ABSTRACT

# THE GROWTH PROBLEMS OF GUWAHATI CITY AND ITS REGIONAL IMPACT

by

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## Introduction

Guwahati is a regional urban centre of North-East India known as the gateway of the region. The study area includes one municipality, two town committees, eightytwo sub-urban and rural areas and fifteen other areas like refinery, railway, military and university areas. The total area of Greater Guwahati is about 243.2 Sq.Km. including North Guwahati of 23 Sq.Km. area located on the northern bank of the river Brahmaputra.

## Problems

Like other old cities of India, Guwahati has also the bitter legacy of urban sprawl and unplanned growth. Topographic constraints, non-existent urban planning and particularly, encroachments on public land and non-enforcement of municipal regulations are the main reasons those have turned Guwahati into one of the ugliest cities of the country. The topography of Greater Guwahati, controlling the natural drainage, becomes ineffective during the flood season every year. Backflow of the ruling drainage, Brahmaputra through its outlets like Bharalu, Khanajan and Bondajan cause flood frequently in every summer. Water-logging in streets and the spill out of drain-water, together with rain and sewerage floods vast areas of the city becomes a menace to the citizens of Guwahati. On the other hand, landuse pattern inside Greater Guwahati is very peculiar. In view of the increasing population and pressure of land, it is of utmost importance to study the use,

misuse, overuse and underuse of land because it will help in proper planning in the region. It is in the light of this relationship between topography and landuse that the present study on city morphology of Guwahati is carried out.

**Objectives**

After shifting of capital of Assam from Shillong to Dispur in the eastern suburb of Guwahati, three exigent features cropped up. They are: (i) necessity for rebuilding the city, (ii) resolving the chronic problem of the city in war footing, and (iii) reconstruction of ecology. Natural increase of population together with migration of large numbers of official staff, business communities and other associated personnel tremendous congestion and chaos was suddenly created in the limited space of the city. This extraordinary increase of population led to unplanned expansion of the city. On the other hand, the chronic problems of the older city have remained impending over the people since long, demanding a rational resolution. The influx of people and reckless alteration of the landscape has brought hazards to ecosystem of the city environs. The cumulative results of all these activities makes imbalance the ecology of the city.

In this scene of chaos and confusion, a trained geographer has enough scope of throwing light on proper diagnosis of the root causes of the various problems and thereby suggest effective measures.

Here the topic that has been selected primarily due to following reasons: (i) low-lying areas of Greater Guwahati are filled

up resulting in obstruction to sewerage and drainage, (ii) abrupt rise of population, (iii) rapid spatial expansion of the city, (iv) great strains on civic amenities, and (v) water logging problem during the period of rainy season especially after every heavy shower.

Therefore, in order to throw light on the root cause of the unplanned growth - this study is found to be useful and indispensable. However, this problem could be effectively solved under joint interdisciplinary endeavour and in this context geographers view point would be of immense use.

**Hypothesis**

In order to achieve the above objectives, following hypotheses were tested in the study area.

1. The mighty river Brahmaputra and three rivulets become ineffective due to topographic constraint in Greater Guwahati during flood season every year.
2. Water level of Brahmaputra equal or exceeds to the danger level almost every year. At times all three rivulets, Bondajan, Bharalu and Khanajan receive water from their catchment area and inundated lowlying areas of most part of the city.
3. Rainfall intensity is higher during monsoon period and causes water logging in some parts of the city.
4. Population pressure over limited space and encroachment upon the land haphazardly became serious problem for proper planning.

5. Environmental degradation by hill cutting, earth filling, deforestation together with water pollution and air pollution etc. turned Guwahati into ecological imbalance.
6. There is a grading of influence from Guwahati city to the surroundings, i.e. Guwahati's influence decreases as the distance from the city increases.

