Environmental Status of Itila Jan(Wetland) under Dimoria Development Block, Assam, India.

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Abstract: Natural waterbodies (Wetlands) are locally known as 'beel' in Dimoria. The wetlands support subsistence and livelihood to thousands of people through fishing, collecting edible plants, agriculture, irrigation and commercial fisheries, besides rich in biodiversity and maintain environmental quality of a region. The role of such wetlands in socio-economic condition of the people of their surroundings is very significant. With the increase of human population and technological development, which accelerates many activities brought about drastic change in the overall environment of the region. At the same time the nature provides ample opportunities for human settlement as well as many economic activities in the region. Encroachment, over fishing, solid and liquid waste disposal in such areas, various engineering structures constructed for different purposes are identified as some of the factors responsible for such changes. The cause and effect of such changes have been taken into account for understanding the present environmental status or ecological set-up of the Itila Jan as well as to foresee the near future situation and has been analyzed here from geographical perspective. Itila Jan is a lotic type in nature, narrow long channel, which is considered as wetland of Dimoria Development Block under Kamrup(Metro) district of Assam, India. To know about the present status of the wetlands environment, a few parameters of water and soil have been selected for analysis. The results of the water quality parameters like pH, turbidity, TS, DO, BOD, COD, ammonia(NH4+N), phosphate(PO43-) etc. and soil quality parameters like pH and OC have been found to be significant in evaluating the status of the wetlands. In the present investigation, one important wetland i.e. Itila Jan have been identified for study as it witnessed various anthropogenic and other activities near the wetlands and it has tremendously impact on the environment of wetlands. Based on the analysis of the results of relevant data a few remedial measures have been suggested for conservation and proper management of the wetlands, which may be reflected in similar wetlands of other parts of the world.

Keywords: Biodiversity, BOD, COD, OC, lotic, anthropogenic.

1. INTRODUCTION

There is a world wide confusion about the definition of the wetlands. There are many definitions currently used in different disciplines according to their purposes. A modified definition about Wetlands are defined by the International Union for the Conservation of Nature and Natural Resources(IUCN,1991), which is accepted by many has been considered for defining the wetlands. In this definition it is stated 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." (William J. Mitsch and James G. Gosselink, 2000)[1]. In the first meeting of the convention in Ramsar Iran, in 1971, it was stated that wetlands are the 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 6 meters (20 ft.). The marshes and swamps are generally known as 'jalah', 'doloni', 'pitoni',

'doba' or 'hola'. Lower part of Digaru and Kalong rivers basins of Brahmaputra river valley has been taken up for the study, which fall under the Dimoria Development Block of Kamrup district(Metro), Assam, India. The Brahmaputra river valley is gifted with myriads of swampy areas which are commonly known as 'beel'(Jhingran & Pathak,1987)[2] . Normally beel are represented vast sheets of water with varying shape, size and depth. The English word 'wetland' subsumes the swamps, bog, fens, lagoons, backwaters and marshylands under its broader connotation. In some areas the beels are often referred to as 'gadeng' (Sharma, 1993)[3].

The wetland help the mankind in various ways such as improvement of water quality, flood control, recharge and discharge of ground water, conservation of biodiversity and as economic resource by providing livelihood to the poorer section of the rural population. Besides, wetlands are always being considered as a main source of fish for the people of the surrounding areas. The wetlands play an important role in agriculture development as well as using for the natural water reservoirs during the dry session. Most of the wetlands are associated with the finer sense of the people as reflected in folk songs and folk stories.

As per the Assam Remote Sensing Application Centre, the number of wetlands in Assam is 3513 which size is more than 2.25 hectares and cover an area of 101,231 hectres of land(ARSAC,1997). The Digaru and Kalong river basins are endowed with larger number of wetlands. The lower part of Digaru and Kalong river basins are fall under Kamrup(Metro) and Morigaon district. The total number of wetlands in Kamrup district is 352 and cover an area of 11407 hectres of land and Morigaon district have altogether 183 number of wetlands which cover an area of 11658 hectres of land. In the lower part of Digaru and Kalong river basins have as many as 85 numbers of wetlands recorded from the toposheets. Unfortunately, these wetlands have been found degrading their environment due to the increase of human population and technological development. Anthropogenic activities like - excessive use of agro-chemicals in adjoining croplands, raising seasonal crops, overgrazing by cattle on the fringe areas, earth cutting, encroachment, over fishing, hunting and poaching in the wetlands, solid and liquid waste disposal, mushrooming of brick kilns, various engineering structures are constructed, responsible for such changes.

