HUMAN INDUCE CHANGES IN WETLAND ECOLOGY OF ASSAM: A CASE STUDY OF GOALPARA DISTRICT

Hem Chandra Kalita

Associate Professor,

Dept. of Geography, Dudhnoi College.

Abstract :

Wetlands constitute one of the most important ecosystem on the earth. They are valuable as sources, sinks and transformers of a multitude of Chemical, Biological and Genetic materials. They have been found to cleanse polluted water, prevent flood and recharge ground water aquifers. Furthermore wetlands play major role in the landscape by providing unique habitats for a wide variety of flora and fauna.

The relationship between human history and wetlands is very old. Wetlands include swamps, bogs, marshes, fens and other wet, ecosystem found throughout the world under many names. They are found in every continent except Antarctica. They cover about 6 per cent of the global land surface.

Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface of the land is covered by shallow water. In Assam there are 3513 wetlands covering area of 101231.60 hectare. Historically these wetlands have been acting as nodes of the natural drainage systems and provide a variety of resources to the people living around. But during recent period, human activities like expansion of settlements, modernization of agriculture, cattle rearing and certain constructional activities in the wetland fringes, excessive fishing and floral resource exploitation have contributed to their degradation. This has resulted in a large number of ecological and economic problems such as loss of bio-diversity, flood and siltation, water pollution, scarcity of animal feeds and poverty among the fishing communities. In this study therefore an attempt has been made to analysis the human induce changes in the wetland ecology of Assam taking Goalpara district as an example.

Keywords : encroachment, environment, degradation, society and wetland.

Introduction :

The relationship between human history and wetlands is very old. Wetlands include swamps, bogs, marshes, funs and other wet ecosystems found throughout the world under many names. They are found in every continent except Antarctica. They cover about 6 per cent of the global land surface. Wetlands are found in arid regions as island salt flats; in humid cool regions as bogs and fens; and in temperate subtropical and tropical coastlines as salt marshes and mangrove swamps.

Wetlands have been defined by different people and agencies for different purposes based on objectives and needs. There is thus worldwide confusion about what constitutes a wetland. But the definition offered by the International Union for the Conservation of nature (IUCN) is the most acceptable one. It defines wetland as "all the submerged or water saturated lands,

natural or man made, inland or coastal, permanent or temporary, static or dynamic, vegetated or non-vegetated which necessarily have a land-water interface."

Wetlands are lands transitional between terrestrial and aquatic system where the water table is usually at or near the surface or the land is covered by shallow water. In Assam there are 3513 wetlands covering area of 101231.60 hectare. Historically these wetlands have been acting as nodes of the natural drainage systems and provide a variety of resources to the people living around. But during recent period, human activities like expansion of settlements, modernization of agriculture, cattle rearing and certain constructional activities in the wetland fringes, excessive fishing and floral resource exploitation have contributed to their degradation. This has resulted in a large number of ecological and economic problems such as loss of bio-diversity, flood and siltation, water pollution, scarcity of animal feeds and poverty among the fishing communities. In this study therefore an attempt has been made to analyse the human induce changes in the wetland ecology of Assam taking Goalpara district as an example.

Methodology :

To access the human induced changes in Goalpara district, a survey schedule was prepared and relevant data like encroachment, overfishing, bird hunting, setting up of brick industries, eco-degradation, siltation and unfriendly development works etc. were collected and analysed.

Location :

Goalpara is located between $25^\circ33'$ to $26^\circ12'$N latitudes and $90^\circ7'$ to $91^\circ5'$ E longitude. It comprises an area of 1824 sq km. The district is surrounded by the river Brahmaputra in the north, Kamrup district in the east, Garo hills in the south and Dhubri district adjacent to Bangladesh border in the west. The rivers which are flowing throughout the district originates in the Garo Hills and flows from south to north direction according to the slope, The wetlands are located unevenly the district but concentration is more near the Brahmaputra river.

Geology and Physiography :

According to physical history, the area come into existence in the Pre-Cambrian period and the plain area was made up in the tertiary period. The hills and hillocks situated in the area comprises igneous rock. These hillocks are extended part of Meghalaya plateau. Meghalaya plateau is a drifted part of Gondowana land. According to physiography the area can be divided into three physiographic divisions from south to north. In south there is southern hills region near Meghalaya plateau, a broad plain region in the middle of the district and flood plain region in the north near the Brahmaputra river.

