



Sarovar

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Volume IX

Newsletter of Wetlands International South Asia



**WORLD
WETLANDS DAY
SPECIAL ISSUE**

***Ecological
Restoration of
Wetlands***

Wetlands International South Asia

SAROVAR

Newsletter of Wetlands International South Asia

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Cover Photo

Field expedition by Wetlands International South Asia team in the carbon-rich wetlands of the Changthang region, Ladakh / Dhruv Verma

Back Cover Photo

Aerial view of Chandertal, a high-altitude wetland in Lahaul Spiti district of Himachal Pradesh / Arghya Chakrabarty

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About Us

Wetlands International South Asia is a non-government organisation which works to sustain and restore wetlands, their resources and biodiversity in the South Asia region. The New Delhi office of Wetlands International South Asia was established on 13th July 1996. Beginning with projects in two wetlands (Loktak in Manipur and Chilika in Odisha), the work now spans 19 Indian states across Nepal, Bangladesh and Maldives. It is a part of the Wetlands International network, which has over 20 offices across the globe and a presence in more than 100 countries. Wetlands International has its headquarters in the Netherlands. In 2023, the organisation celebrated its silver jubilee year of inception.

Wetlands International South Asia is a science-based organisation that uses a mix of approaches, including technical knowledge, policy dialogue, and field demonstrations, to address various issues

related to wetland conservation and management. To leverage change, Wetlands International South Asia works with national and state governments, knowledge centres, civil society as well as the private sector, often acting as catalysts to enable joined-up actions. These initiatives have reached out to over 800 wetlands in India, Bangladesh, Nepal and Maldives.

Wetlands International South Asia works closely in partnership with Central Government Ministries, State Governments, Wetlands Authorities, NGO partners and the private sector for the conservation and wise use of wetlands.

Our vision is a world where wetlands are treasured and nurtured for their beauty, the life they support, and the resources they provide.

Our mission is to inspire and mobilise society to safeguard and restore wetlands for people and nature.

Message from the President



ALL OUR READERS, through their valuable suggestions, have encouraged us to create a better version of our newsletter this time. I am sure with your input, we will be in a position to show

better potential in future years, which will satisfy your expectations. I would like to take this opportunity to present the ninth volume of our Newsletter, *Sarovar*, with the main theme of 'ecological restoration of wetlands'.

Conserving wetlands requires affirmative actions from the entire society, and in this regard, we have witnessed increasing policy and programming attention by our government, as is reflected in the budget announcement on *Amrit Dharohar*, the launch of the *Save Wetlands Campaign*, *Mission Sahbhagita* and others. The network of Ramsar Sites has increased to 75 sites, roughly equivalent to 8% of the known wetland regime. However, efforts on conservation and integrated management do not match up with the pace of degradation, and the necessary investment in developing skill and knowledge base is not forthcoming at the desired level. It is pertinent to translate the policy and programmatic ambitions to see its impact at the grassroots level. Our work, therefore, becomes all the more critical and crucial. The articles in this issue showcase the value of the use of ecological information and community engagement in the restoration of wetlands that have been degraded.

With a changing climate, the frequency and intensity of urban floods have been on the rise. Floods in Chennai, Bengaluru, Himachal Pradesh and the National Capital Territory of Delhi show the adverse impact of losing wetlands and the drainage systems that connected them. It is time for wetlands to be promoted as Nature-Based Solutions and included in sector strategies for disaster risk reduction and urban planning.

It is also pleasing to share the recent developments within the organisation. We concluded the Silver Jubilee year celebrations with the final event on September 2023, which had Prof R K Ranjan Singh, Hon'ble Minister of External Affairs, as the Chief Guest. With the organisation expanding its reach, the need for a spacious office was felt, and hence in January 2023, Wetlands International South Asia shifted to a professional office space at NSIC Business Park, Okhla Industrial Estate in New Delhi, India.

Wetlands International South Asia prioritises the conservation of Himalayan peatlands and has launched a two-year initiative to map the extent and condition of these ecosystems. Work on developing a flagship report on the status of Indian wetlands was also initiated to develop a synoptic view of the status and trends in wetlands, drivers, pressures, and management responses needed. We have also advanced the discussions on the establishment of a South Asia regional initiative for wetlands. In a roundtable meeting of Ramsar National Focal Points of South Asia region held in December 2023 at Pokhara, Nepal, a detailed outline of the regional platform was agreed upon.

I would like to take this opportunity to convey my sincere gratitude to all members of Wetlands International South Asia Society for their unwavering support of our work. I look forward to your suggestions and comments for improving the newsletter further in all respects. Please feel free to give us expert feedback from time to time to infuse wetland awareness in all sectors of society.

Dr Sidharth Kaul
President

New Delhi
January 31, 2024

From the Director's Desk



GLOBAL POLICY PROCESSES are increasingly realizing that halting and reversing biodiversity loss requires broad support and engagement of all societal groups and sectors —“a whole of society” approach. Wetlands conservation distinctly needs this shift if the rapid loss and degradation of these ecosystems are to be stemmed in current times.

Wetlands are essentially societal assets. It is a truism to state that governments are stewards of these assets, and unless the entire society participates in wetlands conservation, tangible change is not possible. In the past, wetlands used to form the core of livelihoods for a major section of society, be it as a source of water, food and places of reverence. Economic development has also meant distancing people from nature, and thus from experiencing the consequences of these vital assets being degraded. For example, the practice of praying in rivers and wetlands during Chhath Puja in North India is being replaced by artificially created pools of water, thus conveniently bypassing the need to keep wetlands clean and healthy. This people-nature disconnect perhaps underlies most of the societal apathy towards wetlands—there is no hue and cry when a wetland is made a solid waste dumping ground or when land is diverted for housing and other infrastructure projects. While everyone would easily travel long distances to click the image of a natural wetland, the loss of a wetland nearby would hardly raise an eyebrow.

But all of this comes to a halt when nature pushes back in the form of floods and droughts. The city of Bangalore, which rampantly converted wetlands to establish the IT park, came to a standstill when the floodwaters inundated the area in November last year, with some estimates pegging the losses at Rs. 200 Cr for two days alone.

It is nearly four decades since India's national wetlands programme came into existence. Over this period, much ground has been covered in the form of national wetlands inventories, developing and implementing

management plans for significant wetlands, putting in place regulatory architecture for preventing adverse developmental impacts, and meeting international commitments by designating wetlands as Ramsar Sites. However, the focus has been on a few wetlands, and the interventions are resource-demanding in terms of budgets, human capacities and institutional coordination needs. It is but natural that these efforts fall short of the rapid pace of degradation that cuts across the entire country. India is a land of small wetlands and assessments indicate that wetlands less than 2 ha form a major proportion of the total. It is the loss of these wetlands which goes unnoticed, causing death by a thousand cuts.

It is time that we reimagined wetlands conservation—making it simpler and a ‘business of everyone’. A beginning can be made by fixing local-scale governance and making a local entity accountable for wetlands. The information on the location of wetlands and the responsible agencies can be made easily accessible to all—perhaps on a smartphone. A simple set of dos and don'ts can be adhered to by all, for example, not discharging waste, not converting wetlands to non-wetland usages, and actively participating in raising awareness on the role of these ecosystems in societal well-being. Wetlands research can be made more practice and management-oriented, and results can be translated into simple, doable actions. Introducing wetlands early in education curricula will help create awareness amongst children and youth. Targeted campaigns can help promote affirmative behavioural change towards these ecosystems. Within the natural limits of these ecosystems, livelihood opportunities linked with wetlands can be promoted as incentives for stewardship.

We are proactively introducing these elements in our programmes and will keep learning from experiences.

Dr Ritesh Kumar
Director

New Delhi
January 31, 2024

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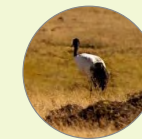
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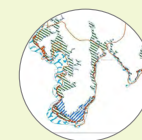
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▲ Mangroves in Ashtamudi in Kerala, India / Harsh Ganapathi

Restoring Wetlands

Preventive measures alone are not sufficient

Dr Ritesh Kumar
Director



Dr Sidharth Kaul
President



Wetlands International South Asia

Several wetlands are shrinking and getting degraded beyond the point of recovery. Despite increasing efforts for wetland restoration, much remains to be done as these efforts do not match up with the rapid scale of wetlands degradation. Systematic changes are required to implement wetlands restoration effectively and bring on board a large number of stakeholders and actors in the process.

In this article, Dr Ritesh Kumar (Director, Wetlands International South Asia) and Dr Sidharth Kaul (President, Wetlands International South Asia) discuss the overall challenges associated with wetlands restoration in India and ways in which its effectiveness can be enhanced at ground level.

The need for restoring wetland ecosystems

Wetlands are one of the most conspicuous parts of the landscape and exhibit enormous diversity due to differences in genesis, geographical location, hydrological regimes and other factors. Broadly speaking, wetlands are shallow aquatic ecosystems in which water keeps up for most of the year and recedes below the surface level during the dry season. These are complex hydrological systems and have been recognised as distinct from the terrestrial and aquatic ones, often combining features of both and known as ecotones.

The Ramsar Convention (ratified by 172 countries to date, including India, which ratified the Convention in 1982) uses a broad definition of wetlands 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’. This broad-ranging definition thus covers a large category of inland aquatic systems (such as ponds, lakes, marshes, swamps and peatlands); coastal and nearshore marine ecosystems (such as coral reefs, mangroves, seagrass beds and estuaries) and human-made wetlands (such as rice-paddies, fish-ponds, and water storage areas as tanks, reservoirs, and dams).

Wetlands in India are distributed in different geographical regions ranging from high-altitude lakes in the Himalayas, marshes and swamps in the Terai, floodplains and ox-bows in the Gangetic-Brahmaputra alluvial plains, saline flats in the Great Indian Desert, tanks and reservoirs in

the Deccan region, and extensive mangrove marshes and coral reef areas interspersed along the over 8,000 km long coastline.

As per the National Wetlands Atlas, India has 15.86 million ha under wetlands, accounting for nearly 4.6 % of her geographical area. In terms of biogeographic zones, the coasts and the Deccan region have the maximum wetlands area, the proportion of natural wetlands being higher in the former and human-made in the latter.

As an integral component of the hydrological cycle, wetlands are critically important in regulating the quality, quantity and reliability of water as it moves through the landscape in various forms. Changes and degradation of wetlands, particularly in their structure and function, can lead to significant changes in their flow pattern and the chemical and microbiological character of water resources. At the same time, wetlands require sufficient water to maintain the desired level of ecological health. With most of the impacts of climate change in the country projected to be water-mediated, the role of wetlands in climate change demands urgent attention and integration in the mitigation and adaptation strategy.

For several cities, wetlands were the primary source of water and continue to be so, as reflected in the moniker ‘city of lakes’ given to Bangalore, Udaipur, Bhopal and many others. For some, this water store can be highly significant, such as the water storage in Yamuna floodplains has been estimated to be equivalent to three-fourths of Delhi’s water supply. Wetlands have traditionally been the backbone of agriculture practised in the Ganga-Brahmaputra floodplains.

The waste treatment capability of wetlands has been effectively used by the City of Kolkata, which depends upon the East Kolkata Wetlands to treat nearly 65% of its wastewater, saving nearly Rs. 4,600 million annually in terms of avoided treatment cost. Wetlands act as major flood defence systems for cities such as Srinagar (Jammu and Kashmir) and Guwahati (Assam).

In the hard rock Deccan Plains and arid regions of the country, there has been an age-old tradition of constructing tanks to store rainwater for use in irrigation and domestic water supply. Wetlands are also intricately interwoven with the rich cultural and religious tapestry of the country, and several wetlands are considered sacred.

Notwithstanding the high value of ecosystem services that wetlands provide to society, these ecosystems continue to be degraded, polluted, encroached upon and converted for alternate uses. A wetland area trend index constructed by the authors for Indian wetlands based on 237 published data points for 1980–2014 using the Wetland Extent Trends index method indicates an average decline in natural wetlands area by 41% and a near commensurate increase in area under human-made wetlands by 44%. These trends are similar to those reported globally, wherein the natural wetlands have been on a decline, whereas the human-made wetlands are increasing.

There is considerable evidence of increasing vulnerability of landscapes wherein natural wetlands have been degraded or lost. A positive relationship between an increase in the built-up area, increasing runoff, loss of wetlands and enhanced flood vulnerability has been

observed in several cities, such as Mumbai, Bangalore, and Chennai. For example, studies on the August 2018 floods in Kerala unsurprisingly indicated that the areas around the backwaters and adjoining river floodplains received prolonged inundation as these were the natural depressions in the landscape, yet also the most heavily populated.

If the floods have brought floodplain and urban wetlands to the limelight, so have tropical cyclones and storm surges to the coastal wetlands. Evidence from the 2004 tsunami and several recent cyclones which have hit the east coast of India has highlighted the role of coastal vegetation (primarily mangroves) and physical settings.

Wetlands degradation also impacts livelihoods in several ways. Receding water levels, deteriorating water quality and reduced fish catch, have taken a toll on the livelihoods of nearly one lakh families living in about two dozen villages abutting Pulicat, a transboundary wetland between Tamil Nadu and Andhra Pradesh.

Ecological restoration

The Society for Ecological Restoration (SER) defines ecosystem restoration as *‘the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed’*. The purpose is to move a degraded ecosystem to a trajectory of recovery that allows adaptation to local and global changes, as well as the persistence and evolution of its component species. The Standards for Ecological Restoration developed by SER use the term restoration for the activity undertaken and recovery for the outcome sought or achieved. It is stressed that for an activity to be

considered ecological restoration, it must result in a net gain for biodiversity, ecosystem health and integrity, and human well-being, including sustainable production of goods and services.

Restoration includes a spectrum of actions, including **(1)** reduction of negative environmental and societal impacts, such as pollution and unsustainable resource use and management; **(2)** removal of contaminants, pollutants and other threats, often known as remediation; **(3)** rehabilitation of ecosystem functions and services in highly modified areas; and **(4)** ecological restoration, which aims to remove degradation and assists in recovering an ecosystem to the trajectory it would be on if degradation had not occurred, accounting for environmental change.

Wetlands restoration in international policy processes

Ecological restoration of wetlands has received increasing support from international policy processes as well. The Ramsar Convention has called for restoration through several resolutions, notable being Resolution in CoP10 on *‘A Framework for processes of detecting, reporting and responding to change in ecological character’*, which resulted in the development of *Ramsar Principles and Guidelines on Wetlands Restoration*.

The United Nations General Assembly declared 2021–2030 as the United Nations Decade for Ecological Restoration, responding to the critical need to halt, prevent and reverse ecosystem degradation and to effectively restore degraded terrestrial, freshwater and marine ecosystems across the globe.

