



Industrial Waste Threaten Environmental Quality of Jiong beel

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ABSTRACT: The Digaru and the Kalong river basins of Assam are endowed with larger number of natural water bodies. These water bodies are locally known as 'beel'. It's maintain environmental quality of a region and support livelihood to thousands of people through fishing and collecting edible plants. 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, a drastic change has been observed in the overall environment of 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 ecological set-up of the Jiong beel as well as to foresee the near future situation and has been analyzed here from geographical perspective. In the present investigation, Jiong beel of Dimoria 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.

Key words: Encroachment, over fishing, solid and liquid waste.

INTRODUCTION

The Brahmaputra river valley is gifted with myriads of swampy areas which are commonly known as 'beel' (Jhingran & Pathak, 1987). 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. 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'. 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). The International Union for the Conservation of Nature and Natural Resources (IUCN, 1991) defined the wetlands 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).

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.

Unfortunately, these wetlands have been found degrading their environment due to the increase of human population and technological development. 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.

The lower part of Digaru and Kalong river basin under the Kamrup (Metro) district of Assam found a large number of wetlands. Jiong is a small linear type of wetland under this study area. It is a narrow kind of channel popularly known as Jiong beel. The same beel it's called by different name in different parts. At the upper parts of the beel is called Taranga, middle part is known as Jiong and lower part is called Itila beel. The main source of the Itila is Taranga or Elenga beel near Jagiroad. The Taranga is connected by Dhankhuli (a narrow channel) with Jiong. Jiong is connected with the Itila by another narrow beel called Hahchara. From Jiong, wetland is following parallelly with the Kalong river and meet with same river near Bogibari village name as Itila.

MATERIALS AND METHODS

Water and soil sample were collected 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 season, 2008 (November). The samples were collected to the laboratory for physical and chemical analysis. The parameters for water quality study are temperature, pH, 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-1998 model, for Electrical Conductivity ELICO LIS-120P, India Model, for Sodium and Potassium-HITACHI-P210, India and for metals test PERKIN ELMEIR-2380 Model were used. Soil samples was collected during winter season 2008 and for the soil sample analysis same models had been used.

RESULTS AND DISCUSSION

A few parameters are selected for the assessment of water quality of the beel. The p^H value recorded in the Jiong is 6.3 (Table 1). The turbidity levels of the water found to be higher than the permissible limit as reflected in the water samples of Jiong (41.2 NTU). The Potable Water the p^H permissible limit is 7.0-8.5 and excessive 8.5-9.2 (World Health Organization, 1971).

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

Dissolved oxygen (DO) is one of the most important components 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). 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 Jiong was recorded 3.5mg/l.

Table 1: Results of Water sample of the Jiong beel.

Sl. No.	Name of Wetland	P^H	EC	Turbidity	Hardness	TS	TDS	TSS	DO	BOD	COD	Mn	Ni	Pb	Se
			$\mu\text{s}/\text{cm}^1$	NTU	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	Jiong	6.3	670	41.2	111	963	558	415	3.5	ND	142	0.102	0.018	0.020	0.025

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,

COD values play an important role for assessment of organic matter in water. The COD was recorded in Jiong beel 142mg/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 ($670\mu\text{s}/\text{cm}^{-1}$), Hardness(111mg/l), TS(963mg/l), TSS(415mg/l), Mn(0.102 mg/l), Ni(0.018 mg/l), Pb(0.020 mg/l), Se(0.025 mg/l) (table-land value of Cl(72.2 mg/l), SO_4^{2-} (57.0 mg/l), $\text{NO}_3\text{-N}$ (6.1 mg/l), PO_4^{3-} (0.53 mg/l) , $\text{NH}_4^+\text{-N}$ (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.

Soil quality of the Itila wetland was measured with digital p^{H} meter (Eutech-356-c) of soil: $\text{H}_2\text{O} = 1:5$ suspension. In this work a few parameters are selected for the analysis of the soil quality.

