LAND DEGRADATION, DESERTIFICATION, AND DROUGHT

IN MAHARASHTRA

JUNE 05, 2024

WORLD ENVIRONMENT DAY

CONTENT

EXECUTIVE SUMMARY-

'Restoring Land, Fighting Desertification, and building drought resilience are important for keeping our environment healthy and sustainable'.

Desertification, land degradation, and drought (DLDD) represent a silent and invisible crisis that significantly impacts people by obstructing land productivity, causing biodiversity loss, and leading to water scarcity. These severe hydrological imbalances greatly affect land resource production and ecological processes, directly impacting humans, wildlife, and plant communities. Desertification's intensity has surged 30-35 times historical rates in recent decades. Droughts, major threats to sustainable development, are escalating globally. By 2050, they may affect over three-quarters of the world's population. Since 2000, drought frequency and duration have increased by 29%, exacerbating water stress for 2.3 billion people.
Land degradation in **India** leads to soil erosion, nutrient depletion, and reduced fertility. 30% of soil is degraded, and droughts exacerbate this (Pandey, 2023). Land degradation, causing crop failures and food security issues, is expected to decrease by 20% by 2050 due to climate change (PIB, 2023) Over-extraction of groundwater leads to decreased water tables and aquifer recharge, impacting 60% of agriculture. Groundwater levels are declining rapidly, affecting crop yields and productivity. Climate change impacts crop selection and pest management, increasing malnutrition and micronutrient deficiencies, affecting 18.7% of India's population (NFHS, 2019-2021). Water scarcity and poor water quality also cause health issues and economic losses because 70 per cent of rural households still depend primarily on agriculture for their livelihood (FAO, 2024).

The evolving landscape dynamics in **Maharashtra** present a spectrum of challenges associated with changing land use and cover. 1.4 million hectares of land in the state are affected by desertification (MoEFCC 2023). Urbanisation drives a notable surge in built-up areas, escalating land pressure, while forests witness a concerning 5% decrease. This rapid urban expansion underscores the urgency for sustainable land management. Concurrently, groundwater depletion, primarily for irrigation, outpaces recharge rates, exacerbating water scarcity. Intensified by climate change, drought occurrences further strain water resources, impacting agriculture, biodiversity, and ecosystem health. Wetlands face diverse threats including land transformation, pollution, and invasive species, endangering critical biodiversity and ecosystem services.
Urban forestry encounters constraints like limited space, resources, and policy barriers, hindering green cover and exacerbating the environmental impacts of urbanisation. Regenerative agriculture emerges as a potential solution, fostering soil health, water retention, and biodiversity, countering land degradation and water scarcity challenges. Addressing these complex issues necessitates holistic strategies integrating sustainable land management, water conservation, climate adaptation, and community engagement for resilient and sustainable development in Maharashtra.
Climate change and erratic monsoons intensify drought conditions, lowering soil moisture, biodiversity, and agricultural productivity. Declining groundwater levels and poor soil moisture retention compound these challenges. Despite efforts in wetland restoration, regenerative farming, and urban forestry, resource allocation, policy enforcement, and community engagement remain persistent obstacles. Effective management practices and **sustainable land use policies** are imperative for restoring ecological balance and ensuring long-term environmental health in the region.

Given the severity and frequency of increasingly severe dry spells, it is imperative that we increase our capacity to withstand drought. Droughts worsen poverty and increase already-existing disparities while also endangering agriculture and water supplies. However, by implementing integrated water resource management, better farming methods, and community empowerment, we may increase our resistance to drought and guarantee the sustainable growth of global communities. We create the conditions for a future in which ecosystems flourish, communities prosper, and our planet's landscapes are preserved for future generations by investing in drought-resistant technologies, encouraging soil conservation, and improving water efficiency.

The government of Maharashtra launched several initiatives to combat desertification. The State Action Plan on Climate Change (SAPCC) has been announced covering eight key areas, including agriculture, water, forests, and biodiversity, to guide adaptation policies and programs. This plan aims to promote climate-resilient agriculture and reduce the impact of climate change on the state's economy

The Integrated Watershed Management Programme (IWMP) aims to protect and restore natural resources to reduce the impact of droughts in Maharashtra. The program focuses on watershed development, soil conservation, and sustainable agriculture practices Also participatory Watershed Development (WSD) in western Maharashtra demonstrated the WSD in addressing land degradation. This approach involves community participation in planning and implementing watershed development projects

Water Stewardship in Rainfed Agrarian Maharashtra: This initiative focuses on water conservation and the efficient use of water resources in rainfed agricultural areas. It involves implementing water-saving technologies and practices to reduce water waste and enhance agricultural productivity

These initiatives demonstrate Maharashtra's commitment to addressing land restoration, desertification, and drought resilience. By implementing these policies and programs, the state aims to achieve a climate-resilient, prosperous, and just future for its people.

