Changing Trends in Urbanization of Deepor Beel Wetland

Sukanya Das (Department of Geography, Visva Bharati University)

Abstract:- Deepor Beel is one of the most substantial wetlands in Assam as well as a Ramsar conceded site (2002) functions as a sponge to recharge and replenish the groundwater table. Deepor Beel is like a boon to a floodprone (natural and urban induced) area like Assam. It had been noticed that the areas surrounding it possess additional potential area characteristics. GMDA (Guwahati Municipal Development Authority) had declared and categorized those under green zones and eco-sensitive zones.

In this work, an attempt has been taken to discern the authentic amount of urban encroachment, its extent, and pattern over the last four decades namely 1995, 2001, 2009, 2019 using LULC (land Use Land Cover Maps). However, it has been noticed that the actual overall encroachment over the demarcated eco-sensitive and green zones was much higher than the area designated by the authorities due to rising and unprecedented urban intrusion.

Keywords:- Wetlands, Mapping, Urban Encroachment, Landsat Images.

I. INTRODUCTION

The area in and around the wetland has seen changes, especially in the context of urbanization in and around the area. The number of built-ups around the area has been rising significantly over the past years over a long span of time. However, the most significant steep rise is seen only in the last decade. The continuous rise in urbanization has also shown its impact on other aspects like vegetation, forest cover, barren land, etc. Even though there has been an impact of climate in changing those aspects, but the considerable contribution of urbanization in changing the areal constitution of the place has surpassed climate. Thus, such a change over the last four decades is shown here. Regular interval years are selected namely 1991, 2001, 2009, and 2019. The land useland cover GIS mappings of these years are shown and then they are interpreted. The individual change in each and every parameter is compared graphically using a graph for an easy visual idea of the spatial and temporal change. Spatiotemporal changes are seen at various stages. In all the six land use-land cover parameters, significant changes are seen. Where on one hand, a significant reduction of vegetation barren land etc has seen a reduction in terms of area, on the other hand, features like built up has been seen to substantially increase over the past decades. Many major buildings and important constructions h ave taken place around main wetland areas as well as the additional potential areas over decades due to lack of space in the Kamrup Metropolitan district. These gradual constructions contribute to the rise in built-up areas. Whereas the areas of vegetation that were cleared for construction or barren lands used for construction contribute to the reduction of areas of barren land and vegetation over decades

II. CHANGE IN LANDUSE / LANDCOVER IN TERMS OF URBANISATION LANDUSE/ LANDCOVER MAP OF 1991



Fig 1: LULC mapping of Deepor Beel Wetland 1991

Feature	AREA	Area (%)
Water Body	7.2765	7%
Sand Bed	2.9781	3%
Forest Cover	17.4672	17%
Barren Land	25.8183	26%
Vegetation	37.2996	37%
Built-up	9.3879	9%
TOTAL	100	100%
Table 1		

A. Area In Percentage of Features Across The Wetland 1991

From the above mapping, we can depict that during 1991, the built-up area i.e. the effect of urbanization was very less around the area selected around the wetland. The total built-up constituted only 9% of the total area. Whereas, towards the South of the wetland, there was a substantial forest cover of 17%. The forest is located in the upland area. The area happens to be made up of low heightened hills. The forest is of deciduous nature. Later over time, this forest area was recognized as a wildlife sanctuary. The urban patch to

the west to the west of the wetland was mainly the airport area of Borjhar. It also includes the area which was established in the year 1958. Other than that, the other urban patches include the area of Azara which includes the airforce station. The other urban patch was seen to the east of the wetland which includes the area of Guwahati University of Jalukbari area which was established in the year 1958. The somewhat dense urban patch towards the northeastern part of the beel was the Kamakhya city which back then included the Kamakhya temple area and the present-day areas of Pandu and Maligaon. Towards the extreme northwestern part of the wetland, beyond the river Brahmaputra is the Sualkutchi village. It had the Assam silk industry back then, which is functional till the present day. The Sualkutchi silk industry existed since the 17th century. Barren land constituted almost 26% which is mainly found around the wetland area and also near the airport area of Borjhar. Other than this, the remaining area was seen to be under normal vegetation cover. A large significant area of about 37% was under vegetation. Thus, it can be concluded that the largest area in 1991was under forest cover and vegetation and that under the urban built-ups were significantly very less.

B. Landuse/Landcover Map Of 2001



Fig 2: LULC MAPPING OF DEEPOR BEEL WETLAND IN 2001

С.	Area	In	Percentage	of	Features	Around	Deepor	Beel
	Wetla	ınd	2001					

FEATURE	AREA	AREA %
Water Body	4.878	8
Sand Bed	0.6003	60
Barren Land	11.6325	11
Forest Cover	17.298	17
Built-Ups	24.048	24
Vegetation	41.7708	41

The above land use land cover map of Depoor beel is of the year 2001. There is a significant change seen from the land use-land cover map of the year 1995. A significant Spatio-temporal change is seen in all the parameters of land use land cover. There is an increase in built-ups from 9% to 24%. The barren land and vegetation cover has both seen to be reduced. The former from 26% to 11% and later from 37% to 17%. The forest has shown not much significant reduction. There is 17% land coverage in both decades. Where on one hand, there is a significant drop in parameters like vegetation and barren land and increment of built-up area is seen instead. They are inversely related. Even though a major increase in the patch is not seen, but traces of scattered increase instead of one large patch is seen. It indicates that no major construction took place within this decade. But the spatial scattered patches are due to an increase in population, and in addition to that more accumulation of people along with the

urban patches. A few of them are the already existing structures like airport, air force station, Kamakhya Temple, etc. Due to the increase in temple-tourism growth of settlements is seen at urban patches of thriving business nodal. Increased growth in hotels is seen along with airports due to a major shift of people's choice towards air transport and more airlines coming up. Hence, those areas show an increase in built-ups. However barren lands are seen to lesson. The reason for that was increased agriculture. Specifically, barren lands near the wetland are seen to be used for agriculture probably for easy and cheap irrigation. But the drop-in vegetation is seen in the clearing of trees due to urbanization. The deciduous forest patch has shown a significant reduction. Thus, the overall conclusion could be to increase scattered urban places.

