WETLANDS OF ASSAM: PROSPECTS FOR DEVELOPMENT AND MANAGEMENT

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ABSTRACT

North Eastern region of India is blessed with abundant rainfall distributed throughout the year with major contribution during the monsoon season. Due to the heavy inflow in the mountainous streams and mighty rivers like Brahmaputra and Barak the places of the region are prone to heavy flood and sedimentation. The typical hydro-geomorphological conditions in the northeastern region resulted in the formation of a number of natural lakes/ wetlands/ waterlogged areas as well as swamps. In the NE region, Assam, Arunachal Pradesh, Manipur, Sikkim and Tripura have vast areas of wetlands, of which Assam occupies the first place. It is reported that there are 3513 wetlands (having areas of over 2.25 ha) covering an approximate area of 1,01,231 ha in Assam. Manipur is in second place in the region with 26,600 ha of wetland. In Assam, the wetlands (or lakes) are locally known as 'Beel'. The mighty river Brahmaputra is flowing through the state. Many tributaries originating from hills of the region are joining the river Brahmaputra. The migrating character of the rivers, the hydrological characteristics and sedimentation pattern in the river valley affects the wetlands of the state. Presently, many wetlands of the region are seriously threatened on account of improper land use in the catchment, over exploitation of resources, agricultural and developmental activities. Shrinking of size of wetlands, pollution, loss of rich flora and fauna and other biological resources due to various reasons have been observed. The hydrological and ecological significance of wetlands and lakes in the region is yet to be acknowledged fully. Some of the wetlands which are in flood plains are behaving like lakes during wet months of the year. The contribution of the wetlands in recharging the ground water aquifers is an important aspect. This paper attempts to assess the wetland resources of Assam, highlighting the prospects for development and management for multipurpose uses like employment generation, recreational activities, aquaculture etc.

INTRODUCTION

Wetlands are most productive life support system in the world and are of immense socio-economic and ecological importance to mankind. These are transitional areas between aquatic and terrestrial ecosystem where the water table is usually at or near the surface or the land is covered by shallow water. In India wetlands are distributed in different geographical regions and north east region is rich in terms of wetland area coverage.

Wetlands play critical role in the improvement of water quality through the arrest of pollutants (organic & inorganic) from direct release to the natural water bodies and by removal of sediments, production of oxygen, recycling of nutrients and treatment of waste water by removing nitrogen, phosphorous, bacteria and viruses. The wetlands act as habitat for fish shellfish, and for birds, mammals, reptiles amphibians, many of which are of economic value in terms of subsistence and commercial fishing, hunting and trapping. Non-consumptive uses

of the wetlands, viz. bird watching, recreation, aesthetic, educational activities and scientific research are also well recognized.

Population pressure in the past few decades led to rapid utilization of natural resources for land based development. In this process wetlands were treated as unwanted. Ignoring their importance, wetlands were considered obstacles in the path of progress and reservoir of diseases. Wetlands were drained, filled and reclaimed for more economic gains. The rivers were dammed, regulated and channellized leading to modification or elimination of floodplains. This led to a considerable alteration of wetland habitats and the composition of associated flora and fauna.

In the recent past importance of wetlands has been realized by the policy makers world over and efforts are being made to protect the wetlands from further deterioration and loss. The status of various wetland situated in the state of Assam, known for its flood conditions, is described with a perspective outlook in this paper.

WETLAND RESOURCES OF ASSAM

Assam located in the north eastern part of the country has a unique topographic features. It is well endowed with natural resources. The mighty Brahmaputra and its perennial tributaries, evergreen forests, fertile soil, invigorating climate and mineral resources are unparalleled in the country (Hazarika, 2004).

Stretching over an area of 78,483 sq. kms the state of Assam is located between $24^0 18'$ N to $27^0 50'$N latitudes, and between $89^0 46'$E to $97^0 4'$E longitudes.

Geographically the state of Assam is surrounded by hills with dense drainage network. Though the average annual rainfall of the state is about 3000 mm the inflow from the adjoining mountainous catchments are also drained into the plains of Assam. The state has several seasonal wetlands also which are found in monsoon season only.

Over 3513 wetlands covering an area of 1, 01,231.60 ha have been identified in Assam. Out of this area of wetlands, the 712 numbers of swamp/marsh occupies the largest area of 43433.50 ha. The 1126 numbers of waterlogged (seasonal) lands occupy an area of 23436.50 ha and the 861 numbers of ox-bow lakes/cut-off meanders also covering 15460.60 ha area. The different types of wetlands, the numbers, area covered by the wetlands are given in Table-1. Wetlands of area more than 2.25 ha are considered here.

