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Wetlands Ecosystem: A Sensitive Landscape of Unorganized Non administered Services

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ABSTRACT

The association of man and wetlands is ancient, with the first signs of civilization originating in wetland habitats such as the flood plains of the Indus, the Nile Delta and the Fertile Crescent of the Tigris and Euphrates rivers. Evidence of the first wetland traces back to the Ordovician Period (485.4 million to 443.8 million years ago), As much 17.56% of the state's geographic area (34.74 lakh hectares) has been identified as wetland/waterbodies in the National Wetland Atlas of the Union ministery of environment and forests. A total of 15.26 million hectares have been identified as wetland in India. Gujarat is followed by Andhra Pradesh, Uttar Pradesh, West Bengal and Maharashtra in the order. Even the coastal Union territories of Diu and Daman have upto 18.46% of their total geographical area as wetland, next only to Lakshadweep whose 96.12% of land area is wetland. India has totally 27, 403 wetlands/water bodies, of which 23,444 are inland wetlands and 3,959 are coastal wetlands. According to the Directory of Asian Wetlands (1989), wetlands occupy 18.4% of the country's area (excluding rivers), of which 70 % are under paddy cultivation. In India, out of an estimated 4.1 million hectares (MHa) (excluding irrigated agricultural lands, rivers and streams) of wetlands, 1.5 MHa are natural, while 2.6 MHa are manmade. To declare any water bodies as wetland, it is manditorily be notified by the Central Government, State Government and Union Territory Administration under the Wetland Rules 2017.Presently there are 41 Ramsar notified wetlands in the country. There is no notified wetlands/ Ramsar wetlands in Karnataka as on date. There is need of hour to introduce panel provisions with Institutional authority in the Wetlands (Conservation and Management) Rules, 2017. Also, provisions for constitution of district level authority shall be made under the Rules with adequate powers for administration, management, development and conservation. Else, there could be more meaningful, if instead Rules, an Act should be promulgated on the lines of Forest (Conservation) Act 1980.

1 Introduction

Wetland ecosystem is the second most ancient ecosystem existing today on the earth planet. It is one of the birth place of origin of life. It also acted as a transitional ecosystem from sea to land. It came to exist much before to forest and wildlife. Wetlannds are complex ecosystem created by flooding or saturation of the soil, which makes low-oxygen environments that favour a specialized assemblage of plants, animals, and microbes, which exhibit adaptations designed to tolerate periods of sluggishly

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moving or standing water. It also encompass open water used by birds, the concept that originally inspired the protection of wetlands and associated aquatic sites. Wetlands are usually classified according to soil and plant life as bogs, marshes, swamps, and other similar environments in general terms. Wetlands cover about 6% of the earth's land surface.

Wetlands and the subdiscipline of wetland ecosystems are relatively new area of study in the field of primary ecology. The premitive laws and other regulations were enacted only after 1970s. The term *wetland,* however, was first used formally in 1953, in a report of the U.S. Fish and Wildlife Services that provided a framework for a waterfowl habitat in the United States. Since then, wetlands have been variously defined by ecologists and government officials. The definition emerged during the Ramsar Convention, an intergovernmental treaty signed in Ramsar, Iran, in 1971 to guide national and international wetland-conservation measures, is among the most widely referenced and adopted by many countries.

Wetlands are areas of *marsh*, *fen*, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low *tide* does not exceed six metres.

Origin of wetlands: Evidence of the first wetland traces back to the Ordovician Period (485.4 million to 443.8 million years ago), when the first terrestrial vescular plants, which were dependent on wet substrates, began to colonize the land. The first marshes and swamps appeared during the Devonian Period (419.2 million to 358.9 million years ago). Swamps , the presence of extensive wetland habitats, later dominated vast regions of southern North America during the Carboniferous Period (358.9 million to 298.9 million years ago), Mesozoic and Cenozoic eras (252.2 million years ago to the present).

Glaciation during the Pleistocene period (2.6 million to 11,700 years ago) caused to several types of landscapes for the development of present-day wetlands. The flat, scoured landscape of Canada's Hudson Bay lowlands is one of the example of wetland originated during that period.

In some of the coldest parts of the world, wetlands are sustained by an impermeable layer of ice that remains in the soil throughout the year. This perennially frozen ground, or permafrost, prevents both the percolation of surface water into the ground and plant contact with mineral groundwater. About 20–22 percent of Earth's land surface is close enough to a polar region or high altitude to experience permafrost. Large part of northern North America and Eurasia, as well as the Mongolian and Tibetan Plateaus, are affected by permafrost, and these regions are hosted with vast expanses of bogs, fens, and peatlands. North America possesses some of the most extensive bog and fen regions on Earth. In western Siberia, larch-spruce-birch forests form part of an enormous inland delta, which is the largest contiguous area of peatlands in the world. Asian plateaus in general host some of the most unusual high-altitude wetland ecosystems.

Some wetlands were created in some other ways during the periods of low sea level, when water was locked in glacial ice. Following a drop in sea level, the coastal plain of the southeastern United States was formed by the deposition of sediment that eroded from landscapes upstream. Rising sea levels that followed the retreat of the glaciers reduced streamflow velocity, and many streams backed up. These changes resulted in the formation of a variety of depressional, flat, and riverine wetlands which ended approximately 11,700 years ago.

Wetlands in nonglaciated regions such as the tropics of Indonasia and likewise were developed during periods characterized by slightly different climates and conytinued changing under present-day conditions. The peat swamp forests of Indonesia are built on peat up to 15 metres thick. The accumulation of this material occurred during a wetter period several thousand years ago. Although new peat is still forming in places where the region remains humid but in other tropical climate of the present day is dry enough to allow the degradation of peat in some areas.

The biggest wetlands on the Earth: Wetlands the places where the land is covered by water, either salt, fresh, or somewhere in between over 6% of the Earth's land surface. Sprinkled throughout every continent except Antarctica, they provide food, clean drinking water, and refuge for countless people and animals around the world. Despite their global significance, an estimated one-half of all wetlands on the planet have disappeared.

Amid the loss, one specific wetland stands out on the planet is **the Pantanal**. Of more than 42 million acres, the Pantanal is the largest tropical wetland and one of the most pristine in the world. It sprawls across three South American countries ie Bolivia, Brazil and Paraguay. This landscape supports millions of people there, as well as communities in the lower *Rio de la Plata Basin*.

The Pantanal if overlaid on the US it would be bigger than New York, Florida, and Wisconsin, among 25 other states. The Pantanal is larger than at least nine countries, including England, Austria, Hungary, Greece, and Ireland of the Europe.

A conservative, cumulative estimate of the size of the world's wetlands places the figure at 1.4 billion acres. Though only a fraction of that figure, the Pantanal remains more intact and pristine that most other wetland systems.

This massive wetland has the largest concentration of crocodiles in the world, with approximately 10 million caimans. Jaguars, the largest feline in the Americas, hunt caiman in the Pantanal, which has one of the highest density of jaguars anywhere the world. The Pantanal is also home to the biggest parrot on the planet, the hyacinth macaw. Sighting these animals and others help attract the 1 million tourists who visit the Pantanal every year. The areas that are protected are globally significant, with parts that fall under an agreement called Ramsar that requires national governments to conserve and wisely use wetlands, and some that are UNESCO World Heritage Sites and Biosphere Reserves. Around 95% of the Pantanal is under private ownership, the majority of which is used for cattle grazing

Wetlands in India: The Gujrat State is ahead of other states in the country in ecological richness evident from the recent past National wetland inventory and assessment report prepared by the Space Applications Centre (SAC), Ahmedabad.The largest amount of its landmass identified as wetlands of different kinds. As much as 17.56% of the state's geographic area (34.74 lakh hectares) has been identified as wetland in the National Wetland Atlas of the Union ministery of environment and forests.

Gujarat is followed by Andhra Pradesh, Uttar Pradesh, West Bengal and Maharashtra in the order. Even the coastal Union territories of Diu and Daman have upto 18.46% of their total geographical area as wetland, next only to Lakshadweep whose 96.12% of land area is wetland.

A total of 1.526 million hectares have been identified as wetland in India. This report has been prepared by the SAC after a gap of nearly two decades with the help of satellite images of much better resolution than were available during the last mapping in 1992-93 (8.26 million hectares).

The association of man and wetlands is ancient, with the first signs of civilization originating in wetland habitats such as the flood plains of the Indus, the Nile Delta and the Fertile Crescent of the Tigris and Euphrates rivers. There are several kinds of wetlands such as marshes, swamps, lagoons, bogs, fens and mangroves. They are home to some of the richest, most diverse and fragile of natural resources. As they support a variety of plant and animal life, biologically they are one of the most productive biodiverse ecosystems.

India has a wealth of wetland ecosystems distributed in different geographical regions. Most of the wetlands in India are directly or indirectly linked with major river systems such as the Ganges, Cauvery, Krishna, Godavari and Tapti and many others land locked rivers.

India has totally 27, 403 wetlands, of which 23,444 are inland wetlands and 3,959 are coastal wetlands. According to the Directory of Asian Wetlands (1989), wetlands occupy 18.4% of the country's area (excluding rivers), of which 70 % are under paddy cultivation. In India, out of an estimated 4.1 mha (excluding irrigated agricultural lands, rivers and streams) of wetlands, 1.5 mha are natural, while 2.6 mha are manmade.

The coastal wetlands occupy an estimated 6,750 sq km and are largely dominated by mangrove vegetation. About 80% of the mangroves are distributed in the Sunderbans of West Bengal and the Andaman and Nicobar Islands, with the rest in the coastal states of Odisha, Andhra Pradesh, Tamil Nadu, Karnataka, Kerala, Goa, Maharashtra and Gujarat.

