecom, gas and petroleum pipelines, fuel stations. Assembly buildings such as libraries, exhibition halls, auditorium, training centre, gymnasiums, meditation hall, yoga hall, public parking areas including multi-storeyed parking, etc. . For detail list refer Table no 47

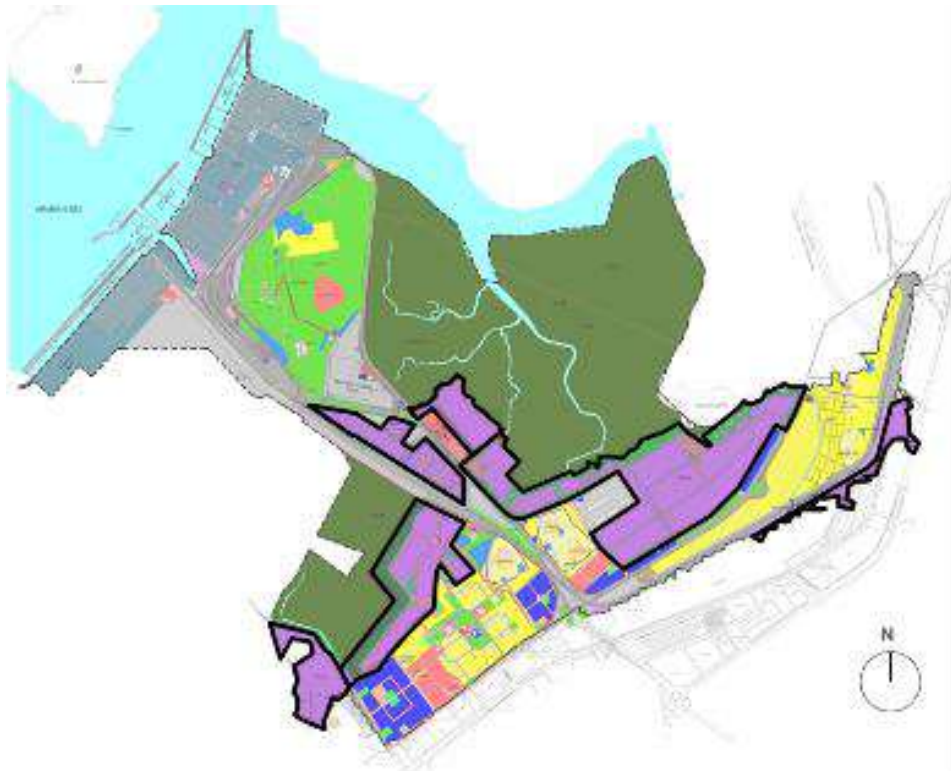
6.1.3 Industrial zone

Figure 104 Land Use map showing Industrial Zone

Intent

- a) To create a conducive environment for industrial development with priority for the following sectors:
 - i. Heavy Engineering
 - ii. Automobile and Equipment Manufacturing
 - iii. Electronics and hardware
 - iv. Non-conventional Energy
 - v. IT&IES
 - vi. Multi-services
 - vii. Agro/food processing
 - viii. FTWZ / Logistics, Data centers
 - ix. Tank farms and warehousing
- b) Industrial plot allocation is preferred to individual group of industries to maintain synergy, co-existence and optimal sharing of industry related facilities.
- c) Industrial zone is proposed to be further divided into plots which accommodate the requirements of various unit holders/ stake holders taking into consideration their respective activity, scale of activity, investment and requirement of built up area for its existing and future requirements, in conformity with rules and regulations.

Uses permitted

Uses permitted in industrial zone are all industries permitted under multi-product category in SEZ Act 2005 and rules amended from time to time subject to approval from the SEZ Development Commissioner, warehousing, Tank farms, godowns, cargo yard, container yards, FTWZ, data centers, IT&ITES, service industry govt./ semi-govt. /SPA offices, hotels, ATM, departmental stores, convenience shops /lower order commercial, restroom, hostel, club houses, gymkhanas, dormitories, crèche, parks, gardens, open space, playground, green belt, nursery, bus stop / bus bay, taxi stands, auto- rickshaw stand, helipad, Rotaries, Weigh Bridge, construction for any mode of transportation, public parking, Container parking, fuel stations, and utilities. For detail list refer Table no 47

6.1.4 Amenity zone



Figure 105 Land Use plan showing Amenity Zone

Uses permitted

Uses permitted in public semi-public zone apart from residences are hotels, restroom, hostel, club houses, gymkhanas, dormitories, day care baby crèche, landscaping and horticulture, parks, gardens, open space, playground, green belt, nursery, open air theatre, amphitheatre, swimming pool, primary health care unit, clinic, hospital, dispensary and casualty/ emergency ward, first aid post, solar and wind energy units, pre-primary, primary school, senior secondary school, integrated school with/without hostel facility, college, electricity distribution/receiving stations/distribution sub stations/ energy power generator supply units, D.G units, pumping station, sewage disposal work, water supply installation & ancillary structures (STP, WTP, ESR, GSR, septic tanks, CETP, ETP etc.), rain water harvesting structure, public toilet, common taps, collection waste bins and transfer stations, solid waste disposal methods (organic waste), composting plants, solid waste disposal methods (inorganic waste), incinerators, telecom, gas and petroleum pipelines with a necessary sub stations of appropriate capacity, optic fibre cables, mobile towers, and communication tower, govt./ semi-govt. /SPA offices (police station, telephone exchange, sub offices of electric supply company, post office, customer care centers, banks, ATM, departmental stores, convenience shops /lower order commercial (photo-copying, shoe repair, cleaning and pressing establishments for clothes, restaurants, eating houses, cafeteria, ice-cream and milk parlours, business offices/ private offices, travel agencies, ticket booking and selling agencies, florists, bakery shops, café, vehicles repair/ servicing

garages, retail trade and shops/stores or shops for conduct of retail business, filling stations of petrol, diesel, compressed natural gas or any other motor vehicle fuel, libraries, reading halls, creative arts and other cultural activities, places of worship, religious buildings, meditation centre, multipurpose community halls,

welfare centres, museum, exhibition halls, swimming pool, auditorium, clubs, assembly halls, training centre, gymnasiums, open air theatre (amphitheatre) spiritual center, meditation hall, yoga hall, bus stop / bus bay, taxi stands, auto- rickshaw stand, public parking areas including multi-storeyed parking, canteen, roads, bridge culverts, walkways, foot over bridge, median pathway, footpath, entrance gate complex, security offices, watchman rooms, etc. For detail list refer Table no 47

6.1.5 Port Operational zone

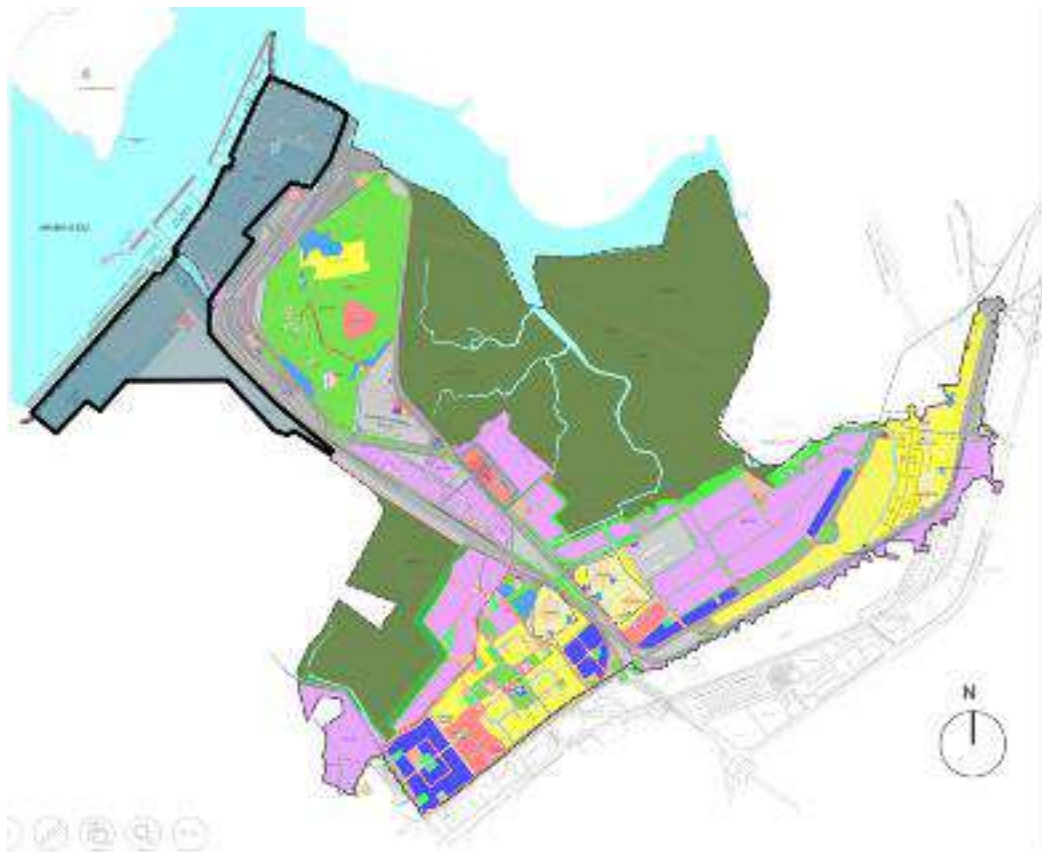


Figure 106 Land Use plan showing Port Operational zone

6.1.6 Transport and Communications zone



Figure 107 Land Use plan showing Transport and communication zone

Intent

- To link various zones through a network of roads, rail, road junctions, rotaries, pedestrian walkways, culverts and underground utility/services.
- To provide new truck parking facility and dormitory for truck drivers.
- To make provision within transportation zone for ease in navigation of vehicular and pedestrian movement.

Uses permitted

Uses permitted in Transportation Zone are roads, bridge culverts, rotaries, walkways, footover bridge, median pathway, footpath, construction for any mode of transportation, Centralize Parking Plaza and transport terminal, driver dormitories, canteen, bus stop / bus bay, taxi stands, auto- rickshaw stand, cycle stand, filling stations of petrol, diesel, compressed natural gas or any other motor vehicle fuel, vehicles repair/ servicing garages, ATM, Govt/ Semi-Govt/SPA offices, fire station, hotel, utility infrastructure and health care unit. For detail list refer Table no 47

6.1.7 Green Zone

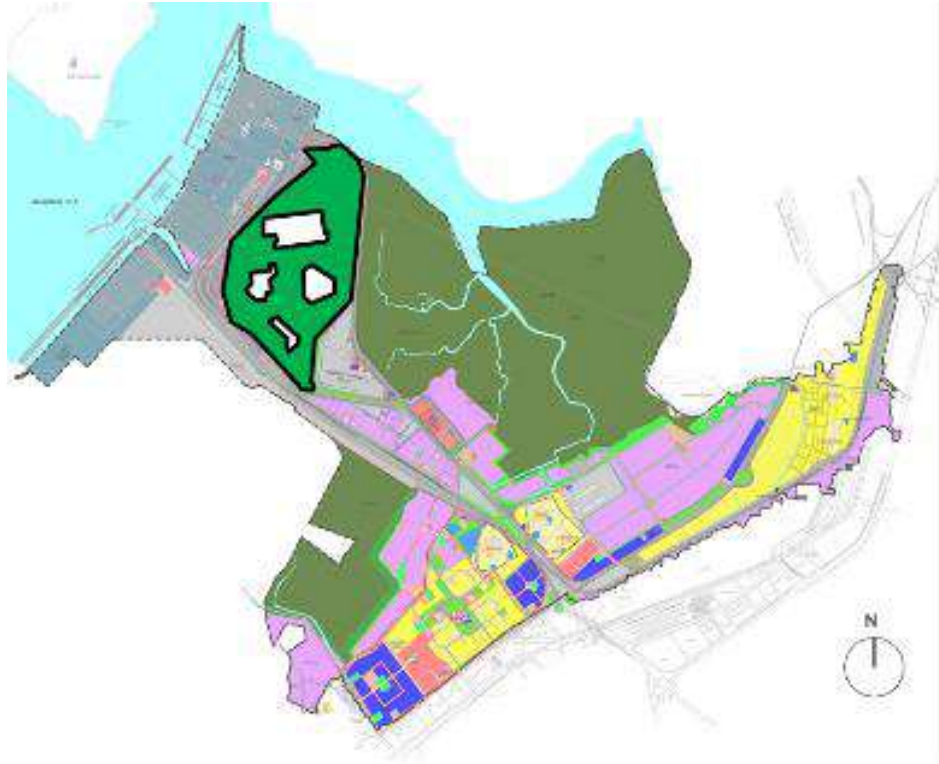


Figure 108 Land Use plan showing Green Zone

Intent

- Provision of protective green zone on sheva hill including natural lakes.
- Protection of natural ecology along the fragile areas.
- Encourage use of green, open spaces, green belt by proper access and signage.

Uses permitted

Uses permitted within Green Zone will include parks, garden, open spaces, playground, green belt, nursery, open air theatre, amphitheater with no permanent structures, club house, landscaping and horticulture, utility distribution/pumping station/ receiving stations/ sub stations/ energy power supply units, solid waste bins and transfer stations. telecom, gas and petroleum pipelines with a necessary sub stations of appropriate capacity and optic fiber cables etc. For detail list refer Table no 47

6.1.8 Natural and protected Zone



Figure 109 Land Use plan showing Natural and Protective Zone

Intent

- Conserve and protect the areas falling in CRZ and mangroves.
- Encourage strategies for using these areas wherever possible for open spaces and utilities.
- Make appropriate use of available CRZ II as per CZMA Notification

Uses permitted

Uses permitted as per Coastal Zone Management Authority Notification. For detail list refer Table no 47

Proposed Zone plan is attached as Annexure III.

6.2 Permitted uses within zones

Table 47 List of permissible uses

Sr. No.	Type	Land Use Classification	Proposed Zones							
			1	2	3	4	5	6	7	8
			Predominantly Residential (PR)	Predominantly Commercial (PC)	Industrial (I)	Amenity (A)	Port Operational (PO)	Transportation & Communication (T)	Green Zone (G)	Natural Area & Protective (NP)
1	Residential and Short term accommodation	Individual Housing / Apartments	✓							
		Hotel/ Rest room /Hostel/	✓	✓	✓	✓		✓		
		Club Houses or Gymkhanas	✓		✓	✓	✓		✓	
		Dormitories	✓		✓	✓		✓		
		Day Care Baby Crèche	✓	✓	✓	✓				
		Govt./Port operation staff quarters	✓							
		Guest house	✓	✓		✓			✓	
		Service apartments	✓	✓						
2	Education	Pre Primary, Primary School, Senior Secondary School, Integrated School with/without hostel facility, College	✓			✓				
3	Health	Primary Health Care Unit, Clinic, Hospital, Dispensary and Casualty/ Emergency Ward	✓		✓	✓				
		First Aid Post	✓	✓	✓	✓	✓	✓		

4	Institutional	Govt/ Semi-Govt/SPA offices (Police Station, telephone exchange, sub offices of electric supply company, Post office, customer care Centers.)	✓	✓	✓	✓	✓	✓	✓	
5	Assembly	Libraries, reading halls, creative arts and other cultural activities	✓	✓	✓	✓				
		Places of worship, Religious buildings, Meditation Centre.	✓		✓	✓				
		Multipurpose Community halls, welfare centres, Museum	✓		✓	✓				
		Exhibition halls, Swimming Pool, Auditorium, clubs, assembly halls, Training Centre	✓		✓	✓			✓	
		Gymnasiums, open air theatre (amphitheatre) spiritual Center, meditation hall, yoga hall	✓		✓	✓			✓	
6	Commercial	Banks	✓	✓	✓	✓				
		ATM	✓	✓	✓	✓	✓	✓		
		Departmental Stores	✓	✓	✓	✓				
		Convenience Shops /Lower order Commercial (Photo-copying, shoe repair,	✓	✓	✓	✓	✓	✓		

		Cleaning and pressing establishments for clothes, Restaurants, eating houses, cafeteria, ice-cream and milk parlours)								
		Business Offices/ Private offices, Travel agencies, ticket booking and selling agencies, Florists, Bakery shops, Café. etc	✓	✓	✓	✓				
		Vehicles repair/ servicing garages	✓	✓	✓	✓		✓		
		Retail trade and shops/stores or shops for conduct of retail business	✓	✓	✓	✓				
		Filling stations of petrol, diesel, compressed natural gas or any other motor vehicle fuel	✓	✓	✓	✓		✓		
7	Industrial	All Industries permitted under multi-product category in SEZ Act 2005 and rules amended from time to time subject to approval from the SEZ Development Commissioner.			✓	✓				
		Warehousing, Godowns, cargo yard, container Yards, FTWZ, Data			✓	✓				

