WETLANDS

Climate Change and Us

World Wetland Day February 2, 2019



Ecosystem Acumen IUCN CEM South Asia Wetlands Day Special Edition

"Wetlands, Climate change and Us" Special Edition Newsletter 'Ecosystem Acumen" of IUCN CEM South Asia on World Wetlands Day, February 2, 2019



Issue on: February, 2, 2019 All copyrights © IUCN CEM South Asia



Dr. Madhav Karki,

Deputy Chair, IUCN Commission on Ecosystem Management

Wetlands for Human Wellbeing



"Wetlands and Climate change" is the theme for World Wetlands Day in 2019. On this occasion, on behalf of the IUCN CEM, South Asia let us raise awareness about the increasing role of wetlands to address our regional, national and local challenges. Especially let's increase our understanding of how wetlands contribute to the future of sustainable and resilient human communities in face of Climate change. Wetlands if managed well can reduce the impact of flash floods, supply drinking water, filter waste, provide urban green spaces and act as a source of livelihoods for poor. Fresh water Wetlands are not only sources of drinking water but they are also support to other living beings and other ecosystems. These water bodies are needed for both sustaining aquatic lives and meeting general needs for irrigation, recreation, water sports and navigation and in recent years, as energy from the micro and macro hydro powers.

Many of these wetlands are also culturally significant ecosystems in South Asian context. Many festivals and traditions can also be seen to be in sync with the seasonal cycle and changes in the wetlands. In Nepal and India, more than 12 major religious celebrations and festivals are connected to the wetlands and rivers. In the festival time, people go to wetland areas to: bathe, collect water, worship, have cultural fairs on the river banks and preserve their traditions in various ways. Many wetlands have been given the designation of Ramsar sites.

The main objectives and general requirements to remain as Ramsar site are as that the wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region; A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities or if it supports populations of plant and/or animal species crucial for maintaining the biological diversity of that region. However, many of South Asia's Ramsar sites are having many environmental, social, economic and governance problems.

Due to increasing demand for water and other human pressure, the carrying capacity of Wetlands is not adequate to adapt. This has led to huge changes in wetland ecosystem. Various types of pollution are also affecting the Wetlands. Especially during religious festival, the paraphernalia used by the pilgrims to worship is dumped in the waters, the runoffs of fertilizers and pesticides from the surrounding farms have also led to the wetlands becoming much polluted. Wetlands are also increasingly being used for other purposes including conversion into agricultural land which has led to decline of the biological diversity. We can also see that vegetation growth has also dried up in many of the wetlands designated as Ramsar sites. Wetlands also suffer from many invasive species of plants that are creating serious problems by covering up the wetlands. Furthermore, due to the release of alien invasive species of fish, the local species of fish are being replaced or wiped out completely. Due to land encroachment, wetland regions are being lost. People have started converting the wetlands building houses, roads and doing other activities. Soil erosion and floods have become extremely harmful to wetlands of South Asia. Heavy siltation is causing drying of the wetlands due to the annual deposition of pebbles, sand and soil mixture following with the incoming flood water from the surrounding eroded catchments, true in the high altitude Himalayan as well lowland lakes. Siltation and pollution are becoming a real threat to Ramsar sites.

Climate change is creating havoc in health of these Wetlands, which are unable today to absorb and remain resilient to flash and seasonal floods and landslides due to increasing frequency of intense natural disasters and abnormal amounts of water in-flow as run-off. All indicators of problems for the wetlands arise from unsustainable catchment management. While wetlands are crucial for climate change adaptations, due to climate change and rapid glacier melting, many wetlands are being created as well which rather pose hazardous due to the possibility of glacial lake outburst floods or GLOFs. These emerging wetlands are in urgent need of new kind of management in today's climate change context.

Dr. Madhav Karki is Executive Director at CGED-Nepal He is the Deputy Chair, IUCN/Commission on Ecosystem Management (CEM) He is a Member in Multidisciplinary Expert Panel (MEP), IPBES/UN and Member in IPBES Task Force on Indigenous and Local Knowledge (ILK TF) He is Expert Member, Environment Protection Council, Govt. of Nepal



CEM South Asia and Wetlands *Message from Dr. Shalini Dhyani*

Regional Chair, IUCN CEM South Asia On World Wetland Day, 2019

The South Asia CEM and as members of IUCN Commission on Ecosystem Management, we have been putting huge emphasis on awareness on ecosystem conservation and 'Wetlands' being crucial for healthy environment. We planned this special issue of our Newsletter dedicated to Wetlands and also to the

champions of Wetlands. The idea is to not only sensitize you but will also give you a reason to look around the Wetlands, understand their ecosystem, constraints and pressures. The entire planet and humanity is going through a phase where degradation of ecosystems and nature has been well observed and are at a very rapid pace due to different climatic and mostly non climatic/anthropogenic drivers. Loss of ecosystems and ecosystem services, that are precious for our survival are being severely affecting the socio-economic wellbeing of the human community.

Water is one of the vital requirements for all and Wetlands secure our vitality. They play a very strategic role by providing provisioning, regulating, supporting and also significant cultural services. These Wetlands are also habitat to many flagship, keystone and threatened species. Recharging the aquifers and securing ground water, providing surface water, controlling storm water, reducing heat islands and improving microclimate are some highly significant functions of wetlands and much needed benefits of ours, that we will be requiring more in changing climatic conditions, in the era of growing urbanization.

South Asia is home to many Wetlands including almost 47 important RAMSAR Wetlands located in India, Nepal, Bangladesh, Srilanka, Bhutan and Maldives. The economic benefits from Wetlands are immense. Kolkata locals getting cheap vegetable and fishes in the metropolis are hugely because of East Kolkata Wetland, a significant Wetland area, used to treat waste water and providing livelihood to thousands. I am sure, there are several such examples we get to hear from people in different cities and smaller towns. South Asia has undergone many urban disasters that were result of human negligence and ignorance towards Wetlands. In last few decades these unique ecosystems across the entire South Asia have been shrinking due to human encroachment. Their pollution are resulting in loss of ecosystem services that earlier supported human wellbeing. Deterioration of these Wetlands has led to loss of many species and has monstrously affected the ecology and arrival of migratory birds in many Asian Wetlands. Encroachment of Wetlands for infrastructure development in last few decades has led to many disasters, with major examples from Chennai flood and recent Kerala disaster making it very clear. On the other hand, Climate change, coupled with anthropogenic interferences, is affecting these Wetlands with infestation of invasive species and deterioration of water quality to large extent.

In the changing world Wetlands have a very significant role by helping to adapt and mitigate the impacts of climate change, if they are protected and managed strategically. They are huge sinks of carbon and can help protecting biodiversity and supporting human well-being. Red list or Montreux Record for the Wetlands by RAMSAR is a register of Wetland sites, that are listed as Wetlands of International Importance, where changes in the ecological characters of the wetlands are being continuously observed, which are happening, or may happen due to different technological developments, pollution or other anthropogenic disturbances



Presently, Keoladeo National Park, Rajasthan and Loktak Lake, Manipur in India are in this list. Both these Wetlands are sensitive ecosystems and habitat to many threatened birds and dancing deer respectively. Chilika Lake has been removed in 2002 because of efforts by government and local communities after improved conditions of the lake. Chilika lake also happens to be the first Ramsar site in Asia that was removed from the Montreux record, with growing interest and concern of not only scientists but also local communities who are now understanding the importance of Wetlands.

