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Wetlands -"Kidneys of the earth": Importance and conservation

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Abstract
Wetlands are disappearing at a rapid pace all over the world and it is a matter of great concern. Wetlands not only harbour a rich biodiversity but also provide a number of valuable ecosystem services such as improvement of water quality, food chain support, flood control and of course carbon sequestration. Wetlands are also important as feeding and breeding grounds for migratory birds. In spite of playing so many significant roles, the wetlands are being converted rampantly to either agricultural farms or for urban settlements and industrial expansion. It is estimated that almost 50% of wetlands are already lost (Verhoeven & Setter, 2010). Tropical peat swamp forests of Indonesia and Malaysia that support unique biodiversity and globally significant stores of soil carbon are subjected to developmental pressure and drainage to support agriculture specially oil palm crop and other monocultures. The prolonged exploitation via drainage based agriculture of peat swamp forests will impact their ecosystem value and hydrological cycle adversely (Evers *et. al.* 2017). A wetland is an ecosystem that is filled with water either permanently or seasonally. It can be distinguished from other land forms or water bodies by its characteristic vegetation of aquatic plants that are adapted to the unique hydric soil. Wetlands occur where water meets land. They include mangroves, peat lands and marshes, rivers and lakes, deltas, floodplains and flooded forests, rice-fields, and even coral reefs. Wetlands exist in every country and in every climatic zone, from Polar Regions to the tropics, and from high altitudes to dry regions. Global-mean sea level rise would result in more incidences of floods by storm surge and potential losses of coastal wetlands through the 21st century (Nicholls, 2004).

Keywords: kidneys of the earth, valuable ecosystem services, wetlands

Introduction

Wetlands are areas where water is the primary factor controlling the environment and the associated plant and animal life. They occur where the water table is at or near the surface of the land, or where the land is covered by water Wetlands can be described as regions with low water levels, often near ground surface, which are covered by active plants during the growing season and water saturation period. Wetlands are some of the most important and valuable ecosystems on Earth and are called "kidneys of the Earth". Welands are vital for humans. There are two basic types of wetlands: natural and constructed (Zhang *et. al.*,2010) [10]. Wetlands improve water quality, protect shorelines, recharge groundwater, ease flood and drought severity, and provide unique habitats for many plants and animals. Scientists and government have paid increasing attention to wetlands to maintain the biodiversity of the aquatic system (Zhang *et. al.*,2010; Marois & Mitsch,2015) [10, 4]. Wetland-related studies are therefore of great importance to protect wetlands and mitigate climate change.

Wetlands are classified by Cowardin *et. al.* (1979) [9] in five major types on the basis of landscape position, vegetation cover and hydrologic regime as follows:

Palustrine (marshes, swamps and bogs)
Riverine (wetlands along rivers and streams)
Marine(coastal wetlands including coastal lagoons, rocky shores, and coral reefs Laucustrine (wetlands associated with lakes)
Estuarine (including deltas, tidal marshes, and mangrove swamps)

These are further divided into subsystems on the basis of degree or frequency of inundation and then into classes based on substrate, hydrological and vegetation types. The Cowardin's classification system has been cited extensively in the scientific literature and applied internationally. In addition, there are human-made wetlands such as fish and shrimp ponds, farm ponds, irrigated agricultural land, salt pans, reservoirs, gravel pits, sewage farms and canals. Wetlands in fact are found from the tundra to the tropics and on every continent except Antarctica.

Why to conserve wetlands?

Wetlands are among the world's most productive ecosystems that provide wide array of benefits. Wetlands are vital for humans, for other ecosystems and for our climate, providing essential ecosystem services such as water regulation, including flood control and water purification. These are cradles of biological diversity, providing the water and primary productivity upon which large number of plants and animal species depend for their survival. They support high concentrations of birds, mammals, reptiles, amphibians, fish and invertebrate species in the Great Plains of North America lies prairie pothole region which provides some of the most important wetland nesting habitat for Waterfowl (Reis *et.al.* 2017) [16]. Wetlands are also important storehouses of plant genetic material. For example, rice is a common wetland plant that is the staple diet of more than half of humanity. The multiple roles of wetland ecosystems and their value to humanity have been increasingly understood and documented in recent years (Mitsch& Gosselink, 2000; Mitsch