		Centers, tank farms, storage with residence for essential staff									
		IT&ITES service SEZ			✓	✓					
		Repair workshops, fabrication workshops, public garages & all other service industry			✓	✓					
8	Green/ Recreational	Landscaping and horticulture	✓	✓	✓	✓	✓	✓	✓	✓	
		Parks, garden, open spaces, playground, green belt, nursery, open air theatre, amphitheatre and swimming pool.	✓	✓	✓	✓		✓	✓	✓	
9	Traffic and Transportati on	Bus stop / Bus Bay, taxi stands, auto- Rickshaw Stand	✓	✓	✓	✓		✓			
		Helipad		✓	✓	✓		✓			
		Public parking areas including multi-storeyed parking	✓	✓	✓	✓		✓			
		Canteen	✓	✓	✓	✓	✓	✓			
		Rotaries, Weigh Bridge, construction for any mode of transportation				✓			✓		
		Roads, Bridge culverts, , Walkways, Foot over Bridge, median Pathway, Footpath,	✓	✓	✓	✓	✓	✓	✓	✓	

		Port container terminals, Berths, storage yards, Port operator offices, Jetty, RO-RO service, Facility building, etc					✓	✓		
		Centralize Parking Plaza and Transport Terminal			✓			✓		
		Entrance Gate Complex ,Security offices , watchman rooms, etc.	✓	✓	✓	✓	✓	✓		
10	Water and Sewage	Pumping station, sewage disposal work, water supply installation & ancillary structures (STP, WTP, ESR, GSR, Septic Tanks, CETP, ETP etc.), Rain Water Harvesting Structure	✓	✓	✓	✓		✓	✓	
11	Electricity	Electricity distribution/receiving stations/distribution sub stations/ Energy Power Generator Supply Units, D.G Units	✓	✓	✓	✓	✓	✓	✓	
		Solar and Wind Energy Units			✓			✓	✓	
12	Public Sanitation	Public toilet, common taps	✓	✓	✓	✓	✓	✓	✓	
13	SWM	Collection Waste Bins and Transfer Stations	✓	✓	✓	✓	✓	✓		

		Solid waste disposal Methods (Organic waste), Composting Plants	✓		✓	✓		✓	✓	
		Solid waste disposal Methods (Inorganic waste), Incinerators.	✓		✓	✓		✓	✓	
14	Fire	Fire Station, Fire Post			✓	✓	✓	✓	✓	
15	Other Services and Utilities	Telecom, Gas and Petroleum pipelines with a necessary sub stations of appropriate capacity, Optic Fibre Cables, Mobile Towers, and communication Tower.	✓	✓	✓	✓	✓	✓	✓	

6.3 Proposed nodes and Land Use plan

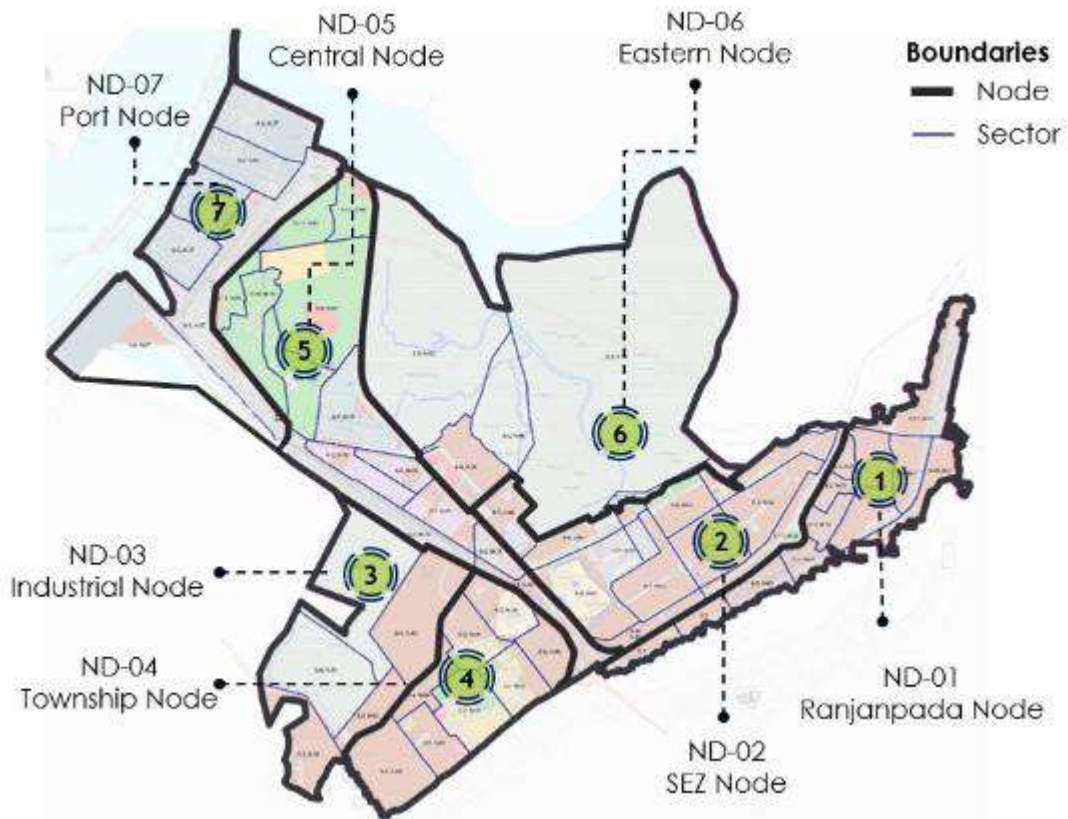


Figure 110 Proposed Nodes in JNPA
Table 48 Land Area statement of proposed nodes

S.N	Node	Name of Node	Approx. Area (Ha.)
1	ND-01	Ranjanpada Node	290
2	ND-02	SEZ Node	431
3	ND-03	Industrial Node	355
4	ND-04	Township Node	299
5	ND-05	Central Node	522
6	ND-06	Eastern Node	1053
7	ND-07	Port Node	464
Total Area			3414

- As per drawing

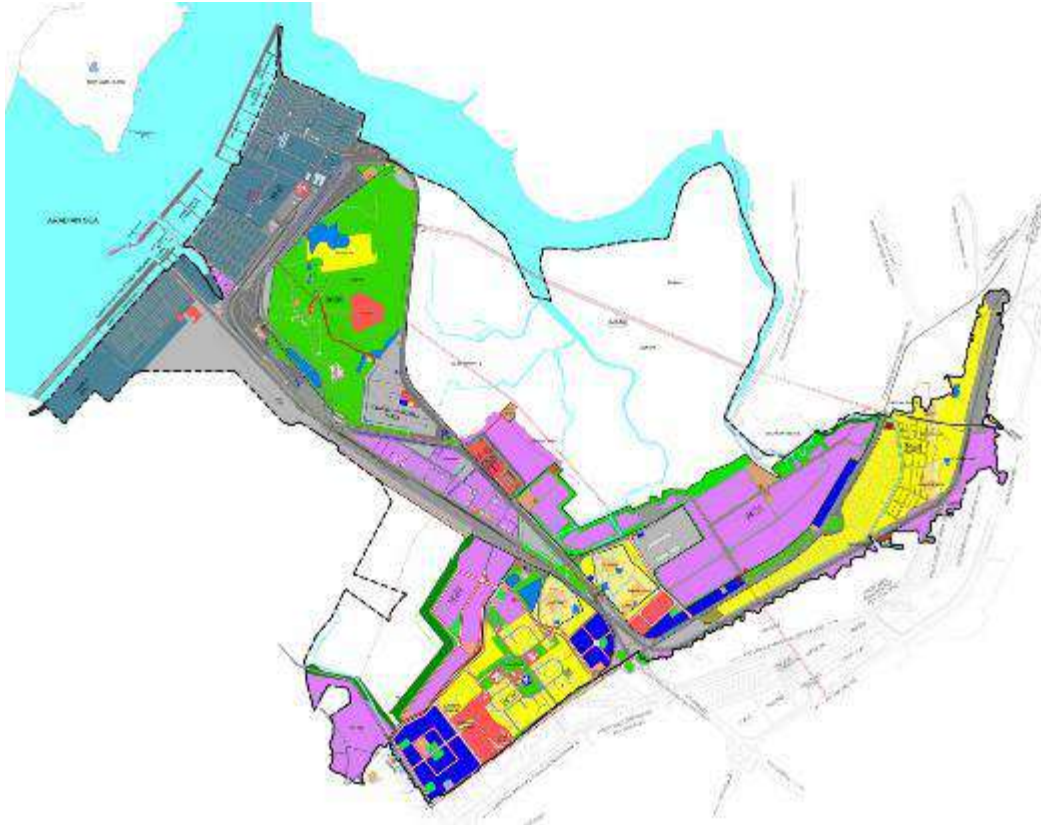
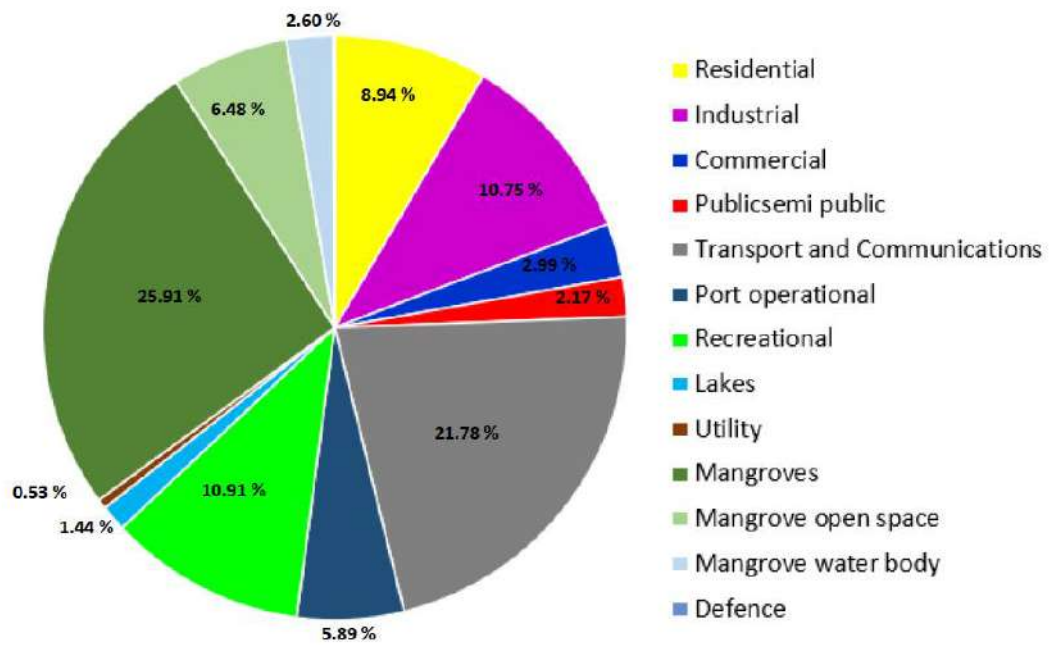


Figure 111 Proposed Land Use plan



Pie Diagram of Proposed Land Use Plan

Table 49 Proposed Land Use area table

Sr No	Land Use	Proposed Land Use	
		Area (in ha)	Total %
1	Residential	289.78	8.49
2	Commercial	367.14	10.75
3	Industrial	102.06	2.99
4	Public Semi-public	74.1	2.17
5	Transportation and Communication	743.79	21.78
6	Port Operational	201.2	5.89
7	Recreational Open space	372.43	10.91
8	Lakes and Natural drain	49.12	1.44
9	Utilities & Services	18.21	0.53
10	Mangroves	884.66	25.91
11	Mangroves Open space	221.21	6.48
12	Mangroves water body	88.93	2.60
13	Defense Area	1.65	0.05
	TOTAL	*3414.28	100
	*Including T4 phase II + Coastal Berth reclaimed area		

Proposed Land Use plan is attached as Annexure IV.

6.4 Proposed roads



Figure 112 Map showing proposed road development and widening

LIST OF PROPOSED DP ROADS IN JNPA							
Road No	Road Name	Type of road improvement	Existing width (in metre)	Proposed Width (in metre)	Proposed Length (in metre)	Road Area (In Sqm)	No of Lanes
1	Uran Panvel road	Widening	5	30	2,323	69,690	6 lane
2	Custom colony road	Widening	3	30	838	25,140	*4lane
3	Uran Sheva road	Widening	5	24+nalla+ 24	2,219	1,06,512	4lane each
4	DP road	New link	0	24	623	14,952	4lane
5	DP road	New link	0	18	2,082	37,476	4lane

6	DP road	New link	0	18	1,194	21,492	4lane
7	DP road	New link	0	24	1,627	39,048	4lane
8	DP road	New link	0	18	1,817	32,706	4lane
9	Jaskhar village road	Widening	5	18	1,600	28,800	4lane
10	DP road	New link	0	18	1,646	29,628	4lane
11	Speedy road	Widening	6	30	1,108	33,240	4lane
12	DP road	New link	0	24	1,106	26,544	4lane
13	Karal to Chandni chowk Slip road	New link	0	9	590	5,310	2lane
14	Green zone road on sheva hill	Widening	3	9	1,315	9,205	2lane
	TOTAL				20,088	4,79,743	

Total 20 Km Road length is proposed for improvement out of which 9 Km is proposed for widening of existing roads and 11Km are proposed new links.

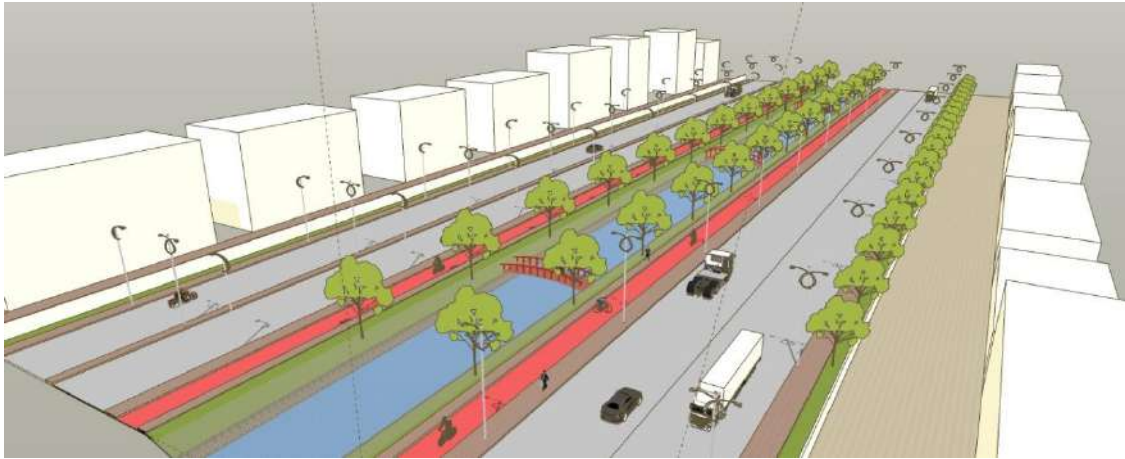
a) **URAN SHEVA road**

- **Proposal** – Concept of Avenue with roads on both sides of natural Drain. Provision of bicycle track, wide pathway, and green areas.
- **Need** – To conserve natural drain and cater to the needs of the Proposed Industrial and Residential, Commercial development along the link.
- **Existing width** – 5m

- **Proposed width – 18m each, 4 lane**



Proposed 60m ROW of Uran Sheva Road



View of Proposed Avenue concept

b) **30m proposed connector near funde**

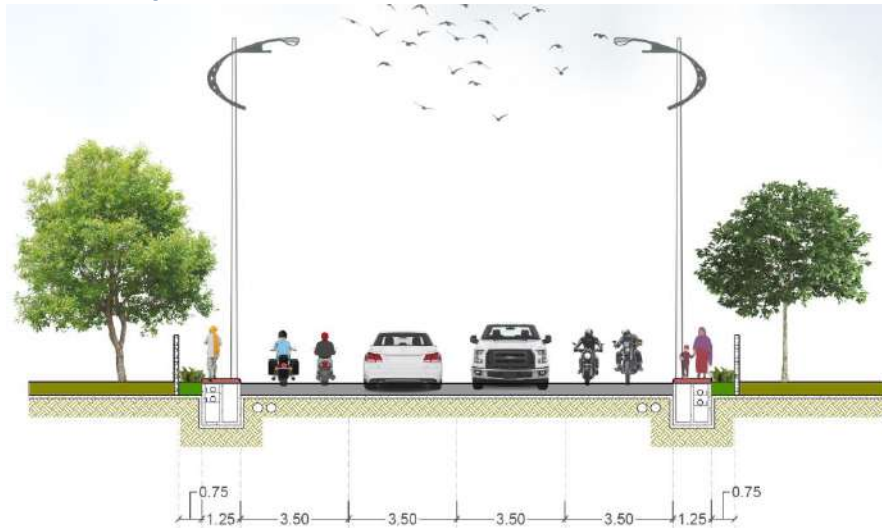
- **Proposal** – Sub arterial connector by strengthening and widening
- **Need** – To cater to the needs of the Proposed development along the link
- **Existing width** – kaccha road
- **Proposed width** – 30m, 4lane