1 INTRODUCTION

Land Use Land Cover (LULC) studies are vital for environmental management, urban planning, and agricultural development. They aid in biodiversity conservation, climate change mitigation, and sustainable infrastructure growth. LULC data supports disaster management, watershed management, and waterbody conservation, informing land use policies that promote balanced regional development and sustainable practices. Additionally, LULC studies provide valuable insights for scientific research, enhancing our understanding of ecological and climate systems.

World Environment Day 2024 focuses on land restoration, desertification, and drought resilience (World Environment Day 2024, n.d.), under the theme "***Our Land, Our Future***" with the tagline "***We are #GenerationRestoration***" (UN Environment Programme, n.d.). This theme aligns closely with Sustainable Development Goal (SDG) 15, "***Life on Land***," which aims to protect and conserve all forms of life on land (Martin, 2024). SDG 15 efforts include protecting and restoring ecosystems and biodiversity, sustainably managing forests, halting deforestation, combating desertification, reversing land degradation, restoring degraded land and soil, and protecting threatened species to halt biodiversity loss. In recognition of this occasion, SwitchON Foundation has highlighted several land restoration issues in the state of Maharashtra through this comprehensive report.

2 AN ASSESSMENT OF LAND USE AND LAND COVER

Maharashtra has seen significant LULC changes driven by Urbanisation, agricultural practices, and climate variability. The studies cited provide insights into these dynamics using remote sensing data and GIS techniques.

2.1 URBANISATION

As per Saraf & Regulwar (2024), urbanisation has significantly increased built-up areas. In the Godavari Basin, built-up areas rose from 0.14% to 1.94% (2009-2019). The Sukhana Basin in Aurangabad District saw a 51 sq km expansion in urban areas (1996-2014) (Vikhe & Patil, 2016). This trend indicates growing land pressure from urban populations, often converting agricultural and natural lands into urban use.

2.2 AGRICULTURAL LAND

Agricultural land remains dominant but is changing. The Shrirampur area (2014-2020) had 84% agricultural land. However, the Godavari Basin saw a decline in irrigated cropland from 62.32% to 41.52%, while the Sukhana Basin had a 195 sq km increase in agricultural land (Vikhe & Patil, 2016). These changes reflect shifts in agricultural practices and policies.

2.3 NATURAL LAND COVER

Natural land cover, like forests and water bodies, is declining in some areas. The Sukhana Basin lost 96 sq km of forest and 4 sq km of water bodies (1996-2014), whereas the Godavari Basin saw an increase in forest cover and shrubland from 0.05% to 2.05%. This indicates varying trends in land restoration and deforestation.

2.4 DEGRADED LANDS

Degraded lands, particularly saline soils, are increasing. In Daund Tehsil, saline land increased by 4.8% (2012-2015) due to poor irrigation practices (Divekar et al., 2021). This highlights the need for better land and water management to prevent soil degradation.

2.5 CLIMATE IMPACTS

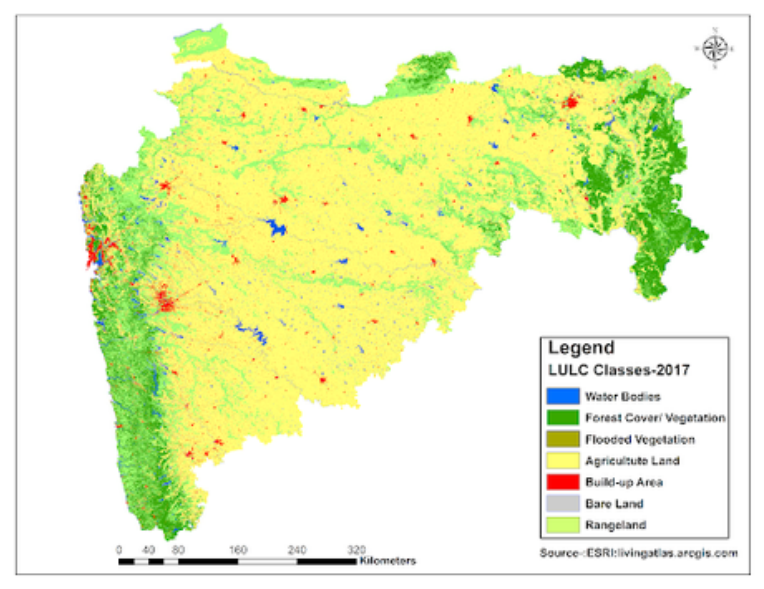
LULC changes significantly impact the regional climate. In Aurangabad District, these changes affect surface temperature and precipitation patterns. Urbanisation and deforestation can worsen climate variability, influencing water availability and agricultural productivity.

