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NAGRIKAL

CITIZENS VOICES
FOR AND FROM
SMALL CITIES

Deep-Dive

FROM DEFINITION TO CONSERVATION

A Study on Urban Wetlands
of India



NAGRIKA

A Deep-dive into the world of Urban
Wetlands with discussions derived from
lived experiences of Indian Cities



About Nagrika

Nagrika is a think-tank enabling citizens in small and mid-sized cities. We create knowledge that shapes unique, authentic and resilient cities. Through this knowledge, we mainstream the voice of citizens in decision making.

We co-create accessible and free knowledge resources for citizens and city governments. We have been creating knowledge about smaller cities from a small city. Much of this knowledge did not exist before and we strongly believe that what we are creating is needed by many but created by none. Our interventions have made it possible to understand these cities better. Slowly and steadily, our work has ensured that smaller cities become part of policy agendas of urban policy making.

We build a sense of ownership and community in small towns while strengthening city-policy-citizen relationship by demystifying public policy. Our activities include creating and amplifying voices from smaller cities, putting spotlight on developments in smaller cities, analyzing larger trends for their impact on smaller cities and various other initiatives that push the boundaries of thought and action in our small towns.

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This report is a living document and will be regularly updated. It is being informed by our ongoing research and co-created knowledge from various actors and institutions across multiple smaller cities.

Foreword

In an era where climate change poses one of the greatest challenges to our global community, its impacts are being felt most acutely in the world's smaller cities including in India. Amazingly, these are the cities where the amount of research and knowledge is limited and hence, these impacts are largely undocumented. These areas, also overlooked in the broader discourse on environmental policy and action, face unique challenges that require innovative solutions. Einstein argued that while knowledge may be limited to what we know and understand in the present, imagination embraces everything that is there to know and understand. This report on Urban Wetlands in India is a symbol of our commitment to enable such re-imaginings in the face of climate change. We want to empower smaller cities to be at the forefront of climate change solutions by fuelling the imagination of citizens, communities and decision-makers through new thought and perspectives from smaller cities.

The Significance of Urban Wetlands for Climate Change

Urban wetlands are vital in the fight against climate change, offering natural solutions to some of our most pressing environmental challenges. They act as natural sponges, absorbing excess rainfall and reducing the risk of floods. They purify our water, filtering pollutants and improving water quality. They also serve as biodiversity hotspots, providing habitat for a wide range of species. This report delves into the myriad ways urban wetlands contribute to the health and resilience of our cities, highlighting their importance in groundwater recharge, flood control, and as sources of livelihood for many communities. Climate change introduces a complex array of challenges for smaller cities, particularly in developing countries like India. These cities are often on the front lines of climate impact, facing increased risks from natural hazards such as floods, droughts, and storms, which are becoming more frequent and severe due to climate change.

Urban areas, with their dense populations and infrastructure, are particularly vulnerable to these impacts, which can impact communities, economies, and ecosystems. Urban wetlands are among the most affected ecosystems, suffering from both the direct impacts of climate change and the indirect effects of human activities. The changing climate, characterized by rising temperatures and altered precipitation patterns, affects the hydrology and ecology of wetlands, compromising their ability to provide essential services. Human activities, including overuse of water resources and pollution, further exacerbate these impacts, leading to a decline in wetland health and functionality.

Reimagining Thought and Action for Urban Wetlands

It has been our belief that empowering small cities through imagination can lead to transformative change. This Nagrikal report serves as a call to action, urging us to rethink our relationship with urban wetlands. By bringing forth perspectives and narratives from citizens, citizen-based organisations, community leaders, researchers, businesses and policymakers, we hope to push the discourse beyond our current thinking in an effort to reimagine and revitalize these ecosystems.

The report provides practical insights on the opportunities and challenges for community engagement, policy reform, and sustainable practices that can help protect and restore urban wetlands.

Addressing the challenges faced by urban wetlands in the context of climate change requires a reimagined approach to urban environmental management. This involves integrating wetland conservation and restoration into urban planning and development policies, recognising the value of these ecosystems in climate change mitigation and adaptation strategies. Innovative solutions, such as the creation of green jobs in wetland restoration and the use of digital technology for ecosystem monitoring, can also support these efforts.

Engaging communities in wetland conservation is essential. Public awareness and participation can drive the protection and sustainable management of urban wetlands, ensuring their benefits are preserved for future generations. This community-based approach aligns with the broader objectives of empowering smaller cities to become more resilient and sustainable in the face of climate change.

The Report's Contribution

This publication contributes to our broader goals of creating climate-ready cities by offering an examination of urban wetlands from multiple dimensions. From defining these critical ecosystems to exploring the challenges of their management, the report aligns with our objective of using imagination to drive meaningful action. It places a special emphasis on lakes as urban wetlands, highlighting their unique benefits and adaptability to urban settings.

We invite readers to engage with the findings of this report and join us in the collective effort to reimagine the future of small cities in the face of climate change. By drawing on the insights and strategies outlined in this publication, stakeholders at all levels can initiate meaningful change. Let us harness the power of imagination to develop innovative solutions to the challenges posed by climate change, ensuring a sustainable and resilient future for our urban environments.

It is our hope that this report will not only inform but also inspire action and innovation in urban wetlands management and beyond. Together, we can achieve our vision of sustainable, resilient, and vibrant urban communities for generations to come.

Executive summary

This Nagrikal series examines Urban Wetlands in India. We start from the basics, i.e., defining what wetlands are, to their significance and decline in the Indian urban landscape.

The report is broadly categorised into four chapters. The first chapter delves into the definition of 'wetlands,' both as per the international Ramsar Convention to which India is a signatory as well as the definition according to the current Indian legislation governing urban wetlands. As the report extensively addresses various aspects of wetlands, this chapter essentially establishes the parameters for understanding the term within the specific context of the report i.e., wetlands in India's urban areas. This chapter also discusses some of the key statistics related to wetlands in India - both in terms of distribution and area.

In the second chapter, we dive into the importance of Urban Wetlands for the cities. According to Wetlands International South Asia, approximately 8% of the total wetland area in India is located within urban areas. In this chapter, we provide examples of Wetlands in Indian cities that demonstrate the vital role of wetlands in groundwater recharge, flood buffering, wastewater filtration, and providing income generation opportunities. A spotlight on the case of East Kolkata Wetlands giving further insight as to how a wetland can be beneficial to the well-being of a city.

In the third chapter, we discuss the decline of Urban wetlands. Indian cities - big,

medium, and small, are simultaneously going through significant changes in their landscape. A consequential outcome of this rapid development is the observed decline of ecology of the urban wetlands. Similar to the previous chapter, we illustrate this decline of wetlands through examples from Indian cities, emphasising the ongoing challenges. The chapter concludes with a spotlight on the case of Deepor Beel in Guwahati that is experiencing the kind of decline previously discussed.

The fourth chapter delves into the complexities and strategies involved in effectively conserving and managing urban wetlands. It highlights the diverse array of stakeholders, policies, gaps, and potential solutions associated with wetland management in urban areas. The chapter underscores the importance of community engagement, as local communities often rely on the wetland for livelihoods, recreation, or cultural practices. The chapter also discusses the role of various stakeholders, including citizens, NGOs, local bodies. The chapter also has a spotlight on the case of Udaipur, highlighting some of the community based initiatives involved in management of the city's wetlands.

This edition of our report has placed a greater focus on lakes as urban wetlands, primarily due to their unique suitability and numerous advantages in urban settings, in contrast to other types of wetlands. Lakes, often centrally located within cities, are more adaptable to urban

landscapes and provide a range of ecosystem services that are directly beneficial to denser populations. They offer a readily accessible source of water for domestic and industrial use, crucial green spaces for recreation, and serve as biodiversity hotspots in otherwise concrete-dominated environments.

Furthermore, the report highlights a range of phenomena related to urban wetlands by combining conceptual discussions with real-life experiences and examples from cities. While prominent cities such as Bangalore, Delhi, and Chennai are

referenced to highlight specific instances, conscious efforts have been made to include examples from less-discussed cities like Srinagar, Nainital, Leh, Kollam, Guwahati, among others.

The insights provided in this report aim to enhance citizens' understanding of urban wetlands and wetlands in general. Moreover, it seeks to inspire citizens, civil societies, and authorities to raise awareness and take action for the improved protection and conservation of wetlands in our cities.



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Introduction

Urban Wetlands and Lakes

Wetlands are remarkable ecosystems that are often overlooked and under-appreciated. Their versatility and ability to perform a variety of important functions have earned them the well-deserved title - "kidneys of the forests". In some places, they even act as a 'kidney' for the cities, such as Kolkata.

In urban environments, wetlands quietly support a wide range of vital functions, such as providing clean water, controlling floods, maintaining biodiversity, and providing livelihoods for countless communities and individuals. They are also a magnet for tourists and provide crucial resources for industries, agriculture, and households.

India's wetlands are incredibly varied; they include everything from lakes and ponds to marshes, mangroves, backwaters, and lagoons. These water bodies are essential for regulating the water balance, preventing flooding, supporting biodiversity, and sustaining livelihoods and food security. Wetlands are found in many Indian cities, including Guwahati (Deepor Beel Lake), Chennai (Adyar flood plains), Mumbai (mangroves), and Kolkata (East Kolkata Wetlands).

Urban lakes, as a category of wetlands, have faced the brunt of unplanned urbanisation. Research indicates that because of the way they have been defined, they have been more prone to exploitation. Hence, this edition of our report has placed a greater focus on lakes

as urban wetlands, as they are the ones that have been under pressure from pollution, land use change, and infrastructure development in multiple Indian cities.

Additionally, they offer unique suitability and numerous advantages in urban settings, in contrast to other types of wetlands. Lakes, often centrally located within cities, are more adaptable to urban landscapes and provide a range of ecosystem services, including a source of water for domestic and industrial use, spaces for recreation, and biodiversity hotspots in otherwise concrete-dominated environments. Many of these services are directly beneficial to denser urban populations.

Lakes often fall under the domain of local governing bodies, unlike rivers and coastal wetlands, which may come under inter-state or national jurisdictions. This distinction significantly influenced our focus on lakes, considering their potential for decentralized management and conservation efforts. Local authorities typically have more direct control and can have a greater interest in managing these bodies of water, allowing for more tailored and responsive conservation strategies. This proximity to governance can also mean greater community involvement and facilitate more effective preservation measures tailored to the unique local characteristics of the lake.

Wetlands International South Asia's

mapping of wetlands from 1970 to 2014 shows that for every square kilometre of increased built-up area, 0.25 square kilometres of wetlands were lost. The cities with the fastest rate of wetland loss were New Delhi, Bangalore, Chennai, Mumbai, and Hyderabad.

Reference

Wetlands International South Asia. 2018. "Wetlands for a Sustainable Urban Future." Sarovar 4 (December): 36.

Part 1

Definitions

Overview

Given the context of urban wetlands as outlined in the above section, this chapter delves into the key definitions that define wetlands in both Indian and international contexts. The chapter also includes information on the various types of wetlands that are present in India. The chapter also talks about their distribution across India, including the proportion of area they cover across various states.



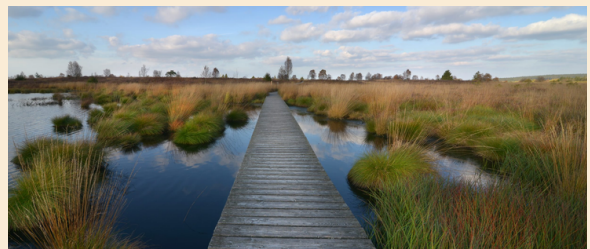
A marsh is an area of land where **water covers the ground for long periods of time**. Marshes are usually treeless and **dominated by grasses** and other herbaceous plants.

What does the term 'Wetland' mean?

Ramsar Definition

India is a signatory to the Ramsar Convention on Wetlands, an international treaty for the conservation and sustainable use of wetlands. The convention was signed in 1971 and came into force in India on February 1, 1982. As of today, India has designated 75 wetlands as Wetlands of International Importance, also known as Ramsar Sites. These sites are spread across the country and are recognized for their significant ecological, botanical, zoological, limnological, or hydrological importance.

According to the Ramsar Convention, wetlands are defined as “areas of marsh, fen, peatland, or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish, or salt, including areas of marine water the depth of which at low tide does not exceed six metres”.



