

AN ECONOMETRIC ANALYSIS OF DEMAND FOR PUBLIC TRANSPORTATION IN SHILLONG

ABSTRACT

THESIS
SUBMITTED TO THE NORTH-EASTERN HILL UNIVERSITY
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY IN ECONOMICS

By

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ABSTRACT

1. Introduction

Shillong, the capital of Meghalaya has developed as an important administrative cum commercial centre not only for the State but for the entire North-Eastern Region. Shillong has experienced phenomenal expansion of population and economic activity resulting in various social and economic problems. The most critical problem faced by the people of Shillong are inadequate, poorly designed, out-dated road system and over-crowded transport facilities. Frequent stoppages, slow movement of traffic due to over-congestion are frequent occurrences in the city. The National Highways No.40 and 44 in the stretch passing through the Shillong city, has far exceeded the point of optimality of road usage, thus breeding bottlenecks to free and unimpeded movement of traffic. The present transportation network is beset with many problems and this is the main cause of backwardness of the state.

2. Objectives of the Study

A survey of research and literature on transportation revealed that meaningful studies have not been made so far in Shillong, hence it was felt desirable to fill the gaps at

least partially. Specifically, the following are the objectives of the study :

a) To review the development of transport in the state since its inception to the present days.

b) To find out the demand for public transportation in Shillong city.

c) To suggest various measures by which the transportation problem in the city can be solved to a certain extent.

3. Data Base

Considering our topic, "An Econometric Analysis of Demand for Public Transportation in Shillong", both primary and secondary data were required for our analysis. Since secondary data were not adequate, primary data were collected from nineteen different localities of Shillong, covering 500 households. We have, however, not followed strict sampling technique in the case of stratification. We may call that our sampling method is purposive and we covered some clusters.

4. Analysis

Our analysis was divided into three parts :

- 1) Statistical interpretation of MTC data
- 2) Econometric analysis of MTC data
- 3) Econometric analysis of primary data.

Interpretation of MTC data gives us the following results. It may be noted that the empirical demand function for estimating the demand for passenger-kilometre by MTC buses is a best fit by accounting for 75 per cent of total variance by regression coefficient. The signs of the estimate of the parameter are also correct. We can also see that income elasticity is 1.39 and price elasticity is 1.42 which means that with the rise in income there will also be a rise in passenger-kilometre.

In the estimate of the demand for energy both linear and log linear equations show the best fit with $R^2 = .9$. The estimate of the parameter of vehicle-kilometre is significant at 1 per cent level but DW statistics show that there is auto-correlation in the disturbance term.

In the case of empirical Repair Cost function we found high R^2 but there is auto-correlation in the disturbance term and the estimate of the parameter of earnings is highly significant.

Then coming to expenditure, we wanted to see how the expenditure are constituted under different levels of cost. In this case we took expenditure as a function of fuel cost, repair cost, tyre cost and administrative cost. Although we expected the signs of the estimated parameters to be positive by virtue of our assumption, but it is seen that the estimate of the parameters of fuel cost and tyre cost bears the

negative sign, which means they are probably not as important as administrative cost and repair cost. Also the estimates of the parameter of fuel cost and tyre cost are not significant, whereas the estimates of the parameters of the repair cost and the administrative cost are significant.

The empirical equation for estimating Tyre Cost with $R^2 = .85$ is a best fit with auto-correlation present in the disturbance term.

In the case of estimating the accidents, we have run into certain problems. We should have taken into consideration the gradient of the road, age and experience of the driver, density of traffic and the age of vehicles. All these factors assume to be directly related to the cause of accidents but we do not have such data. Therefore, we use vehicle-kilometre as the only independent variable to estimate the number of accidents. This equation is a poor fit, as it gives only the account of 15 per cent of the total variance by the regression coefficient.

