Sarovar

Newsletter • October 2014 • Volume – III

Wetlands
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Wetlands International – South Asia

Wetlands International South Asia

Wetlands International South Asia Society (Regd.) (WISA) is a non government organization with a mission to sustain and restore wetlands, their resources and biodiversity, WISA's office at New Delhi, India was established in 1996 as a part of global network of offices of Wetlands International (WI) with a mandate to promote wetland conservation and wise use in South Asia region. WI is a global non-profit organization which works on wetland conservation and restoration through 19 regional offices in over 100 countries supported by a headquarters based in the Netherlands. WI is also one of the five International Organization Partners of the Convention on Wetlands (Ramsar Convention). In 2005, WISA was registered as a legal entity under the Societies Registration Act of Government of India.

The strategic directions and policies of WISA are set by a General Body which comprises eminent experts and conservation planners. Currently, Dr. Ashok Kundra (former Secretary to the ministeries of Mines and Special Secretary, Environment and Forests, Government of India) is the President of the Society. Mr. S. K. Pande (Former Director General, Forests and Special Secretary, Government of India) is Vice-President. Dr. Ajit Pattnaik (Chief Executive, Chilika Development Authority) is the Treasurer. The Governing Body of the Society includes the office bearers; Dr. Sidharth Kaul (former Advisor, Ministry of Environment and Forests) as a nominee of the General Body and Ms. Jane Madgwick (Chief Executive Officer, Wetlands International as ex-officio representative of WI – Headquarters). Dr. Ritesh Kumar (Conservation Programme Manager) holds the current duty charge of the Office of Director.

Sarovar is the newsletter of the Wetlands International South Asia Society (Regd.)

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The editorial panel welcomes contributions of articles and information. These may be sent to: editor@wi-sa.org

Cover photograph: A fisher in Manglajodi, ODISHA.

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DR. ASHOK KUNDRA
President

From the President's Desk

I am happy to place the third volume of our newsletter 'Sarovar' in your hands.

In this volume, we highlight select wetland restoration experiences from India, Pakistan and Bangladesh. These contributions by the site managers bring out their experiences as well as pathways for restoring and conserving wetlands in the development context of the region.

While wetlands form the foundation of water and food security, there is neglect of wetland ecosystem services in developmental planning. Consequences of wetland degradation are also building up fast, ranging from increased risk of flooding of cities, reduced availability of water, disrupted livelihoods of wetland dependent communities and ultimately conflicts amongst stakeholders.

'Wise use' of wetlands as enshrined in Ramsar Convention is an appropriate approach for wetland conservation and promoting environmental, economic and social sustainability, besides strenghtening inextricable connection between livelihoods and biodiversity. Some of these issues have been examined in the Indian context in the thematic article titled 'Wetlands and Development'.

The Ministry of Environment, Forests and Climate Change in India, has recently restructured the national programme on wetlands. It is intended that the states and union territory governments spearhead wetland conservation adopting an integrated approach, creating nodal authorities for wetland management, and ultimately securing convergence with development planning. This shift was long overdue, and we have been actively associating with the Ministry in this endeavour.

This year, we also aim to revisit our strategic intent and review goals for the period 2015-2020. We look forward to the advice of our partners in the South Asia region to make our work relevant and meaningful in addressing challenges relating to wetland conservation.

We look forward to your feedback and contributions for the forthcoming issues.

Happy reading!

Kashmir Deluge

Reconsidering wetlands as natural flood defence

Floods in Srinagar City

Life in Srinagar rolled back by nearly several decades when devastating floods hit the region in first week of September, 2014. On September 5 alone, the city received 156.7 mm of rainfall, which was nearly thrice the monthly average. By September 6, River Jhelum, which cuts across Srinagar engulfed many low-lying parts. In the coming days, critical infrastructure like flood control bunds were washed away, bridges collapsed, power and communication lines snapped, roads and highways were disrupted or caved in, and hospitals flooded and without electricity. Nearly 500 lives were lost, 22,000 injured, and over 0.12 million houses damaged.

The September deluge is touted as being the worst to affect Srinagar since 1902. A closer look, however, underlines Kashmir Valley's increasing vulnerability to extreme events as its natural buffers, the extensive network of wetlands, have been rapidly destroyed and degraded.

The City of Srinagar has evolved on the floodplains of River Jhelum. Wetlands, through their ability to moderate flow regimes, are its natural and primary flood defence. However, the urban sprawl has engulfed large chunks of these fragile ecosystems. Wular, Dal, Nigeen and Achar have shrunk significantly in the recent times, whereas Batmaloo nambal, Rakh-i-Gandakash, Rakh-i-Art and Rakh-i-Khan no longer exist. During summers, as River Jhelum, its tributaries and hill streams ebb with high volumes of water received from the melting glaciers, the wetlands used to accommodate the huge volumes of floodwater and release them gradually during winters. Floodplains of River Jhelum and its channels have been encroached and constructed upon. At the same time, concretized surfaces with high surface run-off during precipitation events have increased exponentially.

In 2007, the Department of Wildlife Protection, Government of Jammu and Kashmir, entrusted Wetlands International South Asia with formulation of management action plan for restoration of Wular Lake. Located 34 kilometre northwest of Srinagar City, Wular is the largest wetland of the Kashmir Valley spanning 160 km2 with 18 km2 as associated marshes. Besides,

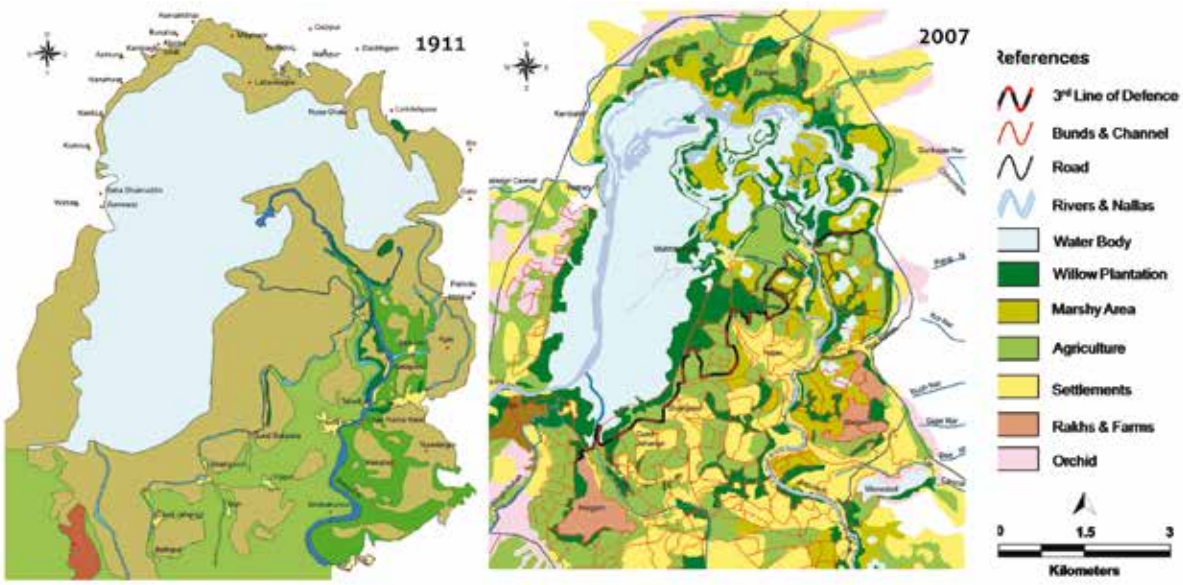
Floods in B.K Pura Block, Budgam District

its role as a flood buffer to the Valley, migrating waterbirds of the Central Asian Flyway use Wular and its associated marshes as habitat for feeding and roosting. Communities living around the wetland harvest fish, water chestnut, and lotus rhizomes for their livelihoods. The Kashmiri Sultan, Zain-ul-Abidin is reputed to have ordered construction of an artificial island of Zaina Lank in middle of the wetland as a storm refuge for boats, for Wular often witnessed strong gales from the mountains of Erin and Bandipore. In 1990, Wular was designated as a Ramsar Site by the Ministry of Environment, Forest and Climate Change of Government of India.

Assessments undertaken during the course of management planning indicated that during the last century, the area of Wular and its associated marshes have shrunk by over fifth (from 217 km2 in 1911 to 178 km2 in 2007). The marshes associated with Wular have been extensively converted for agriculture and settlements. Construction of embankments to protect the agriculture fields has reduced connectivity of the wetland with the Jhelum River and inflowing streams. Extensive degradation of catchments and plantation of willow inside the wetland have resulted in rapid siltation and reduced water holding capacity. Being located in the downstream reaches of Kashmir Valley, Wular is a receptacle of all untreated sewage and solid waste dumped into the waterbodies by upstream and adjoining settlements. Fish species as schizothorax has declined significantly due to pollution and changes in habitat. Reduced availability of water chestnut, fish and lotus rhizomes has increased food insecurity and poverty within wetland dependent communities.

The management plan stresses on the flood buffering role of Wular. Measures for rejuvenating the marshes and increasing water holding capacity of the wetland, alongwith conservation of catchments, sustainable development of fisheries and improvement of livelihoods of wetland dependent communities are proposed. However, to date, plan implementation has been highly fragmented and limited.

The September 2014 deluge is a grim reminder of the ways in which societies are rendered vulnerable due to loss of wetlands. As measures of urban reconstruction and flood risk reduction are being identified and implemented for Kashmir Valley, it is important that the role of wetlands is brought to fore, and integrated as 'natural solutions'.



Transformation of Wular and associated marshes

Wetlands and development

Wetlands support societal well-being in a number of ways, yet are increasingly ending up on the crosshairs of developmental projects. A rational appreciation of interlinkages of wetlands with developmental planning and decision making is important to secure future of these fragile ecosystems. ***Sudhir Pande*** *(formerly Director General, Forests, Ministry of Environment and Forests, Government of India) and* ***Dr. Ritesh Kumar*** *(Conservation Programme Manager, Wetlands International South Asia) explore the wetland-development disconnect in India, and suggest way ahead.*

Chilika lagoon is lifeline for 0.2 million fishers

Why wetlands matter for development?

