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International Institute for Population Sciences
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Study Report on
POPULATION POTENTIAL, LAND USE MAPPING AND ENVIRONMENTAL FIELD VISIT

MA/MSc Population Studies Sem. III

Elective Paper E3.3: Population, Environment and Sustainable Development

Under the guidance of

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Contents

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We sincerely thank the **Environment Life Foundation** for their noble work in mangrove conservation and environmental awareness. We extend our special thanks to **Mr Dharmesh Barai**, the founder of the Environment Life Foundation, for his inspiring efforts and for giving us the opportunity to participate in their weekly mangrove cleanup drive.

We are also grateful to the Foundation for arranging an educational visit to the Municipal Solid Waste Processing Plant, Turbhe and to the **Navi Mumbai Municipal Corporation (NMMC)** for facilitating the visit and sharing insights into their waste management practices.

Last but not the least, our heartfelt thanks to **Prof. Archana K. Roy** for her constant guidance, motivation and support throughout the field visit.

Declaration

We hereby declare that this presentation and the accompanying field visit were undertaken as part of the experiential learning component of the elective course in the Master’s programme in Population Studies. The work presented reflects the collective effort of the student group and has been completed solely for academic purposes as a requirement of the course curriculum.

Relationship between Population Potential, Land Use and Solid Waste Management

- Population potential is a measure of the influence or interaction of an area with its surroundings. Areas with high population potential are those that are **densely populated** and **well-connected** to other areas having large populations through **economic, social, and spatial interactions**.
- For example, being India's major financial and industrial centre, **Mumbai** attracts people from across the country for **employment and better opportunities**, and thus has one of the highest population potentials in India.
- A high population concentration means more people live and work within a small area, creating a greater **demand for land, infrastructure, housing, and other resources**. This often leads to **rapid urban expansion** and intensifies the **pressure on the environment** through land encroachment, waste generation, etc.

Pollution of Mangroves through Urban Waste

Urban Households, Industries, etc.

↓

Solid Waste (Biodegradable and Non-biodegradable) and Sewage

↓ Carried through drains, stormwater channels etc.

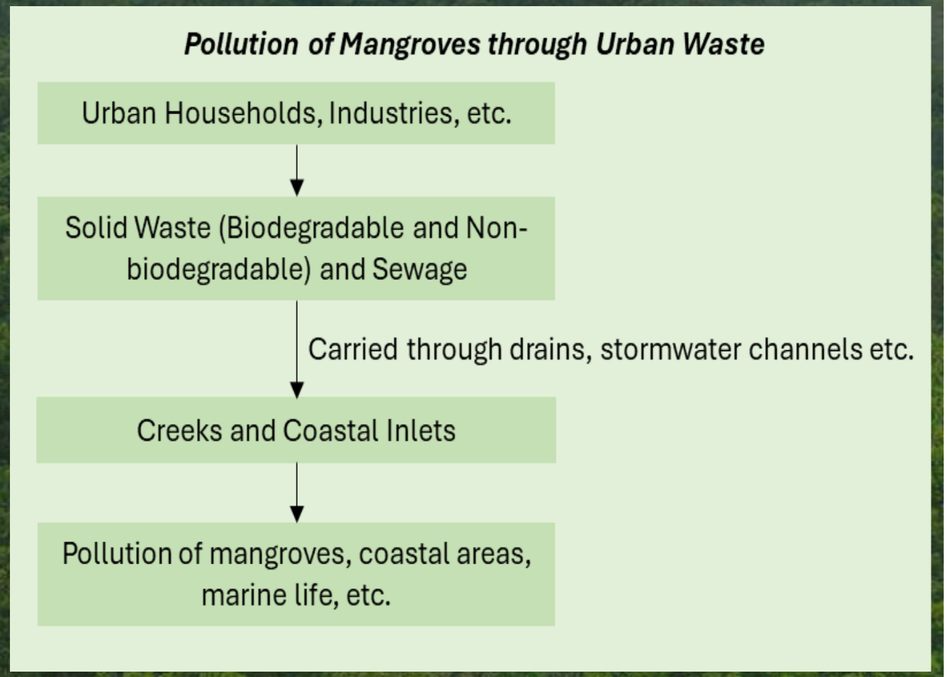
Creeks and Coastal Inlets

↓

Pollution of mangroves, coastal areas, marine life, etc.

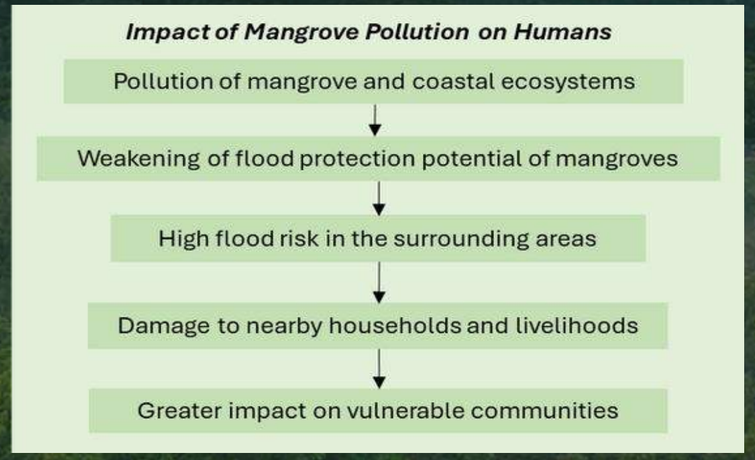
Relationship between Population Potential, Land Use and Solid Waste Management

- Mumbai has expanded similarly and now reflects a **mixed pattern of land use**, where **residential areas, industrial zones, and natural ecosystems exist in proximity**. The coastal areas have l**arge stretches of mangroves** that act as a natural protective barrier for the city.
- However, due to **unplanned land use and human activities**, these **mangroves** are often encroached upon or polluted by the **waste coming from nearby settlements and industries**. This waste, which includes untreated solid waste (both biodegradable and non-biodegradable) as well as sewage, ultimately reaches the sea **through creeks and drainage channels**, and causes pollution of coastal and marine ecosystems.



Relationship between Population Potential, Land Use and Solid Waste Management

- It not only harms the marine life but also degrades the entire mangrove ecosystem, which plays a critical role in **flood control, biodiversity conservation and carbon sequestration**.
- The depletion of mangroves and coastal ecosystems ultimately affects people again, as it increases flood risk and impacts the livelihoods dependent on coastal resources. This reflects the ***"Polluter Pays Principle"***. But, in this case, the pollution is caused mainly by the urban, well-off population, and it ends up impacting the vulnerable and marginalised communities the most, indicating a clear **socioeconomic disparity**.
- Therefore, **solid waste management** needs to be carried out effectively and sustainably to break this cycle and **restore the balance between people and nature**.



Relationship between Population Potential, Land Use and Solid Waste Management

- To address this, waste management plants such as the **Municipal Solid Waste Processing Plant, Turbhe in Navi Mumbai** have been developed to segregate, recycle, and scientifically process municipal solid waste, reducing the burden on the environment.
- Thus, population potential, land use patterns, and waste management practices are closely interconnected aspects, and urban sustainability can be brought about by managing them together.

1. Population Potential Exercise

Population Potential Map

This was part of our curriculum exercise, where in teams we prepared maps for 6 Indian zones at district level.

Concept of Population Potential

Population potential (or potential model) measures **the influence or attraction a place exerts** based on its **population size and distance** from other locations. This type of map illustrates the existing population's power.

It's calculated using the **Potential Model Formula-**

$$P_i = summation \frac{Pj}{Dij}$$

$$P_i = \sum_{j=1}^{n} \frac{P_j}{d_{ij}}$$

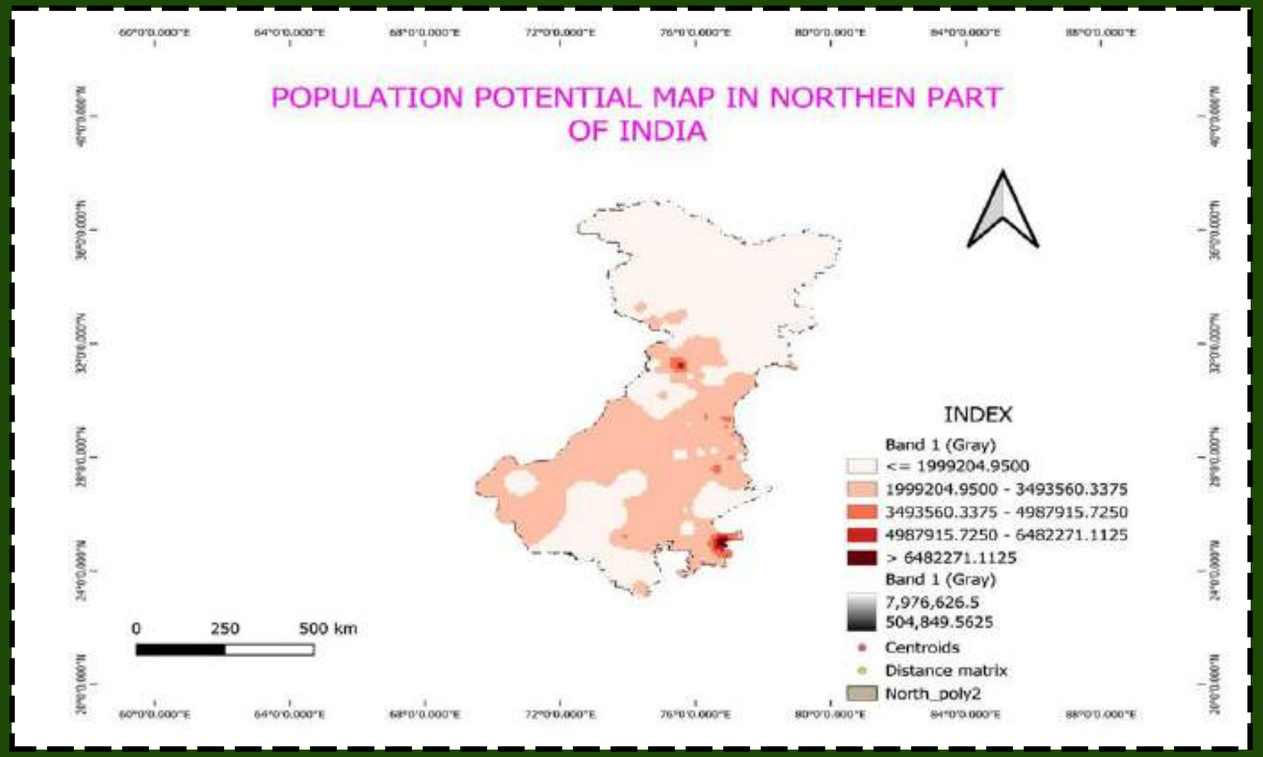
where:

- P_i= population potential at location i
- P_j= population of city j
- d_{ij}= distance between i and j