The wetlands soil of Dimoria region pH ranges from 4.9 to 8.61. The pH in the wetlands soils of the region found around 5.5, which indicates acidic soils of the wetland areas (Sharma, 1993). Acid are produced by humus and various soil organisms (Rayan and Garity, 1983). In the Jiong beel soil pH was recorded as 8.61 (Table 3). Higher value of pH 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 Jiong. The amount of OC is an indicator of high productivity of wetlands. Percentage of OC was 0.07 in Jiong. (Deka *et al*, 2009). Phosphorus concentration largely depends on soil pH. 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 Jiong (0.94 kg/h).

The other parameters considered for tests in the wetlands are Electrical Conductivity(EC), Sodium(Na), Potassium(K), Total Hardness, Total Nitrogen ($\text{NO}_3\text{-N}$), Chloride (Cl^-), Iron (Fe), Copper (Cu), Zinc (Zn), Lead (Pb) etc. Sodium is recorded low in Itila (0.56mg/kg) Table 3 and 4.

Table 2: Results of Water sample of the Jiong beel.

Name of Wetland	Cl^-	SO_4^{2-}	$\text{NO}_3\text{-N}$	PO_4^{3-}	$\text{NH}_4^+\text{-N}$	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
Jiong	72.1	57.0	6.1	0.83	4.10	2.8	69	14.3	15.2	44	0.020	3.12	0.0020

NOTE: Cl^- - Chloride, SO_4^{2-} - Sulphate, $\text{NO}_3\text{-N}$ – Nitrate Nitrogen, PO_4^{3-} - Phosphate, K -Potassium, Ca – Calcium, Na – Sodium, Fe – Iron, Mg – Magnesium, Cu – Copper, Zn – Zinc, Cd – Cadmium, $\text{NH}_4^+\text{-N}$ -Free Amonia Nitrogen, ND- Not Data.

Table 3: Results of Soil sample of the Jiong Beel.

Sl. No	Name of wetland	pH	EC($\mu\text{s}/\text{cm}$)	Na (mg/kg)	K (mg/kg)	Total hardness (kg/h)	Total Nitrogen (mg/kg)
1	Jiong	8.61	0.11	0.94	51.3	38.76	0.239

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

Table 4: Results of Soil sample of the Jiong Beel.

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	Jiong	144.8	25.7	0.693	0.616	0.043	32.3	0.73

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

Total Hardness of soil is Jiong 38.76/kg) in the region. Total Nitrogen is detected high in Jiong (0.239mg/kg). Lead was recorded (0.043mg/kg) in Jiong beel.

The natural environment of wetlands is threatened today by a variety of anthropogenic interventions. Wetlands of Assam have been polluted primarily from two sources - (i) Industrial effluents and municipal wastes and (ii) Agro-Chemicals (Bhuyan, 1987).

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. As many as four wetlands of Dimoria received the solid and liquid waste disposal by the Nagaon Paper Mill. The Turbidity level of water is high of the Jiong beel. Drastic change of wetland water quality is recorded; perhaps extensive use of chemical fertilizers and insecticides is responsible for change of water quality in the fringe area. The unscientific construction of engineering structures viz. - roads cum bandh, sluice gate and RCC bridge over the Jiong cause deterioration of the wetland environment. It was found that shallowness of wetland has been increasing. Shallowness of the Wetlands causes for widespread growth of aquatic macrophytes and it has been form a floating mat. Siltation is very high. Decomposition of the overcrowded macrophytes of different types, especially during the months of October and November causes mortality of fish and other aquatic life. Peoples of the surrounding villages used the wetland water suffered from various skin diseases and stomach problems. Bad smell is coming from the wetland water is adversely effect the people living in the surrounding. It was found that fish and other aquatic goods are unfit to feed. Water drink by the domestic animals are suffered from different diseases. Paddy fields are burn up place wise and production of rice has been decreasing.

Undoubtedly, the Jiong 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 control the deterioration of water quality. 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 thorough 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 Jiong wetlands of the Dimoria region.

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