**Data Base and Methodology**

The present ~~suty~~ study has been carried out on the basis of following categories: Firstly, relevant literature pertaining to the subject has been gathered from the books, journals etc. available in various libraries. Secondly, field investigation has conducted to get first hand information pertaining to the study. Various features of landforms and characteristics of rivers, streams, settlement pattern, market areas, transport network etc. have been studied and analysed. The study makes use of a large number of photographs to exhibit some of the significant aspects considered relevant. Thirdly, secondary data regarding the problems have been collected from various sources. Most of the data are unpublished records collected from Indian meteorological observatory centre, Guwahati, Brahmaputra Flood Control Department, Town and Country Planning Department and Guwahati Municipal Corporation. The published data have been taken from Census of India. There are many simple arithmetic calculations, formulae fitted to the problems and statistical method applied to evolve the results wherever necessary.

To find out average slope analysis the well known C.K. Wentworth's method has been employed. In case of rainfall analysis hourly data of seven years has been collected from Indian Meteorological Department. Average hourly variation of rainfall during monsoon period has been calculated by the following formula:

$$R = \frac{r}{n}$$

where R = average rainfall per hour

r = total rainfall of hour of the month

and n = total number of rainfall occurrence of the hour of the month.

In order to adopt a pragmatic approach, standard deviation and coefficient of variations of hourly data have been calculated on the basis of the following formula.

$$(I)\quad \sigma = \sqrt{\frac{\Sigma (x - \bar{x})^2}{n}}$$

where $\sigma$ = standard deviation

$x$ = hourly rainfall

$\bar{x}$ = mean hourly rainfall

$n$ = number of observation

and $$(II)\quad CV = \frac{\sigma}{\bar{x}} \times 100$$

where CV = coefficient of variation of mean hourly rainfall

$\sigma$ = standard deviation

$\bar{x}$ = mean hourly rainfall

The data regarding various levels of water in Brahmaputra has been collected from Brahmaputra flood central Department for the monsoon period of 150 days (May to September). The average water level percentage of 150 days and cumulative percentage of 150 days has been calculated.

For demarcation of the influence zone boundary, the 'Gravity Potential Model' (based on Newtonian Law of Physics and modified one) has been used for Guwahati city and its surrounding towns. The model is as follows:

$$(I) \qquad P_p = \frac{P_i}{d_{ij}}$$

where $P_p$ = population potential at a centre

$P_i$ = population of the town

$d_{ij}$ = distance between the main city and j-th town

Another model regarding the attraction of surrounding towns and main city Guwahati, the 'Breaking Point Model' has also been applied.

$$(II) \qquad BP = \frac{d}{1 + \sqrt{\frac{PZ}{PY}}}$$

where BP = breaking point

d = distance between the two trade centres

PZ = population of larger city

PY = population of smaller city

This way most of the parameters have been analysed and presented with the help of suitable diagrams and other cartographic aids.

**Summary of the Findings**

So far physiography and geology are concerned, the city located within a crescent shaped basin surrounded by a number of hillocks. The hills are outliers of the Meghalaya plateau, predominantly residual in character. The plains along with swamps and depressed parts are situated in between the hillocks. The low-lying areas are inundated often at the time of heavy rainfall. The oldest precambrian rocks and infilled alluvium precisely indicating low permeability of the area which is responsible for water overflow in certain places.

Tremendous increase of population during last two decades posed serious problems to the Guwahati city. Influx of the immigrant both from inside and outside the state into the city is the prime factor of population explosion. Transfer of capital and establishment of new industry and rampant growth of commercial activities added salt into the problem. Encroachment over vulnerable lands, growth of several new colonies, filling up of low-lying areas for residential establishments led to abrupt and abnormal horizontal expansion of the city. All legislative checks and control on land-use pattern for planned development of the city was foiled completely. Unplanned growth of city functions resulted into the present chaotic civic situation in the city.

From the average slope analysis, it is observed that the elevation of land in Greater Guwahati gradually falls from east to west, with exception of interbasin high grounds. The natural drainage always follow the slope of the land. The artificial drains are not constructed along the natural slope of the land. Hence the flood and water logging is obvious during the heavy rain occurrence. However, the diversion canal in the Dipar basin has relieved to some extent from the flash flood caused by the river Bharalu. The Khanajan river is linked with the Brahmaputra and it discharges water from Dipar bil. The Bondajan is the outlet of Silsako bil.