The UN Decade has set in motion several global commitments for ecological restoration. The Bonn Challenge is a global goal to bring 150 million hectares of degraded and deforested landscapes into restoration by 2020 and 350 million hectares by 2030. In 2015, India pledged to bring 26 million ha under restoration. Similarly, the Freshwater Challenge, a country-led initiative launched at the UN Water Conference in New York in March 2023 under the auspices of the UN Decade of Ecosystem Restoration, aims at restoring 300,000 km of degraded rivers and 350 million hectares of degraded wetlands by 2030 as well as conserve intact freshwater ecosystems.

The United Nations Biodiversity Conference, held in December 2022 in Montreal, Canada, ended with the adoption of the landmark Kunming-Montreal Global Biodiversity Framework. **Target 2** (on the effective restoration of at least 30 percent of degraded ecosystems by 2030) and **Target 3** (on the effective conservation and management of 30 percent of areas of particular importance for biodiversity and ecosystem functions and services) make a specific mention of ‘inland waters’, the term for wetlands in the Convention on Biological Diversity processes. These targets are likely to trigger wetlands restoration efforts under the ambit of the National Biodiversity Strategy and Action Plan.

The Sharm-el Sheikh Implementation Plan that resulted from the United Nations Framework Convention on Climate Change (UNFCCC) CoP27 called for the protection, conservation and restoration of water and water-related ecosystems as a part of the

adaptation actions. The first Global Stocktake that resulted from the UNFCCC CoP28 held in the United Arab Emirates, within the set of measures recommended for adaptation, noted the need to *‘accelerate the use of ecosystem-based adaptation and nature-based solutions, including through their management, enhancement, restoration and conservation and the protection of terrestrial, inland water, mountain, marine and coastal ecosystems’*. Notably, the global mangrove breakthrough that emerged against the backdrop of the CoP27 aims to secure the future of 15 million hectares of mangroves globally by 2030 through collective action.

Restoring wetlands in India: Our journey

Organised efforts for wetlands conservation in India were mainly triggered by India’s ratification of the Ramsar Convention in 1982 and the establishment of a separate Ministry of Environment and Forest (presently Ministry of Environment, Forest and Climate Change) in 1985. Before this, wetlands conservation in India was initially led by wildlife values, and several predominantly wetland landscapes such as Keoladeo, Harike, Kaziranga and Manas were declared as wildlife sanctuaries and national parks.

The Ministry established the National Wetlands Programme in 1986 to provide an overarching

national programmatic framework for wetland conservation in the country. In 1992, the Ministry constituted a National Committee on Wetlands, Mangroves and Coral Reefs to advise the government on appropriate policies and action programmes for wetlands conservation, research and training needs, and collaboration with international agencies. In 2001, the National Lake Conservation Programme was carved out of the former programme to address pollution issues in urban and peri-urban water bodies through interception, diversion and treatment of pollution load. Since March 2013, the two programmes have been merged into the National Programme on Conservation of Aquatic Ecosystems (NPCA). Beyond NPCA, wetlands located within protected areas are funded under the centrally sponsored scheme titled Integrated Development of Wildlife Habitats, whereas mangroves and coral reefs receive funding through a still separate funding stream.

Several wide-ranging policies, strategies and action plans have been formulated by the Government of India which directly or indirectly support wetland conservation in India. The National Conservation Strategy and Policy Statement on Environment and Development (1992) identified pollution and over-exploitation of wetlands as an area of concern. Conservation

of wetlands was emphasised as a strategy for sustainable use of land and water resources as well as biodiversity conservation. Subsequently, the National Environment Policy (2006) laid down specific policy elements for wetlands. India’s National Wildlife Action Plan (2017–2031) identifies the conservation of inland aquatic ecosystems as one of the 17 priority areas and envisages the development of a national wetlands mission and a national wetlands biodiversity register.

Likewise, the integration of wetlands in river basin management has been identified as a strategy for the management of river systems. The National Water Policy (2012) recommends the adoption of a basin approach for water resources management and identifies the conservation of river corridors, water bodies and associated ecosystems as an essential action area. The National Action Plan for Climate Change includes wetland conservation and sustainable management in the National Water Mission and the Green India Mission. The National Disaster Management Plan takes into account several non-structural measures for flood and cyclone risk reduction measures and makes direct reference to wetlands. The national indicator framework for monitoring the implementation of Sustainable Development Goals provides a mapping of various sectoral programmes towards



View of waterbirds in Chilika, Odisha, India / Nikita Mishra

assessing the country's progress on sustainable development goals and makes several references to integrated management of wetlands and water resources.

In 2010, in line with recommended policy actions, a regulatory framework for wetlands was introduced by MoEFCC in the form of Wetland (Conservation and Management) Rules, 2010 under the provisions of the Environment (Protection) Act, 1986. These rules were revised in 2017, wherein state wetlands authorities have been constituted as nodal policy-making, programming and regulatory institutions for wetlands in the state.

Public funds investments into wetlands, especially those of the central sector schemes administered by the MoEFCC, are based on integrated management plans. These plans intend to address the drivers of adverse degradation, as well as maintain and enhance biodiversity and ecosystem services values. However, in several cases, these funds have also been directed at ecological restoration and rehabilitation. We discuss a few of such initiatives in this section and distil lessons learnt.

Restoring natural wetlands:

Chilika, a brackishwater coastal lagoon situated in Odisha and the base of livelihood security to more than 0.2 million fishers, is an assemblage of shallow to very shallow marine, brackish and freshwater ecosystems and a hotspot of biodiversity. The wetland went through a phase of reduced connectivity to the sea during 1950–2000 owing to increasing sediment loads from degrading catchments. There was a rapid decline in fisheries, with annual average landing dropping from 8,600 kg to 1,702 kg between 1985/86 and 1998/99

(Mohapatra et al. 2007). The rapid decline in ecosystem conditions and the associated livelihoods of dependent communities prompted the Odisha state government to constitute the Chilika Development Authority (CDA) as a formal institution mandated to undertake the conservation and management of the wetland. CDA, working with the state and national governments, a range of scientific organisations, as well as civil society organisations, mobilised the necessary evidence for ecological restoration. Measures put in place since 2000 included the opening of a new mouth and dredging of a channel within the northern sector of the lagoon to ensure that riverine sediments are flushed out. These interventions were complemented by a basin-scale participatory watershed management programme to contain silt loading from the catchments and enhance resources for community livelihoods.

The response of the hydrological intervention and basin management has been rapid and sustained. After initial trophic bursts, the annual fish landing stabilised at nearly 13,000 MT. Annual CDA censuses of Irrawaddy dolphins within Chilika reported an increase from 89 to 151 individuals between 2003 and 2022, as well as increases in habitat use, improvements in breeding and dispersal, and declines in mortality rates. Seagrass meadows expanded from 20 km² in 2000 to 172 km² by 2022, along with a significant decline in freshwater invasive species.

Located on the river Yamuna front, the Yamuna Biodiversity Park is an ambitious restoration project of the Delhi Development Authority and the University of Delhi. Since 2005, the restoration

of 157 ha barren and highly sodic floodplains has involved the reintroduction of native plant species, landscaping, and creation of wetland habitats. The majority of the waste dumps and solid wastes accumulated on the floodplain have been removed. Agriculture on the floodplain has been regulated to prohibit the use of agrochemicals and has been restricted to areas beyond 100 m on either side of the river channel. The higher elevation areas of the floodplain are being developed to improve the water quality of the wastewater, which will be allowed to pass post-treatment in the STPs (or *in situ* treatment on stormwater drains).

Restoring urban wetlands:

Restoration of urban wetlands has received considerable attention given the increasing frequency of urban floods. Bengaluru floods of 2022 are the latest example, where India's IT hub reportedly registered a loss of over Rs 225 Crores. Notably, the areas that received maximum damages were converted from wetlands and associated drainages. Proper land use planning and strict legal, regulatory measures can be helpful in preventing such disasters. At the national level, some projects on urban wetlands have been initiated to address pollution, re-establish water regimes, and enhance amenity values.

The restoration of Bhoj Wetland in Madhya Pradesh, implemented during 1995–2005 with financial assistance from the Japan Bank of International Cooperation, is a noteworthy example. The Ramsar Site is a complex of two wetlands, the Upper Lake, created in the 11th Century, and the Lower Lake, created in the 18th Century, and constitute the major source of water supply to Bhopal city. Rapid

urbanisation with insufficient waste management subjected the wetland to various environmental stresses, of which deterioration of water quality, reduction in water spread area and siltation were the most significant. The restoration was targeted at water quality improvement and enhancement of storage capacity. Desilting, de-weeding, afforestation of catchments, creation of waste diversion and treatment infrastructure, curbing grazing and encroachment, and communication and outreach were implemented over a

decade, leading to considerable improvement in lake ecosystem health.

The Hauz Khas, a historic wetland in south Delhi, went dry by the sixties as the catchment flows were diverted and the water table depleted. Its restoration has involved the diversion of treated wastewater, the introduction of carp fingerlings, wetlands-mediated treatment of inflows, and the installation of aerators. The restoration has stabilised the water regimes, increased the sighting of waterbirds, increased groundwater levels and creation

of a recreational avenue for the citizens.

Communities living in and around have historically played an important role in the conservation of urban wetlands. The case of restoration of Kaikondrahalli Lake in south-east Bangalore is an example of collective action by concerned citizen groups. Till 2000, this urban wetland brimmed with freshwater and was a habitat for several species. By 2003, Kaikondrahalli Lake went into prolonged drying as the inflowing channels were blocked, and the solid waste was



▲ Panoramic view of Loktak Lake in Manipur, India / Ravi Prakash

dumped rampantly. Rejuvenation, implemented during 2009–11, involved concerned citizens group working with Bruhat Bangalore Mahanagara Palike (BBMP) to ensure catchment inflows into the wetland, realigning shoreline landuse to maintain waterspread area, diverting and treating waste from upstream sources, enhancing water storage capacity, managing grazing, and educating citizens on the diverse wetland values. As a result of the efforts, the lake regained much of its lost waterspread, with frequent sightings of diverse species.

Several urban wetland restoration projects in recent times have tended to bypass the more complicated catchment restoration efforts and instead leveraged the availability of treated wastewater to restore water regimes.

Mangroves restoration:

Mangrove restoration in India is an impressive turnaround story. As per biennial assessments published by the Forest Survey of India, the extent of mangroves in the country has increased from 4,046 km² in 1987 to 4,975 km² in 2019. Restoration efforts particularly picked pace after the Kalinga Super Cyclone (1999) and Indian Ocean Tsunami (2004), wherein mangroves sheltered hamlets located behind these swamps, absorbing the storm surges to a large extent. This success is attributed to

immense efforts in mangrove plantations based on localised models, community engagement in their protection and upkeep and strengthening coastal zone regulation architecture. States like Maharashtra have established separate Mangrove Cell to ensure a consistent focus on the conservation and management of these ecosystems.

The MS Swaminathan Research Foundation is credited with the popularisation of the fish-bone model of mangrove restoration, which allows for the creation of hydrological conditions for the regeneration of mangroves. What started as an experiment in a small patch in Pichavaram, has now been successfully applied in Bhitarkanika (Odisha), and Krishna Delta (Andhra Pradesh).

The integrated mangrove fisheries farming system, again from the stable of MSSRF, specifically addresses livelihood elements in the restoration of abandoned aquaculture farms in Tamil Nadu, Andhra Pradesh and other parts of the Indian coastline.

Restoring ponds: Historically, ponds have played an important role in water security and livelihoods; however, with the advent of irrigation and water supply systems and the predominance of groundwater use, the relevance of these small wetlands has declined, resulting in their degradation and rampant conversion for alternate land

use. In 2005, the Ministry of Jal Shakti launched a Repair, Renovation, and Restoration (RRR) scheme (later merged with Prime Minister Krishi Sinchayee Yojana, 2015) aimed at harnessing the irrigation potential of these aquatic ecosystems. Pond restoration has received increasing support in recent times, with the major interventions being the restoration of hydroperiod, water depth and silt control. There are several grassroot organisations and motivated individuals who spearhead restoration of ponds, as their revival directly contributes to local water security and livelihoods.

A major impetus for restoring ponds has come from the Government of India's Mission *Amrit Sarovar*. Launched on April 24, 2022, to conserve water for the future, the mission aims at developing and rejuvenating 75 *Amrit Sarovar* (Pond) in each district of the country, totalling about 50,000 *Amrit Sarovar* in the country.

As of 10 January 2024, the Mission Portal indicated that 1.09 lakh Sarovar had been identified under the mission, and work completed in 0.69 lakh.

A deeper reading into the restoration initiatives indicates that restoration benefits are rarely sustained. Following are some of the major lessons learned.

Selection of appropriate restoration goals and

pathways is critical: Clear and achievable restoration goals are critical to successful restoration. In Chilika, restoration targeted the re-establishment of the salinity regime and used the re-establishment of hydrological connectivity between the estuary and the Bay of Bengal as a pathway. Similarly, in the case of restoration of Yamuna floodplains, the project specifically targeted re-establishment of native vegetation. Similarly, in the case of Bhoj Wetlands restoration, clear targets in terms of water quality and water levels were established, and catchment level management was adopted as a restoration pathway. These clear targets and pathways allowed a clear definition of restoration projects.

In the case of Loktak Lake, though the restoration project has identified viable restoration outcomes in terms of desired hydrological regimes and extent of vegetation, the restoration pathway involving the reoperation of Ithai Barrage is highly contested and has not been implemented thus far. In 2023, the MoEFCC called for revising the barrage operations to benefit the National Park, and action is underway after almost one and a half decades. In several urban wetlands, the restoration outcomes in terms of desired water quality standards require heavy investment in greywater treatment infrastructure. The outcomes are seldom achieved because of inefficiencies in infrastructure functioning and poor address of catchment land use interactions.

In several cases, filling up a wetland with water sourced from sewage treatment plants and irrigation canals is touted as wetlands restoration. Such short-cut solutions deride the fact that wetlands are not places for storing

water; they need to be conserved and effectively managed as an ecosystem and as far as possible towards their natural regime. Alternate wetting and drying cycles is a common feature of several wetlands.

Monitoring: Monitoring plays a crucial role in determining the success of ecological restoration and rehabilitation, as well as enabling replication and upscaling. In the cases of Chilika and Yamuna Biodiversity Park, elaborate arrangements are in place to record changes in ecological and hydrological indicators. The monitoring data also instils confidence in decision-makers on the efficacy of their decisions regarding wetlands restoration and rehabilitation.

