PROBLEMS OF URBAN PASSENGER TRANSPORTATION

A CASE STUDY OF THE SUBDIVISIONAL TOWN

BISWANATH CHARIALI

BY

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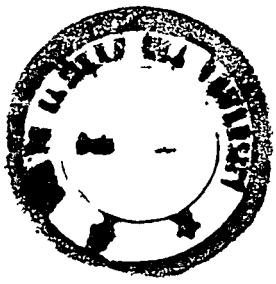

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CERTIFICATE

Certified that the subject matter of this dissertation is the record of work done by Mr. Apurba Kumar Medhi, and that the dissertation has neither submitted for any other degree in any other University nor published earlier in any other form.

He has done a commendable work in the field of Transport Economics and I sincerely believe that he deserves to be awarded Master of Philosophy (in Economics).

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SHILLONG
The 30th April 1987

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(APURBA KUMAR MEDHI)

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LIST OF TABLES

CHAPTER - I

INTRODUCTION

INTRODUCTION

The importance of transport is increasing every day with developments in the field of ways, means, motive power, engineering techniques, organisations, legal enactments, and social, economic and political factors. It is commonly agreed that the urban transportation has serious problems. For over a long period people come from rural to urban areas for better opportunities and modern living. The towns grew both in population and spatially.

The study is devoted mainly to Biswanath Chariali township of Sonitpur district, Assam. This town has been growing an importance since it has been declared a headquarter of the sub-division. Its earlier importance as well as present so far the location of the tea plantation is concerned with the importance has been felt very much. The present transport network is insufficient to meet the need of transport facility of the town, due to the rapid growth of population, development and growing importance of the town.

The objectives of the study will be devoted mainly to the:

(1) Demand for transportation.

(2) Impact of transportation upon economic development.

The transport product is very complex. It is not simply to transfer a consignment from one location to another but to do so at certain time, with a specified degree of security, safety and so on. Transport service is itself a mixed product, the component proportions which can be varied. A variations in the customer requirements with respect to speed or certainty of delivery may change the demand for a particular mode of transport in ways which seem inexplicable or even irrational on a simple analysis of the price-product relationship.

Transport demand is largely a derived demand. It is demanded not because it gives satisfaction directly but because it enables person or goods to be relocated in such a way as to allow a direct demand to be satisfied. This is obviously true of goods; one does not move goods just for satisfaction of moving them but because they are demanded in some other place. It is also generally, though not universally true of person movement. Most people make a journey to work because they prefer to live away from their place of work (or to work away from their residence), not because they like travelling. Relatively, few people travel merely for the joy of travelling. The important implication of this characteristics is that one may need to know a great deal about the basic demands which generate transport needs

and to be able to forecast future demand for those activities in order to understand and forecast the transport demand itself.

The urban transport situation can simply characterised as follows. There presently exists a road and public transport network which, however, efficiently it is managed, is of limited capacity. The more traffic we attempt to load on to the system, the poorer its performance in terms of speed, reliability and environmental acceptibility. In order to formulate urban transportation plans, it has been necessary to analyse what factors presently determine choice of mode and what values to attribute different alternatives services in the future.

We honestly believe that this type of study will not only bring out the problems of urban transportation as such, but also enable the town planners to optimise the use of land through proper planning of human activity, areas, business establishments and human settlements.

1.2. Brief review of the chapters in the dissertation

A brief outline of each chapter is as follows:

Chapter - I is the introductory chapter where scope of the study, main objectives of the study and area of the study briefly described.

Chapter - II is devoted to brief review of the related literature about the transport systems and problems. We set the scene, conceptually and historically. We discussed the nature and problems of urban transportation, impact of transport upon economic activities, modes of transportation in urban set up, nature of demand for passenger transportation and synthesis of demand.

Chapter - III is concerned with historical sketch of transport situation in Assam, district of Darrang, and Biswanath Chariali town respectively. This chapter is divided into three parts. In part 'A' we described the transport situation in the State of Assam. Part 'B' contains a short historical survey of general background and transport situation in the district of Darrang. Part 'C' is devoted to give an over view of general background and transport situation with respect to the town of Biswanath Chariali.

Chapter - IV deals with the data base. It was discussed how data were collected. It contains also the groupism of data and modes of transportation, family size, income, total number of trips and expenditure on transport etc. taken for consideration in research work.

Chapter - V contains methodology of study and empirical analysis. At the beginning it deals with the theoretical

description of demand for transportation. Modes adopted for empirical analysis of data is given in the Chapter. In empirical analysis regression equation has been fitted to find out the proper modes of distribution.

Finally, in Chapter - VI, we concluded on the basis of our entire findings and suggestions for future works.

1.3. Limitations of the Study

In this essay, we only could begin the problem and for a real analysis of demand for transportation is very difficult to make, due to the unavailability of appropriate information and time bound submission.

CHAPTER - II

REVIEW OF LITERATURE

REVIEW OF LITERATURE

2.1. Introduction

Let me introduce this chapter by quoting one of the great masters of Economics:

> "The transport industries which undertake nothing more than the mere movement of persons and things from one place to another, have constituted one of the most important activities of men in every stage of advanced civilization."
>
> (Marshall A. Industry and Trade (1919) p. 423)

Transport has an important positive role in the economic, social and cultural functioning of the world. Modern means of transport, through their fast, safe and efficient services have broken the distances, frontiers and united the whole world into one thread. Raw materials are carried to factories over long distances in national overseas markets, commercial commodities are dumped in scarcity areas within no time for processing, finished goods are distributed for consumption in national and overseas markets, perishable commodities are safely and rapidly distributed ever for and distant places. Similarly, it carries person from their homes to marketing centres, offices, work places,

marketing centres, offices, work places, educational centres, pilgrimages, and various places of historical, natural, cultural, national, industrial and commercial importance. Transport through its widespread network keeps goods, persons, ideas, literature, culture and researches mobile and infuses life in the society in the same way as veins and arteries keep the blood circulatory, in the human body to keep it alive. Without this mobility the society would become stagnant myopic, secluded and probably dead. The introduction of transport system in an area opens new vistas of economic activity gives a kick to dormant potentials inspires hope and life among the people of that area.

2.2. Nature and problems of Urban Transportation

The nature of urban transport (passenger) is a very complex subject. Transport is also held responsible for urbanisation and concentration of population in cities and towns. Workers are attracted to cities or towns in search of higher wages, employment and modern amenities of life. The nature and intensity of transport problems in the town depends upon various factors like the distance to be covered, nature and volume of trade, nature of industries size and nature of population, administrative offices, pilgrimages centres, schools, colleges and universities, court, hospitals, nature of feeding transport etc. Cheap and efficient and fast

transport is needed in the towns for passengers and for goods, labour to the factories, businessman to the shops, employees to the offices, students to the schools, colleges and universities and various such groups to go every morning and come back every evening. Moreover on account of long distance in the urban people require some means of transport for various other purposes like marketing of items of daily use, seeing pictures or going for recreation, meeting relations and friends or visiting places of interests. Besides, every day thousand of persons visit the towns for marketing, attending college, going hospital, attending court or other offices, tourists, salesman and distributors and likewise they move out through the railways or motor buses. The town needs passenger transport service for this purpose, i.e. city transport service for feeding railways or motor buses. In cities or towns therefore the nature of passenger transport requirement is much more complex and hence speedy frequent, flexible cheap, convenient and punctual passenger service is necessary.

The urban transport system management policies usually aim at restoring human scale to the city and preserving it as a centre of economic, social and cultural life. These policies refer to objectives which can be classified into three brand goals of efficiency, equity and quality.

The goal of efficiency refers to the better management of available resources, in particular the objective of better use of existing transportation system and available technologies and optimal use of land energy resources. This goals therefore, emphasise the search for less costly solutions which do not require heavy investment.

The goal of quality refers on the one hand to the reduction of the negative external effects of traffic, particularly in terms of noise, air pollution, accidents, consumption of public space and disruption of social and economic interactions; and transport service (accessibility, particularly to central areas, travel time, congestion).

The goal of equity refers to the objectives of a better response to the differentiated travel demands various groups (the handicapped, the young, the elderly); of a correction of the disparities between those who do and do not have access to a car; of a better distribution of the incidence of financing of transport among the users, the tax payers, and other groups.

The goals of efficiency and quality are reinforces by the general economic situation which requires more careful management of resources, by the demands of the population for quality and by increasing concern for the revitalisation of

inner cities or towns. The introduction of equity concern into urban transport is still relatively less explicit and less emphasised than the two goals of efficiency and quality. However; much progress has been made from the time when efficiency of the transport system was the unique goal and defined in terms of vehicle movement rather than the people movement. (Managing transport, OECD, 1979, Paris).

2.3. Impact of transport upon economic activities

Transport is a basic necessity, the significance are as follows:

(1) The city is spread over a long distance, the housing problem is very acute and it is not possible to get residential accommodation in the crowded markets or other centres. Even if to some extent it is possible, it will create overcrowding, congestion etc. and various other socio-economic problems. Hence the efficient transportation enable people to live at distant places and makes decentralisation possible.

(2) The city or town requires cheap transportation for the passenger otherwise a large amount will be consumed by transport cost and expenses.

(3) City or town life is very busy and if frequent transport service is not provided at the convenient of the passengers, it will cause innumerable hardship to the people.

They have to reach the work place in time. If they delayed or have to waste time in waiting for city bus etc. which will create many difficulties.

(4) Since the people have to travelled long distances, fast service is essential in the city or town.

(5) City transport must also be adequate particularly at peak hours in the morning and evening to avoid overcrowding and rush.

(6) For maintaining law and order, extinguishing fires, avoiding accidents traffic control in busy and crowded streets, efficient system of transportation throughout the city is needed.

(7) City transport service are feeders of railways, motor buses etc. if the efficient transport service are not available, the railways and buses will not get traffic and the passengers will be put to hardship.

In brief the significance of urban transport is great in all walks of life, economic, social or political. The city life will become miserable if efficient and cheap transport is not available.

2.4. Types or modes of Transportation in Urban Setup

Roadways is an ideal urban and local transport. Urban transport requires very frequent adequate small sized transport service with the facility of frequent stoppages and

every door to door service, and this is possible only through road transport. These are the various means of urban passenger transportation.

(1) Sub-urban Railways - Railways suit heavy and large volume of traffic for long distances, the use of sub-urban railways is therefore strictly limited to big cities.

(2) Tramways - Tramways which are a kin to railways also require dense and regular traffic for their successful operation. The tramways could not become very popular in India for city transport.

(3) City bus service - In all the cities or towns of India, municipality have provided city bus service for passenger transport. The city bus is the most popular and convenient means of city transport. The main object of city transport is to provide door to door service is really a necessity for poor and middle class people.

(4) Motor taxis and autorickshaws - The use of motor taxis is to city or towns for visiting some places of tourist interest. Since their charges are very high, they are hired either by rich people or by other persons in case of emergencies. They have the capacities of 4 to 5 persons only. The use of auto-rickshaws and tempo is increasing in every cities.

They are fast although a bit costly, substitute for cycle rickshaws. They are needed in between the motor taxis and suit the upper middle classes people and those who wish to travel in groups.

(5) Cycles - Cycles are most cheap and handy means of transport. India is passing through the cycle age. More than thirty lakhs cycle are produced in India for internal and export use.

(6) Cycle-rickshaws - This is the most common city transport for all cities and towns except a very few cities. Even in this big cities in the less busy streets sub-urban the use of cycle-rickshaws is common. The capital cost of three wheeled cycle-rickshaws is only 1200 to 1600 and running cost is negligible it is pulled by human energy. This is very popular because it is cheap convenient and provided frequent and door to door service.

(7) Motor Car - The use of motor car is also increasing in cities and towns. But this is only a private means of transport and can be afforded by the wealthy people as its running and capital cost are high.

(8) Scooter and Motor Cycle - The use of motorcycle and scooter in the urban area is rapidly increasing. They are

handy convenient fast and cheap means of transport. Their demands is a growing among middle class people, particularly those who are in service and have to cover long distances every day.

(9) Horse carriage, bullock carts etc. - The use of Horse carriage like ekkas and bullock carts etc. is gradually decreasing in Indian cities.

In recent times consideration of total transport task health reason, social and environmental issues as well as to some extent energy, have lead to recognition of the importance of the pedestrian and bicycle mode in the urban system. The foot and cycle modes play important vital parts in urban transport and urban activity. It is now recognised that urban transport strategies and plans must ensure the co-existing of all the various modes and categories of transport users. (Seminar, 1979, OECD & ECMT).