Degradation of wetland environment :

The wetland eco-system, though highly efficient is very fragile and easily disturbed by human interference. Toxic substances produced as a result of human activities may run off with water to be accumulated in the wetlands. This will poison the water and kill all living organisms. Agricultural practice on the banks as well as the shallower parts of wetlands and cattle rearing produce not only siltation, but also makes the water murky. This results in decreased available sunlight for the micro-flora, thereby diminishingly the bio-productivity of the wetland. Extensive fishing methods too kill or generally 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 at the wetland ecosystem within a remarkably short time. Major causes of degradation of wetland environment are manmade and natural. Manmade causes are encroachment, overfishing, bird hunting, setting up of brick industry, ecological degradation and developmental works by Government Natural causes of degradation of wetland environment are siltation, draught and flood. These causes are discuss in detail with the help of field study undertaken in Goalpara district of Assam.

In Goalpara district there are 165 wetlands of various size and shape covering an area of 63.96 sq.km. To understand the intensity of degradation four wetland have been selected according size and location are urpad which is largest in the district, Kumri, Hashila and Saitara-Naitara.

Encroachment :

Encroachment is one of the major factors for the degradation of wetland environment. It has been observed in the district that most of the villagers encroach wetlands for agricultural purpose on individual capacity. Wetlands are generally surrounded by agricultural fields. Most of the cultivated slowly fill-up parts of the wetland and start cultivation. Moreover, for the purpose of fish production villagers encroach wetlands and transform them into fisheries. This type of activities have badly damaged the ecosystem and organic continuity of wetlands.

It is observed that at present the average size of wetland in Goalpara is 35.77 hectares which was 62.86 hectares in 30 years back. The smaller wetlands get reduce more rapidly than the medium and bigger ones. Most of the encroachers belong to immigrant group of people. They encroached wetlands for the purpose of fishing and Boro rice cultivation. Fishing is the main occupation of the people living on the banks of the wetlands. But now they practise Boro rice cultivation in the shallower parts of the wetlands because of population pressure and poverty. The density of population is very high in the villages. For example Chandamari village located on the south bank of urpad beel is thickly populated in which there are 372 households having a population of 1966 according to 2001 census. According to villagers, about 90 per cent people earn their livelihood as fisherman and do fishing at Urpad beel. But now most of them have encroached the shallower parts of the beel for Boro rice cultivation. They consider Boro rice cultivation in the wetlands as their additional income which help them in maintaining their big family, having more than 6 persons on an average. Previously fishing was the main occupation of the villagers but now due to increase in family size, they can not maintain their family properly as a consequences of which they have encroach the wetland for cultivation. Same situation prevail in the villages located on the bank of Kumri, Hasila, Saitara-Naitara and other beels of the

district. The rate of encroachment is very high in all the wetlands of the district. It is observed that within a period of 30 years 43 per cent of the wetland area has been reduced.

TABLE - 1

Changes in area of the wetlands in different revenue circle during 1985-2015

Circle name	No. of wetland	Area of wetland in hectare(1985)	Area of wetlands in hectare(2015)	Difference in pc
Ronjuli	20	1191	753	37.36
Dudhnoi	43	1276	726	43.10
Matia	42	4010	2185	45.65
Balijana	25	3370	1835	45.55
Lakhipur	35	1360	904	33.53
Total	**165**	**11207**	**6403**	**43.00**

Over fishing :

Wetlands are rich in fish resources. All the wetlands irrespective of size supply some amount fish to the surrounding villages. The bigger wetlands like Urpad, Kumri-Hasila and Saitara-Naitara of Goalpara district are highly productive in his regard. There are 22 villages with a population of 25,060 in the areas around these four wetlands. Most of the people of these villages are to a great extent, dependent for their livelihood on the fish resources of the wetlands. There are some families who are solely dependent on wetland products for their sustenance. The number of such families is 110 in the case of Saitara-Naitara, 127 in Kumri and 465 in Urpad Beel with a total population of 5010. Some families use country boats for fishing in the wetlands. There are more than 250 boats engaged in fishing activities in these three wetlands. Among the poor fishing communities, population growth is very high which ultimately puts pressure on the wetland environment.

Fisherman use very thick net to catch fish of all size and breeds. They use drums to make a peculiar sound in the boat while catching fish. This type of sound disturbs the fishes and birds. As a result many of the birds fear to visit the wetlands. The excreta of the birds are sources of food for the fish. Decrease in number of birds is one of the factor for gradual decline in fish production. It is important to note that sometime monsoon arrives late in this region and drought like situation prevail. The wetlands are dried-up upto some extent which favors fisherman to catch fish easily in shallow water. Excessive fishing in breeding season has lead to decrease in fish production subsequently. Moreover, revenue and forest department also leases out some of the wetland every year. The leases operate fishing activities in al the seasons of the year for which production of fish is decreasing day by day. Now nobody is there to protect the wetlands as they are treated as nobody's properly. As a result, the wetland environment is deteriorating very fast.