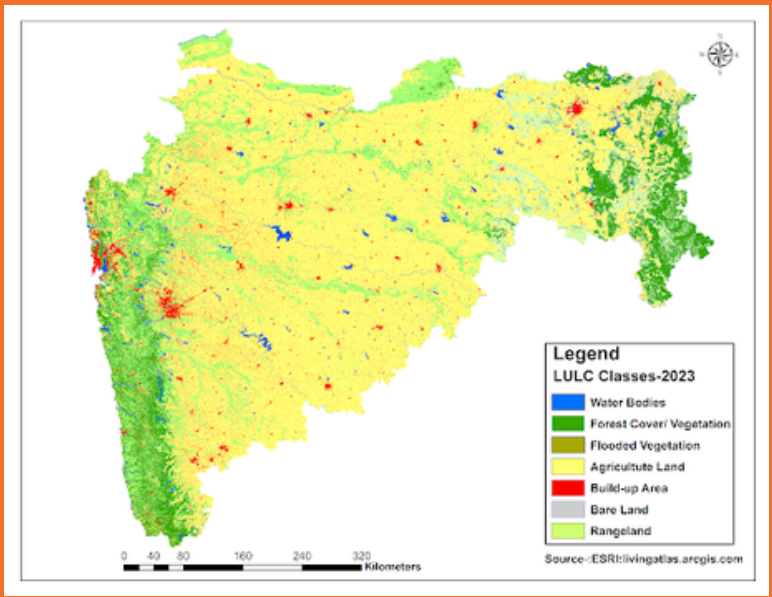
2.6 KEY THEMES IN MAHARASHTRA'S LULC DYNAMICS INCLUDE:

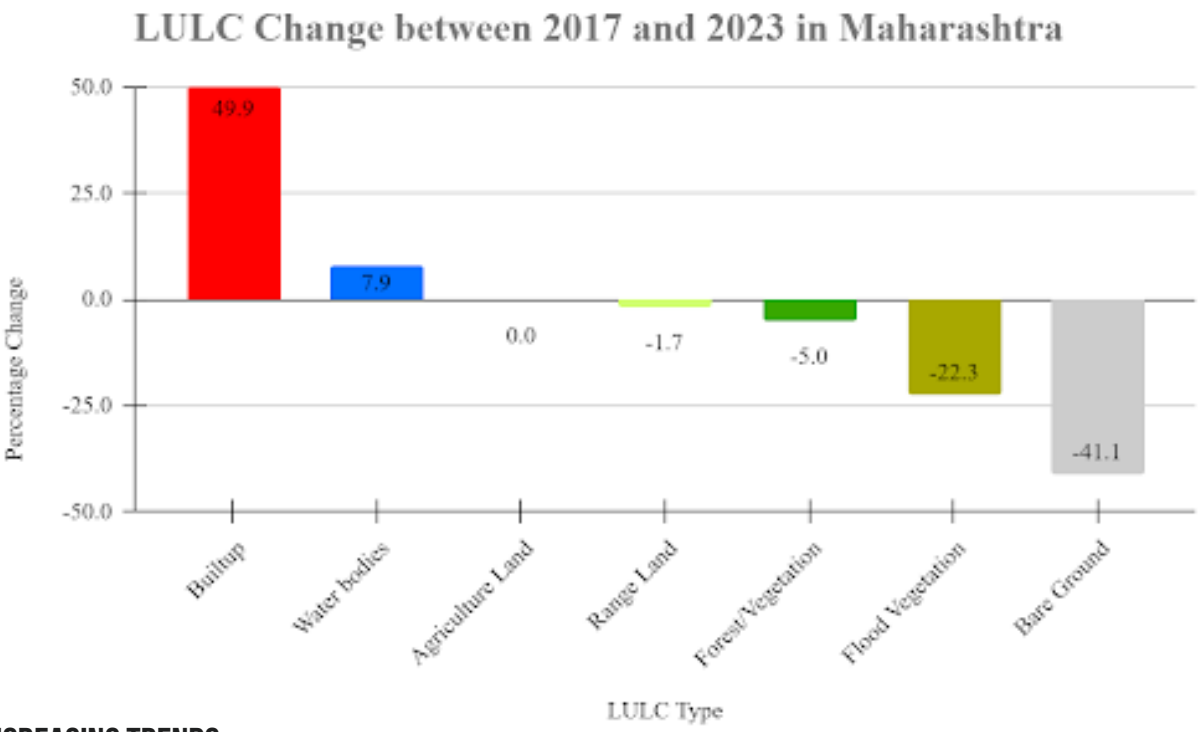
i) Urban Expansion: Reducing agricultural and natural lands, necessitating sustainable urban planning.
ii) Agricultural Changes: Reflecting shifts in practices, requiring supportive policies.
iii) Natural Land Degradation: Calling for conservation and better land management.
iv) Climate Impacts: Requiring the integration of LULC planning with climate adaptation.

