Chapter I

INTRODUCTION

The Problem

The Brahmaputra valley is a land-locked area. It lies between 89°40'E to 96°E longitudes and 25°40'N to 28°N latitudes (Figure 1). There are certain unavoidable natural difficulties of terrain and topography for growth and development of other means of transportation like railways and airways, where roadway communication is the only alternative. Development and maintenance of roadway is naturally more economic than other means of transportation. The present communication system of the Brahmaputra valley is the nerve centre of communication to the neighbouring States like Arunachal, Nagaland, Tripura, Mizoram, Meghalaya and also to Bhutan. Obviously transport and communication plays the vital role in the process of economic transformation of Assam as well as the neighbouring regions.

Owing to physical and economic strains, road transport is the only vital means of inter and intra regional mobility. It is not enough to consider the road transportation network as an important organic element of a social and economic system of the valley. The entire
gamut of geographic, economic, social and cultural interaction is motivated principally by the system of transport arteries that are in existence at time and distance. The system not only provides mobility of the people and their goods between fixed points over time and distance but also generates motive forces for its future growth and development.

The Brahmaputra valley has a personal identity. The valley is structurally homogeneous in character. The other qualities such as relief, climate, soil characteristics etc. are also identical throughout. The life process of the valley is primarily determined by its physical configuration. Therefore the valley may be considered as distinct geographical region.

The valley may also be recognized as a functional region as it functions in a variety of ways for the cause of entire North-East India. Being a land-locked valley, the entire flow of man and material to and from the neighbouring regions is controlled by a number of transport nodes within the valley. Consequently the responsibility of the valley cannot be undermined so far the activities and usual growth processes of the neighbouring states are concerned. On this ground the functionality of the valley can not be overlooked. Geographers adopt two
different points of view in identification of regions: Uniformity and Functional Organization. When the geographer searches for uniformity in a region, he stresses on the manner in which the different points of the region are similar or dissimilar. When he examines the functional organization of a region, he stresses the manner in which the different points within the region are linked to each other or to other points outside the region.

Now the question arises how far the physical homogeneity and functionality of the region has been the stimulus for economic development of the region and how far the road communication has been able to deliver the goods? To obtain an answer to this question, a comprehensive explanation regarding its physical and economic setting is warranted. The Brahmaputra river with its numerous tributaries, variable gradients and sources, the scattered hills and hillocks, all remain as colossal physical impediments for the construction of highways.

For most purposes, surface highways or railways seek high firm and well-drained ground. But the

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Brahmaputra valley is composed of alluvial materials, lacks the firmness of the ground which causes frequent damage to the roads.

The roads generally do not follow river routes except the main river the Brahmaputra and are aligned transversely in order to connect the settlement areas and markets. Being an alluvial plain, the valley is crisscrossed by innumerable streams and streamlets. This has necessitated construction and maintenance of countless bridges and culverts at close intervals and at a very heavy cost.

The vagaries of weather and climatic conditions are other bottlenecks that impede smooth running of traffic over the valley. Seasonal floods are almost a regular feature in this region. Damages and breaches of road communication annually drain a substantial amount from the State and Central exchequer. Thus the land-forms, drainage systems and climate etc. are not wholesome and conducive for construction, maintenance and operation of transport system in the State.

The present net-work of roads in this region is the outcome of a series of specific historical interests. Many of the present lines are innovations of the older ones.

Economic development of a region depends upon the inertia of productivity. The exploration and processing of
the products are streamlined, rather augmented by approachable lines of transport facilities. Agricultural or industrial production in whatsoever form it may be, seeks movements from points of production to points of marketing and distribution. The quick movement of the products is generally performed by the roadways in the region. As roads give the door to door services with least transhipment cost, it is a universally desirable service for all concerned. The limited railways, the high cost in air transport and underdeveloped water transport facilities have compelled the producers, consumers, industrialists and others to depend mostly over road transport. The roads also serve the railways and waterways as effective feeder lines.

The recent technological improvement in the automobile industry has been responsible for a revolutionary changes in roadways world-over and Assam can not be an exception. The dense network of roads in the valley pinpoints the limitations of railway services, especially between the centres of settlement and markets. The roads provide facilities of intercommunication of settlements and at the same time, enhance the accessibilities of farflung areas.

