



Effect of river environment on the land use of Guwahati city: perspectives from nature-culture relationship

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Abstract

The city of Guwahati has a rich historical past and finds frequent mention in medieval historical sources and epics. From the pre-historic existence, the city has evolved through various stages of development and lately, the city has entered a phase of vigorous growth changing remarkably its fabric of settlement and the overall morphology of the urban landscape.

Throughout the history of growth and development of Guwahati city, the river Brahmaputra has played the most important role in shaping the socio-economic life of its dwellers and the land use pattern of the city. The river still continues to play a unique role in maintaining the city's scenic beauty, grandeur, health and prosperity. In fact the nourishing presence of the river in the heart of the city provides a variety of facilities and opportunities to the city dwellers, some of which are, however, directly visible, while many others need careful observation for assessing their contribution.

Of late, this eco-city has also been witnessing a severe demographic hazard because of migration of people from other parts of Assam and the Northeast as place of opportunity. The growing urban congestion and extension of human settlement, roads and other constructions to the marginal and delicate areas like the hill slopes, fringes of the *beels*, wetlands and rivulets have now made the city's drainage highly complicated and increasingly inefficient. These have caused some severe problems such as killer landslide, erosion, water logging and flash flood.

Keywords: Land use, urban landscape, river-city relationship

1. Introduction

The city of Guwahati, located at latitude 26°10'45" N and longitude 91°45'0" E in the district of Kamrup is considered as the gateway to the seven northeastern states of India. The city spreads about 10 km in north south direction and 27 km in east west direction. The city extends along the bank of Brahmaputra in a linear shape and is bounded by the river on the north and a series of hills along the remaining periphery, except for a portion in the west where a natural wetland, the Deepar Beel is situated. On the south bank of the Brahmaputra there are as many as five tributaries—Bharalu, Mora Bharalu, Barapani, Khanajan and Bondajan. Among them

Bharalu (the upstream portion of which is called Bahini) and Bashistha run through the city. The Bharalu channel has its outfall in Brahmaputra while Bashistha flows to Deepar Beel through Mora Bharalu channel, which is connected to Brahmaputra with Khana Jan. Bonda Jan in the east of the city connects Silsakoo Beel with the Brahmaputra.

The river Brahmaputra, mighty enough to support a rich civilization named after it, has been playing the most significant role in shaping the city of Guwahati since ancient days, when it was known as Pragjyotishpur. The river is the lifeline of Guwahati, providing water to perform all day-to-day activities as well as soaking the extra water during the rainy

season. Although a large number of urban centres have sprung up just on the bank of the river or a few kilometers apart throughout Assam, Guwahati, the capital city of the state and the nerve centre of the entire northeast, is the single most important urban agglomeration on the river bank having some distinct metropolitan characters.

The two banks of the river have different characters even though they are on the banks of the same river. One has a completely rural ambience and the other is a bustling city. The river has a total length of 28.67 km and total area of 49 sq km in the city.

2. Objectives of the study

The main objectives of the study are:

1. to find out the relationship between the city of Guwahati and the river Brahmaputra,
2. to assess what actually the city gets from the river and what the river gets from the city.
3. to examine the future prospects of the city on the banks of Brahmaputra and
4. to suggest measures to ensure a symbiotic relation between the river and the valley-plain including the city of Guwahati.

3. Data Source and Methodology

The study has been carried out on the basis of both secondary and primary data. Initially, secondary data on various aspects like changes in the development of the city, changes in the river, status of economic activities associated with the river, changes in the environment, drainage situation in the city, utilization of river water for various purposes, transportation through the river, demographic changes in the city, process of urbanization, etc., have been collected from sources such as Guwahati Metropolitan Development Authority, Guwahati Municipal Corporation, Town and Country Planning, Inland Water Transport Department, Brahmaputra Board, Pollution Control Board, Office of the Deputy Commissioner (Kamrup), Directorate of Economics and Statistics, Department of History and Antiquity, Kamrup Anusandhan Samiti, etc. Primary data on the problem are being collected through questionnaire survey and personal inquiry.