India has an extensive wetland regime extending to 15.26 million ha[1] (nearly 4.6% of her geographical area), ranging from high altitude lakes of the Himalayas, floodplains and marshes of the Gangetic – Brahmaputra alluvial plains, saline flats of Great Indian Desert, tanks of the Deccan Plateau to extensive mangroves and coral reefs areas straddling the country's nearly 7,600 km long east and the west coastline.

Wetlands have traditionally been viewed as hazardous reservoirs of diseases (as malaria), wasteful loss of productive lands used only for subsistence livelihoods (capture fisheries and traditional agriculture) or biodiversity rich areas excluded from economic use. Reclamation of wetlands in response to the 'Grow more food' campaign of late fifties, or for increasing pressures of urbanization (converting salt marshes adjoining Kolkata to create Salt Lake City) are some notable expositions of this mindset.

However, this outlook has gradually evolved in the recent times as the approach to development has expanded from being centred on physical assets and incomes to encompass a wider set of aspirations which are broadly reflected in the term well-being. International and national development discourses centred on well-being are reflected in Millennium Development Goals and objective statements of our national plans. The central role played by water in the destiny of people and their well-being, has necessitated a focus on wetlands, which are increasingly being 're-valued' as providers of essential ecosystem services. The loss and degradation of wetland ecosystem services harms the health and well-being of individuals and local communities, and diminishes development prospects for all.

One of the most direct contributions of wetlands to human well-being is through their role in water and food security. The principal supply of renewable freshwater comes from an array of inland wetlands. The high altitude wetlands of Himalayas serve as headwaters of ten largest rivers of Asia, basins of which support nearly one-fifth of global population. Groundwater recharged through wetlands plays an important role in water availability making them critical assets for several sectors, especially for agriculture (which sources nearly 60% of irrigation from groundwater. Cities, as Bhopal (Madhya Pradesh), New Delhi and Kollam (Kerala) depend on wetlands for their water supplies. Within their carrying capacity, wetlands help preserve water quality by trapping nutrients and sediments. The East Kolkata Wetlands (West Bengal) form an important component of waste water treatment infrastructure of the Kolkata city; treating nearly 600 million litres of sewage daily through an ingenious practice of waste based pisciculture, agriculture and horticulture. The temple tanks of Tamil Nadu are a unique example of cascading rainwater harvesting system, which have fallen into disuse with increased dependence on piped water supply.

Wetlands contribute to security of human lives and assets through their ability to buffer extreme events such as floods and cyclones. In Kashmir Valley, Wular Lake (Kashmir) accommodates a significant proportion

Photo Credit: K. Ramnath Chandrasekhar / Chilika Development Authority

Photo Credit: V. Dakshinamurthy

Temple Tanks of Tamil Nadu are unique water harvesting systems

of summer flows of Jhelum River protecting the picturesque City of Srinagar from floods. Similarly, floods of River Brahmaputra in Guwahati (Assam) would be several times more devastating if Deepor Beel did not accommodate monsoon flows. The ability of coastal wetlands for stabilizing shorelines and protecting from storms is also well-documented. Evidences from the Super Cyclone of Orissa (1999) and Indian Ocean Tsunami (2004) indicated that villages with wider mangroves between them and the coast experienced significantly fewer deaths than ones with narrower or no mangroves. The opportunity cost of saving a life by retaining mangroves was assessed to be Rs. 11.7 million per life saved during the 1999 Super Cyclone of Orissa.

At local levels, resources derived from wetlands form an indispensable component of livelihoods of communities living in and around these ecosystems. Over 15,000 households living in and around Kanwar Taal (Bihar) harvest fish, fodder, molluscs and a range of vegetables for domestic purposes. The combination of agriculture and aquaculture practiced in the East Kolkata Wetlands (West Bengal) provide livelihood support to a large, economically underprivileged, peri-urban population of 20,000 households. Around 17 different types of medicinal plants found in Loktak Lake (Manipur) are used by communities living in and around.

Spiritual and cultural values of wetland contribute significantly to psychological and mental well-being. Often these values are expressed in the form of wetland tourism. Lake Chilika (Odisha) is annually visited by 0.45 million tourists creating an economy worth Rs. 2,300 million for various sectors. The backwaters of Kerala are visited by over 1.1 million tourists every year. Unregulated tourism has been observed to create stress on wetlands, as has been the case of Dal Lake in Kashmir, or Vembanad Backwaters in Kerala. Wetlands are also settings for rich, diverse and vibrant cultural heritage. Khecheopalri Lake (Sikkim) is revered as 'wish fulfilling lake' and considered most sacred by Sikkemese people. Tarsar and Marsar in Kashmir are revered places for Hindus. The festival of Chhath celebrated in North India is one of the most unique expressions of association of people, culture, water and wetlands.

In economic terms, the value of ecosystem services can be quite significant, and an important rationale for considering these ecosystems as 'natural development infrastructure'. A recent World Bank assessment[2] on economic values of major biomes of the country has estimated the economic value of wetlands to be Rs. 600,950 million (highest amongst all biomes assessed).

Balancing conservation and livelihoods – wise use approach

Located at the interface of land and water, wetlands are indeed one of the most embedded and interlinked ecosystems with human livelihoods. The need for maintaining wetland values and functions, while at the same time delivering services and benefits now and into the future for human well-being necessitates adoption of management approaches which recognize linkages between livelihoods, wetland functioning and biological diversity.

It is under these pretexts that the "wise use" approach was promulgated by the Ramsar Convention as a guiding principle for managing wetland ecosystems. Wise use of wetlands involves their sustainable utilization for the benefit of humankind in a way compatible with maintenance of natural properties of the ecosystem. The text of Ramsar Convention defines wise use as "the maintenance of their ecological character, achieved through implementation of ecosystem approaches, within the context of sustainable development". Notably, this articulation came in much before the famed 1992 Rio Conference on Environment and Development

The wise use principle encourages stakeholder engagement and transparency in negotiating trade-offs and determining equitable outcomes for wetland conservation while promoting maintenance of environmental, economic and social sustainability. Inclusion of ecosystem services within the definition

Photo Credit: Wetlands International South Asia Photo Database

Aquatic vegetation is used in number of ways by wetland communities

of ecological character brings strong emphasis on livelihood and well-being outcomes, alongwith ecosystem components and processes which underpin provision of these services. India as a Contracting Party to Ramsar Convention is committed to 'wise use' of all wetlands within her territory. Wise Use principle has also been highlighted as the guiding approach for wetland conservation in the National Environment Policy (2006), National Biodiversity Action Plan (2008) and as the primary objective of the National Wetland Conservation Programme (presently merged into the National Programme on Conservation of Aquatic Ecosystems (NPCA).

Developmental planning and wetlands

Water and sediments play the most prominent role in structuring wetland functioning and provision of ecosystem services. Developmental planning, especially those related to land and water resources therefore have significant direct as well as indirect implication for wetlands. However, it has been seen that the full range of wetland ecosystem services are seldom considered in design and implementation of development interventions. Such neglect in sectoral developmental planning processes has been one of the major drivers of wetland degradation in the country.

Structural approaches have been the major pathways of water resources development and management in India. Increasing demands for food production and burgeoning population have been met through design and operation of water regulating structures such as dams, barrages, canals, embankments. During the colonial period emphasis was placed on harnessing water resources and converting waterlogged areas to agriculture to support revenue generation. Detailed accounts from Gangetic floodplains and Mahanadi Delta indicate major attempts by the British rulers to regulate floods through embankments, and altering the natural wetland-river connectivity as an outcome[3]. Policies to bring in additional areas under agriculture under the 'Grow more food' campaign of the late 50s and 60s led to government incentives being provided for conversion of marshes nearly all throughout the country. In the more recent times, unplanned urbanization and industrial development have created immense pressure on wetlands.

Examples of adverse impacts on wetlands due to sectoral development abound. In Manipur, harnessing Loktak Lake waters for flood control and hydropower generation through construction of Ithai barrage in 1984 led to drastic decline in migratory fisheries. Inundation of peripheral areas due to high water levels forced an occupation shift from traditional agriculture – fisheries based livelihood mix to predominantly fisheries. Declining resource base with increasing population pressure forced propagation of harmful fishing practices ultimately leading to *phumdi*[4] proliferation and choking of the central sector of the lake. In Kashmir, conversion of marshes associated with Wular Lake for agriculture has led to significant reduction in capacity of the wetland system to moderate hydrological regimes, leading to the valley facing increasing frequency of floods and droughts. In Kanwar Taal (Bihar), intensification of permanent agriculture to nearly 70% of the wetland area, coupled with increasing abstraction of groundwater has led to complete disruption of capture fisheries and domination of stress-tolerant species. Shrinking resource base has accentuated the conflicts between farmers and fishers, the latter having to shift to culture fisheries and agriculture labour for livelihood.

In Vembanad Kol backwaters (Kerala), conversion of wetlands and water regulation to support agriculture has promoted extensive siltation and loss of brackishwater fisheries. The viability of agriculture in Kuttanad is majorly based on government funded subsidies for pumping water. Mahanadi Delta, one of the largest deltas of the country has lost over one third of its wetlands since 1970 to agriculture development and hydrological fragmentation transforming the livelihood systems from being 'flood dependant' to being 'flood vulnerable'. Surajkund and Badhkal Lakes, tourists hotspots in the vicinity of Delhi have frequently run dry on account of excessive

Spotbilled Pellicans in Kolleru Lake

Photo Credit: Wetlands International South Asia Photo Database

Aquaculture in Kolleru Lake, Andhra Pradesh – an unwise use of wetland

Kolleru, located between Krishna and Godavari Deltas in Andhra Pradesh is one of the largest freshwater lakes on the East Coast of India. It acts as natural flood balancing reservoir between the two deltas, and was once famous for hosting the country's largest breeding population of spot-billed Pelican. In its peak inundation, the wetland swells to nearly 900 km^2, which by summer reduces to 135 km^2. An area of 308 km^2 was declared as a Wildlife Sanctuary in 1999. Kolleru was declared by Government of India as a Ramsar Site, primarily on its waterbird values in 2002.