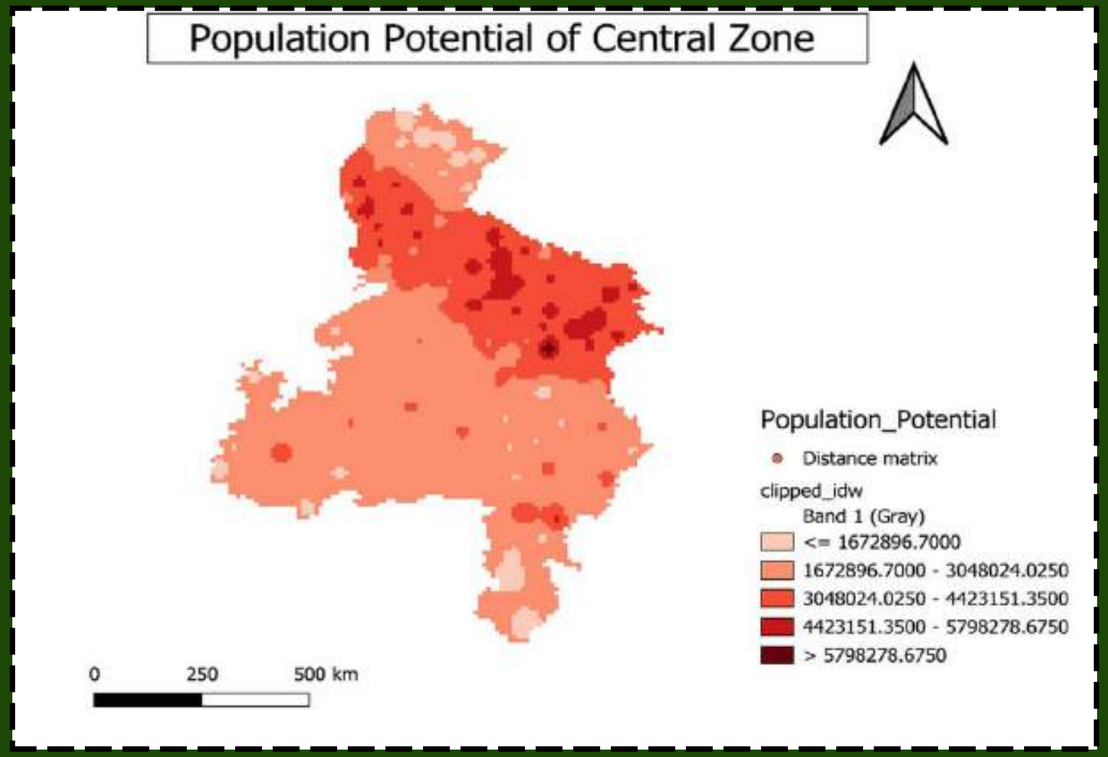
Hence, places closer to large population centers have higher population potential values.

Methodology

- Collecting data (District-wise)
- Loading it in QGIS
- Generating a Distance Matrix
- Exporting the matrix to Excel
- Excel calculations (Scale adjustments)
- Calculating Population Potential using the formula
- Exporting results
- Preparing a choropleth map with classification

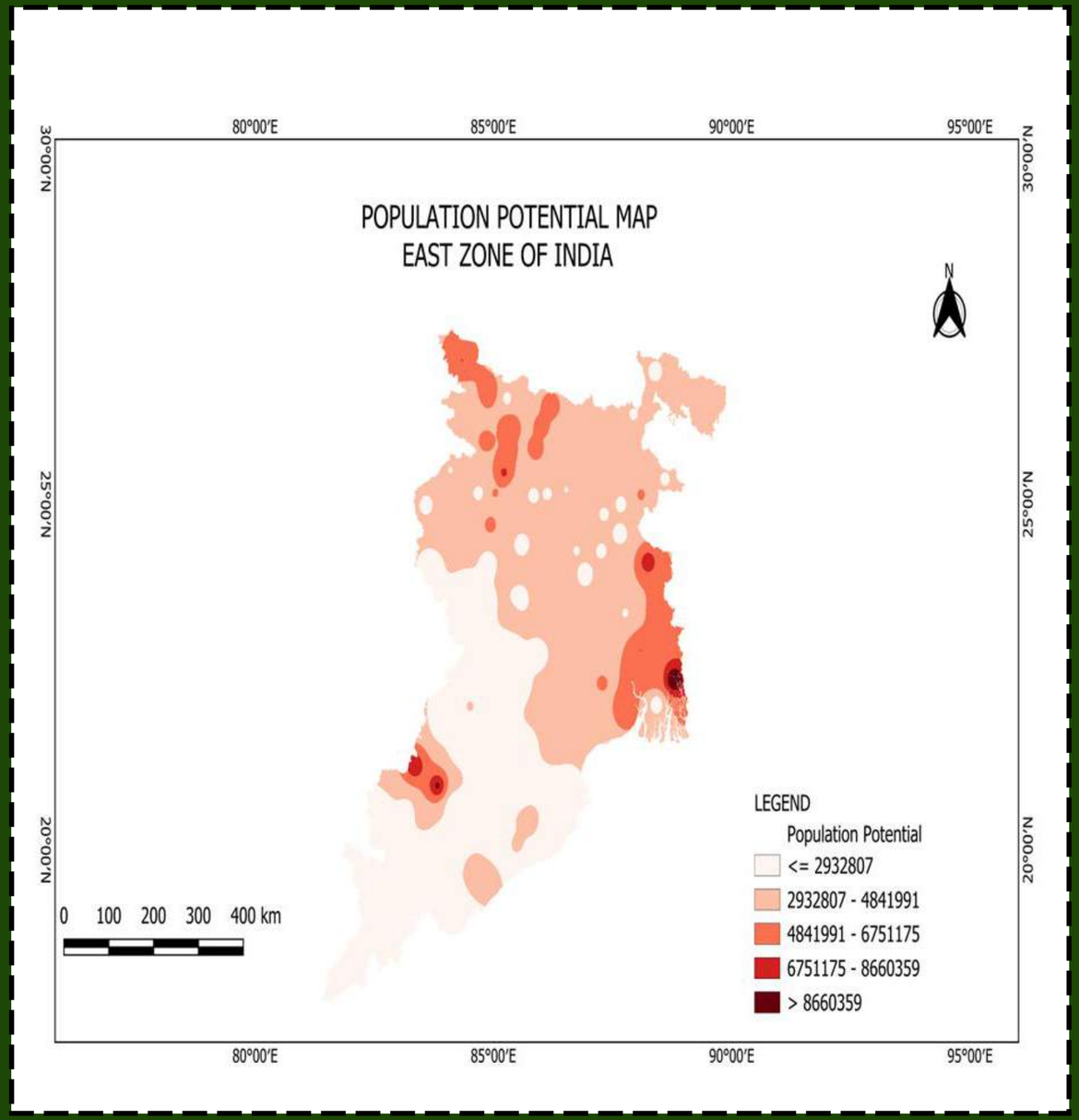


- **High population potential** is concentrated around major urban and plain areas — notably Delhi, Lucknow, Kanpur, and Patna, indicating dense settlements and strong spatial interaction.
- **Low potential zones** cover Himalayan and arid regions like Uttarakhand, Himachal Pradesh, and western Rajasthan, reflecting sparse population and limited accessibility.



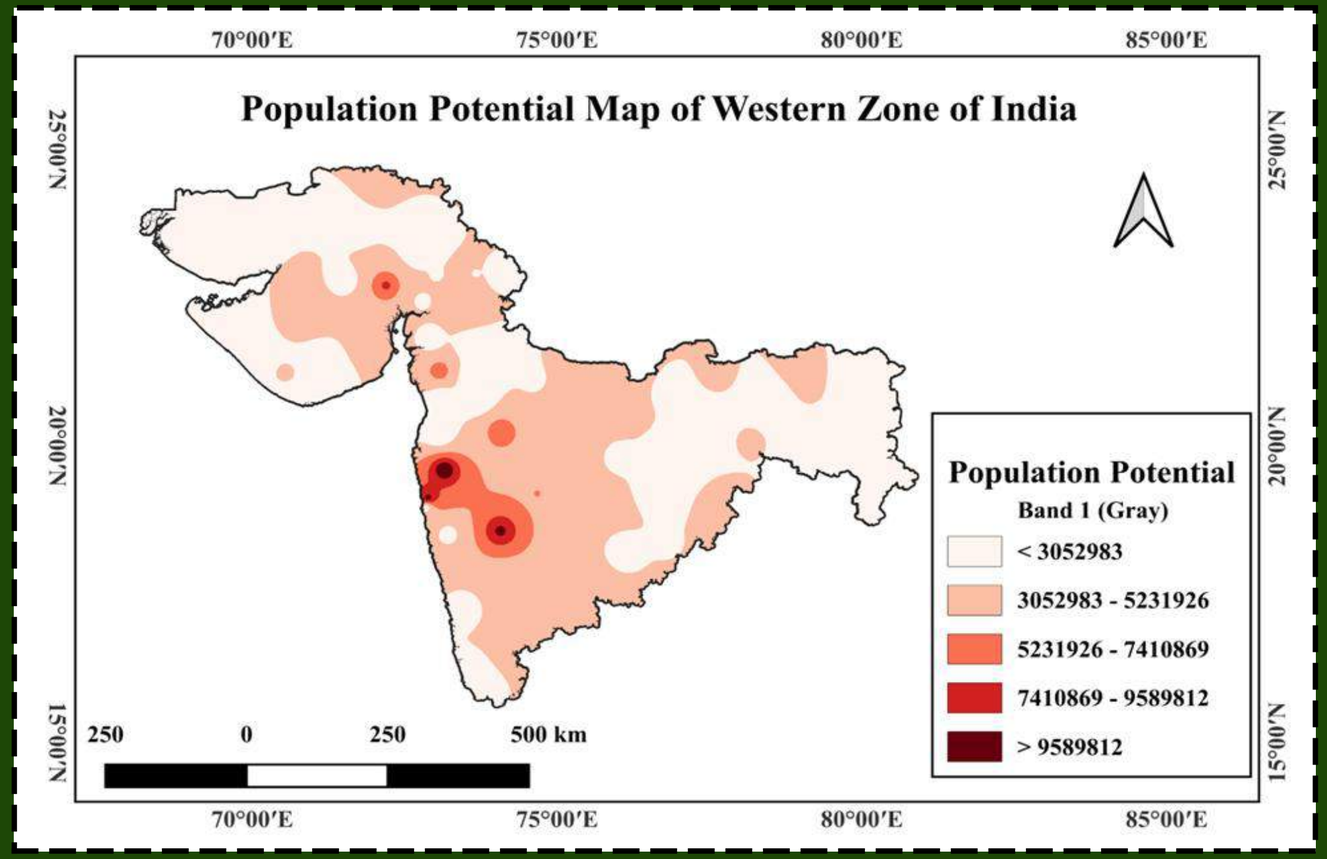
- **High population potential** is concentrated in eastern Uttar Pradesh and northern Madhya Pradesh, especially around Allahabad (Prayagraj), Varanasi, and Kanpur, reflecting dense population clusters and strong spatial interaction.
- **Low potential zones** appear in southern Madhya Pradesh and Bundelkhand, indicating sparse settlements and weaker demographic connectivity.