Among the 23 districts of Assam, Nagaon district has 379 wetlands and ranks first in terms of numbers, whereas, N.C. Hills has the least number wetlands (10). However, the maximum area of wetland coverage is in Morigaon district (1658.00 ha) followed by Kamrup while the minimum area under wetlands (840 ha) is in Hailakandi district as indicated in Table-2. Brief of the different types of wetlands identified within the state are given in the following sections.

Table 1. Distribution of wetlands in Assam

Wetland type		No.	Area (ha.)	Percentage
Natural	Lake/pond	690	15494.00	15.30
	Ox-bow lake/cut-off meander	861	15460.60	15.27
	Waterlogged (seasonal)	1125	23431.50	23.15
	Swamp/marsh	712	43433.50	42.91
	Sub-Total	3388	97819.60	96.66
Man-made	Reservoir	10	2662.50	2.60
	Tanks	115	749.50	0.74
	Sub-Total	125	3412.00	3.34
Total		3513	101231.60	100.00

(Source: ARSAC, 1997)

Table-2: District-wise status of wetlands in Assam

Sl. No.	District	Number	Area (ha)
1	Barpeta	97	3301.00
2	Bongaigaon	100	3158.50
3	Cachar	340	7188.00
4	Darranga	103	3515.50
5	Dhemaji	139	3960.00
6	Dhubri	233	6459.70
7	Dibrugarh	86	2752.50
8	Goalpara	165	3832.50
9	Golaghat	330	5467.50
10	Hailakandi	47	840.00
11	Jorhat	109	2108.50
12	Kamrup	352	11407.00
13	Karbi Anglong	77	897.00
14	Karimganj	70	5719.50
15	Kokrajhar	85	1578.40
16	Lakhimpur	151	3033.50
17	Morigaon	183	11658.00
18	Nagaon.	379	11295.50
19	N.C. Hills	10	2552.50
20	Nalbari	68	1988.00
21	Sibsagar	109	2135.00
22	Sonitpur	206	3651.00
23	Tinisukia	74	2732.50
Total		**3513**	**101231.60**

(Source: ARSAC, 1997)

Lakes/Ponds

A lake is a non flowing body of water held in depression on the earth's surface without direct access for mixing with the oceans. Unlike a pond, a lake has a wave washed shoreline. In contrast, a pond is a natural body of standing fresh water filling a surface depression, usually smaller than a lake. These lakes and ponds are clearly identifiable from satellite imagery due to their occurrence in a unique physiographic setting with undulating terrain and generally with a feeder channel to drain in and drain out the water.

In Assam there are as many as 690 lakes and ponds covering an area of 15494.00 ha which constitutes 0.20 percent of the total geographical area of the state and 15.30 percent of the total wetland area. The largest one has 882.50 ha of areal coverage. Highest number of lakes/ponds are observed in Golaghat district (113 numbers) followed by Dhubri (73 nos.) and Nagaon (68 nos.) districts. But the highest area under this category is observed in Kamrup district (1575.50 ha) followed by Nagaon (2175.5 ha) and Dhubri (1816.50 ha) districts. Some of the important wetlands under this category are Deepar beel in Kamrup district, Dhir beel in Dhubri district, Tamaranga beel and Dalani beel in Bongaigaon district. Most of these beels have no aquatic vegetation or partially vegetated.

Ox-bow Lakes/Cut-off Meanders

It is a crescent shaped body of water located along a stream in an abandoned ox-bow after a neck cut off is formed and the ends of the original beels are silted up. These are clearly identifiable on satellite imagery due to their unique shape and occurrence mostly along the rivers. The fringe zone as well as the ends of the bands are vegetated in most cases and sometimes they are characterized by the presence of complete vegetation cover or agricultural practices. Sometimes, they have feeder channels controlling the inflow and out flow of water.

A total of 861 number of ox-bow lakes/cutoff meanders are observed throughout the state of Assam, covering an area of 15460.60 ha which constitutes 0.20 percent of the total geographical area of the state and 15.27 percent of the total area under wetlands. The largest of this category of wetlands measures 582.50 ha. Highest number of ox-bow lakes/ cut-off meanders are observed in Golaghat district (104 number) followed by Nagaon district (71 numbers) and Dhubri district (68 numbers). The highest area under this category is observed in Morigaon district (2143.00ha) followed by Nagaon (1746.00 ha) and Golaghat (1563.00 ha). Some of the important wetlands under this category are Morikolong and Patoli beel in Nagaon district, Mer beel in Golaghat district and Guruajan in Morigaon district. Majority of this type of wetlands have water with low turbidity. Most of them are either vegetated or partially vegetated.