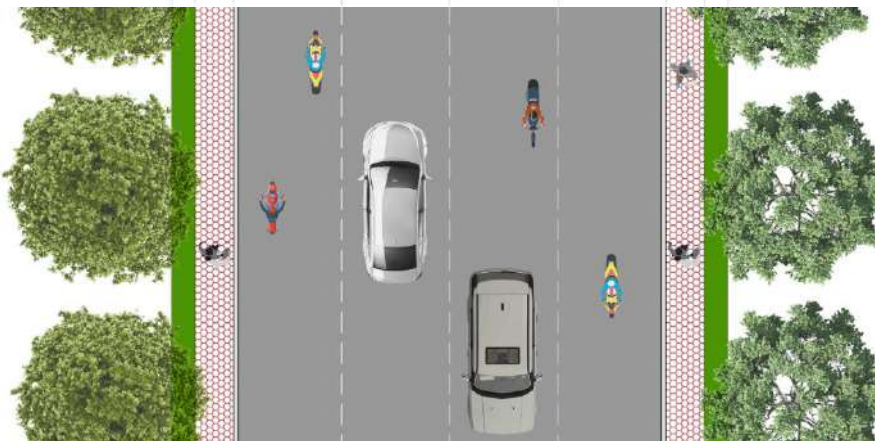
Proposed 30m wide Funde road

c) **30m wide Uran-Panvel highway widening**

- **Proposal** – Widening
- **Need** – For smooth traffic flow
- **Existing width** – 7m
- **Proposed width** – 30m, 6lane



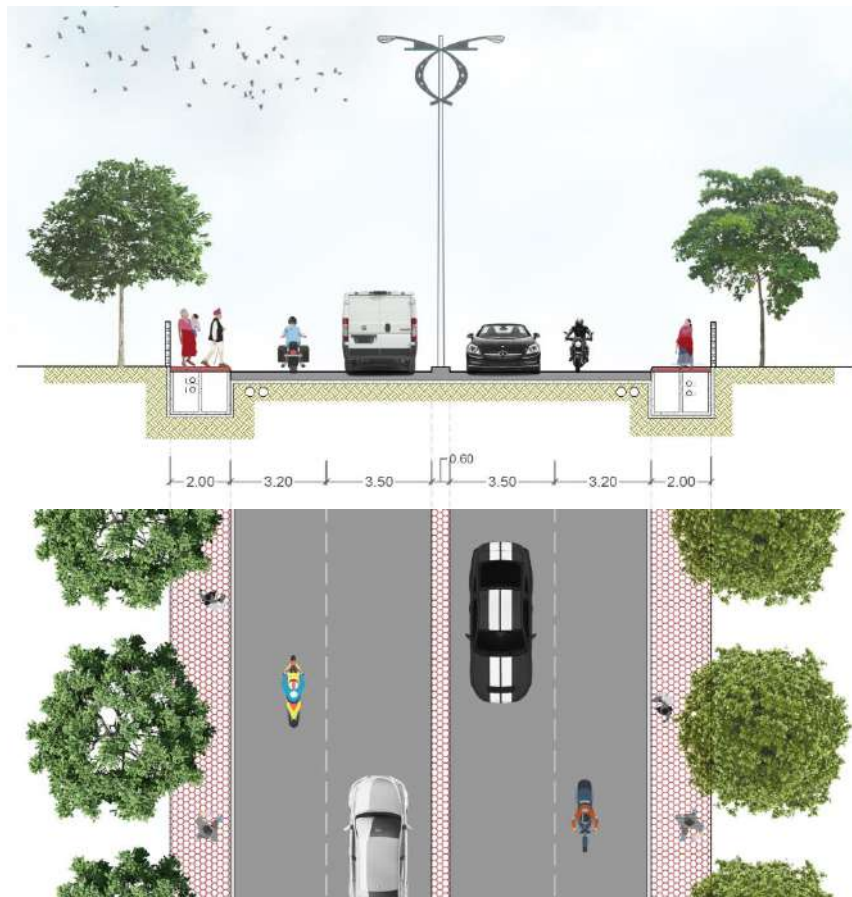
d)



Widening of Uran Panvel Road

e) **18m wide proposed connector**

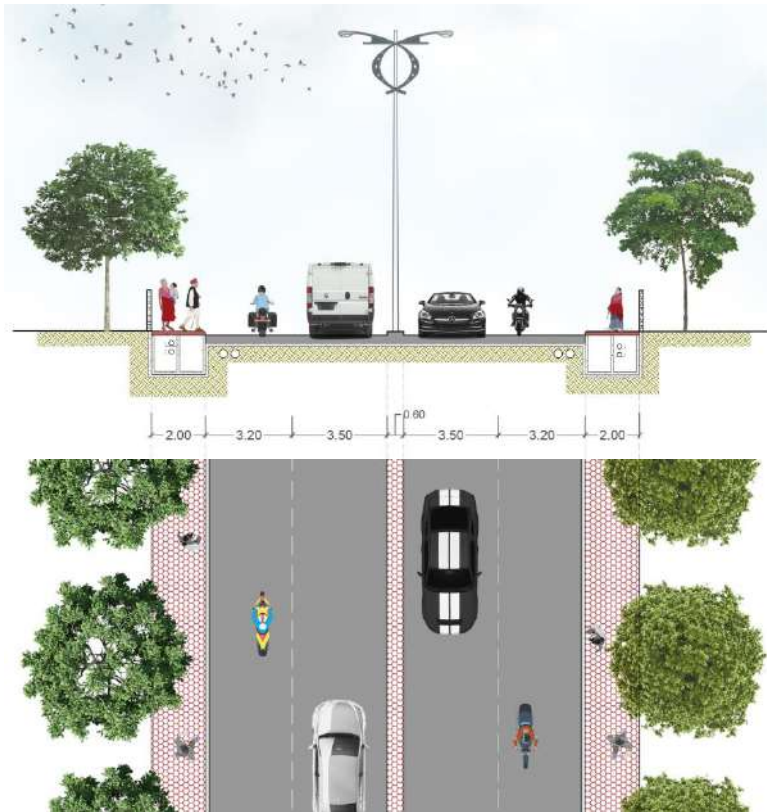
- **Proposal** – Widening and creating new extended link
- **Need** – To cater to the needs of the Proposed development along the link
- **Existing width** – 3m
- **Proposed width** – 18m, 4lane



Proposed 18m wide road adjoining Funde college

f) **18m wide proposed widening Jaskhar road**

- **Proposal** – Widening and linking
- **Need** – Ease the container traffic flow
- **Existing width** – 7m
- **Proposed width** – 30m, 4lane



Widening of Jaskhar road

g) **30m wide proposed link along CFS speedy**

- **Proposal** – Widening and linking
- **Need** – Ease the container traffic flow
- **Existing width** – 7m
- **Proposed width** – 30m, 4lane



Proposed 30m widening and extension of road link along CFS Speedy

h) **9 m wide proposed slip road from Karal to Chandni Chowk**

- **Proposal** – New link
- **Need** – Bypassing the traffic at Karal junction
- **Existing width** – 0
- **Proposed width** – 9m, 2-lane

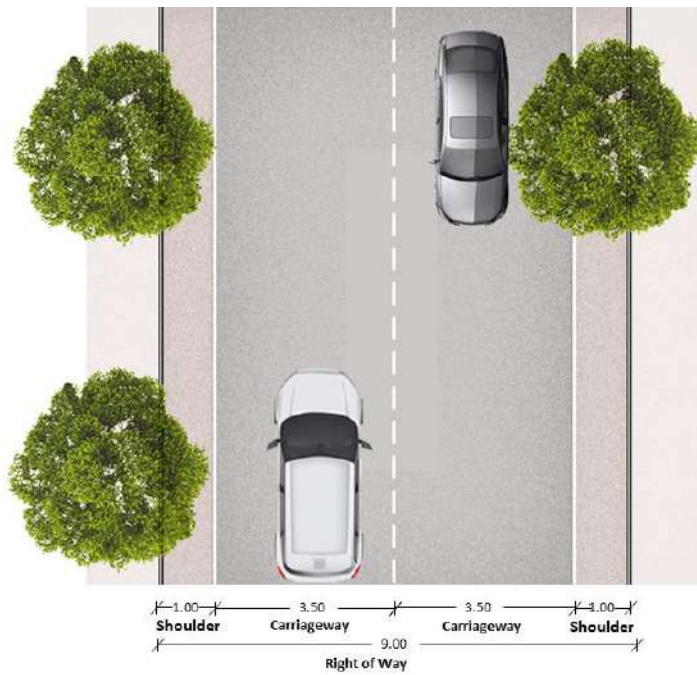
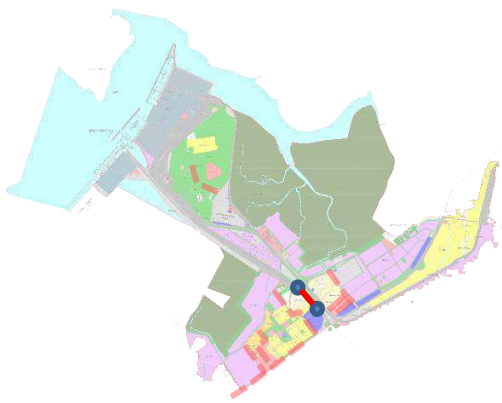


Figure 113 Proposed 9m slip road from Karal to Chandni Chowk

6.4 Proposed Macro Level Road Links

With an objective to ease out container traffic moving in and out towards JN Port area, following road links are proposed in the land Use Plan as seen in figure 114.

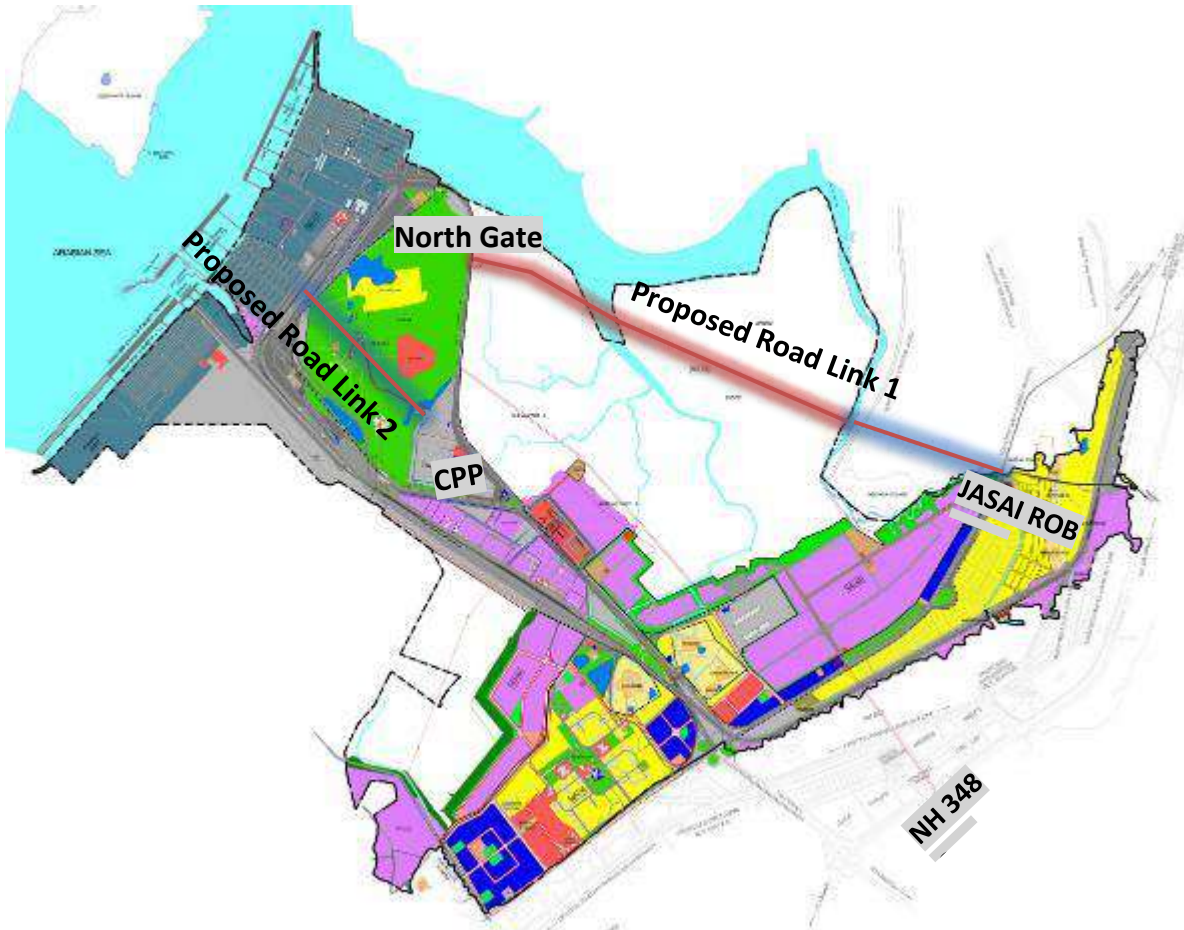


Figure 114 Land Use Plan showing proposed macro level road links

1) Underground Tunnel Link from CPP pump house to JNPCT terminal

- It is proposed to plan an underground road tunnel cutting across the Sheva hill.
- Total proposed length is 1.60Km. The link runs at grade along existing road for 200mts and rest 1.4 Km is proposed to be underground. Minimum 4 lane road width is proposed.
- A techno-economic feasibility study is proposed, which will include traffic - transportation study and market demand assessment study.

2) Partly Elevated and partly underground road link from Jasai ROB to North gate

- The intent of this proposed link is to channelise the container traffic from Navi Mumbai via NH 348 / NH348 A directly to North gate leading to JN Port.
- The link is proposed to start from ROB at Jasai, cutting across Belpada village hill through tunnel and opening at grade on coastal road, further running along existing bund through mangroves area. The link further opens near north gate.

- Total length of the link is 6.0Km, out of which underground is 1.0Km and at grade is 5.0 Km. Minimum 4 lane road width excluding road shoulder is proposed.
- A techno-economic feasibility study is proposed, which will include traffic - transportation study and market demand assessment study.

6.5 Proposed petrol pumps

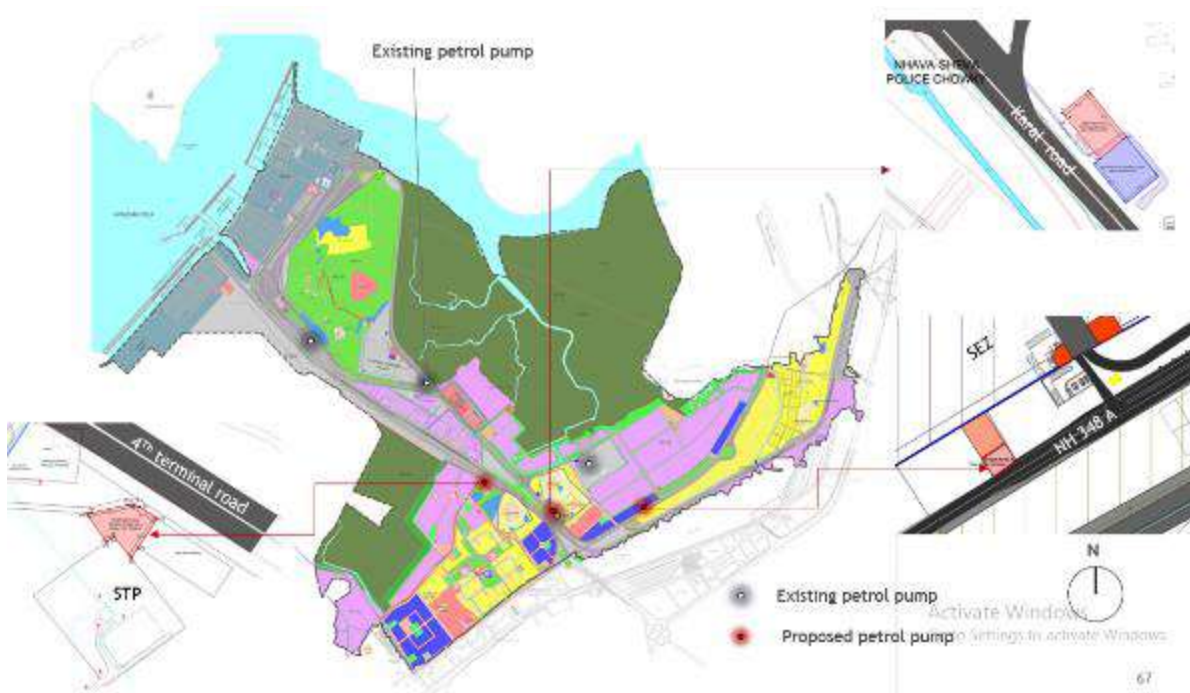


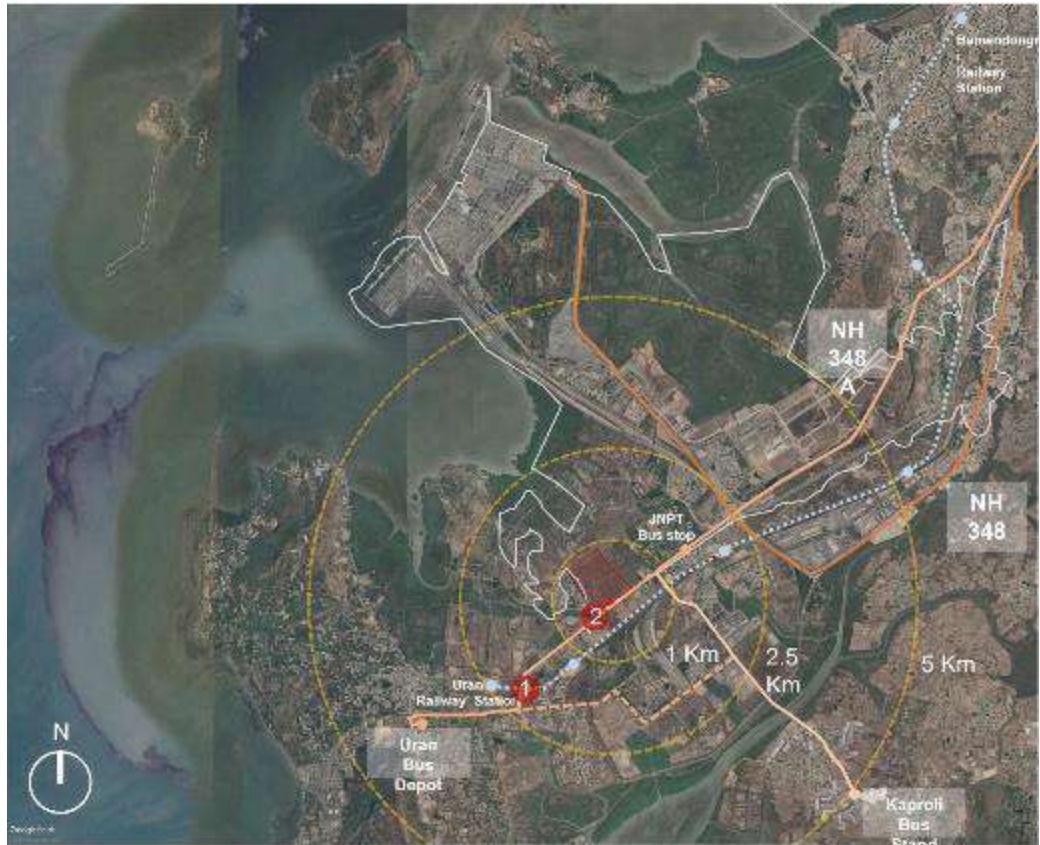
Figure 115 Locations of proposed and existing petrol pumps in JNPA

The existing locations of petrol pumps are near karal, CFS speedy and South gate. Three proposed locations are one along SH54 near SEZ, second expansion of karal petrol pump and third near Sheva police station.

