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Distribution and Genesis of Wetlands in Nagaon District, Assam: A Geomorphological Perspective

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***Abstract*:** Assam is endowed with a large number of wetlands of different kinds. The number and areas of wetlands are variously distributed over the state. Assam has a total wetlands area of 1012 sq.kms with 3514 wetlands representing the highest area under wetlands among the North Eastern states. More than 80 percent of the wetlands falls in Assam regions, which suggest that majority of the regions wetlands originates in the fluvial domain of the Brahmaputra River system. Wetland distribution in district level reveals that Nagaon District has the highest number of wetlands among all the districts of the state. Depending on their locational characteristics, the wetlands are prone to various kinds of geo-environmental problems. Therefore, with growing need of wetlands management, it has become highly imperative to study genesis and development of wetlands.

Key Words*-Fluvial domain, locational Characteristics, Genesis of wetlands*

1: Introduction

Wetland is a generic term used to define the universe of wet habitats including marshes, swamps, bogs and similar areas. Wetlands are found in different geo-environmental conditions over the earth's surface. Wetland distribution at district level reveals that Nagaon district has number (379) of wetlands among all the districts of the state. The genesis and development of wetland are closely related to the geomorphic and tectonic history of the study area, hydrological behavior of the nearby river and prolonged human use of peripheral lands, depending upon their locational characteristics, wetlands is prone to various kinds of geo-environmental problems. Therefore, with growing need of wetland management it has become highly imperative to study genesis and development of wetlands and the present study is to focus on the wetlands of Nagaon district, Assam.

2. Objective Of The Study

The basic objectives of the study are summarized as follows:

1) To study distribution and genesis of wetlands using satellite data.
2) To study morphology and association with nearby rivers.
3) To study autogenic and allogenic processes of the wetlands.
4) To study geo-environmental status of the wetlands in the district.
5) To find out appropriate management strategies for development of wetlands.

3. Methodology

Wetlands of Nagaon district initially identified on the survey of India topographical sheet of 1:50, 000scale.Names of the wetlands, geographical co-ordinates, nearest settlement are taken from the topographical sheets. Present size, shape and area of the wetlands are measured from satellite imageries. Waterlogged area and area covered by sand, mud and vegetation cover are estimated with the help of satellite imagery after extensive field investigations. The standard methodology of data classification, interpretation, integration and analysis has been adopted in different levels to study geo-environmental status of wetlands.

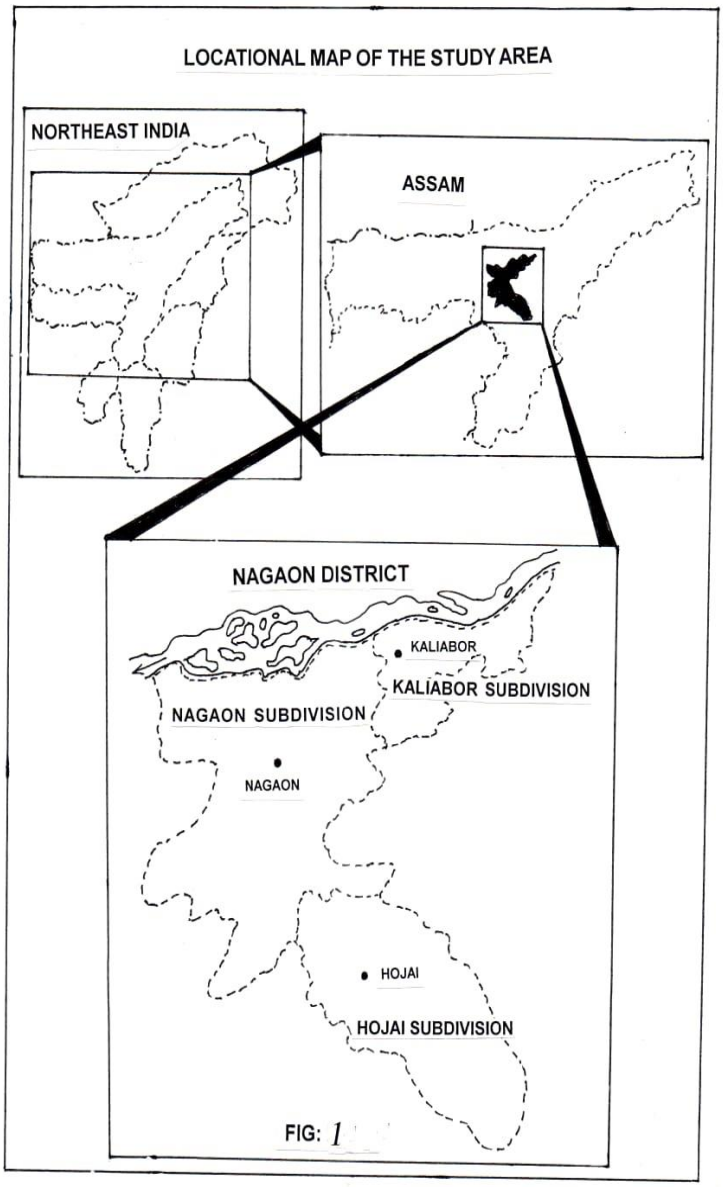

Fig 1: Location and extent of the study area.