Kolleru was historically used by the Vaddi and Dalit communities living in and around for capture fisheries and traditional agriculture, as frequent inundation meant only cropping for one season was possible. In 1974, the system of leasing land within Kolleru was introduced, followed by introduction of pisciculture in 1976 with World Bank and NABARD assistance. Financial assistance was provided for development of 70 fish tanks, of 20 ha each, to be managed by a group of 100 fishers per tank. However, the vulnerability of the fish pond owners who had little capacity to purchase even inputs, induced private entrepreneurs into aquaculture in Kolleru. Entrepreneurs with socio-political status mostly belonging to the upper strata of society rapidly entered into fray, increasing the intensity and scale of operations within the lake. The original owners were reduced to labourers within these ponds, and were given a small share in the form of land lease, which had to be shared through a series of commission agents and money lenders. Kolleru Lake emerged as the 'Freshwater Aquaculture Hub' of the country where more than 77,500 ha aquaculture areas were developed. Over 140 km of roads were constructed inside the sanctuary area alone as a means to reach out to the fish farms. Waterlogging around Kolleru increased significantly as the wetland lost its water holding capacity. Pelican breeding grounds were nearly all encroached.

While the culture fishing industry ascribed Kolleru as one of the most successful examples of culture fisheries, the losses for ecosystem functioning (ability to retain floods and recharge groundwater), biodiversity (support breeding grounds of birds and fishes) and displacement of traditional community livelihoods were apparent. In 2005, the Supreme Court of India, acting on a petition filed by environment groups on illegal aquaculture in Kolleru ordered complete demolition of fish farms. By this time, fish farms extended to over 180 km^2 of the sanctuary area. The loss in fish production and value due to demolition of fish ponds from sanctuary area were estimated to be around 98,000 MT valued at over Rs. 300 crores, and an additional 400 crore for the ancillary industries. The small time wage labourers were the ones most affected, as they had limited options for livelihoods, and limited resources available at their disposal. The cost of ecological restoration, assessed by Wetlands International South Asia at 2008 prices is more than 1000 crore.

mining in the catchments, which prevents inflow of rainwater and recharge of groundwater. A Pollution Audit of Indian waterbodies carried by Comptroller and Auditor General of India in 2010 (covering 140 projects across 24 river stretches and 22 lakes in 116 blocks across 25 states of India) indicated high levels of organic pollution, low oxygen levels for aquatic organisms, and high contamination with protozoa and viruses of faecal origin. With only one tenth of waste water generated in the country being treated, the rest invariably finds its way to wetlands.

Using wetlands for achieving livelihood outcomes

While wetlands have the capability of providing a range of ecosystem services, using these as 'development infrastructure' needs careful consideration of their ecosystem processes and overall carrying capacity. The impact of conservation/ development interventions on wise use (maintaining ecological character) and improvement of well-being can be synergistic or generate trade-offs (conservation being achieved at the cost of reduction in well-being , or development being achieved at the cost of reduction in wetland ecological character). The nature of any intervention will depend on the relevant institutional, social, economic and ecological factors at play. The cases of aquaculture development in Kolleru Lake (Andhra Pradesh) restoration of Lake Chilika (summarized in next article of this newsletter) highlight contrasting pathways.

Development interface in current wetland management practices

National scale efforts for wetland conservation in India started taking shape only in the 80s coinciding with India's accession to Ramsar Convention in September 1982. A dedicated scheme for financing wetland restoration was initiated by the MoEF in 1987 to provide financial assistance to the states for implementation of site management plans. The programme implementation structure envisaged creation of committees at state /UT level to oversee design and implementation of wetland restoration plans. Mangroves were however taken out from the purview of the scheme and established as a separate scheme for mangroves and coral reefs, considering their specific needs for management within coastal zones. In 2001, National Lake Conservation Plan (NLCP) was introduced to address pollution issues in urban and semi-urban environments through interception, diversion and treatment of pollution load entering lakes. As on December, 2013, nearly 150 sites were identified for management under the two schemes.

In 2006, the introduction of New National Environment Policy provided space for articulation of several elements of national policy for wetlands. The policy identified wetlands as 'freshwater resources' and suggested policy actions including integration in developmental planning, management based on prudent use strategies, promotion of ecotourism, and implementation of a regulatory framework. Integration of wetlands in river basin management has also been identified as a strategy for management of river systems.

A regulatory framework for wetlands was introduced in the form of Wetland (Conservation and Management) Rules, 2010 under the provisions of the Environment (Protection) Act, 1986. The rules stipulate prohibition and regulation of a range of developmental activities within a wetland notified under its provision by the state / UT governments. A Central Wetlands Regulatory Authority (CWRA) was constituted for the purpose of enforcement of the rules, evaluate proposals for wetland notification sent by the state governments and set thresholds for activities to be regulated. Besides union government, several state governments (notably West Bengal, Odisha, Kerala, Manipur, Assam) have also enacted their own legislations pertaining to wetlands.

Despite a very modest budget, the national flagship wetland programmes have created the basic fabric of a 'biodiversity centric' wetland conservation programme in the country. There has been a gradual increase in allocation of resources of the national flagship programmes, and also concomitant increase in coverage. Under the Ramsar Convention, the Government of India designated 26 wetlands as Wetlands of International Importance (Ramsar Sites) underlining its commitment to ensure wise use of these ecosystems. However, at the same time, wetlands have continued to degrade. Recent assessments have indicated at least 30% loss in natural inland wetlands in the last three decades.

Efforts to promote integrated management of wetlands have been severely challenged by sectoral approaches to developmental planning at state and district levels within wetland basins, catchments and coastal zones. Seldom are ecological requirements of water for wetland functioning considered within water resources planning and development. The need for multi-agency and multidisciplinary management approaches is further constrained by lack of knowledgebase systems which enable systematic accounting of wetland ecosystem services at river- and lake basin and wetland catchment scale. The economic role of wetlands as suppliers of water, regulator of flows, providers of food security, supporters of livelihoods especially for the poor, and climate benefits have not

been well recognized and integrated into sectoral policies and action plans, and as a direct result state governments have shown less than optimal commitment to protect, invest and manage their wetlands. Given the fact that most of the impacts of climate change in the country would be water-mediated, the opportunities wetlands provide for climate change adaptation and mitigation remain to be fully harnessed and integrated into relevant policies and action plans.

India does not have a national policy on wetlands. There is an overall lack of clarity on what constitutes a wetland, and how can the objectives of sustaining livelihoods as well as seeking biodiversity conservation can be achieved. In several circumstances, wetlands have been regulated using the principles of management of terrestrial ecosystems (for example based on provisions of Wildlife (Protection) Act), which focus management to patch centric dynamics without addressing landscape values.

In absence of a uniform policy framework, different ministries and central government agencies adopt different approaches, which are not always aligned with ecosystem functioning, and hamper integration of wetland ecosystem services and biodiversity into sectoral planning. The National Water Policy (2012) refers to wetlands in a very narrow sense. While recommending allocation of water for maintaining ecosystems, the policy does not consider wetlands as a solution in achieving water management objectives such as flood control, groundwater recharge and increasing overall freshwater availability. The National Action Plan for Climate Change includes wetlands as minor subcomponent of National Water Mission, without referring to the role they play in climate change adaptation, and the risks imposed on wetland ecosystems by mal-adaptation. Wetlands do not find mention in National Agriculture Policy, despite agriculture being one of the most significant drivers of wetland degradation nationally.

The nine fold land use classification used in the country does not include wetlands, thereby preventing any systematic capture of trends in changes in their spatial extent or condition. In several circumstances, wetlands are classified as 'wastelands', and thereby meant to be used for alternate developmental purposes. As per the National Wasteland Atlas of the Department of Land Resources, Ministry of Rural Development, the area under marshes and waterlogging declined from 16,568.45 ha in 2000 to 9,744.97 ha in 2003 and 5,523.29 ha in 2005-06, which are indicators of loss of wetlands.

Despite almost three years of notification of the wetland rules, very limited implementation could be achieved. None of the states or Union Territories has come forward to designate sites under the said rules.

Following a review, the national government approved merger of the two schemes into a unified scheme titled National Plan for Conservation of Aquatic Ecosystems to be operational in the 12th plan period with an overall allocation of 900 crores. The financing pattern has been changed to the central governments and the respective state governments sharing the cost in the ratio of 70:30 (90:10 in the case of northeastern and special category states). The implementation strategy for the national programme was still being worked out at the time of writing of this article. There is a consideration for increasing state government ownership, with the union government playing facilitation role.

Mainstreaming wetlands in developmental planning: way forward

An important step forward for mainstreaming wetlands in developmental planning is addressing developmental goals while designing and implementing wetland management plans. Focus on community infrastructure as water, sanitation and health can create the basis for stakeholder engagement, besides creating positive impacts on ecosystem processes. Similarly, restoration programmes will need to be designed to ensure that local resource management practices are taken into consideration, strengthened and promoted, and wherever possible, interventions designed so that positive incentives for resource stewardship can be generated.

Integrated decision making platforms are required wherein impacts of sectoral programmes on wetlands as well as implications of restoration programmes for various cross cutting and competing sectors can be assessed. Consideration of ecological sensitivities while designing programmes aimed at water and land resources management will help ensure that wetlands are not adversely affected. Equally important is to consider use of wetlands as 'natural infrastructure' for developmental solutions, with reference to the ability of these ecosystems to support water and food security, and increasingly climate change adaptation.

Inter sectoral decision making needs to be supported by governance mechanisms which involve all concerned institutions, particularly local communities in wetland management. Wetland management institutions existing at present are mostly designed to seek and promote the government's interest. It is pertinent to promote multipolar institutional solutions which create possibility of wider stakeholder engagement, while ensuring wise use outcomes. With over 76% of our wetlands below 2.25 ha, the

demands for management are extremely complicated and require exploring local solutions. Similarly, while some form of regulation is necessary for combating developmental pressures, straight jacket uniform approach for all wetlands is not feasible. With water being a state subject under the Constitution of India, the role of state governments in wetland regulation needs to be augmented and brought to the forefront.

Research on wetlands has traditionally focused on structural aspects (largely biodiversity and limnology) with very limited attention on their functioning and ecosystem services. More action research is required on ecosystem provision and interface with livelihoods (the role of power structures, norms and regulations) which influence the way ecosystem services integrate with livelihood capitals.