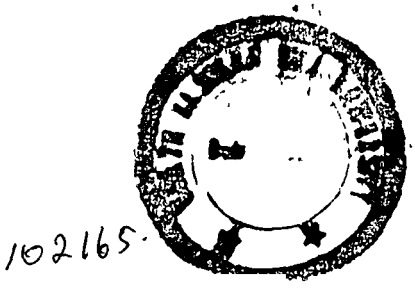
Mobility of transportation and traffic problems in urban areas have become more acute, because of the increasing affluence of urban residents. Highway use and the highway traffic congestion at peak use affects, the efficiency of the use of other surface and sub-surface modes of transport. The demand for all varieties of urban transportation is interrelated. The automobiles and highway dominate the urban

transportation problem simply because of nearly 70% of all transportation trips in urban are in automobile. (Eighth International Symposium, ECMT, 1980).

Studies by Kar Moskowitz assumed that industrials selecting alternative mode of transportation are attempting to maximise utility from the use transportation mode or method. Each person using alternative transportation has made a choice between various mode of travel or combination of transportation means. The traveller in making the choice attempts to maximise satisfaction and minimize the discomfort in valued in making any particular trip. His specific decision will be a function of the syndrome of economic and personnel factors that are relevant to his particular needs, and that reflect in the demand for transportation service. In urban passenger transport demand is multi-dimensional.

2.5. Nature of Demand for Passenger Transportation

1. The Physical Dimension of demand, expressed by various magnitudes and unit of measurement in passenger transport such as passenger K.M.
2. The Temporal Dimension of demand, expressed by differentiations according to the duration of journeys and the time at which they are made.



3. The Spatial Dimension of demand, expressed by differentiation according to lengths of route, spatial relationship (point of origin and destination) and in a more general way according to purpose of transport (location of activites) and mode of transport (supply and infrastructure).
4. The Economic Dimension of demand, approximately expressed by proportion of the gross national product or of family income represented by expenditure of transport, and
5. The Socio-demographic Dimension of demand, expressed by personal or household attributes such as age, occupation, income or car-ownership.

The economic dimension has acquired growing importance during recent years because, by contrast with earlier times, there has been increasing effort to embrace the whole field of effects of social, economic and environmental costs in single, social assessment.

Unlike spatial or temporal dimension of demand derived from "Pure characteristics of journey". The inclusion of the sociological dimension is the analytical consideration of passenger transport was a comparatively late development.

A variety of influences of different magnitudes can be discerned as cause of demand and its development. Macroscopically, the primary contributory causes of the size, character and development of demand may be grouped broadly as follows:

— Economic factors and development, the principal features of which are the trend in incomes of private household and a steadily increasing specialisation of labour in economic activities.

— Changed demographic structures such as wage distribution, level of income or education and sizes of household.

— Changes in the pattern of residential areas and land-use; the effect of this contributory cause are probably those most immediately perceptible. Demand arises from the separation in space of such basic functions as residence, work, shopping and recreation and it is the manner in which these patterns are intermingled or segregated which determines whether, and to what extent, the individual must link up his successive activities in the course of day by means of journey.

The Purpose of Travel is one of the most important feature in the analysis and forecasting of demand, it is by that factor that individual behaviour as respect model choice

length of journey and the incidence of demand in times is very largely determined. In urban areas the percentage of demand for transport on working days respectively attributable to those purposes are as follows:

- Work remains as ever, the most important motive for demand; out of the total demand one journey in every three is to form work.

- Second in order of purpose of travel come shopping or marketing; more than one-fifth of demand arises from private household's need for supplies.

- A further one-fifth of demand comes from leisure activities, business and educational purposes account for one-tenth each and the remaining 5% or so comprise what is called casual traffic (Seventh International Symposium, London, 1977, ECNT).

Although there are a variety of forms of transportation demand, short run supply of transport is simply reference to physical plant and equipment available for movement between at any given time. Another but less important concept of supply refers to the different opportunities for movement between selected points or locations at specified times. Transportation supply is synonymous with transporation capacity.

2.6. Synthesis of Demand

In a functioning market system, if the supply price of goods and services is below on equilibrium price, excess demand occurs. With transportation facilities, existing price of transportation service produce excess demand or congestion. Traffic tie-ups are evidence of excess demand. Current pricing arrangement are not affective, since they do not equate the supply or road space with demand. Congestion is the single most important factor limiting the improvement of urban transportation. General congestion as opposed to bottleneck congestion suggests that demand for highway or other transportation space actually exceeds the supply at given prices. "If prices are higher than costs the basic difficulty is in excess demand resulting from underpricing urban transportation has been affected by both situations" (L.C. Fithch and Associates, Urban Transportation and Public Policy, p. 129).

Given a certain supply pricing policy of the classical instrument consumer behaviour for steering consumers' behaviour. Whilst recognising a wide measure of supremacy, it can be used for the relief of particular infrastructures or the use of services on offer, by means of variations in the price level and price differentials.

Nevertheless the limitations and importance of pricing or fare policies in urban passenger traffic are familiar enough. Briefly put, they are: Consumers' defective price consciousness (the problem of out of pocket costs), the very slight elasticity of demand in relation to prices, where unavoidable journey are concerned, and pronounced differences in income, with the consequent inability of lower income groups to translate their needs for mobility into demand backed by purchasing power.

Consumer preferences should play a role in establishing solutions oriented policies for urban transportation problems. The cost price impact in allocating consumer preferences provides a general orientation for dealing with the problems of urban transportation. The reallocation of existing plant and facilities is an appropriate way to reduce the incidence and variety of urban transportation problems. The improved transportation linkage between inner city residents and adjacent areas is a first - ranking priority in urban transportation systems.

Transport demand or effective transport arises from the interaction of mobility and life style:

Mobility will be understand as the ability to overcome or "bridge" space. It is dependent mainly upon transport

supply and possibility of using it. The most important determinants on the supply side are such familiar factors as speed, frequency, fares, comfort etc. The possibility of using the transport supply mainly depend on income availability of time and the availability of a car.

Transport supply and ability to make use of it are not independent of one another, but have reciprocal connections. For example, if income rises and with its ability to use transport service, this is frequently the cause of an expansion of transport supply.

Life style is defined as the totality of an individuals activities in both spatial distribution and time sequences. The concept thus include three dimensions, individual activities, space and time. The spatial dimension of life style is mainly determined by the distribution of activity. Specific facilities such as location of home, place of work, shopping centres etc. As regards time components, differentiation between daily, weekly and monthly cycles is of particular significance in transport sector effects.

Transport demands is the resultant of the life style components and the ability to make use of available transport

supply, with the inclusion of the transport supply, effective transport arises via transport demand as the interaction between mobility and the life style.

The nature and the type of transportation facilities offered in any urban area is a function of a variety of factors some of which may be particularly localised in selected urban areas. Each city differs in its physical and economic characteristics, income level, distribution, and a variety of other factors. These differentials account for variety as to the type and quality of transportation modes and facilities needed to provide the mobility of resources in urban areas.

There are extensive factors that affect the decision of passengers, but certain characteristics are usually considered to have the heaviest weight or to be the most significant, that is:

> "the essential characteristics of various modes facing the commuter are the money costs, the time in route, and various physiological and physical attributes of the mode which can be called the disutility involved in the travelling by that mode... while one person may spend a great deal just to save a few minutes, another will take a slower or more expensive mode because he can't stand travelling on a seemingly superior alternative."
>
> (C.K. Moskowitz, "Living and Travelling Patterns in Automobiles oriented cities", p. 164-166).

Most people living in urban areas are faced with this transportation decision on a daily basis and the decision is associated in the journey to work. That journey to work choice and the demand for alternative transportation modes is reflected and is addition to "Peak demand for transportation modes". The following sections review the new traditional approaches to peak demand for transportation facilities.

(1) The journey to work

A person travelling to work with the option of various modes can evaluate his equivalents of marginal value of leisure and travel in terms of alternative modes and cost of transportation. The trade off between travel and other time use is a faction in determining place of employment and residence. The income earned by an urban resident is related to his job and location of employment. If it is assumed that all residents attempt to maximise utility from earned income, a series of trade offs occurs between conditions that increase utility and conditions in his life style that decrease utility. The cost of earning income is a cost that offsets increases in utilities from the spending of income. Money and real costs are involved in resident location relative to location of income at place of employment. Money cost include the land and a unique element of rent of land determined by the distances from the place of work to place of residence.

In addition to the time cost, the worker makes money outlays for transportation that are included in the calculation for various location of employment and residence. Money costs vary with the mode of transportation. Given total cost of alternate transportation, costs one chargeable against the gross returns from the worker's employment and may be treated in a somewhat similar function with the time costs.

Time or psychic costs, plus money costs ultimately appear in an employer's total input cost as type of imputed travel.

Studies of journey to work pattern and distance as a determinant in residential location choice indicate that household one located at ranging distances from work because of transportation costs, preference for locations, and incomes.

A. Peak Demand

There are two peak demand periods during any given day, that is, in the morning to work, and in the evening work to home, transport facilities are also required for social and recreational travel and for a polyglot of other trips that are associated with shopping, visit and taking the children to school.

Demand for transportation services can be specified as to the number of units of outputs consumed at different levels of cost. Demand as a concept can be expressed as the demand for movement, the traffic demand, flow demand and dead line demand.

B. Demand Concept

Traffic demand is a reference to frequency and route of trips. Flow demand can be associated with the number of traffic units that flow passed a specific place at a given time. References to the specific destination or terminal place, by frequency of trips or patterns of trips, identical dead time demand. A different concept of demand oriented toward the pattern of frequency or total trips that people take or want to take is turned the demand for movement.

Among the different types of demand for transportation service, the patterns of movement for various purposes reflects regularity simply because certain trips are moved systematic in terms of time and space use. The most important is the journey to work. The most significant "trip purpose" in highway transportation demand is the journey to work and places periodic pressure on the available supply of transport service.

(Lowden Wingo. Transportation and Urban Land, Baltimove; John Hopkins Press 1961). "The journey work problem has the lowest "price elasticity" of demand of all other classes; it would take a very large change in the cost of the work trip to home a perceptible effect on the number of personal trips in the short run. In the aggregate, the journey to work has a higher degree of order than the other classes of movement because of the manner in which work is institutionalised in the community. The other classes of movement relate to the activities whose location tends to be dependent on the distribution of households or to situations in which the household has a considerable number of alternatives as to where as when its transactives may be carried out.

Transportation supply and capacity

Although there are a variety of forms of transportation demand, short run supply of transport services is simply a reference to the physical plant and equipment available for movement at any given time. Another but less important concept of supply refer to the different opportunities for movement between selected points or locations at specified times.

The improved transportation linkage between inner city residents and adjacent areas ia a first ranking priority in urban transportation systems. (ECMT, 1977).

2.7. Importance and Scope of Study

The importance of transport is increasing every day with the developments in the field of ways, means, motive power, engineering techniques, organisations, legal enactments and social economic and political factors. Hence the scope of study of transport is much wider today.

The Committee on Transport Coordination (1966) aptly remarked that:

> "It is not generally realised that the field of transport studies has remained comparatively neglected, not only within the agencies concerned with different modes of transport, but also, in its general aspects in the universities and in research institution."
>
> (Final Report, January 1966, p. 173).

> "Transport, in spite of its two dimensional role of creating time and space utilities in the economic development of the country, has not been given adequate importance by the researchers in the past. Very little attention has been given by the universities and other academic institutions to research in the transport sector in general and its economic and public administration fields in particular."
>
> (Krishna, M. Economics of Transport, A Trend Report, A Survey of Research in Economics, I.C.S.S.R. Vol. VI, p. 59).

It appears that the possibilities for research to provide the makers of transport policy with effective advice

in the task of analysing and forcasting demand for urban transport service are very far from being exhausted priorities in intensified application and promotion of economic research in urban passenger transport, to the matter of demand for passenger transport services come to light when existing, perceptible and future problems of passenger transport, on the one hand, are compared with the present state of available knowledge (potential means of solving them) on the other. The constantly changing problems, objectives and tasks of transport policy are accompanied by growing emphasis on the socio-economic components of transport research. A proportionate contribution to transport policy from a body of economic research, widened to include other disciplined may reasonably be expected to evolve in future.