EAST ZONE



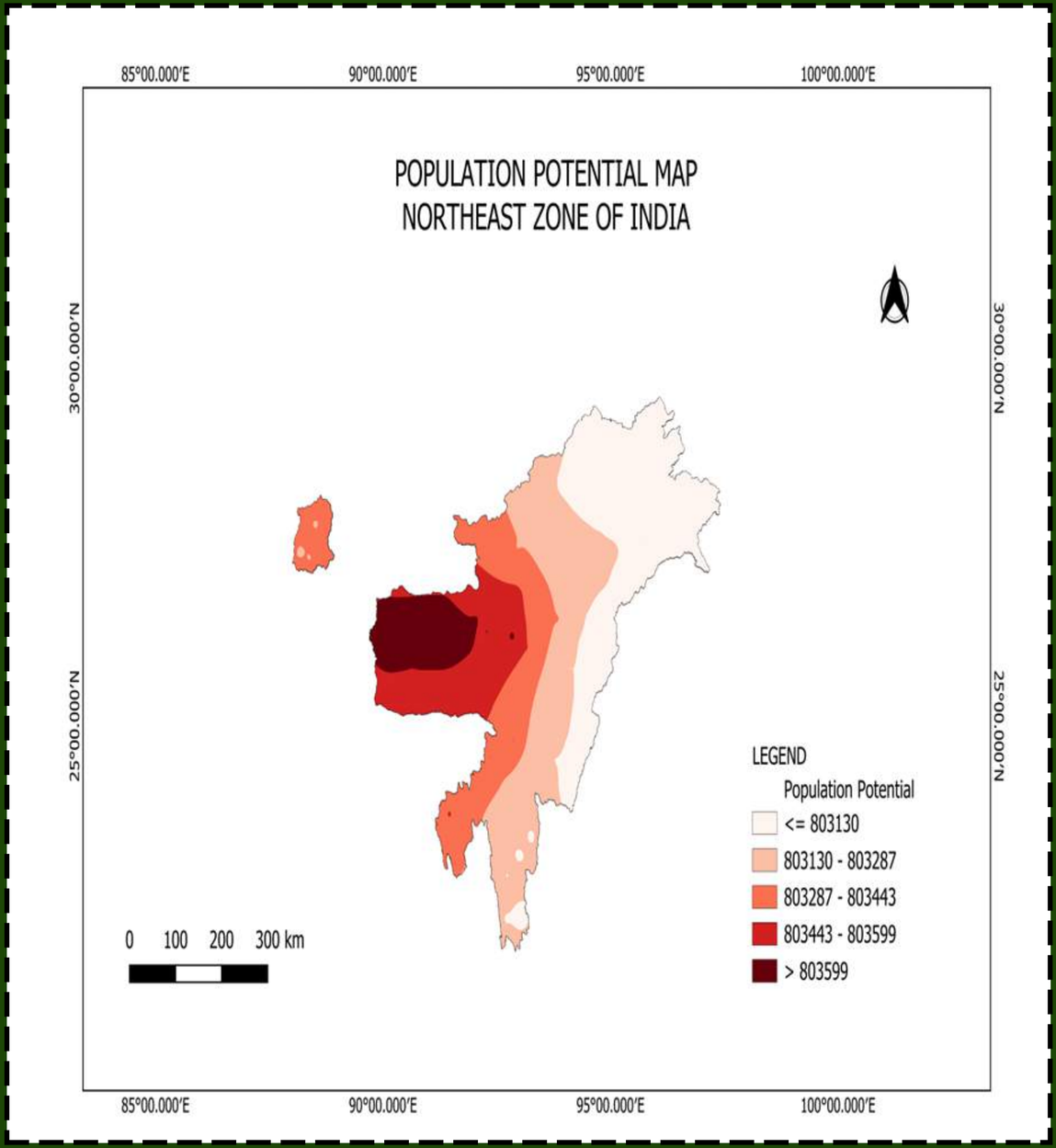
- **High population potentia**l is concentrated in the Kolkata Metropolitan Region and adjoining districts along the lower Ganga Basin.
- These areas show high values due to *dense settlements, fertile alluvial plains, and strong transport connectivity*.
- **Moderate potential** zones extend into Jharkhand and northern Odisha, around Ranchi, Jamshedpur, and Rourkela.
- **Low potential** regions occur in Chhattisgarh and interior Odisha, marked by sparse settlements and forested terrain.
- Overall, the *East Zone's population potential reflects a close link between urbanisation, industrialisation, and accessibility*.

WEST ZONE



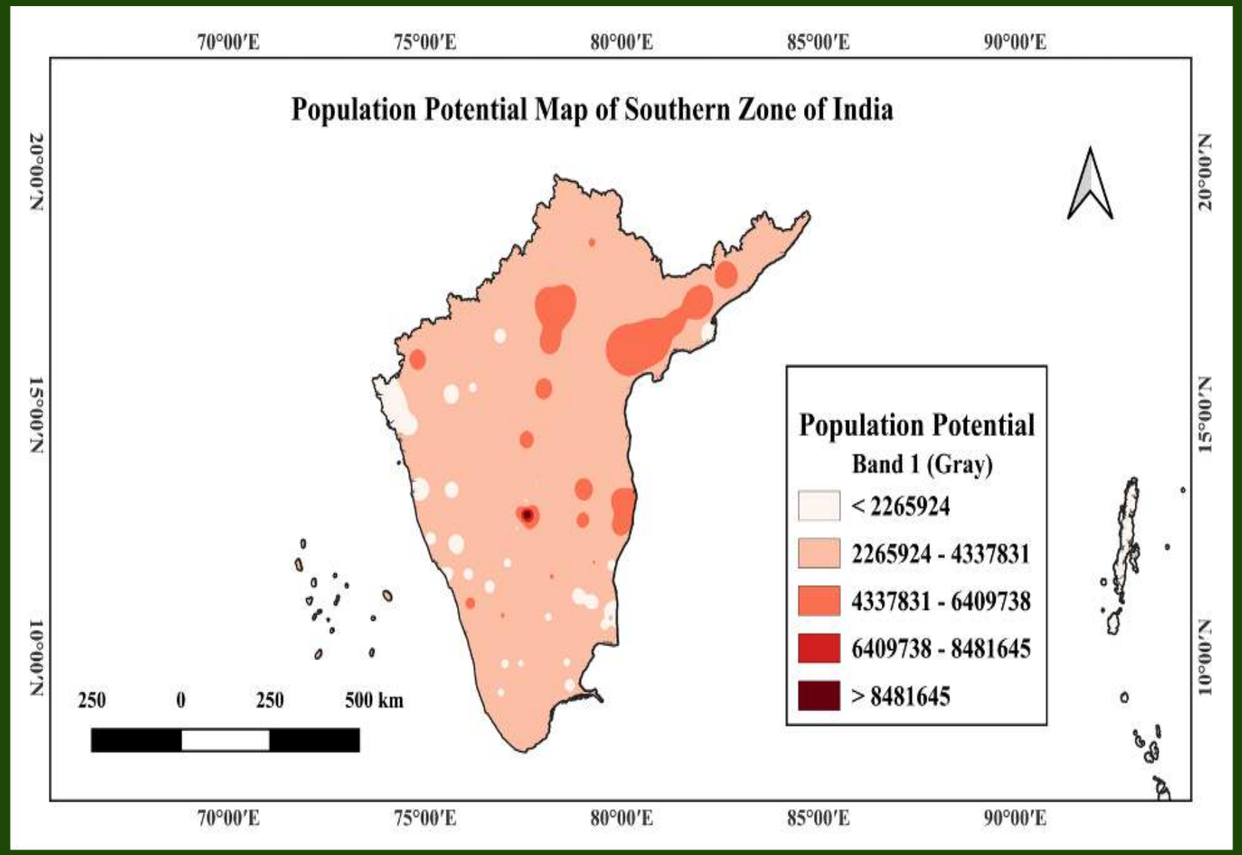
- **High population potential** is observed around Mumbai, Pune, and Ahmedabad, representing major urban-industrial hubs with dense settlements.
- These areas exhibit *strong potential due to industrialisation, port connectivity, and urban concentration* along the western coast.
- **Moderate potential zones** extend through central Maharashtra and southern Gujarat, supported by medium-sized cities and transport corridors.
- **Low potential regions** dominate Rajasthan and northern Gujarat, reflecting an arid climate, sparse population, and limited accessibility.
- Overall, the Western Zone shows a *coastal–inland gradient, where urbanisation and economic activity drive high population potential near the Arabian Sea.*

NORTH EAST ZONE

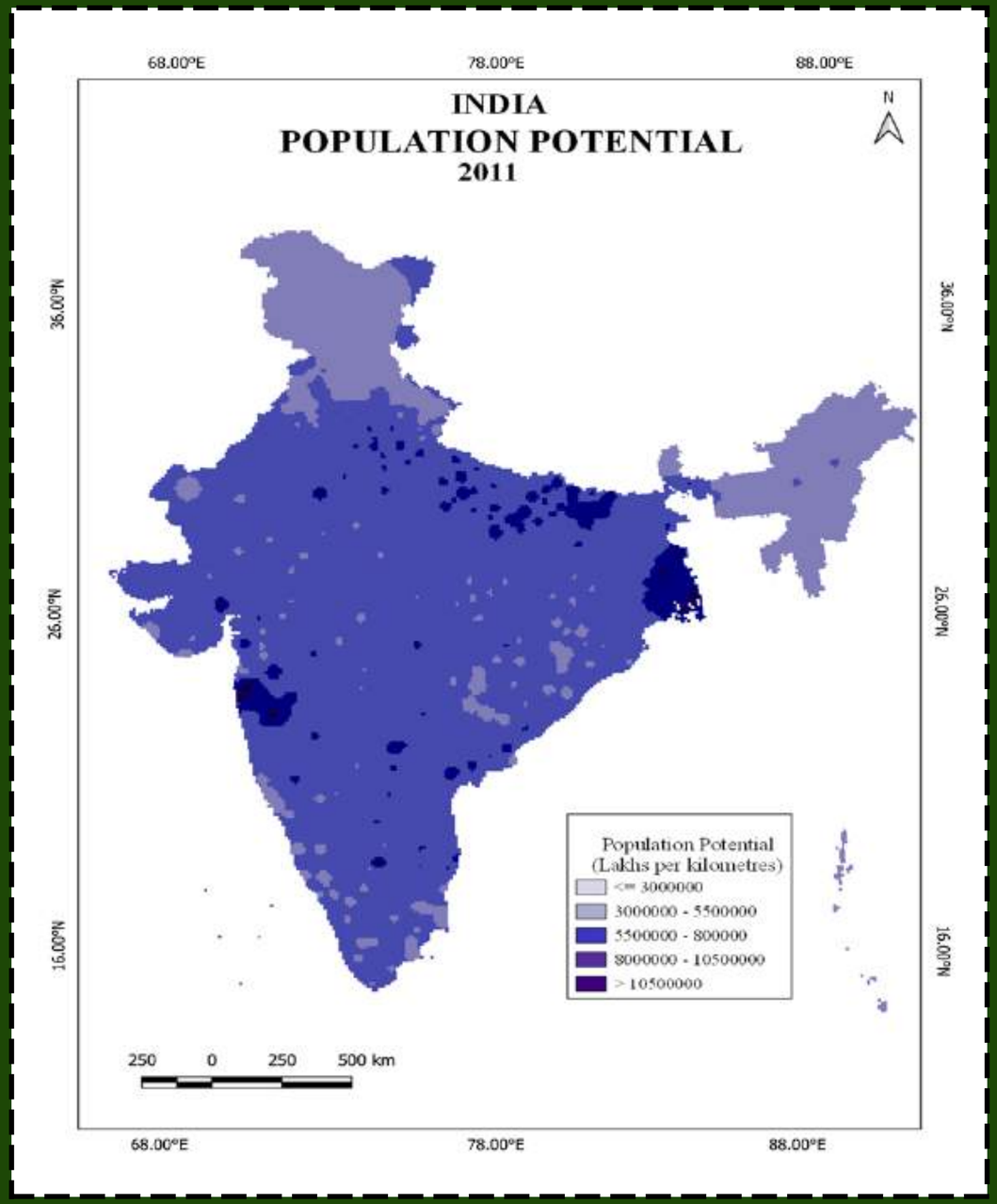


- The North-East Zone shows overall low to moderate population potential due to hilly terrain, dense forests, and scattered settlements.
- **Highest potentia**l occurs in western Assam, especially the Brahmaputra Valley near Guwahati, the region's main urban and transport hub.
- **Moderate potential** zones appear in Tripura, Meghalaya, and Manipur, supported by urban centres and better connectivity.
- **Very low potential** is seen in Arunachal Pradesh, Mizoram, and Nagaland, where rugged terrain limits accessibility and settlement.
- Population potential here is primarily shaped by *physical geography and infrastructure, emphasising the need for better regional connectivity*.