Management plays an important role in sustaining the benefits of restoration and rehabilitation: While restoration and rehabilitation efforts can bring the wetland to a desired condition, maintaining the condition requires putting in place arrangements for managing these ecosystems for the maintenance of their ecological character. In case of Chilika, proactive basin-scale management has ensured that the restoration outcomes have been sustained over time, and the lagoon maintains a salinity gradient conducive for fish landings and habitats for dolphins and other species of high conservation values. Similarly, in Pichavaram, the Forest Department works with communities to maintain the fish bone channels, which provide the desired salinity regime for mangrove regeneration. In contrast, the dissolution of Lake Conservation Authority constituted as a part of Lake Bhopal Conservation and Management Project led to

considerable dissipation of the gains made under the rehabilitation project, as water quality declined, water levels rendered unstable and pressures from intensifying catchment land use increased.

Standardisation helps, but restoration and rehabilitation must take into account the landscape and socioeconomic context:

There is a tendency to standardise restoration and rehabilitation methods, which allows for replication and upscaling of best practices. However, it is important that restoration and rehabilitation measures take into account landscape and socioeconomic factors. A case in point is that of mangrove restoration. The *National Decadal Wetland Change Atlas* published by Space Application Center in February 2022 reports that between 2006/7 and 2017/18, the natural coastal wetlands declined from 3.69 million ha to 3.62 million ha. The intertidal mudflats have decreased by a whopping 116,897 ha and salt marshes by 5,647 ha. Mangrove plantation over inter-tidal mudflats is a prominent reason for this loss.

Institutions matter for restoration success: Successful ecological restoration and rehabilitation efforts were led by dedicated agencies (such as the Chilika Development Authority and the Delhi Development Authority working with the Center for Management of Degraded Ecosystems of the University of Delhi), which ensured the systematic implementation of the restoration plan, bringing on board partners and networks, and periodically evaluating success.

Fishers in Chilika, a brackish water coastal lagoon situated in Odisha, India / Nikita Mishra



Scaling up wetland restoration—future priorities

Efforts placed on restoring and rehabilitating Indian wetlands have not matched up with the rapid pace of degradation of these ecosystems. There is an urgent need to scale up efforts in this direction. The following are some priorities that need consideration:

Ecological restoration planning.

Investment is needed in developing robust, sustainable and equitable wetland restoration and rehabilitation plans. A national system for prioritising wetlands in need of restoration may serve as a basis. Restoration may be guided by reference models, which describe the approximate condition the wetland would be, had the degradation not occurred. Such reference models should also factor in the impacts of climate change. Restoration projects should have clear targets (informed by reference ecosystems), goals (medium to long-term desired ecological and social condition), objectives (interim outcomes towards the condition of recovery) and indicators (specific and quantifiable measures of attributes). The design of restoration plans must reflect the expectations and interests of stakeholders.

Capacity development. The lack of formal and systematic training and skill development opportunities to support wetlands restoration needs to be adequately addressed through targeted training programmes, learning networks, field support and building practitioner-researcher collaborations.

Strengthening wetlands governance.

Successful wetlands restoration requires governance arrangements that can ensure stakeholder engagement, incorporation of diverse worldviews and values, political ownership and continuity of action. The Wetlands (Conservation and Management) Rules, 2017 have mandated State Wetlands Authorities (SWA) as the nodal policy-making and regulating bodies. The SWA can play an important role in ensuring that there is appropriate policy and programmatic support for wetlands restoration within the state. Several states have also constituted district-level wetland authorities, which provide a platform for district-level monitoring and coordination of actions with government line departments. What is pertinent is that site-level restoration is made the responsibility of a single department, which should ensure coordination with other line departments and agencies, experts and civil society organisations in implementation.

With wetlands playing an important role in the hydrological cycle, these ecosystems need to be integrated into water governance and management. The demand-driven approach to water governance promotes the over-allocation of water, often at the cost of wetland ecosystems. Water governance should treat wetlands as our natural water infrastructure and integrate wetlands in water resources management at the scale of river basins. Actions to support water allocation to ecosystems, such as environmental flows placing upper limits on water allocation and new water

management legislation, need to be strengthened.

Building supportive knowledge systems.

Effective restoration planning and implementation require supportive knowledge systems that can assist in making evidence-based choices. Restoration interventions should be guided by the best available knowledge, including traditional and indigenous ecological knowledge. Innovation and learning can be fostered by building practitioner-researchers collaborations. Efforts should also be made to share practical and scientific knowledge to support the efficient implementation of restoration plans.

A major focus of science has been to unpack ‘what wetlands are’ in terms of unravelling the complexities of ecosystem structure functioning. This science has provided a robust basis for conservation. However, for wetlands to be effectively mainstreamed into sector plans and programmes, the pertinent questions are — ‘what can wetlands do to meet development outcomes such as flood buffering, water security’ and so on. This would require a science and knowledge system to demonstrate wetland functioning within a landscape. For most parts, this is an interdisciplinary endeavour, which requires wetland ecologists to work with hydrologists, social scientists, geographers, landscape planners and others.

Monitoring and evaluation.

It is pertinent that restoration success is evaluated through a systematic monitoring and evaluation system that ascertains the effectiveness of investment and application of human, financial and political capital.

Monitoring can be directed at specific hypotheses (such as re-establishing hydrological conditions that are sufficient for the regeneration of native species). Engaging stakeholders in the collection and analysis of data can help build stakeholder capability, as well as provide an environment of collaborative decision-making. Finally, monitoring and evaluation provide the basis of adaptive management by continually updating knowledge and adjusting restoration practices as an outcome. Each wetland restoration project must have an inbuilt component of monitoring and evaluation.

Emphasising the significance of evaluating the management effectiveness of Ramsar Sites and other wetlands, especially in places where mechanisms are not already in place, the Contracting Parties to the Ramsar Convention at their 12th Conference of Parties in 2015 adopted a revised version

of the Management Effectiveness Tracking Tool (METT), called the Ramsar Management Effectiveness Tracking Tool (R-METT), based on the Protected Area Management Evaluation (PAME) tool for effective management over time. This encourages wetland management authorities to evaluate the effectiveness of wetland management in collaboration with relevant stakeholders as appropriate.

Sector mainstreaming. Several sectors, such as water resources development, urban development, and rural development, to name a few, are including wetlands restoration within their plans and programmes. Unfortunately, the restoration practices adopted by the sectors seldom take a holistic view of wetlands as an ecosystem and rather focus on a few elements (such as water regimes or amenity values). Given the complexity of wetlands ecosystems, the

outcomes of sectoral approaches are short-lived and often counter-productive. It is, therefore, essential that all sectors are guided by a common national standard of wetlands restoration and rehabilitation.

While wetlands restoration demands urgent attention, it must be ensured that wetlands are conserved and effectively managed and not allowed to degrade in the first place. This would require strengthening wetlands regulation and management, preventing application of siloed-sectoral approaches, capacity development at various levels, communication and outreach and putting in place robust monitoring and evaluation systems. There is also a need to promote the adoption of best practices based on careful evaluation of examples from other countries.



▼ An aerial view of the Bhoj wetland in Bhopal, Madhya Pradesh in India / Harsh Ganapathi





Rejuvenation of Lakes

Insights from the success story of Jakkur Lake

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Wetlands include a wide range of aquatic habitats such as marsh, fen, peat land/open water, estuaries, flowing water (rivers and streams), or static (lakes and ponds). These ecosystems, being the transition zone between land and water, are ecologically important in relation to the stability and biodiversity of a region and in terms of energy and material flow, evident from the recharge of groundwater aquifers and the stabilisation of shorelines. These ecotonal regions are repositories of rich biodiversity and support the food chain while performing a vital function of uptake of nutrients and bioremediation of heavy metals, volatile organics, and other xenobiotic compounds and are aptly known as “Kidneys of the landscape.” Wetlands act as giant sponges, which help to retard runoff, lower flood

heights, and reduce shoreline and stream bank erosion. The functional ability of wetlands depends on the type of trophic structure and material exchange. Algae, the primary producers, synthesise carbohydrates during photosynthesis and give out oxygen and produce other essential metabolites. The bulk of the CO² gets sequestered into algal biomass in these wetlands systems that aid in combating global warming through reductions of GHG (Greenhouse gases) in the environment. However, the functional aspects of wetlands are tied to the trade-off between the ecosystem function and anthropogenic impacts, including encroachment, altering the catchment (changes in land cover), solid waste disposal in lake beds, the sustained inflow



▲ Jakkur Lake was constructed about 200 years ago to meet the domestic and irrigation water requirement of Jakkur village, Bangalore

◀ The clear water in Jakkur Lake, with abundant phytoplankton diversity in acceptable densities, indicates a healthy trophic status

of untreated sewage from the neighbourhood, etc.

Jakkur Lake was constructed about 200 years ago to meet the domestic and irrigation water requirement of Jakkur village, Bangalore Urban District, throughout the year and has been a source of livelihood to farmers, fishing, and *dhobi* (laundryman) communities. During potential fish growing seasons, fish catch crosses 500 kg per day. Twelve to fifteen *dhobi* families depend on the lake for washing cloth daily. In the command area of the lake, agriculture and horticulture (coconut, banana, and mango plantations) were practised, and remnants of these plantations are present even today in the region. Rapid urbanisation leading to large-scale land use changes has increased paved surfaces and declined groundwater recharge.

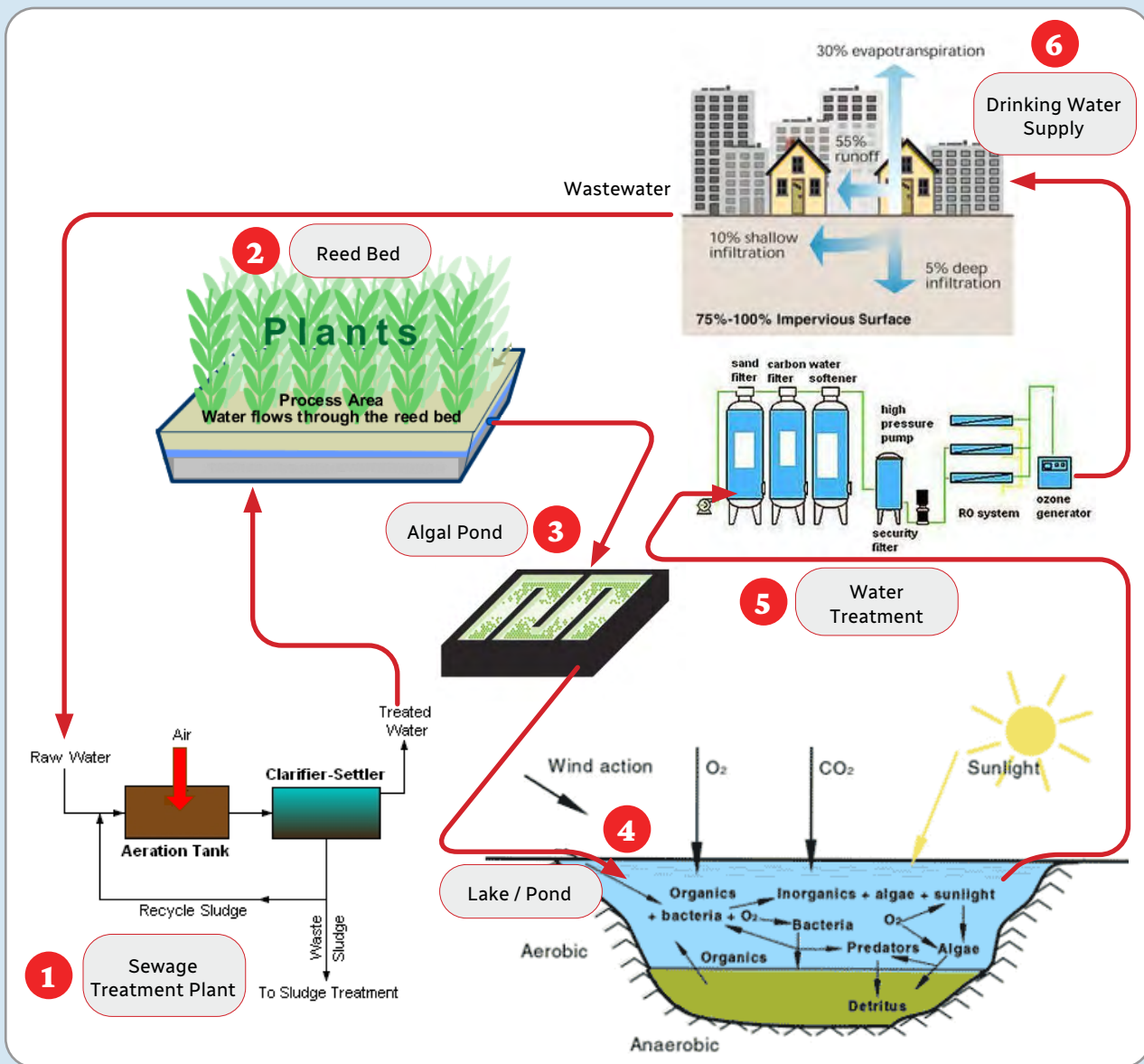
The lake was rejuvenated in 2010 with the removal of accumulated silt (desilting) and implementation of an integrated wetland system consisting of a secondary sewage treatment plant (STP), constructed wetlands, and algal ponds. Treated

water from the integrated wetland system reaches the lake after final polishing (consisting of floating wetland species).

Conventional wastewater treatment options are energy and capital-intensive, apart from their inability to remove nutrients altogether and generate concentrated waste streams necessitating environmentally sound disposal. Compared to this, an integrated wetland system (Figure 1) would help in the cost-effective tertiary treatment (removal of N, P, and heavy metals), which prevents contamination of lake water and groundwater resources. Algae grow rapidly and uptakes nutrients (C, N, and P) available in the wastewater. Algae convert nitrate into organic compounds (proteins, lipids) through photosynthesis. Algae exhibit higher growth rates than other plants due to their extraordinarily efficient light and nutrient utilization. Algal bacterial symbiosis is very effective as algae generate O₂ (during photosynthesis), which

aids in the efficient oxidation of organic matter with the help of the chemo-organotrophic bacteria and provides algae with an enriched supply of CO₂, minerals, and nutrients.