4. Districtwise Distribution Of Wetlands In Assam

From The study, it is revealed that the total number of wetlands in the state is 3513 and the total area covered is 101231.60 hectares. The details of the district wise distribution of wetlands are given in Table 1. The Nagaon district has 379 wetlands of size greater than 2.25 hectares and ranks first in terms of numbers. Maximum area under wetlands (11658.00 hectares) followed by Morigaon district. The N.C hills district has the lowest number of wetlands (10) while area-wise Hailakandi district has the minimum area under wetland (840.00 hectares).

Table 1: District wise distribution of wetlands in Assam

SL.NO	DISTRICT	NUMBER	AREA(HECTARES)
1.	Barpeta	97	3301.00
2.	Bongaigaon	100	3158.50
3.	Cachar	340	7188.00

4.	Darang	103	3515.50
5.	Dhemaji	139	3960.00
6.	Dhubri	233	6459.70
7.	Dibrugarh	86	2753.50
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	1980.00
21.	Sibsagar	109	2135.00
22.	Sonitpur	206	3651.00
23.	Tinsukia	74	2732.50
24	Total	3513	101231.60

5. Geo-Ecological Conditions Of Wetlands

Wetland types and their respective functions are spatial determined at four spatial limits/aspects. These spatial are-(1) Wetland (2) adjoining environment (3) watershed and (4) landscape. The geo-ecological status of wetlands generally depends on all these spatial limits aspects. The wetlands of the study area exhibit some variations in their ecological conditions largely based on locational characteristics. The hydro period of the wetlands varies from place to place. Wetlands sites in which ground water is a major input source, these sites with a mixture of surface water and ground water caused by slopes have a less stable hydrological regime. In fact, the occurrences of these wetlands are largely controlled by the ecological formation and physiography of the area. The wetland of this alluvial plain, particularly the floodplain wetlands and their aquatic system, function as a receptable to seasonal monsoon floods. From the study it is revealed that the ground water levels during the driest months remain within 1 meter near the Brahmaputra and it increases in the area away from the river.

In the study area, almost all wetlands are highly eutrophic system, except the typical pit blogs. The soil nutrients are received from the surrounding catchment along with the surface run-off water. These soils nutrients also become available to wetland vegetations. As the depth and volume of the water increases the nutrient concentration becomes low. The nutrient level in the wetlands is greatly influenced by seasonal water level changes. The wetlands are generally characterized by the presence of hydric soil, which develop due to presence of adequate water. The feature is common to almost all wetlands of the study area. Thus, it can be concluded that the wetlands of the region is highly productive. Table 2 exhibit the typical soil quality of the wetland in the study area.

Table 2: Typical soil quality of the wetlands in Nagaon District, Assam.

Soil Quality Parameters	Range
Ph	5.10-5.80
Organic Carbon	280-5.90
Available Nitrogen – N(ppm)	605.00-782.00
Available phosphorous-P(ppm)	40.00-170.00

The shape and size of the wetlands varies in different geo-ecological conditions. A large number of wetlands in the district are connected with rivers by one or more feeder channels. These feeder channels are the life-line of such water bodies. Natural auto stocking of fishes is maintained by the feeder channels which connect the wetlands to the river. But these channels as well as many wetlands are getting degenerated due to continuous siltation and accumulation of petrified vegetative matters over the years and increasing human interferences.