On this Wetland day with the theme on climate change, it is required that acknowledge the role of these Wetlands in changing climate conditions and also their role in adapting and mitigating climate change and efficiently reducing disaster intensity that we will face due to increasing frequency of extreme weather conditions. We have a reason to act more at local level generating awareness to address and realise SDG, Aichi Targets 2050, Bonn Convention and also Sendai Framework of DRR. Most of these international agreements are based on local actions and have a clear interlinkage with Nature based Solutions, EbA and EcoDRR.

Our CEM members are our ambassadors who are leading conserving efforts for different ecosystems. I would especially higlight and thank our Wetland Champion Mr. Xavier Benedict who is working for the conservation of Pulicat Lake in down south and his efforts are praise worthy. His dedication on ground is sensitizing people and also helping to train next generation of leaders in Wetland conservation so, more power to him and many more leaders of Wetland conservation in the region.

With this, I wish you all a very happy reading. And please do write to us your feedback and comments !!





Messages from experts

Message from Wetland Specialist Dr. Ritesh Kumar on World Wetlands Day, 2019



Geetings from Dr. Sonali Ghosh, renowned conservationist and Indian Forest Service Official





Wetlands and Climate Change

Wetland Specialist Dr Ritesh Kumar Speaks for this World Wetland Day, February, 2019

2 February of each year is celebrated as World Wetlands Day to mark the date of adoption of the Convention on Wetlands, also called the Ramsar Convention. The Ramsar Convention is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The Convention was adopted in 1971 at the Iranian City of Ramsar. India is a party to the Convention since 1982 and committed to the Ramsar approach of wise use of wetlands.

The 2019 theme for World Wetlands Day – Wetlands and Climate Change brings to fore the essential role wetlands have in mitigating climate change as well as assisting humanity in adapting to the climate change impacts.

India is endowed with a rich diversity of wetlands. The country's wetlands range from high altitude lakes in the Himalayas, marshes and swamps in the Terai, floodplains and ox-bows in the Gangetic–Brahmaputra alluvial plains, saline flats in the Great Indian Desert, tanks and reservoirs in the Deccan region and extensive mangrove marshes and coral reef areas interspersed along the country's over 8,000 km long coastline. These ecosystems range in areas from small village ponds (having areas less than an acre) to large lagoons such as Chilika and Vembanad backwaters having an expanse of over a thousand square kilometres. The 2011 National Wetland Atlas, places the national extent of wetlands as 15.26 million ha, equivalent to 4.63 percent of the country's geographical area.

Wetlands help in the mitigation of climate change by acting as natural carbon sinks. They are touted to contain as much as 12% of the global carbon pool and play an essential role in the global carbon cycle. Coastal wetlands – mangroves, tidal mudflats, seagrass beds, famed as "blue carbon ecosystems" act as significant carbon sinks. Seagrass beds are known to sequester up to 10 per cent of all ocean sequestered carbon annually. Coastal wetlands have an essential role in reducing the vulnerability of communities to rising seas and coastal hazards, through their role in sediment capture, vertical accretion, erosion reduction and wave attenuation.

Wetlands underpin societal wellbeing in a number of ways, yet are under threat from a range of anthropogenic and non-anthropogenic drivers and pressures. As public goods, a large category of wetland ecosystem services and biodiversity values are not factored in decision-making, thereby resulting in wetlands being converted for alternate uses. As per estimates of Wetlands International South Asia, nearly 30% of natural wetlands have been lost in the last three decades alone. The resultant losses in ecosystem services and biodiversity have direct economic consequences, which are unfortunately underestimated. Declining water availability, increasing floods and droughts, stresses on wetland-dependent livelihoods, reduced landscape aesthetics and declining diversity of wetlands dependent species are consequences of wetlands loss and degradation. As wetlands degrade, their capacity to mitigate climate change and support adaption goals is also compromised.

Mainstreaming full range of wetlands ecosystem services and biodiversity into developmental policy and planning processes, including climate change is the pressing need of the hour. The multiple benefits and services provided by wetlands are essential in achieving the ambitious agenda to effectively respond to climate change impacts as set by Paris Agreement, and eradicate poverty and achieve sustainable development as set by 2030 Agenda for Sustainable Development Goals.

Dr. Ritesh Kumar is a Natural resource economist with long experience in Wetland ecosystem. He is the Conservation Program Manager at Wetlands International South Asia and also an IPBES Lead Author.



The World Wetland Day

Sonali Ghosh

The world wetlands day is around the corner. It brings me back to beautiful memories of field days as a Divisional Forest Officer in Assam, a state blessed with numerous waterbodies that come alive with a riot of winged visitors.



I recall, the voluntary initiatives colours in the form of fresh water lily blooms upon water or in the many sunlit and shadowy images of our sprightly taken up by small NGOs and local colleges that encouraged the young school and college students to pick up their binocular and bird lists and gear up for a day long vigil in country boats for conducting the annual Asian Water bird census. This is a joint collaborative activity (as coordinated by Bombay Natural History Society and Wetlands International) that has generated exhaustive datasets of migratory and resident water birds in the country for many years now.

While the conservation benefits of such as massive 'crowd-sourced' initiative is beyond doubts, the fact that such exercises have helped create a cadre of young researchers and nature lovers has been an exemplary after-effect.

Let the wetlands be commemorated as a collective conscience of humanity towards protecting its wild flora and fauna. Let this day be celebrated in all its splendour of respecting our water sources, the cultural and aesthetic values that help its sustenance.

Photo Credit: Shri Arnab Bose, Nature's Foster NGO, Bongaigaon Assam Author's photo: Sanctuary Asia.

Dr. Sonali Ghosh is an IFS officer, working tirelessly for conservation of ecosystems and nature.





Wetlands are "Kidneys of Earth"!!

Just as the intricate network of nephrons filter out the unwanted materials from the human organ system, wetlands, with their labyrinth of streams, above and under the ground, serve as the most efficient systems to cleanse the hydrological cycle off the pernicious ingredients running down from the anthropogenic and biotic interface of the ecosystem.

These wetlands, complex ecosystems with intimate interaction between the abiotic and biotic components further act as cushions to the human – ecosystem from various natural hazards which otherwise have long-lasting impacts. So many living organisms are dependent on these wetlands, for their food, cover, water and habitat.

Wetlands can be vulnerable to climate change, being impeded by changes in temperature, rainfall, sea level rise and extreme events. Wetlands also play a major role in capturing and storing carbon, in a much higher rate than other ecosystems.

They serve a great deal in our approach to climate change mitigation and adaptation, through reducing atmospheric greenhouse gases, and providing resilience to hazards such as flooding, storm surge and sea level rise.

These beautiful landscapes are Never "WASTE LANDS". It is our lack of awareness, education, to undermine their enormous values. Humans have done more damage to the wetlands than climate change could.

It is time that we act. It is time we no more keep our wetlands powerless against Climate change. It is our turn to back them up who always stand by us. Let the scientific knowledge spread out to all. Let us act together to keep our wetlands.

Nepal shows us the way as Centre for Green Economy Development, Nepal under the leadership of Subash Karki has developed a Video for undertaking a month long campaign on raising public - especially youth - awareness about the wetlands.

Here goes the link https://m.youtube.com/watch?v=-U1OeNKBzHQ

Let us too follow the footsteps, "Think Global, Act Local".

Wetland Stories

Wetlands harbour lives, directly and indirectly. Their ecosystem services are Key to Sustainability. Dr. Anil Kumar Gupta emphasizes on the values of these essential ecosystems

> Dr. Rajiv Kumar Chaturvedi & Shashwat Gupta Bring Climate change's message to us from COP24. Katowice

What is the status of our Wetlands amidst Climate Change scenario? Dr. Deepu Sivadas notes on resilience of our wetlands



The Kidney of Indian city Kolkata, a Ramsar site, the East Kolkata Wetland is losing out to human greed Dr. Jyotirmay Shankar Deb questions its future

A unique back-water lake, with long history, the second largest lake of India

Dr. Xavier Benedict writes about The Pulicat lake.