6.6 Proposed Bus Station

Existing Bus facility around JNPA

There are four NMMT buses 30, 31, 32 and 34 running along NH 348A connecting Uran to Kalamboli, kparkhairane and Juinagar/Koproli/Pirkon. These routes pass through JNPA area and the proposed bus station site. Currently bus routes have been diverted due to two reasons, one being Trans Harbour Line intersecting existing route at grade of 1.5m and another reason being structurally weak culvert adjacent to the proposed site, due to which by government order heavy vehicles like buses are not allowed to pass from it. The above-mentioned problems are highlighted in the figure below.



1



Railway Crossing at Grade

2



Structurally Weak Culvert






-  Diverted Bus Route
-  Bus Route
-  Bus Stops
-  Bus Stand Location
-  Proposed Bus Stand site

Figure 116 NMMT Buse Routes Passing Through JNPA

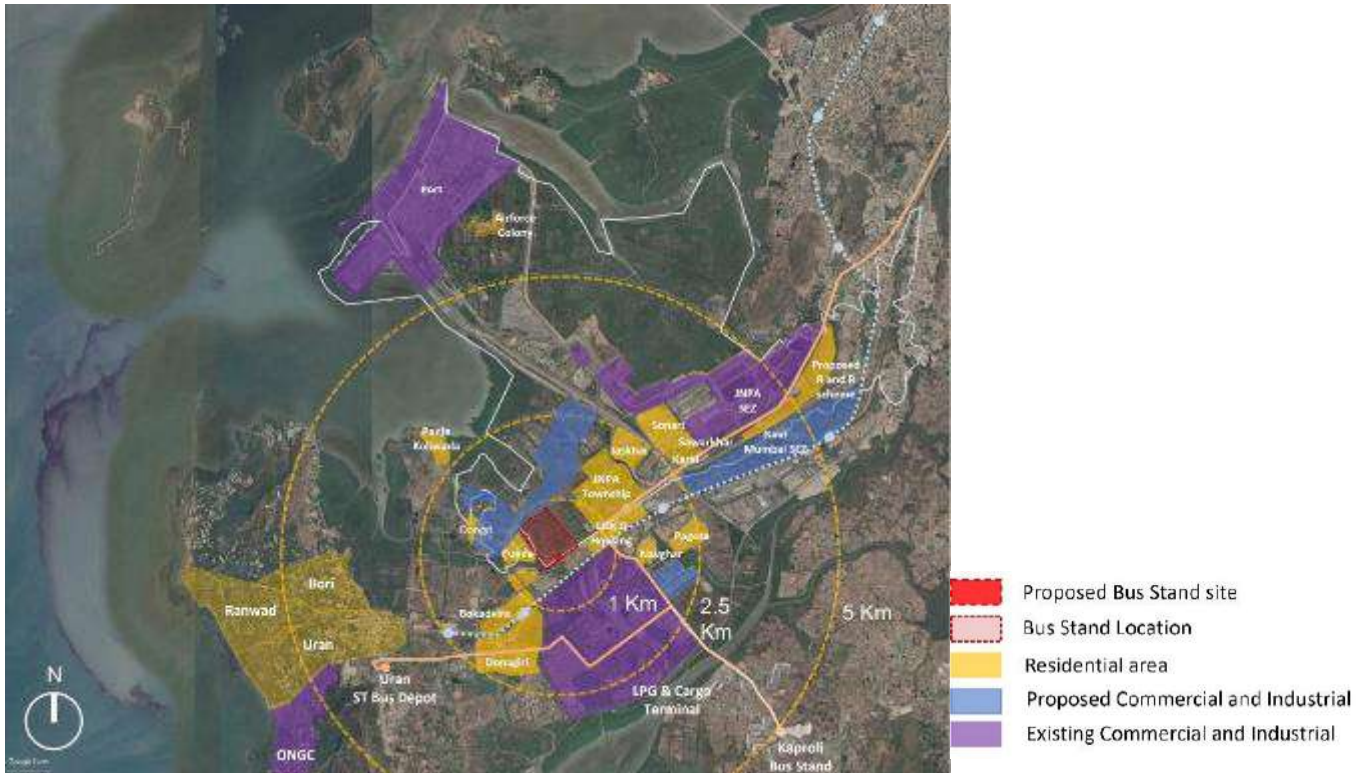


Figure 117 Passenger generating areas

Proposed site selection

The proposed passenger railway line connects Nerul to Uran, its 12.5km length of railway line with nine stations between Nerul and Uran. Railway stations from Seawoods to Kharkopar are constructed and the rest of the railway stations including Uran station are under construction. The Donagiri and Nhava Sheva railway stations are within a 2.5 sq. km radius, this increases the passenger traffic for the proposed city bus station at JNPA. In future the population of growing areas in uran and Drongiri will create a demand for a Bus facility. The site selected for the bus station is central to the growing areas and JNPA area. The final selected site is option 1 of the suggested sites as shown in figure 118 It's a corner plot with 30m wide proposed roads on both sides. Plot area of proposed site is 10,052.7 sq. m with FSI of 1.2 according to CIDCO and URDPFI bylaws. The total built up area comes out to be 20,105.4 sq.m.

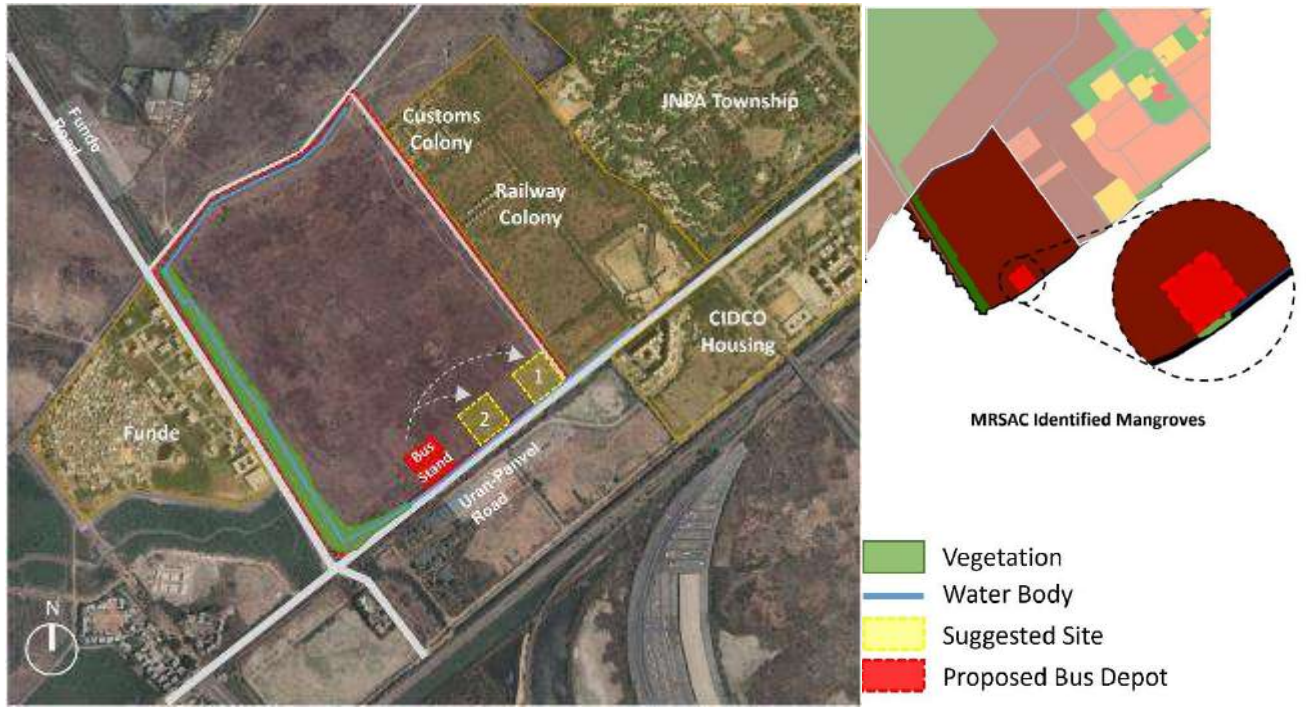


Figure 118 Proposed site location for bus station in JNPA

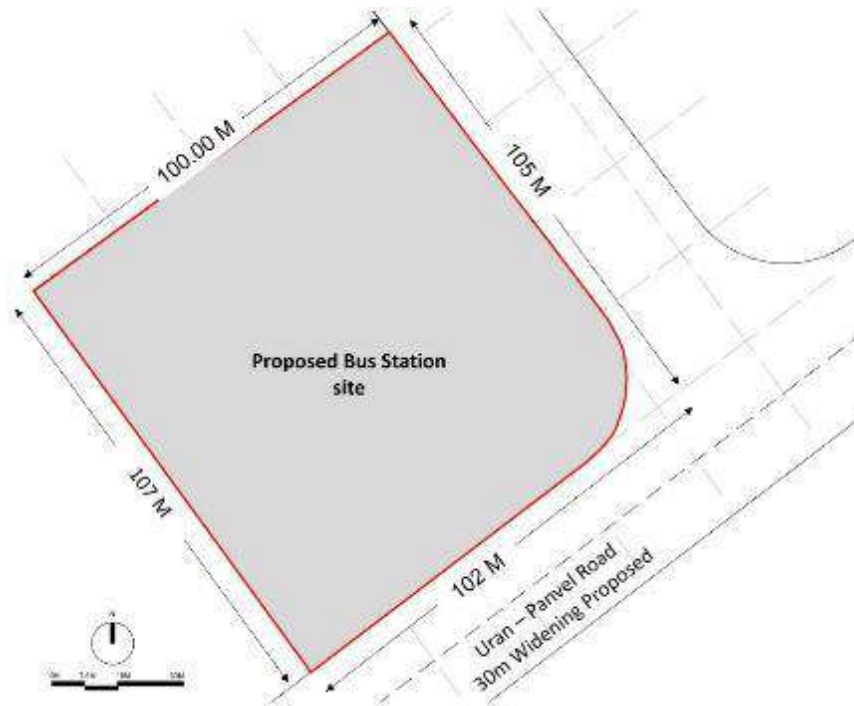


Figure 119 Proposed site

1.6.1 Conceptual Plan

Conceptual plan was done keeping PPP framework in mind. Maximum frontage was given for commercial plot with two approach roads. Separate entry and exit for the bus station. Segregated circulation for bus, vehicle, and pedestrian. Six bus bays are proposed with IPT stop within the site, which increases intramodality of the space.

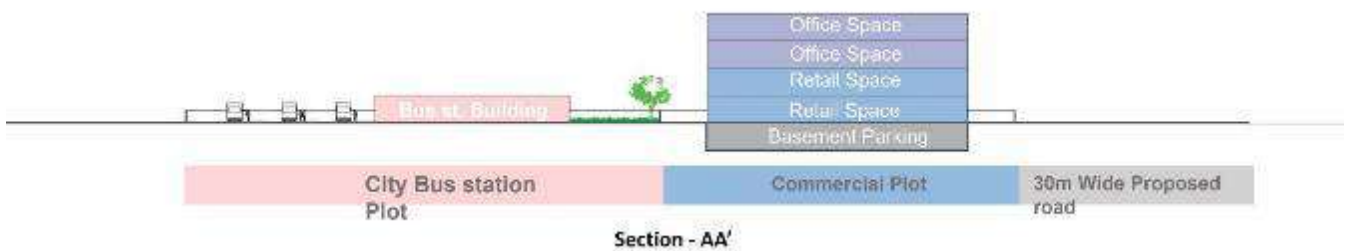
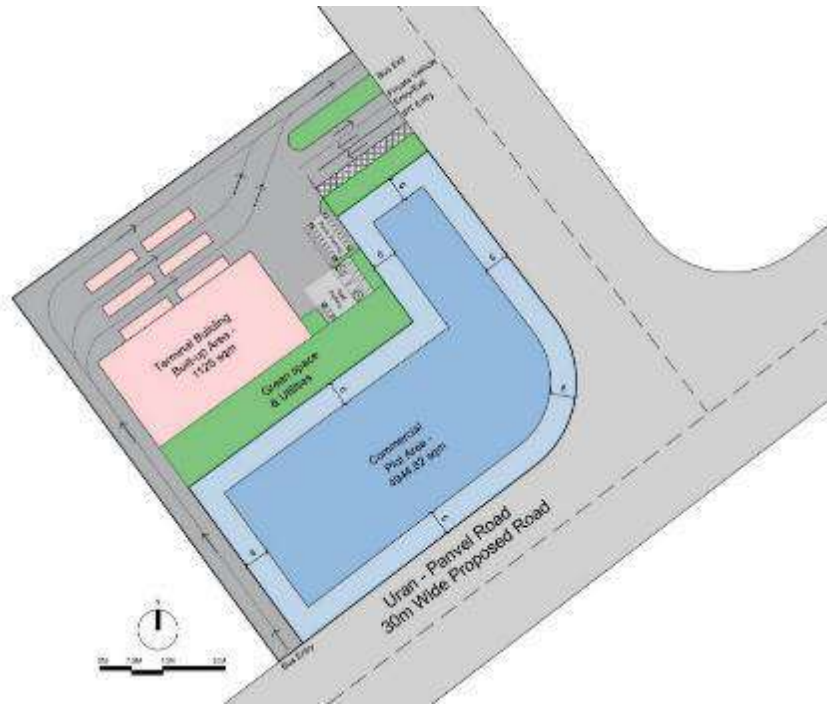


Figure 120 Schematic Plan and Section

CHAPTER 7 – IMPLEMENTATION STRATEGY

For the effective implementation of the land use plan and development proposals it is essential to envisage appropriate institutional framework and suitable mechanisms for financing and implementation.

The land-use plan implementation strategy considered for the JNPA is described in this chapter along with identification of the appropriate framework for overseeing implementation of projects. Following this, the chapter describes the broad cost estimation for implementation and the tools that can be employed for financing the infrastructure development proposals.

7.1 Institutional Structure

Setting up of an appropriate institutional structure at JNPA is necessary for streamlining the implementation of proposals.

It is recommended to form an In-house Planning and Architecture Division within JNPA consisting of a team lead by the Chief Architect and Planner. Following figure shows the proposed department structure.

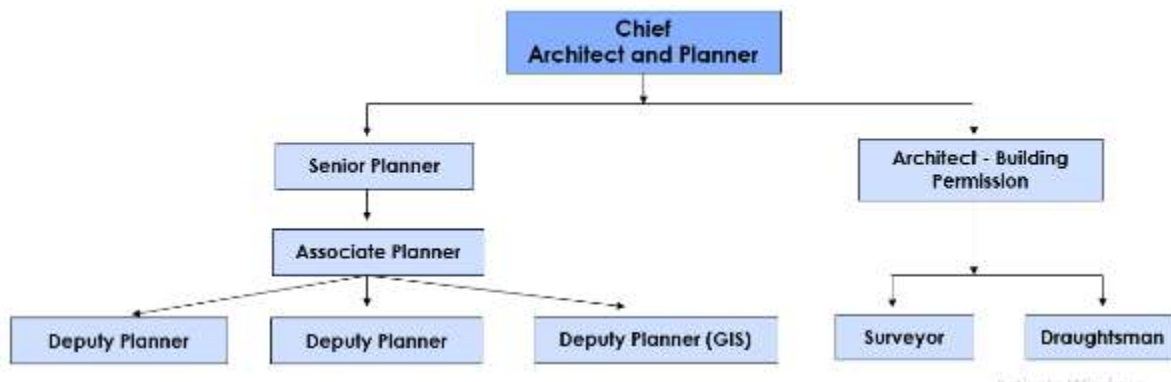


Figure 121 Proposed department structure of Planning Cell in JNPA

7.2. Block Cost Estimate for proposed infrastructure development

A summary of cost estimates for all outlined proposals under broad categories is given in the Table below. This includes all physical infrastructure items and proposed roads in the proposed landuse plan.