SOUTHERN ZONE



- The map shows clear *spatial variation in population potential, with high values in urban-industrial hubs and low values in interior uplands.*
- **Highest potential** occurs around Chennai, Bengaluru, and Hyderabad, driven by IT, industry, and administrative importance.
- **Moderate potential** is found in Coimbatore, Kochi, and Mysuru, reflecting regional urban growth, education, and trade activity.
- **Low potential zones** dominate northern Karnataka, Rayalaseema, and interior Tamil Nadu, due to a semi-arid climate and limited industrialisation.
- Overall, the pattern highlights *how urbanisation, infrastructure, and fertile plains shape population concentration, while terrain and resource constraints limit settlement in upland areas.*



- Major population cores: Indo-**Gangetic Plain and metropolitan regions such as Delhi–NCR, Kolkata, and eastern Uttar Pradesh**, reflecting dense settlements and strong spatial interaction.

- **Secondary high-potential zones** appear along the **western industrial corridor (Mumbai–Pune–Ahmedabad) and southern metros (Bengaluru, Chennai, Hyderabad), driven by urbanisation, industry, and connectivity.**

- **Low-potential regions** dominate **the Himalayas, Rajasthan, and the central plateau,** where terrain, aridity, and inaccessibility limit settlement concentration.

- The **spatial contrast** highlights India’s uneven population distribution, shaped by physical geography, infrastructure, and economic development.

- For planning, the map underscores the need to balance growth and connectivity by managing pressures in high-potential regions and improving accessibility in peripheral areas.

2. Land Use/Cover Exercise

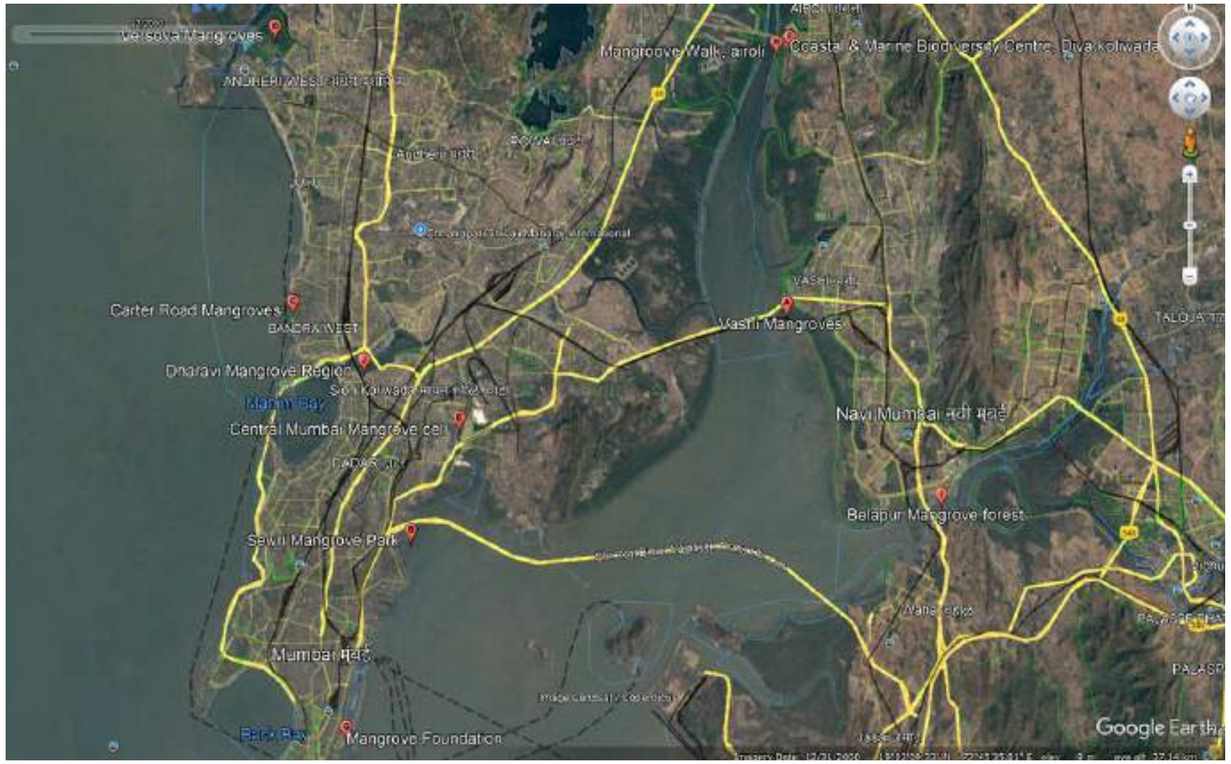
Land Use/Cover Exercise Mumbai MMR

- **Land Use–Land Cover (LULC)** maps show how land is being used and what natural cover exists; they are made to help in planning, monitoring, and managing regional resources.
- Shows clear differentiation of water bodies, mangroves, built-up areas, transportation networks, and open/green spaces.
    - Built-up zones are concentrated along central and southern Mumbai, indicating high urban density.
    - Transport routes (roads, railways, bridges) are highlighted for connectivity across islands and the mainland.
    - Mangrove patches appear along coastal edges, reflecting sensitive wetland vegetation.
    - Useful for urban planning, environmental monitoring, disaster preparedness, and resource management.
- Helps visualize spatial patterns and understand ongoing landscape changes in the metropolitan region.

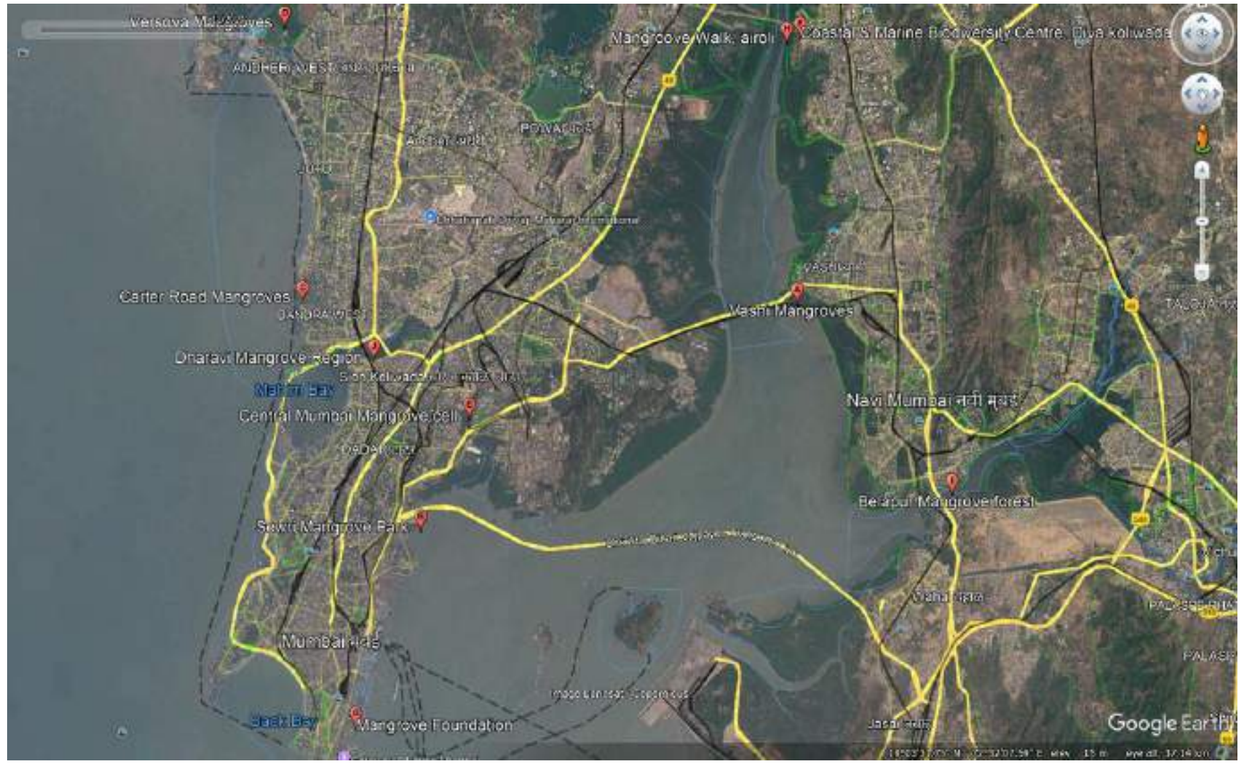
MUMBAI, MAHARASHTRA

2025

SATELLITE IMAGERY (Mumbai, Maharashtra)



Mumbai, 2000



Mumbai, 2020

3. Field Visit

FIELD VISIT: Objectives

09-11-2025

- To understand the sustainable development concepts through linking class-room learning with real-world field exposure.
- To observe how urban population growth and waste mismanagement impact environmental sustainability, using the mangrove cleanliness drive and Turbhe dumping ground as case examples.
- To highlight the role of community participation and responsible waste practices in promoting environmental conservation and sustainable urban living.

3a. MANGROVE SOLDIERS

An initiative of Environment Life Foundation

- Started in 2008 by **Dharmesh Barai** as a college student as ‘The ‘Environment Life’ which taken up many plantation and waterfall clean up drives.
- It was on August 2020, when ‘Mangrove soldiers’ of ‘Team Environment Life’ was initiated. Later known as **Environment Life Foundation**
- Moto: Preserving Mangroves:

  “Dive into the lush embrace of mangrove ecosystems, where land and sea harmonize. Join us in our mission to protect and rejuvenate these vital green lungs, ensuring a thriving haven for diverse marine life and safeguarding coastal communities.”

“Only Take What You Need”

Where we went?

Visited Karave village mangrove site as part of a Mangrove Cleanup Drive.