Econometric Analysis of Primary Data

We have adopted the following models for analysing the primary data :

$$\text{Pass-Km} = a_0 + a_1 \text{ Income} + u \quad \dots \quad (1)$$

$$\text{Travel Expenditure} = a_0 + a_1 \text{ Income} + u \quad \dots \quad (2)$$

From the empirical equations relating to model 1 and 2 we obtain the following results :

We have altogether nineteen equations relating to each locality surveyed. The estimate of the parameters of income in case of travel expenditure comes out to be positive. We note with satisfaction that R^2 the coefficient of determination is nearly equal to .50 or more for most of the localities. Therefore, all the equations fit moderately and most of them have a best fit. In the case of log linear equations we found almost similar results. We found that demand for travel inter alia the travel expenditure is income elastic.

Next we have estimated the demand for passenger-kilometre. We have adopted here the log linear version of the empirical regression coefficient and finally we estimated for all the nineteen points of survey. We have found the signs of the parameters are correct, but R^2 in some of the equations are so small that it does not guarantee the empirical regression function is a best fit. On the other hand, we have satisfactory t values even for these equations. DW statistics show there is auto-correlation in the disturbance term. However, most of the equations are best fit with high value of R^2 and the estimate of the parameters of income are also highly significant. We have found that income elasticity of demand for passenger-kilometre varies

from .23 to .89 and therefore, the demand for travel may be considered to be income elastic.

In conclusion we see that with increase in income, both passenger-kilometre and travel expenditure increase to a significant extent.

Chapter Plan

Chapter-II - Review of Literature - This chapter is devoted to research and literature on transportation in India and abroad.

Chapter-III - State of Transport in Meghalaya - Here we have made a detailed study of the development of passenger transportation in Meghalaya with special reference to Shillong from the olden days to the present. We have also made a detailed analysis of goods and rural transport facilities in the state.

Chapter-IV - Data Base, Methodology and Analysis - As an attempt to study the demand for public transportation in Shillong both primary and secondary data were collected for the sake of analysis.

Econometric models have been designed to estimate the demand for passenger transportation as well as to study the relationship among the concomitant variables besides

understanding the influence of the exogenous variable upon the endogenous variable.

Chapter-V - Conclusion - In this chapter, we briefly review the main findings and highlight various suggestions by which the problem of transportation in the city can be solved to a certain extent.

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SUPERVISOR'S CERTIFICATE

Certified that the thesis entitled **AN ECONOMETRIC ANALYSIS OF DEMAND FOR PUBLIC TRANSPORTATION IN SHILLONG** submitted by **Ms. Soma Sen** for the **Degree of Doctor of Philosophy in Economics** of the North-Eastern Hill University, Shillong, embodies the record of original investigation carried out by her under my supervision.

She has been duly registered and the thesis presented is worthy of being considered for the award of the Ph.D degree. This work has not been submitted for any degree of any other University.

Dated December 12th, 1995.


(K. BEZ)
Supervisor

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ACKNOWLEDGEMENTS

I wish to express my sincere gratitude to my Supervisor, Prof.K.Bez, who as guide, not only provided able guidance and wise counsel throughout the period of study, but has also been a source of inspiration and encouragement. I will always remain indebted to him.

I am always very grateful to Mr. B. Mishra, Department of Economics who has helped me with the computer work required for the analysis.

I extend my sincere thanks to my respected teachers and the office staff the Department of Economics, North-Eastern Hill University, for helping me all along in my work.

I avail myself of this opportunity to thank the authorities of the District Transport Office, East Khasi Hills, the Public Works Department, Government of Meghalaya, the Shillong Municipal Board, the Meghalaya Transport Corporation, the Commissioner of Transport, Government of Meghalaya, the Directorate of Economics and Statistics, Government of Meghalaya, the North Eastern Council, Shillong, for the provision of valuable data without which my work would have had a setback, and for their generosity,

consideration and cooperation, I hold the officers and staff of these offices in high esteem.

I wish to express my thanks to Mr. Godfrey Pathaw for typing out this thesis in time.

Finally, I acknowledge my deep sense of gratitude to my family and friends for helping and encouraging me throughout the course of my study.

Dated December 12 / 12, 1995.