The integrated wetland system (1.6 Ha) consists of Upflow Anaerobic Sludge Blanket Reactor (UASB) with an extended aeration system for 10 MLD sewage treatment. Treated effluent then gets into wetlands (settling basin) of spatial extent ~4.63 ha consisting of diverse macrophytes such as *Typha sp.*, *Cyperus sp.*, *Ludwigia sp.*, *Alternanthera sp.*, Water hyacinth, etc., in the shallow region (with an area of ~1.8 ha) followed by deeper algal basin (covering an area of about 2.8 ha). This system with macrophytes and algae jointly helps in nutrient removal and wastewater remediation. The water from the settling basin through sluices (with moderate flow) flows into Jakkur Lake, which spans over 45 ha. There was notably less occurrence of floating macrophytes, except near the outfalls (~0.5 ha) due to blockage



▲ Figure 1. Integrated wetland system

of the outflow channels by solid wastes and debris. Local fishermen are managing these macrophytes. The clear water in Jakkur Lake, with abundant phytoplankton diversity in acceptable densities, indicates a healthy trophic status. Integration of the conventional treatment system with the constructed wetlands and the algal pond has helped cost-effectively remove nutrients and chemical ions. Emergent macrophytes (such as *typha*) act

as a filter to remove suspended matter and avoid anaerobic conditions by the root zone oxidation and algae taking the dissolved nutrients. Four to five days of residence time helps remove pathogens apart from nutrients. However, the integrated system requires regular maintenance through harvesting macrophytes and algae (from algal ponds). Harvested algae would have energy value, which could be used for biofuel production. Nutrient analysis highlights

nutrient removal by wetlands due to macrophytes and algae, which removes 77 % COD, ~90 % BOD, ~33 % NO₃-N, and ~75 % PO₄³⁻-P. The first stage comprising of emergent vegetation and an algal pond, removes ~45% COD, ~66 % BOD, ~33 % NO³-N, and ~40 % PO₄³⁻-P. Jakkur Lake aids in the final level of treatment and removes ~ 32 % COD, ~23% BOD, ~ 0.3 % NO³-N, and ~34 % PO₄³⁻-P. The combination of all the stages leads to the complete removal of nutrients to acceptable levels



▲ Top: The macrophytes in the Jakkur wetland area and at the outfalls of the lake, include *Typha augustata* species (54%) followed by *Alternanthera philoxeroides* (28%)

Bottom: Floating macrophytes *Eichhornia crassipes* (84%) were restricted to the outlet reaches

according to CPCB norms. The algal species primarily comprised of Chlorophyceae, followed by Cyanophyceae, Euglenophyceae, and Bacillariophyceae. The macrophytes in the wetland area and at the outfalls of the lake, include *Typha angustifolia* (54%) followed by *Alternanthera philoxeroides* (28%). Floating macrophytes *Eichhornia crassipes* (84%) were restricted to the outlet reaches. A nominal residence time (~5 days) would help remove pathogens apart from nutrients. However, this system requires regular maintenance of harvesting macrophytes and algae (from algal ponds). Harvested algae would have energy value, which could be used for biofuel production. Biomass productivity is ~122 mg/l/d and lipid productivity ~32 mg/l/d. Gas chromatography

and mass spectrometry (GC-MS) analysis of the fatty acid methyl esters (FAME) showed a higher content of desirable fatty acids (biofuel properties) with major contributions from saturates such as palmitic acid [C₁₆:0; ~40%], stearic acid [C₁₈:0; ~34%] followed by unsaturated such as oleic acid [C₁₈:1(9); ~10%] and linoleic acid [C₁₈:2(9,12); ~5%]. This study provided vital insights into the environmentally sound option of managing wastewater while addressing the water crisis due to unscientific and chaotic urbanisation in Bangalore. Replication of this model in Bangalore would help meet the water demand and also help in recharging groundwater sources without any contamination. Measures required to mitigate

the water crisis in burgeoning Bangalore are:

- Rainwater harvesting at decentralised levels through rejuvenated lakes addresses the water crisis as it helps harvest 15 TMC of rainwater generated in the Bangalore catchment.
- Rejuvenation and restoration of existing lakes are necessary to decontaminate water bodies due to the sustained inflow of untreated wastewater. Removing deposited silt would aid in eliminating nutrient-rich silt (which is useful for enriching croplands) apart from enhancing the storage capacity.
- An integrated wetlands ecosystem consisting of constructed wetlands and algal pond helps treat wastewater through bioremediation. Replicating the Jakkur Lake ecosystem would help treat water and reuse it. Rejuvenating lakes will have the added advantage of maintaining groundwater quality in the vicinity.

The integrated wetland system at Jakkur provides an opportunity to assess treatment efficacy apart from providing insights for replicating similar systems to address the impending water scarcity in the rapidly urbanising Bangalore.



Restoring High-Altitude Wetlands in the Hindu Kush Himalaya

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High-altitude wetlands, found above 3,000 masl (metres above sea level), of the Hindu Kush Himalayan (HKH) region are critical for local economies and regulation of natural processes. These wetlands contribute to flood mitigation, regulate water flows, maintain water quality, and are vital carbon sinks.

For instance, the Sichuan Ruoergai high-altitude wetland in China's Sichuan Province sequesters 750 megatonnes of carbon per year and plays a critical role in regulating local climate, conserving water and soil, and reducing greenhouse effects. The Tsomoriri Ramsar Site (wetlands designated to be of international importance under the Ramsar Convention) in Ladakh, India, provides goods and services that contribute to ecotourism and recreation, allowing communities to earn US\$ 700–1,200 during the summer season annually.

However, important high-altitude wetlands such as these are disproportionately impacted by climate change, with far-reaching consequences for these vital ecosystems.

High-altitude wetlands: Critical ecosystems in the HKH region

The HKH region—extending over 3,500 km across Afghanistan,

Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan—contains the headwaters of 12 major river basins and sustains the lives and livelihoods of nearly two billion people. Wetlands cover 10% of the HKH, and the region hosts the highest number of high-altitude wetlands in the world.

These high-altitude wetlands are fed by glacial or snow melt originating from the surrounding mountains. These wetlands are unique ecosystems with significant ecological, cultural, and spiritual values. Twenty-one of the 44 wetlands designated as Ramsar sites in the HKH are high-altitude wetlands.

High-altitude wetlands in the HKH region harbour a wide array of floral and faunal species, making them a unique abode for biodiversity. They are important habitats for many rare, threatened, and endemic species, and breeding and staging areas for migratory waterfowl. They are also critical for the healthy completion of the yearly life cycle of flagship migratory waterfowl that use the Central Asian flyway. However, many of these wetlands are degraded, resulting in 'missed links' in habitats along the migration route.

Beyond the economic and ecological benefits of high-altitude wetlands, these sites also hold cultural significance

for local communities. Several high-altitude wetlands, such as Gosaikunda and Gokyo in Nepal, Gurudongmar Wetland Complex in India, and Mansarovar in Tibet, are of religious and cultural significance for followers of Buddhism and Hinduism.

Threats to high-altitude wetlands

High-altitude wetlands in the HKH are under severe threat, mainly due to climate change and other anthropogenic activities. Unplanned development, unregulated tourism and grazing, excessive resource harvesting and

declining water quality, are further exacerbating the threats to wetlands. Increasing plastic pollution from tourism and trekking, mostly in the headwaters of many high-altitude wetlands and sources of rivers, is creating a huge challenge for their restoration.



▲ The Gangtey-Phobji Ramsar Site in Bhutan is a wintering habitat for the globally vulnerable Black-necked Crane (*Grus nigricollis*) (Alex Treadway/ICIMOD)



Restoration of the Zoige wetland in China has enhanced carbon storage (Alex Treadway/ICIMOD)

Increasing rates of glacier melt is leading to the conversion and expansion of glacial lakes into water lakes, increasing the threat of outburst floods. This is also leading to increased suspended load and additional element loading in aquatic systems, leading to the deterioration of wetlands. Alpine and temperate ecosystems are highly sensitive and fragile, and any change in water quality can impact floral and faunal diversity. Acid deposition during spring season and heavy metal (mercury and cadmium) deposition from global industrial pollutants are also impacting water quality.

Restoring high-altitude wetlands can be particularly challenging because of the increased intensity and frequency of

monsoonal rain and water-induced disasters. Additionally, the difficult terrain, limited accessibility, as well as the water source (mostly glacier melt) can make restoration complex.

Therefore, a different approach is required for the restoration of high-altitude wetlands compared to wetlands at lower altitudes. Over the past decades, various restoration measures have been carried out to revitalise wetlands in the region. The Zoige wetlands, covering approximately 5% of the wetland area in the Tibetan Plateau, were drained mostly for grazing prior to the 2000s. In recent years, various pilot projects have been launched to safeguard and restore the natural character of the Zoige wetlands.

A regional agenda for restoration

It is important for each HKH country to have a wetland conservation policy and strategies in place, supported by a national database of wetlands and site-specific restoration plans. To conserve and restore high-altitude wetlands, we need to integrate traditional and scientific knowledge, community-based restoration approaches, innovative financing into our interventions, applying a nature-based solutions lens, promoting wise-use and employing appropriate ecological restoration techniques and best practices.

There is an urgent need for the ecological restoration of high-

altitude wetlands in the HKH region. Considering the United Nations Decade of Ecosystem Restorations (2021–2030), ICIMOD is committed to collaborating with regional partners to understand the status of wetlands, conserve their health, and contribute to the global initiative of halting and reversing wetland degradation.

The ecological services and climate mitigation potential of these wetlands are invaluable, and their conservation and restoration demand

concerted efforts from governments, communities, and international agencies. ICIMOD aims to bring HKH countries together to share information, conduct joint research, and coordinate management actions aimed at restoring critical wetlands. This can help HKH countries to enhance wetland restoration and regional cooperation, especially in transboundary landscapes.



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Dr Zhu Dan is an Ecologist at Chengdu Institute of Biology, Chinese Academy of Sciences. His research interests include the carbon cycles of wetlands and the sustainable use of natural resources in the Himalayas.



▲ Figure a, b, c: Narrow-shallow wetland—identification of site, desiltation followed by ecological restoration and establishment of *Tamarix*-*Phragmites* forest community.

◀ Celebrating Wetlands Day along the restored wetland at Yamuna Biodiversity Park.

Yamuna Biodiversity Park

A wasteland to wetland

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Wetlands are among the most important ecosystems on earth. In fact, life flourishes wherever land meets water. However, with the rapidly growing human population and associated land use changes, wetlands degradation is rampant and their existence threatened by reclamation and degradation through drainage and landfill, discharge of domestic and industrial effluents, dumping of solid wastes, hydrological alteration, over-exploitation of natural resources resulting in loss of wetlands and their life-supporting potentials. Wetland degradation has potential influences on human health, biodiversity, climate, and regional water security. Floodplain wetlands are also important for associated riverine ecosystems.

In the development matrix of the urban centres, native ecosystems are completely wiped out and the wetlands are largely being seen as wastelands. Although, wetlands in India cover nearly 5% of its geographical area, Delhi the capital city of India has been facing

water security issue besides air and water pollution like any other urban centres. This has led to the degradation and loss of wetlands despite multiple steps being taken by the Government.

Delhi Development Authority (DDA) in joint collaboration with Centre for Environmental Management of Degraded Ecosystems (CEMDE), University of Delhi decided to restore the life-supporting landscapes of Delhi through establishing a network of Biodiversity Parks. Today, there are seven Biodiversity Parks in Delhi which are first of its kind in India and the Yamuna Biodiversity Park is one of them. Biodiversity Park can be defined as a designated site (marginal/degraded land) where assemblage of plant species from a specific ecological range are established in the form of forest communities utilising some of the principles of ecological restoration.

The ecological restoration process in the Biodiversity Parks begins with the sound understanding of

ecology, knowing the ecological history of the site, finding reference ecosystems and initiating ecological processes with the help of grasses and legumes.

Yamuna Biodiversity Park is the first Biodiversity Park of the country. It spreads across 185 ha of both the inactive and active floodplains of River Yamuna, just above the Wazirabad Barrage, near Jagatpur village of north east

Delhi. The restoration work was initiated in the year 2002.

In Yamuna Biodiversity Park, the soil was highly alkaline and water was saline due to an embankment constructed in 1978 to avoid flooding of human habitation. Establishing here, native forest communities was a herculean task with innate challenges. An initial survey was carried out from the origin to the confluence of river Yamuna to ascertain the existing forest communities, grasslands

and characteristic wetlands. Initially, wetlands were identified through the existing vegetation—*Typha* and *Phragmites*, which suggested that the subsoil aquifer was high or in other words it was a wetland which was silted or filled up. A plan was made to desilt them on the basis of drainage and contours and silted material was used to create mounds on which native forest communities belonging to Yamuna River basin were established. A narrow shallow wetland (>1.5 km in

length and depth varying from 0.5 m to 1.5 m) and a deep wetland (about 3 ha and depth varying from 0.5 m to 2.0 m) were restored in the inactive floodplain with the characteristic vegetation within and along the fringes with the objectives to create habitats for the resident and migratory birds. A typical *Phragmites-Tamarix* riparian community was established all along the narrow, shallow wetland, followed by grassland and forest communities belonging to the



▲ Figure d, e, f: Deep wetland—identification of site, desiltation followed by ecological restoration and the arrival of migratory birds.

Yamuna River Basin. Many species of grasses such as *Leptochloa fusca*, *Sporobolus diander*, *Bothriochloa pertusa*, *Chrysopogon zizanioides*, *Imperata cylindrica* etc., were reintroduced along with some legumes in the inactive floodplain which facilitated ecosystem process of enhancing microbial activities. The restored habitat was ready for the establishment of desired forest communities. *Leptochloa fusca* a grass species, acted effectively in reducing soil pH.

A 100 acres of the wetland was also restored in the active floodplains through de-siltation and re-introduction of aquatic vegetation such as *Hydrilla verticillata*, *Vallisneria spiralis*, *Potamogeton sp.*, *Nymphaea sp.* *Nymphoides sp.*, followed by *Paspalum* and *Typha* among others. The marshes and grasses such as *Saccharum spontaneum*, *Saccharum munja*, *Chrysopogon zizanioides* etc. got established, followed by the establishment of floodplain forest communities through assemblage of species.



▲ Figure g, h, i: Restored floodplain wetland and characteristic forest community in active floodplain.

The characteristic floodplain grassland was established comprising *Saccharum spontaneum*, *Chrysopogon zizanioides*, *Imperata cylindrica*, *Dichanthium annulatum* etc. along with *Cenchrus setigerus* on the uplands. The established forest communities comprise of *Kem Mitragnya parvifolia*, *Arjun Terminalia arjuna*, *Jamun Syzygium cumuni*, *Gutel Trewia nudiflora*, *Sisham Dalbergia sissoo*, *Ber Ziziphus mauritiana*, *Khair Acacia catechu*, *Chanrod Ehretia laevis*, *Jangli Phalsa Grewia sp.*, *Gul Dhavi Woodfordia fruticosa*. All the vegetations were established and the wetland restored, simulating forest communities and wetland ecosystems characteristics of the

Yamuna River Basin as per the reference ecosystems observed in the floodplain.