Ecosystems in which **waterlogged conditions prevent plant material from fully decomposing**. Consequently, the **production of organic matter exceeds its decomposition**, which results in a net accumulation of peat



Fens are an important and unique wetland type. **Fens are peat-forming wetlands that rely on groundwater input** and require thousands of years to develop and cannot easily be restored once destroyed.

In other words, according to the Ramsar Convention, wetlands can be any type of water body, from shallow marshes to deep lakes. While some definitions may imply that wetlands are typically shallow water bodies and classify lakes differently from wetlands, it's important to recognize that these ecosystems are interconnected and that both have important roles to play in supporting the health of our planet.

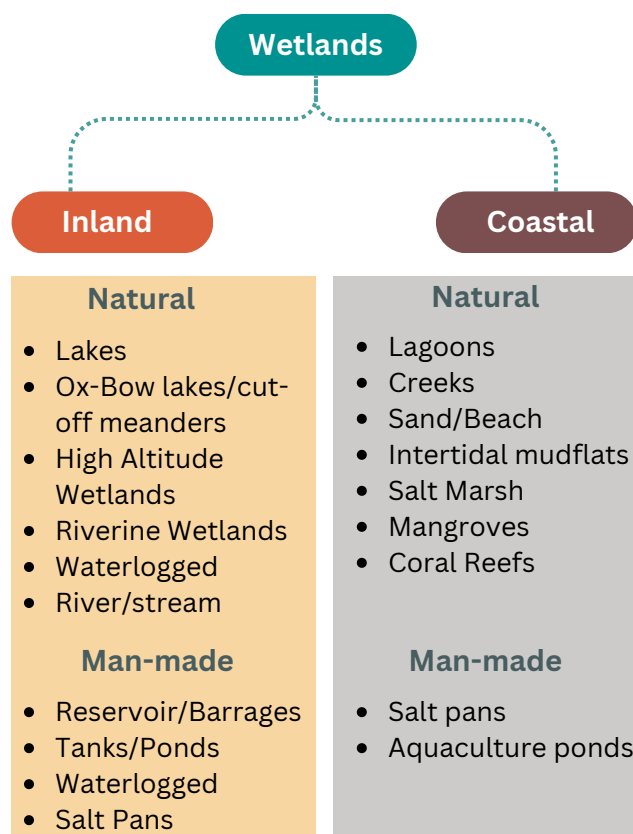
All such wetlands that are found in and around cities or their suburbs may be classified as urban wetlands.

Divergence of Indian definition from Ramsar Convention

The Wetlands Conservation and Management Rules of 2017, which are the principle legislation governing wetlands in India, rule out certain man-made wetlands from being notified as wetlands, even though man-made wetlands are included in the Ramsar list. Due to this, Hussainsagar Lake, a lake that has been around since 1563, has been a topic of debate. It is a hotspot of diversity, with 117 species of plants and 162 species of fauna, including mammals, birds, reptiles, amphibians, and insects. There is a disagreement between the MoEF&CC and the state government regarding whether Hussain Sagar is a wetland or not, causing the issue to remain unresolved. Denotification allows the environmental regulations to become a grey area, which makes the water body vulnerable to exploitation.

Defining the Types of Wetlands

The wetlands can be categorised into four broad categories: Inland natural; inland manmade; coastal natural; and coastal man-made wetlands.



Inland wetlands: Areas of of water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt' (unlike marine and coastal wetlands not affected by tidal flood).

Coastal wetlands: Wetland types found in coastal watersheds include salt marshes, bottomland hardwood swamps, fresh marshes, mangrove swamps, and shrubby depressions.

Figure 1: Classification of Wetlands
Source: RAMSAR and USEPA

The distribution of these wetlands in India is varied and extensive, encompassing both natural and man-made wetlands. Rivers and streams are the most prevalent, making up 34.46% of the total wetland area. Lake/ponds also represent a significant portion, comprising 4.78% of the total wetland area. These natural inland wetlands, which also include lake/ponds, ox-bow lakes/cut-off meanders, and riverine wetlands, constitute the majority of wetland areas, accounting for 43.39% of the total wetlands in India. Overall, the inland wetlands constitute almost 70% of the wetlands in India.

Coastal wetlands, on the other hand, contribute 27.13% to the total wetland area. Natural coastal wetlands such as lagoons, creeks, mud-flats, mangroves, coral reefs, etc. make up almost 24% of total wetlands. Man-made coastal wetlands such as salt pans and aquaculture ponds add another 2.86%.

Interestingly, smaller wetlands, i.e., wetlands less than 2.25 hectares in size (which have not been mapped due to technological and methodological reasons), constitute the remaining 3% of the total wetland in India.



Figure 2 : Types of Wetlands with examples
Source : National Wetlands Atlas- India

Where are the Wetlands?

There are about 7.5 lakh (750,000) wetlands in India. West Bengal has the most wetlands (147,000), followed by Uttar Pradesh and Orissa. However, the majority of the wetlands in West Bengal are smaller than 2.25 hectares. States like Gujarat, Andhra Pradesh, and West Bengal have a high proportion of coastal wetlands, while

states like Uttar Pradesh have the highest inland wetlands.

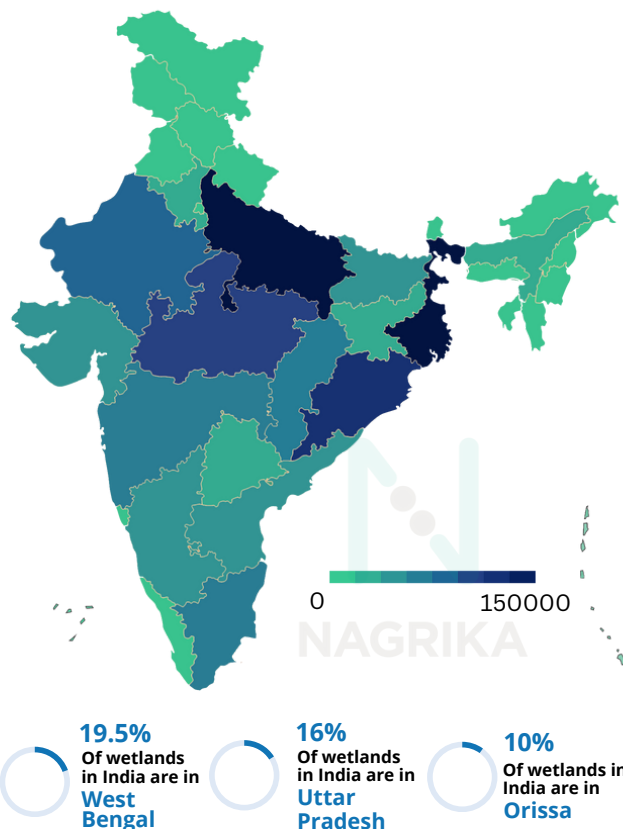


Figure 3 : Number of wetlands : States-wise
Source : National Wetlands Atlas - India

How much area do they cover?

The diverse wetland ecosystems cover substantial areas, with certain types occupying larger percentages of the total wetland area, as highlighted before. Rivers and streams are the most expansive, covering 34.46% of the wetland area. Following this, reservoirs and barrages represent a significant portion, accounting for 16.26% of the total wetland area and then intertidal mud-flats that occupy 15.82%. Tanks and ponds also hold a notable share, making up 8.59% of the wetland expanse.

In terms of state wise distribution of the wetland area, the maximum wetland area

is in Gujarat, followed by Andhra Pradesh and Uttar Pradesh. Gujarat contains almost a fifth of the total wetland area in India.

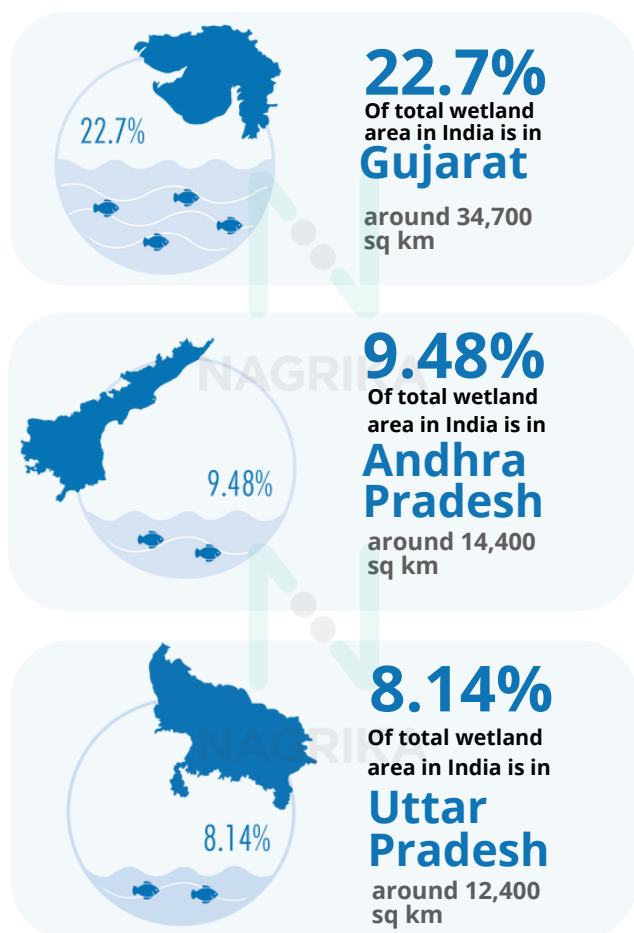


Figure 4 : Top 3 States with maximum wetlands area in the country
 Source : National Wetlands Atlas - India

Proportion within State area

When examining the wetlands area as a percentage of the state's geographical expanse, Gujarat stands out with 17.5 percent, showcasing a significant portion of wetland coverage in the region. Following Gujarat is West Bengal, with 12.5 percent of the state's area being characterised by wetlands.

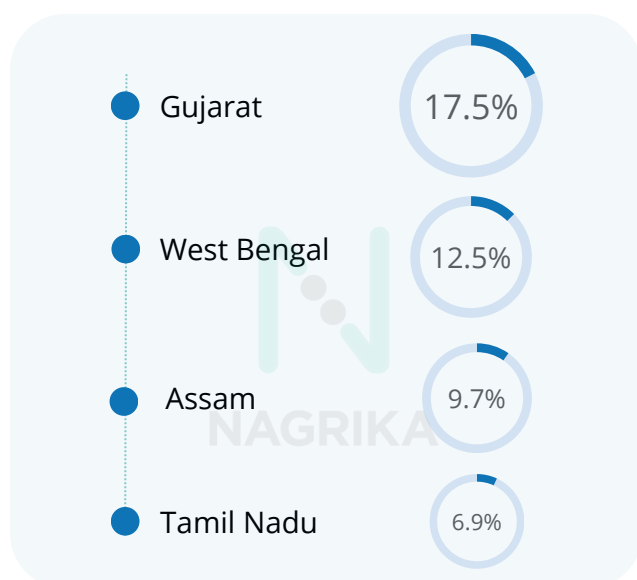


Figure 5 : Proportion within state geographical area
 Source : National Wetlands Atlas - India

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Part 2

Advantages of Urban Wetlands

Overview

As per a Census Report of pan-India water bodies published by the Department of Water Resources, River Development and Ganga Rejuvenation, only 2.9 percent of water bodies (out of a total of 2.35 million) were estimated to be in urban areas. The definition in this census, however, takes a more utilitarian perspective, considering water bodies primarily as units for water storage, unlike the definition of wetlands (as per the Ramsar Convention as well as India's legislation concerning wetlands), which also acknowledges their ecological value.

As per the estimate by Wetlands International South Asia, approximately 8% of the overall wetland area is located within urban sprawls. More than half of the entire area of urban wetland is made up of the states of Andhra Pradesh, Telangana, West Bengal, Odisha, and Uttar Pradesh.