Table 50 Block cost estimate for infrastructure development works

Block Cost Estimates for Infrastructure Development Works						
S. No.	Item	Description	Quantity	Unit	Rate (Rs.)	Amount (Cr.)
1	Internal Road					
1.1	Flexible pavement	Bituminous Pavement	9403.00	Rm	70,101	65.92
1.2	Rigid pavement	Cement Concrete Road	10685.00	Rm	88,198	94.24
1.3	Footpath	60 mm thick paver block including kerbstone as required.	60264.00	Sqm	1,040	6.27
2	Strom Water Drain	Storm water drainage system including cross drainage works, outfall structures and all associated structures. RCC drains sizes ranging from 0.45 x 0.45m to 1.65 x 1.65m	21370.00	Rm	19,339	41.33
3	Water Supply System :	External water supply system including intake works, booster stations, pumping, pipe to Desalination Plant, Desalination Plant	45.00	MLD	12,22,86,658	550.29
		Construction of UGR, Pumping house, & Misc. E&M works	1.00	KL	1,79,92,177	1.80
		Construction of OHSR & Misc. works	1.00	KL	1,11,85,278	1.12
		Providing, Laying, Jointing, Testing and Commissioning of 110 mm to 180 mm dia HDPE (HDPE PN 6 Kgs/cm ²) & 200 mm to 350 mm D.I. (K-7) pipe including valves, valve chambers etc. complete.	10685.00	Rm	1,555	1.66
4	Fire Water Supply System	Supplying, installation, testing and commissioning of Electric & Diesel driven main fire pump suitable for automatic operation and providing, laying, testing & Commissioning of Firefighting network	10685.00	Rm	2,600	2.78

Block Cost Estimates for Infrastructure Development Works						
S. No.	Item	Description	Quantity	Unit	Rate (Rs.)	Amount (Cr.)
		System of 150mm dia MS Pipe including External Hydrant				
5	Recycle Water Supply System	Providing and laying of Recycle water lines including Submersible Pump sets, Lift Stations & Electro Mechanical Items Etc.	10685.00	Rm	1,800	1.92
6	Sewage Collection & Treatment System	Providing and laying of Sewer lines including Submersible Pump sets, Lift Stations & Electro Mechanical Items Etc.	10685.00	Rm	5,111	5.46
		STP including Operation and Maintenance with all Civil & Electro-Mechanical works, piping, etc., complete in all respects	23.50	MLD	1,10,00,000	25.85
7	Power Distribution System and Street Lighting	33/11 KV Sub-station	1.00	Job	5,00,00,000	5.00
		33kV Under Ground Distribution System	10685.00	Rm	3,500	3.74
		11kV Under Ground Distribution System	10685.00	Rm	4,400	4.70
		External Illumination System with LED High Mast and street Light LED luminaire with Lamp including Feeder Pillar with RCC Foundation	10685.00	Rm	2,500	2.67
		Telecommunications/ Data Network Conduiting	10685.00	Rm	150	0.16
8	Solid Waste Management	Considering Waste bins at different location, equipment, vehicles, transfer stations, landfill site, etc., all complete	1.00	Job	2,00,00,00,000	200.00
COST OF INFRASTRUCTURE DEVELOPMENT WORKS						1,014.91

7.2 Financing the Planning Proposals

Mechanisms for implementation of the plan proposals are closely linked with the cost estimates. The priority infrastructure development such as roads and physical infrastructure may be funded through JNPA's own revenue sources. Alternative financing mechanisms such as PPP and CSR can be considered for certain suitable projects that can result in reduction in the overall costs to be directly borne by the Authority.

The project proposals identified for implementation can be categorised into the following:

1. Priority infrastructure development projects to be developed through Authority's own financing sources
2. Projects with potential of a PPP option
3. Projects with potential of a Corporate Social Responsibility (CSR) option

Indicative categorization of the proposals as per financing strategy:

SI No.	Project proposal	Proposed source of Financing
1	Roads	JNPA
2	Storm Water Drainage	JNPA
3	Water Supply system	JNPA
4	Underground sewerage network	JNPA
5	Power supply and streetlighting	JNPA
6	Solid Waste Management Plant	PPP
7	Parks and gardens	CSR

Projects that have a clear revenue stream which offer opportunities for recovering capital and operating costs incurred for these projects such as solid waste processing and disposal facility, Bus Stand and commercial complex, etc., can be developed through the PPP arrangement.

JNPA may engage with other public sector agencies or its private sector partners to develop some facilities such as parks and gardens through CSR basis.

7.3 Phasing of the Plan Proposals

The proposed development is over a large area and therefore it will not be feasible to service such a large area with physical infrastructure all at once. Broad phasing will be necessary so that proposals can be prioritized for implementation in certain critical areas where development is essential in the first few years of the plan period.

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ANNEXURES

Annexure I: Benchmarking Case Study of Port Cities

1 Kandla Port, Gujarat

1.1 Introduction

Kandla, Deendayal Port Authority, is a seaport and town in Kutch district of Gujarat state in western India, near the city of Gandhi Dham. Located in the gulf of Kutch, it is one of India's major ports on the west coast. The Port of Kandla is India's hub for exporting grains and importing oil and one of the highest-earning ports in the country. Major imports entering the Port of Kandla are petroleum, chemicals, and iron and steel and iron machinery, but it also handles salt, textiles, and grain.

1.2 Key Statistics

Kandla Port has been handled by the authority of Deendayal Port Trust. It has spatial extent of around 2582.7 hectare. The cargo handling capacity is 185 MMTPA annually. It consists of 10 berths.

1.3 Location and Regional Context

Kandla port, the gateway of Northwest India, is in Kutch District, in a state of Gujarat, India. Kutch is the largest district of India covering an area of 45,650 sq.km. Since the Indus era, Kutch has been a well-known port district by virtue of its long coastline and natural harbours. Due to its favourable location, it has traditionally served as an entry point to international seafarers hailing from East Africa, the Malabar Coast, and the Persian Gulf.

The port is the nearest, most economical, and most convenient for handling imports and exports of the highly productive granary and industrial belt stretching across Jammu & Kashmir, Punjab, Himachal Pradesh, Haryana, Rajasthan, and Gujarat. Following schematic depicts the location of Kandla Port and hinterland that is being serviced:



Figure 1 Regional Location of Kandla Port



Figure 1 2 Spatial setup and regional connectivity with port

1.4 Port Economy

The Economy of Kandla port is based on major imports such as petroleum, chemicals, and iron. Apart from this it also handles salt, textiles, and grain. The port of Kandla Special Economic was the first special economic zone to be established in India and in Asia. Established in 1965, the port of Kandla SEZ is the biggest multiple product SEZ in the country. Kandla is the first export processing zone in India. Covering over 310 hectares, the special economic zone is just nine kilometres from the port of Kandla. Apart from the SEZ, the port of Kandla is India's hub for exporting grains and importing oil and one of the highest earning ports in the country. Other social infrastructure such as school, hospital and hospitality has also been prioritized as alternatives of revenue generation.

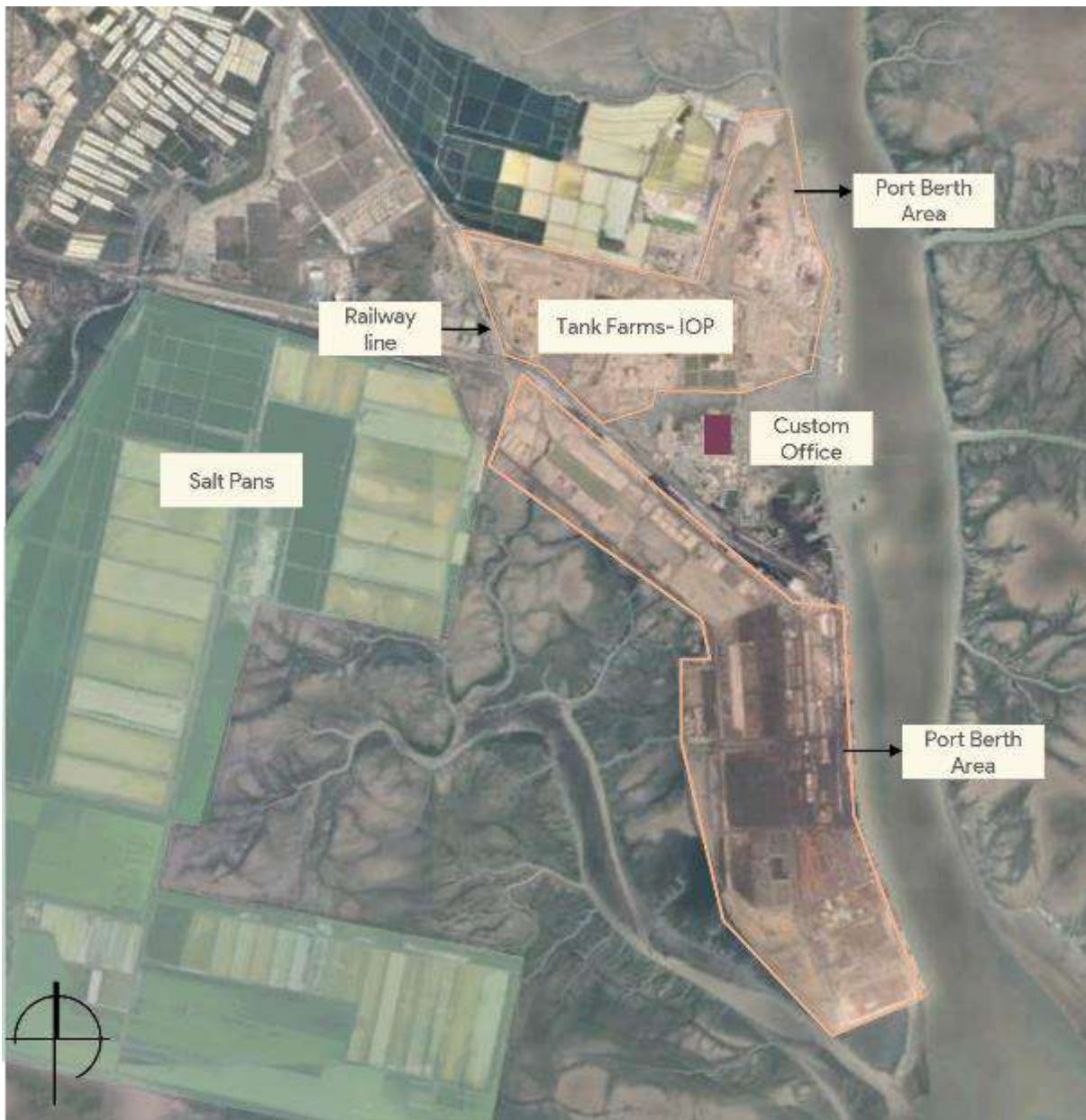


Figure 1 3 Kandla Port region with Salt pans and berths along the creek

1.5 Port planning and Land use

The overall Kandla port region lies majorly in The Land Use Plan of the port is based on the planning concept called, ' Transit Oriented Development': all major institutions, retail and other commercial activity that attract most traffic should be planned only in high density nodes within walking distance of mass public transportation, in this case the bus stops.

Designated area of township is termed to be "smart industrial Residential Area". Area surrounding the township site area is designated Green Belt Area planned to be surrounding most of the Site Area and creating a buffer on three sides. It also has access road connecting the port are with the township.

Under the process of making India's first SIPC in Kandla, 2 SIPC Regions have been planned currently. One which is a Residential setup – Township and the other is an industrial area.

The proposed townships have area bifurcation in a manner that certain density is foreseen. The Mixed-Use District Centre will be a busy and lively area with lots of Public Spaces. The introduction of environmentally friendly public transportation and a clear car parking policy are part of the strategy to ensure the public space will become people friendly and not car centric. The Central Park through the Mixed Use and Residential Zones up to the Green Belt three Green Corridors are planned. These Green Corridors are essentially narrow parks that provide an alternative pedestrian route from the traditional footpaths along the streets.

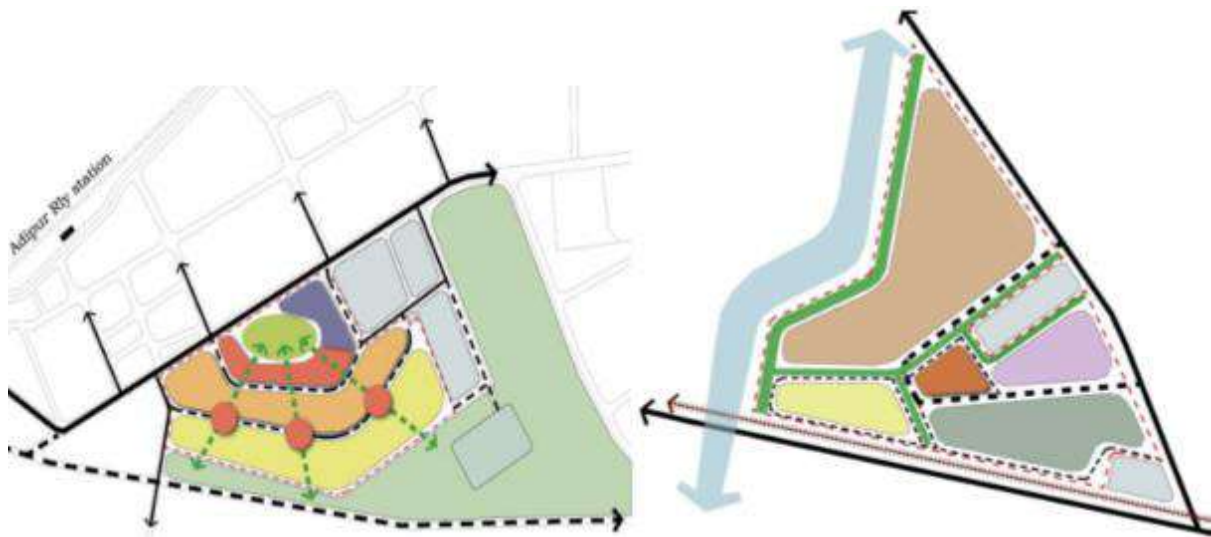


Figure 1 4 Land Use plan for SIPC township and Industrial region

For the industrial region, certain regulations were introduced such as Along the Creek side and the tank area a green buffer zone is planned as part of the Coastal Regulation Zone- 100 meter from the high tide line. The zone has the potential to be used as a long green park containing several recreational. Clustering of all common facilities from all industries have been cumulated to one single large Mixed Use Commercial Node at the heart of the Site.

The concentration of all the facilities in one node will create enough footfall to make this area an attractive location for a small Bus Station.

The Site is planned to contain Industrial zones and one large Truck Terminal all situated in a way that will ensure easy accessibility from the Public Road and the internal main Road.

1.6 Environment and Public Facilities

In the proposed SIPC township, from the central park through the green corridors will provide a short cut connection exclusively for pedestrian directly cutting through the urban fabric of the township. These green corridors are car free and will be an attractive network for both recreational users providing equipment such as jogging trails, neighbourhood playgrounds, fitness equipment. The three Green Corridors will also link certain neighbourhood Retail Nodes. The idea is to provide services in a proximity of 400m walk.

1.7 Key Takeaways

Certain planning strategies such as in terms of township planning, assigning hierarchy of building heights, focus on the central park, ensures a uniform development and sense of belonging. Further, for the industrial area a provision of common facility node which helps to ensure better public transport connectivity. Furthermore, the idea of incorporating separate townships for separate departments such as SIPC, SEZ, also makes connectivity to the respective zones easier.

2 Mundra Port, Gujarat

2.1 Introduction

Established in 1998, Mundra port is the largest private port of India located on the north shores of the Gulf of Kutch near Mundra, Kutch District, Gujarat. It also has a special economic zone. The combined company was renamed Mundra Port and Special Economic Zone limited. It is the largest container port in India. The port's location gives major maritime routes and good connection through rail, road, air and pipelines. This makes it a preferred gateway for cargo bound westwards. The port has been designed to handle all types of cargo viz. containers, dry bulk, break bulk, liquid cargo, and automobiles.

Mundra Port has not only pioneered the concept of deep draft integrated port model, but also of port based SEZ. The multi-product SEZ consisting of Mundra Port and its surrounding areas is planned to be spread over 135 sq.km. Currently, notified Multi-product SEZ is spread over an area of 6473 hectare, with an additional 168 hectares notified as a Free Trade Warehousing Zone.