> The UNESCO World Heritage Wetland Sunderban Mangroves, are dwindling under anthropogenic pressure and Climate Change.

> Dr. Abhijit Mitra emphasizing on their Carbon Scrubbing abilities suggests restoration

Unawareness, Greed, Climate Change Vs Scientific education & Ecosystem based management The onus is on us to decide the fate of mangroves which may not see the next century

Oindrila Basu voices the environmentalists' fear



Reaping the Values of Wetland Ecosystems For Green - Disaster Free Growth

Anil Kumar Gupta

Recent times witness great dichotomies in this living world. The transit generations we belong to witnessed greatest technological evolutions and revolutions in almost all sectors. On the contrary, the world is facing continuous economic slowdown past two decades or so. It brings critical questions on our developmental approaches particularly while we want to achieve happiness for each (i.e. SDGs) along achieving climate change free and disaster safe world. The

caution "ecological slowdown" – less emphasized, less understood, less valued, but cause of increasing complex miseries. Disasters especially the ones related with flash flood, urban flooding, landslides, droughts, storms and also the associated conflicts faced especially by the developing and smaller nations call for mainstreaming 'ecosystem services' concept in their developmental processes. How the sectoral plans and national / sub-national flagship programmes or schemes of employment, skill development, education and disaster risk reduction can utilize wetland benefits? is the current task on the table. There is huge scope of harnessing wetland benefits in strides of national goals of resilient agriculture along doubling farmer's income, smart city

We know the wetlands as our kidneys of the cities but we tend to devalue their significance for our own sustainability. Loss of wetlands and its allied ecosystems especially in urban and perurban areas has been un-countered in India in the wake of past urbanization pace and real estate boom. Series of major urban and peri-urban flooding like the recent ones – Srinagar, Chennai, Guwahati, call for systematic approach to land-use and developmental planning integrating ecosystem values and functions as core component of green growth strategies for disaster safe and climate resilient programme, skill India programme, Clean India mission, etc. but the challenge lies due to huge capacity gaps especially at sub-national and local levels.

Let this world wetland day, we take the mission in hand to make each and every one of us knowing our wetlands in our own vicinities and grasp on their benefits.



Dr. Anil Kumar Gupta is Head of the Division of Environment, Climate and DRM, In-Charge – National / International Cooperation, Advisory Services, Ministry of Home Affairs, National Institute of Disaster Management, New Delhi, India

Services by our Wetlands



Mine voids fill with rain water are important wetlands providing significant ecosystem services Photo: Dr. Shalini Dhyani



Religious and Spiritual Values of Rivers: A glimpse of river Ganga being worshipped by local communities Photo: Dr. Shalini Dhyani

Let's move forward

- A message from COP24 at Katowice

Rajiv Kumar Chaturvedi and Shashwat Gupta, Department of Humanities and Social Sciences, Birla Institute of Technology and Science, Pilani, K K Birla Goa Campus, Goa, India write



Towards the end of the year 2015, 196 parties to the United

Nations Framework Convention on Climate Change negotiated a new global Climate Change Agreement for the period 2020 to 2030, popularly known as the Paris Agreement (PA). PA adopted an ambitious goal of holding global warming to below 2°C and further, for the first time, agreed to pursue efforts to limit warming at I.5°C. This landmark global climate Agreement received mixed response from global leaders, scientists and practitioners. The UN Secretary General hailed it as a "Monumental triumph for the Earth", and President Obama termed it as the "best chance to saving the planet". Professor James Hansen, a prominent climate scientist on the other hand described the Agreement as "worthless words,.... with no action, just promises", one of the foremost climate advocacy groups in India Centre for Science and Environment too described the Agreement to be "weak and unambitious". In the heart of these assessments lay the realisation that the PA indeed was a historic effort and an opportunity where countries announced voluntary emission reduction commitments, across geographic and annex divides. Different science based assessments concluded that as a result of PA GHG emission projections for the 21st century are significantly lower compared to the Business as usual. However, on the downside many scientific assessments too pointed to the fact that the country commitments as submitted in the run-up to the Paris Agreement are not enough to meet the stated goal of the Agreement i.e. limiting warming below 2°C, and are indeed on the course to take the global temperature rise to 3°C (at 66% probability). One of the assessments carried out by our team and published by the Financial Times, London (Figure I) in the run-up to the Paris Conference concluded, that the emission reduction commitments made in the runup to the Paris Agreement put the world on a risk where the average global temperatures may rise by up to 4°C in 2100 (at lesser probabilities).

Climate Change Calculator

"In my climate model global CO2 emissions fall but warming approaches 4°C by 2100"

Share your results using the buttons below



Fig !: Projections of global temperature rise towards the end of the 21st century, while considering the country commitments as agreed at the PA (based on Chaturvedi and Woods 2015)

Forest and land-use sector has a large role to play in the global climate change mitigation efforts, as forests store carbon in biomass, and are also capable of absorbing CO2 from the atmosphere with the growth of trees and forests. A recent study published in the Journal Nature Climate Change concluded that forest sector contributed to about 25% of the total emission reduction commitments of the PA. It further reported that out of the total emission reduction commitments of 15.8 GtCO2e at the PA, the Forest sector commitments contribute to a total saving of 3.8GtCO2e in terms of emission per year in 2030.

Coming after three years of the Paris Agreement, conference of parties to the UNFCCC (COP24) at Katowice carried the heavy burden of global environmental expectations. COP24 at Katowice was supposed to write down the rule book for operationalization of the Paris Agreement which comes into effect from next year, i.e. 2020. Katowice meeting was also supposed to find ways to entice parties to step-up and enhance their climate mitigation ambitions so as to bridge the gap to the goal of limiting warming below 2°C.

Operationalizing Paris Agreement required clear rules for measuring, reporting and verification (MRV) of emission reduction commitments from the parties to UNFCCC. One of the key achievements at Katowice meeting has been the evolution of understanding and agreement around MRV related issues that are critical to put the Paris Agreement in to Practice. This outcome was aptly summed up by the tagline that we did make progress at Katowice and "we can move forward now". However, discussions on the rule book for the forests, and land-use sector ran in to rough weather as doubts were raised over possible double counting of carbon credits from forest sinks. In a setback, discussions on forest carbon sinks and how to standardise the monitoring, reporting and verification of these mitigation measure has been deferred to the next year.



Coastal Forest Ecosystem, Gulf of Mannar Marine National Park

However, for concerned environmentalists what has been the most disappointing is the fact that no further emission reduction commitments are announced at Katowice. Since the Paris Agreement, the United States (US), second top GHG emitter in the World has walked away from the Paris Agreement, putting enormous strain on the

already weak global climate agreement. While US

withdrawal has been hotly debated at different forums, there is another emerging issue that too deserves our attention in context of global climate mitigation efforts. As discussed above, emission reduction commitments from the forestry and land-use change sector account for about 25% of the total emission reduction commitments at the PA. It is important to note that much of the emission reduction commitments in the forest sector are coming from tropical rainforest countries of Amazon rain forests, and South-east Asia. As the forest conservation efforts falter in Brazil and elsewhere, it is an important and emerging question, whether we will

we be able to meet our forestry commitments, and this poses another major challenge to the PA commitments.