It is also important to promote and secure the role of wetlands as the post 2015 development agenda is being set. During the Rio+20 Conference (United Nations Conference on Sustainable Development) a process of setting future international development agenda along Sustainable Development Goals (SDGs) has been initiated. "Green economy" based development models are increasingly being discussed as the key basis of setting development priorities post – 2015. While different versions and visions of green economy exist, common denominators of the model are "reduction in environmental risks" and "reduction in ecological scarcities" as an outcome of efforts which aim at "improvement of human well-being and social equity. Increased emphasis is being laid on assessing and accounting for ecosystem degradation that takes place along with economic development, so as to highlight the environmental burden of economic development. Recent efforts in India include development of a framework of green national accounts by the Central Statistics Office (CSO)[5] and using a system of indicators to integrating environmental performance in determining allocation to states by Planning Commission.

The nexus between water, food and energy forms one of the core challenges identified for development of SDGs. With wetlands being a fundamental part of local, regional and global water cycles, they are central to achieving transition to green economy. The challenge lies in ensuring that the role of wetland ecosystem services is recognized, and their continued degradation halted as a positive outcome of human development. This will assist in translating to practical action the dominant theme of our National Environment Policy (2006), which in clear terms stresses that the most secure basis for conservation is to ensure that people dependent on particular resources obtain better livelihoods from the fact of conservation, than from degradation of the resource.

1. As per remote sensing imagery based assessment by Space Application Center (at 1:50,000 scale using images of 2006–07). Of this, inland wetlands constitute 69.22% (10.56 million ha).
2. World Bank (2013) India: Diagnostic Assessment of Select Environmental Challenges – Valuation of Biodiversity and Ecosystem Services in India
3. D' Souza, R. 2002. Colonialism, Capitalism and nature, debating the origin of Mahanadi Delta's Hydraulic crisis (1803-1928). Economic and Political Weekly, Special Article.
4. A mix of nearly 60 species of plants and sediments in various stages of decomposition which floats on water. While phumdi are characteristic feature of Loktak, its spread in central sector has been a concern as it impacts fisheries and other biota, enhances sedimentation and reduces water quality.
5. Report of the Expert Group of the Committee on Green National Accounts in India chaired by Prof. Partha Dasgupta available at www.mospi.gov.in

A fisher in Kanwar Jheel. Nearly 15,000 fisher families have become migrant labour due to declining wetland resource.

Photo Credit: Wetlands International South Asia Photo Database

Restoring Lake Chilika

Restoring Lake Chilika, the lifeline of 0.2 million fishers, is widely hailed as an example of a stakeholder led participatory management. ***Dr. Ajit Pattnaik*** *(Chief Executive, Chilika Development Authority) presents an account of how an adaptive management philosophy enabled this dramatic turnaround.*

Situated on the eastern coastline of Odisha State, Lake Chilika is a coastal lagoon spanning between a monsoon maximum of 1,165 km^2 to a dry season minimum of 906 km^2. An assemblage of shallow to very shallow marine, brackish and freshwater ecosystems, Chilika is hotspot of biodiversity. Over one million migratory birds commonly winter here. Chilika is one of only two lagoons in the world that support Irrawaddy Dolphin populations. The diverse and dynamic assemblage of fish, invertebrate and crustacean species provide the basis of rich fishery which generates more than Rs. 900 million annual revenues and contributes over 6% of the state's foreign exchange earnings. The tourism industry around the wetland generates more than Rs. 2,300 million to various economic sectors. The wetland is also inextricably linked to the local culture and belief systems. Chilika was designated as a Ramsar Site in 1981.

Degradation

The interface created by coastal environment of the Bay of Bengal and freshwater environment of the River Mahanadi enable Chilika to sustain this spectacular diversity and provide livelihoods to the fisher and farmer population living in and around. This intermixing brings about a gradient in salinity levels across the wetland. Since 1950s, increased sediment loads from degrading catchments led to loss of connectivity with the sea. As a result, fisheries underwent a major decline, invasive weeds proliferated and there was shrinkage in area and volume. This had tremendous impact on the livelihood of communities, especially fishers who depended on lake for sustenance. Introduction of shrimp culture also led to pressures on lake ecology and significant disruption of community institutions, especially the traditional community governance of lake fisheries.

Response

Rapid degradation of Chilika was recognized as a major environmental issue in the late nineties. Fishers made a series of protests and representation to the government. The Chilika Development Authority was borne in 1991 of these concerns, and was mandated with the responsibility of protecting and revitalizing a dying wetland. Moreso, Chilika was placed under Montreaux Record of the Ramsar Convention in 1993. Placing a wetland under the record is a signal of severe degradation of a wetland, and signifies need for urgent attention.

Creation of Chilika Development Authority was the first major building block of an adaptive management process. The Authority is chaired by the Chief Minister of the Government of Odisha, which signifies the high priority accorded by the government to wetland conservation, as well as provides a platform for cross sectoral coordination with various line departments and stakeholders. The General Body of the authority has secretaries of all concerned government departments (forests and environment, fisheries and rural husbandry, tourism, revenue and finance) as members, alongwith elected representatives, members of fisher cooperatives and selected experts. The formal structure has been further embellished over a period of time by a network of over 40 international, national, and community level organizations which contribute to various work programmes of the authority.

Hydrological intervention: Since the choking of the inlet from the sea played a key role in triggering degradation of the wetland ecosystem, particularly decline in fish catch and invasion of freshwater weeds, the CDA, after extensive local consultations and inputs from scientific agencies, opened a new mouth towards the sea on 23rd September 2000. This intervention had a tremendous impact on wetland ecology, leading to increase in salinity and tidal flux, flushing out of sediments, rejuvenation of biodiversity and most importantly rapid increase in fish, prawn and crab catch.

Participatory watershed management: Degradation of catchments, particularly over the last six decades had led to siltation of the lagoon. CDA initiated a massive participatory watershed management in the western catchments to restore the vegetative cover, improve soil moisture and enhance resources for community livelihoods. Through dedicated capacity building, conflict resolution and trust building, CDA enabled formulation of watershed management plans, and also provide resources for their implementation. This has led to increase in overall forest cover, improvement in soil conditions, rejuvenation of commons as village ponds, grazing lands, and ultimately reduction in overall silt loading into Chilika.

Awareness generation: CDA has launched an intensive awareness campaign on values and functions of the wetland system, particularly amongst the nearby villages and school children. A visitor centre at Satapada serves as the hub for these activities. This centre is open to local communities and visiting tourist round the year providing information on the wetland through exhibits, dioramas and models. Telescopes are placed in the Visitor's Gallery for Dolphin and waterbird watching. An education kit for school children has also been developed. Events as World Wetland Day and World Environment Day are celebrated each year within the local schools and community centers to promote awareness and seek participation of communities in wetland management. Newsletter 'Chilika' in English and 'Chilika Darpana' in Oriya published by CDA are important means of communicating programmes and policies to the stakeholders.

Sustainable tourism: The tourist interest in Chilika has been consistently on an increase with improvement in lagoon aesthetics, increase in dolphin and waterbird population. CDA has undertaken specific initiatives for promoting community based sustainable tourism by building capacity of the boatmen association. A code of conduct for dolphin watching has also been developed. In Manglajodi and adjoining villages of the northern sector, a perceptible change in community behaviour is apparent. These villages, once famous for poaching of birds, are now protectors of these winged visitors. Equipped with binoculars and watchtowers, these communities are now local guides to birdwatchers, and also CDA's para-scientists assessing habitat and populations.

Improving community infrastructure and livelihoods: To improve connectivity in island villages, a ferry services for people and vehicles was launched between Satpada and Jahnikuda benefitting more than 70,000 people and drastically reducing the road length between Berhampur and Puri. CDA has also strengthened fishing infrastructure through construction of landing centers and jetties. Woman SHG Groups have been organized and trained to undertake enterprises on manufacture of fish deef, dry fish and crab fatting.

Community managed fisheries: Fishing in Chilika was historically managed by community institutions. However, weak capacities and economic non-viability led to their gradual decline, with the fishers falling into debt traps in the hands of unscrupulous moneylenders. In 2010, CDA through technical collaboration with Japan International Cooperation Agency (JICA) formulated a Fisheries Resource Management Plan (FRMP) based on over 3 years of resource survey, assessment of biology and ecology of eight commercially important high value fish, prawn and mud crab species; modeling for various conservation and management options; wide- range stakeholder consultations and ratification by an expert committee. The plan entails convergence in fisheries governance to ensure sustainable fish production through wise use of fisheries resources as well secure livelihoods of fishers. The plan recommends a co-management strategy with active participation of fishers.

In July 2010, the State Government established a new Central Fishermen Cooperative Society called Chilika Fishermen Central Cooperative Society (CFCCS) Ltd as the apex agency for managing Chilika fisheries. Availability of credit at equitable terms plays an important role in economic viability of the PFCS (Primary Fishermen Cooperative Societies). Under a pilot initiative, CDA through the Fisheries and Animal Resources Development Department is providing Rs. 7 lakh as revolving fund to PFCSs to revive the institution and ensure fair access to credit to the member fishers. The results have so far been encouraging. Jayantipur PFCS is one of the early cooperative societies to stop depending on middlemen for credit. It currently receives around Rs. 20,000 monthly through loan repayment from fishers, which is being used to build back the seed capital for second cycle of loans.

Lack of appropriate storage facilities force the fishers to sell their catch to the middlemen who exploit their vulnerability by paying lower prices and manipulating weights. CDA through support of Marine Products Export Development Authority (MPEDA) has launched an initiative to provide ice boxes to the fishers so that the catch could be maintained for longer time and fishers could choose their preferred point of sale. A 70 liter box costs Rs. 2,200, of which 50% is subsidized by MPEDA, 30% by CDA and the rest is borne by the fisher. This scheme has been very warmly received and thus far 1,000 boxes have already been distributed with fishers reporting atleast 30% increase in sale proceeds.

Building knowledgebase: To support systematic management, an intensive hydrological and ecological monitoring programme has been put in place. These programmes are coordinated through the Wetland Research and Training Center constructed on the shorelines of Chilika in 2002. Equipped with state of the art facilities, the Center is also a node for national and international training programme for wetland managers. Over the years, CDA has also established collaborations with over fifty organizations of

Flamingoes wintering in Chilka

international and national repute to support scientific studies related to various dimensions.

Management planning: Building on the knowledgebase developed and interventions so far, an integrated management plan to guide conservation and wise use of Chilika has been put in place. The plan has been developed by Wetlands International South Asia in consultation with local communities as well as expert groups.

