Chapter VII

SUMMARY AND CONCLUSION

7.1 Summary

The research work under the titles’ spirit and purpose examines several research questions relating to landform characteristics and its influence on urban development in the Goalpara urban area. The research work also studies the pattern and problem of urban development of the area concerned. On the basis of the landform characteristics, the Goalpara urban area is divided into seven landform units. Each landform unit has unique characteristics. The work also focuses how different landform units have their differentiated impacts on urban development.

The whole research work has been divided into seven chapters. The Chapter I contains introduction of the research work including statement of the problem, review of relevant literature, the study area, objectives of the study, research questions, database and methodology and significance of the study. Chapter II describes geographical background of the study area including location and situation, physical bases of landform, geological and geodynamic background, topographic characteristics, hydrological background (drainage and water bodies, ground water characteristics and potential), climatic characteristics (rainfall pattern, temperature and humidity), natural biotic environment and edaphic characteristics. Chapter III carries the study of landform and flood characteristics including introduction of landform, relief characteristics (absolute relief, profile characteristics, relative relief, slope characteristics, dissection pattern), physiographic division and characteristics along with a short description of flood characteristics. Chapter IV contains socio-economic character which includes distribution and density of population, community distribution and characteristics, and economic background of the people. Chapter V describes pattern and processes of urban development in the Goalpara urban area which includes history of
urbanization, locational characteristics of Goalpara as urban center, present status and trend of Goalpara urban area, pattern of urban development along with growth of satellite market centers in the Goalpara urban area. Chapter VI contains problems of urban development including perennial and emerging problems and mitigation of problems. Chapter VII has forwarded the summary and conclusion of the study. And lastly, bibliography is included which underline different sources and reference materials used in the study.

The first work of research for the study area is to prepare the base map from Cadastral map of 1: 3960 scale and Indian topographical maps of 1:50,000 scale in consultation with relevant satellite images. Contour map is prepared from topographical map even as the GPS survey was also carried to incorporate more contours and necessary details in order to obtain a sound base map. Physical characteristics are analyzed based on extensive maps drawn and the field survey. The necessary information are collected from primary and secondary sources. The climatic data on rainfall, temperature and humidity are collected from Goalpara District Agriculture Office. The hydrological data for water flow analysis are collected from concerned water resource department of the Central and State governments. The socio-cultural and economic characteristics of the study area are analyzed based on field survey and secondary sources of data. The landuse and road maps are prepared from Landsat TM satellite images and Google maps respectively. The impact of landform on urban development within the Goalpara urban area are identified and analysed mainly based on field observation, even as different sources are taken for help.

The whole research work is primarily based on field survey and observation, and collection of primary and secondary data and the analysis of the same using available statistical techniques. But there are some limitations experienced during the work and report writing. These limitations includes (i) limited reference and data relating to background information of the Goalpara urban
area (ii) secondary sources of data are very scanty, (iii) absence of continuous records of relevant data for desirable periods, (iv) lack of reliable data from government and non-government agencies, (v) scanty meteorological data for the study area.

7.2 Findings

The findings of this research work based on analysis of field observation and secondary data along with concepts are summarized below:

i) The Goalpara urban delimit encompasses a small area characterized by variation of topography, soil, and landuse. The contour map which is prepared from topographical map and GPS survey shows the variation of relief within 43 and 323 meters.

ii) The Goalpara urban area is composed of three major geological formations from Archean gneiss to Sub-Recent formation. The Archean granite and gneisses are exposed in the Holukanda, Rangagara and Pancharatna hillocks. The area has a number of wetlands and ponds. Among them the Hasila beel (wetland) is the largest in respect of area, which plays a significant role as a water reservoir in the study area.

iii) The study area had been experiencing high, medium and low intensity earthquakes. The earthquakes that had occurred in 1897 and 1950 damage land, drainages and buildings. This kind of disturbance did occur in the Holukanda hill due to the great earthquake 1897 of 8.7 Richter scale.

iv) The Goalpara urban area experiences the sub-humid tropical type of climate. The average annual rainfall recorded is 2322.5 mm during 1994-2012. The highest rainfall recorded during the period was as high as 5168
mm in 2004. During 2011, the annual average rainfall is 1868.1 mm, temperature is 20.47\(^{0}\)C and relative humidity is 86.08 percent. All this have shaped accordingly the surface of the Goalpara urban area and the activities thereon.

v) The study area is very rich in flora and fauna. Most of the area falls under the tropical deciduous forest. The forest is mostly dominated by Sal trees, besides Teak, Gamari, Simul and other medicinal trees. The wetlands also support various type of aquatic flora. The forest in the area had at times kept intact producing a highly conducive ecosystem. Now much of the ecosystem is disturbed due to a number of causes - man-induced as well as natural causes.

vi) The varieties of soil layers including the lateritic, old and new alluvium have exercised geomorphologically significant roles.

vii) Relief is a very significant component not only to analyze geomorphic features but also to have the degree of relationships of man and nature. The absolute relief in the Goalpara urban area varies between 43 and 323 meters, while the relative relief varies between 2 and 220 meters.