Even though a small percentage of the wetland area (as well as water bodies in general) are in urban areas, their presence is critical to cities. The presence of healthy wetlands is essential for creating livable cities and towns, as they

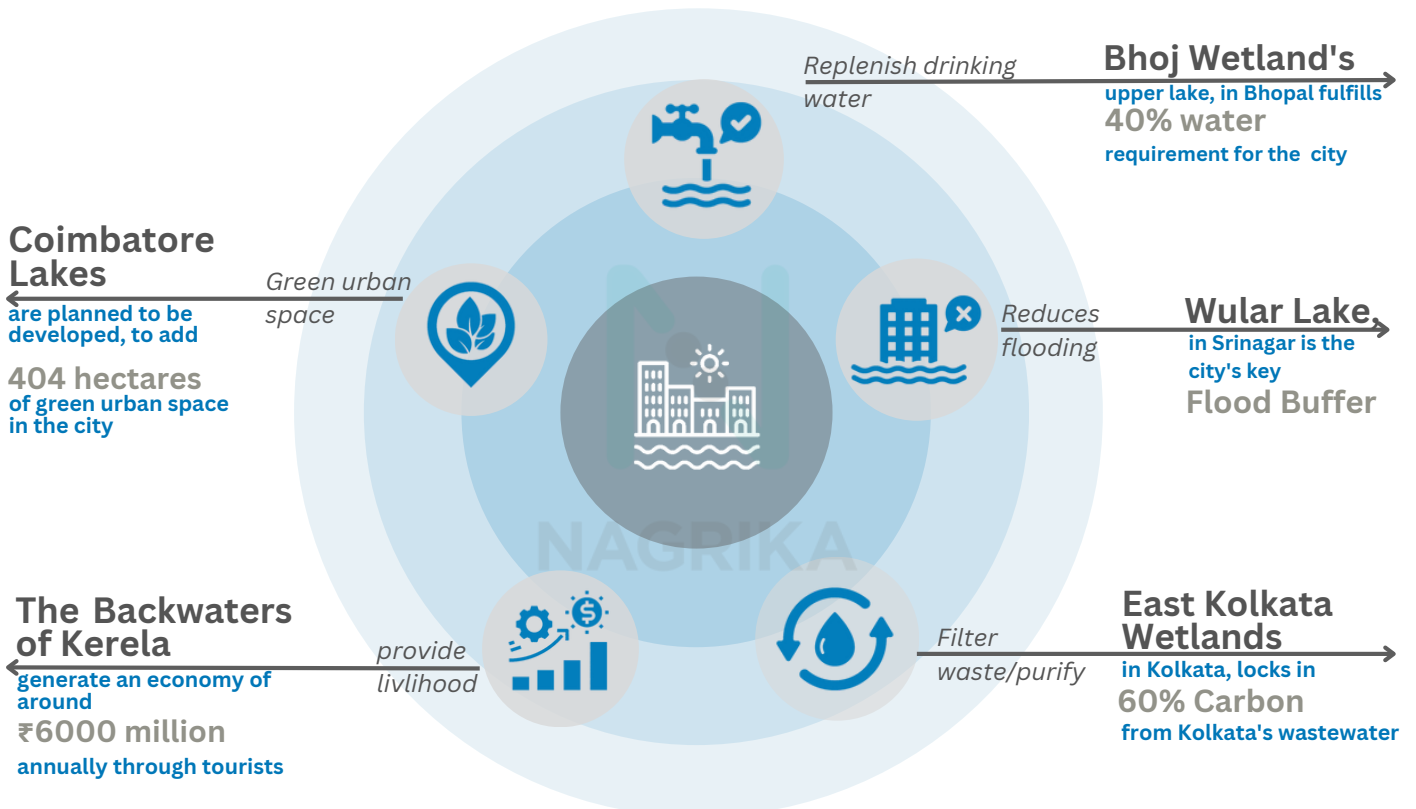


Figure 6 : Advantages of Urban Wetlands : Indian Examples
Source : Various sources

contribute significantly to groundwater recharge, flood mitigation, wastewater filtration, microclimate regulation, the improvement of aesthetic appeal, and the provision of opportunities for livelihoods. The current chapter delves into some of these benefits that urban wetlands accord to cities (Figure 6).

Flood Control

“Water bodies are an essential source of flood moderation and act as retention or detention basins. The importance of these water bodies is not being realised,” as per Mr Sharad Chandra, director of the flood forecast monitoring division of the Central Water Commission. The frequent flooding in Chennai, Hyderabad, and Bangalore has all been attributed to encroachments and neglect of Wetlands (Figure 7).

The residential area of Velachery in Chennai serves as an example of flooding because of the neglect of its wetlands. The area was severely affected by flooding in 2015 and continues to experience flooding every November due to the encroachment of the neighbouring Pallikarandai marshland. Over time, the marshland has been encroached upon and has lost 1850 hectares (nearly 75.5% of the total wetland) between 1991–2015 to projects like the Mass Rapid Railway line, the IT corridor, and other infrastructural projects. Due to this, the wetland could no longer hold the capacity to absorb a large amount of flood water.

Wetlands act as natural sponges that trap and slowly release flood waters. Wetland vegetation also slows the flood water and distributes it slowly over the floodplain. When the catchment area is encroached upon, reduced, or the connections between the water bodies are disconnected, the drainage is compromised, and floods overtake.

Water Supply

Lakes and other wetlands are used for water supply in many cities, like Udaipur, Bhopal, and Mumbai. Almost 40% of the water requirement in Bhopal is met by Bhoj Wetlands (Upper Lake). Similarly, in Udaipur, the city’s water requirement is met by lakes like Pichhola Lake, Fatehsagar Lake, and Jaisamand Lake (Figure 8).

Wetlands also help hold rainwater and allow it to soak into the ground, which helps increase the level of the water table, i.e., the amount of water stored beneath the ground. For example, as part of the Delhi government’s initiative ‘City of Lakes’ launched in 2018, some of the completed projects have reportedly led to an increase of up to 2 metres in groundwater levels. Similarly, in Mysore and other parts of Karnataka, dried-up lakes are being revived by the irrigation department to improve the overall groundwater level.

Climate Change

Lakes are critical components in the fight against climate change, serving both as biodiversity hotspots and climate regulators within an urban landscape. These water bodies provide sanctuary for a multitude of species, from fish and amphibians to a variety of bird species and aquatic plants, thus playing a pivotal role in maintaining urban biodiversity. The presence of such diverse ecosystems within city limits not only enriches ecological diversity but also contributes to the genetic reservoir necessary for species adaptation and resilience in the face of environmental changes.

Lakes also act as natural climate buffers, mitigating the urban heat island effect that is exacerbated by the prevalence of concrete and asphalt, which absorb and

re-radiate heat. The water in these lakes absorbs heat during the day and releases it more slowly than on urban surfaces, leading to cooler surrounding areas. This temperature regulation is vital for maintaining a more stable and comfortable urban climate, which can reduce the need for energy-intensive air conditioning and contribute to lower greenhouse gas emissions.

Additionally, lakes are more sensitive to broader environmental changes and can provide early warning signals for the impacts of climate change, making their preservation and management a key aspect of urban sustainability strategies.

Recreational Spaces

The Biophilia hypothesis dictates that people possess an innate connection with nature. Hence, wetlands have also acted as a community engagement space for people for social interaction and recreation. Wetlands like Sukhna Lake in Chandigarh and Shahpura Lake in Bhopal are examples of wetlands being used as recreational spaces by the locals.

Many neglected wetlands hold the potential to be developed into accessible green urban spaces. This potential is being realised in some smart city

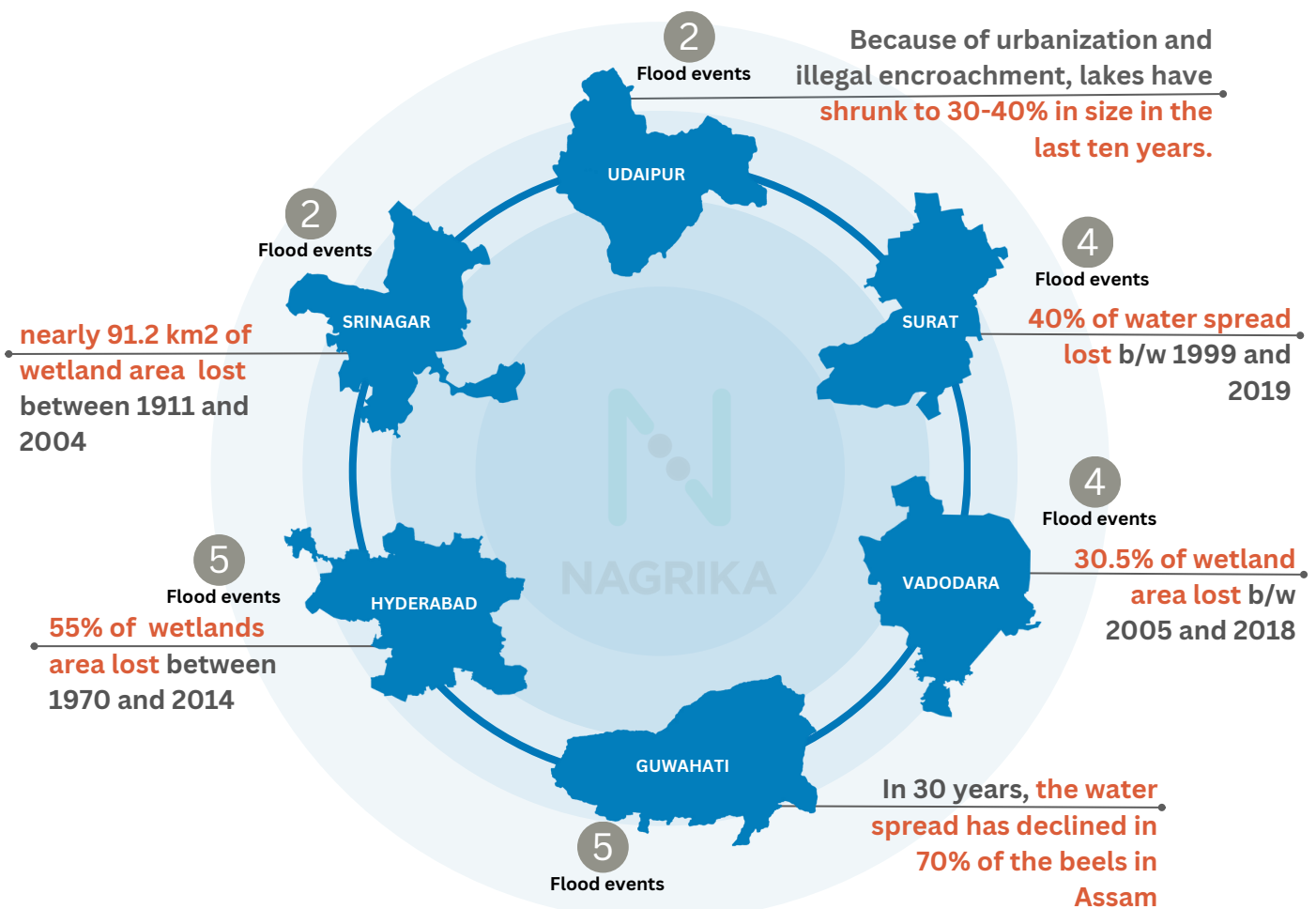


Figure 7 : Loss of water spread and recent floods : Indian Examples (Flood events were recorded between 2005-2016)
 Source : Centre for Science and Environment, Other Various sources

proposals, like Faridabad and Coimbatore. In Coimbatore, the smart city mission aims to rejuvenate all of the city's wetlands and convert them into urban green spaces like parks and gardens. The plan was to thereby increase the green area per person to 4.3 square metres, which is double the pre-existing green area- 404 hectares was planned to be added to the already existing 403 hectares. WHO recommends 9 sqm of green space per capita.