Environmental Management & Policy Research Institute Bengaluru has organised a complusary training for the Indian Forest Service Officers in the last week of November 2020. I was one of the guest speaker and penalist on wetlands . I was not surprised that officers were not having full informations in this subject matter. I decided to place awriteup in this regard . Hence this paper.

2 Facts and Discussion

Indian Constitution: And whereas clause (g) of article 51A of the Constitution stipulates that it shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures.

National Environment Policy, 2006: It is unfortunate that till date there is no National wetland policy in the countery. Also, there is no State policy on wetlands in Karnataka. A part of National Environment Policy, 2006 briefly deals "with wet land polcy". In the said policy wet lands have been loosely described as:

Wetlands, natural and manmade, freshwater or brackish, provide numerous ecological services. They provide habitat to aquatic flora and fauna, as well as numerous species of birds, including migratory species. The density of birds, in particular, is an accurate indication of the ecological health of a particular wetland. Several wetlands have sufficiently unique ecological character as to merit international recognition as Ramsar Sites.

Wetlands provide freshwater for agriculture, animal husbandry, and domestic use, drainage services, and provide livelihoods to fisher folk. Larger wetlands may also comprise an important resource for sustainable tourism and recreation.

Wetlands are under threat from drainage and conversion for agriculture and human settlements, besides pollution. This happens because public authorities or individuals having jurisdiction over wetlands derive little revenues from them, while the alternative use may result in windfall financial

gains to them. However, in many cases, the economic values of wetlands' environmental services may significantly exceed the value from alternative use. On the other hand, the reduction in economic value of their environmental services due to pollution, as well as the health costs of the pollution itself, are not taken into account while using them as a waste dump. There also does not yet exist a formal system of wetland regulation outside the international commitments made in respect of Ramsar sites. A holistic view of wetlands is necessary, which looks at each identified wetland in terms of its causal linkages with other natural entities, human needs, and its own attributes. Further, in this policy some targets as stated below have been fixed for action.

a. Set up a legally enforceable regulatory mechanism for identified valuable wetlands, to prevent their degradation and enhance their conservation. Develop a national inventory of such wetlands.
b. Formulate conservation and prudent use strategies for each significant catalogued wetland, with participation of local communities, and other relevant stakeholders.
c. Formulate and implement eco-tourism strategies for identified wetlands through multi-stakeholder partnerships involving public agencies, local communities, and investors.
d. Take explicit account of impacts on wetlands of significant development projects during the environmental appraisal of such projects; in particular, the reduction in economic value of wetland environmental services should be explicitly factored into cost-benefit analyses.
e. Consider particular unique wetlands as entities with “Incomparable Values”, in developing strategies for their protection.
f. Integrate wetland conservation, including conservation of village ponds and tanks, into sectoral development plans for poverty alleviation and livelihood improvement, and link efforts for conservation and sustainable use of wetlands with the ongoing rural infrastructure development and employment generation programmes. Promote traditional techniques and practices for conserving village ponds.

The govt. of India took first step under the Environment Policy 2006 to frame the Rules in 2010 and notified as Wetlands (Conservation and Management) Rules 2010 mainly to prevent degradation of wetlands. These Rules were modified and diluted in 2017. The 2017 Wetland Rules limit monitoring and omit important wetland types. The targets fixed in the policy 2006 are partly attended but largly fall in deaf ears of Govt files.

The Central Govt ammendeted/formulated the Rules 2017 under the provisions of Environment Protection Act 1986.These rules may be called the Wetlands (Conservation and Management) Rules, 2017.

Preamble for Rules 2017: Whereas the wetlands, vital parts of the hydrological cycle, are highly productive ecosystems which support rich biodiversity and provide a wide range of ecosystem services such as water storage, water purification, flood mitigation, erosion control, aquifer recharge, microclimate regulation, aesthetic enhancement of landscapes while simultaneously supporting many significant recreational, social and cultural activities, being part of our rich cultural heritage;

And whereas many wetlands are threatened by reclamation and degradation through drainage and landfill, pollution (discharge of domestic and industrial effluents, disposal of solid wastes), hydrological alteration (water withdrawal and changes in inflow and outflow), over-exploitation of their natural resources resulting in loss of biodiversity and disruption in ecosystem services provided by wetlands;

And whereas clause (g) of article 51A of the Constitution stipulates that it shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures;

And whereas the Environment (Protection) Act, 1986 is a comprehensive legislation to provide protection and improvement of the environment, including inter-alia, wetlands, and for matters connected therewith;

And whereas the National Environment Policy, 2006 recognises the ecosystem services provided by wetlands and emphasizes the need to set up a regulatory mechanism for all wetlands so as to maintain their ecological character, and ultimately support their integrated management;

And whereas India is a signatory to the Ramsar Convention on Wetlands and is committed to conservation and wise use of all wetlands within its territory;

And whereas the Central Government has published the Wetlands (Conservation and Management) Rules, 2010, vide number G.S.R. 951(E), dated the 4th December, 2010;

And whereas conservation and wise use of wetlands can provide substantial direct and indirect economic benefits to state and national economy, and thereby the Central Government stands committed to mainstreaming full range of wetland biodiversity and ecosystem services in development planning and decision making for various sectors;

And whereas the State Governments and Union Territory Administrations need to take into account wetland ecosystem services and biodiversity values likewise within their developmental programming and economic well-being, also taking into cognizance that land and water, two major ecological constituents of wetland ecosystems, are enlisted as State subjects as per the Constitution;

And whereas the Central Government considered it necessary to supersede the Wetlands (Conservation and Management) Rules, 2010 for effective conservation and management of wetlands in the country;

And whereas the Central Government had, in exercise of the powers conferred by section 25, read with subsection (1) and clause (v) of sub-section (2) and sub-section (3) of section 3 of the Environment (Protection) Act, 1986, published the draft Wetlands (Conservation and Management) Rules, 2016, vide number G.S.R. 385 (E) dated 31st March, 2016 for information of the public likely to be affected thereby; and notice was given that the said draft rules would be taken into consideration by the Central Government after expiry of a period of sixty days from the date on which copies of the Gazette notification is made available to the public;

And whereas the Central Government has received the suggestions and objections from the State Governments, Union Territories and its organisations, individuals and civil society organisations on the draft Wetlands (Conservation and Management) Rules, 2016;

And whereas the suggestions and objections received in response to the above-mentioned draft rules have been duly considered by the Central Government in consultation with State Governments and Union Territory Administrations.

Now, therefore, in exercise of the powers conferred by section 25, read with sub-section (1) and clause (v) of sub-section (2) and sub-section (3) of section 3 and section 23 of the Environment (Protection) Act, 1986 and in supersession of the Wetlands (Conservation and Management) Rules, 2010, except as respects things done or omitted to be done before such supersession, the Central Government

hereby makes the following rules for conservation and management of wetlands, namely, Wetlands (Conservation and Management) Rules, 2017.

Defination:"wetland" means an area of marsh, fen, peatland or water; whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters, but does not include river channels, paddy fields, human-made water bodies/tanks specifically constructed for drinking water purposes and structures specifically constructed for aquaculture, salt production, recreation and irrigation purposes;

Wetlands Authorities: 1**.** The Central Government hereby constitutes the State Wetlands Authority in each State with the following members, namely:

a) Minister In-charge of the Department of Environment/Forests of the State Government or Minister Incharge of the Department handling wetlands - Chairperson;

b) Chief Secretary of the State or Additional Chief Secretary equivalent - Vice Chairperson;

c) Secretary in-charge of the Department of Environment - Member *ex-officio*;

d) Secretary in-charge of the Department of Forests - Member *ex-officio*;

e) Secretary in-charge of the Department of Urban Development - Member *ex-officio*;

f) Secretary in-charge of the Department of Rural Development - Member *ex-officio*;

g) Secretary in-charge of the Department of Water Resources - Member *ex-officio*;

h) Secretary in-charge of the Department of Fisheries - Member *ex-officio*;

i) Secretary in-charge of the Department of Irrigation and Flood Control - Member *ex-officio*;

j) Secretary in-charge of the Department of Tourism - Member *ex-officio*;

k) Secretary in-charge of the Department of Revenue - Member *ex-officio*;

l) Director, State Remote Sensing Centre - Member *ex-officio*;

m) Chief Wildlife Warden - Member *ex-officio*;

n) Member Secretary, State Biodiversity Board - Member *ex-officio*;

o) Member Secretary, State Pollution Control Board - Member *ex-officio*;

p) Additional Principal Chief Conservator of Forests of the Regional Office of Ministry of Environment, Forest and Climate Change - Member *ex-officio*;

q) One expert each in the fields of wetland ecology, hydrology, fisheries, landscape planning and socioeconomics to be nominated by the State Government; and

r) Additional Secretary/Joint Secretary/Director in the Department of Environment/Forests or Department handling wetlands - Member Secretary.

The Central Government hereby constitutes the Union Territory Wetlands Authority for each Union Territory with the following members, namely:

a) Administrator or Chief Secretary of the Union Territory - Chairperson;

b) Secretary in-charge of the Department of Environment - Vice Chairperson;

c) Secretary in-charge of the Department of Forests - Member *ex-officio*;

d) Secretary in-charge of the Department of Urban Development - Member *ex-officio*;

e) Secretary in-charge of the Department of Rural Development - Member *ex-officio*;

f) Secretary in-charge of the Department of Water Resources - Member *ex-officio*;

g) Secretary in-charge of the Department of Fisheries - Member *ex-officio*;

h) Secretary in-charge of the Department of Irrigation and Flood Control - Member *ex-officio*;

i) Secretary in-charge of the Department of Tourism - Member *ex-officio*;

j) Secretary in-charge of the Departments of Revenue - Member *ex-officio*;

k) Director, Remote Sensing Centre - Member *ex-officio;*

l) Member Secretary, Union Territory Pollution Control Committee - Member *ex-officio*;

m) Member Secretary, Biodiversity Board of the UT - Member *ex-officio*;

n) Chief Wildlife Warden - Member *ex-officio*;

o) Additional Principal Chief Conservator of Forests of the Regional Office of Ministry of Environment, Forest and Climate Change- Member *ex-officio*;

p) One expert each in the fields of wetland ecology, hydrology, fisheries, landscape planning and socioeconomics to be nominated by the Union Territory Administration; and

q) Additional Secretary/Joint Secretary/Director in the Department of Environment/Forests or Department handling wetlands - Member Secretary.