Waterlogged (seasonal) Lands

These waterlogged areas play significant role in the environment of the state. In these areas large numbers of fishes and other aquatic fauna and providing habitat to a variety of migratory as well as domestic birds. Besides, they have the potential for supplying irrigation water to the nearby agricultural fields during the water stressed periods. Some of the waterlogged areas can be developed for recreation, tourism development and employment generation.

In Assam, a total of 1125 number of waterlogged areas are reported. These land cover an area of 23431.50 ha which constitutes 0.30 per cent of the total geographical area of the state and 23.15 per cent of the total area under wetland. The largest one has 3010.00 ha. Highest number of waterlogged areas are observed in Cachar district (4869.50 ha) followed by Karimganj (4667.00 ha) and Nagaon (2559.50 ha) districts. Some of the important wetlands under the category are Son beel in Karimganj district and Raumari beel in Darrang district. Most of these wetlands are free from aquatic vegetation.

Swamps

A Swamp is an area intermittently or permanently covered with water, having shrub and trees but essentially without the accumulation of peat. These swamp/marsh areas constitute a major group of wetlands in Assam. These are identifiable on satellite imagery by their reddish tone indication the presence of vegetation associated with dark blue tone inferring to the presence of water and their occurrence in low lying areas.

In Assam, as many as 712 number of swamp/marsh areas have been identified from satellite data which cover an area of 43433.50 ha constituting 0.55 per cent of the total geographical area of the state and 42.91 per cent of the total area under wetlands. The largest one has 1350.00 ha of areal coverage. Highest number of swamp/marsh areas are observed in Kamrup district (155 number) followed by Nagaon (92 number) and Goalpara (68 number) districts. Hence, with respect to area of coverage swamps are more in Kamrup district (8109.50 ha) followed by Morigaon (7051.00 ha) and Nagaon (4764.50 ha) districts. Some of the important wetlands under this category are Nandani-Sonai beel in Morigaon district, Batha beel in Darrang district and Urpad beel in Goalpara district. Majority of this type of wetlands are with moderately or highly turbid and are partially vegetated.

Reservoirs

Reservoirs are artificial impoundment of water for irrigation, flood control, municipal water supplies, hydroelectric power generation and so forth.

In Assam, there are as many as 10 number of reservoirs covering an area of 2662.5 ha which constitutes 0.03 per cent of the total geographical area of the state and 2.63 per cent of the total area under wetlands. The smallest of them covers 17.50 ha while the largest one has 930.00 ha of areal coverage. Highest number of reservoirs are observed in N. C. Hills district (4 Nos) followed by Golaghat and Nalbari districts (2 nos each). The highest area under this category is observed in N. C. Hills district (2365.00 ha) followed by Kamrup (220.00 ha) and Golaghat (37.50 ha) districts.

Tanks

A tank is an artificial pond, pool or lake formed by building a mud wall across the valley of a small stream to retain the rain water to fulfill the demand of water during drier period of the year or in the area where there is scarcity of water. As these are created and maintained by men, the water of the tanks has generally less turbidity and the presence of vegetation of any kind is not seen in the tanks.

Besides providing water to the people of the nearby areas, these tanks can also be used for rearing fishes and raising plantation crops like coconut, arecanut, cashew nut etc. along the sides of the ponds. Ornamental gardens can also be developed on the banks of the ponds for development of recreation facilities.

HYDROLOGICAL SIGNIFICANCE OF WETLANDS IN ASSAM

From the description preceded, it may be deduced that the different types of wetlands observed in the state of Assam are of varying genesis. In other words, some are depression storage due to high flood in river Brahmaputra and its tributaries; some are artificially created; some are due to drainage congestion; some are due to high erosion and sedimentation rates and even some are created as a result of the morphological characteristics of the rivers. The hydrological implications of these wetlands are thus obvious. The wetlands act as buffer zones for confining the flood waters and the sediments it carry year after year. These are the areas where the potential evapo-transpiration (PET) matches with the actual evapo-transpiration (AET). The replenishment of aquifers though continuous recharging is facilitated by these lakes/wetlands. Further, this depression storage can be viewed as potential water harvesting means to meet out irrigation requirements for the localities during lean seasons.