Sustaining Livelihoods

Wetlands promote tourism in the city, like in the cases of Naini Lake in Nainital, Dal Lake in Srinagar, and Lake Pichola in Udaipur. Tourism, in turn, aids the generation of various collateral businesses like Houseboat rentals, taxis, cafes, restaurants, hotels, gift shops, etc. The Nainital Lake and its watershed alone generate an economy of INR 50 million per

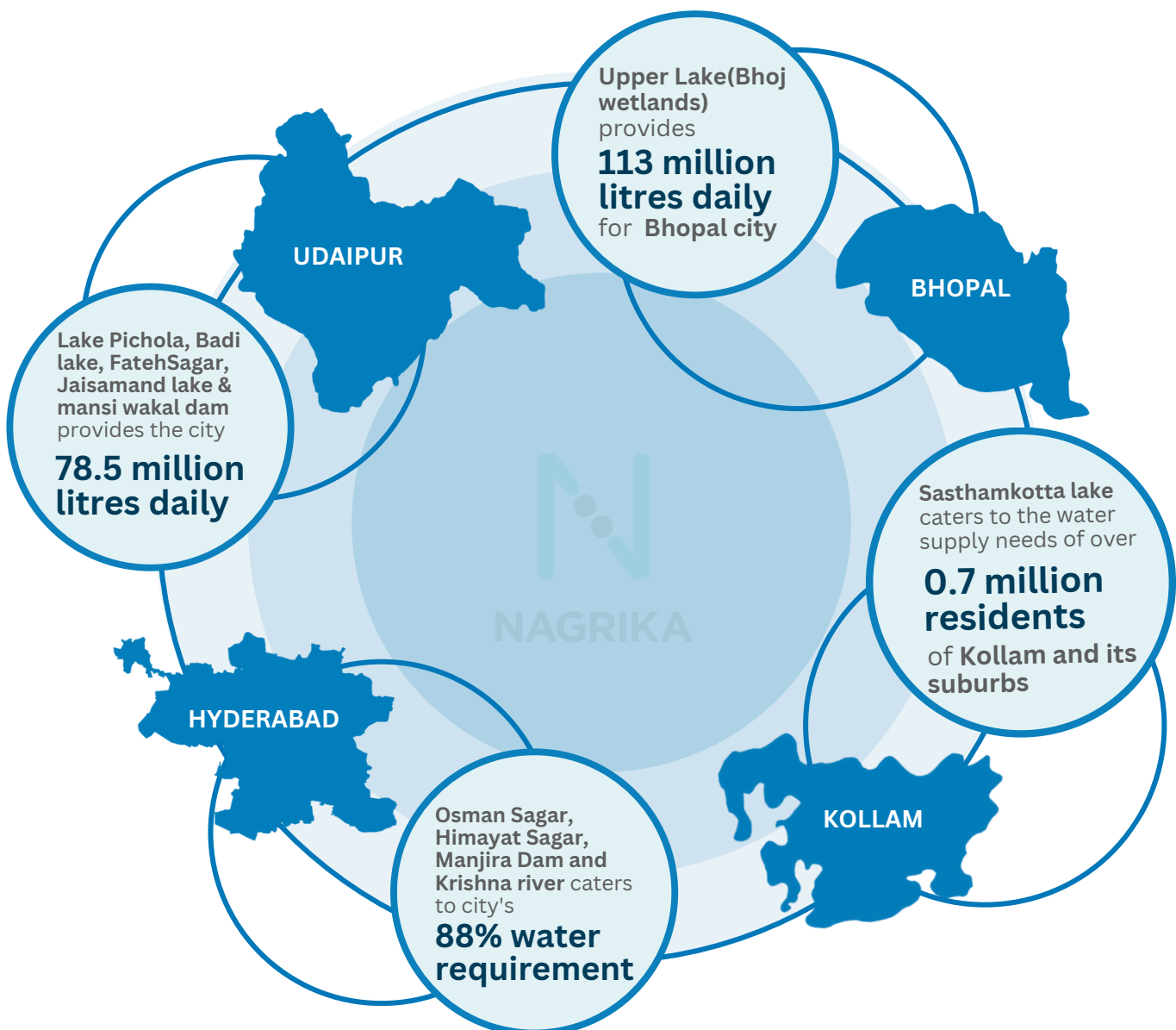


Figure 8 : Wetlands that provide water supply : Indian Examples
 Source : Various sources

hectare annually. They also provide a livelihood for locals through the cultivation of fox nuts, water chestnuts, and vegetables in water bodies. Vegetables like Nadroo (lotus stem), kale, radish, turnips, etc are grown in Dal Lake.

In recent years, India's inland fisheries industry has undergone a significant transformation and now accounts for around 70% of the country's total fish production. There is further potential for further growth through the optimal use of fisheries, technology infusion, and capacity building. Wetlands like Loktak Lake in Manipur and Goroimari Lake in Assam are used by locals to catch fish. The Chetpet Lake in Chennai, restored in 2013, belongs to the Department of Fisheries of the Tamil Nadu government and is now used for water sports and recreational fishing. Some other examples of wetlands maintaining livelihoods are given in Figure 9.

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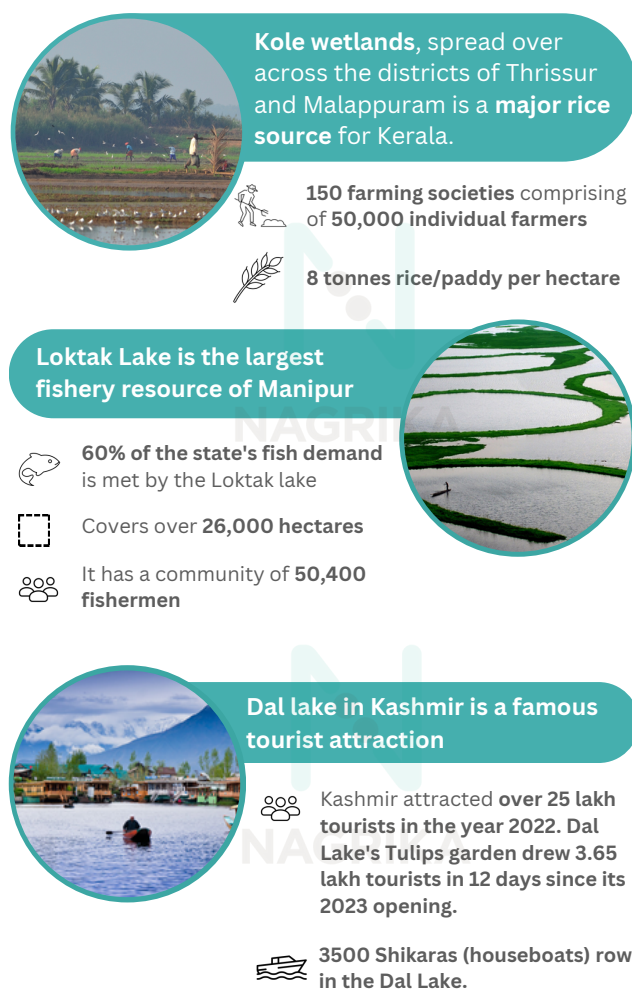


Figure 9 : Wetlands that provide Livelihood : Indian Examples
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Spotlight on Advantages- The case of East Kolkata Wetlands

The East Kolkata Wetlands (EKW) provide a multitude of advantages, both ecological and economic, to the city of Kolkata. As the world's largest natural and organic sewage management system, the EKW treats about 60 to 80% of Kolkata's sewage, supporting around 50,000 agro-workers and supplying about one-third of Kolkata's fish requirement. This unique wastewater-fed aquaculture system processes and recycles wastewater, functioning as a natural kidney for the city. The wetlands treat the daily sewerage produced in Kolkata which saves ₹4680 million annually in terms of purification costs.

The EKW also plays a significant role in carbon sequestration. Researchers have shown that the wetlands lock in over 60% of the carbon, acting as a carbon sink and cleaning up the city's air. The soil and biota (plant and animal life) of the EKW sequester carbon, thereby reducing the amount of CO₂ in the atmosphere.

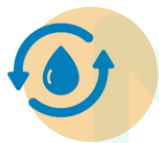
Spread over 125 square kilometres, the wetlands act as a massive sponge that soaks up excess water, which eventually recharges the groundwater. The wetlands produce 20,000 MT of fish, and 50,000 MT of vegetables and irrigate 4700 hectares of paddy fields.

Placed in the flood plains of two rivers (Kulti and Hooghly), the wetlands act as a storage reservoir, thereby protecting



Flood Buffer

Placed in the flood plains of two rivers, the vast extents of the wetlands **act as a storage reservoir**, thereby **protecting Kolkata from Monsoon floodings**



Purify water/filter

The wetlands **treats 65 percent of the daily sewerage** produced in Kolkata. It **saves 4680 million rupees annually** in terms of purification costs



Replenish drinking water

Spread over **125 square km**, the wetlands act as a **massive sponge** that soaks up excess water which eventually **recharges the groundwater**.



Source of livelihood

The East Kolkata wetlands **produce 20,000MT of fish, 50,000MT of vegetables and irrigates 4700ha of paddy fields**

Kolkata from monsoon flooding. In the early 20th century, the first Chief Engineer employed by the Calcutta Municipal Corporation constructed two canals to divert storm water and sewage from the city into the wetlands. The idea was to stabilise the fish population and use the nutrients in the sewage to increase it. These canals can perform even better if the health of the canals is maintained.

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Part 3

Declining Urban Wetlands

Overview

According to Wetlands International South Asia, a staggering 30% of India's natural wetlands have disappeared in the past three decades, largely due to illicit construction, unsustainable urbanisation, agricultural expansion, and pollution. Even smaller cities in India are no longer immune to the challenge of urbanisation, with rapid infrastructure development and concrete sprawl posing a threat to their wetlands. A US-based study has found that for every percentage point increase in impervious surfaces such as roads and parking lots, floods have risen by an average of 3.3% annually.

In this chapter, we will explore the various factors that have contributed to the decline of urban wetlands, drawing examples from several Indian cities.

Unplanned Urbanisation and Encroachment

In the majority of states, wetlands lack recognition as a unique land use category and are frequently combined with the 'wastelands' meant to be utilised for alternate developmental uses. This definitional gap, combined with shortage of land due to the rapid influx of people into urban areas, has triggered unplanned

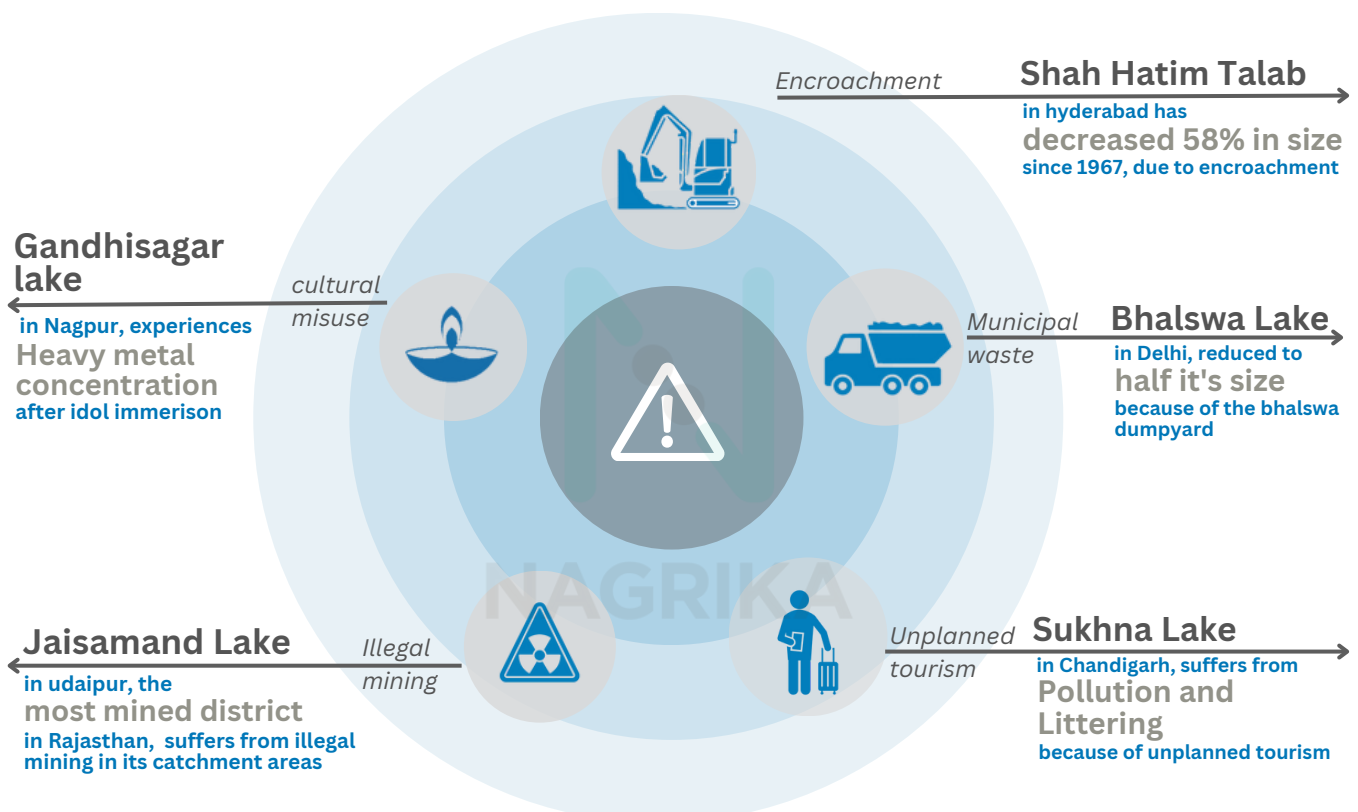


Figure 10 : Reasons for Decline of Urban Wetlands : Indian Examples
Source : Various sources



Figure 11 : The Shah Hatim Talab in Hyderabad decreased by 58% | Source : New Minute



Figure 12 : Development around Kaikondrahalli lake in Bangalore as seen in Google Earth photos from 2002 and 2022

developments and widespread encroachments on wetlands. Chennai has seen a drastic reduction of 90% in its wetlands, primarily due to haphazard urban expansion, which has led to challenges in water security and environmental degradation.