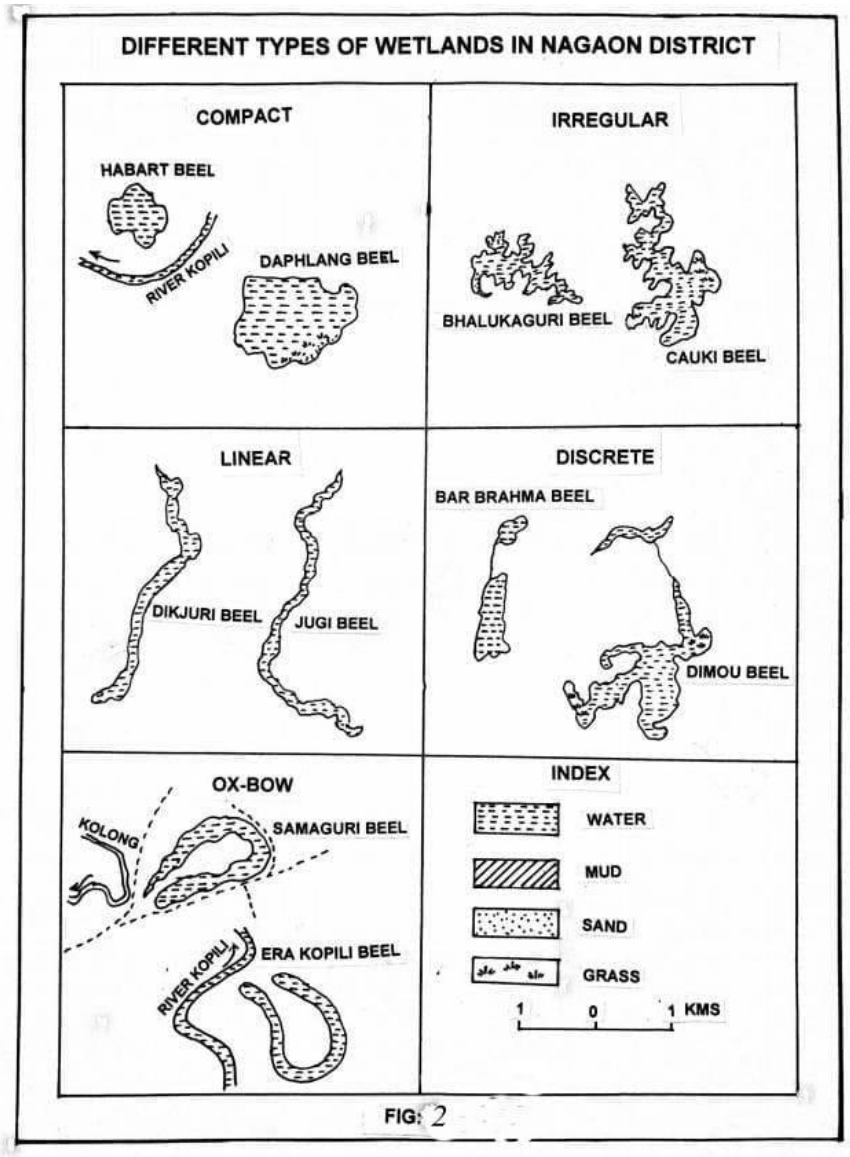

Fig 2: Different types of wetlands in Nagaon District

In spite of this entire depredation, still we have some healthy wetland system in the district, especially in the wetlands of Kaziranga National Park (World Heritage Site) and Laokhowa Wildlife Sanctuary is very rich in bio-

diversity. The wetlands of the district are also characterized by wide variety of flora and fauna. The wetland floral varieties broadly include algae, bryophytes, mosses and ferns to woody angiosperms. Trapanatans and Euryaleferox are common in many wetlands of the district. Recently Ipomoea Fistulosa has become dominant weed of marshy lands and also in ecotone region between aquatic and terrestrial zone of the wetlands. The faunal diversity of the wetlands is also very diverse containing animals from protozoa to mammalians. But gradually this diversity has been reducing to a considerable extent due to growing anthropogenic activities

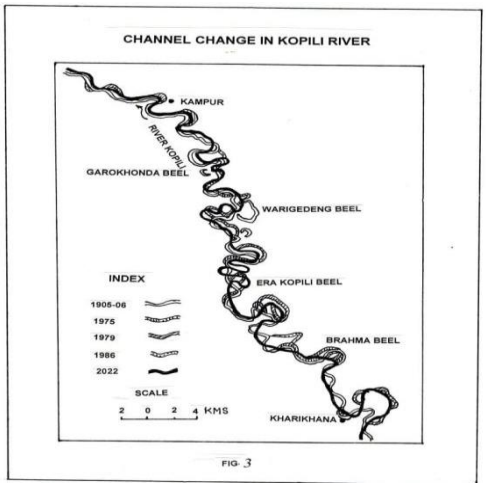

Fig 3: Channel change in Kopili River

6. Morphology Of Wetlands In The District

Nagaon district occupy the central part of extensive south plain of the river Brahmaputra. The general slope of the study area is mainly towards the west and slightly towards the North West. Almost all the rivers and their tributaries flow across the extensive plain of the district changing their courses frequently. Flood plains of all the major rivers are made of Newer Alluvium. The occurrence of wetlands are generally controlled by the hydro-geological and physiography of the area. Depending on their locational characteristics the morphology or configuration of the wetlands varies place to place and the wetlands of the district are sub-divided into five types viz. linear, compact, discrete, irregular and ox-bow shaped. (Figure 1). The number of wetlands in each type linear, compact, discrete, irregular and ox-bow shaped is shown below respectively. From the study it reveals that about 73 percent of wetlands in district falls under the categories of linear and compact types.