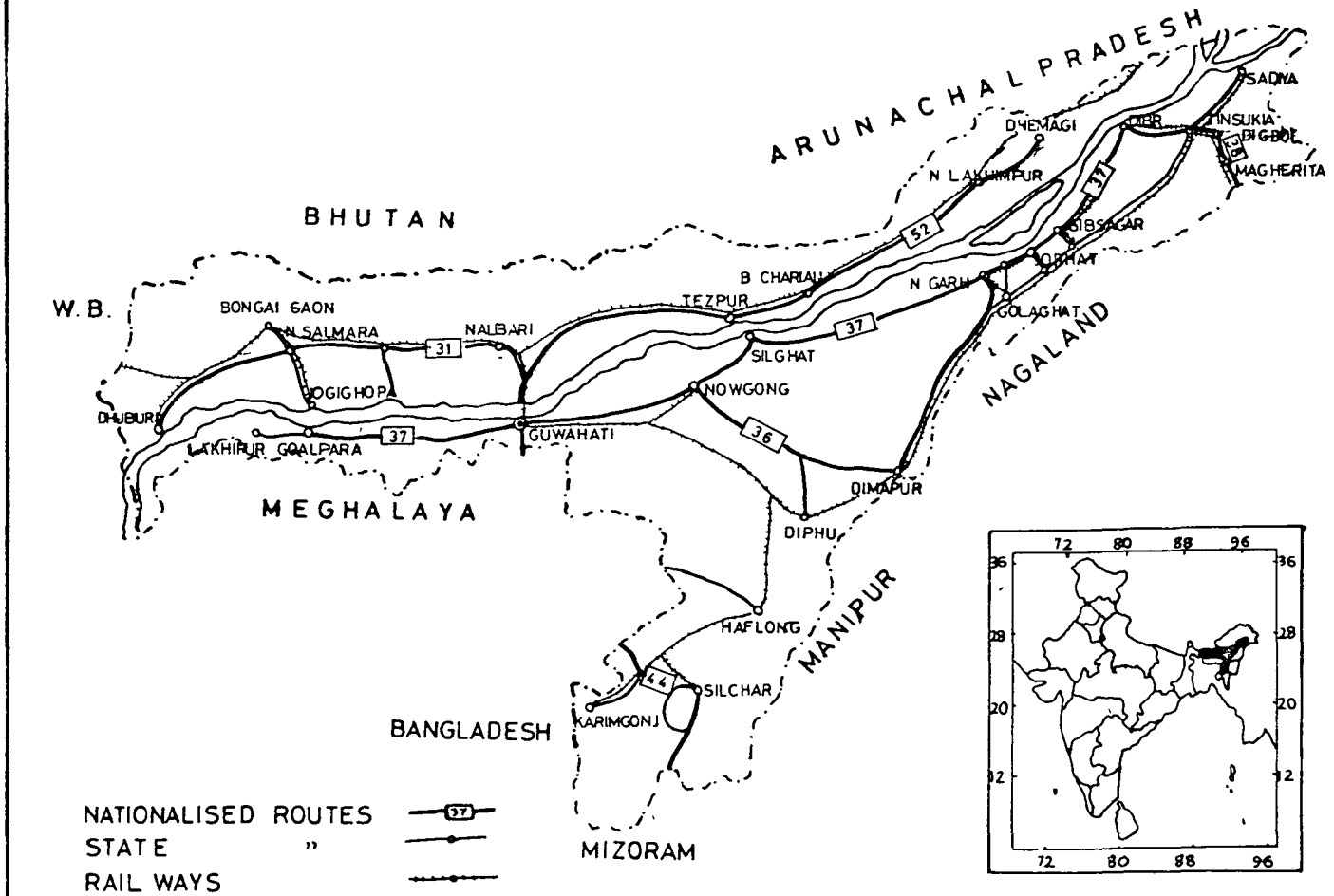
CHAPTER - III

PART - A: TRANSPORT SITUATION IN THE STATE OF ASSAM: A HISTORICAL SKETCH

PART - B: GENERAL BACKGROUND AND TRANSPORT SITUATION IN THE DISTRICT OF DARRANG

PART - C: GENERAL BACKGROUND AND TRANSPORT SITUATION IN THE TOWN OF BISWANATH CHARIALI

ASSAM
TRANSPORT & COMMUNICATION NETWORK



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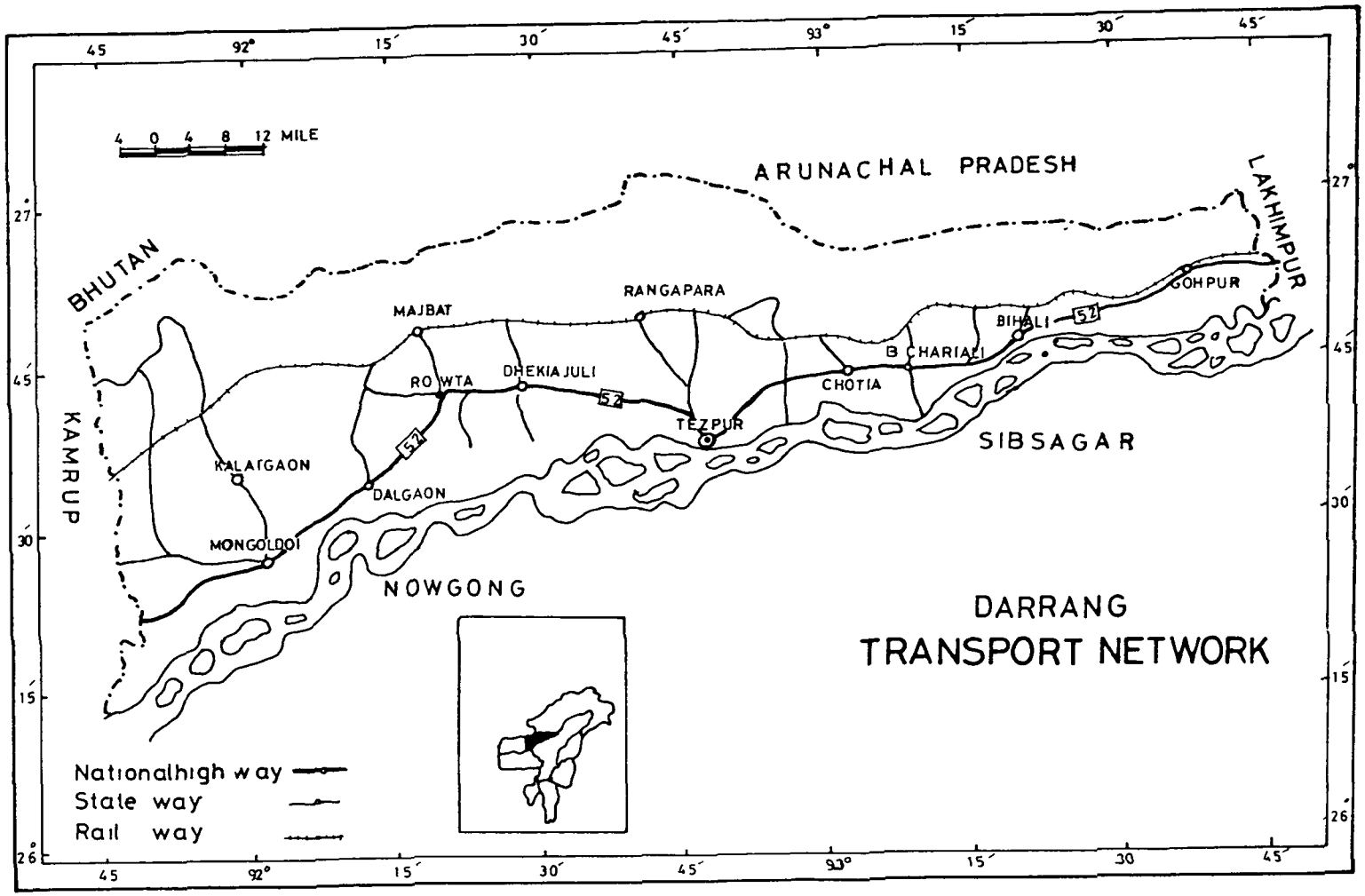
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PART - A

3.1 TRANSPORT SITUATION IN THE STATE OF ASSAM: A HISTORICAL SKETCH

Introduction

A well knit transport system is of vital importance for economic advancement of a country or a region. A well development system of transport not only subserve the social needs but also provide necessary infrastructure for rapid economic growth. Unfortunately Assam, the core State of the North-Eastern Region hardly enjoy a creditable position in this respect. The State still continues to suffer from inadequate transport and communication facilities, which also explain the economic backwardness. This chapter discusses the transport situation in the State of Assam early stage to present stage.

3.1. (A) EARLY STAGE

3.1.1. (A) ROAD TRANSPORT

In the Sixteenth and Seventeenth centuries good roads (notable Dhodar Ali and Gosain Kamala Ali) throughout many villages in the Upper Assam were built by the Ahom Kings. After the fall of Ahom power these roads become useless owing to lack of maintenance. In the early part of the British rule in Assam road development was neglected, as the

the water ways provided a good and cheap means of transport. It was the tea industry which is greatly responsible for the development of roadways. It was only after 1850 that the foreign rulers began to take interest in the improvement of road transport by 1859, although the public works department was yet to be born, the government started construction of roads in some places and the tea industry could use bullock carts and elephants to carry its traffic over short distances. The first notable work done by the government was the construction of the Assam Trunk Road in 1866. In 1868, the Government established the public works department (P.W.D.) for the specific purpose of road construction. Subsequently, in 1880 the local Boards were formed mainly for improving roads in the rural areas. The Guwahati-Shillong road, opened for wheeled traffic in 1877, took two days to reach Shillong by a "tonga".

Even up to the end of the nineteenth century, complaints about roads were a regular subject in all the reports of the Indian Tea Association. However, it was only after the First World War that the need for better roads was keenly felt by the Government. In 1912, with the reformation of the province of Assam, the Chief Commissioner put special emphasis on the development of communications. It was only 1922 that the first passenger bus service started between

Jorhat and Jhanji in the Upper Assam and since that regular passenger service has been in vogue on this important route. Even in 1927 roads in Assam were in a horrible state. During the Second World War, road construction was accorded top priority to meet defence needs. Towards the end of 1942 where there was acute shortage of transport capacity owing to requisitioning of vehicles for military operation. After that Assam Government set up a Committee recommended the retention of the Assam transport organisation the Government decided to remodel it and named it 'State Transport, Assam' with effect from 1948.

In March 1948, road kilometerage per 100 square kilometers in Assam was much below the other States as well the national average of 20 Kilometers, as seen from the following table.

Table 3.1.1: Road Kilometers per 100 Sq. Km.

West Bengal	Bihar	Madras	India as a whole	Assam	Orissa
74.5	43.8	29.6	20.1	14.7	12.3

(Source - G.O.I..Ministry of Transport: Basic Road Statistics (1951).

The number of motor vehicles per 100 Kms of road, 100 Sq. Kms of area and per lakh of population in Assam was

60, 9 and 124 respectively as against 70, 9 and 78 in India as a whole (G.O.I., Basic Road Statistics, 1953).

A significant landmark in the history of road transport in Assam was the adoption of a policy of nationalisation of road transport by successive stages on 27th September, 1948, by the Government of Assam. According to this policy, a total of 550 kilometers of road was brought under the state transport service till 31st March 1951. The State Transport Service began to operate from 16th January 1951 (Alam, 1983).

Table 3.1.2: Length of roads maintained by the P.W.D. (Assam)

Year	Total length	Black topped	Metalled	Gravelled	National Highway
1947	8,586	1,422	140	2,286	-
1948	9,662	1,478	128	2,611	1,290
1949	9,735	1,454	156	2,842	1,290
1950	10,037	1,469	174	2,728	1,290

Source: Statistical Abstract of Assam 1951, p. 107.

Table 3.1.3: Road Development in Assam and India in 1951

India/ Assam	Road length per 100 Sq. Kms of area			Road length per lakh of population in (Kms)		
	Surfaced	Unsurfaced	Total	Surfaced	Unsurfaced	Total
Assam	2	13	15	25	183	208
All India	5	7	12	43	67	110

Source: G.O.I. Basic Road Statistics 1953, p. 20.