Vadodara has witnessed a 30.5% decrease in wetlands from 2005 to 2018. In Coimbatore, a survey found that 49% of wetlands vanished within 20 years due to human activities. Notably, Kolkata, Gurgaon, and Bangalore are among the other cities where significant portions of wetlands have been taken over by buildings and infrastructure development.

Waste and Pollution

The discharge of municipal waste into wetlands such as lakes, ponds, and rivers

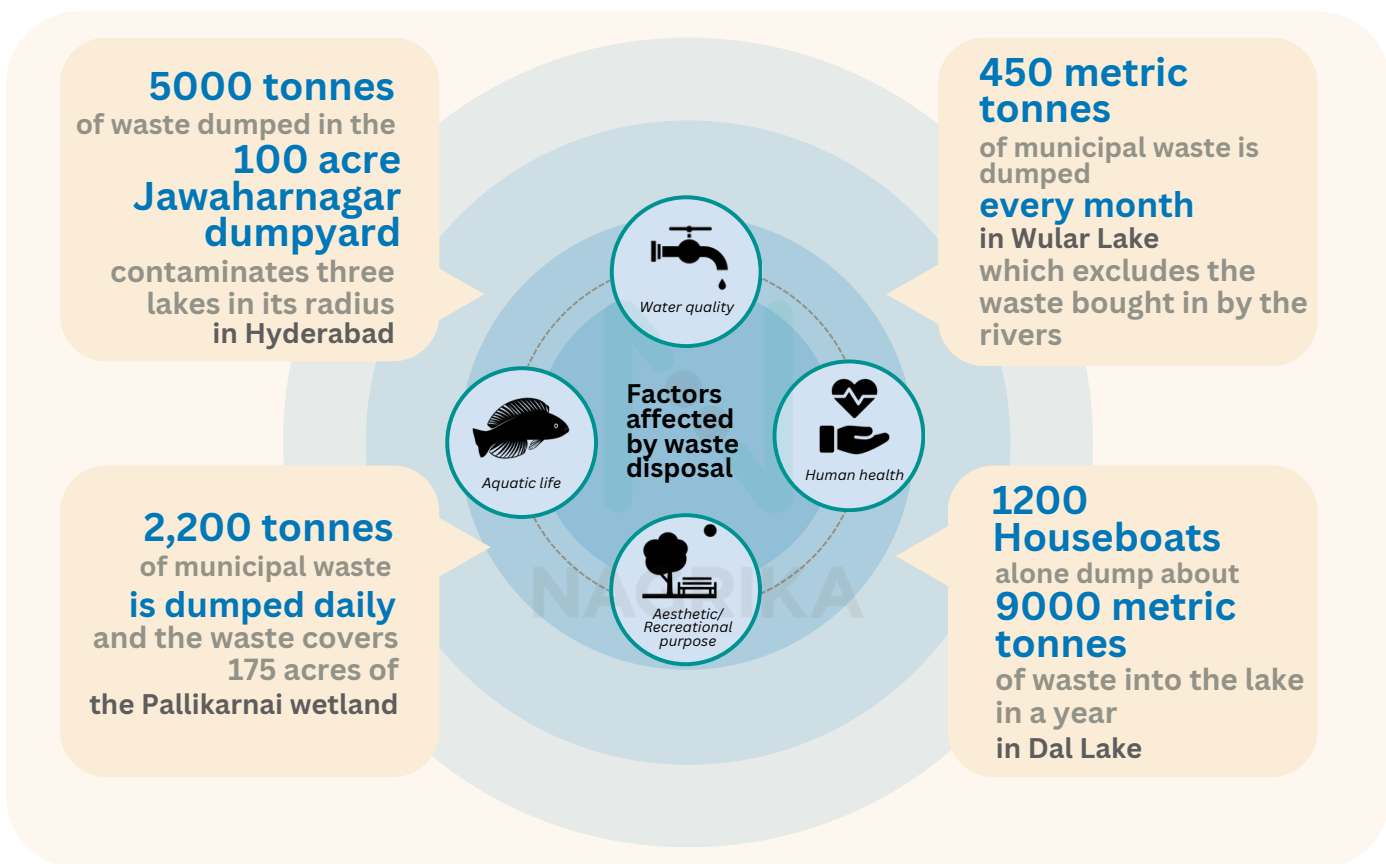


Figure 13 : Affect of Waste Disposal on Wetlands : Indian Examples
Source : Various Sources

severely pollutes the water and threatens the survival of aquatic life. The discharge of solid waste into wetlands results in water contamination, which poses a significant threat to both human health and the ecosystem (Figure 13).

The Guwahati Municipality dump yard, located in the eastern corner of Deepor Beel, a Ramsar Site, is just one example of such contamination. The unscientific dumping of solid waste near Deepor Beel has led to significant water and sediment contamination. The leaching of harmful substances from the waste has resulted in elevated levels of heavy metals and other pollutants, exceeding maximum permissible limits and posing serious threats to aquatic life and human health.

For instance, the embankments of Wular lake, Asia's largest freshwater lake, have turned into a garbage dump. There has been a significant accumulation of waste directly along the lake's shores and in the water, posing a serious threat to the lake's aquatic life and ecosystem. Large sections of the lake have been transformed into shallow streams, and areas that were once vast expanses of open water are now covered in silt and littered with solid waste. This accumulation of waste and silt has led to a decrease in the lake's depth and overall area, causing it to shrink. Similarly, the Bhalswa dump yard has halved the size of Bhalswa Lake in Delhi and the Pallavaram Lake, Thazambur Lake, and the



Figure 14 : Solid waste lying at a large dump site, Bomgard, near Leh town. **"Leh had no landfills until the two roads opened – Leh-Srinagar highway and Leh-Manali road."**
 Source : Athar Parvaiz, Scroll

Pallikaranai Marshland in Chennai have become a dumping ground for municipal waste. The waste dumped by authorities can harm wetlands in numerous ways, including negatively impacting human health, aquatic life, and the quality of life for locals.

Industrial, Bio-medical, and Electronic waste also often makes its way to the wetlands, either through the soil or through deliberate waste-dumping in the water bodies. This waste can cause the water to become stagnant, cause various skin, lung, and parasitic infections, and kill aquatic animals. Heavy metal concentrations can be found in lakes in Futala, Gandhisagar and Ambazari lakes in Nagpur due to idol immersion and in the Hussain Sagar Lake in Hyderabad due to the influx of industrial waste water from Kukatpally Nala and idol immersion every year.

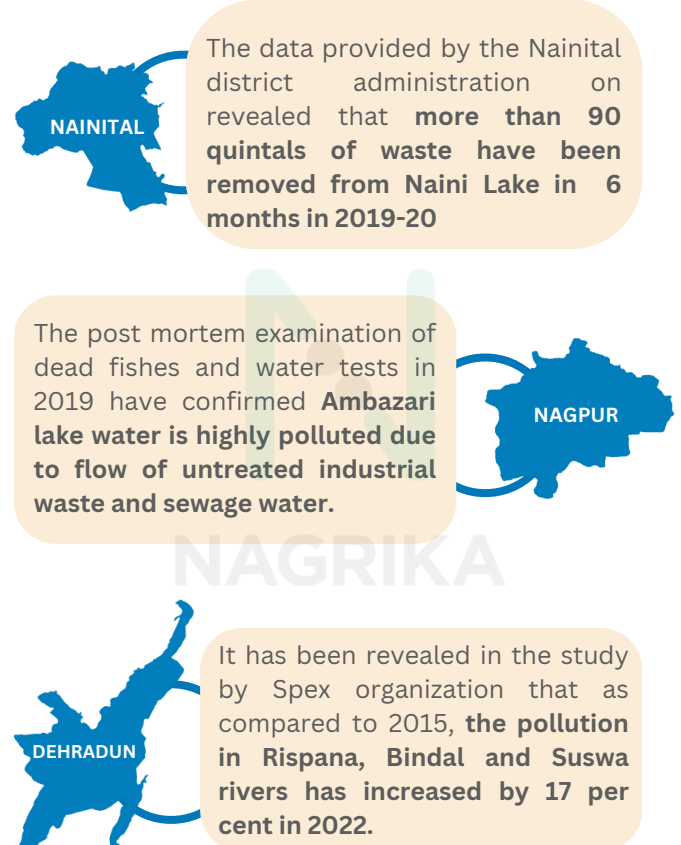


Figure 15: Pollution in Wetlands : Indian Examples
 Source : Various sources

A study done in Shahpura Lake in Bhopal found a marked elevation in pH, hardness, chromium, cadmium, and lead after the immersion of idols. The High Court of Rajasthan has banned idol immersion along with other activities like bathing and washing clothes in the lakes of Udaipur. Similar steps have been taken in Nagpur, Telangana, Delhi, and Bangalore to curb the pollution in the lakes due to Ganesh Chaturthi, Durga Puja, and Tazia processions.

Excessive Tourism

Unplanned tourism can have a negative impact on the environment, particularly in areas where infrastructure is not well-developed or regulated. In such areas, the rapid growth of unorganised hospitality businesses, such as cafes, hotels, and campsites, leads to a lack of an appropriate buffer zone around the water body.

Additionally, inadequate waste management systems and lax garbage disposal arrangements can lead to the accumulation of waste that is often dumped directly into the water or left on the shore. For example, Leh saw a sudden hike in the number of tourists after the Atal Tunnel (also known as the Rohtang Tunnel) was opened to visitors. In July 2022, Leh had a tourist influx of 2.5 lakh (i.e., eight times the population of Leh (census 2011)).

Dal Lake in Srinagar, Tso Morari, and Pong Lakes in Ladakh are examples of areas where unplanned and unregulated tourism has had long-term harmful effects on both biodiversity and the local ecosystem. Approximately 1,200 houseboats on Dal Lake contribute around 9,000 tonnes of waste into the water every year.

According to a study conducted in Sikkim,

Phedang Tso (Elephant Lake) exhibited a higher species richness of migratory birds compared to other wetlands, primarily attributed to its inaccessibility to tourists.

Illegal Mining

Illegal mining of lakes for building materials like sand and stones has had a negative effect on the wetlands and is one of the main causes of the loss of many water bodies in India. Sand mining can impact wetlands, as seen in the case of Suraj Kund and Badkhal Lake in Faridabad. These lakes, which were Faridabad's major tourism hotspot, dried up due to illegal mining and water extraction by bottled water companies in the vicinity. Currently, restoration efforts for Badkhal Lake are underway through the Faridabad Smart City Mission's Agenda for Balanced Development projects.

Similarly, Vembanad Lake, spread along multiple districts of Kerala, the second largest wetland in India and a Ramsar site, has been subject to unlawful black shell mining and illegal construction of resorts and housing along its shores. Fortunately, the fishermen in the area contested the illegal construction in court, leading to a court order for the demolition of the structures.

Illegal sand mining is an offence, as it violates the Indian Penal Code, the Mines and Minerals Development and Regulation Act of 1957, and the Environment (Protection) Act of 1986. Despite the legal framework, there are still significant gaps in the data related to illegal sand mining, particularly due to undocumented small-scale operations.

In response, the Mineral Conservation and Development Rules of 2017 were implemented, mandating the creation of

state-level task forces and the use of satellite tracking to monitor and prevent illegal mining. Despite these measures, illegal sand mining continues to be a significant problem, with the real issue being the enforcement of these laws.