3 MAPS ON LAND USE, COVER, AND PATTERN: HIGHLIGHTING THE SHIFTS OVER TIME

Land Use and Land Cover (LULC) maps of the state for the years 2017 and 2023 were obtained from ESRI's Living Atlas of the World (livingatlas.arcgis.com) in GeoTIFF format. These GeoTIFF files were subsequently opened in a GIS platform. Initially, the datasets contained 256 classes, including 0 values, which were later consolidated into 7 classes: water bodies, forest, natural vegetation/forest, built-up areas, barren land, and rangeland (uncultivated grasslands, shrublands, woodlands, wetlands, etc.). The symbology tool in QGIS was employed to classify these areas. The areas of the 7 classes for both years were analysed and calculated to assess the changes between 2017 and 2023.







3.1 INCREASING TRENDS

There has been a substantial increase in built-up areas, which have expanded by nearly 50%. This dramatic growth indicates significant urbanization and infrastructure development across the state. Additionally, water bodies have increased by 7.9%, reflecting efforts such as the construction of new reservoirs, and lakes, or the expansion of existing ones, likely for irrigation, drinking water supply, or flood control purposes.

3.2 DECREASING TRENDS

Conversely, several land cover types have experienced declines. The bare ground has seen the most significant decrease, shrinking by 41.1%, which suggests that previously barren lands have been repurposed, possibly for agriculture or development. Flood vegetation has diminished by 22.3%, indicating changes in floodplain management, reduced flooding events, or conversion to other land uses. Forest and vegetation cover has decreased by 5.0%, pointing towards deforestation, possibly due to logging, agricultural expansion, or urban sprawl. Rangeland has decreased by 1.7%, reflecting a minor decline likely due to conversion to agricultural land or urbanisation. Notably, agricultural land has remained stable, with no change in percentage, suggesting that agricultural practices and extents have been maintained despite other changes in land use.

Overall, the data reflect a trend towards increased urbanisation and water resource development, while natural and semi-natural landscapes, including forests, flood vegetation, and range lands, have been reduced. These changes underscore the ongoing transformation of land use patterns in Maharashtra, driven by developmental pressures and changing environmental management practices.

4 GROUNDWATER RESOURCES: CURRENT SCENARIO AND HOW IT HAS CHANGED OVER TIME

Groundwater is the primary source of freshwaterfresh water, which is crucial for various uses in Maharashtra. Various districts of the state experience significant challenges regarding groundwater. According to the 2022 data from the Central Ground Water Board, Maharashtra's annual groundwater recharge is 32.29 BCM, with a total extraction of 16.65 BCM. Notably, groundwater extraction for irrigation stands at 15.29 BCM, while domestic and industrial uses account for 1.35 BCM (CGWB, 2022). Maharashtra receives an actual rainfall of 1372.5 mm, contributing to the development of 21.26 BCM of groundwater (IMDPUNE, 2022; CGWB, 2022).

As per Dynamic Ground Water Resources Of India, 2023 report of the total groundwater consumed, a significant 85% is dedicated to irrigation, and more than 10% is used for domestic purposes (CGWA, 2023). This heavy reliance on groundwater is evident in the categorization of the state's 272 talukas, where 62 are classified as Semi-Critical, 7 as Critical, and 11 as Over-Exploited (CGWB, 2022). As groundwater extraction rates continue to rise, the balance between recharge and consumption becomes increasingly precarious, posing a significant challenge in meeting the drinking water needs of rural populations, where 80% of the people depend on groundwater.