Table 3: Type wise distribution of wetlands in Nagaon District

WETLAND TYPE			AREA (IN HECTARES)				TOTAL
	<1OO	100-150	150-200	200-250	250-300	>300	
Linear	135	19	4	-	1	-	159
Compact	131	13	4	1		1	152
Discrete	20	2	1	1	1	-	25
Irregular	9	5	2	-	-	-	16
Ox-bow	19	7	1	-	-	-	27
Total	314	45	12	2	2	1	379

7. Association Of Wetlands With Rivers

The genesis and development of wetlands of Nagaon District are closely related to the hydrological behavior of the rivers and almost all wetlands of the study area are ubiquitous in the flood plains of the rivers. About 96 wetlands are associated with Kolong River and 113 wetlands are closely associated with Kopili river system. Therefore, it can be concluded that the morphological processes operating in the wetlands in the district are closely

associated with channel changes of corresponding rivers. It is also observed that from the paleo-channel study in the district that the course of rivers has changed at different places during very recent past as shown in figure – (3). The frequency of occurrence of beels decreases as their distance from corresponding river increases (Figure-3.3). Again, more than 28 percent of wetlands are found within 400 meters from rivers (Table – 4). From the study it is also observed that numerous new ox-bow lakes have been formed at different places, while in other old dead channels get rejuvenated due to channel change processes. Thus, shifting of river channel also leads to changes in the morphology of ox-bow lake type wetlands.

Table 4: Occurrence of wetlands according to distance from rivers.

Name of River				Distance of river (in meter)				
	<400	400-800	801-1200	1201-1600	1601-2000	2001-2400	2401-2800	>2800
Borapani	10	02	01	01	01	00	04	0
Brahmaputra	14	05	03	01	01	00	01	01
Nonoi	02	02	01	00	00	00	00	00
Haria	09	03	01	01	00	00	00	00
Kolong	20	24	13	05	03	02	03	02
Kopili	18	14	03	05	01	01	00	01
Leteri	03	02	03	04	01	01	01	00
Mora Leteri	03	01	00	00	00	00	00	00
Nishari	04	01	00	00	00	00	00	00
Lutumari	01	02	01	00	00	00	00	00
Sunai	30	06	03	03	05	02	02	01
Tepari Sonai	02	01	00	00	01	00	00	00
Total	116	63	29	20	13	6	11	05

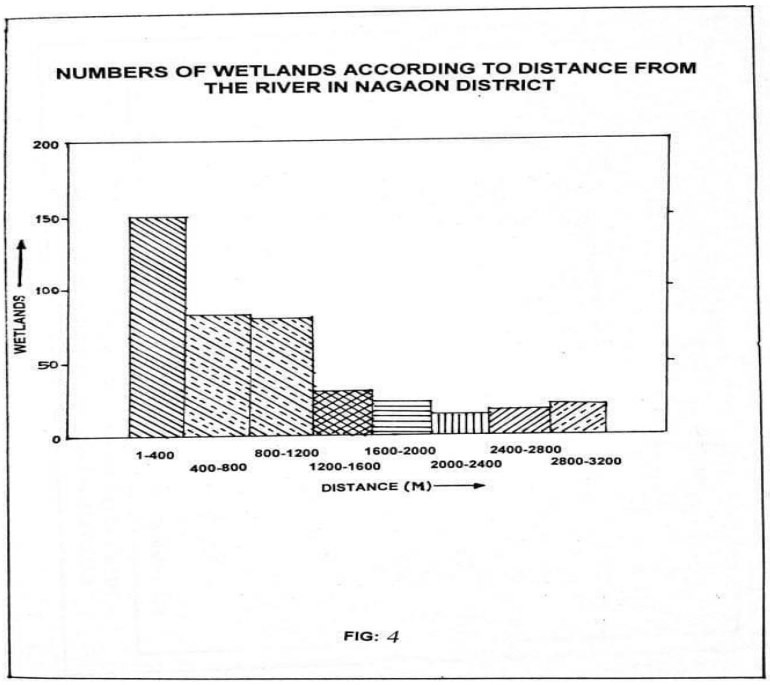

Fig 4: Number of wetlands according to distance from rivers

8. Classification Of W Etlands Depending On Their Origin

Wetland degradation and degeneration is such a serious problem which results from the interaction of many physical, chemical and biological processes. Changing fluvio-geomorphic conditions attributable to growing human interferences are the chief causes of such degeneration. These changes also determine the shape and size of the wetlands. From the study, the wetlands of Nagaon district can be classified into two major categories depending on their origin (Fig: 5) they are also follows-

I) Wetlands of specific locational origin which includes compact, discrete and irregular types. These wetlands are formed due to various locational factors such as tectonic activities, earthquakes and hydraulic activities of corresponding rivers.