*et.al.*2009) [17, 18]. This has led to sincere efforts to restore lost or degraded hydrological and biological functions of wetlands. But it's not enough – the race is on to improve practices on a significant global scale as the world's leaders try to cope with the accelerating water crisis and the effects of climate change. As an estimate the world's population is likely to increase by 70 million every year for the next 20 years. Global freshwater consumption increased six fold between 1900 and 1995, more than double the rate of population growth. One third of the world's population lives in countries already experiencing moderate to high water stress. By 2025, two out of every three people on Earth may face life in water stressed conditions. The ability of wetlands to adapt to changing conditions, and to accelerating rates of change, will be crucial to human and wildlife everywhere as the full impact of climate change on our ecosystem lifelines is already felt. In addition, wetlands are important, and sometimes essential, for the health, welfare and safety of people who live in or near them. Coastal wetlands dampen the impact of storm surge and strong winds. Studies on the economic valuation of this protective service provided by wetland ecosystems are, however, rare. An analysis on property damage caused by 88 tropical storms and hurricanes hitting the United States between 1996 and 2016 showed that counties with more wetland coverage experienced significantly less property damage. The expected economic value of the protective effects of wetlands varies widely across coastal US counties with an average value of about $1.8 million/km^2 per year and a median value of $91,000/km^2 Wetlands confer relatively more protection against weaker storms and in states with weaker building codes. Recent wetland losses are estimated to have increased property damage from Hurricane by $430 million (Sun & Carson, 2020) [6].

Peat lands absorb heavy rainfall; provide protection against floods, and release water slowly, ensuring a supply of clean water throughout the year. Millions of people World over depend on peatlands for herding cattle, catching fish and farming. Tropical peat swamp forests are home to thousands of animals and plants, including many rare and critically endangered species such as the orangutan and Sumatran tiger. Peat lands contain twice as much carbon as the world's forests. When disturbed or drained, peat lands can become significant sources of greenhouse gas emissions. The wetlands in dry regions are very essential for farmers and pastoralists who graze animals, and the livelihoods of people who fish and collect plants from these water bodies. They are also important to millions of water birds that breed in Europe and Asia, such as waders and herons.

Wetlands provide tremendous economic benefits, for example, water supply (quantity and quality), fisheries (over two thirds of the world's fish harvest is linked to the health of coastal and inland wetland areas), agriculture, through the maintenance of water tables and nutrient retention in floodplains, timber production, energy resources, such as peat and plant matter, wildlife resources, transport and recreation and tourism opportunities. In addition, wetlands have special attributes as part of the cultural heritage of humanity, they are related to religious and cosmological beliefs, constitute a source of aesthetic inspiration, provide wildlife sanctuaries, and form the basis of important local traditions. These functions, values and attributes can only be maintained if the ecological processes of wetlands are allowed to continue functioning. This realization has spurred enhanced protection and restoration of wetland ecosystems all over the world. Unfortunately, and in spite of important progress made in recent decades, wetlands continue to be among the world's most threatened ecosystems, owing mainly to ongoing drainage, conversion, pollution, and overexploitation of their resources. Though wetlands cover only 6% of the Earth's surface, 40% of all plants and animal species live or breed in wetlands. These are disappearing three times faster than forests due to human activities and global warming. The reported long term loss of natural wetlands averages between 54-57% reaching up to 90% in some regions of the world. The study on wetland degradation shows historical habitat loss of 69-75% decline of inland wetlands in the twentieth century, whereas coastal wetlands declined 62-63% (Reis *et.al.* 2017*)* [16]. The anthropogenic degradation of wetlands causes loss of biodiversity in the form of biotic homogenization or reduced β-diversity (Hautier *et.al*.2018; Socolar *et.al.*2018,Price *et. al*.2019) [19, 7, 5]. Asia and North America contain the largest extents of wetlands, 4.1 million km^2 and 2.5 million km^2 respectively. Asia is home to one- third of the human population and wetlands are severely suffering the consequences of increasing pressure to meet human demands. More than 75% of the world's paddy fields are situated in tropical Asia and majority of them are converted wetlands. Deforestation, drainage and reclamation of wetlands, including peat swamps for agriculture, fish culture or other uses as well as construction of dams on rivers with floodplains are increasing potential threats to these wetlands during the last many decades. The current loss rate for Asian wetlands is estimated at about 5000 km^{2}per year (Gopal, 2013; Das Kangabam & Govindaraju, 2019; Nag *et. al.* 2020) [3, 11, 15] that calls for an urgent action for their conservation.