Table 1: Change in groundwater Scenario over 5 years

Year	Annual Ground Water Extraction (BCM)	Stage of Ground Water Extraction (%)
2017	16.33	54.62
2020	16.63	54.99
2022	16.65	54.68

(Source: Press Information Bureau (PIB), 2022)

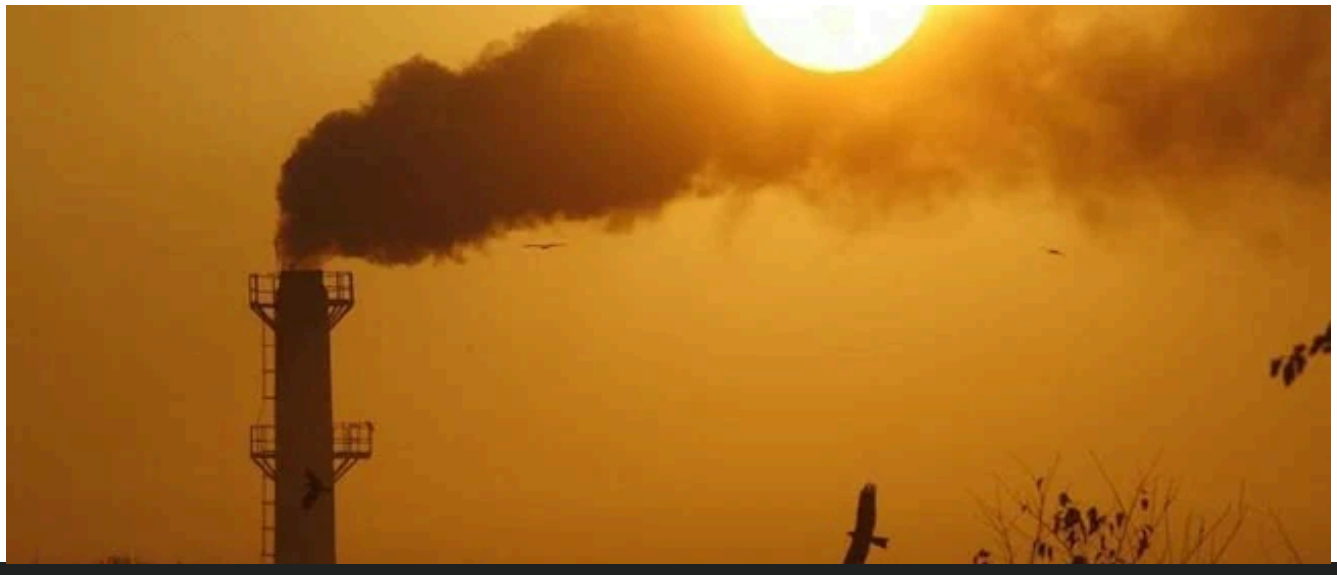
The table1. illustrates the change in groundwater extraction over five years from 2017 to 2022. Despite minor fluctuations, the annual extraction remains relatively stable at around 16.6 BCM. However, the stage of groundwater extraction, as a percentage, shows marginal variability within the range of approximately 54.6% to 55%.

5 PERCEIVED IMPACT OF DROUGHT IN ECOLOGY

Due to climate change, Maharashtra has suffered from dual climate events of droughts and floods. With coastal areas of Maharashtra seeing an increase in floods, while the inner regions of the state have experienced a higher number of droughts. An analysis of meteorological data, mapped the occurrences of droughts from 1970-2019. The study revealed there has been a seven-fold increase in drought occurrences over the last 50 years. With droughts becoming more frequent with every passing decade (Mohanty 2020 & Wadhawan 2020). 11 droughts were recorded between the period of 1970 and 1979. This number rose to 79 during the period of 2010-2019 (Mohanty & Wadhawan 2020). Currently regions such as Aurangabad, Jalna, Latur, Osmanabad, Pune and Nashik are flagged as especially prone to droughts. In recent times, the state suffered from significant droughts in 2012, 2013, 2019 and most recently in 2024 when the state government declared 73% of the state to be drought affected (IndianExpress 2024). It is estimated that the continued reduction in crop productivity will result in a minimum 8% decrease in total gross value for the state (IndiaSpend 2019).

Water scarcity is one of the most immediate impacts of drought in Maharashtra. Approximately 80% of the state's drinking water sources depend on groundwater (Udmale et al, 2014). However, prolonged droughts and consecutive years of reduced monsoon rainfall have severely depleted these reserves. The average residence time of shallow groundwater in the state is less than four years, making it highly vulnerable to extended drought periods. The situation is exacerbated by the increased extraction of groundwater through bore wells, some extending over 600 meters deep, which threatens long-term water availability and leads to severe water scarcity.

Additionally, droughts in Maharashtra have led to significant ecological imbalances. The reduction in water availability affects not only human populations but also wildlife and natural vegetation. Prolonged drought conditions can lead to desertification, further degrading the fragile ecosystem. The state has witnessed shifts in the cultivation calendar, new pest attacks, and longer pest infestations due to changing climate patterns (IndiaSpend 2019). With 70% of Maharashtra's geographical area classified as semi-arid, the region is particularly vulnerable to climate-induced droughts.