The State Wetlands Authority or Union Territory Wetlands Authority may co-opt other members, not exceeding three in number, if required.

The State Wetlands Authority or Union Territory Wetlands Authority shall exercise the following powers and perform the following functions, namely:

a) prepare a list of all wetlands of the State or Union Territory within three months from the date of publication of these rules;

b) prepare a list of wetlands to be notified, within six months from the date of publication of these rules; taking into cognizance any existing list of wetlands prepared/notified under other relevant State Acts;

c) recommend identified wetlands, based on their Brief Documents, for regulation under these rules;

d) prepare a comprehensive digital inventory of all wetlands within a period of one year from the date of publication of these rules and upload the same on a dedicated web portal to be developed by the Central Government for the said purpose; the inventory to be updated every ten years;

e) develop a comprehensive list of activities to be regulated and permitted within the notified wetlands and their zone of influence;

f) recommend additions, if any, to the list of prohibited activities for specific wetlands;

g) define strategies for conservation and wise use of wetlands within their jurisdiction; wise use being a principle for managing these ecosystems which incorporates sustainable uses (such as capture fisheries at subsistence level or harvest of aquatic plants) as being compatible with conservation, if ecosystem functions (such as water storage, groundwater recharge, flood buffering) and values (such as recreation and cultural) are maintained or enhanced;

h) review integrated management plan for each of the notified wetlands (including trans-boundary wetlands in coordination with Central Government), and within these plans consider continuation and support to traditional uses of wetlands which are harmonized with ecological character;

i) in cases wherein lands within boundary of notified wetlands or wetlands complex have private tenancy rights, recommend mechanisms for maintenance of ecological character through promotional activities;

j) identify mechanisms for convergence of implementation of the management plan with the existing State/Union Territory level development plans and programmes;

k) ensure enforcement of these rules and other relevant Acts, rules and regulations and on half-yearly basis (June and December of each calendar year) inform the concerned State Government or Union Territory Administration or Central Government on the status of such notified wetlands through a reporting mechanism;

l) coordinate implementation of integrated management plans based on wise use principle through various line departments and other concerned agencies;

m) function as nodal authority for all wetland specific authorities within the State or Union Territory Administration;

n) issue necessary directions for conservation and sustainable management of wetlands to the respective implementing agencies;

o) undertake measures for enhancing awareness within stakeholders and local communities on values and functions of wetlands; and

p) Advise on any other matter *suo-motu*, or as referred by the State Government/Union Territory Administration.

The concerned Department of the State Government or Union Territory shall provide all necessary support and act as nodal Department and Secretariat to the Authority.

1. The Authority shall, within ninety days of publication of these rules, shall constitute:

a) a technical committee to review brief documents, management plans and advise on any technical matter referred by the Wetland Authority; and

b) a grievance committee consisting of four members to provide a mechanism for hearing and forwarding the grievances raised by public to the Authority;

2. The Committees referred to in sub-rule (6) shall meet at least once in every quarter to perform their functions.
3. The Authority shall meet at least thrice in a year.
4. The term of non-official members of the Authority nominated by State Government or Union Territory Administration, shall be for a period not exceeding three years.

Constitution of National Wetlands Committee: The Central Government, hereby constitutes the National Wetlands Committee with the following members, namely:-

a) Secretary, Ministry of Environment, Forest and Climate Change, Government of India - Chairperson;

b) Special Secretary or Additional Secretary dealing with wetlands, Ministry of Environment, Forest and Climate Change, Government of India-Vice Chairperson;

c) Additional Director General, Wildlife, Ministry of Environment, Forest and Climate Change, Government of India - Member *ex-officio*;

d) Adviser or Joint Secretary dealing with wetlands, Ministry of Environment, Forest and Climate Change - Member *ex-officio*;

e) Joint Secretary, Ministry of Tourism, Government of India- Member *ex-officio*;

f) Joint Secretary , Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India- Member *ex-officio*;

g) Joint Secretary, Ministry of Agriculture and Farmers Welfare, Government of India- Member *exofficio*;

h) Joint Secretary, Ministry of Social Justice and Empowerment, Government of India- Member *exofficio*;

i) Joint Secretary, Ministry of Urban Development, Government of India- Member *ex-officio*;

j) Joint Secretary, Ministry of Rural Development, Government of India- Member *ex-officio*;

k) The Chairman, Central Pollution Control Board - Member *ex-officio*;

l) Director, Zoological Survey of India or Scientist F- Member *ex-officio*;

m) Director, Botanical Survey of India or Scientist F- Member *ex-officio*;

n) Director, Space Application Centre, Ahmedabad or Scientist F- Member *ex-officio*;

o) Member, Central Water Commission - Member *ex-officio*;

p) Adviser, Niti Aayog - Member *ex-officio*;

q) Three representatives of State Government or Union Territory Administration on a rotational basis for a tenure of two years each;

r) One expert each in the fields of wetland ecology, hydrology, fisheries, landscape planning & socioeconomics; and

s) Director/Additional Director/Joint Director dealing with wetlands, Ministry of Environment, Forest and Climate Change - Member Secretary.

The National Wetlands Committee may co-opt other members, not exceeding three in number, if required.

1. The National Wetlands Committee shall perform the following functions, namely:
    a) Advise the Central Government on appropriate policies and action programmes for conservation and wise use of wetlands;
    b) Evolve norms and guidelines for integrated management of wetlands based on wise use principle;
    c) Monitor implementation of these rules by the Authority;
    d) Advise the Central Government on proposals received from State Governments or Union Territory Administrations for omission of the prohibited activities as referred in sub-rule (2) of rule 4;
    e) Recommend designation of wetlands of international importance under Ramsar Convention;
    f) Recommend trans-boundary wetlands for notification;
    g) review progress of integrated management of Ramsar sites and transboundary wetlands;
    h) Advise on collaboration with international agencies on issues related to wetlands; and
    i) Advise on any other matter *suo-moto*, or as referred by the Central Government.
2. The tenure of non-official members of the Committee shall not exceed three years.
3. The Committee shall meet at least once in every six months.

Delegation of powers and functions to the State Governments and Union Territory Administrations:

a) The concerned Department of the State Government or Union Territory Administration shall, within a period of one year from the date of publication of these rules, prepare a Brief Document for each of the wetland identified for notification, providing: demarcation of wetland boundary supported by accurate digital maps with coordinates and validated by ground truthing;
b) demarcation of its zone of influence and land use and land cover thereof indicated in a digital map;
c) ecological character description;
d) account of pre-existing rights and privileges;
e) list of site-specific activities to be permitted within the wetland and its zone of influence;

f) list of site-specific activities to be regulated within the wetland and its zone of influence; and

g) modalities for enforcement of regulation;

1. Based on the Brief Document, the Authority shall make recommendations to the State Government or Union Territory Administration for notifying the wetlands.
2. The State Government or Union Territory Administration shall, after considering the objections, if any, from the concerned and affected persons, notify the wetlands in the Official Gazette, within a period not exceeding 240 days from the date of recommendation by the Authority.
3. (a) In case of trans-boundary wetlands, the Central Government shall coordinate with concerned State Governments and Union Territory Administrations to prepare the Brief Document containing information as listed in sub-rule (1).

   (b) Based on the Brief Document, the National Wetlands Committee shall make recommendations to the Central Government for notification of the wetland.

   (c) The Central Government shall, after considering the objections, if any, from the concerned and affected persons, notify the wetlands in the Official Gazette, within a period not exceeding 240 days from the date of recommendation by the Committee.

4. (a) The Central Government shall create a dedicated web portal for information relating to wetlands.

(b) The Central Government, State Government and Union Territory Administration shall upload all relevant information and documents pertaining to wetlands in their jurisdiction.

Restrictions of activities in wetlands: The wetlands shall be conserved and managed in accordance with the principle of 'wise use' as determined by the Wetlands Authority.

The following activities shall be prohibited within the wetlands, namely:

i. conversion for non-wetland uses including encroachment of any kind;

ii. setting up of any industry and expansion of existing industries;

iii. manufacture or handling or storage or disposal of construction and demolition waste covered under the Construction and Demolition Waste Management Rules, 2016; hazardous substances covered under the Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 or the Rules for Manufacture, Use, Import, Export and Storage of Hazardous Micro-organisms Genetically engineered organisms or cells, 1989 or the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008; electronic waste covered under the E-Waste (Management) Rules, 2016;

iv. Solid waste dumping;

v. Discharge of untreated wastes and effluents from industries, cities, towns, villages

and other human settlements;

vi. any construction of a permanent nature except for boat jetties within fifty metres from the mean high flood level observed in the past ten years calculated from the date of commencement of these rules; and,

vii. Poaching.

Provided that the Central Government may consider proposals from the State Government or Union Territory Administration for omitting any of the activities on the recommendation of the Authority.

India's wetlands are generally differentiated into 8 categories depending on their regional presence (Scott, 1989):

- The reservoirs of the Deccan Plateau in the south, together with the lagoons and other wetlands of the southwest coast.
- The vast saline expanses of Rajasthan, Gujarat and the Gulf of Kutch.
- The freshwater lakes and reservoirs from Gujarat eastwards through Rajasthan (Keoladeo Ghana National Park) and Madhya Pradesh.
- The delta wetlands and lagoons of India's east coast (Chilka Lake).
- The freshwater marshes of the Gangetic Plains and the floodplains of the Brahmaputra.
- The marshes and swamps in the hills of northeast India and the Himalayan foothills.
- The lakes and rivers of the mountain region of Kashmir and Ladakh.
- The mangroves and other wetlands of the Andaman and Nicobar Islands.