Bird Hunting :

Bird hunting in the wetlands is one of the important causes of degradation of wetland environment. Poaching of birds including migratory birds by the villages in the wetlands of the district is a common phenomenon. Wetlands are important habitats for a large variety of resident and migratory birds. But it has been seen that aquatic birds are trapped by various techniques and sold in the markets. Some people kill birds by using guns. As the number of wetlands is more in the district, birds visiting the area are also large in number. Sounds of flying birds can be easily heard everywhere in the early winter morning. The birds usually visit different wetlands from the morning till the evening as their routine activity before going back to their night shelters. The villagers select the morning time to kill or trap birds as the birds remain a little careless in the morning time when they eagerly search for food. Another type of Bird-poaching takes place in the months from May to July during the breeding period. In this season, resident birds build their nests in the wetlands. Many of the tribal people traditionally kill birds at night. In traditional killing process, a group of people ten to twelve in number, use light, fire and sound of drum, bell or metal and march to the wetlands. After hearing noises the birds start flying to save themselves from imminent danger and come nearer the source of light where they are beaten to death. This type of traditional practice is more common among the Boro community.

Brick Industries :

It has been sent that brick industries are coming up close to the wetlands all over the district. If one visits the district through the national highway he/she will be able to see small brick industries springing up in the fringes of the wetlands. There are more than 100 small brick industries operating presently in the district with traditional Bhatti system without obtaining any clearance from competent authorities like Pollution Control Board (P.C.B.). The brick industries generally start their operation in the month of November and continue up to February before the pre-monsoon rainfall begins. In this season water level of the wetlands goes down. Moreover, an extra amount of evaporation of water takes place because of burning bricks on the banks of wetlands. This type of process causes serious harm to the aquatic plants and animals. Sometime the smaller wetlands get completely dried up causing death to all creatures living in the wetland. In the case of bigger wetlands, when water level goes down fisherman take the advantage for excessive fishing, as a consequence of which fish production in subsequent year declines.

Eco-degradation :

The growing menace of human civilization has baldy disrupted the organic continuity of wetlands. A large portion of the wetlands have already been encroached for agricultural purpose. Pesticides and chemical fertilizers are indiscriminately used in cultivation which has contaminated the water of the wetlands. To assess the use of pesticide and chemical fertilizer relevant information from 205 households from the villages located near the wetlands namely Urpad, Kumri and Saitara-Naitara of Goalpara district have been collected, out of 205 families 140 families apply pesticide and chemical fertilizer in agriculture. The amount of fertilizer used in cultivation by each family varies from 10-100 kg. In the rainy season, the residuals of fertilizer and pesticides get dissolved in water and flow to the wetlands and thus contaminate the water. This causes death to micro-organisms. Moreover, aquatic plants and animals including fished also suffer from this kind of contamination. The water of wetlands also

turns blue-green in colour with maximum floating weeds. In such a situation, fisher folk have to do their fishing through a thin elongated patch using local country boats because of the present of thick floating green cover. Normally availability of fish is indicated by the birds present in the wetland. Large the number of birds the more is the amount of bird droppings made available to fishes. But due to water pollution and other human induced disturbances the migratory birds have now ceased to visit the wetlands in large number. Thus interference on wetland eco-system by human beings directly or indirectly contributes to the overall degradation of the wetlands.

Unfriendly development works :

Development works like construction of roads, railway etc. also stand as a major problem for sustenance of the wetlands. To prepare plans for such development the technicians carry out survey in the proposed area generally in winter. Moreover, they do not have required local knowledge and idea relating to the adverse effect of the developmental works. They prepare a schemes without proper field experience for which the schemes prove defective after execution. Most of the works of the District Rural Development Agency (DRDA) may be cited as examples in this regard. This government agency constructed village links roads haphazardly within a very short time. The roads are defective. Sometime culverts are constructed as outlets of water in every 200 or 300 metres at a regular interval. In such a process, culverts may be laid in the highland also and in doing so the natural water courses are ignored. This type of defective works sometimes blocks the outlets or inlets of the wetlands. While constructing roads and railways the presence of smaller wetlands are completely ignored and these are often filled-up by earth. The bigger wetlands are also sometime partially filled-up. For example, the Kumri beel near the Brahmaputra river is partially affected by earth filling for the construction of railways through the district. Moreover, birds have ceased to visit the wetland for several years because of the presence of hundreds of railway labours working near the wetland. Such developmental activities are thus found to disturb the wetland environment to a considerable extend.

Siltation :

Siltation is a major natural factor responsible for negative change in the wetland environment. The amount of silt deposited in the wetlands is directly related to the rate of deforestation in the concerned water shade. The rate of deforestation is very high in Assam since 1990. Deforestation is associated with interrelated factors like high population growth and economic compulsion, cross-boarder terrorism, smuggling and international trade activities etc. In North-East India, particularly in Assam, the role of deforestation was negligible until 1970. Gradually it has been increasing mainly because of large-scale immigration of people from the neighbouring countries. During the recent years, because of extremist activities also the state is loosing its forest cover. In a period of fifteen year (1990-2005) the reserve forest of Assam and a part of Garo hills have been badly affected by illegal trading of forest products.