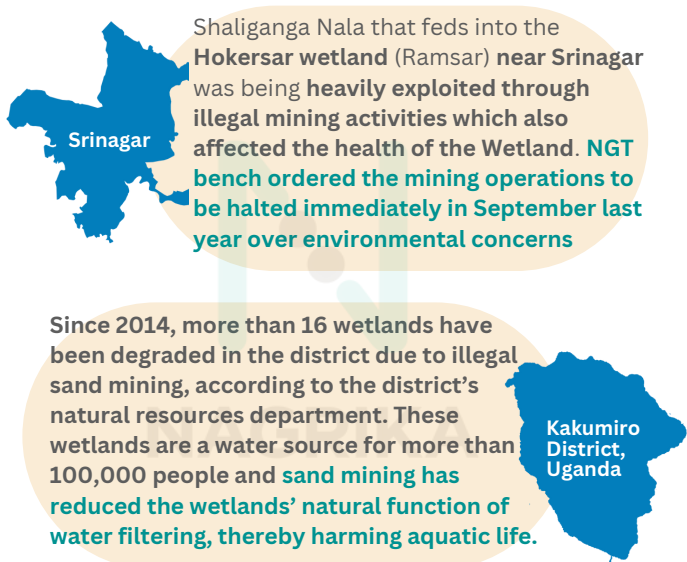


Figure 16 : Examples of decline in wetlands due to mining
Source : Various sources

Lack of Public Awareness and Engagement

Public awareness and engagement in wetland conservation have been often limited in Indian cities and have also contributed to the decline in wetlands due to a lack of understanding of their ecological and economic value, insufficient community involvement in conservation efforts, and the absence of strong advocacy for their protection. This limited awareness can lead to apathy towards the encroachment and pollution of these vital ecosystems, making it easier for urban development projects to override ecological considerations. Furthermore, the gap in public knowledge about the benefits of wetlands has hindered the mobilisation of community-led initiatives to preserve and restore wetland areas.

Enhancing community involvement through education, awareness campaigns, and participatory management approaches can help create a sense of stewardship and encourage local conservation efforts. The story of Ramveer Tanwar is a compelling example of how saving wetlands can raise awareness among the general public and sensitise them to their conservation. The engineer, Ramveer Tanwar, has been instrumental in reviving around 20 ponds and lakes in the city of Noida. His efforts have not only led to the conservation of these water bodies but have also sparked a broader awareness of the importance of wetlands among the local community. Tanwar's work demonstrates how individual actions can also inspire collective responsibility and stewardship for the environment.

Climate Change

Climate change and wetlands have a reciprocal relationship. While climate change impacts wetlands, leading to their decline, wetlands also play a crucial role in mitigating the effects of climate change. Therefore, it is essential to conserve and restore wetlands to maintain their ecological functions and mitigate the impacts of climate change.

Climate change poses a significant threat to urban wetlands in Indian cities, with various impacts that can exacerbate their decline. Rising temperatures, altered precipitation patterns, and increased frequency of extreme weather events due to climate change can significantly affect the hydrology of wetlands, leading to changes in their size, water quality, and biodiversity. These changes can also indirectly contribute to wetland decline by increasing the demand for land and water

resources in urban areas. Changes in precipitation patterns due to climate change can lead to both droughts and floods, impacting the water supply and quality in urban areas. Cities like Chennai, Mumbai, Hyderabad, and Bengaluru have experienced increased urban flooding in recent years, partly due to encroachment on wetlands and also due to changes in rainfall intensity and frequency.

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Spotlight on Decline- The Case of Deepor Beel

Deepor Beel is a freshwater lake (beel in the local language) located near Guwahati City, Assam. It is the only Ramsar site in Assam, as well as the only major stormwater storage basin for Guwahati city. Deepor Beel, is a prime example of the challenges faced by urban wetlands, leading to their decline. This lake has a long history of degradation due to various anthropogenic activities. Unplanned urban expansion, industrial pollution, and improper waste management have led to significant loss of wetland area and steady water quality degradation. The wetland's health is further compromised by the invasion of water hyacinth, an aggressive weed that chokes water bodies and disrupts their ecological balance.

85-90 percent of the daily unsegregated waste from Guwahati, is dumped at the Boregaon dumping site that lies to the east of the lake. The dumping site has been reportedly shifted to a new site but it is still in the 1 km radius of the wetland, even though a huge amount of legacy waste still exists. Also, legal and illegal encroachment has decreased the permanent lake water area from 7.1 sq km to just 4.2 sq km in 2010.

Illegal stone mining in the hilly forest area leads to heavy siltation in the lake. The blasting activities affect the health of migratory birds. The Guwahati oil refinery waste, along with medical/ industrial/ residential waste is disposed of to the beel through Bhalralu and Bahini rivers.

There are also a lot of industries that have been set up along the beel and are a



Encroachment

Encroachment problem has **decreased** the permanent lake water area **from 7.1 sq km to 4.2 sq km in 2010.**



Municipal waste

85-90% of the daily unsegregated waste from Guwahati **is dumped at the Boregaon dumping site** that lies to the east of the lake



Illegal Mining

Illegal stone mining in the hilly forest area have been causing siltation. The **blasting activities** also affect the fauna



Unfiltered waste

The Guwahati oil refinery waste, along with other medical/industrial is directed through the rivers **to the beel.**



Construction

Industrial development within its periphery, **railway line** along the southern boundary has disturbed the beel ecosystem

threat to the wetland's ecosystem. Adding to this complexity to the ecosystem, a railway line also passes through the southern boundary of the wetland, managing to suffocate the beel and divide the elephant reserve at the same time.

The location of Guwahati is like a bowl surrounded by hills around it so when it rains, rainwater gets collected and floods in certain areas. The city of Guwahati does not have proper drainage and thus relies on natural drainage basins to manage floodwater. The five broad natural drainage basins include the Bharalu basin, the Silsako beel basin, the Deepor beel basin, the Kalmoni basin, and the Foreshore basin.

As the city has expanded, it has encroached upon the natural drainage basins, leading to an increase in urban flooding.

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Part 4

Urban Wetland Management

Overview

This chapter explores the complexities and strategies involved in effectively conserving and managing urban wetlands from a public policy perspective. It delves into the diverse array of stakeholders, policies, gaps, and potential solutions associated with wetland management in urban areas.

Stakeholders

There are several stakeholders involved, depending on the biological status of the wetland (Ramsar Convention), the depth of the wetlands (MoEFCC), or their cultural, economic, and climatic importance.

Stakeholders may range from local communities and government agencies to pressure groups and individuals who benefit from the services provided by the wetland. Their interests and impacts can vary widely, making it crucial to identify and involve all relevant parties in the decision-making process related to the management and conservation of wetlands. Local communities rely on the wetland for livelihoods, recreation, or cultural practices. Economically, wetlands provide services such as water supply, support for primary industries, and tourism opportunities. In terms of climate, wetlands play a crucial role in regulating climate, maintaining the hydrological cycle and hence involving stakeholders interested in climate change mitigation.

The common stakeholders involved in most of the cases include-

Citizens: Those dependent on their livelihood, like fishermen, grass cutters, and farmers, are often primary stakeholders who use the wetlands to harvest fish or for irrigational use of water and are directly affected by the decisions made for the wetlands. Various NGOs, ward committees, and citizen-led groups that work for lake conservation or climate action- for example, lake restoration in India has often been spearheaded by individuals and citizen groups.

Fishermen associations, Climate-action groups, and lake restoration initiatives have been responsible for several commendable rescues of our urban

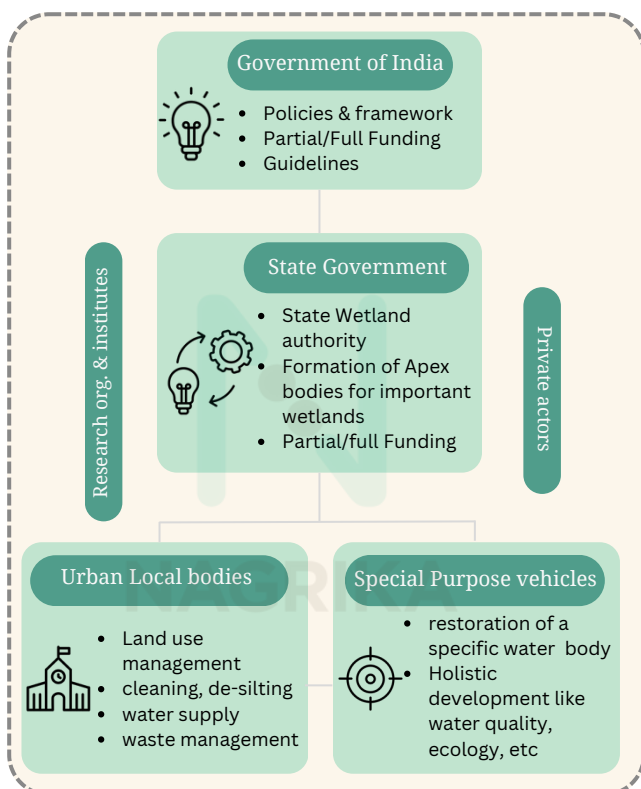


Figure 17: Urban Wetlands Management framework
Source : author

wetlands. Local fishermen, supported by the Matsya Thozhilali Aikya Vedi, a fishermen's union, waged a 14-year legal battle against a luxury resort built on Vembanad Lake in Kerala, India, arguing that it violated guidelines and disrupted their livelihoods. In 2020, the Supreme Court of India ruled in favour of the fishing community, ordering the resort's demolition, underscoring the importance of involving local communities, as primary stakeholders, in decisions affecting wetland management.

Special Purpose Vehicles: SPVs have been established for many wetlands, though mostly for lakes in India. These SPVs are dedicated to a particular lake or a specific region and play an important role in the conservation and restoration of lakes in India. Some SPVs that work for wetland management in India include - Bhoj Wetland Authority, Chilka Development Authority, Loktak Development Authority,

Lonar Crater Lake Development Authority, and Jammu and Kashmir Lake Conservation and Management Authority (LCMA). East Kolkata Wetlands Management Authority is an SPV that oversees the East Kolkata Wetlands, a complex non-lake wetland ecosystem.

Local Bodies: Regional wetlands that have not been recognized as having national/international importance or do not fit the parameters of the schemes are often managed by local bodies like the Municipal authority, development authority, tourism department, the water board, etc. For wetlands that are under schemes like National Plan for Conservation of Aquatic Eco-systems (NPCA), the municipal officials are members of the apex body or act on the decisions of the apex body.

State governments: Responsible for policy inception and implementation, some

states have dedicated guidelines, SOPs, and even acts for the protection of wetlands, like Karnataka Lake Conservation and Development Authority Act 2014 and Kerala's Conservation of Paddy Land and Wetland Act, 2008. All state governments are also mandated to form the State Wetlands Authority under the Wetlands (Conservation and Management) Rules, 2017.

Union Government: Union Government has various agencies that oversee the urban water bodies in India. One of the significant ones is the 'Ministry of Jal Shakti'. It was formed in 2019, by merging the Ministry of Water Resources, River Development, and Ganga Rejuvenation and the Ministry of Drinking Water and Sanitation. It encompasses various initiatives like Jal Shakti Abhiyan, etc. Other agencies like MoHUA with AMRUT 2.0, MoE&F with National Plan for Conservation of Aquatic Ecosystems, and Central pollution control board with their guidelines on Lake restoration have been vital in deciding the fate of our wetlands. In the 2023 Budget speech, a scheme called 'Amrit Dharohar' was introduced to promote unique conservation values of the local communities. This scheme is to be implemented over the next three years to encourage optimal use of wetlands, and enhance biodiversity, carbon stock, eco-tourism opportunities and income generation for local communities.