Provided that the Central Government may consider proposals from the State Government or Union Territory Administration for omitting any of the activities on the recommendation of the Authority.

Waterbodies/wetlands as defined under various disciplines/statues

Ramsar Convention" means the Convention on Wetlands signed at Ramsar, Iran in 1971.India is the signatory of the Ramsar Convention 1971.

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.

The Ramsar Convention takes a broad approach in determining the wetlands which come under its aegis. Under the text of the Convention (Article 1.1), wetlands are defined as: "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres".

In addition, for the purpose of protecting coherent sites, the Article 2.1 provides that wetlands to be included in the Ramsar List of internationally important wetlands: "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".

Five major wetland types are generally recognized: • marine (coastal wetlands including coastal lagoons, rocky shores, and coral reefs); • estuarine (including deltas, tidal marshes, and mangrove swamps); • lacustrine (wetlands associated with lakes); • riverine (wetlands along rivers and streams); and • palustrine (meaning "marshy" - marshes, swamps and bogs).

Wetlands (Conservation and Management) Rules, 2017. "wetland" means an area of marsh, fen, peatland or water; whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters, but does not include river channels, paddy fields, human-made water bodies/tanks specifically constructed for drinking water purposes and structures specifically constructed for aquaculture, salt production, recreation and irrigation purposes.

To declare any water bodies as wetland, it should be notified by the Central Government, State Government and Union Territory Administration.

Provided that these rules shall not apply to the wetlands falling in areas covered under the Indian Forest Act, 1927, the Wild Life (Protection) Act, 1972, the Forest (Conservation) Act, 1980, the State Forest Acts, and the Coastal Regulation Zone Notification, 2011 as amended from time to time.

In Karnataka, there is no notified wetlands (though there is a proposal pending before the Central Government to declare some tanks/tanks as wetland)

Karnataka Tank Conservation and Development Authority Act2014 "Tank" or "Ponds" or "Lake" means an inland water-body irrespective of whether it contains water or not, but mentioned in revenue records as sarkari kere, kharab kere, kunte, katte or by any other name and includes the peripheral catchment areas (Rajakaluve) main feeder inlet and other inlets, bunds, weirs, sluices, draft channels, outlets and the main channels of drainages to and fro; but does not include,- Medium Irrigation tanks which has command area more than 2000 Hectors and above.

Acts prohibited in tanks: Notwithstanding anything to the contrary contained in any law for the time being in force, no person or institution or organization (registered or unregistered) or company or firm or association, Government departments, corporation or any local or other authority and their agents or employees or anybody on their behalf shall:

a) use the tank for any purpose other than storage or impounding of water or for the purpose mentioned in clause (9) of section 5;
b) construct any structure on tank land, occupy any tank land or part there of or cause any obstruction at the natural or normal course of inflow or outflow of water into, or from, the tanks on the upstream and or downstream.
c) make any construction or carry on any commercial or recreational or industrial activity within thirty meters from the outer boundary of the tanks; dump debris, municipal solid wastes, mud or earth soil or liquid wastes or any pollutants, into the tank by using vehicle or otherwise;
d) dump debris, municipal solid wastes, mud or earth soil or liquid wastes or any pollutants, into the tank by using vehicle or otherwise;
e) discharge untreated sewage into the tank directly or indirectly;

f) Construct roads, bridges and allied works within tank area including the tank bund. The Authority may grant permission for such works only after ensuring that the original capacity of the tanks is not reduced even after such work.

g) breach bund, waste weir including lowering raising the height of the waste weir from its original height or remove fence, boundary stones or any hoarding or any sign board erected by the authority; and

h) Do any other act which is detrimental directly or indirectly to the tanks.

Provided that nothing in this Act shall prohibit withdrawal of water for drinking or irrigation or any other purpose, for human consumption from any tank be specified by the Authority from time to time.

Provided further that nothing in this Act shall prohibit stocking of fish seeds and development of fisheries (except the fish which are dangerous or harmful to the aquatic eco-system of the tank) by the Government and its licensee, lessees or contractor in any tank specified by the Authority from time to time.

A judgment by the Uttarakhand High Court, stating that Ganga and Yamuna rivers are "living entities", captured the national imagination. It is worth noting that wetlands, the other major water-based ecosystem apart from rivers, are at a moment of policy transition in the country. A new legal framework for wetlands was passed, the Wetland (Conservation and Management) Rules, 2017, replacing the earlier Rules of 2010. Also, the Supreme Court passed an order directing States to identify wetlands in the country within a stipulated timeframe. But till date no action has been taken. The H,ble SC was furious in some matter recently pointing out non-implementation of its directions in thousands of orders.

Going forward: The 2017 Wetland Rules have been criticised for doing away with strong wetland monitoring systems and omitting important wetland types. At the same time, the Supreme Court order directs States to come forward and notify wetlands. What then could be the way forward for States? Not to act under public/political pressures?

The 2010 and 2017 Rules for wetlands both emphasise that the ecological character of wetlands ought to be maintained for their conservation. 'Ecological character' refers to processes and components which make the wetland a particular, and sometimes unique, ecosystem. For example, as lagoons like Chilika (Odisha) and Pulicat (Tamil Nadu/Andhra Pradesh) are characterised by a mix of saline and fresh water, the flows of each type need to be maintained; river flood plains contain wetlands that require conservation so they can re-fuel the river with fish and other aquatic life during flooding.

In the 2010 Rules, some related criteria were made explicit, such as natural beauty, ecological sensitivity, genetic diversity, historical value, etc. These have been omitted in the 2017 Rules. There are a few reasons why this is problematic. First, there is multiple interest around wetlands. Multiple interests also have governance needs, and this makes it absolutely necessary to identify and map these multiple uses. Leading on from this, and second, it is crucial to identify ecological criteria so that the wetlands character can be maintained. The key to wetland conservation is not just understanding regimes of multiple use but conserving or managing the integrity of the wetland ecosystem. Finally, restriction of activities on wetlands will be done as per the principle of 'wise use', determined by the State wetland authority. Whether wise use will include maintaining ecological character remains to be seen. Under the new Rules, no authority to issue directions, which are binding in nature to desist from any activity detrimental to wetland conservation, has been prescribed to State wetland authorities.

Further, no punishment under these Rules make them more advisory than implementation. Giving powers to Central Govt for removing restrictions cause to make them more velranable and toothless. Infact, there could have been more meaningful, if instead Rules, an Act should have been formulated/promulgated on the lines of Forest (Conservation) Act 1980.

Salt pans are an example how one use (of making salt) has trumped the other (of environmental balance). Salt pans as 'wetlands' have been omitted from the new Rules. They were identified as wetlands in the 2010 Rules, as they are often important sites of migratory birds and other forms of biodiversity. The omission in the 2017 Rules suggests that while saltpans do exist as wetlands, they do not require any conservation or ecological balance. The inference can also be that it would be acceptable to tip the environmental balance or integrity of such a wetland, which could lead to damage and pollution.

The case of Deepor Beel Assam: The issue of wetlands being multipleuse areas and subsequently being abused due to clashes of interest found centre stage this year with the observations of the National Green Tribunal (NGT) in the case of Deepor Beel. (Beel means water body)

Deepor Beel is a Ramsar site and a part of it is also wildlife sanctuary in Guwahati, Assam. (Ramsar Sites are designated because they meet the criteria for identifying wetlands of international importance.) This wetland harbours a wide variety of biodiversity, and also suffers from intense man-made pressure, the city's municipal waste is dumped close to the Beel. Large, meat-eating storks (Greater adjutant storks) are ironically found eating from the mountains of garbage at the site. Potential impacts of contamination or poisoning from the garbage are still unknown. This January, 26 storks died. The fact that Deepor Beel exists as a wetland does not prevent garbage dumping; this is a fate faced by many wetlands. The NGT's observations on Deepor Beel are interesting and symptomatic of what is happening in several wetlands. In an inspection done by the judicial member of the Tribunal, it was noted that waste was being dumped "not beyond the site but within it," and "demarcations are made by drying out areas or cutting off water sources". These are classic ways of killing a wetland and turning it from a wet to a dry ecosystem; or from a lake to a garbage dump or cesspool. The Tribunal has now asked for the "traditional" spread of the wetland.

Given all the modern uses of wetlands, or the use of the wetland only for its land, looking at traditional cartography may be one way to understand catchments of wetlands. It may also be a way of restoring some modicum of ecological character, identity or 'rights' to wetlands, as the river judgment suggested. There are challenges ahead in identifying wetlands – multiple and competing use is just one of them. Understanding the historic spread and ecological character will be an important bulwark for the way forward. Setting clear governance systems would be the next. Without either, we are looking at a complete dilution of wetlands in the country.

Eleven wetlands in the State of Karnataka, including Bellandur, Varthur Ranganthittu and Aghanashini, have been selected by the Ministry of Forests, Environment and Climate Change as focal points for wetland conservation in Karnataka, the only state in the south that doesn't have a Ramsar site. The move, officials in the Forest Department said, was to bring comprehensive restoration and conservation of the lakes. "The Centre has selected wetlands for comprehensive development. The department is preparing documentation for the 11 wetlands," said Subhash Malkhede, Additional Principal Chief Conservator of Forests, adding that the work has been affected by the Covid-19 pandemic. Manju Pandey, MOEFCC Joint Secretary, said under the National Conservation Programme for Aquatic Ecosystem, the Centre has been supporting the state governments in lake preservation.