4. Findings

4.1 Guwahati through Ages

The city of Guwahati has a rich historical past and finds frequent mention in medieval historical sources and also in *Mahabharata*, *Ramayana* and *Raghuvansham* of Kalidasa. From the pre-historic existence, the city has evolved through the long Ahom

period, the British period, and lastly, the post-Independence period. Lately, the city has entered a phase of vigorous growth changing remarkably its fabric of settlement and the overall morphology of the urban landscape. Guwahati was made a regional headquarters of the Ahom king's viceroy sometimes in the 17th century for administering the lower part of Assam. During this period Guwahati was a highly fortified town. At that time, North Guwahati was also within the urban jurisdiction of Guwahati. Thus, Guwahati during the Ahom period included the old town area of the present city on the south bank and North Guwahati on the north bank of the Brahmaputra River. After the annexation of Assam by the British in 1826, Guwahati received a new momentum for further growth. The town was connected by railway line with rest of India in 1890. The establishment of the headquarters of Kamrup district at Guwahati followed by opening of administrative offices, military cantonment, etc., enhanced the urban pull of Guwahati. The country's Independence in 1947 added a new dimension to the process of urbanization in this part of the country also, and Guwahati witnessed a remarkable change in its urban expansion and development. The process of growth was further compounded when the capital of Assam was shifted from Shillong to Guwahati in 1972. The shifting of the capital to Dispur in the south-eastern part of Guwahati along with a large number of other government offices, has contributed substantially to form another nucleus around the capital within the city area. Since then the city has grown enormously in terms of population and development of commercial activities.

The Brahmaputra, which flows through three countries, has been mentioned in ancient sources like *Mahabharata*, *Raghuvansham* of Kalidasa, *Kalikapurana*, *Padmapurana* and *Yogini Tantra*. Throughout the history of growth and development of Guwahati city, the river Brahmaputra remained as its alert guard. It stood as a formidable natural barrier and thus helped in protecting the city and the region from foreign invasion.

The old Guwahati lies along with the south bank of the Brahmaputra River. The three rocky islands of the Brahmaputra – Karmanasha, Urbashi and Umananda, are adjacent to the old city centre. This river bank has provided a stable rocky site for urban development since ancient times. The city has maintained a linkage with the surrounding regions in the north also though the river and the North Guwahati now have been covered under functional

linkages with the city.

This growth of Guwahati has primarily been conditioned by this great river as the early settlements took place in Guwahati Plain along the river Brahmaputra and gradually extended up to the railway line to the south which acted as a barrier. During the fifties and sixties of the last century, however, the city expanded beyond the barrier of the railway line and new settlements developed in areas like Sarania, Gandhibasti, Lachitnagar, Santipur, etc and even in low lying areas. During the same period Maligaon and Jalukbari area were also developed outside the Guwahati Plain through the Kamakhya corridor. The city further expanded during the seventies into the Beltola Plain through the narrow corridor like Fatasil, Dispur, and Noonmati and new settlements took place in Dispur, Khanapara, Kahilipara, Basistha, Kalapahar, Narangi, etc (Master Plan, 1980).

The focal crux of old Guwahati was basically an amalgam of certain places, which in turn, went on to

become the nerve centres of the modern-day metropolis of Guwahati. The core areas of old Guwahati consisted mainly of Pan Bazar, Uzan Bazar, Phansi (Fansi) Bazar and Paltan Bazar, while Rehabari, Kharghuli, Lakhtokia, Kamarpatty, Chatribari, Kumarpara, Athgaon, Machkhowa, Bharalumukh, Santipur, Maligaon and Pandu were the other integral part of the old Guwahati.

Almost all the places that really formed the crux of old Guwahati are situated in and around the periphery or vicinity of the river Brahmaputra. The most plausible reason is that civilization generally flourishes on the banks of a river as water is an indispensable element required for the very existence and development of any living society or civilization.

4.2 Population

The population in Guwahati was 8,394 in 1891, which crossed the one lakh limit in 1961. According to the 2001 census, the population of Guwahati Municipal Corporation Area (GMCA) is 8, 09,895.