2.2 Key Statistics

Mundra Port has been handled by the authority of Adani Ports and SEZ limited, Adani Group. It has spatial extent of around 13,500 hectares. The cargo handling capacity is 338 MMTPA annually. It consists of 24 berths.

2.3 Regional Context

The port's location gives major maritime routes and good connection through rail, road, air, and pipelines. This makes it a preferred gateway for cargo bound westwards. The port has been designed to handle all types of cargo viz. containers, dry bulk, break bulk, liquid cargo, and automobiles. The nearest Urban centre being Mundra, with a spatial extent 1098 sq.km.



figure 2 1 Regional Location of Mundra Port



figure 2 2 Spatial setup with regional connectivity along the Port

2.4 Port Economy

Mundra Port has a diverse cargo base including dry, bulk, break bulk, liquid crude oil, project cargo, cars and containers. Mundra Port owns cargo handling equipment like mobile harbour cranes, grab ship unloaders, pay loaders, excavators, and conveyor systems for handling of bulk and break-bulk cargo.

Besides the port area there is a large land area for development. A part of this area is now notified and functional SEZ which is now largest port based Multi product SEZ. This SEZ is suited to service the hinterland of north and northwest India which account for two-thirds of India's GDP. The area spanning to around 15,000 hectares consist of three investment options that is Special Economic Zone (SEZ), Free trade and warehousing zone and domestic industrial zone.

2.5 Port planning and Land use

The land use plan has been prepared after identifying the requirement of land for various port related activities of the proposed multipurpose berthing facility. While preparing the land use plan, the extent and limits of surrounding development has been given due consideration. APSEZ has developed significant greenbelt within the port and SEZ areas. Planning of greenbelt in proposed backup area will be integrated with overall greenbelt area planning by horticulture dept. Approx. 5-10% of the area will be considered for greenbelt development.



figure 2 3 Land Use Plan for Mundra Port

2.6 Environment and Public Facilities

Under their key policy for Environment, they have prioritized two visions

- Conserve and sustainably use the oceans, seas, and marine resources for sustainable development.
- Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.



2.7 Key Takeaways

Scope of expansion of the port, on both the sides of the deck through capturing sea area along with land area. The segregation of port in terms of handling, such as liquid bulk and contained cargo handling are performed in two different ports which are locationally far off. Mundra also provides an ideal base for traders due to its relatively short logistics connectivity to the northwestern hinterland.

3 Port of Rotterdam, Netherlands

3.1 Introduction

The Port of Rotterdam is the largest seaport in Europe, and the world's largest seaport outside of East Asia, located in and near the city of Rotterdam, in the province of South Holland in the Netherlands. In 2020, Rotterdam was the world's tenth largest container port in terms of twenty-foot equivalent units handled. Due to its depth and the relatively small influence of the tides the port offers good opportunities, even for the biggest vessels. On the land side the port offers good hinterland connections. Special to its location are the inland waterway linkages with good destinations in the hinterland of Europe. The Port of Rotterdam aims to be emissions- free by the year 2050.

3.2 Key Statistics

Established in the year of 1283, Port of Rotterdam has been handled by the Port of Rotterdam authority. It has spatial extent of around 12,464 hectares. The cargo handling capacity is 469 MMTPA annually. It consists of 23 berths.

3.3 Regional Context

The origins of city of Rotterdam go back to the 13th century when its earliest settlement along the river Rotte was formed. With a spatial extent of 324sq.km, The initial success of the Port of Rotterdam can be attributed to its geographical position at the delta of several major European rivers and easy access for sea-going ships, giving access to a market of one hundred million people just a day's drive away in densely populated North-Western Europe.



figure 3 1 Regional location of port of Rotterdam

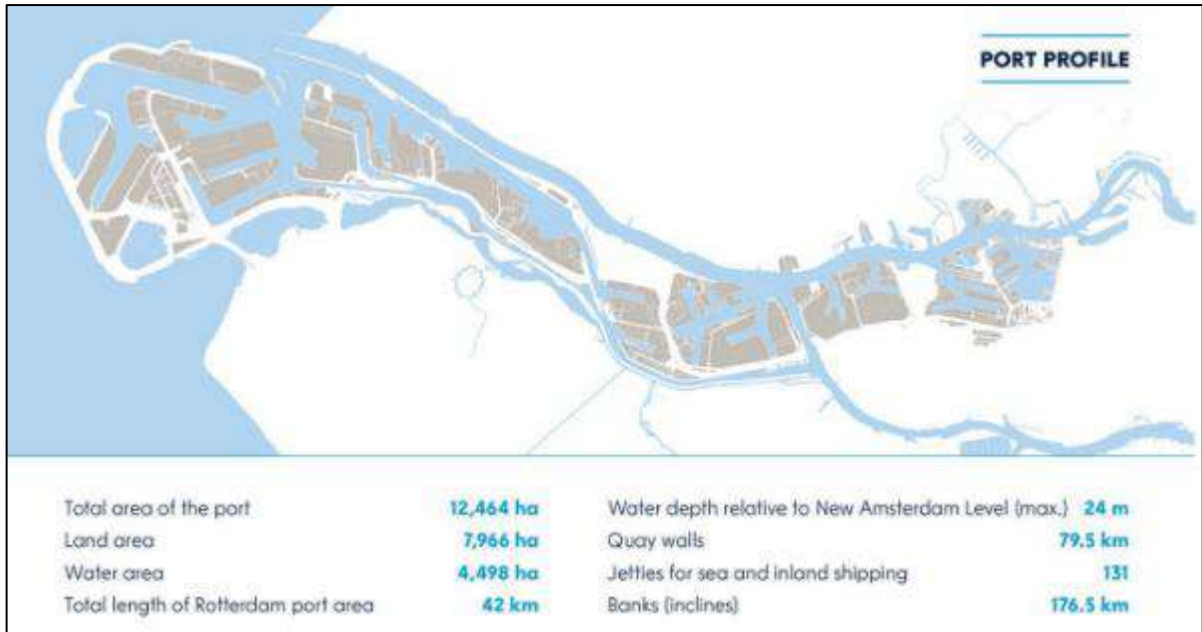


figure 3 2 Port Profile of Port of Rotterdam, Netherlands

3.4 Port Economy

The Port of Rotterdam is still the largest combined harbor and industrial complex in Europe with more than 441 million ton of cargo traffic (2012). Most important for the port of Rotterdam are the petrochemical industry and general cargo transshipment handlings. The port forms the most important transit point for transport of bulk and other goods between the European continent and the rest of the world. From Rotterdam the goods are transported inland by river, road and train.

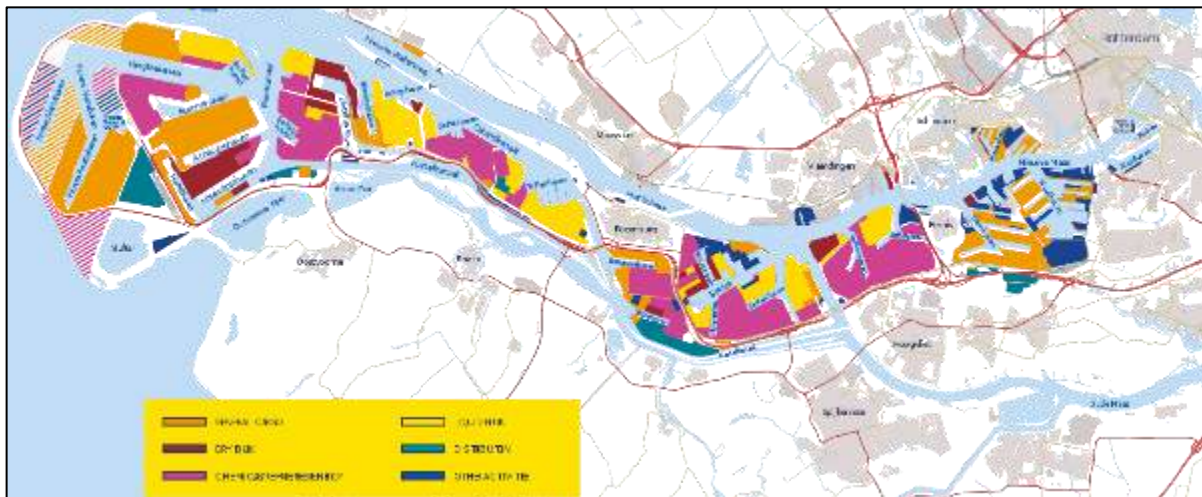


figure 3 3 Cargo category distribution map of Port of Rotterdam

3.5 Port Planning and Land use

The entire port area now stretches over 40 km from the old city harbors to the latest land reclamation area at the seafront to accommodate the largest containerships in the world. With space in the densely built Rotterdam region being limited the Port of Rotterdam has been expanding with land reclamations into the North Sea in the last couple of decades.



figure 3 4 Distribution centre connected through Rail and Road

Redevelopment of the port was initiated focusing on a rapidly growing industry such as the petrochemical business. With the industrial workforce increasing rapidly, the existing residential area reached a saturation hence redevelopment and housing bifurcation were to be planned. Further to cater to the additional demand, certain schemes were worked on:

Reuniting divided City:

Connecting the southern and northern region of city. Re-adjusting the existing urban network between the ends of the city.

Changing City Image

Changing the city image as a cultural and commercial hub on behalf of the existing abandoned port facilities. Improving the surrounding residential area and the downtown of Rotterdam.

Repositioning of City

To enhance the local value, mix use characteristics of co-existence of high-quality housing and business environment have been increased.

Spreading Benefits

Since majority of land is owned nationally, development projects are carried by the corporation between the public and private sectors. The government purchases the entire development site and selects several private investment companies for specific development projects.



figure 3 5 Redevelopment Initiatives for the Port

Retaining some of the industrial heritage and integrating this into the new urban fabric while reusing most of the infrastructure and reusing the iconic built heritage gives former port areas an instant recognizable character and identity. Another factor about the redevelopment is the pedestrian friendly public waterfront Boulevards along a Mixed-use Development with a strong emphasis on leisure and recreation.

3.6 Environment and Public Facilities

To consolidate city's maritime identity, Waterside Leisure and recreation activities are provided. Public beaches and nature reserves near the port also gives an opportunity for coexistence between nature and residents.

3.7 Key takeaways

Redefining of new urban fabric under old heritage buildings, retrofitting of the building has added more to the tourism value of the place. Generating public spaces in the balance land of the port has involved more public activities. Generation of tourism circuit along the port has increased public involvement which has further helped to evolve the character of the city. Constant attempt to evolve the image of the city by initiating design competition for world best architects in creating excellent built forms that could again fetch public interest.

4 Singapore Port, Singapore

4.1 Introduction

The port of Singapore, which collectively consist of facilities and terminals that conduct maritime trade and handles Singapore's harbours and shipping, is ranked as the world's second busiest port. It was also the busiest port in terms of total cargo tonnage handled until 2005. Singapore's strategic location has been a significant entrepot and trading post for at least a couple of centuries. its ports have not become just a mere economic boon for the country, but an economic necessity to complement Singapore's land and natural resources limitations.

4.2 Key Statistics

Established in the year of 1819, Singapore Port has been handled by the Port of Rotterdam authority. It has spatial extent of around 600 hectares. The cargo handling capacity is 65 M TEUS annually. It consists of 67 berths.

4.3 Regional Context

Singapore's strategic location has been a significant entrepot and trading post for at least a couple of centuries. its ports have not become just a mere economic boon for the country, but an economic necessity to complement Singapore's land and natural resources limitations. Singapore's natural deep-sea ports and the geographical location at the crossroads of important shipping channels makes its trade a major economic sector, next to production and services.



figure 4 1 Regional location of Port of Singapore

4.4 Port Economy

Singapore's natural deep-sea ports and the geographical location at the crossroads of important shipping channels makes its trade a major economic sector, next to production and services. There are currently more than 5,000 maritime companies operating in Singapore, including over 130 international shipping groups, which constitute an important pillar for the international maritime transport hub. Besides being the world's busiest port in terms of shipping tonnage handled. It also has a terminal for cruise ships.

Cruise business if Singapore adds to the economy. With higher number of passenger traffic, stationing famous cruise lines, have brought the port 50 million and more of contribution.



figure 4 2 Land Bifurcation of the port for Singapore

4.5 Port planning and Land use

No such separate master plan for the port region but has been incorporated with the overall master plan of Singapore. Majority of port surrounding land use has been dedicated to business corridors. These business areas are intended to be used for clean industry, light industry, general industry, warehouse, public utilities, and telecommunication uses and other public installations. Special industries such as manufacture of industrial machinery, shipbuilding and repairing, may be allowed in selected areas by the relevant authority and competent authority.

4.6 Key Takeaways

Considering the spatial extent of Singapore, A cohesive master plan for the city and the port has been incorporated, this helps in avoiding any externalities or discrepancies for the same. Incorporation of Cruise terminal with the existing port, Tourism sector provision within the port planning is leading to approx. 50million dollar generation annually, making it a more approachable and financially strong port. Singapore's initiative on Smart Port Strategy and incorporating the same, such as automated Cargo handling.

5 Inferences

With the case study being an analytical tool, certain strategies used by the international and national ports on different scales can be implemented or looked upon. Creating recoomer.

5.1 Tourist Circuit

Certain international ports to encourage more public involvement in and around the port, have proposed certain tourist circuits that not only acts as a source of revenue generation but makes maintenance of the port easier with many stakeholders being involved. Also creates awareness about the port among tourists.



figure 5 1 Tourist Attraction in and around JNPA boundary with connectivity

In case of JNPA region, It enjoys the advantage of its geographical context which consist the mangroves, mountains, wetlands and the sea front. The region already has certain spotted tourist attractions such as Uran Beach, Dronagiri fort, shiva Smarak and more. With the accessibility of public jetty and road connectivity from Panvel and Navi Mumbai. These attractions can generate a tourist circuit that can be explored as a one-day picnic spot. To enhance the same certain more initiatives can also be worked out.

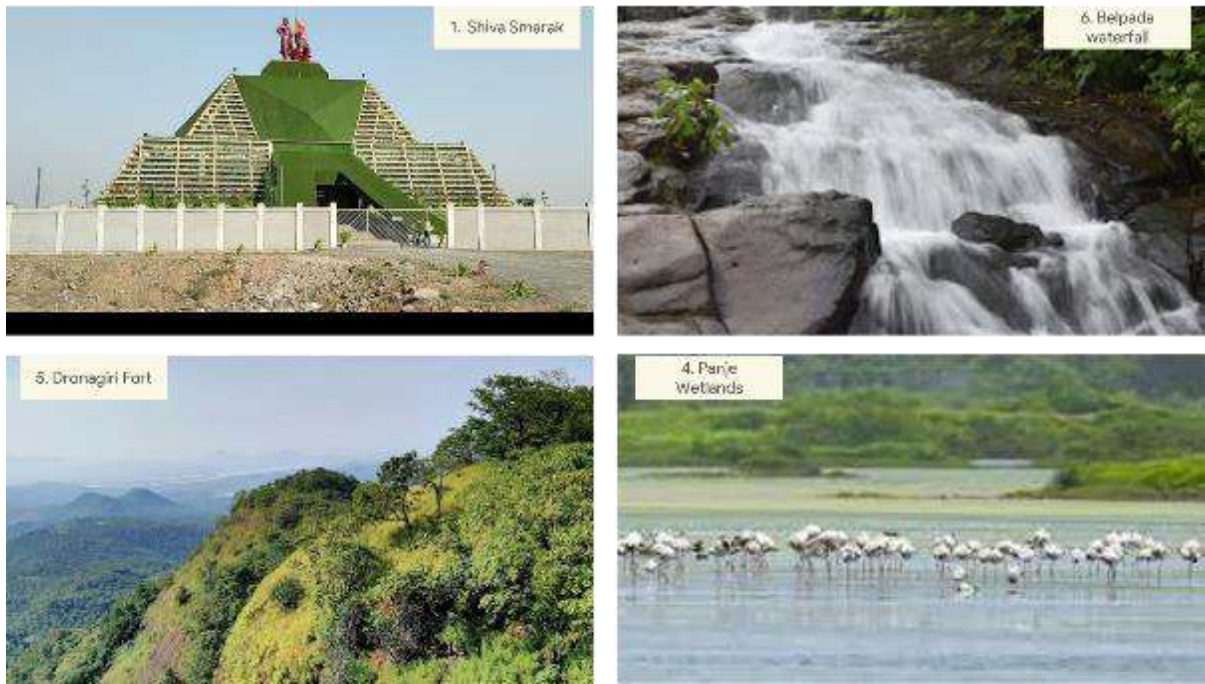


figure 5 2 Tourist attraction around JNPA

5.2 Image of the Port

To create image of the port region as a priority, certain upcoming building projects would be proposed as design competitions to ensure engagement from renowned architects in creating unique landmarks that could outstand the port region.



figure 5 3 identified location that can have iconic built forms

5.3 Township planning Strategies

In terms of redevelopment of townships in JNPA region, separate townships could be proposed for the SEZ and the port region, depending on the proximity to the work area. Planning strategies such as common central park with commercial buildings along it could act like a landmark node of the township, building height hierarchy based on density could also be incorporated.



figure 5 4 Conceptual sketch of township planning showing hierarchy of building form and use (source: Internet)

Certain identified location that can have upcoming commercial activities which further would increase the foot fall, leading to more development in the residing villages of JNPA region.