"We had sought proposals from the state wetland authorities on potential Ramsar sites. We have selected the wetlands considering the aspirations and other available details of the wetland. Some of these places were already under the focus of various programmes," said an officer.Apart from Bellandur and Varthur lakes, Aghnashini (Uttar Kannada), Bonal (Yadgir), Gudavi (Shivamogga), Ranganthittu, Kokkare Bellur (Mandya), Magadhi (Gadag), Hidkal (Belagavi), Heggeri (Haveri) and K G Koppa have been selected for the task.Noting that Karnataka has no Ramsar site that meets the standards of the international convention, she said the selection of lakes is to get at the true potential of the waterbodies."Once we receive proposals from the state government, they will be vetted and based on merit, the Centre will fund projects to develop them," said official in Central Govt.

Ramsar wetlands in India as of November 2020

Chilika Lake wetland: This wetland is located in Odisha, notfied on 01-10-1981, for an area of 1165 square Kms. This is the first lake notified as wetland under the Ramsar convention in India. A brackish water lagoon, spread over the districts of Puri, Khordha and Ganjam on the east coast of India, at the mouth of the Daya River, flowing into the Bay of Bengal. It is the largest coastal lagoon in India and the second largest lagoon in the world. The lagoon hosts over 160 species of birds in the peak migratory season. Birds from as far as the Caspian Sea, Lake Baikal, the Aral Sea and other remote parts of Russia, Kirghiz steppes of Mongolia, Central and southeast Asia, Ladakh and the Himalayas used to visit here. These birds travel great distances; migratory birds probably follow much longer routes than the straight lines, possibly up to 12,000 km, to reach Chilika Lake. In 1981, Chilika Lake was designated the first Indian wetland of international importance under the Ramsar Convention. In November 2002, the Ramsar Wetland Conservation Award was presented to the Chilika Development Authority for "outstanding achievements in the field of restoration and wise use of wetlands and effective participation of local communities in these activities". White-bellied sea eagles, greylag geese, purple moorhen, jacana, flamingos, egrets, grey and purple herons, Indian roller, storks, white ibis, spoonbills, brahminy ducks, shovellers, pintails, and more. Nalbana Island is the core area of the Ramsar designated wetlands of Chilika Lake. Nalbana was notified in 1987 and declared a bird sanctuary in 1973 under the Wildlife Protection Act. The Irrawaddy dolphin (Orcaella brevirostris) is the flagship species of Chilika lake. Chilka is home to the only known population of Irrawaddy dolphins in India and one of only two lagoons in the world that are home to this species. It is classified as critically endangered in five of the seven places it is known to live.

Keoladeo National Park wetland: This wetland is located in Rajasthan, notified on 01-10-1981, for an area of 28.73 square Kms. A complex of ten artificial, seasonal lagoons, varying in size, situated in a densely populated region. Vegetation is a mosaic of scrub and open grassland that provides habitat for breeding, wintering and staging migratory birds. Also supported are five species of ungulates, four species of cats, and two species of primates, as well as diverse plants, fish and reptiles. The canal provides water for agriculture and domestic consumption. Cattle and water buffalo graze on the site. A field research station exists. Placed on the Montreux Record in 1990 due to "water shortage and an unbalanced grazing regime".Additionally, the invasive growth of the grass *Paspalum distichum* has changed the ecological character of large areas of the site, reducing its suitability for certain water bird species, notably the Siberian crane. This wetland requires immediate attention of authorties.

Harike Wetland : This wetland is located in Punjab, notified on 23-03-1990, for an area of 41 squre Kms. A shallow water reservoir with thirteen islands, at the confluence of two rivers. Dense floating vegetation covers 70% of the lake. It is an important site for breeding, wintering and

staging birds, supporting over 200,000 Anatidae (ducks, geese, swans, etc.) during migration. The entire lake is leased on an annual basis to commercial fishery organizations.

Loktak wetland :This wetland is located in Manipur, notfied on 23-03-1990, for an area of 266 squre Kms. The largest freshwater lake in the north-eastern region of the country, which is famous for the phumdis (heterogeneous mass of vegetation, soil, and organic matters at various stages of decomposition) floating over it. Keibul Lamjao, the only floating national park in the world, floats over it. It is located near Moirang, Bishnupur district. The etymology of Loktak is *lok* ="stream" and tak = "the end". The Keibul Lamjao National Park, which is the last natural refuge of the endangered sangai or Manipur brow- antlered deer (Cervus eldi eldi), one of three subspecies of Eld's deer, covering an area of 40 km2 (15 sq mi), is situated in the southeastern shores of this lake and is the largest of all the phumdis in the lake. This place is a global tourist destination. The Sendra tourist hub (a small hillock) is located at Moirang ~58 km from the heart of the city.

Sambhar wetland : This wetland is located in Rajasthan, notfied on 23-03-1990, for an area of 240 squre Kms. India's largest inland salt lake, it is a key wintering area for tens of thousands of flamingos and other birds that migrate from northern Asia. The specialized algae and bacteria growing in the lake provide striking water colours and support the lake ecology that, in turn, sustains the migrating waterfowl. There is other wildlife in the nearby forests, where nilgai move freely along with deer and foxes.

Wular wetland : This wetland is located in Jammu and Kashmir, notfied on 23-03-1990, for an area of 189 squre Kms. The largest freshwater lake in India with extensive marshes of emergent and floating vegetation, particularly water chestnut, that provide an important source of revenue for the state government and fodder for domestic livestock.The lake supports an important fishing industry and is a valuable source of water for irrigation and domestic use. The area is important for wintering, staging and breeding birds. Human activities include rice cultivation and tree farming.

Ashtamudi Wetland: This wetland is located in Kerala, notfied on 19-08-2002, at allocation of 8°57'N 76°35'E, for an area of 614 squre Kms. A natural backwater in Kollam district, Kerala. The rivers Kallada and Pallichal drain into it. It forms an estuary with the sea at Neendakara which is a famous fishing harbour. National Waterway 3 passes through it. Most tastiest backwater fish in Kerala, the karimeen of Kanjiracode Kayal is from Ashtamudi Lake.

Bhitarkanika Mangroves wetland: This wetland is located in Odisha, notfied on 19-08-2002, at 20°39'N 86°54'E, for an area of 650 squre Kms. In 1975, an area of 672 km was declared the Bhitarkanika Wildlife Sanctuary. The core area of the sanctuary, with an area of 145 square Kms, was declared Bhitarkanika National Park in September 1998. Gahirmatha Marine Wildlife Sanctuary, which bounds the Bhitarkanika Wildlife Sanctuary to the east, was created in September 1997, and encompasses Gahirmatha Beach and an adjacent portion of the Bay of Bengal. Bhitarkanika Mangroves were designated a Ramsar wetland of international importance in 2002. It is also famous for its salt water crocodiles and olive ridley sea turtle.

Bhoj Wetland: This wetland is located in Madhya Pradesh, notified on 9-08-2002, at allocation of 23°14'N 77°20'E, for an area of 32 squre Kms. It consists of two lakes located in the city of Bhopal, the capital of Madhya Pradesh. The two lakes are the Bhojtal (Upper Lake) and the Lower Lake, which lie to the west of the city centre. It is a man-made reservoir. More than 20,000 birds are

observed annually. Bhoj Wetland was recognized as a wetland of international importance under the Ramsar Convention in 2002. Upper Lake acts as the lifeline of the city supplying 40% of its potable water. White storks, black-necked storks, bar-headed geese, spoonbills, etc., that have been rare sightings in the past, have started appearing. A recent phenomenon is the gathering of 100-120 sarus cranes in the lake. The largest bird of India, the sarus crane (*Grus antigone*) is known for its size, majestic flight and lifetime pairing.

Deepor Beel wetland: This wetland is located in Assam, notified on 19-08-2002, for an area of 40 squre Kms. A permanent freshwater lake in a former channel of the Brahmaputra River. It is of great biological importance and also essential as the only major storm water storage basin for the city of Guwahati. The beel is a staging site on migratory flyways and some of the largest concentrations of aquatic birds in Assam can be seen, especially in winter. Some globally threatened birds are supported, including the spot-billed pelican (*Pelicanus philippensis*), lesser and greater adjutant stork (*Leptoptilos javanicus* and *dubius*), and Baer's pochard (*Aythya baeri*). The 50 fish species present provide livelihoods for a number of surrounding villages, and *Nymphaea* nuts and flowers, as well as ornamental fish, medicinal plants, and seeds of the giant water lily *Euryale ferox* provide major revenue sources in local markets; orchids of commercial value are found in the neighboring forest. Potential threats include over fishing and hunting pressure upon waterbirds, pollution from pesticides and fertilizers, and infestation by water hyacinth (*Eichhornia crassipes*). A proposal to create a sewage canal from the city directly to the beel is considered to be disastrous in its potential effects. It is in knews due to shrinkage of area and intervention of NGT.

East Kolkata Wetlands: This wetland is located in West Bengal, notified on 19-08-2002, for an area of 125 squre Kms. World-renowned as a model of a multiple use wetland, the site's resource recovery systems, developed by local people through the ages, have saved the city of Kolkata from the costs of constructing and maintaining waste water treatment plants. The wetland forms an urban facility for treating the city's waste water and utilizing the treated water for pisciculture and agriculture, through the recovery of nutrients in an efficient manner - the water flows through fish ponds covering about 4,000 ha, and the ponds act as solar reactors and complete most of their bio-chemical reactions with the help of solar energy. Thus the system is described as "one of the rare examples of environmental protection and development management where a complex ecological process has been adopted by the local farmers for mastering the resource recovery activities" (Kundu et al., 2008). The wetland provides about 150 tons of fresh vegetables daily, as well as some 10,500 tons of table fish per year, the latter providing livelihoods for about 50,000 people directly and as many again indirectly. The fish ponds are mostly operated by worker cooperatives, in some cases in legal associations and in others in cooperative groups whose tenurial rights are under legal challenge. A potential threat is seen in recent unauthorized use of the waste water outfall channels by industries which add metals to the canal sludge and threaten the edible quality of the fish and vegetables.