Table 1 : Growth of population in Guwahati: 1901-2001

Year	Population in GMCA	Decadal Growth (%)	GMA excluding GMCA	Decadal Growth (%)	GMA	Decadal Growth (%)
1901	11661	-	-	-	-	-
1911	12481	-	-	-	-	-
1921	16,480	-	-	-	-	-
1931	21,797	24.39	-	-	-	-
1941	29, 594	26.34	-	-	-	-
1951	43,615	32.14	53,774	-	97,389	-
1961	100,707	130.90	98,775	83.69	199,482	104.83
1971	123, 783	22.91	169,436	71.54	293,219	46.99
1981	268, 945	117.27	102,351	-39.59	435,280	48.45
1991	584, 342	117.27	61,827	-39.59	646,169	48.45
2001	809, 895	38.60	80,878	30.81	890,773	37.85

Source: Census of India 1991 and 2001

The population of Guwahati Metropolitan Area has grown almost 6.5 times between 1971 and 2001. During the same period the municipal limit of the city increased from 43.82 sq.km in 1971 to 216.79 sq.km in 1991.

4.3 Land Use Changes in Guwahati

It is generally agreed that city life including the city's functional efficiency is basically governed by

its land use pattern. A rationally planned and spatially balanced land use pattern can make the cities functionally more efficient and socio-economically more peaceful. Guwahati seems to present almost an adverse picture in this respect. A major part of the city, irrespective of locational and ecological characteristics has been utilized for residential purpose, with meager land under commercial and

industrial uses. But utter deficiency has been observed in the extent of land under parks, playgrounds and spaces for public meeting, exhibition and resort.

The urban areas in Guwahati have grown under varying pressures and have been subjected to multitude

of problems due to lack of proper planning in the past. The land-use pattern that has evolved in Guwahati is essentially multi-functional in character. Shortage of relevant information for the early period renders past land use zoning of the city extremely difficult.

Table 2 : Changing Land Use Pattern in Guwahati City, 1957-1980

Land use category	1957-1958			1971			1980		
	Area in hectare	% of total area	% of developed area	Area in hectare	% of total area	% of developed area	Area in hectare	% of total area	% of developed area
Residential	882	31.10	55.09	1193.71	34.27	44.96	2908.90	47.27	45.11
Commercial	139	4.95	8.68	262.30	7.53	9.88	291.92	4.14	4.52
Industrial	10	0.35	0.62	61.01	1.78	2.32			
Public and semi-public uses	258	9.18	16.11	439.47	12.62	16.55	913.64	12.96	14.17
Parks and Playgrounds	33	1.28	2.06	81.03	2.32	3.05	26.79	0.38	0.43
Roads and Streets	279	9.92	17.43	617.17	17.71	23.24	1671.74	23.72	16.62
Vacant and unused land	1209	43.03	75.51	828.41	23.78	31.20	828.67	11.75	37.16
Total area	2810	100.00	-	3483.71	100.00	-	7047.87	100.00	-
Total developed area	1601	56.80	-	2655.30	76.22	-	6447.06	91.47	-

Source: Town and Country Planning Organization, Govt. of Assam.

A survey undertaken by the Assam Remote Sensing Application Centre shows that during the period from 1967 to 1990, there is an increase of urban land use from 76.91 sq km to 121.93 sq km in a span of 23 years.

Table 3 : Distribution of Land Use of Guwahati City, 1967-68 and 1990 (Area in sq. km)

Land use category	1967-68	Percentage (%)	1990	Percentage (%)
Built-up land	76.91	21.72	121.93	34.60
Agricultural	94.25	26.62	43.92	12.50
Forests	58.65	16.56	47.82	13.60
Wastelands	47.78	13.49	54.61	15.52
Water Bodies	76.13	21.60	82.68	23.45
Total Area	354.00	100.00	354.00	100.00

Source : Assam Remote Sensing Application Centre, Guwahati

The survey of the Remote Sensing Application Centre reveals that in 1911-12 the built up land in the city was confined only to the Uzan Bazar-Chenikuthi and Fancy Bazar area surrounding the two river ports of Brahmaputra – Sukreswar and Kacharighat. The area covered about 7.00 sq. km land, which has grown to 83.80 sq. km in 1967-68 and 132.19 sq km in 1990. The growth took a linear pattern along the river. The city is rapidly increasing in the recent years and the growth is found mainly in south, south east direction of the original city. The infrastructure facilities are also growing in the city with its gradual expansion.