3.1.2.(A) Railways

Because of the expansion of the tea gardens in the interior places of Assam, a great need was felt for constructing a wide network of railway system in order to provide a cheaper means of transport of not only tea, but also coal and food-stuffs for the tea gardens. It was in 1881, that Assam Railways and trading company was formed. By 1885, the railways in Assam were the Dibru Sadiya Railway (meter gauge), constructed by the Assam Railways and Trading Company in 1882 and the Jorhat Provincial Railway (two feet gauge) opened in 1883. Both these railways connecting the distant tea gardens with Brahmaputra, nothing more than feeder lines having no link or contact with any railway system outside the region.

It was opening of the Assam Bengal Railways in 1895 which connected Assam with outside world and as such the impact of railways in Assam is primarily the outcome of the establishment of this railway. Later on, Dhubri was connected with Calcutta by the extension of the Eastern Bengal Railway line in 1902 and Amingaon was connected with Calcutta through Dhubri in 1909-10. By 1909, Dibru-Sadiya Railway was extended to Saikhoa. By 1917, the rolling stock of this railway was plentiful and modern in character and included 55 locomotives, a large number of the latest type of good wagons

and upto date bogie passenger carriages, fitted with electric light and fans. The period between 1896 and 1933 showed a very rapid expansion of railway lines in Assam. In April 1942, the Government of India assumed responsibility for this railway by paying a fixed rental and it played its due role during the inter war period. This line selected an important alignment and was, therefore, of great value in the construction of the Ledo Road, with which in 1942 the Government of India wanted to connect Assam with Burma and China. In 1945, after nearly 65 years of establishment, the D.S. Railway were purchased by the Government and amalgamated with the B.A. Railway.

The Chaparmukh Silghat Railway with a route kilometre of 81.80 was constructed by the Assam Bengal Railway under the guarantee system on behalf of the Chaparmukh Silghat Railway Company. It was opened in 1920.

The partition of the country in 1947 caused service dislocation to the railway transport of Assam with the rest of India, because, as a result of partition, the newly created East Pakistan (Now Bangladesh) stood between Assam and the rest of the country. The Pakistan Government however, allowed transit facilities to all goods over their railways to and from Assam. But these facilities were withdrawn at the end of 1949 and thereby caused service transport bottle-

neck in Assam. In order to connect Assam with the rest of India by a railway line through Indian territory, the work of constructing a link rail line started in 1948. Apart from constructing a total length of 230 Kms of new rail lines. This rail link project also included 5 kilometers of bridges over many turbulent rivers and streams. The work of this project was completed in 1950.

However, except the 230 Kms of new railway line, there was no other programme of extending railway line in Assam during this period.

3.1.3.(A) River Transport

From very early times Assam's trade with the neighbouring provinces was mainly carried by river transport, the main route to Bengal, Bihar and Orissa being the Brahmaputra and Ganges. The three overland routes to Assam described by M'Cosh were not convenient. In 1834, when the steamer service was introduced on the Ganges. Transport and communication to and from Assam were under development. As early as in 1939 when the Assam Company was formed, the company started its own fleet of country boats and a steamer was tried on the Brahmaputra in 1842. In 1844, the river journey from Guwahati to Sadiya by country boats took six weeks. In 1856, the Government steamer service was extended from Guwahati to

Dibrugarh. In 1861, the Indian General Steam Navigation Company started regular traffic on the Brahmaputra with arrangements for the carriage of labour into Assam for tea gardens. Later on, the Assam Company and India General Navigation Company were combined to form the joint steamer companies which maintained the steamer service to Assam throughout the British period.

The earthquake of 1950, which changed the regime of the rivers, was the biggest blow to the river transport of Assam. As a result of navigational difficulties the main line service was terminated 10 Kms down stream of Dibrugarh. Between 1953 and 1956 the following services of J.S. Companies were closed one by one. Amingaon-Guwahati, Tezpur-Neamati, Dhubri-Goalpara, Desangmukh-Dibrugarh, Badati feeder service, Badarpur-Looba Feeder service.

3.1.4.(A) Air Transport

Amongst the alternative modes of transport air transport has a special significance owing to peculiar topography and geographical location of Assam. The potentiality of air transport came to light by the end of 1949 when Pakistan prohibited transhipment of cargo to Assam by waterways. However, even before 1949 the quantum of traffic transhipped from Calcutta by scheduled and chartered air companies was about 1,50,000 pounds a day (Anwer, M. Civil Aviation in India 1954, p.94). By 1954 the traffic increased to 7,50,000 pounds per day.

By 1958, the total air movement to and from Assam was calculated to be about 2,300,000 miles. During 1958, 840,000 miles were operated by the Indian Airlines Corporation from Guwahati to Calcutta, Tripura and the Upper Assam (N.C.A.E.R. Techno-economic Survey of Assam, 1962, p. 130). In 1959, the Government of India stated that the Indian Airlines Corporation was running a large number of services both passenger and freight in Assam area. Till 1958 it was only the private operator who could move in difficult areas.

At present, Calcutta is connected with important towns like Guwahati, Dibrugarh, Tezpur, North Lakhimpur, Jorhat, Silchar in addition to other towns of neighbouring states such as Pasighat (Arunachal), Imphal (Manipur), Agartala (Tripura). Passenger and freight traffic carried by the Indian Airlines to and from stations in Assam area have been increasing during recent years. In spite of the introduction of Boeing 737 passenger service since 1971, the air transport has not been adequate for meeting the needs of increasing volume of passengers mail and goods to and from Assam.

3.1.(B) Development of Transport—Present Stage

The importance of transport in a plan for economic development of Assam is all the greater because of the transport bottlenecks created due to the partition. A dependable and low cost transport system is vital to the economy of

Assam. The transport system of Assam has attained added importance because of Assam's central position in the North-Eastern Region consisting of such outlying States like Arunachal, Nagaland, Tripura, Mizoram and Meghalaya. All traffic in goods or passengers have to pass through Assam.

The following table shows total plan outlay on transport and communication, Assam.

Table 3.1.1 (B): Total Plan Outlay on Transport and Communication, Assam.

Plan	Plan Outlay (Rs. in lakhs)	Outlay on Transport & Communication	P.C. of (3) to (2)
1	2	3	4
First Plan	2,051	349	17.0
Second Plan	5,448	655	12.0
Third Plan	13,244	785	5.9
Ad-hoc Plans	8,551	414	4.8
Fourth Plan	19,839	2,598	13.1
Fifth Plan	55,120	5,560	10.1

(Source - 1st, 2nd, 3rd, 4th, 5th Plan - A Review of Progress.)

3.1.1.(B) Road Transport

Because of many limitations of the railways and the waterways, the road transport system in Assam, has to provide a universal and efficient means of transport in the State. The role of road transport should be principal and not complementary. Therefore, the building up of an efficient and widespread road transport complex was the principal task of the successive plans in Assam.

The road development programme of the first plan in Assam was formulated with the aim of making a reasonable progress towards achieving the objectives laid down in the 'Nagpur Plan' which was a twenty year road development plan adopted in conference of the Chief Engineers held in Nagpur in December 1943. According to the 'Nagpur Road Plan' Assam should have 21,243 kilometres of road within a period of twenty years (1943-1963). As against this target, it was officially reported that at the end of the first plan period, Assam had only 10,944 kilometres of roads. (Second FYR (Assam) Draft, p. 183).

It is further reported that new surfaced roads including National Highways 1,529 kilometers in 1950-1951, but increased to 1,685 kilometers in 1955-56 indicating a percentage increase of 10.20. In case of unsurfaced roads the percentage of increase was higher, that is, 69.0 during the

period 1950-51 to 1955-56 (Census of India 1961, Vol. III, p. 489). Moreover, for the operation of passenger bus services, a fleet of 300 vehicles to ply on the nationalised routes was formed during the first plan period, as against 226 vehicles in 1950-51 (Report of Regional Transport Survey Vol. I, p. 167).

The road development programme in Assam in the Second Plan was formulated with a view to achieving the target laid down in the 'Nagpur Plan' of 1943. However, in the midst of the second plan period, the second Chief Engineers Conference held at Shillong in 1958 formulated a revised twenty year road plan (1961-81). The important feature of the Second Plan of Assam in the field of road transport was the emphasis laid on the nationalisation of more roads particularly in the areas where suitable transport facilities were extremely lacking. For this purpose, the Second Plan of Assam laid down the target of 2,317 Kms of nationalised roads during the Second Plan. However, at the end of 1956-61, total length of nationalised roads became only 1,688 Kms.

The transport and communication sector scored a notable progress in its different aspects during the period of the third plan in Assam. The principal road works completed during the third plan period under the central plan,

and on the basis of sharing cost between State and Central government are as follows. National Highways number 31, 37, and 38 falling in Assam was completed at the total cost of about 31 crores. The most notable achievement of the Third Plan was the completion of the Road-cum-Railway bridge over the Brahmaputra upon National Highway No.31. It was envisaged to construct with central assistance on additional inter-state road parallel to N.H. 31 from northern boundary of India running through States of U.P., Bihar, West Bengal to Assam with a total kilometres of 16,000 from Bareily to Amingaon.

As a result of the road building programmes executed during the third plan period, the total length of P.W.D. roads including National Highways in Assam registered an increase from 14,858 Kms at the end of the Second Plan to 19,024 Kms at the end of the Third Plan. (Third FYP (Assam) A Review of Progress, p. 59).

During the three years period of the Ad-hoc plans, no new project of significance was undertaken in the sector of Transport. At the end of the Annual Plans, the length of nationalised routes increased from 2,934 Kms in 1966-67 to 2,989 Kms. The number of vehicles also increased during this period from 727 to 737, that is, only by 10 (Economic Survey of Assam, 1970, p. 38).

Fourth Plan achievements in the field of road transport relate mainly to nationalisation of route and purchase of vehicles. During this plan 317 Kms length of routes in the different parts of the State was nationalised and about a hundred vehicles were purchased for improving and expanding transport facilities in the State.

During the period of Fifth plan, about 870 Kms length of new road was constructed in Assam out of which surfaced road was 145 Kms at unsurfaced road was 724 Kms. In regard to road transport stress was given in this plan upon extension of road transport facilities to the rural and backward areas. During this period, 651 Kms length of additional routes was nationalised and about 100 buses were put on the road under the Assam State Road Transport Corporation. In addition night delux services were introduced in several long distance routes of the State. (Economic Survey of Assam, pp. 25-26).

Assam is provided with a farily extensive road network. During 1979-80 the State had a total of 20,693 Kms of P.W.D. road length (including 1,339 Kms of N.H.) or against 20,225 Kms in 1978-79 and 17,030 Kms in 1970-71. However, the condition of most of the roads in Assam is not satisfactory and requires frequent repair due to savages caused by nature's wrath, particularly during the rainy season. Moreover, many of the roads being small in width with narrow and weak bridges/culverts, need widening and upgradation.

The growth of P.W.D. road lengths in Assam over the past few years may be observed from the table given below.

Table - 3.1.1.(B): Length of roads under P.W.D. (including National Highways) in Assam.

Year	Surfaced	Unsurfaced	Total
1970-71	3,683	13,347	17,030
1975-76	4,212	15,937	20,149
1977-78	4,497	15,728	20,225
1979-80	4,777	15,916	20,693

Source - Chief Engineer Road, Assam.

Since road network of Assam plays a pivotal role in the field of intra-state and inter-state traffic, high priority has been accorded for its development in the Five Year Plans of the State.

Both the public and private sectors are providing road transport services in Assam. In the public sector is only one organisation viz. the Assam State Road Transport Corporation which provided both goods and passenger traffic in selected routes. Till the end of 1981-82 the corporation covered a total length of 5,889 Kms the total fleet strength of the corporation stood at 776 in 1981-82 which included 712 buses, 27 trucks, 24 cars. (Economic Survey of Assam, 1981-82, p.28).

So far as the quality of roads is concerned, the progress made by Assam during the plans period under review is not all satisfactory. Regarding the quality of Assam's roads the Regional Transport Survey Reports comments. "The existing National and State Highways are different in various respects when compared with the standard prescribed by the Indian Road Congress." (Report of Regional Transport Survey of Assam, Vol. I, p. 96).