Kanjli Wetland: This wetland is located in Punjab, notified on 22-01-2002, for an area of 1.83 squre Kms. A permanent stream, the Kali Bein, converted by construction of a small barrage in 1870 into a water storage area for irrigation purposes. The site fulfils Criteria 3 "it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region", because of its importance in supporting a considerable diversity of aquatic, mesophytic, and terrestrial flora and fauna in the biogeographical region, and acts also as a key regulator of groundwater discharge and recharge with the seasons. By this means and

by direct abstraction of water for irrigation by the local population, the site plays a crucial role in the agriculture which predominates on the surrounding fertile plain, with fewer pressures upon water supplies than elsewhere in the Punjab. The invasive water hyacinth is present and must be removed from time to time; increasing pollution levels, deforestation in the catchment area, and excessive grazing are seen as potential threats. The stream is considered to be the most significant in the state from the religious point of view, as it is associated with the first guru of the Sikhs, Guru Nanak. The stream itself and surrounding marsh is under provincial ownership and surrounding areas privately owned. The site is a centre for environmental tourism and picnicking.

Kolleru wetland : This wetland is located in Andhra Pradesh, notified on 19-08-2002, for an area of 901 squre Kms. A natural eutrophic lake, situated between the two major river basins of the Godavari and the Krishna, fed by two seasonal rivers and a number of drains and channels, which functions as a natural flood balancing reservoir between the deltas of the two rivers. It provides habitat for a number of resident and migratory birds, including declining numbers of the vulnerable grey pelican (Pelecanus philippensis), and sustains both culture and capture fisheries, agriculture and related occupations. Damage and losses due to flooding in monsoon seasons and partial drying out during summers, the results of inadequate management planning and action, are seen as areas for improvement.

Point Calimere Wildlife and Bird Sanctuary wetland: This wetland is located in Tamil Nadu, notified on 19-08-2002, for an area of 385 squre Kms. A coastal area consisting of shallow waters, shores, and long sand bars, intertidal flats and intertidal forests, chiefly mangrove, and seasonal, often-saline lagoons, as well as human-made salt exploitation sites. Some 257 species of birds have been recorded, 119 of them waterbirds, including the vulnerable species spoon-billed sandpiper (Calidris pygmaea) and grey pelican (Pelecanus philippensis) and some 30,000 greater and lesser flamingos. The site serves as the breeding ground or nursery for many commercially important species of fish, as well as for prawns and crabs. Some 35,000 fishermen and agriculturalists support their families around the borders of the sanctuary. Illegal collection of firewood and forest produce such as fruits (gathered by lopping off tree branches), the spread of Chilean mesquite (Prosopis chilensis), increasingly brackish groundwater caused by expansion of the historical salt works, and decreasing inflow of freshwater are all seen as potential causes for concern. Visitors come to the site both for recreation and for pilgrimage, as it is associated with Lord Rama.

Pong Dam wetland : This wetland is located in Himachal Pradesh, notified on 19-08-2002, for an area of 156.62 squre Kms. A water storage reservoir created in 1975 on the Beas River in the low foothills of the Himalayas on the northern edge of the Indo-Gangetic Plain.The Ramsar Site Information Sheet notes that "at a time when wetlands in northern India are getting reduced due to extensive drainage and reclamation, the avian habitats formed by the creation of the Pong Dam assume a great significance" - given the site's location on the trans-Himalayan flyway, more than 220 bird species have been identified, with 54 species of waterfowl. Hydrological values include monsoon- season flood prevention, both in the surroundings and downstream due to water regulation, groundwater recharge, silt trapping and prevention of soil erosion; electricity is generated, and irrigation water is being channeled to fertile areas of the deserts of Punjab and Rajasthan. Low-yield subsistence fishing existed prior to impoundment, but since, a lucrative fishery has grown up, with 27 fish species and a yield increasing each year - some 1800 fishermen

now have direct employment and 1000 families benefit indirectly. A nature conservation education centre is found on the island of Ransar or Ramsar [sic]. Recent management strategies have shifted away from law enforcement and use restrictions towards more participatory approaches and community awareness, and the site is well suited to community-based ecotourism.

Ropar Wetland: This wetland is located in Punjab, notified on 22-01-2002, for an area of 13.65 squre Kms. A humanmade wetland of lake and river formed by the 1952 construction of a barrage for diversion of water from the Sutlej River for drinking and irrigation. The site is an important breeding place for the nationally protected smooth-coated otter, hog deer, sambar, several reptiles, and the endangered Indian pangolin (Manis crassicaudata). Some 35 species of fish play an important role in the food chain, and about 150 species of local and migratory birds are supported. Local fisheries are economically significant, and wheat, rice, sugar cane, and sorghum are cultivated in the surrounding area. Deforested local hills leading to siltation, and increasing industrialization causing an inflow of pollutants, are potential threats, and invasive weeds are a further cause for concern. Nature lovers, birdwatchers, swimmers and boaters visit the site in considerable numbers.

Sasthamkotta wetland: This wetland is located in Kerala, notified on 19-08-2002, for an area of 3.73 squre Kms. Situated in Kollam district, it is the largest freshwater lake in Kerala. The Kallada River had a unique replenishing system through a bar of paddy field which has now disappeared due to indiscriminate clay and sand mining. The lake is now depleting due to the destruction of its replenishing mechanism.

Tsomoriri wetland: This wetland is located in Ladakh, notified on 19-08-2002, for an area of 120 squre Kms. A freshwater to brackish lake lying at 4,595 m above sea level, with wet meadows and borax- laden wetlands along the shores. The site is said to represent the only breeding ground outside of China for one of the most endangered cranes, the black-necked crane (Grus nigricollis), and the only breeding ground for bar-headed geese in India. The great Tibetan sheep or argali (Ovis ammon hodgsoni) and Tibetan wild ass (Equus kiang) are endemic to the Tibetan Plateau, of which the Changtang is the westernmost part. The barley fields at Karzok have been described as the highest cultivated land in the world. With no outflow, evaporation in the arid steppe conditions causes varying levels of salinity.

Ancient trade routes and now major trekking routes pass the site. The 400-year-old Korzok Monastery attracts many tourists, and the wetland is considered sacred by local Buddhist communities and the water is not used by them. The local community dedicated Tsomoriri as a WWF "Sacred Gift for a Living Planet" in recognition of WWF-India's work there. The rapidly growing attraction of the recently opened area to Western tourists (currently 2,500 per summer) as an "unspoilt destination" with pristine high desert landscapes and lively cultural traditions brings great promise but also potential threats to the ecosystem.

Vembanad-Kol Wetland: This wetland is located in Kerala, notified on 19-08-2002, for an area of 1512.5 squre Kms. It is the largest lake of Kerala, spanning across Alappuzha, Kottayam and Ernakulam districts. Famous tourist locations like Alappuzha and Kumarakom, known for houseboats are here. The mouths of the Pamba and Achankovil rivers in Vembanad forms part of the Kuttanad. It is below sea level and is famous for exotic fish varieties and paddy fields that are below sea level.

Chandra Taal wetland: This wetland is located in Himachal Pradesh, notified on 08-11-2005, at 32°29’N 77°36’E, for an area of 0.49 squre Kms. A high altitude lake on the upper Chandra valley

flowing to the Chenab River of the Western Himalayas (4,337 m asl) near the Kunzam pass joining the Himalayan and Pir Panjal ranges. It supports the CITES and IUCN Red Listed snow leopard and is a refuge for many species like the snowcock, chukor, black ring stilt, kestrel, golden eagle, chough, red fox, Himalayan ibex, and blue sheep. These species have developed adaptions to the cold arid climate, intense radiation, and oxygen deficiency. Some 65% of the larger catchment is degraded forest due to overgrazing by the nomadic herdsmen, while 35% is covered by grasslands. Other threatening factors to this fragile and sparse vegetation are summer trekking, littering waste and lack of sanitation facilities. Since declaring the site a nationally important wetland in 1994, the authorities have provided funds for ecotourism. The Spiti Forest Department is the custodian and the State Council of Science, Technology and Environment coordinats conservation management.

Hokera Wetland: This wetland is located in Jammu and Kashmir, notified on 08-11-2005, for an area of 13.75 squre Kms. Located in the northwest Himalayan biogeographic province of Kashmir, on the back of the snow-draped Pir Panchal (1,584 m asl), Hokera Wetland is only 10 km from scenic paradise of Srinagar. A natural perennial wetland contiguous to the Jhelum basin, it is the only site with remaining reedbeds of Kashmir and pathway of 68 waterfowl species like large egret, great crested grebe, little cormorant, common shelduck, tufted duck and endangered white-eyed pochard, coming from Siberia, China, central Asia, and northern Europe. It is an important source of food, spawning ground and nursery for fishes, besides offering feeding and breeding ground to a variety of water birds.Typical marshy vegetation complexes inhabit like *Typha*, *Phragmites*, *Eleocharis*, *Trapa*, and *Nymphoides* species ranging from shallow water to open water aquatic flora. Sustainable exploitation of fish, fodder and fuel is significant, despite water withdrawals since 1999. Potential threats include recent housing facilities, littered garbage, and demand for increasing tourist facilities.