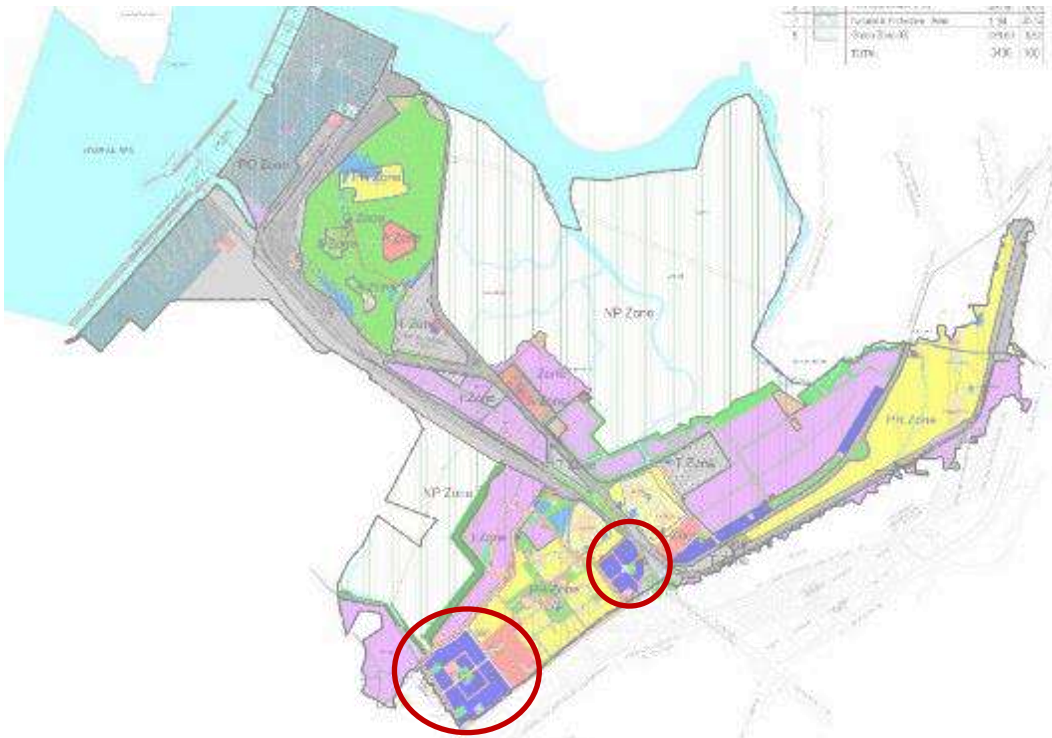
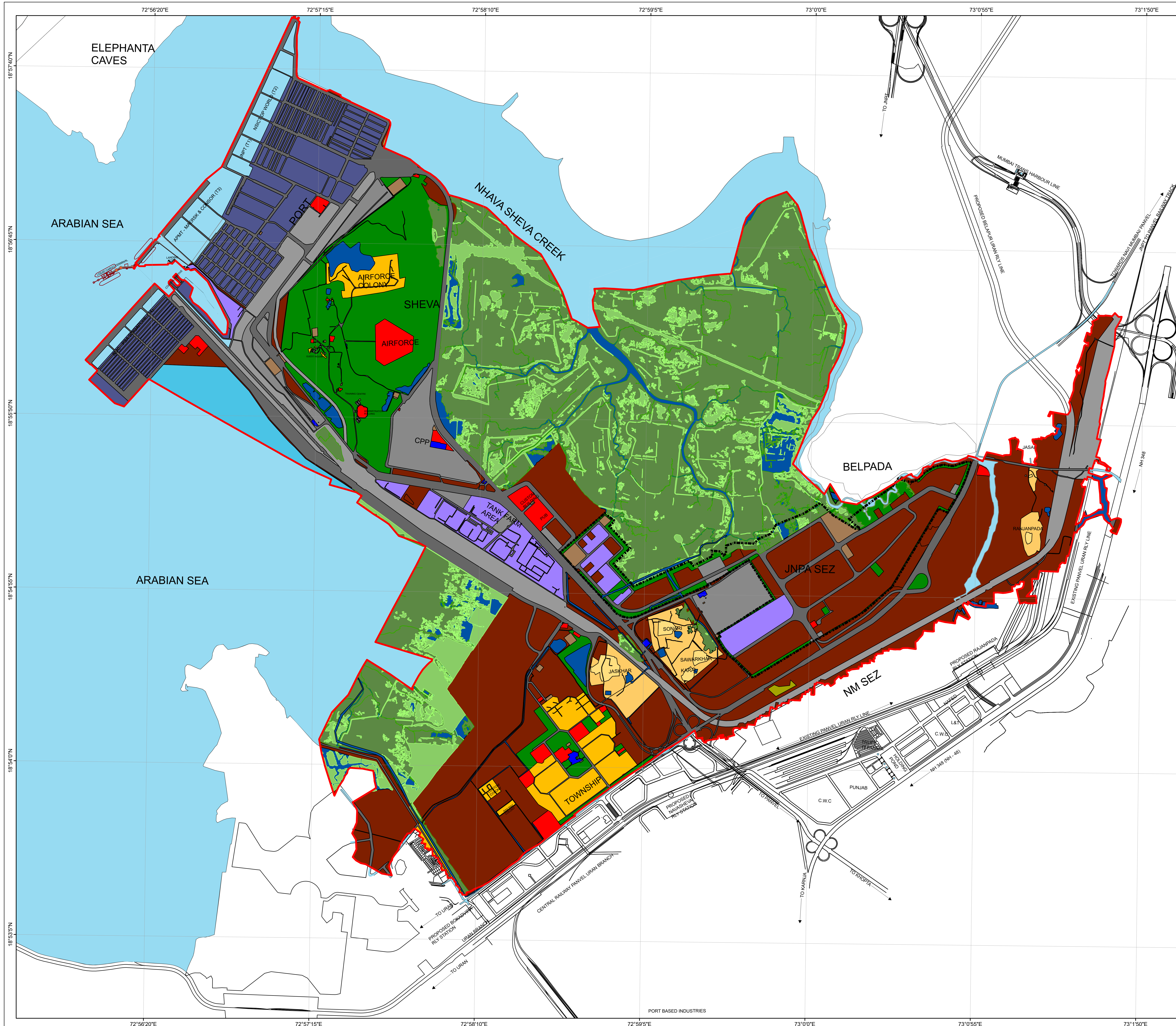


figure 5 5 Identified location in JNPA region for certain commercial buildings.

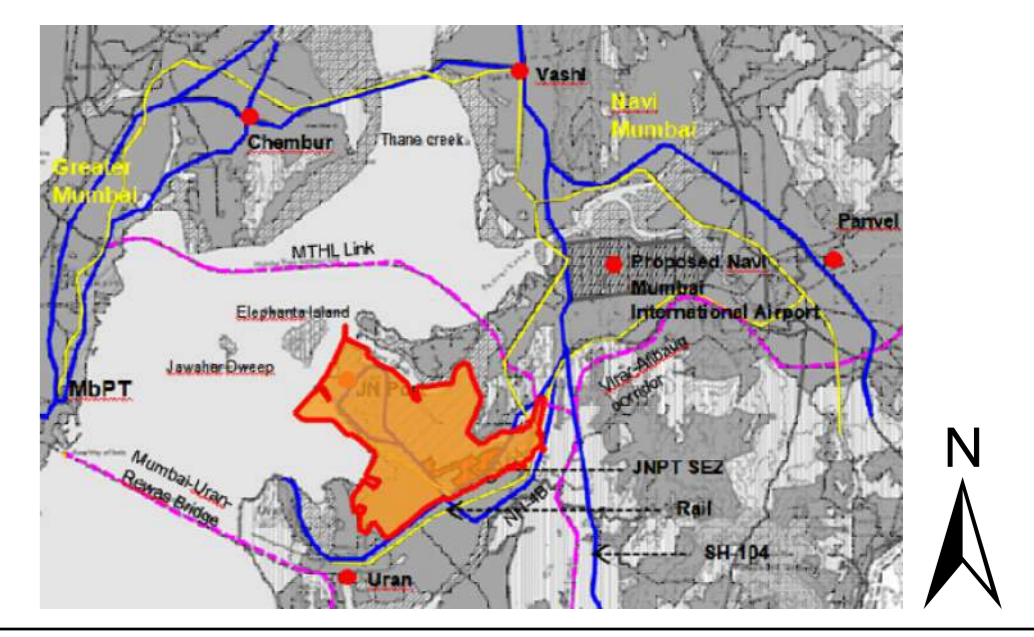
Annexure II: Existing Land Use map for land under JNPA



EXISTING LAND USE MAP FOR LAND UNDER JNPA

Village – Sheva, Funde, Jaskhar, Sawarkhar, Sonari, Karal, Pagote, Jasai, Poundkhar, Navghar, Chirle, Shemtikhar, Taluka Uran, District Raigad, Maharashtra

KEY MAP



LEGEND

- JNPA boundary
- JNPA SEZ boundary
- Residential
- Commercial
- Industrial
- Public, Semi-public
- Open space
- Water body
- Port operational area
- Existing roads
- Parking
- Railway area
- Utilities and services
- Vacant land
- Area under water
- Mangroves
- Mangrove open spaces
- Mangrove water bodies
- Defense area
- Gaothan
- Extended gaothan

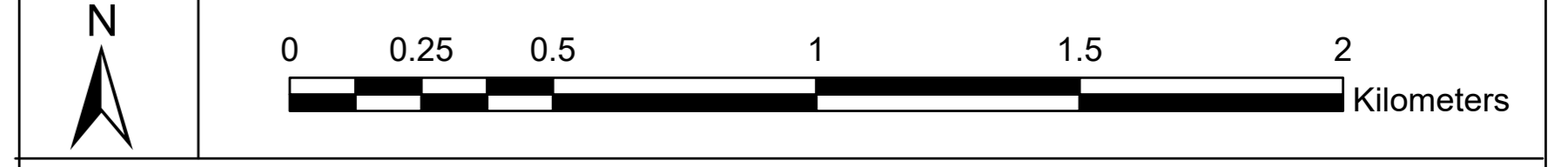
EXISTING LAND USE AREA STATEMENT

Sr.no	Land use	Area (Ha)	Area %
1	Residential excluding goathan	78.1	2.31
2	Commercial	2.87	0.08
3	Industrial	82.72	2.45
4	Public Semi-public	44.49	1.31
5	Parks, garden, open space, playground and green belt	280.17	8.31
6	Lakes and Natural drain	49.12	1.45
7	Port Operational area	157.55	4.67
8	Transportation and Communication	640.31	18.99
9	Utilities & Services	15.21	0.45
10	Vacant Land	770.17	22.84
11	Area under water	53.48	1.58
12	Mangroves	884.66	26.24
13	Mangroves Open Space	221.21	6.56
14	Mangroves Water Body	88.93	2.63
15	Defense Area	1.65	0.04
TOTAL		3370.64	100

CHAIRMAN	DY. CHAIRMAN	CHIEF MANAGER PPD	CHIEF ARCHITECT AND PLANNER, SEZ

Existing Land Use Map of JNPA is as approved in the 3rd meeting of 1st Board (Item No 17) of Jawaharlal Nehru Port Authority, held on 18th August 2022.

- NOTE**
- Drawing shall be read and not scaled
 - Dimensions where not mentioned shall be read as the scale specified
 - The drawing is the Property of JNPA, it should not be used, copied or reproduced without prior written approval



Project
JNPA LAND USE PLAN

Drawing Title
JNPA EXISTING LAND USE MAP

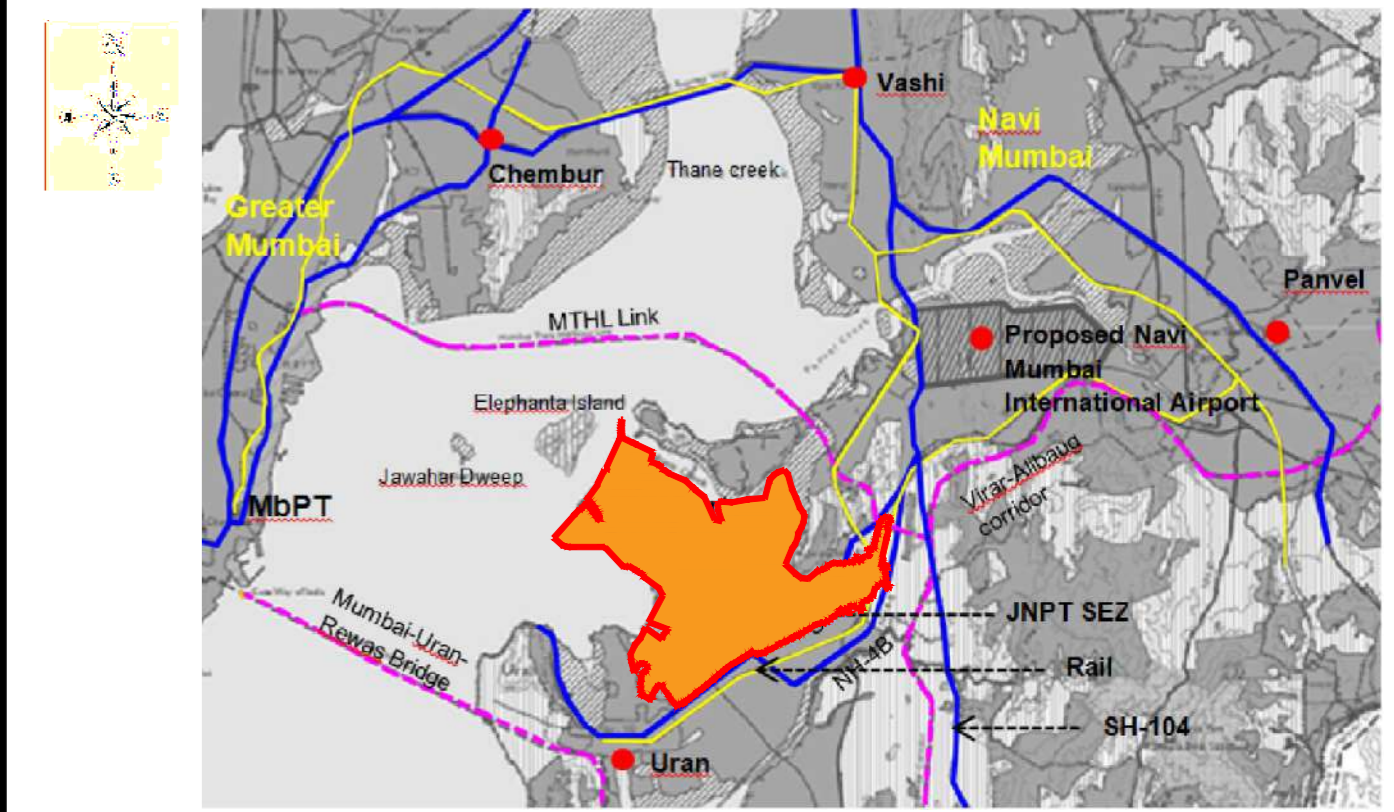
JAWAHARLAL NEHRU PORT AUTHORITY
Administration Bldg, Sheva,
Taluka :- Uran, District :- Raigad,
Navi Mumbai Maharashtra - 400707