viii) The average slope of the Goalpara urban area varies within 0\(^{0}\)13\(^{\prime}\)29\(^{\prime\prime}\) to 14\(^{0}\)57\(^{\prime}\)0\(^{\prime\prime}\), while the dissection index varies between 0.07 and 0.83, the averages being 0.6.

ix) Based on geological structure, topography and relief pattern, the Goalpara urban area is divided into seven different landform units, viz. (a) the Hilly area, (b) the Colluvial plain, (c) the Undulating plain, (d) the Built up plain, (e) the Flood plain, (f) the Active flood plain and (g) the Wetland. Each unit has a significant role to develop the socio-cultural and economic development of the study area.
x) The impact of landform characteristics on population distribution is very significant in the study area. The hilly area which accounts for 15.69 percent of the land area supports 1.18 percent of population while the built-up plain covers 12.15 percent of the land area but supports 55.62 percent of population as per 2001 census of population.

xi) The rapid growth of urban population in the Goalpara urban area is because of inclusion of large areas revenue villages in the newly constituted urban area. The natural growths within the urban population and in migration of population from neighbouring areas to urban area have also rendered increase in growth rates.

xii) The average household density in the Goalpara urban area is 214 households/ km² and the family size per household varies from 5 to 6 persons.

xiii) The diversity in population composition is observed in the study area where scheduled castes, scheduled tribes and general categories of population live together in peace and harmony with their own traditional customs, culture, language and religion in the Goalpara urban area.

xiv) The Goalpara urban area has 30.28 percent of total population identified as working population where the female workers accounts for 11.30 percent as recorded in Census 2001.

xv) 87.00 percent of the total working population in the Goalpara urban area are engaged in non-agricultural activities (household industry workers 1.70 percent and other workers 85.30 percent) as per Census of 2001.

xvi) The literacy rate within the study area is 58.22 percent with a remarkable variation in the different landform units. The built-up plain registers
65.68 percent of the total literates while the hilly area accounts only for 0.92 percent.

xvii) The Goalpara town established in 1875 can boast of as the second town committee in Assam in the backdrop of annexation of Goalpara by the British.

xviii) The expansion of the Goalpara urban area has been restricted by the river Brahmaputra in the northern side, the Holukanda and the Pancharatna in the eastern and western sides respectively. The expansion of the urban area has therefore been going in the southern boundary only.

xix) The developmental process of the Goalpara urban area is very slow because of non-existence of strong economic base.

xx) The expansion of the Goalpara urban area took place at different stages of time. In 1971, Goalpara Municipality covers an area of 5.95 km$^2$ with 12 Municipality wards, in 1991, more areas were included in the Municipality and the area increased to 12.18 km$^2$ with 19 wards. The Government of Assam through a notification dated Feb.26, 2004 let to include more revenue areas under the Goalpara urban delimit (Goalpara Master Plan) covering altogether an area of 72.03 km$^2$.

xxi) The Goalpara urban area comprises 51.45 percent of unusable land covered with reserved forests and hills. As many as 18.17 percent of this area has already been used for residential and other purposes and the remaining 30.38 percent of land can be utilized for future urban growth.

xxii) The Goalpara urban area due to connection with the Naranarayan Setu over the river Brahmaputra has created an atmosphere of better communication with far away distances from the Goalpara urban area.
xxiii) Goalpara has been continuing as an important market center since 1792. Physical layout of the landform in the Goalpara urban area limits continuous expansion of the commercial activities and as a result the satellite market centers are developed in different areas.

xxiv) Due to unplanned expansion, the Goalpara urban area has been facing a number of perennial and emerging problems. The most noticeable emerging problems associated with urban expansion of the Goalpara urban area are wetland encroachment, water logging and landslides.

7.3 Conclusion and suggestions

Unlike many other urban centers in Assam, the Goalpara urban area has passed a unique status and trend of development since 1875. There are lots of positive points in the urban area in the midst of many negative points. This urban area on a nodal point of the backbone of Assam must be taken care of.

In view of the practical significance and academic importance of the research problem, an attempt has been made here to put forward some suggestions based on field observation and experiences gained in course of the research.

i. As the development of an urban area needs multi-faceted requirements, the urban development authority should be equipped with modern tools like use of satellite images for monitoring the development aspects with the help of valuable traditional system, Geographical Information System (GIS) and Global Positioning System (GPS).

ii. Proper database is to be formulated and maintained for the sound health of the urban area like the Goalpara urban delimit.
iii. Restructuring of urban landuse should be carried out on the basis of landform characteristics and pattern.

iv. Feasibility and workability in response to physical characteristics of different landforms and their relationships with the dwellers’ perception and need be studied for the balanced development of the urban area.

v. The set of geomorphological data generated through this research work on the Goalpara urban area will help plan for the proper utilization of resources of the area.

vi. Researchers should be encouraged to take up projects to investigate the problems and prospects of the Goalpara urban area.