The successfully restored functional wetlands, marshes and forest communities of the Yamuna Biodiversity Park are now home for many insects, birds, reptiles and mammals. Many animal species have started reclaiming their historical geographical distribution ranges. A heronry is established in the restored *Tamarix-Phragmites* forest community along the narrow-shallow wetland facilitating mass breeding of *Black-crowned Night-heron Nycticorax nycticorax*, *Oriental Darter Anhinga melanogaster*,

Little Cormorant Microcarbo niger and *Little Egret Egretta garzetta*. A viable population of *Seibold's Snake Ferania sieboldii* reappeared after 70 years in the Delhi Yamuna Floodplain. *Hog Deer Axis porcinus* once reported locally extinct, have reappeared in the Yamuna Biodiversity Park. Now restored Yamuna Biodiversity Park forms the natural heritage of Delhi, providing essential goods and services to the city and an apt model for urban environmental sustainability and resilience and may be utilized elsewhere for floodplain restoration.



▼ Heronry established in the restored *Tamarix-Phragmites* forest community in the narrow-shallow wetland.



Ecological Restoration of Wular Lake

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Wular Lake is the largest freshwater resource in Kashmir and provides a range of essential ecosystem services to nearby human communities. The lake supports large extractive industries, including fishing and the harvest of aquatic plants; it holds large amounts of water during summer high flows and thus reduces downstream flooding, and much of the surrounding land is used for agriculture. It is also ecologically important, for example, as a Ramsar-designated stopover site for migratory birds. The lake provides livelihoods to a population of 10,964 households in 31 villages along the shoreline. Water from the lake is drawn with the help of lift water supply installations and meets the requirements of some major towns around the lake. The outflows from the lake are also utilised for generating hydroelectric power in the series of run-off river installations, namely Lower Jhelum Hydroelectric Project (105 MW capacity located at Ghantamulla), Uri Hydro Electric Project Phase 1 (480 MW capacity located at Uri) and Uri Hydro Electric Project Phase 2 (240 MW capacity also located at Uri). Water storage in Wular has a direct bearing on the availability of water in the river for hydroelectric power generation. Despite its importance, the ability of Wular Lake to provide these services

has decreased dramatically over recent decades. A Comprehensive Management Action Plan (CMAP) was formulated by Wetlands International South Asia in 2007. The recommendations pertaining to the lake directly are directed towards increasing the volumetric capacity of the lake to restore/improve lake function. The proposal is to:

- i. remove 35.5 MCM of silt from designated areas, and
- ii. clearing willow trees from 27.72 km² area, felling about 2.1 million trees along with their rootstock.

This plan, prepared in 2007, had a total outlay of Rs 386.39 Crore and was to be completed in five years. Subsequently, the State Government constituted a technical committee to examine the report and their recommendations for the implementation of different components were accepted in 2010. Whereas the work was initiated in 2011, major progress of the work done so far was achieved between 2020 and 2022.

Conservation issues at Wular Lake

Siltation is the most challenging problem for Wular Lake. Huge quantities of silt from multiple sources are ultimately deposited within the lake, leading to a loss



▲ **Figure 1:** Major conservation issues at Wular Lake (a) Huge quantities of silt from various sources is deposited in Wular Lake over the decades, leading to loss of water holding capacity (photo shows the extent of silting); (b) Land use changes including conversion of marshy areas for agriculture & horticulture development; (c) Extensive salix plantation within the lake area; (d) Non-native aquatic weed infestations; (e) Accumulation of huge quantities of solid waste; and (f) Degradation of catchment areas around the lake / Photo credits: (a), (e) & (f) WUCMA; (b), (c) & (d) Ather Masoodi.

in its water-holding capacity. The major contribution of silt comes from the River Jhelum, which flows directly in the lake. Land use changes include the conversion of marshes associated with Wular Lake, for agricultural purposes under the government-sponsored Grow More Food Programme implemented in the 1950s. Besides the rapid degradation of forests and pastures. Salix (Willow) plantations were raised by government departments to meet the fuel wood requirements of the region and are not a natural feature of the lake. These plantations enhance the discharge of the silt from River Jhelum within the lake. Non-native aquatic weeds are an emerging issue for the overall conservation of the lake.

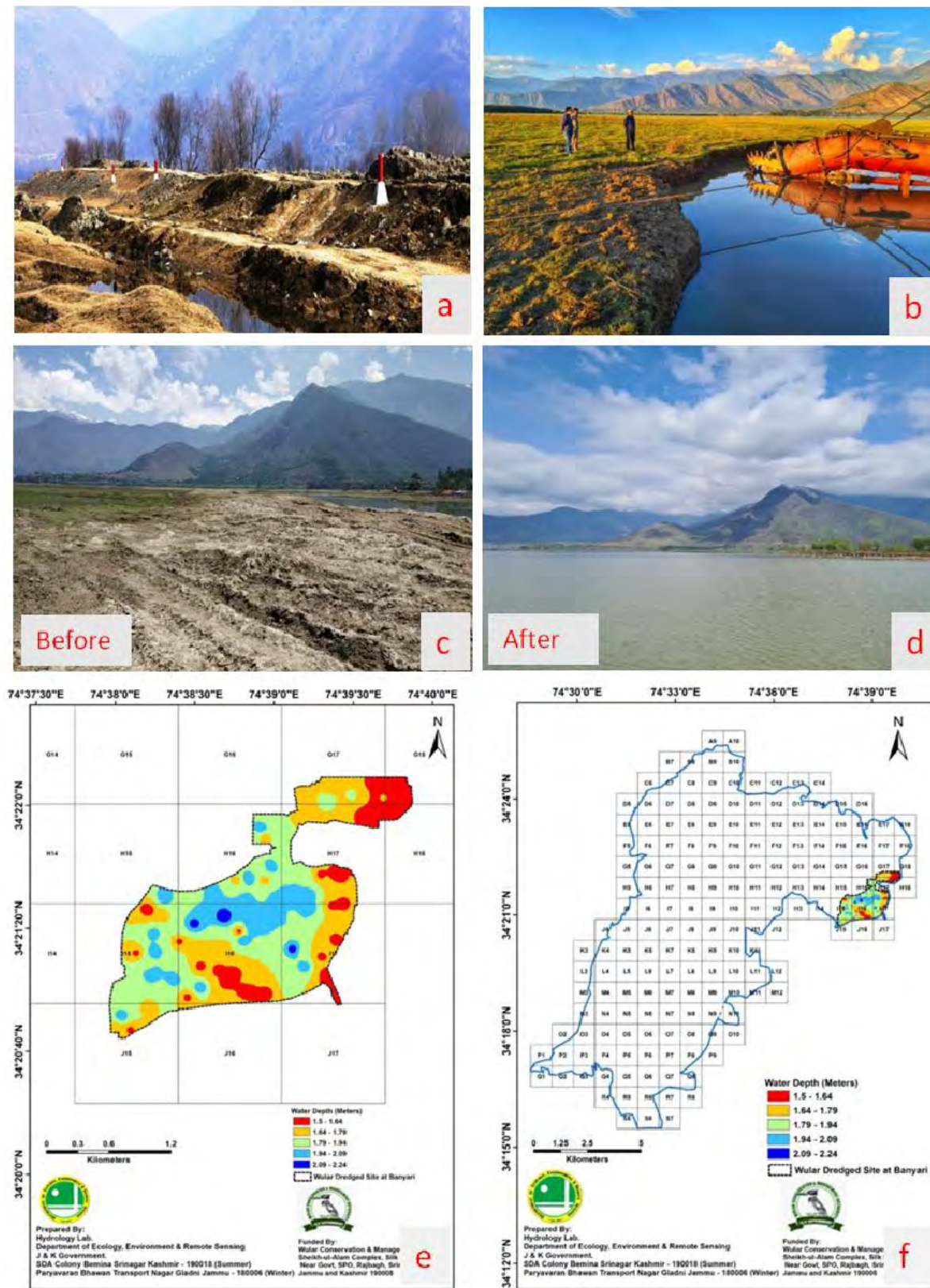
Restoration of Wular Lake is threatened by the invasion and rapid expansion of aquatic weeds, including alligator weed. Wular is a shallow eutrophic lake basin, which gives these species the potential to completely cover the lake, including the areas which have been restored recently. This would drastically reduce the size of the fishery, would negatively affect many other benefits of the lake, and would likely be a disaster for the human welfare of those living in the region. Solid waste from and sewage water from adjoining areas and also upstream, coming along with River Jhelum, is ultimately dumped in Wular lake. This has severely deteriorated the water quality and also the prevalence of diseases among the locals, the majority of whom live below the poverty line. Degraded Catchment area has further

enhanced siltation and decline in the overall functioning of the lake.

Restoration measures undertaken so far at Wular Lake

Demarcation of lake has already been completed using revenue records and satellite data. A total of 1,159 geo-tagged, serially numbered boundary pillars have been installed along 83.6 km boundary line of the lake using remote sensing technology. The total area of the lake is 130 km². The CMAP for Wular Lake had identified 27.72 km² area as critically silted. Whereas dredging in Wular Lake and adjacent nallahs started in year 2012 and upto 2018, 1 km² area was restored using pokland and excavators. Major progress was however achieved between 2020 to 2022, during which 3.1 km² area was restored using three cutter suction dredgers (with 250kw cutter power), tug boat and other machinery. A total of 4.35 km² area has been restored so far at Banyari site and 77.42 Lakh cubic metres of silt excavated. The extracted silt has been deposited along banks to create provisions for some parks along the shoreline. Work on dredging of the remaining 23.37 km² area is in progress. The total number of willow trees cut is 1,21,202, and the total revenue realised so far is 24.33 Crore. The results of our earlier study, as part of the TEEB India Initiative, has provided overwhelming evidence, based on economic calculations, in favour of removing Willows in a timely fashion. Benefits from the sale of Willows, generation of hydropower, and costs of floods avoided outweigh the high costs of

Non-native aquatic weeds are an emerging issue for the overall conservation of the lake.



▲ Figure 2: Conservation activities within Wular Lake (a) Geo-tagged boundary pillars in Wular Lake; (b) Aerial view of cutter suction dredging machinery site; (c) & (d) Before and after photographs of dredging site at Banyari; (e) Water level at the dredged site has increased by 2 m; (f) The 4.3 km² dredged site in Wular Lake.

de-siltation and loss of carbon sequestration benefits.

Within the direct catchment of the lake, 24 micro watersheds (out of 109 total) comprising of an area of 7446 ha have been prioritised for treatment. To arrest soil erosion and improve groundwater recharge, WUCMA has carried out afforestation activities and soil & water conservation measures in the priority micro watersheds. A total of 19.30 Lakh plants besides checkdams, DRSM and cratewire structures have been constructed along stream banks, nallahs and gullies to prevent erosion.

Impact of restoration measures in Wular Lake

The dredging section of Wular Lake at Banyari-Saderkoot shows significant increase in open water post-dredging. The previous satellite imageries reveal lake bed as landmass formation with no water within the same area. The water depth analysis of Wular Lake was carried out from the design bed level i.e. 1575.50 m amsl at Banyari Site during

the month of October. The results show that the average water column has increased by two metre at dredging site Banyari. The fish production has shown increasing trend and 5,000 metric tonne is the average annual yield reported from Wular. Sustainable fisheries development through enhancement of fish yield and diversity is critical to livelihood improvement of the communities. The chestnut is the second most important aquatic product harvested from Wular. The average annual yield of chestnut is reported around 4,000 metric tonne. Development of recreational facilities such as boardwalk, nature trails, guided boat rides, landscape gardens and watchtower in the lake are under progress for promotion of ecotourism and diversification of livelihood opportunities for local communities and generating awareness about the importance of Wular Lake. Besides several awareness campaigns, workshops, and seminars have helped bring awareness and a positive change among the locals.

The way ahead

It is highly desired that the recommendation in the Comprehensive Management Action Plan for Wular Lake formulated by Wetlands International be implemented in totality and in a time-bound manner to achieve the overwhelming benefits of restoration. The accruals from the sale of willows should be ploughed back towards the restoration of the lake.



▲ **Figure 3:** Impact of restoration measures in Wular Lake (a) Long-tailed duck (*Clangula Hyemalis*) sighted in Wular Lake after 84 years; (b) Smew (*Mergellus albellus*) sighted after 116 years; (c) Afforestation in immediate catchment is arresting soil erosion; (d) Recreational facilities including watch towers and boardwalk (h) are promoting ecotourism and livelihood diversification; (e) Harvest of fish and (f) nutlets of *Trapa natans* are showing an increasing trend / Photo credits: (a), (b), (c), (g) & (h) WUCMA; (e) & (f) Ather Masoodi.



From Neglected Wasteland to a Ramsar site

Haiderpur wetland's journey towards ecological restoration

Ashish Loya

Art of Living Foundation
Faculty



Art of Living faculty based in Bijnor, UP. A passionate birder and conservationist, he works with authorities, NGOs, scientists, media and local community for conservation of Haiderpur Wetland, for which he has been recognised as a Wetlands Ambassador by Wetlands International and a Wetlands Champion by Mongabay

Introduction

Haiderpur Wetland is one of the largest wetlands in Uttar Pradesh, that was formed in 1984 after the construction of the Madhya Ganga Barrage. Long neglected as a wasteland, it lay largely hidden from the world due to its peculiar shape and geography. In 2013, when I first stumbled upon this area, I was taken aback by the stunning biodiversity and immediately knew that this was a potential Ramsar Site. Thus, began my journey of recording the fauna and sharing it with concerned authorities and media to generate awareness.

The region is fed by the Ganges and its tributary Solani River, constituting an area of 6,900 ha within the Hastinapur Wildlife Sanctuary in Muzaffarnagar and Bijnor districts. The wetland lies in the strategic Central Asian Flyway and is an important stop-over site as well as a wintering ground for migratory birds.

The wetland has a combination of different habitats like river, grassland, forest patch, water bodies surrounded by agriculture, marsh area and water level varying from few meters to shallow mudflats. This has caused a large variety of flora and fauna to flourish.

Among the mammals, jungle cats, fishing cats, otters, monkeys, fox, Nilgai, jackal, mongoose, Swamp Deer (*Barasingha*), Hog Deer, Spotted Deer, wild boars, rabbits and bats inhabit the wetland area. Reptiles such as monitor lizards, pythons, and the Indian Cobra are found in large numbers. A significant population of *Gharial* and Gangetic Dolphins are observed in the adjoining Ganga River Basin. It is home to nine species of turtles and 39 species of fish. A survey of Swamp Deers has resulted in a count of 150 for the last two years. Otters have been regularly sighted.