3.1.2.(B) Railways

Among the different systems of transport railways serve most as a cheaper and speedier transport. It is remarkable that in Assam upto 1961 there was practically no extension to the railway route kilometres are since of the start of second world war except the 230 Kms of new railway line under the rail link project. However, the railway route length in Assam increased from 1,758 Kms in 1960-61 to 2,226 Kms in 1967-68 accounting for only 3.8% of the total route length in India. Some of the notable achievements in the railway transport system during the plan period are road-cum- rail bridge over the Brahmaputra completed in 1962, extension of the railway route from Rangapara to Murkangselek in 1966 and from Kakalighat in Assam to Dharmanagar in Tripura (1966) and the extension of the broad gauge line from New Jalpaiguri to Guwahati. Other measures relating to improvement of the

railway transport system taken recently included long distance express trains, increase in coaches in trains, introduction of regular fast through goods trains etc. (Economic Survey of Assam 1970 and 1984).

Railways serve as the main communication link between Assam and the rest of India. During 1982 the State had a total railway route length of 2,178.55 Kms (105.22 Kms under broad gauge and 2,073.33 Kms under metre gauge) which constituted nearly 4% of the total railway route length of the country. However, the position of the State in respect of broad gauge route length was very much disappointing. So, far as electrified route is concerned, there is none in Assam as well as in the entire N.F. Railway section. Among the important steps under implementation for improvement of railway facilities in the State, the most notable one is the conversion of existing metre gauge line into broad gauge line of the new Bongaigaon Guwahati section which was completed in 1984. There is also a proposal for conversion of Guwahti-Dibrugarh metre gauge line into broad gauge line. Further, the Railway Ministry has approved the proposal for construction of a rail-cum-road bridge across the river Brahmaputra connecting Jogighopa and Pancharatna along with the connecting rail link on the south bank from Jogighopa to Guwahati (136 Kms). If those proposals get materialised, substantial improvement is likely to take place in the railway facilities in the State of coming years.

3.1.3.(B) River Transport

Inland water transport has some basic advantages in a State like Assam. Assam has a total navigable length of 4,065.6 Kms out of which 2,193.6 Kms are navigable throughout the year and 1,872 Kms only during the monsoon. (Report of the Regional Transport Survey, Vol. I, p. 201).

Water transport has got some definite limitations in Assam. First, water transport cannot be provided in all places specially in hilly areas because of steep gradient and shallow rivers. Moreover, the partition affected the water transport of Assam with Calcutta very adversely.

However, water transport can still play a useful role, provided it is thoroughly reorganised and several development measures are taken, e.g. conservancy of the river system, organisation for development and maintenance of water ways, provision of modern port and dry dock facilities at different terminal points, replacement of old vessel by new and efficient or provisions of a good marine workshop, acquisition of heavy cranes for loading and unloading of heavy cargo etc.

During the second plan period, the development of the Inland water transport was the setting up of a directorate of Inland water transport with the responsibility of dealing with matters relating to investigations, planning and designing

of various navigational projects relating to water ways. In the third plan period four schemes relating to inland water transport were implemented in Assam there one:

(a) Hydrological survey of a few rivers.
(b) Undertook a pilot project of bottom panelling work in the river Brahmaputra.
(c) The first phase of the Pandu Indland port was completed during the period.

The third plan also saw the start of the work on the second inland port at Jogighopa to facilitate cargo handling to end from broad gauge line at that point.

(d) The provision was made to give the preliminary training in the various lines of navigation.

During the fourth plan and fifth plan several schemes undertaken for the development of the inland water transport in Assam. Expansion of crew training centre, construction of ferry vessels. Twenty modern ferry vessels were constructed for replacing the old wooden pull ferries (Fourth FYP (Assam) A Review of Progress).

Inland water transport system was developed in several respect in the fifth plan period as represented by the increase in the number of vessels, quantum of cargo carried by the vessels and number of passengers carried.

During 1981-82 vessels of different types were in operation in about 5,200 Kms of water ways of the State. Two public sector organisations viz. the State directorate of inland water transport and the central inland water transport corporation are presently providing navigational facilities in the State on commercial basis. The state directorate of inland water transport operated its ferry servies in 17 different routes across the river Brahmaputra during 1981-82. The number of passengers and volume of goods carried by these services during the year were of the order of 22.4 lakh number and 8.5 lakh tonnes. In addition to the above, these services also carried 33.9 thousand vehicles, 96.6 thousand motor cycles/ bicycles and 25.5 thousand animals during 1981-82. The directorate had fleet of 108 different crafts in 1981-82, of which 45 were modern steel vessels, 4 ramp powered lighter vessels, 11 motor boats and 12 relief boats. (Economic Survey of Assam 1982-83, p. 29).

3.1.4.(B) Air Transport

Assam is regularly served by air transport services of the Indian Airlines. These services are operated through six civil airports of the State viz. (1) Guwahati (Borjhar), (ii) Tezpur (Salonibari), (iii) Jorhat (Rawriah), (iv) Dibrugarh (Mohanbari), (v) Lakhimpur (Lilabari), and (vi) Silchar (Kumbhirgram). The Indian Airlines operates regular air

services between Assam and Calcutta with the introduction of a direct air service between Guwahati and Delhi with effect from January, 1981, a long felt demand of the people of the State has been met. Moreover, Guwahati has also been brought under air bus schedule of the IA with effect from 1st June 1982, and thus became the eleventh city in the country to be served by Airbus. In addition to the above, a third level air transport services, christened as "Vayudoot" also continued to operate connecting several places of the North Eastern Region (including Assam) with effect from 26 January, 1981. (Economic Survey of Assam 1982-83, p. 29).

PART - B

3.2.(B) GENERAL BACKGROUND AND TRANSPORT SITUATION IN THE DISTRICT OF DARRANG

Introduction

The Darrang district covers as alluvial tract between the Brahmaputra river on the south and the foothills of the eastern Himalayas forming parts of Bhutan; Kameng and Subansiri district of Arunachal Pradesh on the north. To the east it is bounded by the Lakhimpur district and to the west by the Kamrup district. The district covered a total area of 8,775.00 Sq. Kms. and had a total population of 17,36,188 according to the Census Report, 1971.

3.2.1. Old Time Route

The present Darrang District had close cultural and trade links with the rest of India and other neighbouring countries. Its geographical position also favoured such ties. The mighty Brahmaputra along its southern boundary was a natural waterways to other parts of India and passes on the north-west outlets to Tibet and China. Tributaries of the Brahmaputra were also used to some extent for trade and communication by mountain passes to Bhutan and Tibet also flourished. According to the Tabaquat-I-Nasiri there were as many as thirty five passes between Assam and Tibet and through them horses were brought to Lakhnauti.

During the reign of Koch King Narnarayana (1534-1584 AD) the Gohain Kamala Ali (road) connecting Coochbehar in Bengal with Narayanpur in Lakhimpur district was constructed under the supervision of the King's brother, Gohain Kamala. The great Ali (Road) ran across the Darrang district and was completed in 1547 AD. A few Raj Ali (road) or raised roads or embankments were also constructed by the Assam Kings in the district. Generally speaking, road communication in Darrang district did not make as much head way during the Ahom period as it did in Sibsagar district.

3.2.2. Road Transport

When the British came in occupation of the district, difficulty of communications proved to be serious obstacle to its development. When A.S. Mills visited Assam in 1853, the roads were few and bad. Although the P.W.D. was established in 1868, roads were concern of the Deputy Commissioner assisted by a committee. The Assam Local Rates Regulation of 1879 provided for the levy of a local rate and the appointed of a committee in each district to control the expenditure on roads etc. Such committees were replaced in 1882 by sub-divisional Local Boards which were entrusted with the maintenance of all roads within their jurisdiction except a few main lines. It was only in 1890 that provincial roads and ferries were taken over by the P.W.D. which were also to execute all works costing more than Rs. 500/- (Assam District Gazetteer, 1978).

It was only after the constitution of Road Board in 1926-27 in Assam that the construction of roads made some headway. A separate Board was constituted for the administration of Tea Cess fund for improvement of road. Classification of roads into metalled, gravelled and unsurfaced was proposed and adoption of mechanical means construction was recommended. It was also proposed in finance construction of bridge over 300' in length by raising separate loans. (Goswami, 1963).

In 1928, the Road Development Committee called for a change of the road policy of the government, and suggested taking over of a bigger share of the road building activities. From 1929-30 onwards Assam received a substantial amount from the Central Road Fund. During the Second World War the road building activities were stepped up in Assam but being war oriented such activities were mainly continued to the south bank of Brahmaputra. Till independence, the development of road communication of the district was rather negligible, except in case of tea gardens areas where good roads were constructed connecting tea gardens with railway stations and steamer ghats.

After independence, in 1948-49 there were only about 100.7 Kms of metalled road, about 675 Kms of gravelled roads, and about 77 Kms of natural soil roads under the Central Assam Division of Public Works Department. This Division comprised Darrang district, a part of Lakhimpur and Balipara Frontier Tract (Statistical Abstract of Assam 1951, Department of Eonomics & Statistics, Government of Assam, p. 105). These figures indicate the paucity of roads in Darrang district at that time.

Some progress was made during the First Five Year Plan at the end of which there were about 957 Kms of all weather roads, about 35 Kms of fair weather roads and about 3 Kms of

non-motorable roads giving a total of 995 Kms or road under the public works department in Darrang district (Statistical Abstract of Assam 1960, p. 384). Roads in the distruct further increased during the Second Five Year Plan. According to the Census of 1961, the total roads in Darrang district under the P.W.D. stood at 1,371. 726 Kms of gravelled roads, 181.218 Kms of earth and 4.024 Kms of briddle paths.

The following table indicates further development of road in Darrang district under the P.W.D. for subsequent years.

Table - 3.1: Development of road in Darrang district under P.W.D.

Year	Black topped	Length (in Kms) metalled	Gravelled	Motorable in fair weather i.e. earth	Total
1966-67	527.64	-	1,248.70	140.94	1,917.28
1967-68	528	11	1,335	115	1,989
1968-69	528	11	1,342	259	2,140
1969-70	478.47	Nil	1,362.90	119.61	1,860.98
1970-71	510.81	Nil	1,345.11	149.58	2,005.50
1971-72	523.29	Nil	1,414.71	219.82	2,157.82

Source - Statistical Handbook of Assam, 1973).

'The Nagpur Plan' which was a twenty years road development plan adopted in a conference of the Chief Engineers held in Nagpur in December 1943. The Nagpur Plan laid down the objectives of providing a well balanced road system, suitable to the needs of the country and the target indicated in the plan was an achievement of an average of 26 miles (about 42 Kms) of road per 100 sq miles (about 289 Kms) of area in 20 years period. The total area of the Darrang district according to the 1971 Census is about 8,720 Sq. Kms and it had about 1,371 Kms of road number the P.W.D. of the Government of Assam. This shows that the target was well within the reach.

The following table shows under each division of the P.W.D. in Darrang district as on 1.1.72 (excluding the North Trunk Road).

Table - 3.2: Division of P.W.D. in Darrang district as on 1.1.72.

(Length in Kms)

Name of Division	Number of roads	Black topped	Gravelled	Earth motorable	Total
Tezpur	94	107.075	308.89	57.802	473.749
Charali	96	47.53	379.78	73.26	500.57
Mangaldai	69	39.50	635.53	16.52	691.55

Source: Superintending Engineer, Northern Assam Circle, Tezpur.

Again the following table shows the progress of roads in different Block-cum-Panchayats in 1969-70.

Table - 3.3: Achievement of the Development Block in the field of Village Communication

Name of the block	New Katcha roads constructed in Kms	Existing Katcha road improved in Kms
1. Sipajhar	-	-
2. Behali	-	-
3. Gabharu	1	3
4. Kalaigaon	-	-
5. Dolgaon	2	8
6. Charduar	-	-
7. Majbat	-	16
8. Dhekiajuli	2	5
9. Biswanath	10	5
10. Udalguri	25	198

Source - C.D.P. of Assam 1969-70, Department of Economics and Statistics, pp. 91-100.

The following table shows the Motor Vehicles on Road in Darrang district 1965 to 1981.

Table - 3.4: Number of Motor Vehicles on Road

Year	Buses	Private carriers	Public carriers	Motor cycles scooters	Taxi	Motor car jeep	Tractor	Govt. vehicle	Auto-Rickshaws	Total
1	2	3	4	5	6	7	8	9	10	11
1965	225	1103	318	331	32	1217	493	233	-	4479
1966	254	1222	489	342	51	1209	561	237	-	4956
1967	262	1250	390	401	38	1271	629	-	-	4899
1968	256	1127	398	439	42	1231	627	348	-	5161
1969	227	745	373	454	37	1103	485	329	-	4170
1970	232	762	416	504	43	1165	498	349	4	4381
1971	195	779	433	554	65	1225	503	277	-	4446
1972	199	779	457	679	75	1280	536	316	15	4792
1973	222	764	486	777	100	1327	555	316	40	5056
1981	130	267	1390	4144	183	855	181	446	118	8062

Source - Transport Statistics of Assam.