2. STUDY AREA

The lower part of Digaru and Kalong river basin is fall under the Kamrup(Metro) district and Morigaon district of Assam. These two river basins are considered as a Dimoria region. Itila is a small linear type of wetland under this region. It is a narrow kind of channel popularly known as Jan. The total area of Itila Wetland is about 4.26 hectares. The wetland is approximately extended from $92^0$4´ east to $92^0$5´ east longitudes and $26^0$10´north. to $26^0$12´north latitudes. The same wetland it's called by different name in different parts. At the upper parts of the wetland is called Taranga, middle part is known as Jiong and Lower part is called Itila wetland. The main source of the Itila is Taranga or Elenga wetland near Jagiroad. The wetland Taranga is connected by Dhankhuli (a narrow wetland) with Jiong wetland. Jiong is connected with the Itila by another narrow wetland called Hahchara. From Jiong, wetland is following parallely with the Kalong river, Mitoni village and meet with same river near Bogibari village.

3. OBJECTIVES OF THE STUDY

The objectives of the study are:-

(i) to assessment the water and soil quality of Itila wetland .

(ii) to study the impact of developmental activities on wetlands and problems caused by such activities.

4. MATERIALS AND METHODS

The study has been done based on both primary and secondary data. The primary data for different purposes i.e. regarding the population patterns in fringing villages, fish composition and utility of wetland has been collected by using questionnaires. Wetlands of the study area have been selected in different locations for water and soil sample collection and mixed them to make a composite representative sample. Necessary care was taken to prevent contamination of the samples during transportation to the laboratory, storage and analysis as per the guidelines of model used for water and soil quality test. The water samples were collected in post monsoon seasons, 2008 (November). The samples were collected to the laboratory for physical and chemical analysis. The parameters for water quality study are temperature, p^H , total solids(TS), total suspended solids(TSS), total dissolved solids(TDS), turbidity, hardness and electrical conductivity(EC), dissolved oxygen(DO), biological oxygen demand(BOD), chemical oxygen demand(COD), chloride, sulphate, nitrate, phosphorous and metal as compounds of metals of potassium, calcium, sodium, iron, magnesium, copper, zinc, cadmium. manganese, nickel, lead, selenium etc. For water quality test APHA-1989 model, for Electrical Conductivity ELICO LIS-120P, India Model, for Sodium and Potassium- HITSCHI-P210, India and for metals test PERKIN ELMEIR-2380 Model were used. Soil samples of the Itila Jan was collected during winter season 2008 and for the soil sample analysis same models had been used.

5. DISCUSSION

5.1 DISCUSSION ON WATER QUALITY

A few parameters of water quality analysis indicate the nature of change that has been noticed due to the effect of human interference. Therefore, a few parameters are selected for the assessment of water quality of the wetland. The p^H value recorded in the Itila 8.0(Table-1). The higher p^H for prolonged period may develop toxic environment to aquatic organisms particularly the fishes. In the same way the turbidity levels of the water found to be higher than the permissible limit as reflected in the water samples of Itila. The Potable Water the p^H permissible limit is 7.0-8.5 and excessive 8.5-9.2(World Health Organization, 1971).

Turbidity is a factor arising out of non-soluble substances like clay, silt, organic matter, Phytoplankton and other microscopic organisms in water. The turbidity value was recorded 20.2 NTU in the Itila wetland

(Table-1). The higher turbidity makes the water unfit for domestic purposes, food and food processing industries etc. It is worth mentioning that wetland Itila is connecting Nagaon paper mill with Taranga, Dhankhuli and Jiong wetland. The waste materials carried by them from the mill and discharge it in Kalong river through Itila wetland.

Dissolved oxygen(DO) is one of the most important component for the aquatic community. The saturation value of DO varies from 8-15mg/l. For active fish species(Trout and Salmon) 5-8mg/l of DO is required whereas less desirable species like carp can survive at 3.0mg/l of DO(Kaushik & Kaushik,2004)[4]. The low level DO in wetlands adversely affected the fish and other aquatic life. The permissible limit of DO is 3.0mg/l(max) according to Board of industries. The DO value in the Itila wetland was recorded 7.2mg/l.

COD values play an important role for assessment of organic matter in water. The COD was recorded in Itila wetland 101mg/l. The high COD is due to the presence of high concentration of both biodegradable and non-biodegradable pollutant in them. The higher concentration of chlorides, nitrates, phosphates, sulphates in pond and wetlands is due to the use of inorganic fertilizers found to be responsible for high value of COD in the samples. The permissible limit of COD is 250mg/l(max) according to the board of industries.