D. Landuse/Landcover Map 2009 Of Deepor Beel Wetland



Fig 3: LULC MAPPING OF DEEPOR BEEL WETLAND IN 2009

E. Area In Percentage Of Features Around Deepor Beel Wetland 2009

Area	Percentage
Water Body	9%
Sand bed	3%
Forest Cover	15%
Barren Land	13%
Vegetation	30%
Built Up	30%

This is to note that this was a decade that started to see a sharp population rise in Guwahati and hence, it was the decade of the advent of encroachment in and around the Deepor Beel area. Even though this decade had seen very little change with respect to the previous Landuse/ Landcover map of 2001. In2009, the built-up is seen to be 30% compared to 2001 which was 24%. Hence it shows a little rise of just 6%. The area which has seen the rise is an area beside the airport which was a barren land area in 2001. The probable reason was the popularization of the airplane as a proper mode of transport. Hence, the area beside the airport showed commercialization.

Other than buildups, the deciduous forest is seen to have no change or very little change as there were not much interruptions. Moreover, to talk about vegetation, it has seen a sharp reduction of 11% from 41% in 2001 to 30% in 2009. This could be due to rapid urbanization and more specifically agricultural practices. Hence there has been a reduction in vegetative patches. The barren land has seen a reduction of 2% which does not indicate a big change.

Hence, even though this decade didn't show much change from the previous one, but however it has the transitional year which is indicative of a bigger potential of population explosion and ultimately increased commercialization and increased urban intrusion. F. Landuse/Landcover Map of 2019



Fig 4: LULC MAPPING OF DEEPOR BEEL WETLAND IN 2019

G. Area In Percentage of Features Around Deepor Beel Wetland 2009

AREA	PERCENTAGE
Water Body	5%
Sandbed	1%
ForestCover	16%
BarrenLand	5%
Vegetation	32%
BuiltUp	41%

This is the decade that saw the maximum possible changes. Urbanization and population explosion was at its peak and very significant urban intrusion in the eco-sensitive areas was seen. The only thing that did not see much transformation since 1991 is the deciduous forest towards the South of the Beel. The barren land had seen a reduction from 13% to 5%. The areas of reduced barren land are seen to be converted into red built-ups in the land use land cover maps. Hence, it can be concluded that even some barren land got converted into built-up areas. The built-up during this time had seen the most of urban intrusions. Moreover, many of the intrusions that took place are on the demarcated greenbelt or eco-sensitive belt. Instead of scattered dispersion, patches are seen to have grown. The urban patch is seen to have a rise of 11% from 30% in 2001 to 41% in 2009. They are seen in large patches. There were a few important constructions within this decade that should be talked about. The ASTM was constructed in 2010. The elephant corridor was interrupted by the construction of a railway track from over the elephant corridor. This has recently led to the killing of an elephant accidentally by a gushing train. Moreover, the TISS Guwahati campus was built in 2017 in an extremely ecosensitive zone. The Radisson Blu was built in 2014 on an ecosensitive zone too. Hence, from the above, it's clear that there was a substantial urban intrusion in the eco-sensitive zone over the last four decades.



III. INTERPRETATION OF CHANGING LAND USE PATTERN OVER LAST FOUR DECADES



Combined Graph



_____Features Fig 9: COMPARATIVE GRAPHICAL ANALYSIS OF LULC MAPPINGS

IV. CONCLUSION

The above four diagrams are the graphical representation of the land use land cover maps of the four decades namely 1995, 2001, 2009, 2019. This is shown with the help of four individual pie charts. If we look closely at the four diagrams, we can see that the vegetation cover of the first one is the most and the built-up area of the last one is the most. The middle ones show the transitional phase. Graphically, hence it is very clear that there was an urban intrusion from 1995 to 2019 and mostly in between 2009 to 2019. This is to be understood that in a city like Guwahati which has seen a population hike in the past decade, just a set of policies cannot eradicate the whole problem at once. The rapid increment of the population is inevitable. Hence, it is very necessary to take up a planned sustainable approach. Wetlands act as a sponge to take in water and that helps in replenishing the groundwater table as well. In an area like Assam, which gets frequent floods, a large wetland like Deepor Beel is a boon. It had been noticed that various areas surrounding it have additional potential area characteristics. GMDA (Guwahati Municipal Development Authority) had declared those zones as either green zones or eco-sensitive zones.

In this work, an attempt has been taken to see the real amount of urban encroachment, extent, and pattern over the last four decades (1995, 2001, 2009, 2019). Land use land cover maps are made to check the same. However, it is noticed that the actual encroachment overall and also over the eco-sensitive and green zones were much higher than the area designated by the authorities. There has been too much urban intrusion. Various problems have arisen out of the over encroachment of urban areas in the areas around the beel. Firstly, there had been a loss of migratory birds that used to come. Deepor beel is known for the arrival of huge amounts of migratory birds. Secondly, due to over encroachment, the pollution level of the water has gone high. There are traces of metal contamination. This has a serious health effect on the people as well as the wildlife in the forest South of the Beel, as those animals directly consume the water. Moreover, a railway line has been constructed across the elephant corridor. This can prove a serious threat to wildlife.

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