6 CONSERVATION, RESTORATION, AND THE MANAGEMENT PLAN OF THE URBAN WETLANDS-

6.1 OVERVIEW

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Overall, the data reflect a trend towards increased urbanisation and water resource development, while natural and semi-natural landscapes, including forests, flood vegetation, and range lands, have been reduced. These changes underscore the ongoing transformation of land use patterns in Maharashtra, driven by developmental pressures and changing environmental management practices.

6.2 THREATS TO WETLAND

In Maharashtra, the threats to freshwater resources are predominantly uniform throughout the state, though some threats are specific to particular sites. These major threats vary in character and intensity, posing significant challenges to the conservation and sustainability of these vital ecosystems (Jay Samant). The major threats include-

- **Land Use Transformation and Degradation:** The conversion of land for urban, industrial, and agricultural purposes, alongside soil erosion, significantly impacts wetland ecosystems.
- **Water Mismanagement and Pollution:** The misuse of water for agriculture and industry, coupled with untreated sewage and industrial effluents, leads to widespread water contamination (Jay Samant).
- **Biodiversity Decline and Invasive Species:** Invasion by non-native plant species results in the displacement of indigenous flora, leading to a reduction in local biodiversity and ecological disruption (Jay Samant).
- **Climate Variability and Natural Disasters:** Changing climate patterns, including more frequent and intense droughts, floods, and other natural disasters, pose significant threats to wetland health and stability (Jay Samant).

6.3 WETLAND RESTORATION EFFORTS

- **Identification and Prioritization**

  The conversion of land for urban, industrial, and agricultural purposes, alongside soil erosion, significantly impacts wetland ecosystems.

- **Pragmatic Government Policies**

  Implementing pragmatic government policies with active community participation to ensure judicious use of water from all available sources, including rivers, reservoirs, dams, tanks, and ponds.

- **Local Agriculture Adaptation**

  Aligning local agriculture practices with regional agro-climatic conditions and the availability of local water resources to ensure sustainable water use.

- **River Basin Approach**

  Implementing a river basin approach for irrigation to ensure equitable distribution of water among all stakeholders in the basin, discouraging ad-hoc water diversion for non-priority uses.

- **Promotion of Drip Irrigation**

  Promoting the mandatory use of drip irrigation technology for water-intensive crops like sugarcane and bananas, allowing farmers to grow multiple crops efficiently with the available water.

- **Conservation Awareness**

  Creating awareness about wetland conservation by seeking recognition for state-identified wetlands as wetlands of national or international importance from organizations like the Ramsar Convention Bureau and Wetland International.

- **Advocacy for Recognition**

  Advocating for the recognition of Maharashtra's wetlands as internationally significant sites by global bodies like Ramsar or Wetland International, and seeking recognition from UNESCO as heritage sites for conservation purposes.

7 URBAN FORESTRY: PRESENT STATUS

Urban forestry is essential for preserving ecological balance and enhancing the quality of life in urban areas, including cities like Mumbai and Pune in Maharashtra, India. As the state's population continues to increase, the importance of effective urban forestry management grows. Urban forests not only provide aesthetic value but also play a crucial role in mitigating the urban heat island effect, improving air quality, and supporting biodiversity.

7.1 MIYAWAKI DENSE FOREST PROJECT UNDER GREEN MAHARASHTRA MISSION

In 2019, the Maharashtra government launched the 'Green Maharashtra Mission' aimed at planting 33 crore trees. As part of this initiative, the government decided to implement the 'Miyawaki Dense Forest Project', inspired by the successful 'Anandwan Project'. The project aimed to increase tree density, achieve faster growth, and utilize native species (Pinjarkar, 2019).

To expand green cover, the government planned to implement the project in MIDCs, corporations, municipalities, and at dumping grounds. The forest minister instructed the Forest Development Corporation of Maharashtra (FDCM) to lead the initiative and guide other organizations. This initiative was part of the government's broader goal to increase green cover from 20% to the mandated 33% by planting 33 crore trees (Pinjarkar, 2019).

The Warje Urban Forest:

Wajre Urban Forest, Maharashtra's first urban forestry project, is located on the outskirts of Pune city (Warje Urban Forest in Pune Now a Role Model for the Country, 2020). Developed through a collaboration involving the public, corporations, NGOs, and government actors, the project transformed a 16-hectare barren land, previously used as a dump yard, into a green space. The land, owned by the Maharashtra Forest Department, was revitalized by the TERRE Policy Centre with support from TATA Motors and Persistent Foundations as CSR partners (Warje Urban Forest, 2023). The project aimed to reduce air pollution and create a recreational space for Pune's urban residents. A total of 9,500 plants from 23 indigenous species, each 6-8 feet tall, were planted and have since grown into 9-10 feet tall trees(Warje Urban Forest in Pune Now a Role Model for the Country, 2020). The park also encourages citizen engagement by allowing individuals to adopt specific plants in their names. It attracts around 1,000-1,500 visitors daily, including morning and evening walkers (Warje Urban Forest, 2023).