Policy Landscape

Various wetland related policies and guidelines have been issued over a range of decisions, from the conservation process to establishing which water bodies had more importance- the policies play a significant role in establishing the rules, which have continued to remain critical for the management of wetlands. A timeline of some of the key policies has been

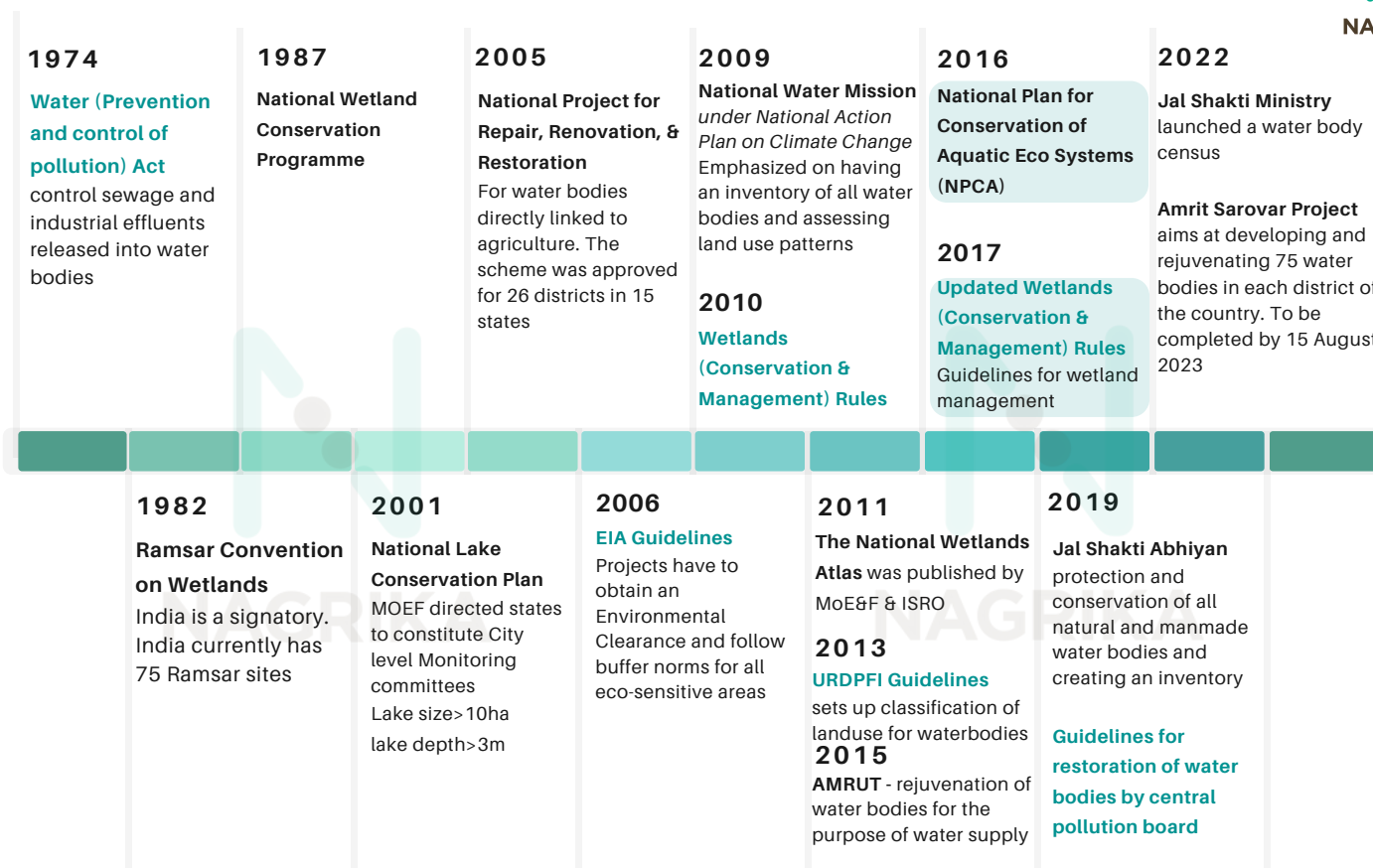


Figure 18 : Timeline of government policies and guidelines
Source : Government websites

indicated in Figure 18. The following subsections outline some of the current policies in place.

National Plan for Conservation of Aquatic Ecosystems (NPCA)

Two separate Centrally Sponsored Schemes (CSS), namely the National Wetlands Conservation Programme (NWCP) and the National Lake Conservation Plan (NLCP) were merged in 2016 to create a more holistic approach to all water bodies and it was named the National Plan for Conservation of Aquatic Ecosystems (NPCA).

In the first cycle of the scheme in 2019, 130 wetlands were selected across states for restoration and rejuvenation. The NPCA has a four pronged approach- Documentation, citizen engagement (wetlands Mitra),

Wetlands health card, and Integrated management plan. An integrated management plan is one of the ambitious and most sought-after solutions to urban wetland management. Some states have already drafted these plans for the wetlands in their state. For example, the wetland authority of Tripura published an Integrated Management Plan for the Rudrasagar wetland and the wetland authority of Mizoram published one for the Temdil wetland in Aizawl.

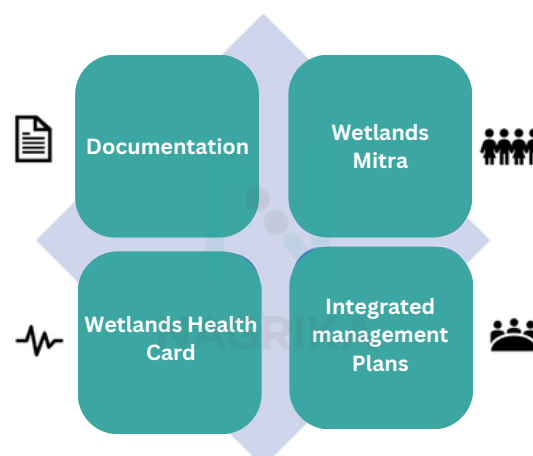


Figure 19 : NPCA's Four Pronged Approach
Source : India Wetlands Portal

Integrated Management Plans

The NPCA recommends that the management of each wetland be guided by an "Integrated Management Plan" (IMP). This plan is a comprehensive document that describes strategies and actions aimed at achieving wise use of the wetland.

It encompasses objectives for site management, the necessary management actions to achieve those objectives, factors that affect or may affect the various site features, monitoring requirements to detect changes in ecological character, the measure of effectiveness of management, and allocating resources for implementation.

Every wetland has a unique set of conservational, maintenance, or remedial needs, which need to be reflected in the IMP. IMPs need to be well-tailored specifically according to the wetland. There are some broad planning principles that need to be kept in mind while preparing IMPs, like recognizing that each wetland

has its own distinctive ecological and hydrological features and, thereby, distinctive management needs. This recognition underscores the importance of adopting a diagnostic approach for defining management approaches and actions, as well as the need for stakeholder participation and effective governance mechanisms. The financing provided to the State government and UTs under NPCA will be done on the basis of the Integrated management plans of the respective wetlands.

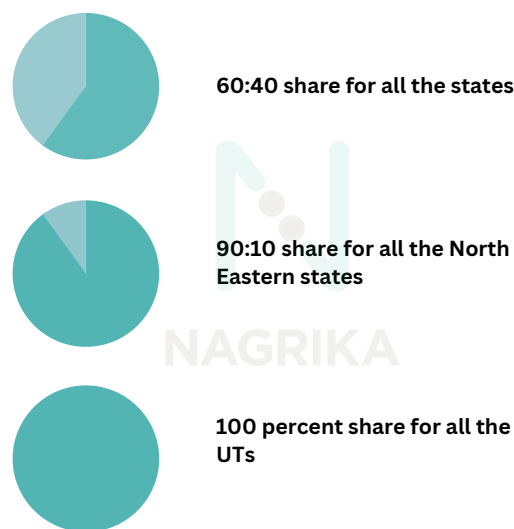


Figure 20 : Share of Funds allocated by Union and State Government under NPCA
 Source : India Wetlands Portal

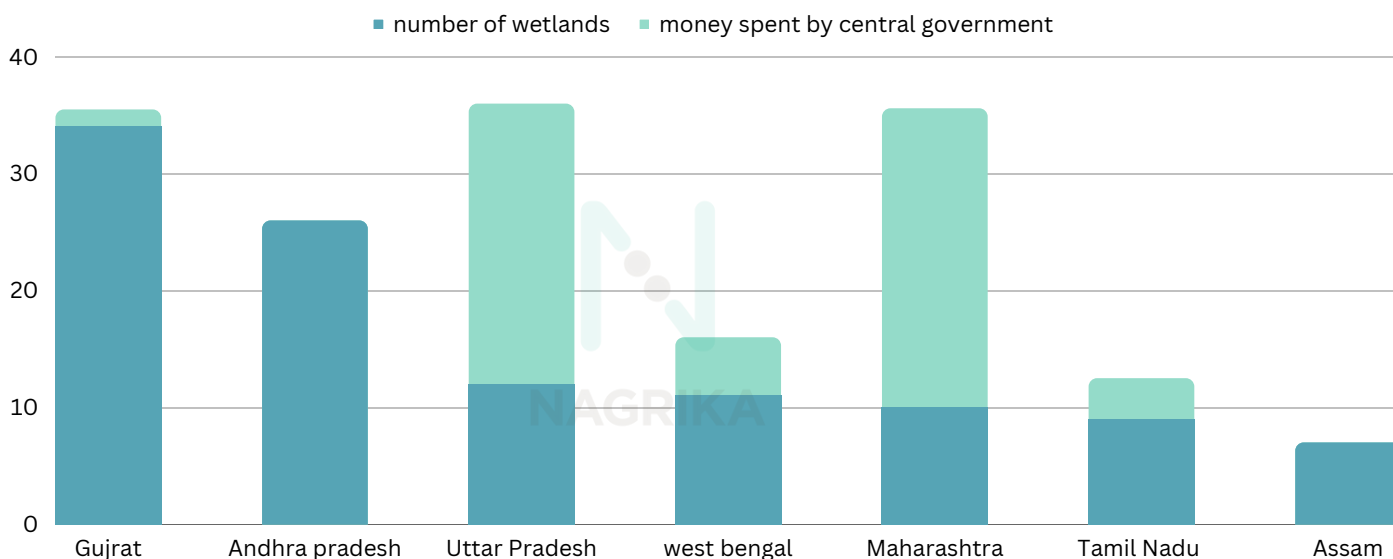


Figure 21 : Central share of funds given to states under NPCA from 2017 to January, 2021
 Source : Lok Sabha

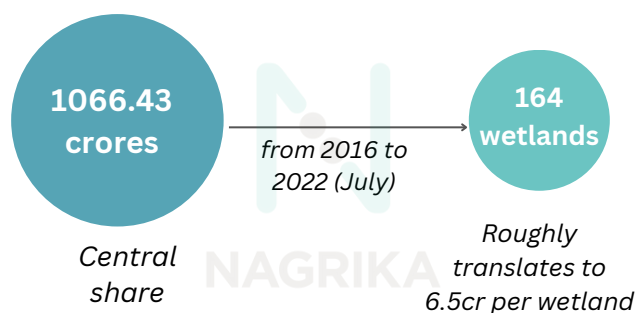


Figure 22 : In a Press release titled 'Protection and Preservation of Wetlands' on 18 July, 2022, it was mentioned that MoEF&CC has sanctioned proposals for conservation of 164 wetlands across the country and released an amount of about Rs. 1066.43 Crores as central share.

Wetland (Conservation & Management) Rules 2017

Notified by the Ministry of Environment, Forest and Climate Change (MoEFCC), these rules serve as the regulatory framework for the conservation and management of wetlands in India. These rules, enacted under the provisions of the Environment (Protection) Act, 1986, emphasise the principle of 'wise use' for the conservation and management of wetlands, prohibit certain activities within wetlands, and mandate the creation of a state wetland authority in each state and union territory. The rules also require all state authorities to prepare a list of all the wetlands within their respective jurisdictions, which will be used to create a digital inventory of wetlands.

Gaps in Urban Wetland Management

Urban Planning

In most states, wetlands are not recognized as a dedicated land use category. They are often put into the 'wasteland' category, that is meant for

alternate development purposes. This allows unclear demarcation of the water body and the danger of encroachment (NCPA guidelines). Recognizing it as a unique land category would make it easier to control the development in the area and impose restrictions.

Governance

There is a lack of a systematic institutional framework that can ensure long-term coordination between the various authorities and stakeholders for effective management of urban water bodies. This would also help maintain a balance that addresses biodiversity and utilisation of the water bodies in a sustainable manner. For example, if the municipal governments or other authorities responsible for wetland management worked in collaboration with various research organisations for the restoration of wetlands they would be mindful of not exploiting the ecological character of the lake.