CONSERVATION AND MANAGEMENT OF WETLANDS

Though the wetlands are highly efficient for eco-conservation, but they are very fragile and are easily disturbed by anthropogenic factors. Toxic substances produced as a result of industries in the catchment may reach wetlands and in due course of time get accumulated in components of ecosystem leading to the problem of bio-magnification.

Human activities like cattle rearing and agriculture on the banks of the wetlands are also responsible for its degradation. They produce not only siltation, but also make the water murky. This results in decreased availability of sunlight for the micro-flora, thereby diminishing the bio-productivity of the wetland. Extensive fishing activities too kill or severely damage the micro-flora resulting in poorer crop in the next year, encouraging man to indulge in more intensive fishing which leads to the destruction of the wetland ecosystem within a remarkable short time which needs restriction for its conservation.

The destruction of the Brahmaputra valley wetland system started with the growth of the water hyacinth more than a century ago. Extensive growth of this fast growing weed can cut out sun light from the micro flora and also produces faster euthrophication by slowing down water current and depositing debris at the bottom. The second phase of enhanced euthrophication took place with the raising of earthen bunds along the banks of almost the entire length of the river and many of its tributaries after the 1950 earthquake. These artificial levees cut off to a great extent the periodic flushing out of the wetlands by the monsoon flood. The third and the final onslaught on the wetlands have taken place with the lower part of Assam. This has turn the wetland into agricultural zone rich in rice and vegetables but totally denuded of wild-life. With the depletion of wetland in this part the fish production also got diminished. In spite of the presence of the mighty Brahmaputra, its numerous tributaries and the large number of wetlands, Assam today imports 0.20 lakh tonnes of fish annually to meet the domestic consumption. Out of this, 0.14 lakh tonnes is consumed in Assam. The total fish production from Assam's wetland is 1.55 lakh tonnes per year, 6.68 per cent of which is met by imports

from other states (sources: Directorate of Fisheries, Government of Assam). As a result, there is a deficit of 0.52 lakh tonnes of fish every year. The production potential of fish from the wetlands in the state is estimated at 400-500 kg/ha/year after development. It shows that there is a vast scope of employment creation/income generation if proper development/management strategy is adopted.

There are a few healthy wetlands still exist within the state. The Kaziranga National Park, the habitat of the great Indian one–horned rhino is one such example. Another is the Panidihing wetland situated in the southern bank of the Brahmaputra, between the tributaries of Disang and Buridihing where the splendor of thousands of migratory waterfowl, the indicator of healthy ecosystem, can be seen every winter between September and April. But this wetland is under degradation due to human activities. There is an imperative need to conserve the wetlands and protect their unique biodiversity. Proper management of the wetlands are going to be a source of immense wealth for the state leading also to enrichment of the quality of the environment.

The following steps may be taken for sustainable use/development of the wetlands:

- Protection of land near the water bodies/wetlands and restricting construction.
- Measures to ensure equitable access and responsibility for sustainable use of resources of the wetlands.
- Conservation of aquatic flora and fauna of the wetlands.
- Awareness generation towards hydrological significance of wetlands in the context of aquifer recharging and water harvesting issues.

CONCLUSION

An attempt is made here to highlight the wetland scenario and its implications in the state of Assam. The wetlands are important in terms of food security. These wetlands are among the most important ecosystem on the earth as they act as vital link between water and land. They are the corridors through which 'life' evolved, prospered, came ashore and conquered the terrestrial areas. They are the 'kidneys' of the biosphere as they moderate the flow of nutrients and silt from land to water by trapping them. They are the perpetuators of the global hydrological cycles. They harbour a significant portion of earth's biodiversity. A key to the future sustenance of the human societies lies in the sustainable wise use of this highly fertile ecosystem.

Proper development and management of the wetlands may provide multipurpose services like reduction in air or water borne pollutants by biophysical processes occurring within the wetland, flood mitigation, storm protection, preventing sediment deposition, nutrient recycling, toxicant removal, water regime management, ground water recharge, wastewater treatment, erosion mitigation, fish habitat etc. besides supporting a diverse range of birds, animals and plants and providing immense scope for eco-tourism. Wetlands are also a source of life support and livelihood to millions of people of the state.

Though the preliminary statistics on the status of wetlands are available by means of remote sensing/GIS techniques, more ground truth information is required to take up detailed planning and management activities. Also, the hydrological aspects of these wetlands needed to be investigated in the back drop of depleting water levels in some pockets. Further, it may be

necessary to keep the water levels high in this region as lowering of water table may result in oxidation of iron rich soil, which in turn may cause undesirable affect on drinking water supply and irrigation.

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