Assam receives heavy rainfall during the summer season, the intensity of rainfall in this period is too high to erode the top soil in the deforested lands. The eroded materials are carried down by the swift-flowing tributaries of the Brahmaputra river as both suspended and bed loads. But when the rivers are over-flooded them the suspended loads travel with the flood water. The

over-floods and after three or four days the suspended sediments get deposited in the beds of the wetlands. Through this process the wetlands are becoming shallower and shallower. This has provided opportunities to the nearby people to encroach the wetlands.

The above discussion reveals the major causes and consequences of wetland degradation which can be sum up as follows: Human induce degradation and natural degradation. Human induce degradation are encroachment over-fishing, birds hunting, brick industries, eco-degradation and unfriendly development works. Siltation is a natural process but it intensity depend on human activities. Major consequences of wetland degradation are reduction of wetland area, small wetlands are transformed into an agricultural field, reduction of fish production and also extinction of some fish species disturbs the food chain in the wetland ecosystem and a variety of algae, fungi and microscopic plants which play important role in photosynthesis die because of polluted water.

Remedial measures :

A master plan should be prepared and executed to protect the wetland on the following points :

i. Stop encroachment of the wetland.

ii. To ensure preservation of ecosystem of the wetland.

iii. Mass awareness of people to protect the wetland.

iv. To enrich its flora and fauna.

v. Plantation should be done in the surrounding of the wetland to stop further erosion.

vi. Formation of rules and regulation to protect the wetland.

vii. Motivation of public living nearby wetlands.

Conclusion :

The plan will be successful when Government will pay attention towards the preparation and execution of the plan. But participation of people to make it a success is vital. As the rural folk is directly benefited by practicing agriculture, catching fishes and poaching birds, attention is to be made to motivate the villagers. Proper education should be imparted to allow them to live harmoniously with the nature to maintain a balance of existing ecosystem. Government N.G.O. as well as public should come forward today to save the wetlands.

Reference :

Adamus, P.R., 1983 : A method for Wetland Functional Assessment, Vol.I, Critical Review and evolution concepts, Washington
        D.C. pp. 23-24.

Assam Remote Sensing Application Centre (ARCAC), 1990 : District Report on Land Use and Land Cover, Goalpara District,
        Assam.

ARSAC, 1997 : Wetlands of Assam, Project Report, Guwahati.

Bhattacharyya, K.G. and Kakoti, G.N., 1990 : Physiochemical Properties of the Deeper Beel Water, Journal Assam, Sc. Soc. 31(3), pp. 15-20.

Bhuyan, M.C. 1987 : Environmental studies of Beels in Assam, compendium workshop on Development of Beel and Fishery in Assam, Assam Agricultural University, Khanapara Campus, pp. 114-121.

Della Cruz, A.A., 1978 : Primary Production Processes : Summary and Recommendations in Fresh Water Wetlands : Ecological Processes and Management Potential, R.E., Good, D.F. Wingham and R.L. Simpson (eds.), Academic Press, New York, pp. 79-86.

Etheringtan, J.R., 1982 : Wetland Ecology, Edward Arnold, London, p. 67.

Ganapati, S.V., 1970 : Energy Flow in Natural Lake Ecosystem in India, Hydro-Biol. Vo. 66(4) pp. 458-498.

Goswami, M.M. 1985 : Limnological Investigations of Tectonic Lake of Assam, India and their bearing in fish producing, unpublished Ph.D. Thesis, Gauhati University, pp. 350-395.

Keddy, P.A., 1983 : Fresh water wetland - Human Induced changes, Environment Management No. 7, pp. 299-302.

Larson, J.S. and J.N. Kusler, 1979 : Preface wetland functions and value : The state of our understanding P.E. Greeson, J.R. Clark and J.K. Clark (eds), American Water Resources Association, Minneapolis Miss, pp. 178-180.

Mitsch, J. William and Gosselink, G. James, 1986 : Wetlands, Von Nostrand Reinhold Company, New York, pp. 4-20.

Sarma, P. 1993 : Geo-Ecological study of Beels and Swamps in Nagaon and Morigaon District, Assam, unpublished Ph.D. Thesis, Gauhati University, pp. 30-38.

Singh, R.P. 1988 : Development of wetland in Manipur valley : A case study of Loktake Basin in R.P. Singh (ed), problems of waste land and Forest Ecology in India, pp. 167-175.

Zium, J.A. and C. Copeland, 1982 : Wetland Management, Congressional Research Service, The library of Congress, Washington D.C., p. 149.