The Ramsar Convention

It is one of the oldest inter-governmental accords signed by member countries to preserve the ecology of the wetlands formed by United Nations Educational, Scientific and Cultural Organization (UNESCO) in February 2, 1971 and came into force from 21st December 1975. The convention is named after Iranian city Ramsar on the shores of the Caspian Sea, where it was signed. Those wetlands which are declared as Ramsar sites are protected by the strict guidelines as per the convention. It provides the detail framework for the conservation and wise use of wetlands and their resources. Presently there are 170 Contracting Parties, with 2,326 wetland sites of International importance, covering a total of 249,579,562 hectares of the earth surface area. The Ramsar Convention has taken a broad approach in determining the wetlands which come under its aegis and defines wetlands as "areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres". In addition, for the purpose of protecting coherent sites "may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands". The Convention adopted a Ramsar Classification of Wetland type which includes 42 types, grouped into three categories: Marine and Coastal Wetlands, Inland Wetlands, and Human-made Wetlands. The

UNEP-World Conservation Monitoring Centre has suggested an estimate of about 570 million hectares (5.7 million km$^{2)}$, roughly 6% of the Earth's land surface out of which 2% are lakes, 30% bogs, 26% fens, 20% swamps, and 15% floodplains. Mitsch and Gosselink (2000) [17] suggested 4 to 6% of the Earth's land surface as wetlands. Mangroves cover some 240,000 km^2 of coastal area and an estimated 600,000 km2 of coral reefs remain worldwide. Nevertheless, a global review of wetland resources prepared for Ramsar COP7 in 1999, while affirming that "it is not possible to provide an acceptable figure of the areal extent of wetlands at a global scale", indicated a 'best' minimum global estimate at between 748 and 778 million hectares. The same report indicated that this "minimum" could be increased to a total of between 999 and 4,462 million hectares when other sources of information were taken into account. Under the "three pillars" of the Ramsar Convention, the Contracting Parties are commited to:

1. Work towards the wise use of all their wetlands;
2. Designate suitable wetlands for the list of Wetlands of International Importance (the "Ramsar List") and ensure their effective management;
3. Cooperate internationally on transboundary wetlands, shared wetland systems and shared species.

The World Wetland Day is celebrated every year on 2nd February to mark the date of Ramsar Convention on wetlands. The theme of World Wetland Day 2020 is Wetlands and Biodiversity to highlight wetland biodiversity, its status, why it matters and to promote action to reverse its loss. The decade 2021-2030 is declared as UN Decade on Ecosystems Restoration. The third United Nations Environment Assembly passed a comprehensive resolution on protecting and restoring water-related ecosystems including wetlands.

Ramsar sites of India

As a signatory of Ramsar Convention, 27 Ramsar sites were declared by India to preserve wetlands of national importance. The prominent and significant Indian wetland sites are Vembanad Kol wetland(Kerala), Chilika lake(Orissa), Wular lake (J&K),Kolleru lake (Andhra Pradesh), Harika(Punjab), Renuka(H.P.), Sambhar lake(Rajasthan),Deepor Beel (Assam),Sunderbands wetland (West Bengal), Nil Sarovar (Gujarat),Bhoj Wetland (M.P.) and Rudra Sagar (Tripura). In 2011, ISRO prepared a National Wetland Atlas and mapped wetlands on the basis of satellite images. According to this report India has 2, 01,503 wetlands that comprise around 4.63% of geographic area of the country. On January 28, 2020 in an effort to improve the conservation, restoration and rejuvenation of wetlands, the Ramsar Convention has declared 10 more wetland sites from India as sites of national importance. Thus India now has a total of 37 Ramsar sites (Figure 1.) covering an area of 1,067,939 hectares. The 10 newly added Ramsar sites are as follows:

- **Nandur Madhameshwar:** This is the 1st Ramsar site of Maharashtra.
- **Keshopur-Miani, Beas Conservation Reserve, and Nangal:** These 3 Ramsar sites are newly added to Punjab. Apart from these 3 sites, Punjab already has 3 Ramsar sites. Thus the total Ramsar sites in the states counts to 6.
- **Nawabganj, Parvati Agra, Saman, Samaspur, Sandi and SarsaiNawar:** These 6 Ramsar sites have been newly added to Uttar Pradesh apart from 1 Ramsar site it already had. Thus, UP now have 7 Ramsar sites.

The Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India has prepared a 4 pronged strategy to restore wetlands. The strategy includes preparing baseline data, wetland health cards, preparing targeted Integrated Management Plans etc. The ministry will work closely with State Wetland Authorities to ensure wise use of Ramsar sites. Recently ministry launched 'Nal se Jal'scheme in 2019 that aims to provide piped water connection to every household by 2024. The public needs to become more informed and involved in conservation efforts of wetlands. If people are taught to love precious wetland ecosystem, they would definitely want to protect them.

Wetlands of Delhi

Delhi ranks second among World's national capitals that hosts around 450 species of birds. Only Nairobi in Kenya invites a greater variety of birds than Delhi's checklist. The National Capital harbours a network of several big and small wetlands. The prominent wetlands of Delhi are Yamuna river, Okhla Bird Sanctuary, Surajpur Wetland, Najafgarh jheel and drain, Sanjay Lake, Bhalswa Lake, Smritivan Lake (Kondli Lake) and Smritivan Lake (Vasant Kunj Lake), Hauz Khas lake and the National Zoological Park. Encroachment, increasing water pollution, greater likelihood of floods and, most importantly, loss of aquatic life and fewer birds, the wetlands in the National Capital Region is facing a huge challenge to their survival (Ghosh, 2019) [14]. According to the Asian Water bird Census 2019, carried out at six wetlands in the NCR revealed that the migratory bird count at Najafgarh jheel and drain had fallen by nearly 50 per cent compared to last year.