Impacts

Restoration of hydrological regimes and re-established salinity regimes led to recovery of fisheries and biodiversity. The average fish landing increased from 1,747 MT in 2000 to 14,228 MT in 2012. Annual censuses by CDA of Irrawaddy Dolphins within Chilika reported an increase from 89 to 142 individuals between 2003 and 2012, an increase in habitat use, and improved breeding, dispersal and decline in mortality rates. The sea grass meadows expanded from 20 km^2 in 2000 to 80 km^2 at present. There has also been a noticeable decline in area under weeds. Improvement of Chilika habitat, in particular the increase in dolphins, has led to a resurgence of wetland tourism, which had dwindled due to degradation. Following an advisory mission in December 2001, the site was delisted and the intervention recognized with the Ramsar Wetland Conservation Award and Evian Special Prize for "wetland conservation and management initiatives" (Ramsar 2008).

The recovery of livelihoods coupled with awareness generation and capacity building programmes has enabled a community based adaptive management within the wetland system. The communities' engagement into wetland management has greatly increased over the years. They actively participate in monitoring, voluntarily enforce species and habitat protection, and communicate their views on a regular basis.

Challenges

- **Ensuring broadbased engagement of communities in wetland management:** Communities living in and around the wetland and dependant on wetland resources for livelihoods are its real stewards. A critical challenge has been to ensure their participation from more resource harvest to building effective science and contributing to management decisions and enforcing sustainability principles.
- **Integrating multiple knowledge systems:** Not all knowledgebase that underpins management of Chilika is based on systematic monitoring using scientific apparatus. An important part is the traditional knowledge which the communities have evolved over generations of interactions with the wetland system. The current wetland management strives to use all forms of knowledge as input to management decisions.
- **Multiplying capacities though strategic partnerships:** CDA, the nodal agency for wetland management, has limited manpower. However, it has worked on a model of strategic partnerships involving various specialist organizations and agencies to support research and engagement. This has helped CDA to function effectively and operate at multiple scales.
- **Linking wetland management to river basin and coastal zone management:** Long term sustainability of Chilika restoration is linked

Photo Credit: K. Ramnath Chandrasekhar / Chilika Development Authority

to its integration in river basin and coastal zone management. To address these needs CDA is working on reviewing the institutional structure and mandate of the organization to seek involvement into decision making at river basin and coastal zone management. It is also investing into active measurement of coastal processes to support integration in state level coastal zone management planning.

CDA is working on climate scenarios and related ecosystem and livelihood vulnerabilities to develop a response strategy. The government is also in advanced stages of enforcing Chilika Bill which will provide statutory powers to CDA to regulate destructive fishing practices as illegal prawn farming. A State Wetlands Authority has also been constituted to bring management of all wetlands of the state under the ambit of single management authority, and to benefit from the experiences of Chilika restoration.

The story of Chilika restoration is a unique experience of its own. Instead of designing and implementing a complex restoration plan, there has been a conscious effort to take incremental steps using available resources, and continuously learning from monitoring. There are several emerging lessons. Firstly, wetland management needs adaptive institutions with ability to work at multiple scales and engage with diverse stakeholders. Managing social transformation is an equally important component of ecological restoration. Effective decision making structures play a crucial role in successful restoration. Investing into multiple knowledge base systems to benefit from cutting edge science as well as traditional knowledge has an important role in the process. Finally, institutional collaborations and partnerships strengthen adaptive management and ability to respond.

A signage proudly proclaiming transformation of Chilika

Dates of 2015 Asian Waterbird Census announced

Each year, in January, thousands of volunteers across Asia and Australasia count waterbirds under the ambit of Asian Waterbird Census (AWC) programme to assess the health of wetlands and wetland dependant migrating waterbirds. AWC is part of a global waterbird monitoring programme, the International Waterbird Census (IWC), coordinated by Wetlands International. It runs parallel to other regional programmes of the International Waterbird Census of waterbirds in Africa, Europe, West Asia, the Neotropics and the Caribbean. The Asian Waterbird Census (AWC), as always, runs over the second and third weeks of January. As for the year 2015, the AWC is scheduled to start from January 10, Saturday to January 25, Sunday.

http://south-asia.wetlands.org/WhatWeDo/AsianWaterbirdCensus/AWCNews/tabid/2971/Default.aspx

Waterbird Census Team in Delhi

Wetlands highlighted in India's National Biodiversity Targets

In 2010, in Nagoya, Japan, 193 countries meeting for the Convention on Biological Diversity (CBD) agreed on 20 targets to reduce pressures on biological diversity. Known as the Aichi Biodiversity Targets, these goals cover a range of issues from avoiding extinctions of threatened species, to reducing subsidies that are harmful to the environment, to protecting 17% of the Earth's land and 10% of its seas by 2020. Notably, nearly 11 of these 20 targets involve conserving and sustainably managing wetlands. Countries were encouraged to frame their own national targets as contribution to the global targets.

India has set 12 national biodiversity targets as a framework to provide a road map for achieving Aichi targets. Four of these have explicitly included wetlands as target indicators. This inclusion marks an increasing recognition of ecosystem services and biodiversity values of wetlands in national policies. The targets and indicators are presented in India's fifth national report to the Convention on Biological Diversity, released in March 2014 by the Ministry of Environment, Forests and Climate Change. The report can be accessed from CBD's website at www.cbd.int/doc/world/in/in-nr-05-en.pdf

'Wetlands for our Future' – the 2015 theme of World Wetlands Day

World Wetlands Day is celebrated on the 2nd of February every year. This day marks the date of the adoption of the Convention on Wetlands on 2 February 1971, in the Iranian city of Ramsar on the shores of the Caspian Sea.

The 2015 theme for World Wetlands Day is – Wetlands for our Future. The theme focuses on the ways wetlands provide for humanity's future – ensuring freshwater, purifying waste, feeding humanity, habitats to biodiversity, nature's shock absorbers, helping fight climate change, and providing sustainable livelihoods.

World Wetlands Day
2 February
Wetlands for our Future

The Convention has launched a new page for World Wetlands Day, which can be accessed at: http://www.ramsar.org/activity/world-wetlands-day-2015

Conservation of Tanguar Haor, Bangladesh

Md. Wahiduzzaman Sarker
(Thematic Coordinator, Community Based Sustainable Management of Tanguar Haor Project, IUCN Bangladesh) *presents an account of restoration initiative being implemented in Tanguar Haor, one of the largest natural wetland regime of northern Bangladesh*

Haors are big natural depressions. During winter a haor is a vast, almost limitless stretch of green land, whilst in rainy season it is a vast sea of turbulent water. The word haor is believed to be corrupted form of the Sanskrit word Shagar (Sea) or the Arabic word Bahar (Sea).

Tanguar haor is located in Sunamganj District in Sylhet Division. It spans over 9,727 hectares and consists of a seasonally flooded depression dotted with 52 permanent water bodies or beels and 122 channels. Tanguar Haor is exceptionally rich in terms of fisheries resources that play a critical role in Bangladesh's economy. It directly sustains the livelihoods of over 60,000 people from 88 villages in its vicinity and largely contributes to the country's food production and food security.

In terms of sheer species abundance, Tanguar Haor is one of the richest areas in Bangladesh, having at least: 150 wetland plant, 135 fish, 11 amphibians, 34 reptiles, including 6 turtles, 7 lizards and 21 snake, 208 bird and several dozen mammal species. The area provides a habitat for various *globally*

threatened wildlife species, listed on IUCN Red Data lists and CITES Appendices. This includes 1 amphibian species, 3 turtles, 2 lizards, 4 snakes, 10 birds and 6 mammal species. At least 92 waterbird species have been recorded at Tanguar Haor (including many migratory species), making this by far the richest wetland in terms of water bird diversity including a breeding area for rare species such as the Pallas's Fish-eagle *Haliaeetus leucorhyphus*. It harbors some of the last vestiges of swamp forest in Bangladesh, and is one of the few remaining haor ecosystems with a more-or-less natural hydrological regime.

The Government of Bangladesh declared Tanguar Haor as an Ecologically Critical Area in 1999 and the country's second Ramsar site on 10 July 2000. On 12th February 2001, the management of the Tanguar Haor had been handed over from the Ministry of Land (MoL) to the Ministry of Environment and Forests (MoEF) to promote conservation measures.

Fish leasing system practiced in the wetland since 1930s was a major driver of ecological degradation in the wetland complex. In theory the "jurisdiction" of the leaseholders would vary according to the season. In the dry season, this concerned the beels while in the wet season this jurisdiction extended to the entire water body. In the monsoon season the villages are isolated in this water body, for days, weeks and sometimes months. The leaseholders, who could employ up to 1000 enforcement agents, would impose their control over all the resources throughout the year, often employing violence to prevent villagers from accessing fish and other resources, even for subsistence purposes. Fisheries production gradually declined due to over-fishing and habitat destruction. Nearly 23 fish species have possibly disappeared from the area over the past decade. The exclusion of the local community from fisheries resulted in vulnerability, impoverishment, and has lead to an over-exploitation of other natural resources. Hunting of turtles, tortoises and waterfowl was widespread, and part of everyday life. In the absence of strong monitoring by government agencies, leaseholders also gained control of non-fisheries resources. These prompted the Government to abolish the lease system in 2001.

During the 2003-05 period, management of the wetland complex was limited to moratorium on commercial fishing, and patrolling to enforce the ban. The then District Administration underlined the fact that the above mentioned moratorium on fishing was not tenable in the long-term. The District Administration had made commendable efforts in communicating to communities that the purpose of the moratorium was to allow regeneration of the resources, and that this regeneration would be for the benefit of the communities. However, pressure from local communities was mounting to allow access to the resources. The District Administration lacked both the technical and financial resources to establish sustainable resource access rules and modalities.

In 2002 IUCN Bangladesh on behalf of Ministry of Environment and Forests (MoEF) developed a proposal titled "Community based sustainable management of Tanguar haor" with a view to initiating community based sustainable management of natural resources. Financial assistance was secured from the Swiss Agency for Development and Cooperation (SDC) and technical support from IUCN Bangladesh.