Renuka wetland: This wetland is located in Himachal, Pradesh 08-11-2005, for an area of 0.2 squre Kms. A natural wetland with freshwater springs and inland subterranean karst formations, fed by a small stream flowing from the lower Himalayas out to the Giri river. The lake is home to at least 443 species of fauna and 19 species of fish representative of lake ecosystems like *Puntius*, *Labeo*, *Rasbora* and *Channa*. Prominent vegetation ranges from dry deciduous plants like *Shorea robusta*, *Terminalia elliptica*, *Dalbergia sissoo* to aquatic plants. There are 103 species of birds of which 66 are resident, e.g. crimson- breasted barbets, mynas, bulbuls, pheasants, egrets, herons, mallards and lapwings. Among ungulates, sambar, barking deer and ghorals are also abundant in the area. The lake has high religious significance and is named after Renuka, the mother of Hindu sage Parshuram, and is thus visited by thousands of pilgrims and tourists.Conservation measures so far include community awareness, and prevention of silt influx from eroded slopes and 50 ha of planting in the catchment. The site is managed by the Shimla Forest Department, Himachal Pradesh.

Rudrasagar wetland: This wetland is located in Tripura, notified on 08-11-2005, for an area of 2.4 squre Kms. A lowland sedimentation reservoir in the northeast hills, fed by three perennial streams discharging to the Gomti River. The lake is abundant in commercially important freshwater fish genera like *Botia*, *Notopterus*, *Chitala*, *Mystus* and the species *Ompok pabda*, *Labeo bata*, and freshwater scampi, with annual production of 26 metric tons, and an ideal habitat for IUCN Red Listed three-striped roofed turtle (*Batagur dhongoka*). Owing to high rainfall (2500 mm) and downstream topography, the wetland is regularly flooded with 4-5 times annual

peak, assisting in groundwater recharge. Aquatic weeds are composed of rare marginal-floating-emergent- submerged weeds. Lands are owned by the state with perennial water areas leased out to the subsistence fishermens' cooperative, and surrounding seasonal waterbodies are cultivated for paddy. The main threats are increasing silt loads due to deforestation, expansion of agricultural land and intensive farming, and land conversion for population pressure.Vijayadashami, one of the most important Hindu festivals with various sports events, attracts atleast 50,000 tourists and devotees everyyear.

Surinsar- Mansar wetlands: This wetland is located in Jammu and Kashmir, notified on 08-11-2005, for an area of 3.5 squre Kms. A freshwater composite lake in semi-arid Punjab Plain, adjoining the Jhelum Basin with catchment of sandy conglomeratic soil, boulders and pebbles. Surinsar is rain-fed without permanent discharge, and Mansar is primarily fed by surface run-off and partially by mineralised water through paddy fields, with inflow increasing in rainy season. The lake supports CITES and IUCN Red Listed Indian flapshell turtle (Lissemys punctata), Indian softshell turtle (Aspideretes gangeticus) and Mansariella lacustris. This composite lake is high in micronutrients for which it is an attractive habitat, breeding and nursery ground for migratory waterfowl like the Eurasian coot (Fulica atra), common moorhen (Gallinula chloropus), black-necked grebe (Podiceps nigricollis), tufted duck (Aythya fuligula), and various Anas species. The site is socially and culturally very important with many temples owing to its mythical origin from the Mahabharata period. Although the lakes support variety of fishes, fishing is discouraged for religious reasons. The main threats are increasing visitors, agricultural runoff, bathing and cremation rituals. Conservation is focused on raising awareness.

Upper Ganga River (Brijghat to Narora Stretch) wetland: This wetland is located in Uttar Pradesh, notified on 08-11-2005, for an area of 265.9 squre Kms. A shallow river stretch of the great Ganges with intermittent small stretches of deep-water pools and reservoirs upstream from barrages. The river provides habitat for the IUCN Red Listed Ganges river dolphin, gharial, crocodile, six species of turtles, otters, 82 species of fish and more than hundred species of birds. Major plant species, some of which are said to have medicinal value, include *Dalbergia sissoo*, *Saraca indica*, *Eucalyptus globulus*, *Ficus benghalensis*, *Dendrocalamus strictus*, *Tectona grandis*, *Azadirachta indica* and aquatic *Eichhornia*. This river stretch has religious importance for thousands of Hindu pilgrims and is used for cremation and holy baths for spiritual purification. Major threats are sewage discharge, agricultural runoff, and intensive fishing.Conservation activities carried out are planting to prevent bank erosion, training on organic farming, and lobbying to ban commercial fishing.

Nalsarovar Bird Sanctuary wetland: This wetland is located in Gujarat, notified on 24-09-2012, for an area of 123 squre Kms. A natural freshwater lake (a relict sea) that is the largest natural wetland in the Thar Desert Biogeographic Province and represents a dynamic environment with salinity and depth varying depending on rainfall. The area is home to 210 species of birds, with an average 174,128 individuals recorded there during the winter and 50,000 in the summer. It is an important stopover site within the Central Asian Flyway, with globally threatened species such as the critically endangered sociable lapwing (*Vanellus gregarius*) and the vulnerable marbled teal (*Marmaronetta angustirostris*) stopping over at the site during migration, while the vulnerable sarus crane (*Grus antigone*) takes refuge there during summer when other water bodies are dry. The wetland is also a lifeline for a satellite population of the endangered Indian wild ass (*Equus hemionus khur*) which uses this area in the dry season. Local communities heavily rely on the lake as it provides them with a source of drinking water and water for irrigiation, as well as an

important source of income from fishing for catla fish (*Labeo catla*) and rohu (*Labeo rohita*). An average of 75,000 tourists visit the wetland annually.

Beas Conservation Reserve wetland: This wetland is located in Punjab, notified on 26-09-2019, at 31°23'N 75°11'E, for an area of 64 squre Kms. A 185-kilometre stretch of the Beas River located primarily in the north-west of Punjab. The river meanders down from the Himalayan foothills to the Harike Headworks, where its course is diverted into a number of channels. The river is dotted with islands, sand bars and braided channels creating a complex environment supporting substantial biodiversity. More than 500 species of birds are documented along this stretch, along with more than 90 fish species. The reserve also hosts the only known population in India of the endangered Indus river dolphin (*Platanista gangetica minor*). Further threatened species include the endangered mahseer (*Tor putitora*) and hog deer (*Hyelaphus porcinus*) as well as the vulnerable smooth-coated otter (*Lutrogale perspicillata*). In 2017, a programme was initiated to re-introduce the critically endangered gharial (*Gavialis gangeticus*) with 47 individuals released into the river 30 years after their disappearance. Major threats include urban and domestic pollution as well as impacts of agriculture along most of the river's course. The Department of Forest and Wildlife, Punjab, conducts the scientific management of the wetland.

Keshopur-Miani Community Reserve wetland: This wetland is located in Punjab, notified on 26-09-2019, for an area of 34 squre Kms. The reserve is a mosaic of natural marshes, aquaculture ponds and agricultural wetlands maintained by rainfall runoff. It is heavily human influenced, and includes a series of managed fishponds and cultivated crops such lotus and chestnut. This management helps support a variety of flora, with 344 species of plants recorded in the area. In this way, the site is an example of wise use of a community-managed wetland, which provides food for people and supports local biodiversity. Threatened species present include the vulnerable common pochard (*Aythya ferina*) and the endangered spotted pond turtle (*Geoclemys hamiltonii*). The Department of Forest and Wildlife, Punjab, forms the management committee.

Nandur Madhameshwar wetland: This wetland is located in Maharashtra, notified on 21-06-2019, for an area of 14 squre Kms. The site is a mosaic of lakes, marshes and riparian forest on the Deccan Plateau. Construction of the Nandur Madhameshwar Weir at the confluence of the Godavari and Kadva rivers helped create a thriving wetland: originally designed to overcome water shortages in the surrounding area, the site now also serves as a buffer against floodwaters and as a biodiversity hotspot. With 536 species recorded, its diverse habitats contrast with the surrounding semi-arid conditions caused by the rain shadow of the Western Ghats mountain range. The site hosts some of India's most iconic species, such as the leopard and Indian sandalwood (*Santalum album*). It also provides sanctuary to critically endangered species including Deolali minnow (*Parapsilorhynchus prateri*), Indian vulture (*Gyps indicus*) and white-rumped vulture (*Gyps bengalensis*). Invasive species including common water hyacinth (*Eichhornia crassipes*) threaten the site, along with the effects of urban development and water abstraction. The Office of the Conservator of Forests (Wildlife) manages the site.

Nangal Wildlife Sanctuary wetland: This wetland is located in Punjab, notified on 26-09-2019, for an area of 1 squre Kms. Located in the Sivalik Hills of Punjab, the sanctuary supports abundant flora and fauna including threatened species, such as the endangered Indian pangolin (*Manis crassicaudata*) and Egyptian vulture (*Neophron percnopterus*) and the vulnerable leopard (*Panthera pardus*). It occupies a human-made reservoir constructed as part of the Bhakra- Nangal

Project in 1961. The site is of historic importance as the Indian and Chinese prime ministers formalized the Five Principles of Peaceful Coexistence there in 1954. More than half a million people downstream benefit from the reservoir as the flow of water is regulated, reducing the risks to both people and property from floods. The Department of Forest and Wildlife (Rupnagar Wildlife Division), Punjab is responsible for managing the sanctuary.

Nawabganj Bird Sanctuary wetland: This wetland is located in Uttar Pradesh, notified on 19-09-2019, for an area of 2 squre Kms. A shallow marshland 45 kilometres from Lucknow in Uttar Pradesh. Monsoon rains feed this diverse wetland while the Sarda Canal supplies additional water. The sanctuary supports recreation and tourism activities as well as local biodiversity. It is a haven for birds, with 25,000 waterbirds regularly recorded and 220 resident and migratory species documented. Among these are globally threatened species including the endangered Egyptian vulture (*Neophron percnopterus*) and Pallas's fish eagle (*Haliaeetus leucoryphus*) as well as the vulnerable lesser adjutant (*Leptoptilos javanicus*) and woolly- necked stork (*Ciconia episcopus*). Protection and afforestation measures have helped increase the overall diversity of wildlife, with golden jackal (*Canis aureus*) and jungle cat (*Felis chaus*) now present. The highly invasive common water hyacinth (*Eichhornia crassipes*) poses a threat, as does the removal of timber from the forests.State forest officers along with the Office of the Conservator of Forest (Wildlife) jointly manage the sanctuary.