Usually the pattern of the road network is the product of the geographical characteristics of the area.
concerned as well as its degree of economic viability. In the present stage of development, roads are the major channels of both inter and intra-regional transportation of goods and people. The interactions of various market centres of the valley region is greatly facilitated by roadways.

Growth of population and settlement is another important factor that demands ever-increasing facilities of movement. The growth of new linkages is also motivated by this ever-increasing population force.

From the existing network, a number of patterns or transport zones could be identified viz. dominant type of transport zones, transport combination zones, transport density zones, adequate and inadequate transport zones etc. But the task of delimitation of the above zones poses great difficulties primarily for unavoidable superimposition.

The big towns and the district headquarters serve as the nodes in the road transportation system. Some of the nodes in the transportation network have easy access to all other nodes whereas others are remote. So a question of fundamental importance concerns the relative accessibility of these nodes. Each node has its own locational advantages. A significant characteristic of nodes in a network can be represented by the term gateway which might be attached to
cities located in transitional zones between major regions or to cities where routes fall out on one side and are concentrated on the other.

The existing pattern may also be looked upon as the result of distinct nodal organization based on linkages. The linkages in turn lead to the growth of hinterland or zone of influence at variable levels. But it becomes problematic to bring the entire system into a systematic orders or nodal organizations, primarily for its linear geographical configuration. Moreover the trunk linkages tend to shatter the hinterlands or the zone of influence locally which make it more difficult to demarcate the hinterland neatly in a series.

**Objective**

The road transport is considered as an important organic part of the social and economic system of a region. So it is attempted to show that road transport system in the valley forms a part of geographic, economic, social and cultural milieu which together determine the development of the region. Perhaps, the study would be more meaningful in the present context if the objective is directed towards deeper understanding of the functional role of the road transport.

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Therefore, the study is initiated with the following questions in mind:

(1) To what extent the physiography of the Brahmaputra valley region plays an important role in the present lay-out of the road transport network? How far the geologic and climatic influences have contributed towards its present roadways structure?

(2) How the present network of roads is the outcome of the historical past?

(3) To what extent cultural background is responsible for its present status?

(4) What role the population and settlement plays in developing the linkages and in conditioning the existing network for easy and comfortable mobility?

(5) How far the intra and inter-regional traffic flow of the region is controlled by the roadways?

(6) Whether the existing system shows nodality and whether the nodality could be put in orders to find out the relative accessibility?

(7) Whether the nodal centres have their commanding hinterlands or the zone of influence and whether the hinterlands could be demarcated?
(8) Whether road net-work subserves economic growth or the economic growth of the region is subservient to road net-work development?

Significance of the Study

The significance of the present work lies in its correlative nature and in selection of the homogeneous geographical area of investigation i.e. the Brahmaputra valley. Relatively, few studies attempt to view the economic geography of transportation net-work within an area as a whole or examine the nature of the relationship between transport provision and economic growth.

These two aspects of transport geography are of vital significance in under-developed countries like India. While road transport for its easy accessibility and the regional economy have been recognised to be significant in the development of a region, yet no such attempts are made especially in this part of the country.

Moreover, the study of road transport as an important limb of a single economic process and regional analysis is mere limited in its scope primarily for paucity of relevant

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data, particularly in a developing country.

Significance is also laid on this type of study because the road transport and the market centres form important aspects of the total economic and cultural complex of a region. The markets provide, principally a base for collection and subsequent distribution of various agricultural products of neighbourhood. Most of such market centres have originated largely as rural centres and subsequently assumed urban characteristics by virtue of their modality, function and services.

Investigations in the present road net-work, related growth of settlements, functional zones etc. would perhaps open new vistas for further research in the field of transport geography. Besides the finding of such studies may also assist in preparation of future transport plan blueprints.

**Methods of Investigation**

The present work has been undertaken with the help of two principal sources, viz. (i) Maps, Statistics and available Literature and (ii) Direct Field Observation and Survey of the phenomena associated with transport and markets.