Influence of Climate on Policy

According to scientific studies and the climate assessment report by the Ministry of Earth Sciences (MoES), the sea level in the Indian Ocean has been observed to rise at an average rate of approximately 1.7 mm per year. However, in recent decades (1993-2015), this rate has increased to 3.3 mm per year. This continuous rise in sea levels and the frequent flooding of coastal areas are expected to have a negative impact on the coastal wetlands. This could lead to a loss of biodiversity, changes in salinity levels, and even the disappearance of these wetlands altogether. It is crucial to take into account the role of climate change in all integrated management plans and guidelines being developed to tackle this issue.

Documentation and research

The management of these vital ecosystems often suffers from a lack of comprehensive documentation and research. For example, a scientific and well-defined census is required for the water bodies. For example, in 2001, on the order of the High Court, a joint survey committee assessed the number of natural water bodies in Delhi and came up with a list of 508 water bodies, which differed from a count of 794 submitted by TAPAS (a Delhi-based NGO). The court asked for another survey and the Delhi Development Authority (DDA) came up with a new count of 580 water bodies in Delhi in 2004. There is also a limited emphasis on research on functional aspects such as ecosystem services and community livelihoods.

Similarly, there's a noted decline in the number of bheris (fish ponds) engaged in commercial fish farming in EKW, with no current research explaining this trend. There's also a lack of studies on auction markets for fish. Additionally, the existing researchers point to the lack of research on functional aspects of wetland management such as the institutional practices in sewage-fed fisheries management, governance and legal frameworks, and the status of 'wise use' in the EKW.

Strengthening Governance

Indian wetlands are facing numerous challenges, including encroachment, waste dumping, pollution, and land use change among various other difficulties. These issues pose significant threats to the ecological, social and economic value of these crucial ecosystems. However, by implementing effective governance strategies and actively involving local communities and citizen groups, it is possible to improve the situation and

ensure the sustainable management of wetlands across the country.

a. **Policy reforms** are needed to protect and manage urban wetlands effectively. For example, the Master Plan Delhi (MPD) 2041 focuses on the conservation of water bodies and the land around them, adopting a 'green-blue policy' that recognizes the interdependence of water bodies and land. However, there is a need to safeguard water bodies that do not qualify as wetlands under the current Wetlands Management Rules, such as salt pans and man-made lakes. These ecosystems hold significant ecological value and need to be included in conservation efforts. The Ramsar Convention has helped protect some important sites, but many urban wetlands remain ignored.

b. **Institutional Capacity Building:** Enhancing the capacity of government agencies responsible for wetland management is crucial. This includes providing adequate resources, training, and expertise to effectively monitor, regulate, and enforce wetland conservation measures. For example, the Ramsar Convention provides a framework for the conservation and wise use of wetlands and their resources, offering various resources and publications that could be useful for capacity building.

c. **Integrated Planning and Management:** Integrated planning and management involves coordination among various government departments, such as those responsible for city management, environment, water resources, urban planning, and tourism, among others. This approach is necessary to ensure comprehensive planning and implementation of conservation strategies. The East Kolkata Wetlands serve as an example of how wetlands can

be integrated into urban management, treating a significant portion of the city's wastewater naturally. However, in many cities, historical land and water body use is disregarded in urban planning and expansion, leading to increased vulnerabilities, especially for marginalised groups.

Although the NPCA suggests integrated management plans for the wetlands, it is up to the state wetland authorities to draft the action plans and ensure maximum stakeholder participation.

Local Community Involvement:

a. **Community Participation:** Empowering local communities living in and around wetland areas is essential. Their involvement in decision-making processes, planning, and implementation can enhance the effectiveness and sustainability of conservation efforts. Promoting community based institutes & establishing mechanisms for their active participation is crucial. During keynotes and workshops related to wetlands, officials and ministers working in the union government have highlighted the importance of community participation in conserving wetlands in Manipur and Bihar.

b. **Traditional Knowledge Integration:** Recognizing and incorporating the traditional ecological knowledge of local communities is key to better understanding wetland ecosystems and developing context-specific conservation strategies. This can be achieved through engaging with local stakeholders, conducting participatory research, and integrating indigenous practices into management plans.

c. **Livelihood Opportunities:** Encouraging sustainable livelihood options for local communities can reduce their dependence on wetland resources and alleviate pressure on these ecosystems. Promoting eco-tourism, sustainable agriculture, and

alternative income-generating activities can foster economic development while ensuring the protection of wetlands.

Citizen Groups and Non-Governmental Organisations (NGOs):

a. **Awareness and Education:** Citizen groups and NGOs play a crucial role in raising awareness about wetland conservation, the importance of ecological balance, and the adverse impacts of encroachment and pollution. Conducting educational programs, workshops, and campaigns can promote a sense of environmental responsibility among the public.

b. **Monitoring and Advocacy:** Citizen groups and NGOs can actively monitor wetland health, report violations, and advocate for stronger regulatory measures. By collaborating with government agencies, these groups can help ensure accountability and transparency in wetland management.

c. **Research and Data Collection:** Encouraging citizen science initiatives and promoting research collaborations between experts, local communities, and NGOs can help generate valuable data on wetland biodiversity, water quality, and ecosystem services. This data can inform evidence-based decision-making and support conservation efforts.

Limitations

Data Availability and quality:

- The study mentioned experiences of a limited number of urban wetlands in India, which may not be representative of the entire country.
- The statistics for the number of wetlands may not entirely cover all the wetlands in India, as the satellite data can miss smaller wetlands.
- The data primarily relied on news reports, and there is a possibility that certain follow-up news events were

not included in the report.

- The absence of encroachment data was due to the ongoing water census, data for which was not available during the preparation of this report.

External Factors and Variables:

- The study did not address all possible factors and variables that may influence urban wetland ecosystems in India, such as climate change or natural disasters.

Research Methods:

- The research primarily relied on secondary data, which may not fully capture the comprehensive challenges faced by urban wetland ecosystems, as not all data is accessible or available online.

Limitations of Recommendations:

- The recommendations provided in the report are based on the findings and conclusions of the study; however, their implementation may face practical, financial, or logistical challenges that were not fully explored.

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Role of Community- The case of Udaipur Lakes

Lakes are viewed as vast expanses of water in pristine landscapes where people go for recreation. It is a place to experience nature with activities like boating, camping, fishing, swimming, and bird watching. However, urban lakes differ from the usual notion of lake, they possess social values and provide multiple ecosystem functions.

Known for the wetland ecosystem, “City of Lakes” or “Venice of the East”, Udaipur is one of the famous destinations of both national and international tourists. The water bodies of the ‘lake city’ play an important role in several spheres of human interest: culturally, socially, scientifically and economically.

Udaipur is mostly dependent on surface water sources to meet its water needs; around 78.5 million litres of water per day of surface water is extracted from Pichhola Lake, Fatehsagar Lake, Jaisamand Lake, Badi Lake, and the Mansi Wakal Dam.

The city's heritage fabric is an excellent example of harmony between *its natural elements* (water and water reservoirs, mountains, dense forests, fauna in the wild and perennial rivers in Aravalli hill ranges, abundant natural landscapes-green open spaces, gardens, and wildlife) and *man-made elements* (lakes, lakefronts, gardens, streets and squares, fort walls, historic monuments such as forts, palace complex, havelis, pavilions, historic temples, streetscapes and clock tower, the community structures and old residences and the water reservoirs).

In Udaipur, Tourism is one of the most important economic drivers. According to the Tourism department, 1,54,000 domestic tourists and over 14000 international tourists visited Udaipur in October, 2023. The hotel industry in Udaipur is a huge source of employment. “The Udaipur hospitality industry is a thousand crore industry, employing over ten thousand people with over one thousand hotels, resorts, guest houses and homestays,” Rakesh Choudhary, Secretary, Hotel Sansthan Dakshini Rajasthan, a hoteliers’ body.



Provide drinking water

78.5 MLD of surface water is extracted from lakes to cater water demand of the Udaipur



Tourism

1,54,000 domestic tourists and over **14000 international tourists** visited Udaipur in October, 2023



Construction

The Rajasthan High Court **puts a ban on construction of any road** that passes through any lakes in Udaipur



Source of livelihood

Udaipur hospitality industry employs **over ten thousand people.**

Water resources have always been politically contested at the municipal, state, national, and even international levels. With the rise in development, numerous rivers and lakes have disappeared in cities.

In Udaipur, lake encroachments have also been a problem around its famous Lake Pichola, as the areas which were once uninhabited near lakes are teeming with people. Waste, solid and liquid goes into the lake with a rising number of buildings and houses near the lake area.



..Pichola was well-maintained right from the time it was constructed but with growing population, more houses were constructed and drainage systems were connected directly to the lake. This had an adverse effect on the lake's ecological balance, resulting in disposal of faecal waste in the lake, which in turn resulted in the depletion of the lake's water quality

Dr Madhusudan Sharma,
 environmentalist and Professor of Zoological Studies, ML
 Sukhadia University

Source: Udaipur's Iconic Lake Pichola in Crisis: Encroachment and an outdated sewerage system take a toll (NDTV)

The primary source of drinking water in the city is being contaminated by activities such as bathing and washing, waste, sewage, chemical effluents, and layers of algae. It is concerning to note that untreated industrial waste from mining sites, marble factories, and zinc smelting plants ends up in water streams.

However, various citizen groups have been tirelessly working towards reducing pollution, encroachments, and activities that affect the quality of water.

The Jheel Sanrakshan Samiti, a lake conservation organisation, has been actively pressuring government institutions since 1992. The organisation was formed to

work on lake restoration and to prevent lake encroachment. The organisation formed after the drought in the late eighties, when the Pichola and Fatehsagar lakes dried up and the population faced enormous water shortages. The organisation has been instrumental in the establishment of the Lake development Authority and in developing the Lake Conservation Plan to ensure that adequate budget is allocated for lake conservation.

...tourism has led to excessive demands for hotels and water. The hotels are being constructed near lakes, there is hill cutting as well for construction of hotels. These hotels are water intensive due to usage of water pools, bathrooms, bathtubs and so on

Snippets from Nagrika's field work in Udaipur



Similarly, another social group, Jheel Hiteshi Nagrik Manch, is dedicated to keeping the lakes clean. The citizen's efforts have occasionally gotten positive support from the court, which summoned government officials on the issue and directed the government to develop a time-bound plan to clean up Udaipur's lakes.

In September, 2021, the Rajasthan High Court stopped construction of any road that passes through any lakes in Udaipur. Industrial bodies like Hindustan Zinc in collaboration with Smart City have commissioned 60 MLD Sewage Treatment Plant to help Udaipur treat its sewage.

Three cities - Udaipur, Bhopal, and Indore have been nominated for the Wetland City Accreditation (WCA) scheme under the Ramsar Convention, which helps cities gain international recognition for their efforts to protect their natural or human-made wetlands.

These wetlands are an integral part of the city's culture and identity, and the recognition will help these cities in maintaining bioclimate and become a buffer from extreme events.

Several case studies presented as 'key learning from experience' illustrate that the indigenous people and local communities play an important role in wetland wise use and conservation.

Udaipur stands to benefit significantly from obtaining international recognition through the Ramsar Convention. This recognition will facilitate the effective integration of local communities and their traditional knowledge into efforts aimed at conserving biodiversity, promoting sustainable water resource management, minimising pollution, and enhancing the overall well-being of both lakes and the surrounding communities.



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- 'Talk in the Town' - An Interview with Anil Mehta, Water conservation specialist <https://www.youtube.com/watch?v=91uoJacl6eM&t=10s>

Initiatives

Citizen-Led movements in Cities

Save Bharalu Abhiyan

<https://www.sentinelassam.com/guwahati-city/save-bharalu-abhiyan-holds-awareness-programme-in-guwahati>

Tsomgo Pokhri
Sanrakshan Samiti

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Jheel Sanrakshan Samiti

<http://cdn.cseindia.org/userfiles/tej%20ral%20b%20desh%20pd.pdf>

EcoWatch Organisation

<https://india.mongabay.com/2020/10/a-citizens-movement-to-protect-wetlands-emerges-in-jammu-and-kashmir/>

Dhruvansh Organisation

<https://www.thebetterindia.com/271703/woman-converts-dump-yard-into-lake-in-hyderabad/>

Salem Citizen's Forum

<https://www.youtube.com/watch?v=ha10ruXo2BU>

Ram Nadi Restoration
Mission

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Korattur Aeri
Padugappu Makkal
Iyakkam (KAPMI)

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