The global mean temperatures have already risen by about 1°C. Even this level of warming is already impacting the natural and production systems across the world. The recent report on 1.5°C by the Intergovernmental Panel on Climate Change concludes that humanity have only 12 years left to limit 'climate change catastrophe'. However, what surprises us is that still major economies of the world are not serious about climate change issue. At the 24th meeting of the parties of UNFCCC at Katowice, Brazil in an overt display of its climate scepticism, withdrawn its offer to host next year's talk. So long World leaders and global public do not realise the urgency to act on climate change and other environmental issues, gains in meetings, workshops, and conferences will be limited as exemplified by the COP24 outcomes in Katowice. However, we need to move ahead and continue making efforts to make our world safe and green.

Dr. Rajiv Kumar Chaturvedi is Assistant Professor at BITS Pilani, KK Birla Campus, Goa He is a core member of CEM and Co-Chair of Forestry Ecosystems Group at CEM-IUCN)





Calling responsible people to search for the answer to Biodiversity loss and climate change



One Day Brainstorming **"Biodiversity Loss : Gaps and Issues"**

Our planet is in dire need of a radical transition in our thinking process how we interact with nature and biodiversity. We need paradigm shift in our approach from sustainable development to sustainable co-existence. Anthropogenic interferences leading to biodiversity loss have polluted the air we inhale, water and nutrition security, while affecting our ecosystems and finally to climate. Real transformations to overcome these challenges will only happen if science, technology, business, government, and civil society works together in an approach that heals biodiversity and nature by responsible conservation and restoration efforts.



CSIR-NEERI, Auditorium 4th February, 2019 10:00 am to 6:00 pm



Contact:

Dr. Hemant J. Purohit, Chief Scientist and Head EGBD **Dr. Shalini Dhyani**, Scientist, WTMD **Dr. Lal Singh, Scientist**, EGBD Email: biodiversity.neeri@gmail.com

ARE WETLANDS RESILIENT

What is the PRESENT STATUS

Deepu Sivadas takes a plunge to find out the answer

Healthy, natural wetlands are critical for human survival. Yet they face many challenges. They include some of the world's most productive ecosystems and provide ecosystem services leading to countless benefits (MEA, 2005; Russi *et al.*, 2013). The Convention on Wetlands (the Ramsar Convention) is the only international legal treaty primarily focused on wetlands, signed in 1971 in the Iranian city of Ramsar, which entered into force in Switzerland on 16 May 1976 and presently with 170 Contracting Parties and 2,336 Ramsar Sites with a total surface area of 251,749,767 ha. Ramsar Sites likely cover 13–18% of the global area of terrestrial and coastal wetlands, demonstrating considerable commitment from Contracting Parties (Davidson & Finlayson, 2018). The importance of wetlands in building resilient communities is emphasized in *The Sendai Framework for Disaster Risk Reduction*, noting their role in reducing flood risks and attenuating storm damage.



Data on the extent, distribution, and trends of wetland types are still incomplete. The most recent estimate of global inland and coastal wetland area is more than 12.1 million km². The *Global Biodiversity Outlook*

(Convention on Biological Diversity, 2014), *Global Land Outlook* (UNCCD, 2017), Land Degradation and Restoration Assessment (IPBES, 2018), *Global Wetland Outlook* (Ramsar Convention on Wetlands, 2018) and The Economics of Ecosystems and Biodiversity (Russi *et al.*, 2013), had noted the loss and degradation of wetlands and the importance of wetlands for ecosystem services and supporting local communities.

Wetland quality and quantity are continuing to decline, with immediate and long-term impacts on biodiversity, and reduction of ecosystem services with adverse outcomes for human livelihoods, such as through declining food and water security. Wetland Extent Trends (WET) Index in 2017, shows a continuing progressive decline (UN WCMC, 2017). It

suggests a decline of about 35% in both marine / coastal and inland natural wetland areas studied between 1970 and 2015. The average annual rate of natural wetland loss estimated by the WET Index is -0.78% a year; over three times faster than the average annual rate of loss of natural forests (-0.24% a year).

Drivers of Wetland degradation: Wetlands continue to be lost and degraded through drainage and conversion, the introduction of pollution and invasive species, extraction activities, and other actions affecting the water quantity and frequency of flooding and drying. Indirect drivers relating to the supply of energy, food, fibre, infrastructure, tourism, and recreation also adds to this. Climate change is a direct and indirect driver of change.

Wetland-dependent species: Recent assessments support earlier analyses suggesting that many populations of wetland-dependent species are in long-term decline and threatened with extinction. Red List Index (RLI) trends are negative for all four-wetland dependent taxonomic groups with available data (mammals, birds, amphibians, and corals), indicating that species are increasingly moving towards extinction. 25% of inland wetland-dependent

species (of over 18,000 species surveyed) are globally threatened, with 6% being Critically Endangered. In the Eastern Himalaya and the Western Ghats regions, threats to fish are high (18% and 37% respectively) and amphibians in the Western Ghats (41%), although other taxa are less threatened than in Europe and Africa. (Molur *et al.*, 2011).



 Continental Africa: Darwall et al. 2011; Madagascar: Máiz-Tomé et al. 2018; Indo-Burma: Allen et al. 2012; Eastern Himalaya: Allen et al. 2010; India: Molur et al. 2011; Arabian Peninsula: Garcia et al. 2008; Tropical Andes: Tognelli et al. 2016; Europe: BirdLife International 2015a, Bilz et al. 2011, Cuttelod et al. 2011, Freyhof & Brooks 2011, Kalkman et al. 2010, Temple & Cax 2009, Garcia Criado et al. 2017; Pacific Islands of Oceania: Pippard 2012; East Mediterranean: Smith et al. 2014; Others: Red List database 2017.3 (accessed 30 October 2017).

** Red List assessment exists for many waterbirds, but this taxon was not covered by many of the sub-regional Red List freshwater assessments

Water quality trends

Water quality trends are mostly negative. Major threats include untreated wastewater, industrial waste, agricultural runoff, erosion and changes in sediment. Erosion transports 23-42 million tonnes of nitrogen and 15-26 million tonnes of phosphorus (FAO & ITPS, 2015). 25 to 40 billion tonnes of topsoil erode every year, mainly from farmland. Globally, nutrient loading and eutrophication of wetlands remain the largest water quality challenges. Early findings from the global water quality monitoring programme show severe pathogen pollution already affects one-third of all river stretches in Latin America, Africa and Asia (UNEP, 2016). For two decades loadings of fecal coliform bacteria have generally increased. Microbial contamination of wetlands is a serious health risk (Santo Domingo *et al.*, 2007), responsible for diseases such as cholera and giardiasis (Horwitz *et al.*, 2012).



Contaminants of emerging concern – pharmaceuticals, hormones, industrial chemicals, personal care products, and many others – are continually evolving and often detected at concentrations higher than expected (Sauve & Desrosiers, 2014). At least 5.25 trillion plastic particles, weighing over 260,000 tonnes, are afloat in the world's oceans (Eriksen *et al.*, 2014). About 88% of reported incidents between biota and marine debris are associated with plastics (GEF, 2012); in the Mediterranean, plastic has been found in 18% of the stomachs of larger pelagic predatory fish (Romeo *et al.*, 2015), and microplastic pollution is increasing in many inland systems such as the Great Lakes (Eriksen *et al.*, 2013) and remote mountain wetlands (Free *et al.*, 2014).