Kyuki kisi ko laga yaha mere ek kachra fekne se kya he ho jayega (Because someone thought, “What difference will it make if I throw just one piece of garbage here?”)

Orientation Before Cleanliness Drive

About the Project

Initiated five years ago with a focus on conserving the mangrove ecosystem, the project designates specific sites for regular cleanup activities every Sunday.

Legal Knowledge

Mr. Sushil Jadhav:

India has Environmental Protection Act and the Forest Conservation Act. while laws exist, their implementation is weak, unlike in European countries. Highlighted the need for civic sense in protecting the environment. Discussed M.C. Mehta’s contributions and the Polluter Pays Principle, stressing accountability for environmental damage.

Information About Mangroves

- How the Mangrove ecosystem works, what species can be seen, also experienced the voice of kingfisher during the orientation.
- Afforestation without proper planning and knowledge about the ecosystem is not beneficial for the environment.

What we did?

- Collected waste from the site and observed the type of wastes prevalent at the site.
- Learnt what Minimalistic Sustainable Living truly means

Experiences of other Volunteers

NSS unit of SIES college and KBP college volunteers shared their experience how they changed their habits and perspectives after joining the Environment Life Foundation.

Changes Observed

(from 2020 to 2025

https://maps.app.goo.gl/iD87cN8XQ8qMNefSA?g_st=ipc

Source:https://www.instagram.com/environmentlifefoundation?igsh=Zjc4bXloZzdic3Zo

Source: Clicked on 09 November 2025 during field visit

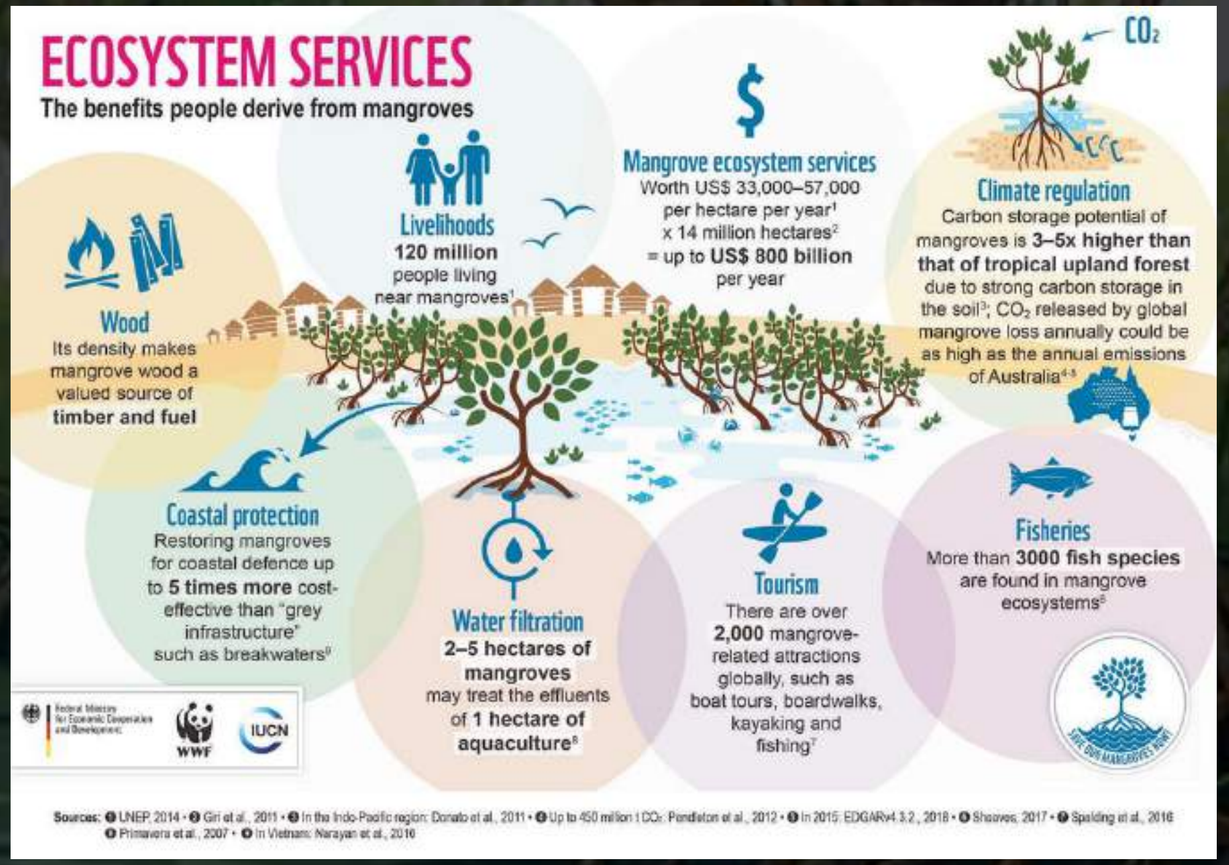
Mangroves

4%
of the India's mangrove is present in Maharashtra

Mangroves are highly specialised coastal ecosystems that function as critical interfaces between terrestrial and marine environments.

Importance

- **Act as significant carbon sinks**: mangrove soils and roots store up to four times more carbon than many other tropical forests.
- **Serve as biodiversity hotspots**: they provide nesting, breeding and nursery habitat for a vast array of species including fish, crabs, shellfish, birds and turtles.
- **Improve and maintain local water quality**: their intricate roots and vegetation filter pollutants and trap sediments, protecting adjacent aquatic habitats.
- **Provide coastal protection**: acting as a buffer between the sea and the land, they reduce erosion, slow down storm impacts and mitigate sea-level rise risks.



Source: Mangrove Cell, Government of Maharashtra

Mangroves of Maharashtra

Crabs: The Soil Engineers of Mangroves

White-throated

Mudskipper

- Maharashtra has a coastline of 720 km with **32,000** hectares of mangroves.
- These forests support a remarkable faunal community, providing breeding grounds for crustaceans, molluscs, insects, and reptiles, which in turn sustain a rich bird population including kingfishers, herons, storks, sea eagles, kites, sandpipers, bitterns, egrets, cormorants, and black-winged stilts.
- The Thane Creek Flamingo Sanctuary beautifully showcases how mangroves sustain life, providing a safe haven for thousands of flamingos and over 200 bird species, making it a vibrant symbol of nature thriving alongside the city.
- Crabs helps in maintaining the overall health, productivity, and balance of the mangrove environment.

Mangroves of Maharashtra

Avicennia marina var. acutissima

Sonneratia alba

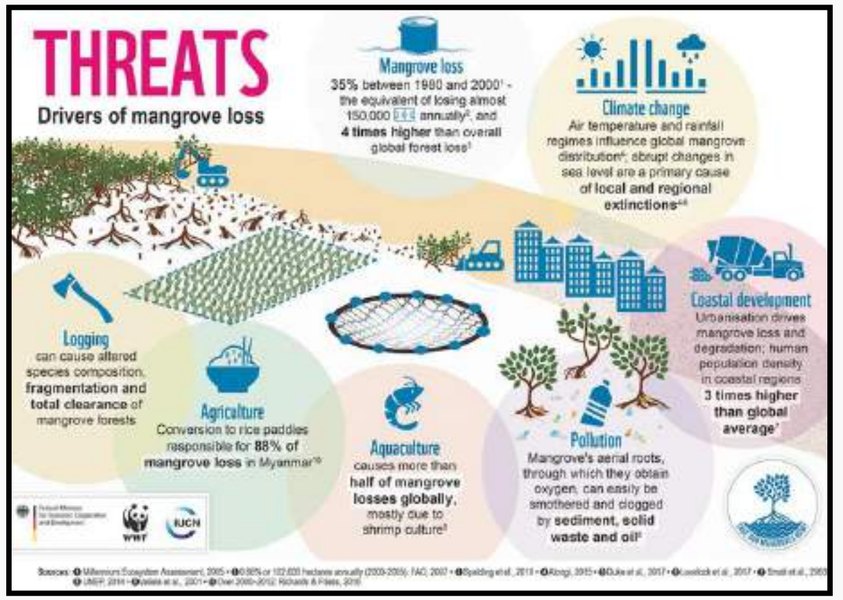
Bruguiera cylindrica

- The dominant mangrove species found in Mumbai include Avicennia marina var. acutissima, Avicennia marina var. acutissima forma pumila (forma nov.), Sonneratia apetala, Avicennia alba, Aegiceras corniculatum, and Bruguiera cylindrica.

- Maharashtra is also the first coastal state in India to declare a **State Mangrove Tree (Sonneratia alba)**, reflecting its commitment to long-term coastal ecosystem protection.

Threats to Mangroves Roots

Anchoring roots



Source: Mangrove Cell, Government of Maharashtra

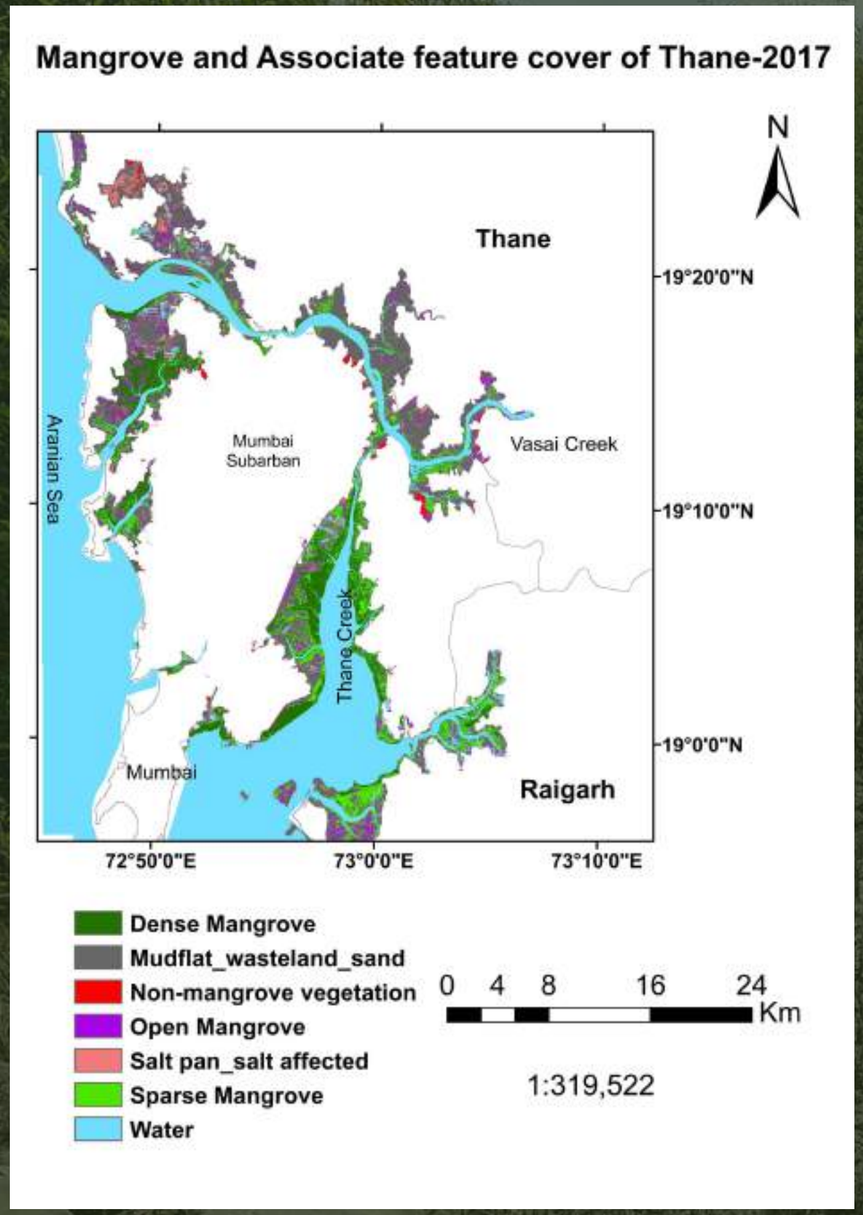
Pneumatophore s

- Mangroves face multiple threats such as logging, agriculture, aquaculture, pollution, coastal development, and climate change. These pressures lead to large-scale loss, fragmentation, and degradation of mangrove forests globally.