However, the most visible diversity in the wetlands is that of the avian

species, especially migratory birds. The visual spectacle that unfolds here every year from November to March is stunning. The checklist of birds at the wetland is currently at 327 species, which includes some endangered and globally threatened species like the Indian Skimmer, Black-bellied Tern, Bristled Grassbird, Sarus Crane, Yellow-breasted Bunting, Black-headed Ibis and Pallas's Fish Eagle. A few vagrant species like Smew, Penduline Tit, Chinese Ruby-throat and Red-tailed Wheatear have also been spotted. Some species are present in unusually large numbers like over 4,000+ Ferruginous Ducks, 3,000+ Common Pochards and 3,000 Greylag Goose.

First step: Recognizing the area as a wetland and getting the Ramsar tag

The first step was to recognise the area as a wetland. In January 2019, the Forest Department established the first *chowki* to check encroachments and started the conservation activities. In mid-2019, Mr Sanjay Kumar, a senior IAS officer and a nature enthusiast, arrived as a Divisional

Commissioner of Saharanpur. I shared my findings with him, and realising the importance of the place, he brought together nature lovers, NGOs, government departments and all stakeholders, and initiated measures to promote ecotourism. Viewing points were created and a watch tower erected. The Forest department started 24-hour surveillance, and trespassing and encroachments came down in few areas. Bird counts as part of Asian Waterbird Census at Haiderpur since 2019 have consistently resulted in counts of over 20,000+ migratory birds, thereby satisfying an important criterion for Ramsar Site tag.

The concerted actions resulted in Haiderpur Wetland getting declared as India's 47th Ramsar site in 2021.

Involving the local community: Cultural connections help create bonds

During COVID-19 in 2020, I found a group of local community youth playing in the wetland area. I organised an Art of Living workshop for them, teaching yoga, meditation and breathing techniques. The spiritual and cultural program helped me

bond with them, and they started to learn birdwatching. One of them, Mr. Ashish Gujjar, is especially gifted and has a talent in recognising bird calls. Soon, he started working as a bird guide, assisting visitors. He has guided more than 300 birdwatchers so far and assisted research teams from WII and WWF. He is now employed as a field assistant with NMCG-WII.

International Association of Human Values (IAHV), a trust formed by Gurudev Sri Sri Ravishankar, is implementing a project in which 15 local youth are being trained to become nature guides. Ashish Gujjar's success has inspired many others to come forward and join the team. This team also conducts sensitisation workshops in villages around the wetland. They have given 1,600 students from nearby schools an educational tour of the wetland as part of the project. Another local youth, Gaurav Kumar, has given up fishing activities and is now spreading awareness as a team member of the IAHV project.

These youth have been the eyes and ears on the ground and their feedback helps prevent ecological tragedies. Their valuable knowledge of local

◀ The wetland is wintering ground for over 50,000 migratory waterfowl every year

▶ A sensitisation workshop being held by the nature guides trained under IAHV





▲ As part of the IAHV project, local village youth are training to be bird guides, who further conduct village sensitisation programs. They have given 1,600 students educational tours of the wetland.

terrain has helped document the biodiversity and enriched our understanding of the functioning of this ecosystem.

A birding hotspot attracts visitors from India and abroad

The presence of a local nature guide, Ashish Gujjar, has facilitated visits by birdwatchers, who have been flocking to the wetland, especially for the sightings of elusive and endemic Indian Grassbird, Bristled Grassbird, the endangered Indian Skimmer

and Black-bellied Tern. Besides, this is the only wetland in India where a male Smew has been spotted. Many noted ornithologists who visited have been duly impressed, including Ms Carol Inskipp and Mr Asad Rahmani. BNHS has included a stopover at Haiderpur as part of its tour, and wildlife tour operators like Asian Adventures have brought birdwatchers from abroad. I give regular updates in local and national media to encourage visitors. Increased ecotourism has helped in the monitoring and maintenance of the wetland.

▼ Birdwatchers from across the globe visit Haiderpur wetland



A tragedy strikes as the wetland is dewatered but Ramsar tag helps address the problem

Every year around February, the irrigation department, which manages the Bijnor Barrage, opens the gates of the barrage and empties out the wetland for their annual maintenance purposes. After the annual checkup of their systems, the gates are again closed in June, and the ponding process

of accumulating the water starts. This fills the wetland area with water, creating a pond which attracts and sustains biodiversity.

But there are no set dates on which the gates are opened, and this is often done under pressure from local farmers, who then encroach on the emptied wetland area to sow wheat crop. At times the water was released for the purposes of Magh Mela held downstream at Prayagraj. Ad hoc reasons dictated the timetable of

water release, and the presence of migratory birds had absolutely no influence on the decision-making of the irrigation department.

In 2023, I was shocked to see the gates were opened around 13th January and all water was emptied in just three days by 15th January, forcing 35,000 migratory birds to fly away and seek other suboptimal habitats. This included over 4,000 Ferruginous ducks, one of their largest congregations in India, 3,000 common pochards,

▼ After the Irrigation department opened Bijnor Barrage gates and dewatered the wetland in January 2023



a rare lone Smew and many more endangered species that had made this wetland their winter home. This reckless action dealt a severe blow to the ecosystem and destroyed the pristine habitat.

Since Haiderpur Wetland is now a Ramsar Site, I decided to bring the matter to the attention of authorities by writing to Wetlands International, releasing news to environmental reporters of national media and posting before and after pictures of the devastation on Twitter. This created widespread outrage, and the MoEFCC officials asked the UP Government to explain what was being done to follow the Ramsar Site rules governing the wetland. The government took corrective action, and the barrage gates were closed again around 30th January, and water reaccumulated.

Reaccumulation of water resulted in 5,000 migratory birds coming back, which stayed till the first week of April. Storing water in wetland till the middle of April also prevented the early invasion of the area by cattle and further reduced commercial exploitation, significantly reducing human presence and instances of grassland areas being ravaged by fire. Also, local villagers reported increased availability of groundwater in the summer. Earlier, they had to draw water from deeper wells in summer, but this year, they did not have to go deeper as water was available at shallow depths.

A committee of senior officials across various departments submitted a report, and it has now been decided that the irrigation department will henceforth release water only after the migratory birds have left and at the recommendation of the local DFO. It was agreed that a certain minimum level of water at 220.5 meters amsl will be maintained throughout the migratory season. (Though the optimal level of water in wetland to sustain a flock of 30,000 birds is around 221.5 meters amsl. At this level, it will also be difficult to do large-scale encroachments).

Barrage gates were then opened in April when the DFO certified that migratory birds had left. The irrigation department carried out their maintenance tasks over a one-month period in May and June.

► Avian species form the most visible diversity in the Haiderpur wetland

The way forward

The irrigation department needs to be sensitised regarding the ecological impacts of their work. The wetland boundary needs to be demarcated and made clear with signages to reduce encroachments. Excessive illegal fishing inside the protected area needs to be curtailed. The main threats to the ecological health of Haiderpur Wetland are all human-made. Corruption in the governance system enables these activities and poses a big challenge to implement conservation measures. But despite all these challenges, the concerted efforts of the administration, NGOs, local community, nature lovers, and bird watchers are committed to the conservation of wetlands is a cause for hope that Haiderpur Wetland will continue its journey towards ecological restoration.





▲ Pockets of carbon rich peat bogs in Miyar Valley / Harsh Ganapathi

Miyar Unveiled

A tapestry of culture, wilderness and wetlands

Harsh Ganapathi
Senior Technical Officer / Ecohydrology



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Dhruv Verma
Senior Technical Officer / Wetlands Conservation



Wetlands International South Asia

Miyar Valley, nestled in the north Indian state of Himachal Pradesh and spanning ~964 km², is a breathtaking Himalayan destination that captivates visitors with its pristine beauty and charm. This remote valley situated between 2,000-6,000 metres amsl, surrounded by towering peaks and glaciers remains relatively untouched by anthropogenic stresses. This valley is adorned with shallow wetlands, supraglacial lakes, lush green meadows, dense forests, the Miyar River and its tributaries that flow through its heart. The valley provides several ecosystem services namely: water to downstream communities, rangelands for grazing, carbon storage in peatlands, tourism, and habitat for diverse flora and fauna. One of the striking features of this landscape is its isolation, accessible only through a challenging trek that rewards the trekkers with surreal panoramic views with

snowcapped peaks emerging like sentinels guarding the valley. The visitors to this landscape often find themselves immersed in a realm of unparalleled tranquillity and awe-inspiring vistas. The cultural richness of Miyar Valley is evident in its scattered villages, each with its unique charm. The inhabitants, primarily of Tibetan descent, lead a traditional way of life, sustaining themselves through agriculture and livestock. The ancient monasteries that dot the landscape add a spiritual dimension, harmonising with the surrounding natural beauty. The valley offers one of the best rangelands for local and nomadic agro-pastoral communities, the *Gaddis* and *Gujjars* herding nearly 30,000 livestock annually, predominantly adding cultural richness to the region.

A remarkable aspect of Miyar Valley is the presence of peatlands, sporadically spread across the valley covering nearly 0.02 % of the



▲ Glacial melt feeding the Miyar River / Harsh Ganapathi

landscape. Their role in locking millennia old trapped carbon and sequestering additional carbon becomes vital in mitigating the impacts of climate change in the region. In Miyar Valley these peatlands are usually form a delicate network of waterlogged habitats that serve as crucial carbon sinks storing between 39 to 78 tonnes per hectare and support myriad of plant and animal life. The waterlogged condition slow down the decomposition of organic material, allowing layers of peat to accumulate over centuries. This buildup of peat serves as a reservoir for carbon, helping mitigate the impact of green house gases. Given the global concerns about climate change, understanding and preserving these peatlands becomes increasingly vital.

The unique flora thriving in Miyar Valley's peatlands add to their ecological significance. Sphagnum moss, with their remarkable water retention properties, create a specialised habitat that support a variety of plant species adapted to acidic and nutrient-poor conditions. The migratory avian diversity attracted to these peatlands for breeding and feeding further accentuate their ecological significance. These peatlands provide a habitat rich in insects and other invertebrates, making them essential for survival of bird species.

Over the years, impacts of climate change in the Himalayas has had profound effects on the culture and society dependent on the various bounties offered by the landscape. Melting glaciers, erratic and unpredictable weather conditions, changing rainfall

patterns, and increasing temperatures are impacting the people and biodiversity of the region. Climate change impacts coupled with human activities such as improper landuse and drainage for agriculture or infrastructure development disturbs the hydrological balance crucial for peatlands to be in a healthy state.

Conservation efforts are imperative to ensure resilience of Miyar Valley's peatlands against these challenges. However communities in the Miyar Valley actively employ traditional practices to enhance climate resilience and play a vital role in preserving and conserving the natural heritage through efficient resource management strategies. Over time, local communities have developed various institutions like the Jowari System and Kuhl Committee, driven by social cohesiveness, collective action, and a shared motivation to address environmental and social challenges. Grazers for example follow rotational grazing to ensure sustainable use of the pasture enabling regeneration of biomass. An integrated approach between communities, government and private sectors in Himachal Pradesh with collaborative efforts can enable conservation actions to protect the landscape from further degradation.



▲ A supraglacial lake near Miyar Glacier / Harsh Ganapathi



▲ Pastoralists in Miyar Valley / Harsh Ganapathi

Deciphering the Dilemma of Prioritising Wetlands' Conservation Over Developmental Activities in the Great Nicobar Island

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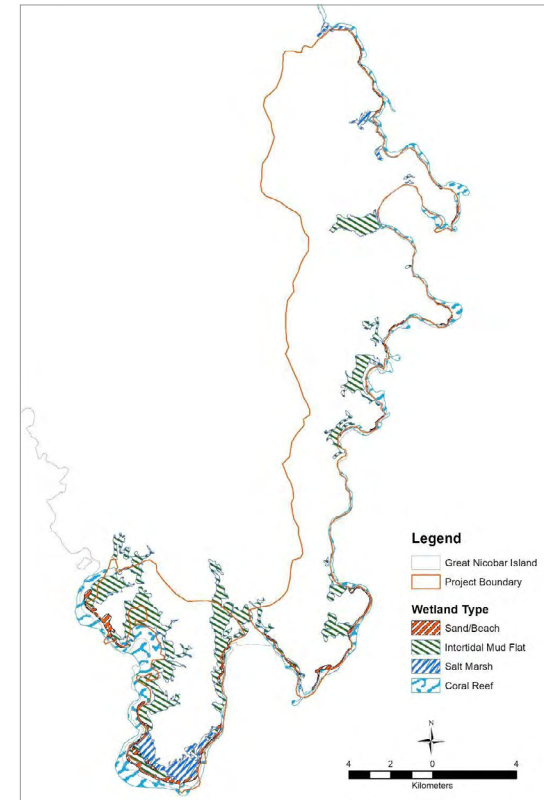

 Wetlands International South Asia

The intricate relationship between environment and development has become undeniable. It has led to the emergence of the concept of sustainable development, a paradigm that recognises the imperative to harmonise human advancement with the preservation of nature for future generations. However, as we stand at the crossroads of environmental challenges and developmental aspirations, it is widely observed that development projects have a consequential toll on the environment, leading to unforeseen ecological degradation and a setback to development progress.

One such dilemma has come up with the news of the development of a mega-infrastructure project in an ecologically unique and fragile area in the Great Nicobar Islands, Nicobar district (Map). The project aims to boost India's national security, triggering economic development in the region through trade opportunities in the IOR and beyond. The project raises serious concerns as it poses irreversible threats to the overall

socio-ecological integrity of the landscape. The region hosts a diverse and unique assemblage of threatened species in the tropical evergreen forests, and wetland types like intertidal mudflats, salt marshes, coral reefs, and sand/beach. The wetland catchments house about 650 floral and 1,800 faunal species.

Based on its unique characteristics and vitality, the landscape is safeguarded by the Andaman and Nicobar Islands Regulation of 1956, Forest (Conservation) Act (1980), Coastal Regulation Zone (CRZ) rules under the Environment Protection Act (1986), and Forest Rights Act (2006). However, the execution of the developmental project would involve bypassing some of these rules and adversely impacting the socio-ecology of the region. The project aims to develop an international container transshipment terminal of 14.2 mTEU, a greenfield international airport that can carry about 4,000 peak hour passengers, a residential township, and a 450 MVA gas and solar-based power plant. The proposed township will comprise commercial, industrial and



▲ **Map:** Parts of the proposed developmental project overlapping with existing wetland types in the island

residential zones, while a significant area will be dedicated towards tourism projects and activities. Out of the 16,610 ha designated for the assignment, almost 50% will be taken up under the first of three implementation phases.