The North Trunk Road which stems from the National Highway No. 31 connect Darrang with Kamrup and Lakhimpur district. Total length of this road in Darrang district is 233.56 Kms. The importance of the North Trunk Road that runs across the district can hardly be over emphasised. This road recently was converted to National Highway No. 52. The arterial routes connecting various parts of the district with the National Highway No. 52 have been gradually improved during the last two decades.

The difficulties of construction and maintenance of roads in the district are stupendous. The swirling currents of the Brahmaputra and its tributaries wash away many bridges and cause extensive damage to the roads. The roads have to be well raised above the surrounding land to protect them from the flood.

The construction of Kalia Bhomora bridge over the Brahmaputra connecting Kaliabor (Nowgaon District) and Bhomaraguri (Darrang District) will improved the road transport system, the bridge is expected to be completed by 1987.

3.2.3. Railways: From Early to Present Stage

The railway line of the district was the 39 Kms long Tezpur-Balipara narrow gauge line constructed in 1895 by a private company to afford an outlet to tea manufactured in the district through the river port at Tezpur. There was also another small line about 25 Kms. from Orang to Singri of the Brahmaputra to cater to the needs of the tea industry. It was only in 1912-13 that the Eastern Bengal Railway extended the meter gauge railway track upto Tangla in Darrang district from Rangia in the Kamrup district. Again in 1930, the Rangia-Tangla section of the Eastern Bengal Railway (now north east frontier railway) was further extended upto Rangapara an intermediate station of the Tezpur-Balipara line.

This was a major Railway Project in Darrang district and including this the total length of railways in the district came to 160 Kms.

The Tezpur-Balipara Railway continued to function as a separate line till September 1952, when Tezpur was directly connected with the Rangia-Rangapara North Section, the conversion of line from narrow gauge to meter gauge was completed by 1953-54. In 1960, Government of India undertook the project of extending the North East Frontier Railway from Rangapara to North Lakhimpur, a total length of about of 173 Kms. This new railway line was opened to passenger traffic on phases from Rangapara North to Dhalaibil in March 1962, and Dhalaibil to North Lakhimpur on 15th January 1963. Most of these stations on the new line within the Darrang district are situated near tea gardens and rice fields. The important stations of this new line like Balipara, Nizchatia, Biswanath Chariali, Monabari, Helem, Gohpur etc. are provided with facilities of water supply, waiting hall for passenger and goods platforms.

3.2.4. Waterways

As has been mentioned that the Brahmaputra which runs across the state served as a great highway of trade and commerce in the past when roads and railways were not developed. M'Cosh writing in 1837, stated that a large boat took from

six to seven weeks to come from Calcutta to Gauhati. Though the post which was conveyed in small canoes rowed by two men, who were relieved every fifteen to twenty miles, reached Gauhati in ten days and Biswanath Ghat in three days more. (B.C. Allen, Assam District Gazetteers, Vol. V. Darrang, Allahabad 1905, p. 172).

The river services had their hey-day before "Assam link" in 1950. They continued, however, to carry about 80% of the Jute and considerable quantities of Petroleum products from Assam to Calcutta till they met with three major setback. (District Gazetteers, 1978).

Firstly, the earthquake of 1950 caused considerable changes in the course of the Brahmaputra resulting in deterioration of the navigation channel, particularly in the upper reaches resulting in closure of river services by the Joint Steamer Companies from 1954 onwards. Secondly, the construction of the rail-cum-road bridge known as Sarighat Bridge across the Brahmaputra at Pandu in 1962 greatly improved the over length road and railway transport system, and thus it dealt a great blow to river services. Thirdly, due to Indo-Pak hostilities in 1965, the Inland Steamer Service connecting Assam with the rest of the country was closed down.

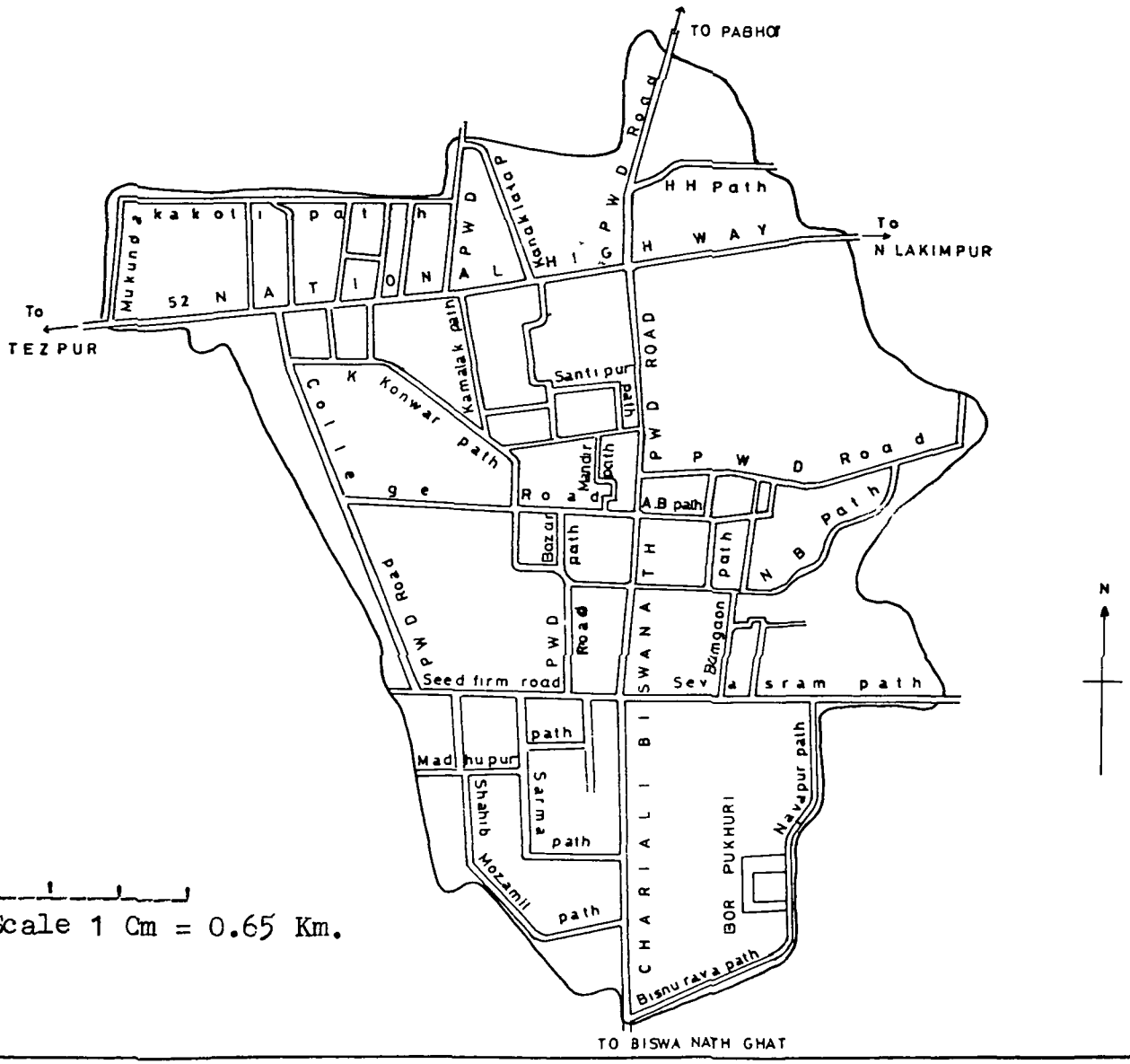
It may be mentioned here that boats which supplemented steamer services on the Brahmaputra are still used extensively and they still serve the purpose of trade and commerece to some extent in absence of steamer service. In 1971-72, there were about 434 private boats and 238 commercial boats in Darrang district. (Source- Transport Department, Government of Assam).

The ferry services in the district are Tezpur-Silghat route and Panpur-Silghat route. In 1972-73, goods carried by these two services amounted to 6,360 tonnes and 120 tonnes respectively. There are some other ferry services over the tributaries of the district which are maintained by the P.W.D. These are the following ferry services under the Chariali division. One, Lower Bargang and Lower Burai ferry services on Monabari-Barangabari road, Pichala ferry on Kalabari-Subansiri road. Other, ferry services ply at Lower Gabhur ghat over the Gabharu river, Chowkighat over the Bharili river near its confluence with the Brahmaputra river on Tezpur-Jamuguri road and Silanighat over the Bharili river.

3.2.5. Air Transport

The only air field of this district is at Saloni which is about 11 Kms north of Tezpur. The Indian Airlines Corporation maintains the flight connections of this aerodrome with other stations.

BISWANATH CHARIALI
ROAD NETWORK



PART - C

3.3. GENERAL BACKGROUND AND TRANSPORT SITUATION WITH RESPECT TO THE TOWN BISWANATH CHARIALI

Introduction

Biswanath Chariali is a town on the North Trunk Road (now it is National Highway No. 52) about 76 Kms east of Tezpur. About nine kilometres to the south of the town lies Biswanath, a pilgrim centre with a rich tradition and glorious history. Bishwanath was a steamer ghat on the Brahmaputra.

3.3.1. Area and Population

According to the 1971 Census the town comprises an area of 6.78 Sq. kilometres with a total population is 9301. At present the population is 23,765. The following table shows the clear picture about the population growth of the town.

Table - 3.5: Population growth of the town

Year	Area of town	Total population	Population within the radius of 15 Kms	No. of Household
1971	6.78 Sq. Kms	9,301	60,000	1,458
1974	6.78 Sq. Kms	12,027	60,000	2,000
1985	7.21 Sq. Kms	23,765	54,000	2,514

Source: Town Committee, Biswanath Chariali.

The table shows that during the last ten years population increased by nearly fifty percent. Migration from the rural areas to the urban areas is a common factors in Assam. Migration from the rural areas to this town is also one of the causes of increasing population.

3.3.2. Economic Development

In the past, the Biswanath Chariali area has grown slowly, but at present the rate of growth has grown rapidly and it has been one of the fastest growing town areas in the district. Its earlier importance as well as present so far the location of tea gardens is concerned, the importance has felt very much. The town lived by a mix of businessmen, service holders and families with children, workers and students. Besides other industries there is also a Co-operative Sugar Mill at Lehugaon near it. It is important commercial centre of the subdivision and two big bi-weekly 'hat' (Market) is held here. The town provides for the outlet of the bulk of tea produced in the tea gardens. Hence, both wholesale and retail trade are done in rice, oilseeds, jute etc.

There are many educational institutions including a College and a new Agricultural College will be open here very soon. With the rapid development of the town in the last two

decades the number of educational institutions has gone up. A number of State and Central government offices located here.

The following table shows general picture of the town.

Table - 3.6: General picture of the town

No. of Education Institution	Government offices	Banks	Hospitals	Markets	Cinema Halls & theatre halls	Parks
College - 1 High School & Higher Secondary School - 4 Primary School - 12	57	2	1	2	2	1

3.3.3. Transport System

This town is connected by National Highway No. 52 with other part of the State. There is railway station situated about three Kms north from the heart of the town. Besides these, there are many arterial roads connecting tea gardens and other areas of the Sub-division. The present transport network is insufficient to meet the need of transport facility of the town. Congestion is the resultant of limited road

space and mere absence of pedestrian footpath. According to the town committee report, there are 32.20 Kms of road within the town area in 1985. Out of this, 16.13 Kms are black-topped, 14.87 Kms are gravelled and 1.20 Kms are Katcha road. The Katcha roads are not motorable during the rainy season. The total number of vehicles in the town are as follows:

Table-3.7: Transportation Modes Available

Year	Bicycles	Rickshaw	Hand-carts	M/Cycles scooters	Car	Bus	Mini-Bus
1984	1,200	256	300	175	20	6	4
1985	1,500	306	325	196	24	11	5
1986	1,650	327	328	212	31	20	11

Source: Town Committee, Biswanath Chariali.