4.4 The River and the City

The river Brahmaputra has played a unique role in maintaining Guwahati's scenic beauty, grandeur, health and prosperity. In fact the nourishing presence of the river in the heart of the city animates the dwellers and lends vibrancy to their day to day existence, sustains their culture and shapes their imagination. Moreover, it provides a variety of facilities and opportunities. Some of which are, however, directly visible, while many others need careful observation for assessing their contribution.

With the change of season and fluctuation of the climatic parameters during a year, the river changes its appearance, behaviour and vigour, which are reflected explicitly or implicitly in the city's natural environment. During the summer, when the river water rises up, the sand bars, locally known as chars, gradually disappear. The rising water often submerges the slopes of the river banks and even the busy roads in the city running close and parallel to the river are inundated during exceptionally high floods. The river fed with heavy monsoonal rain and melting snow in the Himalayas during the summer months, cools down its immediate surface air. The relatively cold riverine wind in the later part of the day proceeds to the city centre in order to lessen the temperature of the 'heat island' developed due to excessive heating of the metallic roads and other concrete structures including the high rise buildings. The peculiar wind not only regulates the city's micro-climate but also considerably diffuse the pollutants emitted by the ever-increasing vehicles and industries. Thus, the wind to and from the Brahmaputra bears great significance as far as the health of city-dwellers is concerned. During the winter, on the other hand, the moisture-free wind with slightly more speed carries large amount of powdery silts and finer sands from the exposed dry banks and the sand bars of Brahmaputra and makes the city life miserable. Very recently, this phenomenon has been getting

intensified in and around Guwahati as a result of increasing removal of vegetation cover and land degradation in the hill slopes within the city and its neighbourhood. Mud, which is carried by the run-off water from the hills, has been posing a serious health hazard as the dry mud, carried by the wind, causes eye infection and respiratory diseases.

Throughout the year, the river provides facilities for water transport. Guwahati is connected with most of the river bank towns of the Brahmaputra valley by ferry and motor-boat services. These ferry services facilitate movement of cargo, passenger, vehicles and animals from to and from the city and its neighbouring regions. Vegetables and pulses produced in the *chars* are supplied to the city markets, which are transported through the Brahmaputra. The Brahmaputra provides the perfect backdrop for developing an efficient inland waterways system for smooth connectivity with the rest of the country. While the river has been declared National Waterways 2 by the Ministry of Shipping, the waterway has not been utilized properly for effecting movement of goods and people. At present, ferry services are operated by the state run organizations between the south and the north banks of the river Brahmaputra primarily catering to movement of people. However, the ferries used for carrying passengers are old and do not have the capacity to carry vehicles thereby reducing the effectiveness of the entire system. The apparent lack of connectivity via this mode has contributed towards lack of development of North Guwahati in the past.

The river also sustains the fishing community of the city providing natural fishing grounds. Moreover, in some favourable areas of the river bank where the river regularly leaves fresh alluvium, market gardening is a very profitable economic pursuit. In such areas, the farmers raise a variety of vegetables and other winter crops for sale in the Guwahati market. The Dolabari-Dadara area on the city's north bank is the best example in this regard. Thus, the river has significant contribution in regenerating livelihood for the people living on its two banks through various economic activities like fishing, kitchen gardening, transport of passengers and goods, markets by the river, etc.