The initiative led to formation of a community organization having representatives from 76 villages around the wetland. The whole wetland was categorized into 2 geographical zones-the Core Zone and the Buffer Zone. Arrangements with communities allow for harvest of fish from the wetland, provided contributions towards biodiversity commitments are met. Community members support habitat management, maintenance of fish grounds, maintenance of waterbird habitats, and overall watch and ward of resources. A selective ban on gears and maintenance of close fishing periods is also observed.

The actions are guided by the Participatory Resource Management Plan (PRMP) developed in each of these villages. Direct abstraction of water for agriculture has also been regulated to a large extent.

The efforts made under this initiative has infused a sense of empowerment to the wetland communities, who are set to manage this unique wetland on long term basis.

Rehabilitation of Lungh Lake, Sindh, Pakistan

Dr. Najam Khurshid, *Former Regional Advisor (ASIA), Ramsar Convention*

Lung Lake, an important wetland of Sindh located in District Larkana was declared as a Wildlife Sanctuary in 1982. The lake is spread over 97 acres. A range of habitats characterize the wetland and include open water with typha and Juncus on the edge, swampy area dominated by Tamarix and surrounding rice fields with predominant Juncus. An earthen embankment on the periphery forms boundaries of the lake, which normally dries out in summer. There is a small rest house, an education and research station and hideouts for bird watchers on the lake fringes.

Presently situated on Indus flood plain, Lung Lake was once in the river bed. Being on the Indus flyway, it used to be one of the most significant congregation sites for migrating waterbird. However, there was a rapid shrinkage in wetland area on account of upstream water diversions. The number of waterbirds also dwindled considerably.

Sindh Wildlife Department has taken an important initiative to rehabilitate the lake during 1997-1998. This rehabilitation process took about 2 years to complete. An important component of restoration was ensuring adequate water, which has subsequently recreated the habitat mosaic suited for waterbirds. The lake is now one of the most prominent wetland features of Sindh.

Photo Credit: Dr. Najam Khurshid

High Altitude Wetlands of Ladakh

Himalayan high altitude wetlands are reservoirs of biodiversity and headwaters of major rivers. ***Dr. Pankaj Chandan*** *(Head, High Altitude Wetlands Programme of WWF-India) presents an account of the challenges faced by high altitude wetlands of Ladakh, and conservation initiatives being taken up.*

Key wetlands of Ladakh

At an altitude ranging from 4000 to 6000 meters above mean sea level is a unique and internationally significant biodiversity rich landscape of Changthang within the Trans-Himalayan region. The entire region is dotted with a large number of wetlands, many of which feed their water directly into the Indus River. These wetlands support spectacular waterbird diversity, with Palearctic as well as Oriental elements, displaying a range of behavioral adaptations to make best use of very limited but locally and seasonally abundant resources. Presence of over 310 bird species belonging to 148 genera and 40 families has been recorded. These are the only known breeding grounds of Black-necked Crane and Bar-headed Goose within India. The enchanting beauty of the wetlands and surrounding landscapes brings a sizeable number of tourists to Ladakh during summer months. This area was declared as Changthang Cold Desert Wildlife Sanctuary in 1987 by the state Government of Jammu & Kashmir in order to protect endangered wildlife species and their habitat.

Lake Tsomoriri, located at an altitude of 4595 m above mean sea level spans 120 km^2, and on an average is about 50 m deep. The lake is fed by a number of small glacial streams like Phirtse, Korzok, Chumik Sheltay, Chakshan, Dachung and Peldo. A strip of marsh of width ranging between few to 250 meters girdles the northern and southern shores. Stream confluence areas and bays on the northern

A scenic view of Tsomoriri, Ladakh

Photo Credit: Kamal Dalakoti

and southern margins have given rise to a number of muddy depressions which serve as important feeding habitat for migratory birds. An island near the northern shore is conspicuous as the main nesting site of Bar-headed Goose and Brown-headed Gulls. The stiff ravines in the west of the lake near Korzok village (famous as one of the world's highest human settlement area) serve as a good nesting habitat of Brahminy Ducks. Korzok has a distinction to have a 400 year old monastery that has been considered as the most important and main Buddhist religious centre of Changthang.

Photo Credit: Kamal Dalakoti

Waterbirds in Tsokar, Ladakh

Tsokar Basin contains two lakes, Tsokar and Startsapuk Tso, connected by a stream. Notably, Tsokar is a salt water lake whereas Startsapuk Tso is freshwater.

Tsokar is an irregularly L-shaped lake with an area of 20 km^2. During summer, the lake receives water through a small channel from the nearby freshwater lake Startsapuk Tso. The other source of water is Pongonagu stream which originates from the meadows located at the north western side of the lake. Apart from the two streams, there are few springs those originate from the marshes of nearby Thukjey village located at the north-eastern side of the lake also drain into it. The inhabitants of this region include nomadic and semi nomadic communities spending winters in Thukjay.

Startsapuk Tso is located about 4 km south of Tsokar and is a breeding ground of several waterbird species. It receives water from two glacial streams, Chemur and Nagchuthang , which drain into its southern and western shores. In the north, a small stream connects to Tsokar. A hamlet of about 20 houses is near the eastern shore of the lake which serves as winter home to the nomadic community. There are few islands on the southern side of the lake. During summer months, Bar- headed Goose, Great-crested Grebe, Brown-headed Gull, Common Tern can be seen breeding in the area.

Pangong Tso spanning over 700 km^2 is the largest lake on the Changthang Plateau. About two third of its area is in China, and the rest in India. It is deep-brackish lake surrounded by marshes and meadows in the northern and western sides within the Indian limits. These marshes and meadows give way to the extensive sandy plains merging with undulating terrain and rolling barren hills. The landscape is devoid of vegetation due to sandy soil and extreme aridity. Village Phobrang lies about 1 km off its northern boundary. The main livelihood source of the residents is livestock rearing. This lake is also a major attraction for the tourists.

Chushul Marshes are located at an altitude of 4347 m, about 35 km north of Dungti along the Line of Actual Control. There are two small fresh water lakes; Tsigul Tso to the south and Tsonayak to the north of the central hillock. Both the lakes are fed by natural water springs originating in their vicinity. Tsigul Tso is a deep water lake with several small mounds. The lake is surrounded by patches of marshy vegetation and meadows. In contrast, Tsonayak is shallow, and contains floating and marshy vegetation, surrounded by undulating terrain. The major stream in the area is Aar Lungpa, which originates from the northern end of Tsigul Tso and flows through the middle of Chushul village, and finally drains further north into Pangong Tso. There is a hot water spring north of central hillock which flows into Aar Lungpa stream.

The terrain of **Hanle Marshes**, located at an altitude of 4325 m above mean sea level, is mostly characterised by vast open plains, interspersed with marshes and meadows which are surrounded by gentle sandy hill slopes to rugged steep rocky mountains. Hanle marshes are fed by two main streams; one originates from the southern catchment above Punguk hamlet while the other originates from the rocks at the base of the Tashi Choling Nunnery. Both these streams merge at the base of Hanley monastery forming Hanle River that flows northwards for about 40 km to join Indus River at Loma. Besides these, several springs originating from different locations also feed these marshes.

Some of the marshy patches have been reclaimed for agricultural purposes and crops like barley, potato and wheat are grown during the short summer season. There are three patches of Populus and Salix, which were planted way back in 1976 by the Department of Forest, Jammu and Kashmir, in order to increase green cover over the landscape. Water from the nearby streams is diverted to these newly created crop fields

and plantations. The existence of plantations is being debated by the conservationists along with the issue of diversion of water. Both of them are considered as serious conservation issues.

Conservation and management issues

Unregulated Tourism has emerged as a major threat to wetlands of Ladakh. The tourist season here is short and overlaps with peak period of biological activity. The construction of roads right up to the wetlands has opened up this once remote basin for tourism and economic activities. Aggressive promotion by tour operators of the remoteness, pristine character, novelty, and lively cultural tradition are bringing increasing number of tourists to the highly fragile area, without necessary safeguards for the wetland and associated waterbird habitats.

Grazing pressure by domestic livestock is a major concern. Increasing pressure on pastures with the exponential rise in the numbers of trekkers and pack animals has reduced the prospects for pasture regeneration, given the extremities in climatic conditions. Soil compaction and deep barren jeep tracks are an increasingly common sight around popular camping grounds.

Human-wildlife conflict is also fast emerging as a challenge. The local communities around some wetlands of Ladakh practice subsistence agriculture drawing water from the feeder streams and in some cases, as in Hanle, by reclaiming wetlands for agriculture. In recent years there are increased reports of human wildlife conflicts resulting from crop damage caused by wildlife and also to loss of livestock due to depredation by snow leopards and wolves. The number of feral dogs in the area pose a major threat for the chicks of migrating birds as Black-necked Crane and Bar-headed Goose. Plentiful food availability from the armed forces camps has only complicated the problem.

Developmental planning of the region is largely sectoral and does not adequately address the ecological fragility of the region. With each passing year, more roads and buildings are coming up in the landscape, posing a threat to the ecological niches, scenic value of wetlands and the habitat quality in the long-term.

WWF-India's Conservation Initiative

WWF-India, through its field programme in Ladakh, has launched a major conservation initiative for the conservation of these unique and highly productive wetland ecosystems of Ladakh. The Department of Wildlife Protection, Government of Jammu and Kashmir is an active partner in this initiative. A 12 year study on the status of Black-necked Crane at various high altitude wetlands of Ladakh has been recently completed. Field guides in local language on birds, mammals, and flora of Ladakh have been produced. These are acting as a handy conservation tool for local communities.

The management plans for Tsokar and Tsomoriri has been produced and is currently being implemented by the Department of Wildlife Protection, Government of Jammu and Kashmir. Tsomoriri has been declared as a Ramsar Site. In addition to this all the key stakeholders in the region: Ladakh Autonomous Hill Development Council, Indian Army, Indo-Tibetan Border Police (ITBP), Tourism sector, Local Communities and Local educational institutions are being actively involved in various conservation activities related to these wetlands. As the problems related to these wetlands are taking a new dimension by every passing year, it is hoped that future conservation actions will be designed as per new and emerging challenges.