For travel to and from the town the bus is the main transport system and another mode is by train. Beside these, public carriers and other modes also available for travel purpose. More goods are transported by trucks though rail service continue to meet some of this need. Every day thousand of people coming to town for various purposes. The Assam State Road Transport Corporation bus ply mainly on the Highway and privately owned public buses ply between various important places of the subdivision. The city bus service

ply within the town area. The privately owned public buses convey passengers and goods to and from the town and thus play a vital part in present network system.

The following table stated the status of A.S.T.C. Services of Biswanath Chariali A.S.T.C. Bus stations.

Table - 3.8: Status of A.S.T.C. Service of Biswanath Chariali

Year	No. of vehi-cles	Total Passengers	Total Revenue	Fare per Km	Vehicle K.M.
1981	10	1,16,434	9,29,235	N. Super - 1.35 D. Super - 1.10	602330
1982	11	1,37,825	10,86,406	Express - 0.90 Ordinary - 0.55	655200
1983	12	1,29,600	10,13,213	N. Super - 1.50 D. Super - 1.35	604340
1984	12	1,49,950	13,81,963	Express - 1.05 Ordinary - 0.85	612810

Source: Station Superintendent, Biswanath Chariali A.S.T.C. Bus Station.

The bicycles mode play important vital parts in present transport system. A significant number of town residents use bicycles for work, shopping, recreation, school and college and other purposes.

3.3.4. Conclusion

This town has been growing importance since it has been declared a headquarter of the subdivision. Its modern importance day to day increasing due to increase of population, business and other economic development.

CHAPTER - IV

DATA BASE

DATA BASE

This chapter is devoted to data source. There is no available recorded data on Transport consumption by the households according to income and size of the family in which we primarily interested. The present work is a case study of Biswanath Chariali town on problem of urban transportation. The study requires data on different modes of transportation used by the households and their monthly income. As the published data are not available in government offices including Municipality office of Biswanath Chariali town hence collection of primary data become necessary for analysis.

In our study we have considered the following modes of transportation.

1. Bicycle
2. Rickshaw
3. City bus
4. Auto Rickshaw
5. Scooter/Motorcycle
6. Taxi
7. Private Car
8. Pedestrian
9. Other modes

However, we feel that not all the households are capable of giving exact amount of expenditure involved in transportation. This is so when the number of income earners in a family are more than one.

4.2. Sampling frame

For the collection of primary data stratified random sampling design has been adopted. For this purpose we have taken each ward as a stratum. In Biswanath Chariali town there are four administrative wards. For each of the wards the number of the households with house numbers were made available to us by the Town Municipality. We have used this list of households as a primary sampling frame. Due to the financial and time constraints we have decided to take 5 per cent of the household units into the sample. The sampling fraction is 20. So the sampling interval between any two chosen sample units i.e. households is 20.

Actually while we were collecting data we had resorted to systematic sampling. According to the procedure of systematic sampling is to select the random number between 1 to 20 and if the first unit happens to be 10 then the successive households to be taken to samples will be 30, 40, etc. etc. Although we have faced a great deal of troubles in collecting data for the consumption of transport and income, we could cover 90 households.

4.3. Questionnaire

In the time of data collection, a specially designed questionnaire, was used in the field. Types of questions that we have asked the respondents is given in the appendix.

4.4. Problems faced in Data Collection

In the time of data collection, we have to face certain difficulties in approaching the respondents by ourselves. Firstly, the people do not keep a record of the exact amount of expenditure on transport. Secondly, the people are not interested about giving information regarding their income and expenditure.

4.5. Secondary Data

In the collection of secondary data we have visited the office of the Director of Economics and Statistics, Government of Assam, Guwahati. At our request the office supplied us statistical Abstract, Assam, 1978 and Economic Survey of Assam, 1981-82, 83-83 and other reference books, concerning data for research work, we also visited Book Depot Section, Government Press, Assam and collected handbook and journals. We also collected data from the Commissioner of Transport and other transport offices. Some other published data are collected from books, magazines, journals, papers etc. in the North-Eastern Hill University, Shillong, North Eastern Council Library, Shillong, and Gauhati University, Guwahati.

4.5. Data arrangement

From our survey data we have tabulated data of households according to the number of families and their monthly income distribution, number of families and their distribution of expenditure. Income distribution of Households with average family size, total expenditure of transport and average family expenditure on transport, occupation of the head of the family, number of persons involved in different occupation, purpose of travel, distances, mode of transport and number of trips etc.

In our survey there are 90 observations. Therefore, certain groupings are necessary in order to have a manageable set of data for the purpose of analysis. We have used the following methods to modify the data according to the following manner.

It is permissible to rearrange only the exogenous variables and not the indigenous variables. Therefore, we rearranged monthly income in this manner.

First we took at the minimum income and the maximum income so that minimum is succeeded by the maximum. Suppose we have in our 90 observations, there are 4 families with the minimum income of Rs. 300.00. For the purpose of analysis we took Rs. 300.00 as minimum income as such. But so far

indigenous variables, we have different values for different families as given by the master tables. In order to get single figure for this indigenous variables we added all the transport expenditure of the 4 families and took the average of it.

Table-4.1: Income distribution of households with average family size

Family Income (Rs.) Class Interval	No. of Families F	Average Family size A.F.S.	Total No. of Family Member N.F.M.(P)
300 - 500	4	7.5	30
500 - 700	7	8.0	56
700 - 900	5	11.4	57
900 - 1100	16	6.8	109
1100 - 1300	9	7.0	63
1300 - 1500	7	8.7	61
1500 - 1700	8	9.0	72
1700 - 1900	4	12.7	51
1900 - 2100	7	4.7	33
2100 - 2300	2	4.5	9
2300 - 2500	4	4.2	17
2500 - 2700	3	4.6	14
2700 - 2900	2	5.6	11
2900 - 3100	2	8.7	17
3100 - 3300	1	6.0	6
3300 - 3500	1	5.0	5
Over 3500	8	9.6	77
	90		688

Table-4.2: Total expenditure of transport and average family expenditure on transport

Income Group (Rs) Class Interval	Total expenditure on transport (Rs.)	Average family expenditure on transport (Rs.)	Total No. of family
	T.T.E.	A.F.E.T.	T.N.F.
300 - 500	15	3.75	4
500 - 700	19	2.70	7
700 - 900	42	8.40	5
900 - 1100	111	6.90	16
1100 - 1300	65	7.20	9
1300 - 1500	99	14.10	7
1500 - 1700	98	14.25	8
1700 - 1900	59	14.75	4
1900 - 2100	116	16.60	7
2100 - 2300	21	10.50	2
2300 - 2500	72	18.00	4
2500 - 2700	60	20.00	3
2700 - 2900	5	2.50	2
2900 - 3100	47	23.50	2
3100 - 3300	22	22.00	1
3300 - 3500	20	20.00	1
Over 3500	370	46.25	8
	1241		90

Table-4.3: Occupation of the Head of the family

Occupation of the Head of the family	Number of families
1. Service	62
2. Business	25
3. Others	3
	90

Table-4.4: Occupations (Number of persons)

Service	Business	School/College	Others	Total
134	185	214	73	606

Table-4.5: Purpose of travel

	Office	Business	School/ College	Shop- ping	Recrea- tion	Others	Total trips
Number of trips	268	370	428	112	96	18	1292

Table-4.6: Distance from home to bus stop

Distance to nearest bust stop/ rickshaw stand etc. in the class interval (in Kms)	No. of families
0 - 0.5	12
0.5 - 1	21
1 - 1.5	15
1.5 - 2	16
Over 2	26
	90

Table-4.7: Mode of transport and number of trips

Mode	Number of trips
Bicycle	612
Bus	240
Rickshaw	184
Scooter/Motor cycle, Moped etc.	152
Private Car	32
Taxi	4
Others	68
Total	1,292

Table-4.8: Frequency distribution of trips

Trips by family	No. of families	No. of people
1	2	3
0 - 2	28	114
2 - 4	46	312
4 - 6	12	102
6 - Over	4	60
Total	90	688

Table-4.9: Modes and Number of Trips

Income	W	Bi	Ri	Bus	Pc	Mc/ Sc	Total no.of trips	No. of family	No. of people
300 - 700	14	110	18	36	0	4	182	11	86
700 -1100	10	180	46	58	0	6	300	21	166
1100 -1500	10	132	50	32	0	38	262	16	124
1500 -1900	8	106	34	30	2	40	220	12	123
1900 -2300	8	44	18	24	0	36	130	9	42
2300 -2700	6	24	12	16	0	12	70	7	31
2700 -3100	4	6	2	20	0	16	48	4	28
3100 -3500	2	0	0	8	12	0	22	2	11
3500 -3900	2	6	2	12	10	0	32	4	36
Over 3900	4	4	2	4	12	0	26	4	41
Total	68	612	184	240	36	152	1292	90	688

W = Walking

Bi = Bicycle

Ri = Rickshaw

Pc = Private car

Mc/Sc = Motor Cycle/Scooter

Table-4.10: Modes of Transport

Income	W	By	Ri	Bu	Mc/Sc	Pc	Total Mode	No. of people
300 - 700	7	55	9	18	2	0	91	86
700 - 1100	5	90	23	29	3	0	150	166
1100 - 1500	5	66	25	16	19	0	131	124
1500 - 1900	4	53	17	15	20	1	110	123
1900 - 2300	4	22	9	12	19	0	65	42
2300 - 2700	3	12	6	8	6	0	35	31
2700 - 3100	2	3	1	10	8	0	24	28
3100 - 3500	1	0	0	4	0	6	11	11
3500 - 3900	1	3	1	6	0	5	16	36
Over 3900	2	2	1	2	0	6	13	41
Total	34	306	92	120	76	18	646	688

W = Walking

By = Bicycle

Ri = Rickshaw

Bu = Bus

Mc/Sc = Motor cycle & Scooter

Pc = Private car

CHAPTER - V

METHODOLOGY

METHODOLOGY

5.1. Introduction

Demand for transportation may not be construed as demand for consumer goods found in classical literature. The reason for this view could be apparent in the following sections. The concept of utility in the context of multitude of substitutes, the concept of consumer in a hypothetically idealized situation as one of the homogeneous groups, the perennial substitution principle through price discrimination or variation and finally non-existent natural constraint (such as land in the transport network) may assume different meaning when transportation is assumed to be the most essential item. However, like in all other demand analysis the principal poles that delimits the growth and nature of growth of demand of transport are no other than price and income and yet there are variables which may be as important as price and income — these are:

(a) Population - Adult population.
(b) Economic - Activity assumes
    (1) Academic status
    (2) Employment
    (3) Business establishments
    (4) Institutions
    (5) Pleasure Houses (Cinemas etc.)

(c) Other communication system - such as telephone

(d) Spatial - i.e. distance.

The statistical problems relating to the exogeneous variables being correlated may be ascribed as the problem of multicollinearity. Yet, it is often found that in order to improve the fitness of a regression model, correlated exogeneous variables are incorporated in the model.

In transport demand models, we believe that the income is not as sensitive as the price. On the other hand, in specific cases, where substitute models are not available price hardly serves the purpose as enunciated by economic theory. In this context, the income happens to be the most important variable. Again, if we assume that all journeys are necessity, the income factor also ceases to play the role of influencing the demand for transportation. In this situation, we may, probably, have to depend on conventional variables such as population, family size, distance from the residence to area of economic activity etc. For global demand analysis, some of these conventional variables may not be exactly measured. The best travel demand analysis in an idealized locality where residence colony and areas of business activities are specified, then distance could be the guiding criterion.

Again, we face another problem regarding choice of models. Econometric models may be theoretically adequate, parametrically sound, yet when cross-section data are used for verification, the prognosis power of the model is not found to be reliable. The reason is, transport demand is not continuous over time and insaturated over space and time-expensive and cost-expensive travels are sometimes foregone without serious consequences. This is not the case with some other consumer goods.

Let us take the specific case of gravity model,

$$T = \frac{A_i \, A_j}{d_{ij}^2}$$

or linearised modified version.

$$T = a_o + a_1 A_i + a_2 A_j + a_3 d_{ij} = u$$

where

T = pass-Km

A_i = population of ith zone

A_j = population of jth zone

d_{ij} = distance between i and j

What is the implication of the original version of the model? If we assume that distance between i and j is only 1 Km and the population in i and j respectively also one

person then the model would generate only 1 pass-Km demand for transportation. While, if the population is doubled and the distance is still one Km then, the model would generate 4 Pass-Km. Thus, the impediment may reduce or increase pass-Km in a proportionate way. This is not exactly the reality. In order to avoid any misgivings, we have adopted very simple econometric models.