The most remarkable point in respect to the relationship between the city and the river is the continuous exchange of water. The natural topography of Guwahati is such that the rain water of all the areas on the south of Brahmaputra River are carried by river Bharalu and river Basistha to Deepar Beel and

ultimately discharge into the river Brahmaputra via Khona River on the west. However, because of the rapid increase of built up areas, the existing capacities of these natural channels are found to be inadequate to carry surface run-off. This has resulted in frequent flooding of most of the low lying areas of the city. In the north bank areas mostly the discharge is either directly to Brahmaputra or via Ghorajan River. However, backflow of the water from the river Brahmaputra due to blockage in the drainage system causes floods frequently in every summer. Moreover, highly flowing and meandering course of Brahmaputra obstruct the normal charge of water and thus the velocity is reduced which delays the passage of water resulting in stagnation of water.

Of late, this eco-city has also been witnessing a severe demographic hazard because of migration of people from other parts of Assam and the Northeast as place of opportunity. The growing urban congestion and extension of human settlement, roads and other constructions to the marginal and delicate areas like the hill slopes, fringes of the *beels*, wetlands and rivulets have now made the city's drainage highly complicated and increasingly inefficient. These have caused some severe problems such as killer landslide, erosion, water logging and flash flood.

Moreover, currently the river has become a 'natural dustbin' directly or indirectly for dumping the huge wastes of the city. This may pollute the river water, as in the case of some other rivers of the country, causing sufferance not only to the city-dwellers, but the people on the down streams as well. There is, therefore, an urgent need to take up planning in a sustainable way to keep the city's ecology intact. A well-planned relationship between the city and the river can help significantly in this regard.

River Brahmaputra generally has low pollution level. However, the river has been contaminated with bacterial pollution due to the discharge of raw sewage directly into the river without any treatment. Additionally, there is a backflow from the river during the flooding season in Guwahati. Within the city, the Bharalu Channel, criss-crossing a vast expanse of the GMA, discharges flow of rain water to the Brahmaputra. A major portion of the municipal waste, refinery waste water flowing from the Indian Oil Corporation Refinery at Noonmati, flows through the drain directly to River Bharalu. The waste water from the households, commercial and business establishments, small and medium industries within the city also flow into the Bharalu through the system

of mutually interdependent drains.

The flood water from Brahmaputra, into the region was naturally accommodated in the low lying areas on both sides of the main channel before the construction of Town Protection Embankments and extensive encroachments of human settlements but the appearance of these activities has aggravated the dimension of flood because of marked reduction in the water accommodating capacity of the channel. A glaring example of such embankment is the siltation of riverbed and its consequences in creating flood during the rainy season leaving major damages to the adjoining areas of the river.

5. Conclusion

Rivers are a great source of energy. All great cities are built on rivers, and a proper connectivity between an urban river and the process of urbanization can offer immense opportunities for growth and development of a city. A river in a region incorporates the community's history and culture and Guwahati, shaped by the River Brahmaputra, is one of the best examples in this regard.

In the mid-nineteenth century, many cities in the Western countries turned away from their rivers as railroads made water transportation obsolete. Waterfront streets and shops were abandoned. Industries and scrap yards overtook the banks. Many urban rivers were little more than open sewers, conduits for waste. But environmental consciousness is more prevalent today, fostering a stewardship ethic for natural resources. Growing interest in outdoor recreation has more people interested in what their local rivers have to offer. City planners are realizing that an attractive riverfront can act as a magnet that keeps people and businesses downtown and counteracts sprawl. Thus 'river renaissances' has become a very popular and important subject among the social scientists. Thus the present problem in Indian cities especially in the metropolitan ones is currently becoming relevant and it is no less so in a fast developing city like Guwahati of the Northeast.

The Brahmaputra flows through some of the most impoverished communities in the state. But the river's natural qualities and beauty have not been given due importance or made accessible in the city of Guwahati, of which it is in fact the lifeline. The Brahmaputra proves that nature does indeed exist in the city. Besides attracting tourists this vast river front can be a place of respite for the people of Guwahati.

Former President Dr APJ Abdul Kalam appealed that the Brahmaputra should not be taken

merely as a water resource but as “an economic proposition” which can transform lives for the better. He said that the river with a proper approach could emerge as a communication link to many

places and also facilitate tourism. Overlooking Assam’s signature river, this could be as impressive a riverside promenade as any in Europe or, as is the current fashion, Shanghai.

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