Warje Urban Forest

Source: https://terrepolicycentre.com/

CONSTRAINTS AND SOME REMEDIES IN URBAN FORESTATION-

Urban forestation in urban areas faces significant challenges, which are-

- **Space Constraints:** Urban areas often have limited space for planting and maintaining trees, making it challenging to create green spaces (The NJ Tree Care, 2024).
- **Insufficient Resources:** Proper maintenance of urban forests requires significant resources, including time, funding, and coordination from municipal governments, but limited resources often hinder these efforts (Achieng, 2022).
- **Encroachment from Development:** Urban development often leads to the loss of urban forests and green spaces due to the pressure of expansion or infill projects (The NJ Tree Care, 2024).
- **Policy and Institutional Challenges:** Urban forestry projects often face policy and institutional barriers, as municipalities may prioritize other issues over the improvement of green spaces and lack the technical skills and resources needed to manage urban forests effectively (Achieng, 2022).

The few remedies for these challenges are-

08 REGENERATIVE AGRICULTURE: ITS EFFECTIVENESS IN PREVENTING LAND DEGRADATION-

Maharashtra's agricultural and soil conditions are diverse and complex, influenced by regional climatic variations and topographical features. Addressing challenges like soil degradation and water scarcity through sustainable practices such as regenerative agriculture can significantly enhance agricultural productivity and resilience in the state.

- Regenerative practices increase soil organic matter, enhancing nutrient availability and water retention. This is crucial for the semi-arid regions of Maharashtra where water scarcity is a significant issue (Meena et al., 2024).
- Techniques like cover cropping and minimal tillage reduce soil erosion, which is a major problem in the hilly and plateau regions of Maharashtra (Bhattacharyya et al., 2023).
- Crop diversification and agroforestry practices foster biodiversity, which can help control pests and improve ecosystem resilience(Meena et al., 2024).
- Improved soil structure and organic matter content increase the soil's water-holding capacity, which is vital during dry spells and erratic monsoon rains (Bhattacharyya et al., 2023).

9 STATE GOVERNMENT INITIATIVES FOR THE PROMOTION OF SUSTAINABLE AGRICULTURAL PRACTICES-

The interventions induced through support from NABARD aimed at promoting sustainable agricultural practices and the outcome of such initiatives have been detailed below:

- **Campaign on Efficient Use of Water (2018-19)**-The campaign is being implemented in 10 districts of Maharashtra viz, Kolhapur, Sangli, Solapur, Ahmednagar, Osmanabad, Aurangabad, Nandurbar, Washim, Nagpur and Yavatmal. The emphasis of the campaign is on the promotion of drip irrigation in sugarcane and it would complement the efforts of the State Government which aims to promote micro irrigation in a mission mode for sugarcane crops.

- **Ramling Farmer Producer Company (FPC)** was formed in 2015 with the support of NABARD's PRODUCE fund. After the formation of the Producer Company, the members obtained license from the Department of Agriculture and started providing quality agri-inputs like seeds, fertilizers and insecticides at the right time and at a cheaper rate. They also organized various trainings and workshops on the effective use of the inputs by agriculture experts from various organizations to increase the knowledge of farmers.

- Efficient management of natural resources for sustainable agricultural practices-(Organic Farming- VermicompostingIntegrated Farming- Biogas Plant Conversion of Agricultural waste into value-added products etc.

- **"Green Energy Clean Energy: Waste to Wealth Creation"** – Conversion of Agricultural waste to Biomass briquette supported by NABARD. A UPNRM project was sanctioned by NABARD to Agrotech Energy Solution LLP, Mehkar Road, Malegaon, District Washim for conversion of agricultural waste generated from farming into white coal briquettes. These briquettes could be used as a replacement for coal. The use of these briquettes as fuel has not only reduced carbon emissions but also has generated a supplementary source of income for the farmers. The project also provides direct and indirect employment to rural people.