Gulls in Pangong Tso, Ladakh

Photo Credit: Pankaj Chandan

Wetlands versus Development:

The case of wetlands of Punjab

The once wetland rich landscape of Punjab has witnessed rapid degradation of these ecosystems in recent years on account of rapid expansion and intensification of agriculture, and pollution in the rivers. ***Dr. (Er.) N.S. Tiwana*** *(Former Executive Director, Punjab State Council for Science and Technology) and* ***Dr. S.K. Saxena*** *(Principal Scientific Officer, Punjab State Council for Science and Technology) discuss the way economic development has impacted wetlands, and the possible role of regulatory regimes in this context*

Wetlands of Punjab

The riverine landscape of Punjab once used to be dotted with marshes and lakes, which have gradually receded to occupy less than 1% of its geographical area. There are accounts of nearly 30 important wetland complexes of natural origin, of which several (as Rahon De Chhamb and Bhupinder Sagar) have already lost their wetland characteristics. Presently, the state has 8 manmade and 12 natural wetlands. Of these, Harike, Kanjli and Ropar have been declared as Wetlands of International Importance under Ramsar Convention, and an additional two (Ranjit Sagar and Nangal) as wetlands of national importance under the erstwhile National Wetland Conservation Programme. Harike has also been identified as an Important Bird Area (IBA) under the Birdlife International's IBA network initiative. Harike and Nangal have also been accorded the status of Wildlife Sanctuary under Wildlife (Protection) Act, 1972.

Harike Lake came into existence in 1952 with the construction of barrage at confluence of Sutlej and Beas rivers in Punjab. It was declared wetland of National importance in 1987 & was included as a Ramsar site no. 462 in 1990. This is a man-made, riverine, lacustrine wetland. Its total area has been assessed to be 41 km^2, of which waterspread extends to 28.5 km^2. The sanctuary covers a larger area extending to 86 km^2.

Harike wetland is an important habitat for the water birds migrating from across the international frontiers. It supports over 360 species of birds. Nearly 0.1 million waterbirds winter in this wetland annually. Recorded biodiversity in Harike also includes about 50 indigenous species of fishes, 7 species of turtles, 4

Harike Lake

Photo Credit: Wetlands International South Asia Photo Database

species of snakes, 6 taxa of amphibians, 189 taxa of invertebrates and 38 taxa of plants.

This wetland is a part of major reservoir in the plains of Punjab providing irrigation and drinking water supply to south-west Punjab and Rajasthan through the Ferozepur and Rajasthan feeder canals.

Kanjli Wetland came into existence with the construction of head regulator in the rivulet Kali Bein. It is located about 4 km from the city of Kapurthala. Kanjli wetland was designated as a wetland of National Importance in 1988 and a Ramsar Site (No. 1160) in February 2002. It is spread over 12 villages, covering an area of 183 ha. It is a man made fresh water riverine system. Kali Bein (Holy Bein) on which Kanjli wetland is located is one of the important tributaries of Beas River. Bein ultimately joins Harike wetland downstream.

Kanjli attracts a large number of resident and migratory birds. Over 90 species of birds and 35 species of fish have been reported from this wetland. This wetland is also important for several plant species of ecological significance, notable being the insectivorous plant *Utricularia* sp, and pollutant managers *Phragmites* sp, *Typha* etc. The wetland has high cultural significance due to its association with revered Saint Shri Guru Nanak Dev Ji.

Ropar Wetland came into existence after construction of barrage on Sutlej River near Ropar city in 1887. It was declared as wetland of National importance in 1996. The wetland covers a total area of 13.65 sq km, and 8 sq km area of wetland is under water.

55 species of fish & 318 species of birds have been reported from this wetland area. It serves as an important habitat for Pangolin, Sambhar & Hog deer and for some threatened species in the Shivalik foothills like Scaly ant eater, Python etc.

The wetland is important as a source of groundwater recharge, and flood protection to nearby settlements. Ropar has its distinct place in history since Anglo - Sikh relations and territories were defined by an agreement between Maharaja Ranjit Singh and Lord William Bentinck in October, 1831 under the shade of an old ficus tree on the banks of Sutlej River. Due to its tremendous recreational value, a number of bird watchers and nature lovers visit the area. Since this wetland is an important source of fisheries, it is significant from an economic point of view for the State.

Economic values of ecosystem services

Wetlands of Punjab form an important source of water for the state. A study done in 2006 on Ropar

Photo Credit: Wetlands International South Asia Photo Database

Kanjli Lake in Kapurthala District

wetland in Punjab indicates that a wetland's annual contribution to agriculture could be around Rs. 12.46 crore, ground water recharge Rs. 32 lac, fisheries Rs. 38.25 lac, flood mitigation Rs. 27.46 lac, sediment retention Rs. 9.15 lac and water cleansing Rs. 22.88 lac[2]. The net economic value for various services estim ated for Ropar wetland was up to Rs. 16.19 crore. WISA had also carried out an economic valuation of Harike lake[3]. It was assessed that the wetland's contribution to irrigation could be Rs. 22 crore, ground water recharge Rs. 4.77 crore, fisheries Rs. 59 lac, flood mitigation Rs. 3.37 crore, sediment retention Rs. 2.63 crore and water cleansing Rs. 4.11 crore lac per annum. The net economic value for various services estimated for Harike wetland was up to Rs. 43 crore.

Does Development affect wetlands?

Intensification of agriculture and development of industrial centers along the rivers has affected the state of wetlands, impairing their functioning. Fertilizer run-off from agricultural fields causes algal blooms or rapid growth of weeds in the water, depleting oxygen levels in water and causing stress to wetland dependent species. Non-judicious application of pesticides or herbicides in the fields end up as runoff to the wetlands posing a major threat to ecological health of wetlands. For example, Harike lake has witnessed high levels of infestation of water hyacinth, aggravating siltation and impeding natural hydrological regimes, and posing a major challenge for management. There are also instances of wetlands being encroached upon for extending agriculture and settlements, which reduce their ability to recharge groundwater and provide water purification functions. Discharge of industrial waste into the rivers ultimately increases the threats of bioaccumulation and biomagnification of heavy metals in plant & animal tissues.

Photo Credit: Wetlands International South Asia Photo Database

Rich vegetation helps manage nutrient levels in Kanjli

Conserving wetlands

The use of wetlands needs to be guided by sustainability principles, which requires that society design activities to meet its present needs from these ecosystems at levels which do not impair their ecological functioning. There is a need to adopt a holistic approach to management of wetlands of the state considering the interlinkages of their functioning with land management practices in the basin, and finally the overarching economic development policy of the state. Water regime requirements of wetlands would need to be built in management of rivers and associated structures. Agricultural practices around the wetlands would also need to be realigned with functioning of these ecosystems.

For protection of wetlands from adverse effects of development, Government of India has come up with Wetlands (Conservation & Management) Rules, 2010. These restrict and prohibit activities adversely affecting wetland ecosystems such as permanent construction, discharge of waste water, dumping of hazardous waste etc. and in addition livelihood activities like agriculture, horticulture, and fishing. Regulation however needs to be aligned with 'wise use' approach of wetland management, which provides for meeting livelihood needs from wetlands provided their ecological character is maintained. A major part of wetlands exist in private land tenures, and thereby landowners would need to be incentivized to become stewards of wetland resources. The Wetland Rules in the present form are likely to result in non-cooperation of community in protection of wetlands and biodiversity and therefore need to be reconciled with Ramsar Guidelines to allow wetlands to play an effective role in development.

Downstream Voices

This publication, resulting from experiences of Partners for Resilience project, makes the case for addressing ecosystem degradation as one of the root causes of risk and vulnerability and for opting for ecosystem-based solutions as a way to reduce disaster risk and build community resilience. It focuses on water-related hazards in particular, as they make up a vast majority of risks, and are often exacerbated by inadequate water and natural resource management. Mahanadi Delta has been taken as one of the three case studies.

The publication presents some pointers for governments, practitioners and the private sector for integrating ecosystems into resilience practice:

- Healthy ecosystems make a crucial contribution to the resilience of communities and nations.
- Ecosystem degradation should therefore be considered as one of the root causes of disaster risk.
- Ecosystem-based approaches such as wetlands restoration and Integrated Water Resource Management should be at the centre of solutions to reduce disaster risk.
- It is essential to understand the environmental root causes of risk in a given area and ensure sound land, water and natural resource use policies, ensuring that ecosystem services are sustained.
- Risk reduction measures should be planned at multiple spatial scales.
- The design and implementation of ecosystem-inclusive risk reduction measures requires collaboration with multiple sectors.

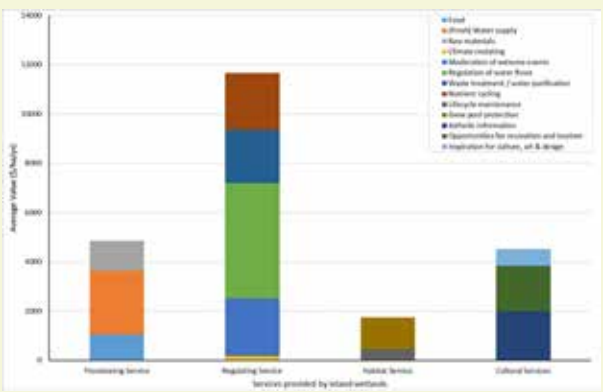
http://www.wetlands.org/Portals/0/publications/Book/Downstream%20Voices_Wetland%20Solutions%20to%20Disaster%20Risk%20Reduction_Web%20Version.pdf

Assessing the economics of wetland ecosystem services: The TEEB – India initiative

Initiated in 2007 by the G8 and five major developing economies, the international TEEB (The Economics of Ecosystems and Biodiversity) study compiled and presented a compelling case for using an economic basis for conservation of ecosystems and biodiversity. The study drew on expertise from around the world to evaluate the costs of biodiversity loss and associated decline in ecosystem services, and to compare these with the costs of effective conservation and sustainable use. Since the results of TEEB study were made available at the Convention of Biological Diversity's 10th Conference of Contracting Parties in 2010, over 20 countries, from the developed as well as developing world alike, have initiated similar assessments.

The Ministry of Environment and Forests initiated TEEB-India in February, 2011. Key objectives included synthesis of the latest ecological and economic knowledge to structure the evaluation of ecosystem services, assessing costs and benefits of conservation investments, developing information and tools for improved biodiversity related business practices and finally raising public awareness of the contribution of ecosystem services and biodiversity towards human welfare, of an individual's impact on biodiversity and ecosystems, as well as identifying areas where individual action can make a positive difference.