5.2. Methodology*:

We have adopted the following models for analysis of travel demand:

(1) $TTE = a + bY + u$

(2) $TTE = a + bY + cAFS + u$

(3) $TNT = a + bp + u$

(4) $TNT = a + bY + u$

(5) $TNT = a + bY + cp + u$

(6) $TTE = a + bY + cTNT + u$

(7) $AFET = a + bY + u$

(8) $DPTE = a + bY + u$

(9) $DPTE = a + bAFS + u$

where,

TTE = total travel expenditure

TNT = total number of trips

Y = income (family)

*The author is grateful to Dr. K. Bez for suggestion of the models.

P = population

AFS = Average family size

AFET = Average family expenditure on travels

TNF = Total number of family

DPTE = Daily per capita travel expenditure

u = Stochastic term

a,b = Parametres of the model.

Now, we would like to discuss these variables in details.

Total travel expenditure

In economics when we analyse consumption expenditure of the household in the absence of data on quantity or volume of goods we proxy these variables as expenditure. This was the line of analysis used by Engel and others in consumer expenditure. Now, we here, on the other hand, try to correlate total travel expenditure as a function of income. In fact we are thinking analogus to consumption function where we assume consumption as a function of income. The variable total expenditure is organised according to ascending order of income variable of the families that are included in this sample.

Income:

This variable need not be explained as social status, academic standard are also indicated by these variable. Therefore, besides being an important economic variable it also indirectly representing social status and academic status.

Total number of trips:

Usual procedure of course in travel demand analysis the proper variable is Passenger Kilometer, Biswanath Charia-li being a small town of 6.78 square kilometer in area. Hence trip distances may not be so significant. Although in our questionnaire we have asked the distance travel but the respondents could not give exact information on this count. Hence we have thought of using number of trips rather than passenger kilometre as indigenous variable in our model.

Population:

This particular variable is as important as the income variable. As we have stated earlier, in the so called gravity or attraction model, the population of the two zones are the principal exogeneous variable while demand for passenger transportation is estimated.

Average Family Size

This is serving almost the same purpose as the population variable itself. Therefore, we do not need to interpret further. The same goes for the variable total number of family. They are nothing but the concomitants of population.

Daily Per Capita Travel Expenditure:

The choice of this variable was accentuated by the frequency of use of transport by the families. At the same time a model in having this variable indicate daily traffic movements in the town.

Average Family Expenditure on Travel

We have already mentioned about the relationship between total travel expenditure and income. This almost serve the same purpose as the total travel expenditure. On the other hand, micro analysis of this type reveals the need and the growth of travel demand by respective families given the respective income category.

5.3. Analysis:

We have estimated the parameters of the model discussed above and results are as follows:

1. $TTE = f(Y)$

$TTE = a + bY + u$

$TTE = 27.87 + 0.022$

$R^2 = 0.076$

2. $TTE = f(Y, AFS)$

$TTE = a + bY + c\ AFS + u$

$TTE = -83.45 + 0.032 + 12.52\ AFS$

$R^2 = 0.196$

3. $TNT = f(p)$

$TNT = a + bp + u$

$TNT = -3.072 + 1.922p$

$R^2 = 0.918$

4. $TNT = f(Y)$

$TNT = a + bY + u$

$TNT = 308.7 - 0.078$

$R^2 = 0.793$

5. $TNT = f(Y, p)$

$TNT = a + bY + cp + u$

$TNT = 110.4 + 1.348p - 0.032Y_2$

$R^2 = 0.971$

6. $TTE = f(Y, TNF(p))$

$TTE = a + bY + c\ TNF + u$

$TTE = -27.55 + 0.019$

$R^2 = 0.492$

7. $AFET = f(Y)$

$AFET = a + bY + u$

$AFET = 2.542 + 0.005$

$R^2 = 0.531$

8. $DPTE = f(Y)$

$DPTE = a + b\,Y + u$

$DPTE = 19.34 + .0112$

$R^2 = 0.553$

9. $DPTE = f(AFS)$

$DPTE = a + b\ AFS + u$

$DPTE = 4.300 + 0.308\ AFS$

$R^2 = 0.288$

5.4. Observation on empirical relations

We found that total travel expenditure is though positively related to income, yet its parameter is not found to be higher magnitude. It may be so that total travel expenditure per day may be a small fraction compared to other expenditures. Looking at the coefficient of determination we are

not so happy that line is a good fit. We thought of considering the equation number (1) to be excluded from the analysis. But economic theory is in conformity with our theoretical model. Hence we have presented this equation.

The second empirical equation gives almost similar results, that means even here the parameter of the income variable is almost of the same magnitude as in the first equation. Although the sign of parameter is found to be exactly the way we expect. On the other hand, we have reason to be satisfied with this equation from the viewpoint of the high magnitude of the parameter for average family size. As we have said earlier in the methodology section that travel demand is more sensitive to population. Our views are confirmed by this equation. Although we have a relatively small coefficient of determination.

The empirical equation (3) truly and adequately confirms the view that population is more sensitive to demand for travel. Here we found that the coefficient of determination is very high which is $R^2 = .91$ is evidently a case of best fit. This shows that it is the population which is the most important exogeneous variables for estimating total number of trips. Thus, in general with the increase in population there is every possibility of increase in total number of trips.

The fourth empirical equation is estimating the total number of trips, using income as an exogeneous variable. Our first objection to this equation is that income is negatively related to total number of trips. This is beyond our expectation, also theoretically inappropriate. On the other hand, coefficient of determination $R^2 = .79$ which is truly an indicator of the best fit. This equation again like the first one income is not so as significant contributor to total number of trips. We have again observe another interesting point with the result given in equation number five. Hence, total number of trips is regressed on income and population. Like in equation number (3), population variable turns out to be the most positive influencing factor in generating total number of trips. Like in the other empirical equation, for example, equation number (1), (2), (4) income is not a significant factor in estimating the total number of trips. However, we are satisfied with the value of coefficient of determination R^2 which is as high as .97. Hence we may conclude that the equation is empirically a best fit.

We have tried another empirical equation number (6). In this equation we tried to estimate total travel expenditure by regressing on income and total number of families.

Interestingly, it is again the population variable in the guise of total number of families comes out to be a very significant variable in determining the total travel expenditure. We are also not so happy about the estimate of parameter of the income. It is found that income is positively related to total travel expenditure. Also the value of R^2 is quite high implying that the equation is reasonably representing the nature of relationship as enunciated by this equation.

The equation number (7) is another trial for estimating average family expenditure on travel as a function of income. Though income parameter is not of very high magnitude, but it has positive effect on average family expenditure on travel. At the same time R^2 is also quite high. Hence, this equation also statistically acceptable.

We believe that daily per capita travel expenditure as a function of income. In fact we do not think such an equation could be statistically adequate. The reason behind this contention is that usually the consumer spends his own income for his travel and not that of the income earn by the family. But in India, in a joint family system, family income through the actual earner may be one or two member of the family, their income is shared by every other member

of the family. From this viewpoint the equation may be sustained. As you have seen in the earlier cases, in this equation number (8) too, the income is not as an influential, variable as the population, R^2 is found to be .55. Hence the equation is a good fit.

The last empirical equation is taken for a number of reasons. In a family some times travel or trip is made by only one member of the family. If he is the only earner or doing usual activities which needs travel. The empirical relation is not statistically as interesting as the equation number (8), because of its fitness determined by R^2 = .28 is found to be weak. Hence this equation is not as reliable as the equation number (8).

CHAPTER - VI

CONCLUSION

CONCLUSION

Most of the empirical works in economics are not only always upto the mark. The reasons are the inadequacy of the data, the reliability of the data, aggregation bias and behaviour of the consumer. As in this case cannot always be determined with certainty. Like in any other consumer demand, the demand for travel would also be influence by other factors which are not economic factors. For example, the behaviour pattern of the consumer, the externalities may also be another reason for limiting or delimiting the behaviour of passengers.

In a time series analysis the behaviour of the consumers is well taken care of by the model itself, whereas analysis with cross section data does not indicate even implicitly the behaviour of the consumer.

Another important point is that the price which, is the second most principal variable in any consumption analysis is not incorporated into this model for technical reason as well as due to the constraints in supply of other modes of transportation. Therefore, in a cross section analysis price do not vary because there is no day to day change in the prices. Another factor is that we have only

one mean of public transportation. The price of private transportation like bicycle, scooter, motor cycle and car are only need to be differentiated when they are competitive with other modes of transportation.

The analysis of price becomes absolutely essential when the choice of mode of transportation is not impository but selective or say elective. Now, here we have a situation where people do not have any other means other than using either private means of transportation or city buses. In this situation price may not be as essential as we think to be.

In our analysis, we can say with confidence that it is the population, average family size, total number of family which are found to be more important variable for estimating travel demand as compared to income of the family. But this does not mean that income is a redundant variable. We can say that demand for transportation increases with the economic activity as well as rise in income, because income compared to the travel expenditure is of many-fold magnitude, specifically in a town like Biswanath Chariali.
In this regard we also believe that with the growth of population there will be the growth of the town and hence increase in demand for transportation. Therefore, we believe that

unless future expansion planned in such a way that the economic centres to be established later should be located in a decentralised manner and yet at the same time where possible residential colony should be adjacent to them. This would minimize the distance for travel and minimize the demand for transportation.

However, the author consider this dissertation is of exploratory nature and this study of course, in this context can be an eye-opener. In future he feels that there will be other following works so that a clear picture of the urban transportation planning can be envisaged from further investigation. The author has the interest in doing his Post M. Phil. research in the transport situation of Assam as a whole so that a critical analysis could be made which could be useful for state planners.

APPENDICES

APPENDIX - I

QUESTIONNAIRE FOR SURVEYING TRANSPORT REQUIREMENTS AND THE COST OF TRANSPORT IN THE TOWNSHIP OF BISWANATH CHARIALI

1. Name of the Occupants:

2. Size of the family :

	Below 5 Yrs	Above 5 Yrs
Male		
Female		

3. A. Economic Status:

Occupation	No. of people
a) Service	
b) School going	
c) Others	

B. Total family income (monthly) :

Service	Business	Others

4. Types of vehicle owned by the family:

5. Purpose of travel, Mode used and No. of trips made

(Symbols in the travel)

Matrix - O = Office
S = Shopping
C = School/College
R =
A = Others

Mode of Transport

No. of trips made	F	BC	M/S	BUS	R	AUT	TAXI
1							
2							
3							
4							
5							
6							
7							
8							

6. Expenditure on Transport for the family:

   a) Monetary -

   b) Time -

7. Nearest Bus Stop -

8. Waiting time at Bus stop

Outward/Inward Journey	

9. Change of transportation along the distance travelled:

10. a) Distance from home to office:

    b) Distance from home to school/college:

    c) Distance from home to shopping:

    d) Distance from home to others:

11. Comfort - Do you always get a sit? Any other:

12. For gone travel (if any):

13. Others :

Data would be collected on Midweek Days

APPENDIX - II

COMBINED TABLE FOR ESTIMATION

Sl. No.	TTE	TNT	Y_1	AFS	P	Y_2
1.	15	182	400	7.5	86	500
2.	19	300	600	8.0	166	900
3.	42	262	800	11.4	124	1300
4.	111	220	1000	6.8	123	1700
5.	65	130	1200	7.0	42	2100
6.	99	70	1400	8.7	31	2500
7.	98	48	1600	9.0	28	2900
8.	59	22	1800	12.7	11	3300
9.	116	32	2000	4.7	36	3700
10.	21	26	2200	4.5	41	3900
11.	72		2400	4.2		
12.	60		2600	4.6		
13.	5		2800	5.5		
14	47		3000	8.7		
15.	22		3200	6.0		
16.	20		3400	5.0		
17.	370		3500	9.6		

APPENDIX - III

SUM OF PRODUCTS AND SQUARES

TTE	Y_1	AFS	TNT	P	Y_2
204481	2837000	9884.2	69494	37534	1653700
	83610000	234200	1174000	676800	36420000
		1003.67	10745.6	5532.1	179270
			266456	136434	1959600
				72064	1141200
					65860000
1241	33900	123.9	1292	688	23000

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