However, the construction and activation of the project may arouse catalytic adverse impacts maligning the socio-ecological character of the landscape. The project involves the felling of about 0.8 million trees, resulting in the loss of 12-20 ha of mangroves, 298 ha of coral reefs and the degradation of about 13,000 ha of primary forest in the Great Nicobar Biosphere Reserve, encompassing the Galathea National Park in the south and Campbell Bay National Park in the north of the island.

The proposed area for the project spans across four wetland types viz., sand/beach, intertidal mud flat, salt marsh, and coral reef, with an estimated overlap area of about 310.45 ha, 1,987.06 ha, 361.14 ha, and 1,951.71 ha, respectively, jeopardising the habitat of 14 species of mammals, 222 species of birds, 26 species of reptiles, 10 species of amphibians and 113 fish species besides countless endemic

flora. Therefore, the vision of tapping the island's economic potential does not seem to harmonise with the immense environmental degradation it may cause.

Based on the potential adverse impacts that the project may ignite, Conservation Action Trust and several others filed an appeal to the National Green Tribunal (NGT), India's apex green court, against the environmental clearances granted by the MoEFCC to halt the irreversible socio-ecological shifts. The appeal pointed out several significant shortcomings in the clearance, including the location of the proposed port falling within the prohibited zone of the CRZ-IA underlining the presence of many large coral beds and ecological data from a single season compared to the prescribed three seasons' data for comprehensive impact assessment. The displacement of local tribes like the Mongoloid Shompen tribe (population 237) and Nicobarese tribe (population 1,094), whose legal rights are otherwise re-enforced by the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act of 2006 remains unappraised. The proposal also involves a denotification of an effective area of 711 ha from the Great Nicobar Biosphere Reserve, and diversion of 15.02% of the total forest land otherwise inhabited by the local tribes.

Thus, on one hand, the proposed project is of paradigm significance in capturing the strategic location to develop a new economic hub in IOR, countering foreign power consolidation in the IOR, and improving connectivity with Indian mainland. On the other hand, project developments would entail a gigantic loss of wetlands and wetland biodiversity degrading a total wetland area of 4,610 ha representing 5% of the total island area. It may not appear in plain sight, but in order to achieve the project-triggered financial development and strategic gains, the landscape may be stripped of the provisioning, regulating, cultural and supporting services catered for by the wetlands, triggered by the loss of approximately 41% of island's total wetlands. This also heightens climate and disaster vulnerability since the island is located between the Indian Plate and the Burmese Plates (a part of the Eurasian Plate) and has witnessed previous earthquakes and tsunamis like the infamous tsunami of December 26, 2004 (magnitude of 9.3 on the Richter Scale and killed over a population of 0.2 million people across 14 countries), and increase the natural disaster vulnerability of the region.



Roundtable Meeting of Ramsar National Focal Points of the South Asia region Pokhara, Nepal

Dr Asghar Nawab
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Wetlands International South Asia

Wetlands International South Asia, considering regional homogeneities in the South Asia region and the benefits of the exchange of best practices, envisions the establishment of a South Asia regional platform for wetland managers. This will enable capacity development, informal exchange and sharing of best practices to address the complex development contexts in which the region's wetlands are placed.

Wetlands International South Asia joined hands with the International Centre for Integrated Mountain Development (ICIMOD), Nepal, to bring together Ramsar Wetlands National Focal Point representatives from South Asia countries to develop modalities for the operation of the Regional Platform for Wetlands Conservation and Wise Use. The Roundtable meeting was held in Pokhara, Nepal, from 13–15 December 2023 and was attended by representatives from Bangladesh, Bhutan, India, Nepal and Sri Lanka.

This meeting was the third in the series, beginning from the first one held at Ramsar CoP13 in Dubai, wherein the representatives of the national governments and international organisations concurred with the idea of the development of a regional platform for wetlands managers of South Asia. This was followed by a regional meeting of the National Focal Points (NFPs) at the International Water Management Institute (IWMI) headquarters in Colombo in 2019, wherein the possible roles of the platform were identified. In 2022, a virtual training programme on wetlands and water management was also organised by Wetlands International South Asia in collaboration with

Ramsar Regional Centre–East Asia (RRC-EA). Subsequently, in CoP14, at a side event on 'Regional Collaboration for Wetlands Conservation and Wise Use in South Asia' held on November 8, 2022, the national governments endorsed the need for a South Asia Regional Platform to enable capacity development, information exchange and sharing of best practices to address the complex development contexts in which the region's wetlands are placed. Four roundtables on Regional Platform vision and mission, objectives, governance and collaboration framework and action plan were held. These were chaired by **Mr Shiva Kumar Wagle** (Ramsar National Focal Point/Director General of the Department of Forests and Soil Conservation, MoEFCC-Nepal); **Dr Manjula Amararathna** (Ramsar National Focal Point/Director, Department of Wildlife Conservation, Sri Lanka); **Mr Cheten Thinley** (Department of Water Ministry of Energy and Natural Resources, Bhutan); **Dr Santosh Kumar** (Scientist E, Zoological Survey of India, MoEFCC-India); and **Mr Imran Ahmed** (Conservator of Forests, Wildlife & Nature Conservation Circle, Bangladesh Forest Department, Bangladesh).



▲ Participants at the Roundtable Meeting of Ramsar National Focal Points of the South Asia region Pokhara, Nepal, 13–15 December 2023

The *Regional Initiative Proposal* was adopted by the participants, and it was recommended to be endorsed by the member countries for administrative approval.

Key recommendations that emerged from the discussions:

- The rationale for regional collaboration encompasses essentially the urgency to halt the decline of the wetland ecosystems and the need to scale up action on wetlands conservation and wise use by sharing national and regional experiences of South Asian countries.
- The vision for the Regional Platform was specified as—*A well-conserved and effectively managed wetland network as a contribution to sustainable development in the South Asia region.*
- The mission for the Regional Platform was stated as — *Support all stakeholders in inclusive and integrated wetland management through international cooperation, networking, knowledge development and exchange of best practices, funding support and capacity development.*
- The objectives set out emphasised supporting the implementation of Ramsar Convention commitments and Strategic Plans; Enhance regional coordination, cooperation and networking in South Asia; Build capacity of stakeholders to design and implement wetland conservation and management programmes and to operate a Wetlands Fund to support implementation of strategic priorities for the

conservation and wise use of wetlands in South Asia region.

- The geographic coverage of the Regional Platform will include the present Ramsar Convention Contracting Parties in South Asia as well as the new countries as they become members of the Ramsar Convention.
- A three-tier Governance Framework for the Regional Platform was adopted. The Steering Committee to include the Ramsar National Focal Points as the nodal authority and which meets at least once a year. An Advisory Committee exclusively for South Asia to be constituted, the committee to recommend topics and issues for the development of the work programme of the Regional Initiative. An Executive Committee to appoint thematic leads and to oversee fund raising for programme implementation.
- The South Asia Regional Platform would collaborate with different national and international organisations through a memorandum of understanding, technical cooperation, and funded projects approved by the Steering Committee.
- Resource mobilisation efforts will largely be directed at capacity development, creating a Small Grants Fund to support wetland action, developing strategic knowledge products, joint technology development and regional monitoring programmes.



Round up of News

Mangroves in the spotlight at UNFCCC

To address the need for a coordinated worldwide strategy for mangrove protection, the Global Mangrove Alliance (GMA) and the UN Climate Change High-Level Champions issued a call for signatures on the “Mangrove Breakthrough” announced at CoP27.

By taking coordinated action on the following, the Mangrove Breakthrough hopes to safeguard the future of 15 million ha of mangroves worldwide by 2030:

- Halting mangrove losses.
- Restoring half of recent mangrove losses.
- Doubling the protection of mangroves globally.

Ensuring sustainable long-term finance for all existing mangroves by achieving an investment of 4 Billion USD by 2030 to conserve and revitalise these coastal ecosystems.

Current signatories to the breakthrough include Global Mangrove Alliance members, the Ocean Risk and Resilience Action Alliance (ORRAA), and Salesforce, among many others. By joining the Mangrove Breakthrough, signatories recognised the need and showed a willingness to achieve a future where these critical ecosystems are restored and protected.

To assure support for both international and local projects aiming at preserving and restoring these coastal forests, the Breakthrough will channel finance at scale. Different organisations involved in these activities have been brought together by the GMA since 2018, which has served as a platform and community of practise to coordinate efforts and develop best practises for mangrove conservation and restoration. In order to effectively engage and coordinate collective action at the local and national levels, the GMA has recently established a number of National Chapters. These kinds of initiatives present investment-ready opportunities and offer a practical

means of achieving the objectives of the Mangrove Breakthrough.

Mangrove forests have been increasingly recognized as critical coastal ecosystems and are proven nature-based solutions to a changing climate. Their ability to provide food, extreme weather protection, and livelihoods, all while harbouring incredible biodiversity, enhancing coastal resilience, and acting as immense carbon sinks make mangrove conservation and restoration a common sense-investment.

The 2022 United Nations Climate Change Conference or Conference of the Parties of the UNFCCC, more commonly referred to as COP27, was the 27th United Nations Climate Change conference that took place from 6–20 November 2022 in Sharm El Sheikh, Egypt. The Mangrove Breakthrough is part of the Sharm El Sheikh Adaptation Agenda of the Marrakesh Partnership. In order to increase resistance to the climate threats that people in vulnerable places around the world confront, it has defined important 2030 Adaptation Outcome Targets as high-impact solutions. The Sharm El Sheikh Adaptation Solutions offer the chance to deliver system-level resilience while accelerating transformative adaptation initiatives. By concentrating efforts across the Partnership and resilience players, they allow the Race to Resilience to aim to increase the resilience of 4 billion vulnerable people by 2030.

New Global Biodiversity Framework recognises Wetlands

The United Nations Biodiversity Conference (CoP15) ended in Montreal, Canada, on 19th December 2022 with a landmark agreement to guide global action on nature through to 2030. Convened under UN auspices, chaired by China, and hosted by Canada, the 15th Conference of Parties to the UN Convention on Biological Diversity adopted the “Kunming-Montreal Global Biodiversity Framework” (GBF), including four goals and 23 targets for achievement by 2030.

A target was set to ensure that by 2030 at least 30 per cent of areas of degraded terrestrial, inland water, and coastal and marine ecosystems are under effective restoration, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity. Among the 23 targets identified under the Kunming-Montreal Global Biodiversity Framework, it was also emphasised to ensure urgent management actions, to halt human induced extinction of known threatened species and for the recovery and conservation of species, in particular threatened species, to significantly reduce extinction risk, as well as to maintain and restore the genetic diversity within and between populations of native, wild and domesticated species to maintain their adaptive potential, including *in situ* and *ex situ* conservation and sustainable management practices, and minimize human-wildlife conflict for coexistence.

A target was also set to promote nature-based solutions and ecosystem-based approaches to enhance nature’s contributions to people, including ecosystem functions and services, such as regulation of air, water, and climate, soil health, pollination and reduction of disease risk, as well as protection from natural hazards and disasters.

Target was also set to minimize the impact of climate change and ocean acidification on biodiversity and increase its resilience through mitigation, adaptation, and disaster risk reduction actions, including through nature-based solution and/or ecosystem-based approaches, while minimizing negative and fostering positive impacts of climate action on biodiversity.

A target was also set to ensure that areas under agriculture, aquaculture, fisheries and forestry are managed sustainably, in particular through the sustainable use of biodiversity, including substantial increase of the application of biodiversity-friendly practices, such as sustainable intensification, agroecological and other innovative approaches contributing to the resilience and long-term efficiency and productivity of these production systems and to food security, conserving and restoring biodiversity and maintaining nature’s contributions to people, including ecosystem functions and services.

A target was also set to ensure that the management and use of wild species are sustainable, thereby providing social, economic and environmental benefits for people, especially those in vulnerable situations and those most dependent on biodiversity, including through sustainable biodiversity-based activities, products and services that enhance biodiversity, and protecting and encouraging customary sustainable use by indigenous peoples and local communities.

Target was also set to reduce pollution risks and the negative impact of pollution from all sources by 2030, to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects, including: reducing excess nutrients lost to the environment by at least half including through more efficient nutrient cycling and use; reducing the overall risk from pesticides and highly hazardous chemicals by at least half including through integrated pest management, based on science, taking into account food security and livelihoods; and also preventing, reducing, and working towards eliminating plastic pollution.

Central Asian Flyway initiative establishment gets a fillip

The Ministry of Environment, Forests, and Climate Change organised a meeting of Range Countries to strengthen conservation efforts for migratory birds and their habitats in the Central Asian Flyway (CAF). This meeting was organised from May 2–4, 2023, in New Delhi in collaboration with the United Nations Environment Programme/Convention on Migratory Species (UNEP/CMS).

The meeting was attended by 11 countries of CAF region including Armenia, Bangladesh, Kazakhstan, Kyrgyzstan, Kuwait, Mongolia, Oman, Saudi Arabia, Tajikistan, and Uzbekistan, besides the Secretariats of CMS, AEWA and Raptors MOU, and representatives of Chief Wildlife Wardens of States, scientific institutions in India, international and national non-governmental organizations, and subject experts.

Deliberations were held to form an institutional framework for the CAF, priority areas for implementation were identified and a draft roadmap for updating the CMS CAF Action Plan was agreed

upon. This initiative was hailed as a major step towards the conservation of migratory birds and their habitats.

The discussions also led to the modalities of formalising an institutional framework mechanism with the aim of developing a coordinated approach to the conservation of migratory birds and their habitats. A consensus was made and was appreciated as a milestone under the CAF initiative.

A field trip to the Sultanpur National Park in Gurugram, Haryana was also conducted for the delegates. Observations were made on the best management practices for managing a bird sanctuary in India.

The main outcomes of the meeting were to:

- Agree on an institutional framework for the CAF for all migratory birds through the establishment of a CAF Initiative, under the umbrella of the CMS and with the support of the Government of India, that will include governments, MEAs, international organisations, international NGOs and other stakeholders.
- Consider options for a CMS CAF coordination unit to be hosted by India in coordination with the CMS Secretariat.
- Draw conclusions from the draft comprehensive CAF Situation Analysis report presented by BirdLife International and discuss priority areas for implementation. The meeting agreed to contribute to the finalisation of the report by providing feedback by the end of May to meet

the aim of making the final report available at the CMS CoP14 in Uzbekistan in October 2023.

- Develop and agree on a draft roadmap for updating the CMS CAF Programme of Work and Action Plan.
- Develop and agree on a draft CMS Resolution text, and the Terms of Reference for the new Initiative, as well as CMS Decisions outlining the next steps in the development of the initiative. These documents would be proposed for consideration and adoption to the CMS CoP14 in Samarkand, Uzbekistan (Oct 2023).