II) Wetlands of riverine origin which includes linear ox-bow type and are formed due to various activities of rivers. These activities include channel migration, cut offs and loop formation.

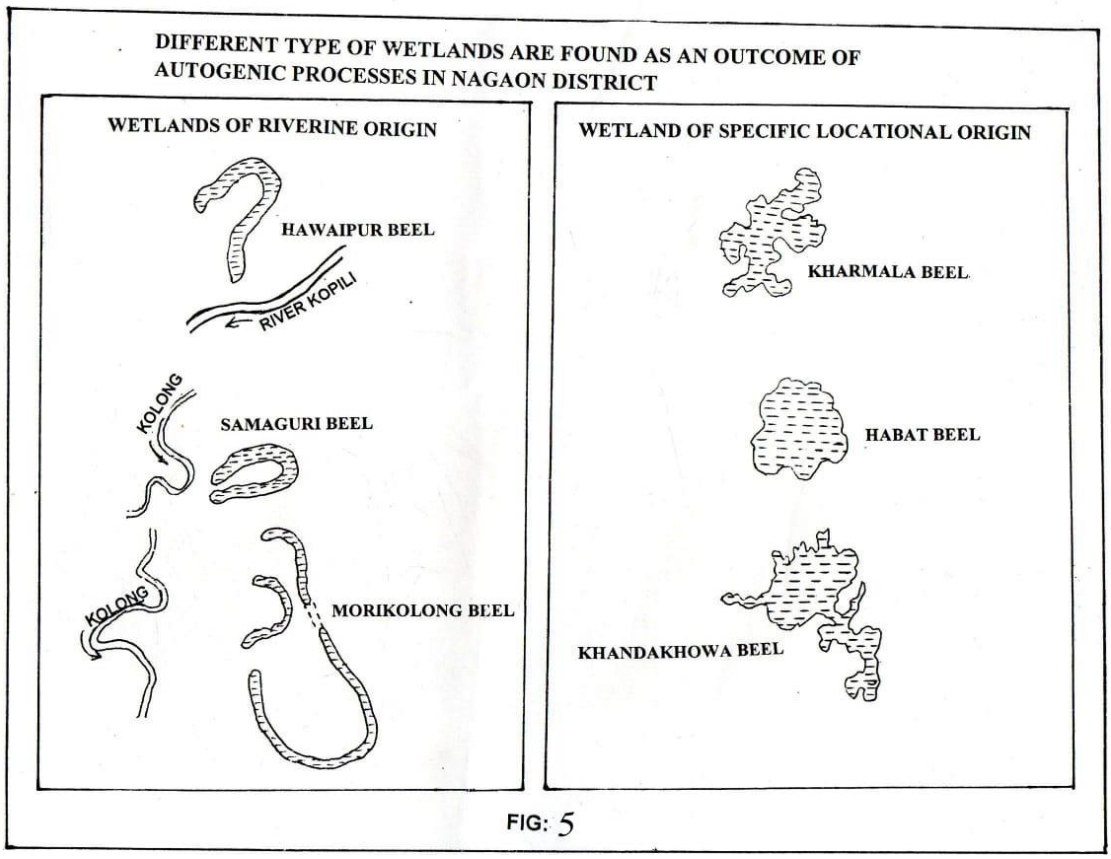

Fig: 5 Different types of wetlands are found as an outcome of autogenic processes in Nagaon District.

9. Conclusion

It is observed from the study that particularly human interferences are responsible for formation, transformation and degeneration of the wetlands of the district. The major factors affecting the wetlands ecosystem are land use and human habitation, transportation and communication lines, fishing, grazing activities and construction of various engineering structures, irrigation, flood controls and other community purposes development scheme. Conservation of wetlands in general is a far cry in the absence of appropriate state policies. The rich biodiversity of the wetlands receives least attention. Further, wetlands are rarely considered as an integral part of the watershed. If these wetlands are properly managed, it will not only reduce the flood hazard but also help in keeping ecological balance in the district.

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