- During the clean-up drive, we learned that mangroves have two main types of roots: **anchoring roots** that grow into the soil and aerial '**breathing roots**' **(pneumatophores)** that absorb oxygen from the air.

- When these breathing roots get clogged by plastic, debris, or sediment, the trees are deprived of oxygen and gradually die. Protecting mangroves therefore requires keeping their root zone free from waste and preventing activities that restrict tidal flow or smother the soil surface.

Mangrove Conservation in Maharashtra



Source: Mangrove Cell, Government of Maharashtra

- In 2005, the Bombay High Court order directed that mangroves on government land in Maharashtra be declared **Protected Forests**, later upgraded to **Reserved Forests** in 2013.
- In January 2012, the State Government of Maharashtra set up the **Mangrove Cell** to protect and conserve the mangrove ecosystem of the state.
- The state's mangrove cover increased from 186 sq. km in 2013 to 320 sq. km in 2019 due to continuous patrolling, removal of over 5000 encroachments, and targeted conservation actions.
- In 2015, Maharashtra created the Mangrove Foundation to secure permanent, reliable funding for long-term mangrove and marine conservation.
- Thane Creek was one of the main areas targeted for special conservation work under the Indo-German GIZ project, which was supported by India's Ministry of Environment, Forest and Climate Change (MOEFCC).

Field Observations from the mangrove site

Piles of plastic waste :

- The forest area was covered in such large quantities of plastic waste, that it was covering up the entire ground, blocking the pneumatophores.
- Regular clean-up drives by the Mangrove Soldiers have helped to reduce the plastic accumulation significantly, giving way to growth of new plants.
- Large numbers of polythene bags could be seen tangled on the branches and roots of the trees , which had to be manually detangled one by one.

Residuals from Religious and Cultural activities :

A considerable amount of the waste seen on the site were residuals from cultural and religious activities. These mainly included earthen lamps, clay pots, bottles of oil, and flowers used for worshipping were seen being discarded inside polythene bags. Coconuts used for pooja were also found in large quantities all over the ground.

Field Observations from the mangrove site

Impact on local fishing communities

The accumulation of garbage in the mangrove lands and the ocean waters is heavily impacting the local fishermen communities.

It was found that previously the fishermen could catch fishes, crabs etc. within 50 metres of distance from the shore, however, because of heavy pollution now, they are required to go deeper into the ocean for fish, which is making it difficult for them to make a living.

This is not just hindering them financially, but is also endangering their lives since they now have to tread deeper waters for fish.

Field observations from the mangrove site

Environmental impact of mangrove pollution:

- The mangrove forests are home to complex species ecosystems. It is important that the balance in these ecosystems is maintained. Heavy Pollution in these mangrove forests has immense impact on these biological ecosystems of the area.

- The accumulation of garbage is causing disruption of balance in these ecosystems and leading to habitat destruction, displacing the numerous animals, birds and reptiles in the area.

- The mangroves play a key role in the absorption of carbon and pollution and thus, destruction of these forests can lead to more air pollution and accumulation of carbon in our surroundings.

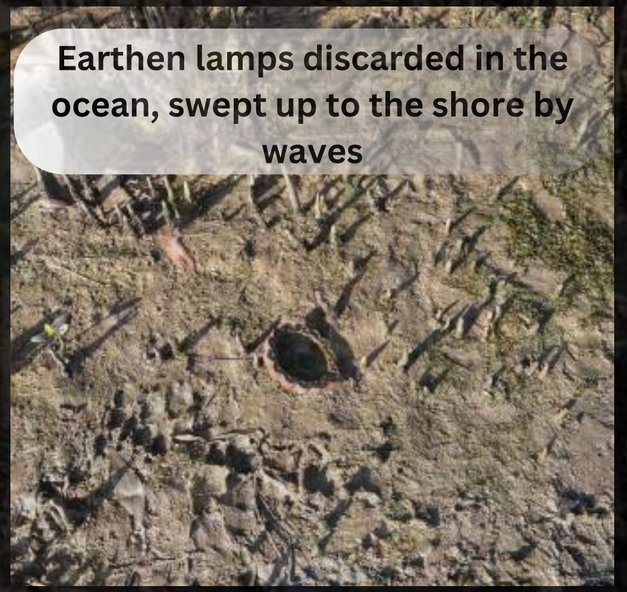
Types of Waste found

A variety of wastes were collected from the site, most of which were non-biodegradable. The biodegradable wastes found, like earthen lamps and coconut shells were left as is and only the non-degradable wastes were collected. The collected wastes include:

- Polythene Bags and plastic wrappers
- Broken thermocol boxes
- Polythene foam wrappers used for wrapping fruits
- Syringe
- Diapers
- Tablet films
- Broken Tyres
- Plastic bottles
- Glass bottles and other broken glass material
- Shoes
- Clothes
- Flowers in plastic Bags
- Coconut shells
- Earthen lamps and pots
- Idols of god
- Plastic Cutlery

Plastic tangled in the aerial roots of the trees

Idols used for worshipping found discarded in the forests



Earthen lamps discarded in the ocean, swept up to the shore by waves

Coconut shells used for praying

Wastes collected during the cleanliness drive

3b. Visit to the Turbhe Solid Waste Management (NMMC)

Turbhe Dumping Ground and Solid Waste Management Unit

The Turbhe Solid Waste Management and Processing Unit, located in the Maharashtra Industrial Development Corporation (MIDC) area of Navi Mumbai, plays a crucial role in the city's overall solid waste management system.

It serves as both a processing facility and a final disposal site, managed by the Navi Mumbai Municipal Corporation (NMMC).
Every day, approximately 700–750 metric tonnes of municipal solid waste generated across Navi Mumbai is collected, transported, and brought to Turbhe.

Here, the waste undergoes segregation, composting, recycling, and treatment before the inert and non-recyclable residue is finally sent to the Turbhe Dumping Ground (landfill site) for scientific disposal.

This integrated setup reflects the link between waste processing and disposal, ensuring that waste is scientifically treated, environmental impacts are minimised, and sustainability goals of NMMC are met.

- The Turbhe Waste Processing Unit in Navi Mumbai, managed by NMMC, receives waste from across the city. The plant follows scientific waste management methods to reduce landfill pressure, promote recycling, and convert organic waste into compost and refuse-derived fuel (RDF).

- **Waste Segregation and Processing:** At the plant, waste is weighed and segregated into wet and dry types both manually and mechanically. The wet waste undergoes composting to form organic manure, while the dry, combustible fraction is converted into Refuse-Derived Fuel (RDF) and Material-Derived Fuel (MDF) used in industries. This process minimizes landfill waste and supports resource recovery.

- **Leachate Treatment:** Leachate formed during decomposition is collected in an equalization tank. It is treated using chemicals such as lime, alum, and ferric chloride to remove impurities. The treated water is reused for irrigation, and the remaining sludge is directed to the sewage system for safe disposal, preventing soil and water pollution.

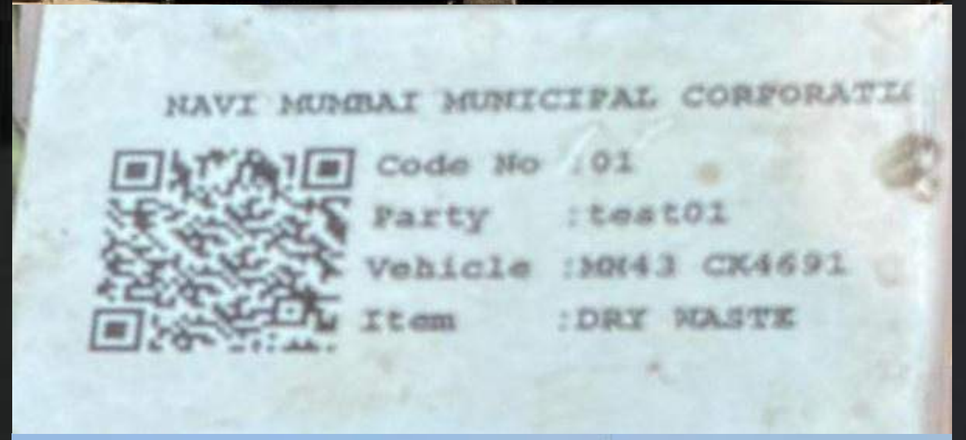
- **Inert Waste and Scientific Landfill:** Inert and non-recyclable waste is transferred to a scientific landfill designed with impermeable liners. The waste is compacted and covered with soil layer by layer, reducing odor, leachate seepage, and pest problems. This ensures environmentally safe and sustainable waste disposal

Segregation of Waste

Segregating waste before processing it is very important. This is because it makes the processes like recycling and composting much efficient, saves a lot of energy and protects the environment from further damage.

It lowers risk to public health by preventing the contamination of hazardous chemicals with other materials.

Segregating the waste significantly reduces the amount of waste sent into landfills.



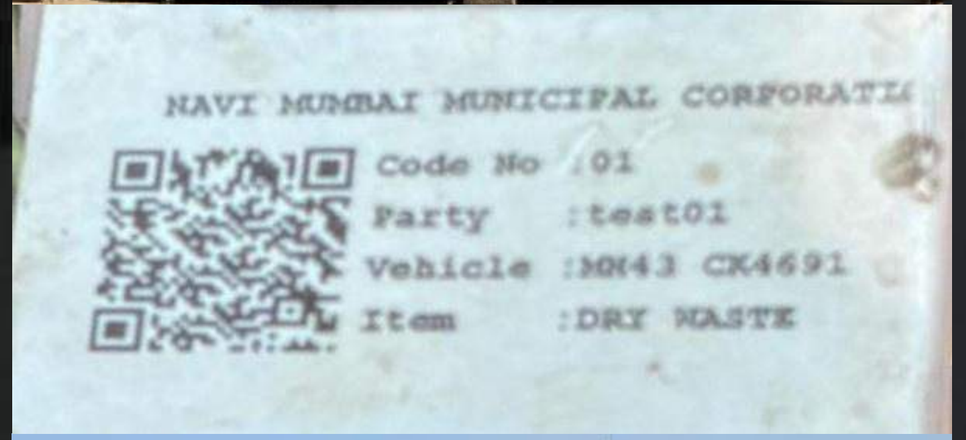
1. Weighing of Waste

The garbage collected from different parts of the city is brought to the dumping ground by garbage trucks, which are separately assigned as wet or dry waste.