Besides, values of other parameters are recorded as EC(763 $\mu s/cm^{-1}$), Hardness(82.0mg/l), TS(901mg/l), TSS(603mg/l), Mn(0.290 mg/l), Ni(0.013 mg/l), Pb(0.009 mg/l), Se(0.020 mg/l) show in the table-1, and value of Cl(58.2 mg/l),, SO_4^{2-}(65.0 mg/l), NO^-_3–N(5.4 mg/l), PO_4^{3-}(0.53 mg/l) , NH_4^+ -N(2.40 mg/l), k(3.6 mg/l), Ca(54 mg/l), Na(9.4 mg/l), Fe(4.6 mg/l), Mg(21 mg/l), Cu(0.010 mg/l), Zn(5.6mg/l), Cd(0.0018mg/l) is show in the table-2.

Table 1: Results of Water sample of the Itila Wetland

Sl. No.	Name of Wetland	P^H	EC	Turbidity	Hardness	TS	TDS	TSS	DO	BOD	COD	Mn	Ni	Pb	Se
			$\mu s/cm^{-1}$	NTU	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	I TILA	8.0	763	20.2	82.0	901	603	303	7.2	ND	101	0.290	0.013	0.009	0.020

Notes: EC – Electrical Conductivity, TS – Total Solid, TDS – Total Dissolved Solid, TSS – Total Suspended Solid, DO – Dissolved Oxygen, BOD – Biological oxygen demand, COD – Chemical oxygen demand, Mn – Manganese, Ni – Nickel, Pb – Lead, Se – Selenium,

Table 2: Results of Water sample of the Itila Wetland

Name of Wetland	Cl^-	SO_4^{2-}	NO^-_3 –N	PO_4^{3-}	NH_4^+ -N	K	Ca	Na	Fe	Mg	Cu	Zn	Cd
	Mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
ITILA	58.2	65.0	5.4	0.53	2.40	3.6	54	9.4	4.6	21	0.010	5.6	0.0018

Note: Cl^- - Chloride, SO_4^{2-} - Sulphate, NO^-_3 –N – Nitrate Nitrogen, PO_4^{3-} - Phosphate, K -Potassium, Ca – Calcium, Na – Sodium, Fe – Iron, Mg – Magnesium, Cu – Copper, Zn – Zinc, Cd – Cadmium, $NH4^{+N}$ -Free Amonia Nitrogen, ND- Not Data

5.2 DISCUSSION ON SOIL QUALITY

Soil quality of the Itila wetland was measured with digital p^H meter (Eutech-356-c) of soil: H_2O= 1:5 suspension. In this work a few parameters are selected for the analysis of the soil quality. Soil p^H of wetlands in

Assam normally varies from 6.0 to 7.5(Dutta and Lahon, 1987) [5]. In general, Brahmaputra valley shows slightly higher mean soil p^H (5.3) than wetlands of Barak valley (5.0). Wetlands of Upper Assam have the lowest mean soil p^H followed by Central Assam and Lower Assam (Ecology and fisheries of Beels in Assam, 2000) [6]. But in the wetlands of Dimoria region p^H ranges from 4.9 to 8.61 (Deka, 2011) [7]. The p^H in the wetlands soils of the region found around 5.5, which indicates acidic soils of the wetland areas (Sharma, 1993) [8]. Acid are produced by humus and various soil organisms (P.J. Rayan and M. Garity, 1983) [9]. In the Itila wetland soil p^H was recorded as 5.87 (Table-3).Higher value of p^H was probably due to the impact of industrial effluents and urban sewage respectively from Nagaon Paper Mill and Jagiroad Town. Use of chemicals fertilizer in the littoral paddy field may also cause increase of soil p^H in Itila.

As a whole the wetlands of Assam has wide range of Organic Carbon variation. This variation is mainly depends on the quality of macrophytes present in the wetlands and their magnitude of decomposition. The mean values of soil Organic Carbon indicated that wetlands of the Brahmaputra valley were more productive than Barak valley. For wetlands of Assam OC concentration in soil is 1.5 to 25. This amount of OC is an indicator of high productivity of wetlands. Percentage of OC was 0.98 in Itila (Deka, D. R. et al, 2009) [10]

Phosphorus concentration largely depends on soil p^H. Phosphorus is very high in all the wetlands in the study area. High phosphorus concentration in the soil is the indicator of high productive capacity of fishes. The high concentration of phosphorus was recorded in Itila wetland (41.2 kg/h).

The other parameters considered for tests in the wetlands are Electrical Conductivity(EC), Sodium(Na), Potassium(K), Total Hardness, Total Nirogen ($NO3^{-N}$), Chloride (Cl^-), Iron (Fe), Copper (Cu), Zinc (Zn), Lead (Pb) etc. Sodium is recorded low in Itila (0.56mg/kg). Total Hardness of soil is low in Itila (14.21mg/kg) in the region. Total Nitrogen is detected high in Itila (0.378mg/kg). Lead is very high in the Itila. wetland (0.960mg/kg) comparatively than the other wetland in the study area.