In 2017, the Union Environment Ministry amended the law of 2010 by decentralising wetlands management and giving states powers to identify and notify wetlands within their jurisdiction and keep a watch on prohibited activities. The Wetland (Conservation and Management) Rules, 2017 prohibit several activities in wetlands such as setting up and expansion of industries, waste dumping and discharge of effluents. The Delhi government formed a committee to deal with conservation and management of wetlands in the national capital last year. The members of the committee include the environment secretary, the DDA vice-chairman, the environment secretary, PWD secretary, urban development secretary, DJB CEO, fisheries secretary, irrigation and flood control department secretary, and the municipal commissioners.

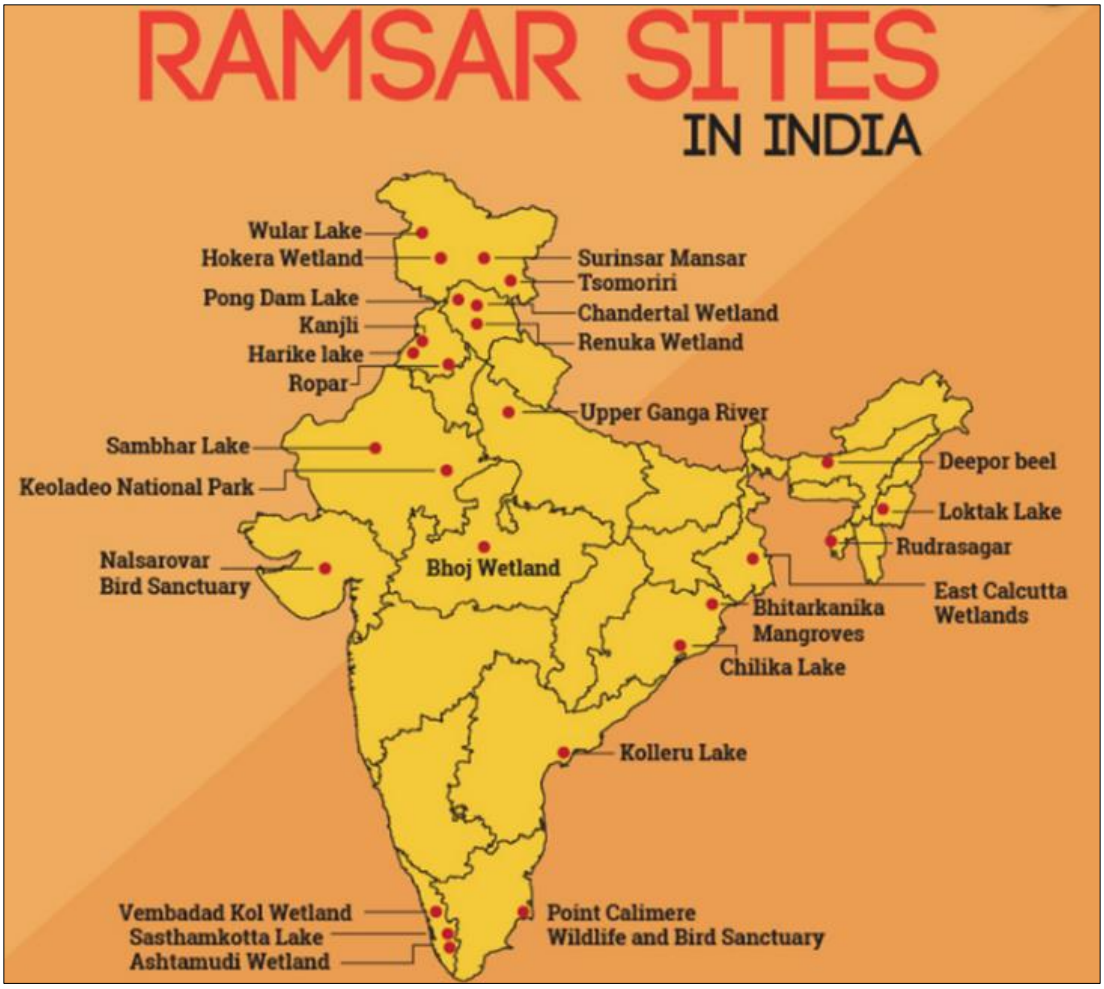

Fig 1: Map to show the location of Ramsar sites of India

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