Indian Scenario

India became a contracting party to the Ramsar Convention in 1981. The Chilika lagoon in Orissa and the Keoladeo National Park in Rajasthan are the first two wetlands designated as Ramsar sites in 1981. Since then total 26 wetlands in the country have been designated as Ramsar sites by 2012, together representing 2.64 % of the total area. The latest one in the series is the Nal Sarovar Bird Sanctuary in Gujarat designated during 2012.

Vembanad - Kol Wetland of Kerala: The Vembanad-Kol wetland is a large complex aquatic ecosystem covering 2.5% of the geographical area of Kerala State. With a total area of 1,51,250 sq. km is the largest Ramsar site declared in India. The wetland is typically divided into two distinct segments, the freshwater dominant southern zone, and the salt-water dominant northern zone. The wetland system functions as a receptacle to the monsoon flood flow. It is estimated that such monsoon flows into the Vembanad lagoon vary from 10000 Mm³ to 18000 Mm³ and the lagoon protects the areas west of it from severe floods. The major interventions in the river basins of the wetland systems are irrigation and hydroelectric schemes and a network of roads with several bridges in the Kuttanad region, followed by the reclamation of land for agriculture and plantation, pollution due to industrial effluents, agrochemicals, sewage and over-extraction of the lime shell. Reclamation and bunding activities in the river mouth are affecting the natural facility for breeding and migration of species. This wetland serves as a vessel for the effluents of several industries and domestic sewage from the city of Kochi and from many smaller towns.

Every year, 44,000 MT of liquid insecticides, weedicides, fungicides and chemical fertilizers (21,000 MT) reach this wetland. The water quality in the lake, particularly in the southern part of the lake and in the lead canals, appears to be too bad for supporting any useful flora and fauna (Planning Commission, GoI report 2008). Vembanad is a world-renowned tourist attraction of Kerala. Currently, the area is being overexploited in the form of tourism activities, due to the added demand, many hotels and resorts are coming up newly without any care and concern to the natural environment. The shrinkage of Vembanad Lake because of land reclamation, has been the most important environmental consequence of various human interventions. The water carrying capacity of the system is reported to have reduced to an abysmal 0.6 km³ from 2.4 km³.

(Source: Global Wetland Outlook, 2018; National Wetland Atlas, 2013; Planning Commission, GoI report, 2008)



Author, **Dr Deepu Sivadas**, is an active member of **IUCN Commission on Ecosystem Management, South Asia**. He is a Post-Doctoral Fellow at Plant Systematics & Evolutionary Science Division of Jawaharlal Nehru Tropical Botanic Garden & Research Institute, Thiruvananthapuram, India.

> Vembanad Lake, Allappuza, Kerala Photo: Oindrila Basu

The Threats to our Lakes



Our Lakes are getting eutrophicated and infested with weeds: A serious state of concern of high altitude Dal Lake in Kashmir Photo: Dr. Shalini Dhyani



Fractured and disturbed catchment area with intensive agriculture is a common story: A case of Khurpatal in Nainital, India Photo: Dr. Shalini Dhyani

World Wetlands Day 2 February 2019



Wetlands and climate change





Wetlands for a sustainable urban future



Wetlands for Disaster Risk Reduction

World Wetlands Day Tuesday, 2 February 2016



Wetlands for our Future Sustainable Livelihoods

World Wetlands Day Monday, 2 February 2015



Wetlands for our Future



The East Kolkata Wetlands a forgotten Ramsar Site?

Jyotirmoy Shankar Deb pays a tribute to Dr. Dhrubajyoti Ghosh, the Wetland Warrior of Kolkata

"I think I now know how to know ecology that saves people in ecological distress." – Dr. Dhrubajyoti Ghosh

Wetlands are the most threatened ecosystems in the world, nowadays. Because, it can be easily converted to other type for our own requirement – for agriculture, for aquaculture, for real estate, for so-called infrastructure development, etc. Sometimes, the people can realize it, and most of the

times they can't. Ecologists and Nature lovers have been struggling for decades to save these ecosystems. The RAMSAR Convention(1971) has framed the guidelines to protect the important wetlands around the world by declaring "Wetlands of International Importance (RAMSAR sites)"; India has 26 such sites till date. There are 115 wetlands in India which have been identified as "National Wetlands", including these 26 Ramsar

sites. East Kolkata Wetlands (EKW) is the only Ramsar site (Site No. 1208) in the state of West Bengal that falls under Freshwater category. This is the largest wetlands area (12,500 ha) in the world having both freshwater and sewage-fed aquaculture ecosystems.

Almost 200 years ago, the British Authority of Kolkata (then Calcutta) City planned to drain away the sewage of the city. Mr. William Clarck, Chief Sanitary Engineer, prepared a detailed drainage scheme in the year 1853 to facilitate the plan. To carry out the removal of city wastes and sewage water, the authority excavated some canals (**Khals**), and finally those were connected to river Ganga. All these happened by the end of 1910. Successful commercial fish culture was started by a fish farmer in the year 1929 in the low water bodies. After the Independence of India, the whole area of this category became the center of attraction of the West Bengal State Government to expand the Calcutta Metro towards its eastern territory. Some water bodies became vanished permanently for construction of Salt lake City and some were transformed into agricultural fields. In the meantime Dr. Dhrubajyoti Ghosh (1947-2018), a young engineer cum ecologist accidentally discovered this wetland area as well as it's traditional ecosystem management practices, while doing a survey in that area in early 1980s. He uncovered the sewage-fed aquaculture system as well as natural freshwater recycling system in that area during his first visit. He was the Chief Environment Officer of West Bengal Government, and he had been fighting for more than 3 decades to save this wetland till his last breath. It is him, for whom this area has been declared as a Ramsar site. At present there are more than 250 Bheris (large water bodies) where sewage-fed aquaculture is practiced. The area is also rich in some important floral and faunal biodiversity.



The sewage water comes from the Kolkata Metro city carrying Dr. Dhrubajyoti Ghosh huge amount of organic foods with it. This water has a very

(Photo credit: Tishwampati Ghosh)

high BOD value due to the presence of nitrogen and phosphorous. This sewage water gets treated in the fisheries here and returned back to the rivers through several canals away from the wetlands. The sewage water comes through underground drainage system and reaches 6 pumping stations situated at the eastern territory of the city, nearby the wetlands area. Almost 80% of the BOD is decreased by the treatment. The heavy materials are deposited as sediment on the bottoms. Hence, the sewage water becomes almost clean while expelled out from the wetlands.

The organic pollution of the waste water is lowered down by the fish culture ponds. This is a unique example of pollution control by natural process. The sewage fed aquaculture is practiced



Constructon by Plugging the East Kolkata Wetland, Photo: Pravash Mallick; Source: Article on "Down to Earth" by Tiasa Adhya, of HEAL, Kolkata

here by using traditional methods.

Of the total East Kolkata Wetland area under study, 47% is substantially water body area, 38% is agriculture area, 5% is garbage farming area, and 10% comes under settlement area as recorded in EKWMA record. The settlement area is further divided into rural and urban parts. But, the actual scenario is something different from the record. The water body area is less than the record, while the settlement area is elevated from it's earlier value. Specifically, the urban settlement area is increasing day by day at the cost of water body and rural

settlement areas.