10 SUGGESTIVE WAYS TO RESTORE LAND, HALT DESERTIFICATION, AND COMBAT DROUGHT-

The world is celebrating World Environment Day 2024 on June 05, and bringing attention to how people can contribute to halting environmental deterioration and revitalising neglected regions. Here are a few ways to get involved in ecosystem restoration on World Environment Day-

- **Make agriculture sustainable and use smart farming practices**

In Maharashtra, a significant majority of the people are dependent on agriculture for their livelihood. However, our current farming practices are unsustainable and a prime driver of land degradation. There is a lot that can be done to fix this. Governments can promote regenerative agriculture to increase food production while preserving ecosystems.
The use of artificial intelligence in smart farming techniques offers a practical answer to the problems facing agricultural sustainability in the contemporary period. Time series analysis, deep learning, and machine learning are crucial to smart farming. Agriculture involves a wide range of operations, including crop selection, crop yield prediction, categorisation of soil compatibility, and water management. Time series analysis is used for agricultural demand forecasting, commodity price prediction, and crop yield production forecasting. Machine learning algorithms are to be utilised for crop selection and management. Deep learning techniques are to be used for crop selection and crop production forecasting. Machine learning and deep learning algorithms are to be used to select crops based on a variety of parameters, including soil composition and compatibility classification.

- **Preserve the Soil**

One of the most biodiverse environments is soil. 95% of the food we eat comes from the earth, where nearly 60% of all organisms reside. To mitigate climate change, healthy soil serves as a carbon sink, trapping greenhouse gasses that might otherwise escape into space. Governments and the financial industry may encourage organic and soil-friendly farming to maintain healthy and productive soil. Zero-tillage is a practice that agricultural businesses can use to maintain organic soil cover by farming crops without disturbing the soil through tillage. The fertility of the soil could be increased by adding compost and other organic materials. Mulching and drip irrigation are two examples of irrigation strategies that can be utilised to assist in maintaining soil moisture levels and minimize drought stress. Individuals can also make compost from leftover scraps of fruits and vegetables and use in their kitchen gardens and balcony plant pots.

- **Protecting the Pollinators**

75% of the crops are dependent on pollinators (United Nations Environment Program, 2024). The most abundant pollinators are bees, bats, insects, butterflies, birds, and beetles all contribute significantly but bees are the most prolific ones. Some fruits, such as mangoes, avocados, and bananas would disappear if bats disappeared. All pollinators, bees, in particular, are seriously declining despite their importance.
In order to save them, humans need to reduce air pollution, lessen the harmful effects of fertilizers and pesticides, and preserve the wetlands, woodlands, and meadows that are home to pollinators. To help restore nature, governments and citizens need to grow urban green areas and add additional ponds that are beneficial to pollinators. Birds, butterflies, and bees will be drawn to urban and residential gardens when a wide variety of native flowers are planted.

- **Revitalization of the Freshwater Ecosystem**

Freshwater ecosystems sustain the water cycles that keep land fertile. They supply food and water to people, protect us from droughts and floods, and provide a habitat for countless plants and animals. Yet they are disappearing at an alarming rate due to pollution, climate change, overfishing and over-extraction. People can stop this by improving water quality, identifying sources of pollution and monitoring the health of freshwater ecosystems. Maharashtra can join the Freshwater Challenge to accelerate the restoration of degraded rivers and wetlands by 2030 (Freshwater Challenge, 2023). Invasive species could be removed from degraded freshwater habitats and native vegetation replanted. Cities could champion wastewater innovation that addresses sewage management, stormwater runoff and urban flooding.

- **Renewing the Coastal Belts**

Seas and oceans assist communities to prepare for catastrophic weather events and mitigate climate change while simultaneously giving humans oxygen, food, and water. The livelihoods of almost 3 billion people, mostly in developing countries, are dependent on marine and coastal biodiversity.
Governments can expedite the adoption of the Kunming-Montreal Global Biodiversity Framework to safeguard this priceless resource for future generations. In order to stop pollution, excess nutrients, agricultural runoff, industrial discharge, and plastic waste from seeping into coastal areas, the government can restore blue ecosystems, which include mangroves, salt marshes, kelp forests, and coral reefs (CBD, 2024). A life-cycle strategy might be utilized by nations to redesign plastic items so that they can be recycled, repaired, reused, and eventually kept out of the ocean.

- **Reintroducing Nature to the Urban Space**

More than 45% of the people of Maharashtra live in cities. By 2050, it is projected that two in three people will live in an urban centre. Cities consume 75 per cent of the planet's resources, produce more than half its global waste and generate at least 60 per cent of greenhouse gas emissions (United Nations Environment Program, n.d). As cities grow, they transform the natural world around them, potentially leading to droughts and land degradation (United Nations Environment Programme, 2024). Urban forests can improve air quality, provide more shade and reduce the need for mechanical cooling. Preserving cities' canals, ponds and other water bodies can alleviate heatwaves and increase biodiversity. Installing more roof and vertical gardens in the city buildings can provide habitats for birds, insects and plants.

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