During the peak period of discharge, the Brahmaputra water level rises up and frequently crosses the danger mark. The cumulative graph shows about 10 days the Brahmaputra water level reaches the danger level or exceeds it during this period. At the same time of high water, the sluice of Bharalu, Bondajan and Khanajan are closed to stop the backflow from the Brahmaputra. Eventually, constant closure of the sluices results inundation in the low-lying areas, as the accumulated water cannot flow out the catchment area.

The river bed of Bharalu from Zoo road bridge to Lakhra road bridge point (Cherapbhati Chariali) is found to be of higher elevation than the upper course. This is perhaps due to meandering course and deposition of enormous silts. This area should be regraded and resectioned with proper design so that the water volume discharged properly even in high peak runoff.

Rainfall analysis provides adequate background information not only on the climatological process and hydrological forcastings but also for city planning. From the rainfall analysis it is apparent that Guwahati experiences about 8 peaks hours of high intensity rainfall periods in one monsoon season. At times, surface runoff together with silt eroded from surrounding hill slopes inundates the low lying areas of the city. The intensity of hourly rainfall is kmaximum in June and is always alarming as it exposed the inherent drawbacks of the Guwahati's drainage system.

The natural environment is progressively destroyed for unplanned construction and landuse. Removal of plants cutting of hill sides, unplanned construction of buildings and roads, release of industrial wastes to the drainage channels, stagnation of filthy water in the intermittently unfilled depressions, which become the breeding place of mosquitoes, etc. have created serious problem of environmental pollution, endangering the health of civic life of Guwahati.

So far the relationship between Guwahati and its surrounding region the economic and social criteria has been examined. The economic criteria selected for the study are bus service and retail trade while the socio-cultural criteria are newspaper circulation, education service and health service etc. Both the empirical and theoretical methods have been applied for its precision result. Though few smaller focii of attraction have been found still regional pull of attraction in Guwahati City only.

**Suggestions and Recommendations**

The following suggestions and recommendations seem to be useful for future planning for its growth and development.

1. It is utmost necessary to constitute a coordination committee between the Town Planning Organisation, Municipal Corporation, Guwahati Development Authority, Flood Control Department, P.W.D. (Roads) and Deputy Commissioner (Development) for effective development of the city.

2. A town research laboratory is essential to survey slope of local topography. This laboratory will examine the silt amount carried by runoff, seepage capacity of soil and evapotranspiration of vegetal covers which will help to determine the runoff of the area.

3. A few meteorological substations are to be set up within the city for long term observations regarding rainfall distribution for short interval, and at Kilometer distance.

4. Unauthorised encroaches are to be evicted from vulnerable points for which strict legislative control will be necessary.

5. Land allocation and utilization should be made under the provision of urban land utilization act.

6. Strict vigilance are necessary for restricting the unauthorised construction.

7. Proper legislation for avoiding environmental pollution and disposal of industrial waste is urgently necessary.

8. Aerial photograph of Greater Guwahati should be taken for proper landuse planning.

9. To avoid further congestion in southern bank of Guwahati the capital of Assam should be shifted to North Guwahati with immediate effect provided a link road bridge over the Brahmaputra from Sukreswarghat to North-Guwahati.

10. The diversion canal of Bharalu to Dipar bil seems to be ineffective during heavy shower. Hence, it should be redesigned, resectioned, and regraded for its easy discharge of water.

11. In addition a canal parallel to Brahmaputra in its southern part from Dipar bil to Dora bil should be constructed as early as possible. Then only Guwahati city will be relieved from flood if it attain even metropolitan character.

This work cannot be claimed to be all pervading and complete in all respects. There are ample scope for further investigation in this field by geographers. However, the contribution made through this humble work within a short period might be helpful in tackling this age old problem.

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