These trucks have specific ID cards which are to be scanned when entering the ground.

The trucks are weighed using a weighing bridge and records are kept by their IDs.

These trucks bring the waste inside the waste processing units, where there are separate units assigned for processing of wet wastes and dry wastes.



2. Manual Segregation of Dry Waste

The wet waste is kept for a week for it to decompose and give off all the leachate, which is then processed in the leachate processing unit and the residual solid decomposed material is composted.

The dry waste on the other hand, is put on conveyor belts in the processing unit. Beside the conveyor belts, workers stand to manually segregate the waste.

Each person is assigned a particular type of material and as the waste moves through the conveyor belts, every worker picks out the material they are assigned and puts it in a designated dustbin.

Sometimes the waste is also laid out on the ground and the workers segregate it manually.

Separating the dry waste further helps in reducing the quantity of waste that goes into landfills and it enables the recycling of waste according to material.

a.Types of Dry Waste

The segregated dry waste is then divided into 7 types of waste, for which there are 7 different designated dustbins -

1. Furniture
2. Shoe
3. Clothes
4. Paper
5. Metal
6. Glass
7. Scrap Plastic

What happens Next?

Dry Waste is repurposed into Refuse-Derived Fuel (RDF) for supply to chemical industries, cement factories, and thermal power stations.

Recyclable materials are sent to the MRF (Material Recovery facility) Recycling industry

Contract with different agencies for collecting the dry waste which can be used for other purposes like current collaboration with Stree **Shakti Sangathan** who sents workers for collection of waste of their choice and use it as per their further requirement.

Plastic Wastes to wealth

Washing And Drying

Processing low density plastic thorough plastic cutting machine

Plastic Wastes to wealth

Plastic is dried and process into Aglo processing unit having a capacity of 3 TPD

The aglo in granualar form is sold to plastic recycling industry for reuse

Plastic Wastes to wealth

Further rest of the material is crused in shredder of 150 mm, 75 mm, 50 mm, 14 mm
14 mm RDF sold to cement plants in loose form and Bale form derived from bailing unit as well in average 3 TPD

Refused Derive Fuel

Shredder Machine

Bailing Unit

Plastic Wastes to Wealth

10 percent inert waste goes to scientific landfill sites.

https://www.youtube.com/@navimumbaimunicipalcorpora976

Solid Wastes to a Garden

Scientific landfill sites are turned into Gardens
Example: Khaparkheda / Koparkhairane

https://images.hindustantimes.com/img/2022/03/03/550x309/0513c762-9ae4-11ec-82cf-231c0ab4e0db_1646306528249.jpg

COCOPEAT FORMATION

COCONUT SHELL

Collected AVERAGE 40 - 45 TPD

(Ton per day)

Cocopeat Formation

Dehusking

- Coconut husks are fed into the dehusking machine to crack and loosen the outer shell.
- This step separates the coarse outer material so that it can be processed further
- Produces raw husk pieces for further processing

Crushing and Fibre Separation

- Raw husk goes into the crusher, which grinds it into smaller pieces and separates coir fibres from cocopeat
- Long coir fibres fall aside while shorter brown particles (actual cocopeat) drop near the outlet
- Fibres and cocopeat start separating during this stage

Sieving

- Crushed material passes through a rotating sieve drum
- The drum filters the cocopeat by size.
- Fine cocopeat powder passes through the mesh and collects below, while the coarser fibres move out from other end
- Final output is clean, fine, cocopeat ready for drying and packaging.

Uses of Coir Fibres and Cocopeat

- The cocopeat is used **in nurseries and gardens**, while the extracted fibres are repurposed for **cushions and sculptures**

- The material is **compressed into cocopeat cubes**, which are lightweight, eco-friendly and widely used as a growing medium for plants due to their excellent water retention and aeration properties

- After extracting cocopeat from coconut husk, the long fibrous portion (coir fibre) is separated and used for **rope making.**

    - The fibres are cleaned, dried, and spun using mechanical spinning machines like the one shown in the images.

    - These machines twist the fibres together to produce strong coir ropes, which are then rolled into bundles for sale.

    - Cocopeat is sold loose at a lower price and sold at a higher price if pakaged, depending on fibre quality.

    - Also, the coir fibre is used for making internal structures of eco-friendly Ganpati idols.

b. Wet Waste Treatment

Wet waste typically refers to biodegradable waste.

This includes all waste materials that decompose naturally and can be broken down by microorganisms. Common examples of wet waste include food scraps (vegetable peels, leftover food, fruit waste), tea bags and coffee grounds, garden waste (leaves and grass clippings), eggshells, and used tissues and paper towels.

Since wet waste is organic, it can be composted easily and turned into nutrient-rich manure, reducing the load on landfills and benefiting the environment

Compost Processing

The wet waste is first deposited in large covered sheds, where it is kept for about seven days. During this period, excess water drains out and is directed to the leachate treatment plant.

After drying, the waste is piled and organised. Machines and workers remove unsuitable materials and prepare the waste for biological processing.

Decomposers are added to the prepared waste, and the material is mixed thoroughly using machinery. This accelerates the breakdown of organic matter.

The decomposed waste gradually turns into fine compost. Once ready, it is sieved, collected, and finally packed into bags for sale.

c. Leachate Treatment

- The wet waste begins to decompose within a few days (**approximately 7 days**) after being deposited at the waste processing site.

- This decomposition occurs due to **microbial activity** and the **heat generated** within the waste pile.

- As the organic waste breaks down, **it releases moisture**, which then **mixes with existing liquids**, including rainwater and liquid residues present in the waste.

- This process results in the formation of a dark, highly contaminated liquid known as **leachate**. The leachate accumulates at the base of the waste pile and is carried out **due to gravity** through drainage channels towards a **centralised collection point (Leachate Tank)**.

- The drainage system is designed to prevent the leachate from percolating into the soil.

- From the Leachate Tank, the leachate is then carried through pipelines to the **Leachate Treatment Plant (LTP).**

Fig.1 Wet waste

Fig. 2 Leachate tank

Leachate tank water

Leachate Treatment Plant

- The Leachate Treatment Plant (LTP) treats the contaminated liquid (leachate) that drains from solid waste.

- It aims to remove harmful chemicals, adjust pH, and make the water safe for discharge or reuse.

- The treatment involves several tanks, like an equalisation tank, mixer tank, flocculation tank, etc., each helping in purification through physical and chemical processes.

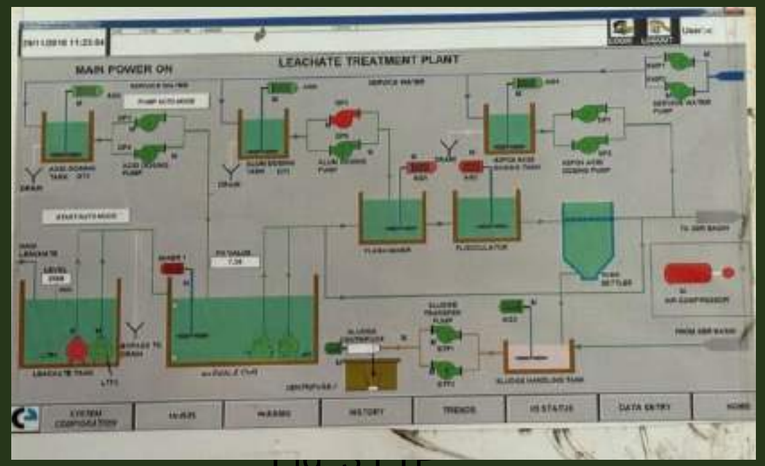


Fig. 3 LTP

Equalisation and Mixing

- Leachate, from the Leachate tank, first enters the Equalisation Tank, where it is stored and homogenised to balance variations in flow and concentration.

- From here, it moves to the Mixer Tank, where the leachate is stirred to ensure uniform mixing of water and any added chemicals. Acids or alkalis are added in small quantities, if needed, to bring the pH to an optimum level (around neutral), ensuring effective treatment in later stages.

Fig. 4 Equalisation tank

Leachate Treatment Plant

Flash Mixer and Flocculator

- The leachate then passes through the **Flash Mixer**, where coagulant chemicals like alum are added. These help small, suspended particles to come together.

- It then enters the **Flocculator Tank**, where slow mixing allows the particles to form larger flocs that can easily settle out. These two tanks together help in separating solid impurities from the liquid.

Fig. 5 Flash mixer & Floccutlator tank

Tube Settler and Sludge Handling

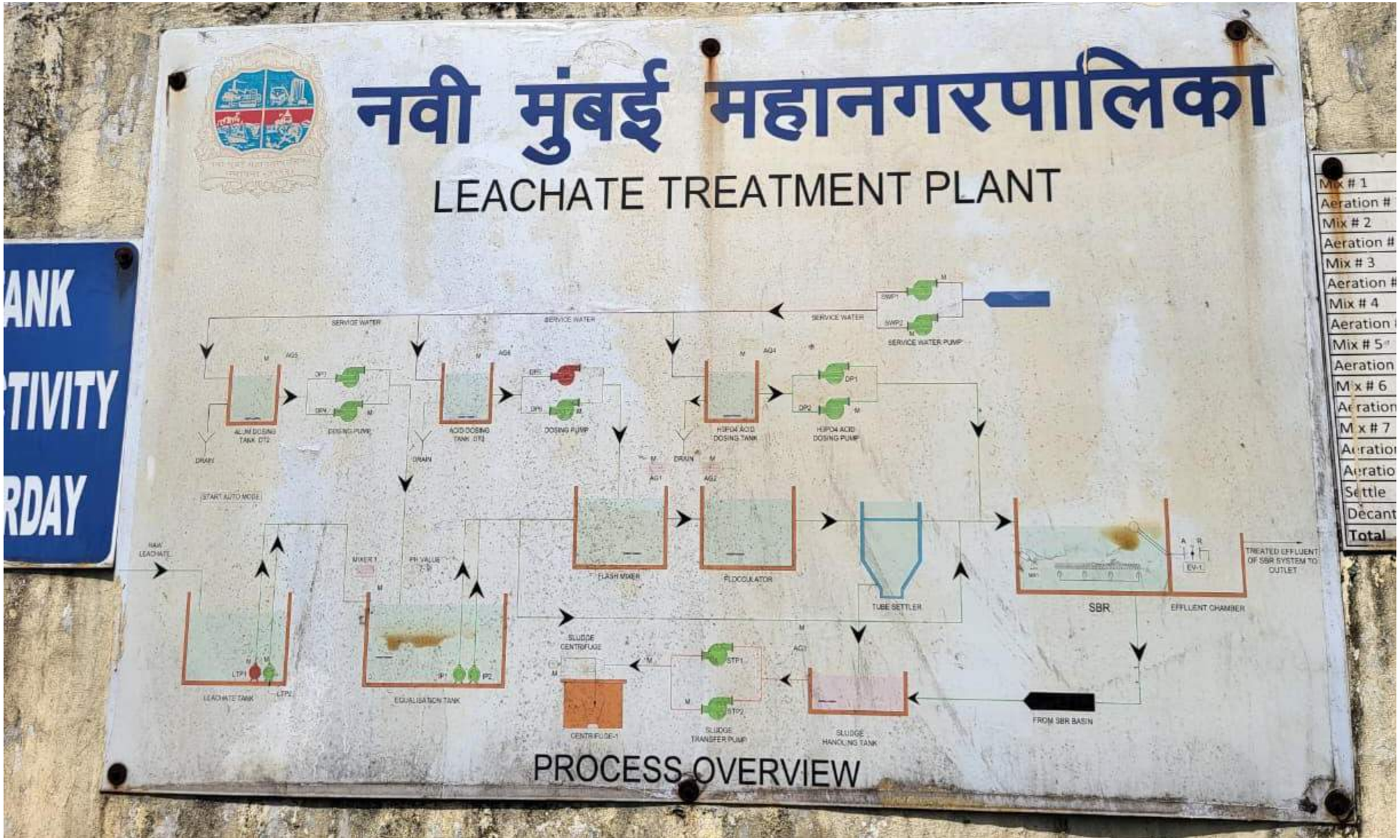
- The mixture then moves to the **Tube Settler**, where the heavy flocs settle at the bottom as sludge. The clear water is sent for further treatment in the **biological tanks, like the SBR (Sequencing Batch Reactor)**.