A Corporate sector partnership to support wetlands

'Sahbhagita' a national workshop was organised by the Ministry of Environment, Forests, and Climate Change (MoEFCC) on May 21, 2022, at Chennai, Tamil Nadu's National Centre for Sustainable Coastal Management (NCSCM). Both national and international participants attended the workshop which included 24 representatives from State and UT Wetland Authorities, 14 corporates, 13 Wetland Champions, five NGOs, six knowledge partners, three experts from the National Wetlands Committee, and four representatives from the Ministry's wetlands division. The workshop was organised under the aegis of the Integrated Management of Wetlands Biodiversity and Ecosystem Services project, which is funded by the GEF, UNEP, and MoEFCC.

The highlight of the workshop was the signing of a Memorandum of Cooperation between Indian

Business and Biodiversity Initiative and the MoEFCC to establish a joint work programme on wetlands. Appreciating the launch of the initiative, the Union Minister Mr Bhupender Yadav informed that as a part of the celebration of *Azadi Ka Amrit Mahotsav*, *Mission Amrit Sarovar* aimed to develop and revitalize 75 water bodies in each district of the nation. Thus, it was important to strike a balance between development and nature preservation at various levels. He emphasised on the role government played in increasing the awareness on how important wetlands were to India's traditions and cultural heritage.

Round table discussions were held under three themes that promoted: **i)** building convergence with conservation and development plans, programs, and investments at various levels, **ii)** develop an enabling and participatory governance environment for *Sahbhagita*, **iii)** bridging the science-policy-action divide to support *Sahbhagita*.

Hon'ble Union Minister Mr Bhupender Yadav and Hon'ble Minister of State Mr Ashwini Kumar Choubey felicitated 13 Wetland Champions from across the country with a memento.

The Wetland Champions felicitated include Mr Tambor Lyngdoh from Meghalaya, Ms Shweta Hule from Maharashtra, Mr Sangay Lama Sherpa from Sikkim, Mr Ramveer Tanwar from Uttar Pradesh/ National Capital Region, Mr Meerasa from Tamil Nadu, Mr Manish Rajankar from Maharashtra, Mr Kochu Muhammed from Kerala, Ms Ganga Rajput and Ms Babita Rajput from Madhya Pradesh, Mr Bijay Kumar Kabi from Odisha, Mr Arturo D'Souza from Goa, Ms Aditi Deodhar from Maharashtra and Mr Sankar from Tamil Nadu.

14th Meeting of the Conference of the Contracting Parties to the Ramsar Convention on Wetlands Held in Geneva, Switzerland

The 14th meeting of the Conference of Contracting Parties was held in Geneva, Switzerland, from 5–13 November 2022 with the theme '*Wetland Action for People and Nature*'. The CoP was originally scheduled to take place in Wuhan, China, with the People's Republic of China serving as the host; but, due to the COVID-19 pandemic, the meeting was staged in a hybrid format with simultaneous telecasts in Wuhan and Geneva, with negotiations taking place in the

latter venue. Nearly 1,100 representatives from 146 Contracting Parties, 55 observer organisations, and other participants attended the CoP. While 24 Draft Resolutions were tabled at the CoP21 resolutions, with some addressing procedural yet some widening the scope of the Convention, were finally adopted.

CoP14 | Contracting Parties from South Asia concur on establishing a Regional Initiative for wetlands conservation and wise use in South Asia

On November 8, 2022 a side event on '*Regional Collaboration for Wetlands Wise Use in South Asia*' was organised in Geneva by Wetlands International South Asia in collaboration with Ramsar Regional Center East Asia (RRCEA), International Water Management Institute (IWMI) and GIZ-India. The event was attended by Ramsar Focal Points from India, Nepal, Bhutan, Pakistan, and Sri Lanka, along with several international and national organisations.

News from South Asia

Bhutan

A meeting for the future of Black-necked Crane in Bhutan

To build a Black-necked Crane network and exchange knowledge on crane conservation, the Royal Society for Protection of Nature organised the International Black-necked Crane Conservation Network meeting in Thimphu in November 2022.

The experts made presentations on the status of Black-necked Crane conservation and development in their countries and shared the challenges and opportunities.

The meeting brought together experts from the BNC-range countries and other international partners to discuss issues and challenges for BNC conservation and find actions to mitigate those issues.

Nepal

The wetlands are in crises, according to Nepal's Prime Minister Pushpa Kamal Dahal because of the hazards brought on by the climate as well as unjustified human intervention.



▲ Participants in the "Meeting of Range Countries to strengthen conservation efforts for migratory birds and their habitats in the Central Asian Flyway (CAF)" / Convention on the Conservation of Migratory Species of Wild Animals

In a message on International Wetlands Day on February 2, 2023, Prime Minister Dahal urged the three levels of government, local communities, and the corporate sector to safeguard, expand, and sustainably manage wetlands.

The Prime Minister has also asked everyone involved to coordinate, cooperate, and collaborate with one another in order to conserve the wetlands.

According to the Prime Minister Dahal, wetlands should be preserved to protect biological diversity, for water purification and recharge, carbon storage, ensure food sources, ability to deal with dangers brought on by climate change, protect resources for subsistence living, and boost tourism.

Bangladesh Single-use plastic banned in Sundarbans mangrove forest

Bangladesh has imposed a ban on carrying single-use plastics by tourists visiting the Sundarbans to save the environment and biodiversity in the world's largest mangrove forest.

In March 2023, the Environment Minister of Bangladesh, Md Shahab Uddin announced a ban on single-use plastic covering 6,500 km² (2,500 square miles) of the forest. The Sundarbans mangrove forest lies on the delta of the Ganges, Brahmaputra and Meghna rivers on the Bay of Bengal. Conservationists in Bangladesh are alarmed that tourists are dropping plastic trash in the world's largest mangrove forest had seriously damaged the ecosystem.

Sri Lanka Plastic ingestion by Fishing Cats causes concern in Sri Lanka

In the course of studying the diets of Fishing Cats that reside close to Colombo, Sri Lanka, scientists discovered something unexpected. Some scat samples collected contained plastics. These results, which range in size from microscopic microplastics to larger debris in the form of macroplastics, are concerning for the fragile species, according to conservationists. Fishing Cats (*Prionailurus viverrinus*) are a wetland-dependent species and eat a varied diet of fish, birds and rodents. Researchers believe this is likely an example of trophic transfer, in which contaminants go up the food chain, given the species is not known to forage in or eat trash.

Instead, they suspect the species was exposed to plastic via its prey.

Pakistan Floating Wetlands Project to be launched in Punjab, Pakistan

The Punjab government is set to launch the Floating Wetlands Project in collaboration with UNICEF, aiming to address wastewater treatment and disposal. Starting with a pilot project in the Sheikhpura district, the initiative utilises the unique "floating wetlands" method to treat sewage accumulated in a village pond. As per the details, the project aims to improve water quality, meet environmental standards, and enhance the quality of civic life.

India 75 Ramsar Sites in 75th Year of Independence

In August 2022, India achieved a significant milestone on the eve of her 75th year of independence by placing 75 wetlands in the *List of Wetlands of International Importance* of the Ramsar Convention. The network of Indian Ramsar Sites currently covers 1.33 million ha and is the largest in Asia. In 2022, the Ministry of Environment, Forest and Climate Change (MoEFCC) designated 28 wetlands as Ramsar Sites. The new sites are spread across seven states: Tamil Nadu, Odisha, Jammu & Kashmir, Madhya Pradesh, Maharashtra, Gujarat and Uttar Pradesh.

The chief guest of the event was Mr Amitabh Kant, G20 Sherpa and formerly Chief Executive Officer, NITI Aayog. The event was attended by 72 dignitaries from central government agencies, international organisations, academia, civil society, media and experts.

26,059 wetlands developed under Mission Amrit Sarovar

Mission Amrit Sarovar was launched by Hon'ble Prime Minister of India in April 2022 to conserve water for the future. The mission aimed at developing and rejuvenating 75 water bodies in each district of the country. As of December 19, 2022, 92,015 sites have been identified, and work has commenced in 53,226 sites. 26,059 *Amrit Sarovars* have been developed, with more than 8,590 in the state of Uttar Pradesh.



▲ Participants in the National Consultation workshop held in New Delhi in September, 2022 / NIDM

Wetlands as Nature-based Solutions for addressing water-related disaster risks

National Institute of Disaster Management (NIDM) in collaboration with Wetlands International South Asia organised a national consultation workshop in New Delhi on September 12–13, 2022 for representatives of State Disaster Management Authorities and State Wetlands Authorities. The objective of the workshop was to facilitate the integration of wetlands conservation and Nature-based Solutions (NbS) within disaster management plans. The workshop involved discussions on

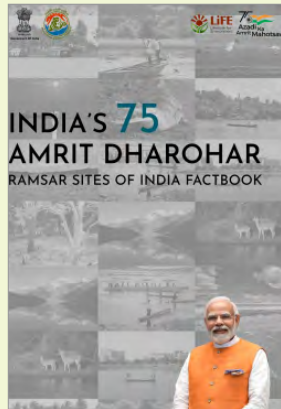
understanding the degradation of wetlands as a driver of disaster risks, understanding the relevance of Nature-based Solutions for disaster management, and identifying opportunities and challenges for integrating NbS in disaster management. The workshop dignitaries released a guidance manual on Naturebased Solutions for disaster management professionals to support the integration of NbS in state and district-level disaster management plans.



We keep you updated in real time.

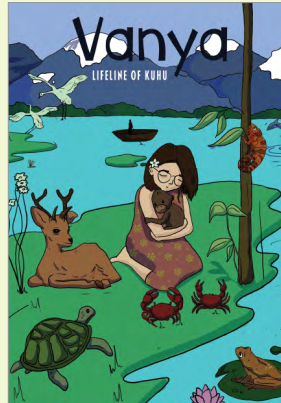
Read news from Wetlands International South Asia on our website <https://south-asia.wetlands.org/>

Publications



India's 75 Amrit Dharohar: The Ramsar Sites Factbook is a compendium of factsheets of the 75 Ramsar sites of India. The factbook presents the values and benefits of these wetlands of international importance and the threats they face.

In August 2022, India achieved a significant milestone on the eve of her 75th year of independence by designating 75 wetlands as Ramsar sites. The network of India currently covers 1.33 million ha, the largest in Asia.



Vanya: Lifeline of Kuhu

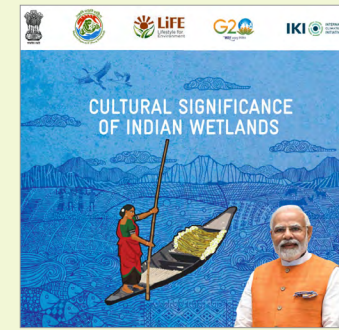
The publication "*Vanya: The Lifeline of Kuhu*" is an attempt to sensitize children and youth on the diverse values of wetlands and foster their participation in the conservation and wise use of these ecosystems.

Published by Wetlands International South Asia, the publication was released on World Wetlands Day, 2023.



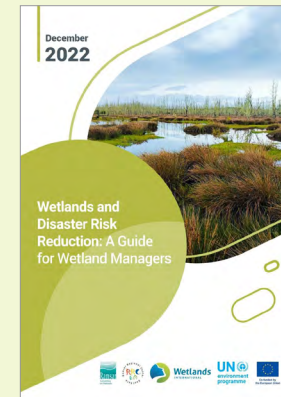
Wetlands Conservation and Wise Use: The Role of Citizens

The book '*Wetlands Conservation and Wise Use: The Role of Citizens*' focuses on the critical role of individuals in conserving the wetlands, emphasising on an all-of-society approach towards wise use. Published by Wetlands International South Asia, the book was released by Hon'ble Union Minister of State (External Affairs and Education) Dr R K Ranjan Singh during the Silver Jubilee event of Wetlands International South Asia on September 29, 2022, in New Delhi.



Cultural Significance of Indian Wetlands

The book titled '*Cultural Significance of Indian Wetlands*' is an effort to document some of the cultural practices associated with wetlands. It is organized into five thematic sections—Livelihoods, Wise Use, Faith and Spirituality, Traditional Knowledge and Conservation. This book is published by Ministry of Environment, Forest and Climate Change and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.



Wetlands and Disaster Risk Reduction: A Guide for Wetland Managers

To support the implementation of Ramsar Resolution XII.13 and integrate Eco-DRR principles in the wetland management plans a guidebook titled '*Wetlands and Disaster Risk Reduction: A Guide for Wetland Managers*' was published. The guidebook is jointly authored by the United Nations Environment Programme, Secretariat of the Ramsar Convention on Wetlands, Ramsar Regional Center-East Asia and Wetlands International South Asia. This guide provides an introduction to the interconnectivity between natural hazards, disasters and wetlands. It outlines the key steps for integrating Disaster Risk Reduction (DRR) with wetland management, to reduce hazard impacts to wetland ecosystems and the associated communities by promoting the approach of Ecosystem-based Disaster Risk Reduction (Eco-DRR).

Upcoming Events at a glance

JUNE

World Environment Day: It is an annual event celebrated on the 5th of June to raise awareness about the importance of preserving and enhancing our environment. This year, the theme for World Environment Day is "*Journey to a Greener Future*" focusing on the collective effort required to protect our planet and ensure a more sustainable future for all.

63rd meeting of the Standing Committee to the Convention on Wetlands: The 63rd meeting of the Standing Committee (SC63) of the Convention on Wetlands will take place from 3–7 June 2024 in Gland, Vaud, Switzerland.

AUGUST

World Water Week 2024: With the theme "*Bridging Borders: Water for a Peaceful and Sustainable Future*", World Water Week 2024 will take place on 25–29 August, online and in Stockholm.

NOVEMBER

Society of Wetland Scientists 2024 Annual Meeting: This conference, the first SWS annual meeting to be held in Asia, will take place in Taipei and Tainan, November 11–16, 2024. The SWS Asia Chapter, together with the Taiwan Wetland Society, have planned an exciting program around the theme "*Wetlands and Climate Change: Mitigation and Adaptation*".

2025

JANUARY

Asian Waterbird Census: The Asian Waterbird Census (AWC) is part of the global International Waterbird Census (IWC). This citizen-science programme supports the conservation and management of wetlands and waterbirds worldwide. Every January, thousands of volunteers across Asia and Australasia visit wetlands in their country and count waterbirds.

JULY

CoP15 to be held in Zimbabwe: The 15th Meeting of the Conference of the Contracting Parties to the Ramsar Convention on Wetlands (CoP15) will take place in July 2025 in Victoria Falls, Zimbabwe.



Wetlands
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