Threats to the East Kolkata Wetlands

- I. Acquisition of bheri and land for infrastructure development:- The main threat of the East Kolkata wetland area today, the acquisition of bheris and associated lands for so-called infrastructure development purpose. The Government itself has already acquired hectares of area for the same. A flyover is being planned to be constructed through the wetlands area which will hamper the ecological balance of the area. Regular and sudden road expansion also acquires some area concerned.
- 2. Acquisition/Utilization of water and/or land area for tourism or entertainment: Some areas had/are also been acquired for tourism, entertainment as construction of eco-park, guest house, office building, Water Park etc. which in turn hampers the status of the wetland area.
- 3. Filling up of bheri area for agriculture purposes:- Some bheri areas are also being filled up slowly to expand agricultural fields which is a major threat to the wetlands. This activity is increasing day by day.
- 4. Illegal construction inside the wetlands:- Nowadays, a serious activity is found in the bheri areas, in the form of real estate business. The bheris are filled up from the sides by garbage, soil etc. and buildings are constructed by real estate mafias/ local musclemen. The land areas are also acquired by private constructors to build high rises. Due to open areas surrounding the buildings, the apartments are sold very fast at high price. This is the most serious threat to the wetlands today.

It is evident from scientific studies that the EKW is essential for Kolkata city. It is serving as the kidney of Kolkata. If it is gone, the people of Kolkata city will be submerged under waste water. It is ecologically important for the biosphere. We are already late. Let us do whatever is required to save this area and fulfil the dream of it's father, Dr. Dhrubajyoti Ghosh.



East Kolkata Wetlands Crippled by Pollution Photo: Biswarup Ganguly, Source: Article by Sahana Ghosh in Scroll.in



Pulicat Lagoon is the second largest water body covering an area of 757 sq.km located on North of Chennai is a testimony to living heritage integrating monsoon heritage and cultural values of South India. The lagoon was divided by the road constructed to connect Sriharikota island making the large landscape into a lake on the south and marshy land on the north. Tamilnadu and coastal Andhra Pradesh come are the only region get rain from Northeast Monsoon in India. Unlike the Western-Ghats, the South East coast of India has only wetlands to attracts rain clouds. The historical data analysed by IIT-Khadagpur research proves that the eye of cyclones in the last forty-five years had fallen on or closer to five important and largest wetlands of the coast. It proves that the linkage between the health of the wetland and sustainability of this part of India.



Pulicat Lagoon has a unique environmental management system followed by the local fishing community for more than three centuries called Paadu, meaning 'to share'. It is a traditional system followed by the lagoon fishermen for last several centuries of granting entitlements to eligible fish members in certain to designated fishing grounds.

Migrants visiting Lake Pulicat, Source: www.conservationindia.org

This rotational fishing right has become an estuary environment

management system. The practice has protected the lagoon from all destructive intrusion by the government or industrialization, showing the direct link between biodiversity, economic activity, and vernacular sustainable management.

The lagoon is visited by more than eighty thousand winged migrants every winter-monsoon. As per BNHS, there are more than seventy-three species of birds are sighted in the lake. The visit of the birds is very important for the livelihoods of the fishermen. The algae formed from the droppings of the birds are food for fishes, prawns, and mud-crabs. According to the vernacularknowledge of inhabitants, a good rain season could be judged by the movement of winged migrants. The pattern is easily identifiable from the early visitors called *pilot-birds*, who pass on the information to large number migrants for post-monsoon period visit. This clearly makes a link between birds, monsoon, lagoon, and livelihoods of inhabitants are directly and proportionally related.

Pulicat is an anglicised word derived from *azhaverkadu*, which is a combination, three Tamil words; $\sqcup \mathfrak{spp}_{u} Pazha=$ old, $\mathfrak{Su}_{J}\mathfrak{rs}$ \mathfrak{sir} aver=root, $\mathfrak{su}\mathfrak{r}\mathfrak{rs}$ *kadu=*forest. Pulicat through centuries was called in different names. The use of name 'Pulicat' is first recorded around the time of the British acquisition of the place from the Dutch (1825AD). Over the centuries, the place adopted various statuses as a city, port, territory, village, etc., with its corresponding associate names. Pulicat Lagoon has been a centre of maritime trade for more than two thousand years attracting traders from Burma (Myanmar) to Japan on the eastern side and Arabs to Dutch on the western side of India. It is one of the very few water bodies to have influenced history, culture, and lifestyle of this country. The Lagoon played an important role in the creation of Madras [Chennai], which acted as the base for development of modern India. Influence of Pulicat culture, language, textile, and food can be traced in South East Asian and European countries due to its trade links.



Lake Pulicat Photo Credit: B_Jothi Ramalingam, The Hindu (https://www.thehindu.com)

The arrival of Arab traders expanded the popularity of cotton and its market since 8th CE making this part of the country as the central to Cotton-Route of the world. The value of textile trade in the whole of all European maritime trade was 70%, which is very significant for any influence. Archival records show that more than 4500 ships passed through Pulicat between 16th to 18th century not only impacting the coastal region but also hinterlands. Gold was the

standard medium of exchange in this region for textile purchase. The word *Palaykat* [Pulicat], as once called by the Portuguese and Dutch, later became conventional as description for fabric quality. This popular textile exporting port became an international fashion trend. *Palaykat* as a fabric is called *sarong* or *lungi* in South and South East Asia which are worn by women or men. The handkerchief or bandanna in Mexico and South America is still called as *Pallaecatta* [Pulicat] without knowing the origin of the material introduced by Spanish and Portuguese. This famous fabric with a particular style of a pattern of weaving and dyeing is later popularised by the British as Madras Checks.

The Pulicat lagoon shaping and protecting the Coromandel coast of India was once far ahead in development. The trade and commerce along the Coromandel coast for centuries was forefront in influencing India's post-independence growth. The historical influence can be realized even today. However, thus strong nature-culture linkages are destroyed by modernisation and industrialisation. Siltation, not-place-based legislation, ports, industrial pollution, ports oil spillage, encroachment, modern fishing methods, political influence, and aqua-farming have drastically reduced the economic and environmental values of the lagoon. The natural shock absorber is facing a very bleak future. It needs immediate attention by forming Pulicat Conservation Authority.





The Author, Xavier Benedict, is an Architect by Profession, Environmentalist by passion.

The Heritage Activist, involved in the conservation of Pulicat Lagoon through his not-for-profit Trust AARDE Foundation for over a decade is an active IUCN CEM Member.

An ardent Academician – teaching at MIDAS Architecture College, the author writes regularly in Newspapers, Journals, and social media to spread the scientific awareness among common people.

MANGROVES

Best Carbon Storage Devices

Abhijit Mitra looks at restoration possibilities in Indian Sunderban Mangroves



Mangroves, one of the most productive plant communities, are dwindling globally from anthropogenic degradation coupled with erratic climate picture. Sunderban, an archipelago of islands, at the Ganga-Brahmaputra-Meghna delta, shared by India and Bangladesh is home to this specialised group of salt-tolerant plant communities capable of adapting in the tidal environment. This UNESCO World Heritage site is the world's single largest stretch of natural mangrove ecosystem (Danda et al, 2011). The Indian Sunderbans with an area of approximately 4,250 sq. km (Chaudhuri & Choudhury, 1994; Mitra & Pal, 2002) contribute to 46.2% of the total mangroves of India (FSI, 2015).

The mangrove forest famous for the Royal Bengal Tiger (*Panthera tigris tigiris*), is a vibrating ecosystem rich in diverse mangrove vegetation. While *Avicennia spp., Excoecaria agallocha, Rhizophora apiculata, R. mucronata, Bruguiera gymnorrhiza, Ceriops decandra, Phoenix paludosa* (Mitra et al, 2004) are commonly found, the presence of threatened species *Sonneratia apetala, Heritiera fomes* makes the ecosystem even more valuable. A total of 34 true mangrove species have been recorded on studying only Indian Sundarbans.