Annexure III: Zone Plan for land under JNPA

ZONE PLAN FOR JNPA

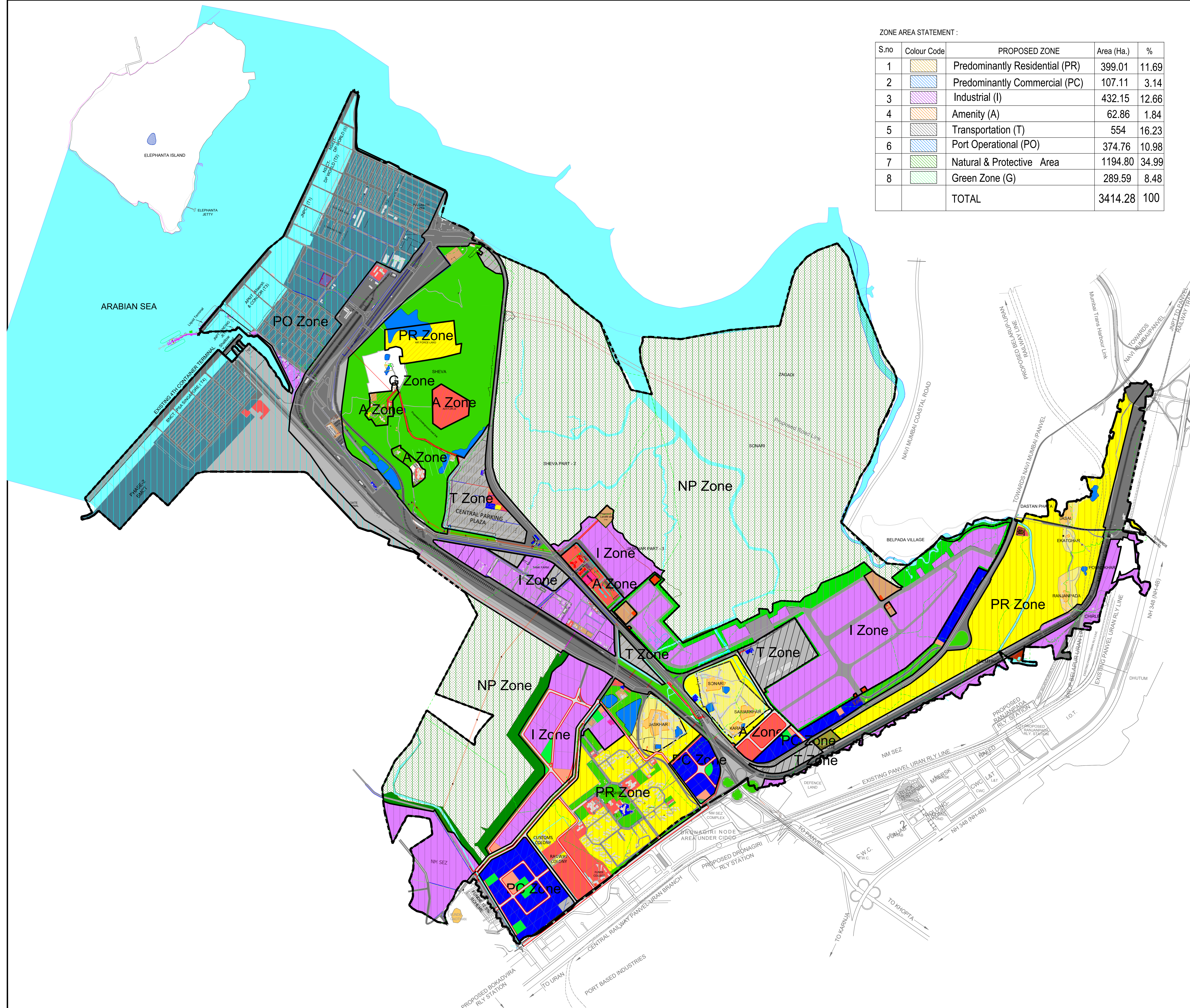
Village:- Sheva,Funde, Jaskhar, Sawarkhar, Sonari, Karal, Pagote, Jasai, Poundkhar, Navghar, Chirle, Shemtikhar, Taluka Uran, District Raigad, Maharashtra

LOCATION PLAN:



ZONE AREA STATEMENT :

S.no	Colour Code	PROPOSED ZONE	Area (Ha.)	%
1		Predominantly Residential (PR)	399.01	11.69
2		Predominantly Commercial (PC)	107.11	3.14
3		Industrial (I)	432.15	12.66
4		Amenity (A)	62.86	1.84
5		Transportation (T)	554	16.23
6		Port Operational (PO)	374.76	10.98
7		Natural & Protective Area	1194.80	34.99
8		Green Zone (G)	289.59	8.48
		TOTAL	3414.28	100



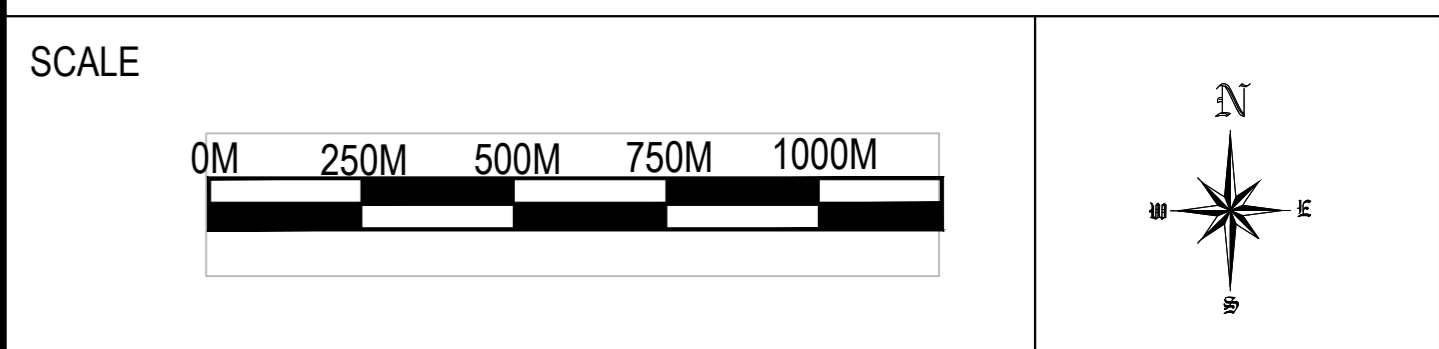
LEGEND

	JNPA Boundary
	Zone Boundary
	Predominantly Residential (PR)
	Predominantly Commercial (PC)
	Industrial (I)
	Amenity (A)
	Transportation (T)
	Port Operational (PO)
	Natural & Protective Area
	Green Zone (G)

CHAIRMAN	Dy. CHAIRMAN	CHIEF MANAGER-PPD	CHIEF ARCHITECT & PLANNER, SEZ

Zone Plan for JNPA is as approved in the 3rd meeting of 1st Board (Item No 17) of Jawaharlal Nehru Port Authority, held on 18th August 2022

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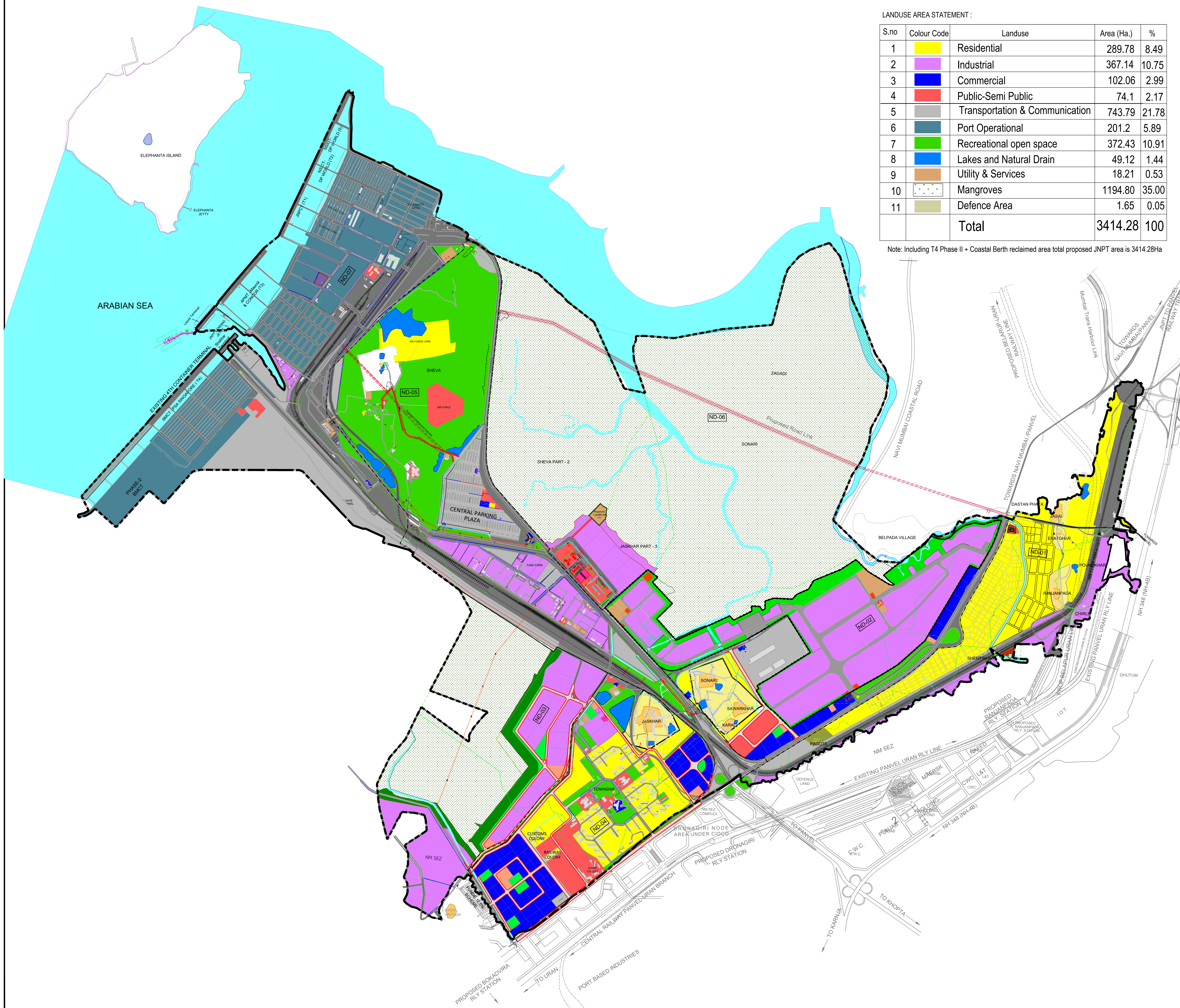
PROJECT: JNPA ZONE PLAN

DRAWING TITLE: ZONE PLAN FOR JNPA

PROJECT SUPPORT CONSULTANTS:
Voyants Solutions Pvt.Ltd
 403, 4th Floor, BPTP Park Centra, NH-8, Sec-30, Gurugram-122001 PH : 0124-4598200, Tele Fax : 0124-4019051

OWNER:
JAWAHARLAL NEHRU PORT AUTHORITY
 Administration Bldg,Sheva, Taluka :- Uran, District :- Raigad, Navi Mumbai Maharashtra - 400707

Annexure IV: Land Use Plan for land under JNPA



LANDUSE AREA STATEMENT :

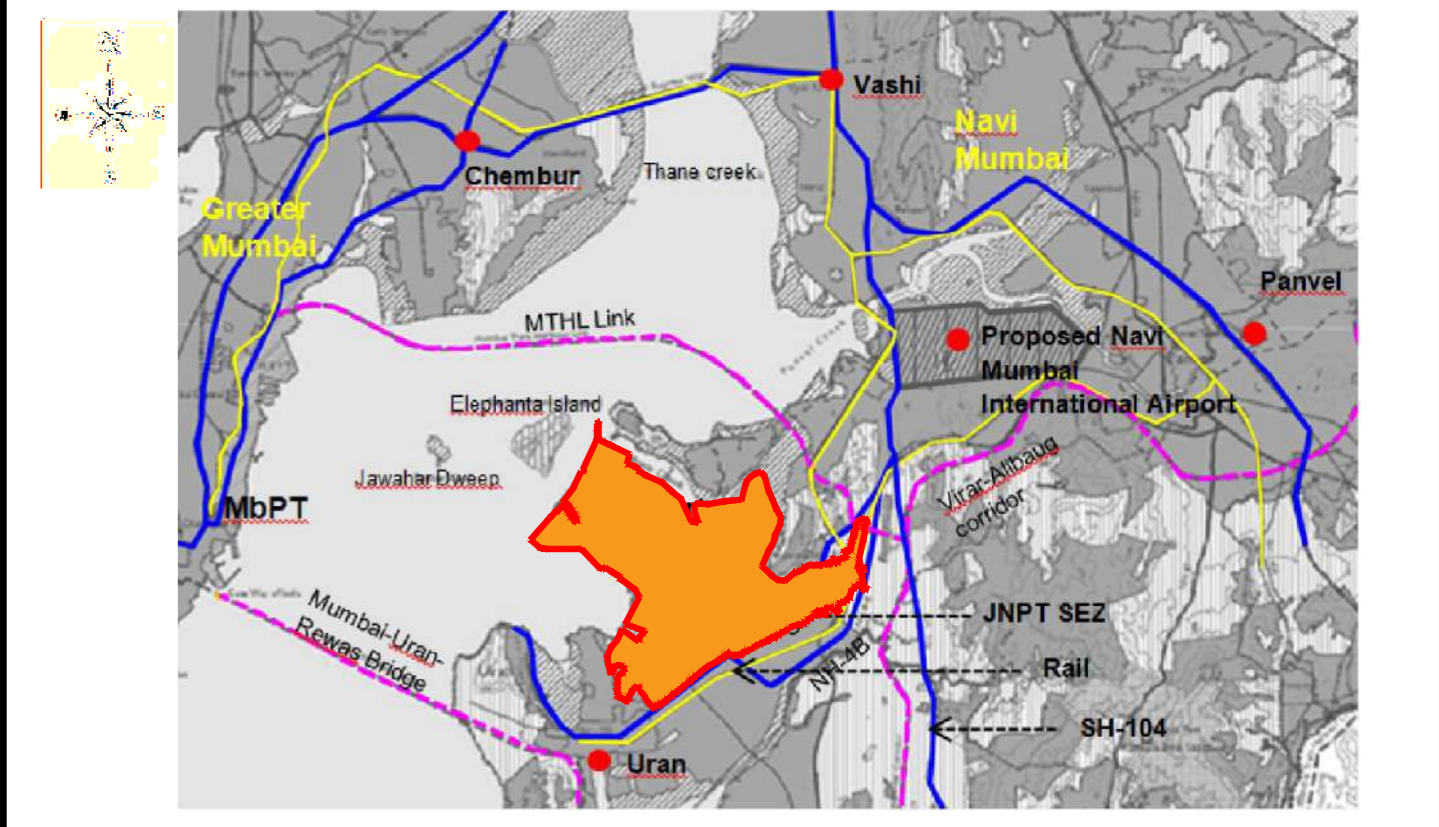
S.no	Colour Code	Landuse	Area (Ha.)	%
1	Yellow	Residential	289.78	8.49
2	Purple	Industrial	367.14	10.75
3	Blue	Commercial	102.06	2.99
4	Red	Public-Semi Public	74.1	2.17
5	Grey	Transportation & Communication	743.79	21.78
6	Dark Blue	Port Operational	201.2	5.89
7	Green	Recreational open space	372.43	10.91
8	Light Blue	Lakes and Natural Drain	49.12	1.44
9	Brown	Utility & Services	18.21	0.53
10	Stippled	Mangroves	1194.80	35.00
11	Diagonal Lines	Defence Area	1.65	0.05
Total			3414.28	100

Note: Including T4 Phase II + Coastal Berth reclaimed area total proposed JNPT area is 3414.28Ha

LAND USE PLAN FOR JNPA

Village:- Sheva,Funde, Jaskhar, Sawarkhar, Sonari, Karal, Pagote, Jasai, Poundkhar, Navghar, Chirle, Shemtikhar, Taluka Uran, District Raigad, Maharashtra

LOCATION PLAN:



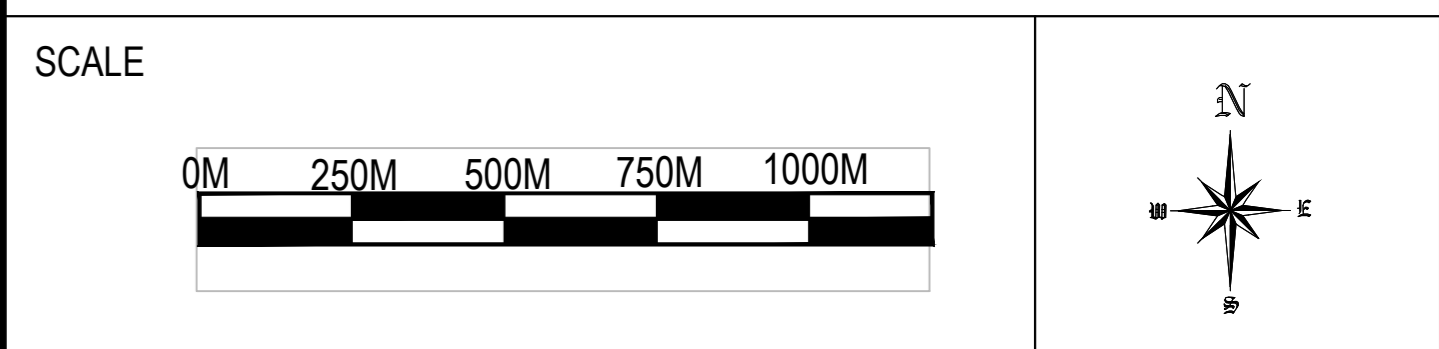
LEGEND

	JNPA Boundary
	JNPA SEZ Boundary
	Village Boundary
	Node Boundary
	Residential
	Industrial
	Commercial
	Public-Semipublic
	Transportation and Communications
	Port Operational
	Recreational Open space
	Utilities & Services
	Railway
	Arabian sea/Natural drain
	Mangroves
	Existing Road
	Proposed Road
	Rail Track
	Water Body
	Petrol Pump
	Bus Stop
	Public Toilet
	Temple

CHAIRMAN	Dy. CHAIRMAN	CHIEF MANAGER-PPD	CHIEF ARCHITECT & PLANNER, SEZ

Land Use Plan for JNPA is as approved in the 3rd meeting of 1st Board (Item No 17) of Jawaharlal Nehru Port Authority, held on 18th August 2022

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PROJECT
 JNPA LANDUSE PLAN

DRAWING TITLE
 LAND USE PLAN FOR JNPA

PROJECT SUPPORT CONSULTANTS:
Voyants Solutions Pvt.Ltd
 403, 4th Floor, BPTP Park Centra, NH-8, Sec-30, Gurugram-122001 PH : 0124-4598200, Tele Fax : 0124-4019051

OWNER
JAWAHARLAL NEHRU PORT AUTHORITY
 Administration Bldg,Sheva, Taluka :- Uran, District :- Raigad, Navi Mumbai Maharashtra - 400707