Parvati Aranga Bird Sanctuary wetland: This wetland is located in Uttar Pradesh, notified on 02-12-2019, for an area of 7 squre Kms. A permanent freshwater environment consisting of two oxbow lakes. These wetlands are characteristic of Uttar Pradesh and offer exceptional habitats for waterbirds, providing both roosting and breeding sites with over 100,000 birds documented in annual counts. The sanctuary is a refuge for some of India's threatened vulture species; the critically endangered white-rumped vulture (*Gyps bengalensis*) and Indian vulture (*Gyps indicus*), and the endangered Egyptian vulture (*Neophron percnopterus*) have all been recorded. It is also critical in the maintenance of hydrological regimes, ensuring groundwater recharge and discharge. Meanwhile ancient temples around the lakes provide religious significance and encourage tourism. Invasive species such as the common water hyacinth (*Eichhornia crassipes*) along with the development of roads and railways present significant threats. The Uttar Pradesh divisional forest officer and chief conservator of forests along with sanctuary officers share management duties.

Saman Bird Sanctuary wetland: This wetland is located in Uttar Pradesh, notified on 02-12-2019, for an area of 5 squre Kms. A seasonal oxbow lake on the Ganges floodplain. It is heavily reliant on the arrival of the south- westerly monsoon in July and August, which provides the vast majority of annual rainfall. The sanctuary regularly provides refuge to over 50,000 waterbirds (187 species have been recorded) and is particularly important as a wintering site for many migrants including the greylag goose (*Anser anser*), with over 1% of the South Asian population present during winter. Vulnerable species including the sarus crane (*Grus antigone*) and greater spotted eagle (*Aquila clanga*) are also found. Ecosystem services provided include supply of fresh water for agriculture, as well as recreation and nature- based tourism based around the huge diversity of birds. Settlement encroachment and salinization present threats. The Office of the Conservator of Forest (Wildlife) oversees the site's management.

Samaspur Bird Sanctuary wetland: This wetland is located in Uttar Pradesh, notified on 03-10-2019, for an area of 8 squre Kms. A perennial lowland marsh typical of the Indo- Gangetic Plain in Raebareli district. Its six connected lakes are heavily relevant on monsoon rains. Annual counts

regularly find more than 75,000 birds present, with over 250 resident and migrant species documented. The sanctuary harbours threatened species such as the endangered Egyptian vulture (Neophron percnopterus) and Pallas's fish eagle (Haliaeetus leucoryphus), and more than 1% of the South Asian population of the vulnerable common pochard (Aythya ferina). At least 46 freshwaters fish species use the wetland, with some migrating in from nearby rivers during monsoon floods.The site provides food products and agricultural fodder, as well as maintaining biodiversity.However, invasive species threaten its ecological character, with over 40% of documented floral species being exotic. The Office of the Conservator of Forests (Wildlife) and state forest officers undertake joint management of the sanctuary.

Sandi Bird Sanctuary wetland: This wetland is located in Uttar Pradesh, notified on 26-09-2019, for an area of 3 squre Kms. A freshwater marsh in the Hardoi district, the wetland is typical of the Indo-Gangetic Plain and receives most of its water from monsoon rains. Rich in aquatic plants, the site provides a productive habitat for waterfowl with over 40,000 individuals counted in 2018. It is home to over 1% of the South Asian populations of common teal (*Anas crecca*), red-crested pochard (*Netta rufina*) and ferruginous duck (*Aythya nyroca*), While the vulnerable sarus crane (*Grus antigone*) has a population of 200 individuals within the sanctuary. These figures justify its designation as an Important Bird Area by BirdLife International. The wetland is a popular recreational and tourism destination and supports farmers as a source of livestock fodder. Drought presents a threat; the sanctuary dried out leading to a subsequent collapse in waterbird populations from 2014 to 2015. The Office of the Conservator of Forests manages the site in conjunction with local forest and wildlife officers.

Sarsai Nawar Jheel wetland: This wetland is located in Uttar Pradesh, notified on 19-09-2019, for an area of 2 squre Kms. A permanent marsh in the Etawah district, this typical wetland of the Indo-Gangetic Plain is fed by the southwest monsoon rains. It is an example of co-habitation of humans and wildlife; farming practices across most of the site play important roles in sustaining the waterbird habitats. A particular beneficiary is the vulnerable sarus crane (*Grus antigone*), with a population of 400 individuals making up the largest flock in the region. The site's name is derived from this large non-migratory crane. Other threatened species present include the critically endangered white- rumped vulture (*Gyps bengalensis*) and endangered woolly-necked stork (*Ciconia episcopus*). The wetland is also a site of spiritual and religious significance with the nearby Hajari Mahadev Temple visited by thousands of pilgrims each year. Droughts along with drainage have the potential to threaten the site's ecological character. It is recognized by BirdLife International as an Important Bird Area.

Sundarban Wetland: This wetland is located in West Bengal, notified on 01-02-2019, for an area of 4230 squre Kms. Located within the largest mangrove forest in the world, it encompasses hundreds of islands and a maze of rivers, rivulets and creeks in the delta of the rivers Ganges and Brahmaputra on the Bay of Bengal. The Indian Sundarban, covering the south-westernmost part of the delta, constitutes over 60% of the country's total mangrove forest and includes 90% of Indian mangrove species. The mangrove forests protect the hinterland from storms, cyclones, tidal surges, and the seepage and intrusion of saltwater inland and into waterways. They serve as nurseries to shellfish and finfish and sustain the fisheries of the entire eastern coast.

Asan Barrage wetland: This wetland is located in Uttarakhand, notified on 21-07-2020, for an area of 4,44 Stretch squre Kms. The Asan Conservation Reserve is a 444-hectare stretch of the

Asan River running down to its confluence with the Yamuna River in Dehradun district. The damming of the river by the Asan Barrage in 1967 resulted in siltation above the dam wall, which helped to create some of the site's bird-friendly habitats. These habitats support 330 species of birds including the critically endangered red-headed vulture (*Sarcogyps calvus*), white-rumped vulture (*Gyps bengalensis*) and Baer's pochard (*Aythya baeri*).More than 1% of the populations of two waterbird species have been recorded here, these being red-crested pochard (*Netta rufina*) and ruddy shelduck (*Tadorna ferruginea*). There are also 49 fish species, one of these being the endangered Putitor mahseer (*Tor putitora*). Fish use the site for feeding, migration and spawning. As well as this support for biodiversity and the hydro-electricity production of the barrage, the site's role in maintaining hydrological regimes is important.

Kanwar Taal or Kabar Taal wetland : This wetland is located in Begusarai District of Bihar, notified on 21-07-2020, for an area of 26.2 squre Kms. Also known as Kanwar Jheel, it covers 2,620 hectares of the Indo-Gangetic Plain. The site is one of 18 wetlands within an extensive floodplain complex; it floods during the monsoon season to a depth of 1.5 meters. This absorption of floodwaters is a vital service in Bihar where 70% of the land is vulnerable to inundation. During the dry season, areas of marshland dry out and are used for agriculture. Significant biodiversity is present, with 165 plant species and 394 animal species recorded, including 221 bird species. The wetland is an important stopover along the Central Asian Flyway, with 58 migratory water birds using it to rest and refuel. It is also a valuable site for fish biodiversity with over 50 species documented. Five critically endangered species inhabit the site, including three vultures – the red-headed vulture (*Sarcogyps calvus*), white- rumped vulture (*Gyps bengalensis*) and Indian vulture (*Gyps indicus*) – and two waterbirds, the sociable lapwing (*Vanellus gregarious*) and Baer's pochard (*Aythya baeri*). Major threats to the site include water management activities such as drainage, water abstraction, damming and canalization.

Sur Sarovar wetland: This wetland is located in Agra district of UttarPradesh, notified on 13-11-2020, for an area of 4.31squre Kms. Originally created to supply water to the city of Agra in the summer, the wetland soon became an important and rich ecosystem. The site's patchwork of habitat types provides refuge to resident and migratory birds, and more than 60 species of fish and birds including threatened species of the vulnerable greater spotted eagle (*Clanga clanga*), sarus crane (*Grus antigone*), and wallago catfish (*Wallago attu)*. The site is also important for bird species that migrate on the Central Asian flyway, with over 30,000 waterbirds known to visit the reservoir annually. Over 1% of the South Asian regional population of the greylag goose (*Anser anser*) is found present here.

Lonar wetland : This wetland is located in Buldhana district of Maharashtra, notified on 13-11-2020, for an area of 4.27 squre Kms. It is the only crater lake in the country formed by the meteorite impact.An endorheic or closed basin, almost circular in shape, formed by a meteorite impact some 50,000 years ago, onto the basalt bedrock. It is one of the four known, hyper-velocity, impact craters in basaltic rock anywhere on Earth. It is high in salinity and alkalinity, as the lack of an outflow leads to a concentration of minerals as the lake water evaporates. Fauna includes the vulnerable Asian woollyneck (*Ciconia episcopus*) and common pochard (*Aythya ferina*) and the grey wolf (*Canis lupus*). It is a National Geological Monument recognized by the Geological Survey of India (GSI). It was identified as a unique geographical site by a British officer C. J. E. Alexander in 1823.Hemadpanti temples are located at the periphery of the wetland. Recently, the color of Lonar lake water had turned pink due to a large presence of the salt-loving "haloarchaea" microbes.

Haloarchaea or halophilic archaea is a bacteria culture that produces pink pigment and is found in water saturated with salt.

REFERANCES

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[5] 5.Karnataka Tank Conservation and Development Authority Act, 2014.

[6] 6.Wetlands (Conservation and Management) Rules, 2017.

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