Extreme anthropogenic disturbances in form of overexploitation and unchecked land use changes to convert these wetlands for agriculture, shrimp aquaculture, salt extraction, urban development and infrastructure, and diversion of freshwater for irrigation³ has led to extensive loss of these ecosystems worldwide. Ninety percent of mangrove forests are found in developing countries and are in verge of extinction in 26 countries due to overexploitation for ecosystem goods and fragmentation due to huge developmental activities (Bhatt & Kathiresan, 2012). The greatest human threat to mangroves is that they are often viewed as *wastelands* (Howard et al, 2014), a barrier to development and economy. Shrimp aquaculture, alone accounts for 20 to 50 percent mangrove losses worldwide⁵. According to (FAO, 2007), the global area under mangroves decreased to 15.6 million hectares from 16.1 million hectares found in 1990. Bhatt and Kathiresan (2012) reported that their depletion at the rate of 0.66% a year may lead to the loss of the entire ecosystems within 100 years.

These highly productive estuarine halophytes have carbon production rates equivalent to tropical humid forests. Mangroves, with more intricate and specialised root system, sequester more carbon below the soil, and have higher below- to above-ground carbon mass ratios than found in terrestrial ecosystems. The soil organic carbon content in mangrove ecosystems have an average of 937 t C per ha and these carbon-rich biomes account for 14% of carbon sequestration by the global ocean (Alongi, 2012).

In an overpopulated agrarian country like India, lack of awareness and opportunity has been taking toll on the health of the mangroves. Urbanisation in addition, increase commercial activities and are leading to the rapid conversion of mangrove forests at the Sunderbans. The Indian Sunderban mangrove forest, widely destroyed, is now largely confined to few islands situated on the east of the Matla River (Scott, 1989). Mangrove restoration has become an essential step to protect these islands from further adversities. To further instigate the restoration activities, scientific studies have been emphasising on the carbon storage of the Sunderban mangroves.

The current study documented the proportional carbon storage by the different dominant species of mangroves over the Sunderban delta to study their role as carbon sink. The carbon stocking ability of mangroves in a particular site depends on the relative abundance, biomass of each species and the age of the vegetation. The interaction between edaphic, climate and topographic factors of an area play a major role in Carbon sequestration of plants which depends upon biomass production capacity.



The results of carbon stock in the selected species shown species wise carbon content are in the order of *Sonneratia apetala* > *Avicennia alba* > *Avicennia marina* > *Excoecaria agallocha* > *Avicennia officinalis.*

Although *Sonneratia* has the highest productivity, it is extremely vulnerable under increasing salinity from rising sea level due to climate change (Mitra et al,

2015). Avicennia, Excoecaria on the other hand would not be impeded by increasing salinity (Alongi, 2015). Sonneratia hence must be considered to eco-restore the hypo-saline western zones of Indian Sundarbans instead of hypersaline central zone (Mitra et al, 2015), which will serve beneficial, both for the concerned species' rehabilitation and conservation of Sunderban mangrove ecosystem. Amidst the climate change scenario the current study, certainly reveals the necessity and species suitability for mangrove plantation programmes to minimize atmospheric carbon.

References:

Alongi, D. (2012). Carbon sequestration in mangrove forests. Carbon Management, 3(3), 313-322.

- Alongi, D. M. (2015, January 30). The Impact of Climate Change on Mangrove Forests. Curr Clim Change Rep, 1, 30–39.
- Bann, C. (1998). *The Economic Value of Mangroves: A Manual for Researchers.* Singapore: Economy and Environment Program for Southeast Asia.
- Bhatt, J. R., & Kathiresan, K. (2012). Valuation, carbon sequestration potential and restoration of mangrove ecosystems in India. Sharing Lessons on Mangrove Restoration Proceedings and a Call for Action from an MFF Regional Colloquium, (p. 19). Mamallapuram, India.
- Chaudhuri, A., & Choudhury, A. (1994). *Mangroves of the Sundarbans* (Vol. 1). India: IUCN, Bangkok, Thailand.
- Danda, A., Sriskanthan, G., Ghosh, A., Bandyopadhyay, J., & Hazra, S. (2011). *Indian Sundarbans Delta: A Vision.* New Delhi: World Wide Fund for Nature-India.
- Danda, A., Sriskanthan, G., Ghosh, A., Bandyopadhyay, J., & Hazra, S. (2011). *Indian Sundarbans Delta: A Vision.* New Delhi: World Wide Fund for Nature-India.
- FAO. (2007). The world's mangroves 1980-2005. A thematic study prepared in the framework of the Global Forest Resources Assessment 2005,. Rome: Food and Agriculture Organisation of the United Nations.
- FSI. (2015). India State Of Forest Report. Dehradun: Forest Survey of India.
- Howard, J., Hoyt, S., Isensee, K., Telszewski, M., & Pidgeon, E. (2014). Coastal Blue Carbon: Methods for assessing carbon stocks and emissions factors in mangroves, tidal salt marshes, and seagrasses. Arlington, Virginia, USA: Conservation International, Intergovernmental Oceanographic Commission of UNESCO, International Union for Conservation of Nature.
- Mitra, A., & Pal, S. (2002). *The oscillating mangrove ecosystem and the Indian Sundarbans* (1 ed.). West Bengal State Office: WWF- India.
- Mitra, A., Banerjee, k., & Bhattacharyya, D. (2004). *Ecological profile of Indian Sundarbans: pelagic primary producer community* (Vol. 1). West Bengal State Office: WWF- India.
- Mitra, A., Pramanick, P., Zaman, S., Fazli, P., Pal, N., & Mitra, A. (2015). Response of Sonneratia apetala to Salinity in the Frame Work of Indian Sundarbans. *International Journal of Innovative Studies in Aquatic Biology and Fisheries (IJISABF), 2*(1), 1-5.
- Scott, D. (1989). A directory of Asian wetlands. IUCN.



Author, Dr. Abhijit Mitra, is Associate Professor and former Head, Dept. of Marine Science at University of Calcutta and has been active in the sphere of Oceanography since 1985, presently serving as the advisor of Oceanography Division of Techno India University, Kolkata.

Dr. Mitra is presently the member of IUCN, SIOS, Mangrove Society of India etc.

He has successfully completed about 18 projects on biodiversity loss in fishery sector, coastal pollution, aquaculture, alternative livelihood, climate change and carbon sequestration.



Mangroves, Us and a Century

In face of Climate Change

Perspective of a budding sylvan, Oindrila Basu

They dominate where the lands meet the sea. They are home to the small fishes, crabs, snails and others who play in the intricate network of their roots. They are bathed twice in the tides daily, yet

they love the salt waters. They feel home there. That is why they marched towards the sea, adapted themselves to thrive in the harsh conditions; to serve their ecosystem the best. But, the salt water is rising; the humans have choked their throat off the fresh water. Their kins are

reduced due to incessant deforestation, land degradation. They are forced to take up excess of heavy metals, pollutants from industry, agriculture, just because they can. They cannot any more swallow all these devastations "with a pinch of salt". Their children are no more growing, crippled in front of these exhausting human exploitations. They are refusing to thrive.

It is us who need them. We need them for they are habitat of our food, our recreation. We need them for valuable traditional medicines. We need them for fuel, fodder, fibre. We need them to fulfil our spiritual beliefs. We need them for fresh oxygen. But we are losing them, because we don't realise how much we need them.