The statistical methods are applied in various aspects for testing the relevant phenomenon and analysis of data.
A simulation model has been used to measure the accessibility of roads in terms of population distribution and major topographic barriers. This suggests that a possible avenue of future investigation of transport expansion in underdeveloped countries might be the application of a simulation models such as the Monte Carlo technique applied by Tersten Hagerstrand in his migration studies (Hagerstrand 1965)4.

In an analysis of the growth of transportation in Nigeria and Ghana5, Taaffe, Morrill and Gould pointed out a strong positive correlation between population and the density of the road system in those countries. Again in an analysis of Turkish railroads John Kolars and Henry J. Malin found that the simulated and real networks showed a high degree of correlation6.


In a discussion of spatial flow, William Warnitz has pointed out that "major transportation arteries in the United States occur on major ridge lines as defined on the potential of population surface".\(^7\)

The success of the simulation model applied in case of Turkish railroad and other analysis of growth of transportation in terms of population distribution have offered further means of analysing road transportation network in the Brahmaputra valley, a part of the developing country.

The advantage of the simulation model is that it helps to verify the hypothesis that the location of roads in the Brahmaputra valley region reflects relative situational advantages with respect to major population concentration as well as general population distribution.

The intensity of traffic in the major arteries of the region with the help of the traffic flow cartograms are shown in the study.

It has been attempted to represent in a simple diagrammatic forms, the hinterlands of the regional centres in terms of bus traffic within the sphere of influence of each service centre. Hinterlands are arranged in hierarchic

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\(^8\) Edward J. Taaffe and Howard L. Gauthier, \textit{op. cit.}, pp. 17-33.
order.

The structural property of the net-work of each hinterland is measured by using the Alpha, Beta and Gamma indices. These three indices are most common and simple measurement of connectivity⁹.

The relative accessibility of each of the urban centres has been found out with the help of the bus traffic, originating and passing through those centres. All the centres are arranged in hierarchical order.

Organization of the Study

The whole study is divided into six chapters on the basis of sequence of the study. The chapter II deals with the geographical personality of the selected area. The personality with regard to history, physiography, climate and its various cultural aspects like demography, agriculture, industry etc., is briefly discussed.

Chapter III describes the evolution of the roads in the Brahmaputra valley in time sequence. The evolution is divided into four periods namely the Ancient period, the Ahom period, the British period and the Post-Independence period. It is attempted to show how the road net-work of the

⁹Peter Haggett and Richard J. Cherley, Net Work Analysis in Geography (Edward Arnold Ltd; "Printed in Great Britain, 1969), pp. 31-35.
valley region has got the present set-up step-by-step in relation to the growth of population and their economy.

Chapter IV inquires into the factors which determine the present lay-out of the roads. The attempt is made to show how the design of the roads was influenced by the physical factors like physiography, geology, climate etc., while the motive forces like population, agriculture, industry etc. gear-up the development of roads in the region.

In Chapter V, a quantitative and qualitative approach is made to correlate the routes with the flow structure of the region. In the first step, the nature of linkages is described followed by the application of Simulation model. With the help of the model, a set of routes are identified in terms of population demand. The model is confined only to the nationalised routes and the population peaks of 5,000 people and above.

The accessibility of the urban centres in terms of positions in the road-net is measured. The traffic flow of both men and materials are described with the traffic flow cartograms whereby the density of traffic in the roads is visualised. The attempt is also made to find out the accessibility of the urban centres in terms of passenger services and the centres of dominant association of each of the urban centres. Again, through the application of the Nearest
Neighbour Analysis, the pattern of distribution of the bus trip destinations of each of the district headquarters are found out. This is done in order to evaluate a measure for the functional jurisdiction of each of the district headquarters. Lastly, the bus traffic hinterlands in a very simple diagrammatic form have been determined and the structure of the road-net in each of the hinterlands has been examined through a number of indices like Alpha, Beta and Gamma.

The last chapter contains the summary, synthesis and concluding remarks on the entire study. Here an attempt is made to compare the quantitative findings with the realities and a comprehensive and concrete steps are suggested for perspective improvement and planning in road development in the Brahmaputra valley.