Table-3: Results of Soil sample of the Itila wetland

Sl. No	Name of wetland	pH	EC(µs /cm)	Na (mg/kg)	K (mg/kg)	Total hardness (kg/h)	Total Nitrogen (mg/kg)
1	Itila	5.87	0.09	0.56	25.4	14.21	0.378

Note: EC- Electrical Conductivity, Na – Sodium, K – Potassium

Table-4: Results of Soil sample of the Itila wetland

Sl.No	Name of wetland	Cl (mg/kg)	Fe(mg/kg)	Cu (mg/kg)	Zn (mg/kg)	Pb (mg/kg)	PO_4^{3-} (kg/h)	OC in %
1	Itila	177.2	38.7	0.567	0.237	0.960	41.2	0.98

Note: Cl – Chloride, Fe – Iron, Cu – Copper, Zn – Zinc, Pb – Lead, PO_4^{3-} -- Phosphate,
OC – Organic Carbon

6. CAUSES OF DEGARDATION

Presently extensive losses and degradation of wetland have been occurred due to agricultural activities in the littoral areas, commercial and residential development, engineering structures, resource extraction, industrial siting, processes and waste , disposal, silviculture and mosquito control etc all over the world. The primary pollutants causing degradation are sediment, nutrients, pesticides, salinity, heavy metals, weeds, low dissolved oxygen, p^H and selenium.

The natural environment of wetlands is threatened today by a variety of anthropogenic interventions. The greatest concern, in the context of wetland ecosystem, is the loss and modification of habitats, which is catastrophic in nature since it causes irreversible environmental degradation. Wetlands of Assam have been polluted primarily from two sources - (i) Industrial effluents and municipal wastes, and (ii) Agro-Chemicals (M. C. Bhyuan, 1987)[11]. Now, many of the wetlands in the study area have been degraded due to agricultural impacts, i.e. the chemical fertilizers and insecticides and also solid and liquid wastes of some of the industries. All these ultimately affected the wetland ecology and biodiversity scenario of the wetlands of the study area.

7. FINDINGS

(i) Itila wetland water is only used for agriculture purpose not for the other purposes in the study area

(ii) As many as four wetlands i.e. Dhankhuli, Jiong, Hahchara of Dimoria received the solid and liquid waste disposal by the Nagaon Paper Mill.

(iii) The Turbidity level is high of the Itila wetland water than the other three wetlands.

(iv) Drastic change of wetland water quality is recorded; perhaps extensive use of chemical fertilizers and insecticides is responsible for change of water quality.

(v) The construction of engineering structures viz. - roads cum bandh, and sluice gate cause deteriotion of the wetland environment.

(vi) Wetlands are the habitat for residential birds as well as migratory birds. But, both birds are absent in the wetland.

(vii) It was found that shallowness of wetland has been increasing. Shallowness of the Wetlands causes for widespread growth of aquatic macrophytes and it form a floating mat which converts a considerable area of wetland into cultivable land and swamps.

(viii) Decomposition of the overcrowded macrophytes of different types, especially during the months of October and November causes mortality of fish.

(ix) Peoples of the surrounding villages used the wetland water suffered from various skin diseases and stomach problems.

(x) Bad smell is coming from the wetland water is adversely effect the people living in the surrounding.

(xi) It was found that fish and other aquatic goods are unfit to feed.

(xii) The Itila Jan is used for production of fish for commercial purposes.

8. CONCLUSION

Undoubtedly, the Itila Jan is play an important role for the economic development and improve wetland environmental quality in the surrounding areas. Therefore, these wetlands need proper management so that it can effectively contribute towards the economic growth of the surrounding villages. The concerned authority could take adequate steps to develop the water quality for pisciculture in organized manner. Besides, the vegetation growth of all categories directly or indirectly support different type of animals, including birds and insects, micro-organisms etc. Therefore, in addition to maintain the geo-ecological status of the wetlands, efforts should also be made to develop the water quality as effective natural floodwater detention basins so as to lower the flood heights and reduce the extent of inundation in the area. Appropriate conservational measure should be taken up in the catchments areas of the wetland, which may be preserved for biodiversity conservation. Based on a through evaluation of the existing status, using modern techniques like remote sensing and GIS, supplemented with detailed ground survey, a suitable environmental management strategy is to be evolved for these resourceful Itila wetlands of the Dimoria region.

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