A two-day national consultation workshop on project implementation modalities was held on 15-16 September, 2011 at Indian Institute of Forest Management, Bhopal. Over 70 participants including leading academics drawn from the fields of environmental economics and ecology, representatives from the Ministry of Environment and Forests (MoEF), biodiversity boards, Planning Commission, Central Statistics Office, Forest Departments, research institutes and national and international NGOs attended the event. Following consultations, it was agreed not to limit the study to economic valuation but instead focus on full mix of economic approaches relevant to management of ecosystem services and thereby include economic instruments, role of regulation, governance, regulatory frameworks. It was also agreed to focus the first phase of the study on wetlands, forests and coastal and marine ecosystems. Funding for the first phase has been secured from GIZ – India under a three year technical cooperation project.

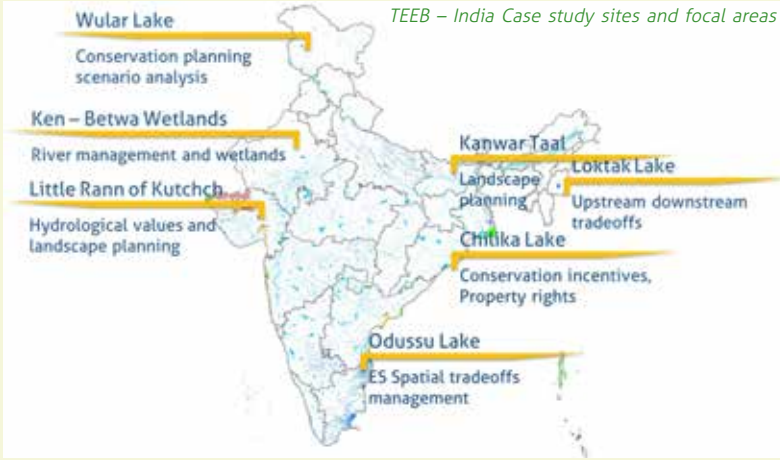


Economic value of inland wetland ecosystem services (in $/ha/year, values for 2007) compiled from TEEB database

Wetlands International South Asia conducted the scoping study for wetlands. The review included synthesis of current status and knowledge on status and trends, drivers and pressures, ecosystem service values and way TEEB – India could contribute to conservation challenges and proposed methodology for conducting the study. A compilation of scoping reports for the three ecosystems were released by the Ministry at the 11th Conference of Parties meeting of Convention of Biological Diversity hosted by India at Hyderabad.

The scoping report reveals some interesting trends. Firstly, economics of wetland ecosystem services is yet to emerge as a major area of research, as very few studies have been published. Amongst the few, majority assessments relate to floodplain wetlands, and spatially, wetlands of the Deccan region and the arid zone are least studied. The research methods are still in early learning curve phases, as the focus has mostly been on wetland products, or on recreational values. Lack of policy centric research is also apparent. Limited focus on regulating services, in particular water security related functions of wetlands, indicate that the required sophistication in research methodology is yet to be achieved. The report concluded that the advantage of an economic assessment for wetlands would be in mainstreaming values in developmental planning and decision making, by creating the necessary conservation effectiveness evidence base, and providing opportunities for designing incentive mechanism for rewarding community resource stewardship.

In its following phase, the inland wetlands component will work on over 12 pilot sites, wherein a network of multidisciplinary teams



TEEB – India Case study sites and focal areas

will be demonstrating application of ecosystem services economics based approaches for integrated site management, regulation and land use planning, property rights and improving distribution of costs and benefits, use of market based instruments to enhance conservation, participatory monitoring and evaluation, and sustainable financing. An interim report of the study is expected to be released by October, 2014.

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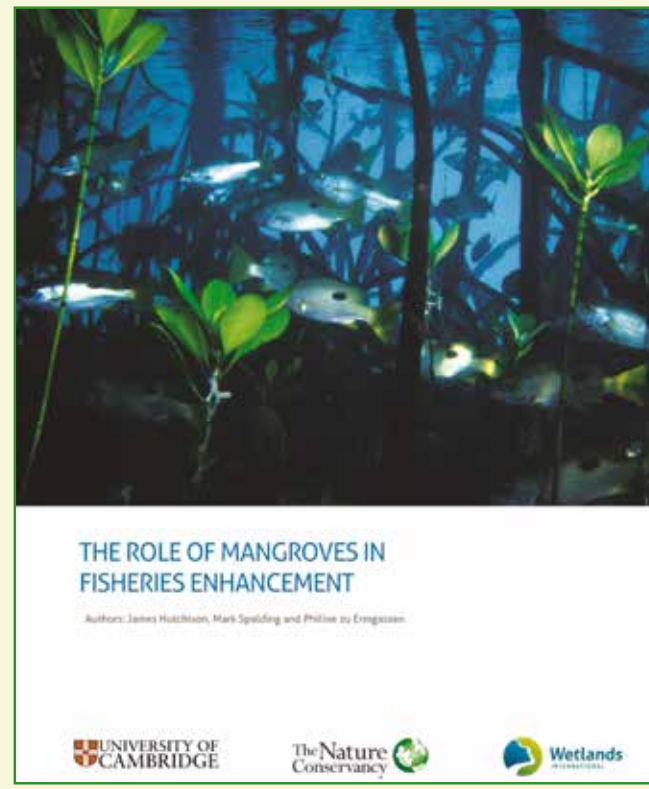
Mangroves and Fisheries – global review of interlinkages



Worldwide, fish accounts for a significant proportion of animal protein intake. The importance of fisheries continues to rise as coastal populations are increasing, and rapidly growing economies are driving up demand for fish. While aquaculture is increasing to meet some of this demand, wild capture fisheries continue to be critically important. Mangroves are known to play an important role in wild capture fisheries. Some 210 million people live in low elevation areas within 10 km of mangroves and many of these directly benefit from mangrove-associated fisheries.

A new study by Wetlands International, The Nature Conservancy and the University of Cambridge, concludes that mangrove conservation and restoration in areas close to human populations will render the greatest return on investment with respect to enhancing fisheries. The analysis indicates that fish productivity from mangroves will be highest where mangrove productivity is high, where there is high freshwater input from rivers and rainfall and where mangroves are in good condition. Fish productivity will also increase with an increase in total area of mangroves, but notably also with the length of mangrove margin since generally it is the fringes of mangroves where fish populations are enhanced. Mangroves with greater physical complexity both in terms of patterns of channels, pools and lagoons, as well as the structure of roots which are important areas for shelter and for growth of some bivalves will enhance fisheries to a greater extent. In conclusion, mangrove conservation and restoration efforts in areas close to human populations are likely to give the greatest return on investment.

Clam fishery of Ashtamudi Estuary gets India's first MSC certification

Ashtamudi short necked clam fishery becomes India's first Marine Stewardship Council certified fishery in India, reports **Dr. Vinod Malayielethu,** *Marine Conservation Programme, WWF-India*

Ashtamudi is the second largest estuary and one of the three Ramsar sites of Kerala. Over 20,000 tonnes of clam, comprising short neck clam (*Paphia malabarica*), Yellow clam (*Meritrix meritrix*), Black clam (Villorita cyprinoides) and blood clam (*Anadara granosa*) are commercially harvested from this wetland. The short neck clam comprises nearly 70% of the total harvest, fetching revenue of nearly 10 crores for over 3,000 fisher households involved in collection, cleaning, processing and trading the clams.

Ashtamudi clam harvest underwent a decline in the nineties mainly due to use of indiscriminate fishing practices. This promoted Central Marine Fisheries Research Institute (CMFRI), district administration and clam collectors to undertake measures for enforcing regulation of use of gears and imposing a fishery ban from December to February – the peak breeding season of the species. These measures have helped revive the resource considerably. However, the communities still were not able to receive the full economic benefit from a sustainably managed resource.

The World Wide Fund for Nature-India facilitated a Marine Stewardship Council (MSC) Certification for the short neck clam fishery of Ashtamudi to enable the communities garner better prices for its sustainably managed clam fishery. The MSC is an international non-profit organisation set up to help transform the seafood market on a sustainable basis and runs the world's leading certification and eco-labelling programme for wild-capture fisheries. The certification looks at the following aspects:

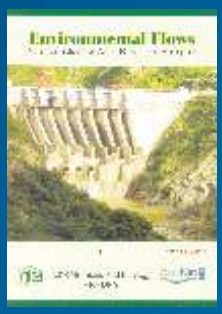
- Sustainability of the resource under certification
- Environmental impacts of the fishery
- Laws and regulations governing the fishery.

The pre assessment results indicated a need to monitor the environmental impact of the fishery, periodical stock assessment for subscribing harvest control rules and a governing council for managing the resources sustainably. A Governing Council to oversee the certification process was constituted with the District Collector as Chairman and the Deputy Director of fisheries as its Convener. The members meet every council has 20 members would meet once in every quarter. The council serves as a platform for review of overall ecological health, and issues related to livelihoods of clam fishers.

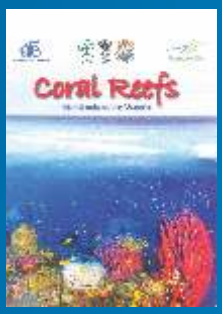
In order to monitor the impact of the fishery on the ecosystem, a project on management and monitoring of possible effects of the fishery on habitats and ecosystems was included in the annual research plan of Central Marine Fisheries Research Institute. Stock assessments, prior and after the closing season were carried out as a means to prescribe the Total Available Catch (TAC) for the fishery.

MSC assessments were completed and certification handed over to the village Panchayat President on November 5, 2014 in the presence of senior officials of Ministry of Environment, Forests and Climate Change, The Marine Products Export Development Authority (MPEDA), state government and WWF-India. The certification will considerably increase value realization to the clam fishers of Ashtamudi estuary.

Recent Publications on Wetlands



Environmental Flows
An Introduction for Water Resources Managers
Available from National Institute of Ecology
Website - http://www.nieindia.org/



Coral Reefs
Rainforests of the Oceans
Available from IUCN-India Office, New Delhi

Mangroves and Fisheries –
global review of interlinkages
Available from www.wetlands.org

Downstream Voices
Available from www.wetlands.org

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