- The sludge is collected in the **Sludge Handling Tank** and passed through a **Centrifuge**, which removes water and makes it ready for safe disposal. This step ensures the removal of remaining solids before the treated water is discharged safely.

Fig. 6 Tube Settler

Each tank in the LTP plays a specific role, and together they ensure that the harmful leachate from waste is treated before reaching the environment.

Leachate Treatment Plant



Utility of the Treated Water

- The **treated water** obtained from the Leachate Treatment Plant (LTP) is **not suitable for drinking**, but is safely used for **non-potable purposes** within the facility.

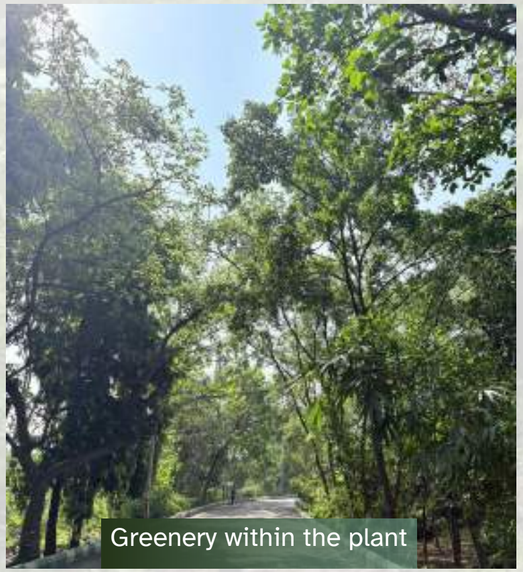
- It is primarily reused to **reduce dependence on fresh water sources** and support sustainable operations.

- ***Gardening and Greenbelt Maintenance***: The treated water is used for watering plants and maintaining landscaped/vegetated areas within the waste management plant, helping to preserve a green buffer around the facility.

- ***Re-wetting of Wet Waste and Leachate Formation***: A portion of the treated water is redirected back to the waste processing unit to maintain the necessary moisture content in wet waste, which facilitates microbial decomposition and improves the efficiency of composting.


Collection of Treated Water


Treated Water


Greenery within the plant

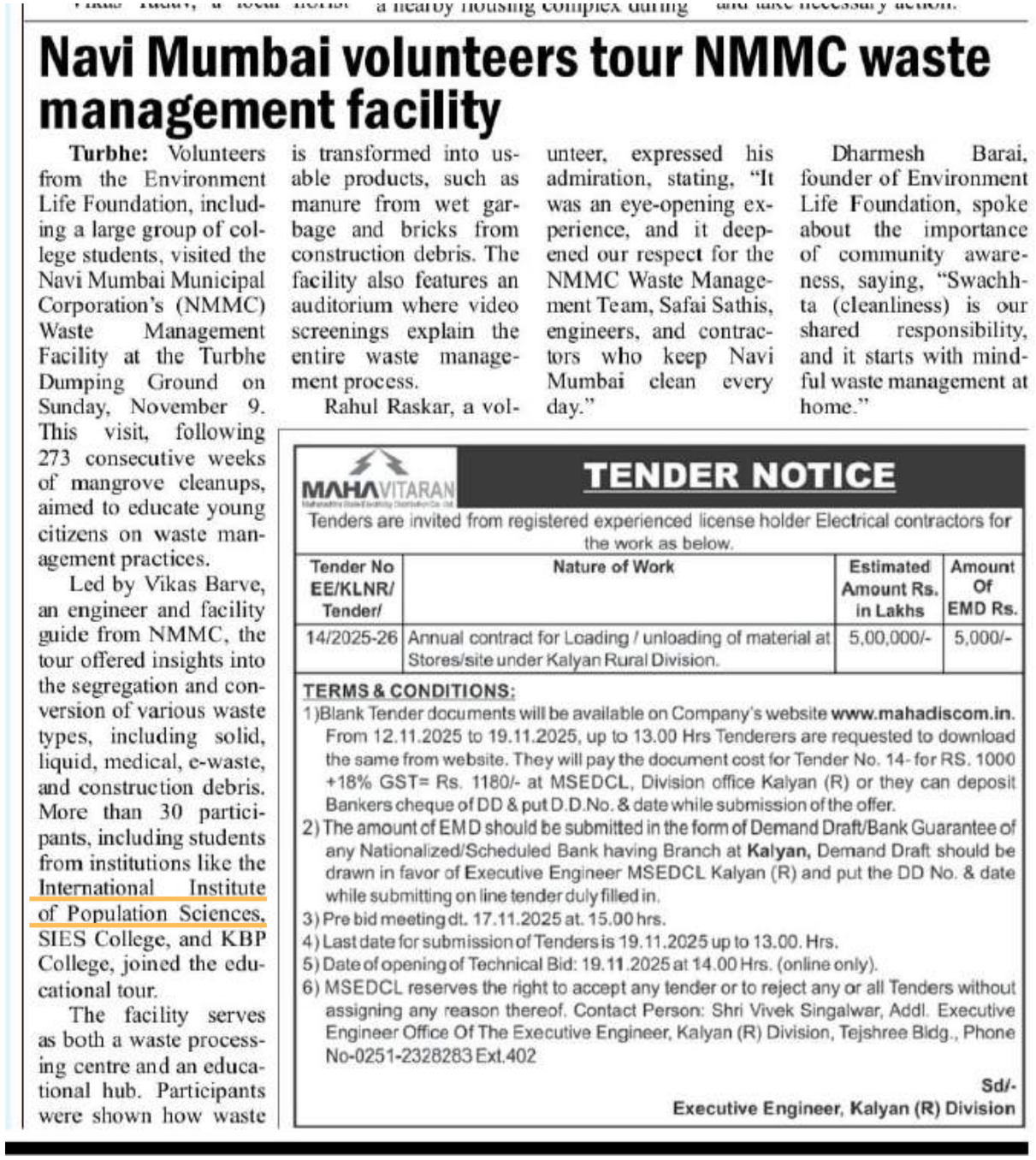
CONCLUSION

- The field visit helped us understand how human activities and population pressure directly impact the environment.
- By collecting waste during the cleanliness drive, we saw how urban behaviour contributes to ecological degradation, especially in sensitive areas like mangroves.
- Visiting the waste processing unit showed us the systematic steps involved in managing and treating urban solid waste and how it is important to segregate the waste at the source for more sustainability.
- The experience strengthened our understanding of Population, Environment and Sustainable Development, especially the ways in which high urban population concentration contributes to greater waste generation and environmental stress.
- Overall, the field work highlighted the need for responsible behaviour, sustainable waste practices, and strong urban environmental management.

Visit to the Turbhe Solid Waste Management Facility was also featured in a newspaper.

The article highlighted the participation of Environment Life Foundation volunteers and students, acknowledging our ongoing mangrove cleanup efforts. It mentioned how the visit helped us understand waste segregation and processing practices.

The coverage appreciated the initiative for promoting awareness on responsible waste management



Navi Mumbai volunteers tour NMMC waste management facility

Turbhe: Volunteers from the Environment Life Foundation, including a large group of college students, visited the Navi Mumbai Municipal Corporation's (NMMC) Waste Management Facility at the Turbhe Dumping Ground on Sunday, November 9. This visit, following 273 consecutive weeks of mangrove cleanups, aimed to educate young citizens on waste management practices.

Led by Vikas Barve, an engineer and facility guide from NMMC, the tour offered insights into the segregation and conversion of various waste types, including solid, liquid, medical, e-waste, and construction debris. More than 30 participants, including students from institutions like the International Institute of Population Sciences, SIES College, and KBP College, joined the educational tour.

The facility serves as both a waste processing centre and an educational hub. Participants were shown how waste is transformed into usable products, such as manure from wet garbage and bricks from construction debris. The facility also features an auditorium where video screenings explain the entire waste management process.

Rahul Raskar, a volunteer, expressed his admiration, stating, "It was an eye-opening experience, and it deepened our respect for the NMMC Waste Management Team, Safai Sathis, engineers, and contractors who keep Navi Mumbai clean every day."

Dharmesh Barai, founder of Environment Life Foundation, spoke about the importance of community awareness, saying, "Swachhta (cleanliness) is our shared responsibility, and it starts with mindful waste management at home."

MAHAVITARAN

TENDER NOTICE

Tenders are invited from registered experienced license holder Electrical contractors for the work as below.

Tender No EE/KLNR/ Tender/	Nature of Work	Estimated Amount Rs. in Lakhs	Amount Of EMD Rs.
14/2025-26	Annual contract for Loading / unloading of material at Stores/site under Kalyan Rural Division.	5,00,000/-	5,000/-

TERMS & CONDITIONS:

1) Blank Tender documents will be available on Company's website **www.mahadiscom.in.** From 12.11.2025 to 19.11.2025, up to 13.00 Hrs Tenderers are requested to download the same from website. They will pay the document cost for Tender No. 14- for RS. 1000 +18% GST= Rs. 1180/- at MSEDCL, Division office Kalyan (R) or they can deposit Bankers cheque of DD & put D.D.No. & date while submission of the offer.
2) The amount of EMD should be submitted in the form of Demand Draft/Bank Guarantee of any Nationalized/Scheduled Bank having Branch at **Kalyan,** Demand Draft should be drawn in favor of Executive Engineer MSEDCL Kalyan (R) and put the DD No. & date while submitting on line tender duly filled in.
3) Pre bid meeting dt. 17.11.2025 at. 15.00 hrs.
4) Last date for submission of Tenders is 19.11.2025 up to 13.00. Hrs.
5) Date of opening of Technical Bid: 19.11.2025 at 14.00 Hrs. (online only).
6) MSEDCL reserves the right to accept any tender or to reject any or all Tenders without assigning any reason thereof. Contact Person: Shri Vivek Singalwar, Addl. Executive Engineer Office Of The Executive Engineer, Kalyan (R) Division, Tejshree Bldg., Phone No-0251-2328283 Ext.402

Sd/-
Executive Engineer, Kalyan (R) Division

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THANK YOU