Mangroves, the salt tolerant plant species dominating the ecotone of three quarters of

Tropical coastlines (Ghosh & Mondal, 2016) are vulnerable today in hands of increasing salinity and sea-level rise due to climate change (Alongi, 2015). They, with their close association with the marine flora and fauna, form a unique coastal wetland ecosystem (Tomlinson, 1986). Many of these halophytic species even with their specialized adaptation are facing degeneration in overall health and extinction due to diseases and salt-stress (de Lacerda, 2002) coupled with anthropogenic exploitation (Ramsar Convention Secretariat, 2010; Clough, 2013). The climate change scenario is creating a more adverse condition raising the sea level hence increasing more salt intrusion in lands (Hazra et al, 2010; Clough, 2013; Alongi, 2015; Sarkar et al, 2016).

Studies suggest that these mangroves are one of the best carbon sequesters (Alongi, 2012). According to The Blue Carbon Initiative reports, the ability of mangroves to store blue carbon in the coastal soils surpasses all other ecosystems' carbon sink abilities (Howard et al, 2014). Flourishing prawn-cultivation causing deforestation poses as the main threat to these



unique ecosystems (IPCC, 2007; Ramsar Convention Secretariat, 2010; Clough, 2013). Agricultural run-offs are adding chemical fertilizers besides the industrial effluents killing huge marine-biota in population ridden tropical countries, impairing the health of mangrove ecosystem (Shete et al, 2007; Clough, 2013; Howard et al, 2014). Mismanaged tourism and excess of boat effluents containing heavy metals are way above the bio-remediation abilities of the mangroves (Shete et al, 2007). The mangroves, habitat to wide variety of flora and fauna, when degraded affect the longevity of such organisms as well. Many species of fishes, crustaceans, birds have become rare today because of their 'mangrove habitat' destruction (de Lacerda, 2002). The mangroves are first line of shoreline stability (Bann, 1998), degeneration of which increases the vulnerability from impacts of storms and cyclones (de Lacerda, 2002). The coastal soil, bound together with intricate root network of breathing root, knee root, stilt root of the mangroves, face havoc erosion and economic loss in deforestation (Giesen et al, 2006).

The Principle number 7 of Principles and guidelines for incorporating wetland issues into Integrated Coastal Zone Management (ICZM) states that *"Coastal wetlands are highly vulnerable to degradation and loss, but although easily degraded their restoration is costly and sometimes impossible"* (Ramsar Convention Secretariat, 2010). Estimates from scientific studies report that up to 67% of historical global mangrove range has already been lost been lost (Howard et al, 2014), and at its current rate of deforestation of 0.66% per year, mangrove disappearance from most forests will occur within this century (Bhatt & Kathiresan, 2012). The Intergovernmental Panel on Climate Change (IPCC) forecasted an increase in global sea surface temperature by I-3°C this century, global sea level rise at an average rate between I.8 and 2.4 mm year; decrease in ocean pH, (0.07–0.31), and rise in mean atmospheric CO₂ concentration to 441 ppm (from 391 ppm in 2011) (IPCC, 2013). According to (FAO, 2007) the global area under mangroves decreased to 15.6 million hectares from I6.1 million hectares found in 1990. Ninety percent of mangrove forests are found in developing countries and are in verge of extinction in 26 countries (Bhatt and Kathiresan, 2012).

Unawareness of what degradation can do to the ecosystems; lack of opportunities; and exploding population are indeed the biggest threats to all our natural ecosystems. In order to conserve and restore these unique ecosystems successfully, effective implementation of well-planned 'flexible and adaptive' (Clough, 2013) scientific solutions is extremely urgent. Mass awareness about the immense value of mangroves and other wetlands needs to be generated educating from common people to policy makers. How our daily habits are influencing the health of these important wetlands, and in turn shaping our future, should become a clear picture to all. Education is the key. Environmental awareness needs to be incorporated in all traditional as well as in lateral education systems globally. The knowledge of the beautiful ecosystem functions is needed to spread beyond the scientific diaspora for their sustainability, our sustainability and a resilient future.

References

Alongi, D. (2012). Carbon sequestration in mangrove forests. Carbon Management, 3(3), 313-322.

- Alongi, D. M. (2015, January 30). The Impact of Climate Change on Mangrove Forests. Curr Clim Change Rep, 1, 30-39.
- Bann, C. (1998). *The Economic Value of Mangroves: A Manual for Researchers*. Singapore: Economy and Environment Program for Southeast Asia.
- Bhatt, J. R., & Kathiresan, K. (2012). Valuation, carbon sequestration potential and restoration of mangrove ecosystems in India. Sharing Lessons on Mangrove Restoration Proceedings and a Call for Action from an MFF Regional Colloquium, (p. 19). Mamallapuram.
- Clough, B. (2013). Continuing the Journey Amongst Mangrove. ISME Mangrove Educational Book Series No. 1.
- de Lacerda, L. D. (2002). Mangrove ecosystems: function and management. New York: Springer-Verlag Berlin Heidelberg.
- FAO. (2007). The world's mangroves 1980-2005. A thematic study prepared in the framework of the Global Forest Resources Assessment 2005,. Rome: Food and Agriculture Organisation of the United Nations.
- Ghosh, D., & Mondal, A. (2016, February). Nature Watch: In Imminent Jeopardy: Sunderbans in Danger. *Resonance*, 21(2), 173-188.
- Giesen, W., Wulffraat, S., Zieren, M., & Scholten, L. (2006). *Mangrove Guidebook for Southeast Asia*. FAO and Wetlands International.
- Hazra, S., Samanta, K., Mukhopadhyay, A., & Akhand., A. (2010). *Temporal Change Detection (2001–2008) Study of Sundarban, Study Report.* Kolkata: School of Oceanographic Studies, Jadavpur University.
- Howard, J., Hoyt, S., Isensee, K., Telszewski, M., & Pidgeon, E. (2014). *Coastal Blue Carbon: Methods for assessing carbon stocks and emissions factors in mangroves, tidal salt marshes, and seagrasses*. Arlington, Virginia, USA: Conservation International, Intergovernmental Oceanographic Commission of UNESCO, International Union for Conservation of Nature.
- IPCC. (2007). Climate Change, 2007: Impacts, Adaptation and Vulnerability: Working Group II Contribution to the Intergovernmental Panel on Climate Change: Summary for Policymakers. IPCC.
- IPCC. (2013). Climate change 2013: the physical basis, contribution of working group I to the fifth assessment report of the Intergovernmental panel on climate change. Cambridge.
- Ramsar Convention Secretariat. (2010). Coastal management: Wetland issues in Integrated Coastal Zone Management. Ramsar handbooks for the wise use of wetlands, 12.
- Sarker, S. K., Reeve, R., Thompson, J., Paul, N., & Matthiopoulos, J. (2016). Are we failing to protect threatened mangroves in the Sundarbans world heritage ecosystem? *Sci. Rep.*, *6*(21234). doi:10.1038/srep21234
- Shete, A., Gunale, V., & Pandit, G. (2007, September). Bioaccumulation of Zn and Pb in Avicennia marina (Forsk.) Vierh. and Sonneratia apetala Buch. Ham. from Urban Areas of Mumbai (Bombay), India. J. Appl. Sci. Environ. Manage., 11(3), 109 - 112.
- Tomlinson, P. (1986). *The botany of mangroves*. New York: Cambridge University Press.



Mangroves at Gulf of Mannar Marine National Park

Photo: Author

Good News On The Eve Of Wetlands Day 2019



Editorial Board

Edit and Design

Oindrila Basu oindrila.basu@ymail.com

Concept and Overview

Dr. Shalini Dhyani, Regional Chair, IUCN Commission on Ecosystem Management, South Asia

Cover photo courtesy

Oindrila Basu

Please do write to us your feedback at <u>oindrila.basu@ymail.com</u> and <u>shalini3006@gmail.com</u>