Soma Sen
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Chapter—I

INTRODUCTION

1.1. Introduction

The nature of urban transportation is a very complex subject. "The transport industries which undertake nothing more than 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, 1992). Transport as such is a service catering to the mobility needs of the rural population as well as city dwellers with a wide range of modes and means. Thus, by providing mobility through the various ways such as land, water, air, etc., transport service increases the place and time utility of various commodities. In modern times, urban transport installation, operation and its management has become a challenge in many of the developing countries. Transport is held responsible for urbanization and concentration of population in cities and towns. As a service, transport is a derived demand and does not exist in isolation for its own sake, but for meeting the economic and social objectives. Certain factors such as population size, structure, number of households, working population, land use such as physical lay out of towns, centres of economic and social institutions and educational activities etc. have an effect on demand for transport. In fact, demand for

transport is the net result of the interplay of its determining factors. Of the two basic components of transport demand, namely freight and passenger traffic, the former is directly concerned with the level of economic activity and development needs and has accordingly received greater attention in planning priorities, but passenger traffic, particularly journeys to and from work and business travel, is as essential to development and maximization of production as freight traffic. Besides, it is incorrect to label non-work passenger journey as socially wasteful entitled to lower or no priority at all, as most non-work travel undertaken by people in cities and on inter-city routes is linked with essential social needs such as visits to families, educational institutions, religious centres and other similar purposes.

The case for creation of transport capacity in anticipation of future demand rests logically on two stronger considerations. Firstly, transport like power is a non-traded commodity, that is, its services cannot be imported and secondly transport investment is lumpy in character. It is, therefore, necessary to allocate funds for creating transport capacity even if the demand for its service does not justify investment on the basis of its commercial viability. Secondly, the lumpiness of investment also makes it necessary to create capacities on a scale larger than is

justifiable in relation to immediate demand if we are to benefit from economics of scale associated with a transport plan.

To meet the increased transportation demand, large investment have to be made which involves an element of risk and uncertainty and moreover long lags involved in construction of transport projects also create difficulties in planning of transport supply. Despite various efforts to augment the capacity of various modes of transport, the sector has generally experienced bottlenecks and capacity shortages. The imbalance between demand and supply of transport facilities has adversely affected the smooth functioning of the economy. However, whether and how the supply will adjust itself to the changes in demand will depend on the resource policy of the government, shifts in plan priorities, and several other imponderables.

1.2. Scope of the Study

Transport, complex a problem as it is, has become one of the burning topics of the day, and its importance has gained momentum with the new developments in the fields of ways, means, motive power, economic and political factors. Hence the scope of the study of transport is much wider today covering such aspects as economic, technical, organizational, social, legal, financial etc. However, considering the sub-

title of our study, i.e. "An econometric analysis of demand for public transportation in Shillong", We restrict our study to public transportation only where public transportation means transportation by the people using both public and private conveyance system. This in no way belittle the importance of transport service, as a whole. Our present study is but a part and parcel of the whole.

Urban transport problem is not peculiar to Shilling city alone, but presents itself as one of the most complex problems of all regions of the world. However, considering the state which host this city, Shillong, being mainly characterized by hilly topography and rough terrains, we are obliged to tackle the problem in a single-minded way with what best efforts we can in our modest way.

In the last few decades, Shillong has experienced phenomenal expansion of population and economic activity. While business and economic activities has mainly been concentrated in central areas, residential colonies have spilled over into suburbs thus greatly adding to intensity of commutation. Essentially urban transport problem arises because of separation of residence from work place, enlargement of employment opportunities and relatively free choice of residence aggravate these problems. In practice the average trip length tends to increase with the growth of the city. When employment opportunities remain concentrated

in central areas trip length increase because residential accommodation keeps on spreading to the periphery which itself drifts further away from core as the city expands. The volume of transport is growing daily and the existing public transport system is under severe strain. Overcrowding is becoming unbearable and ever maintaining the existing transport facilities is posing great difficulties. Urban transportation problem is more pronounced in Shillong, because of its peculiar characteristic which harbours the heavy curvature of roads, hence, reducing the speed of vehicles; the too narrow roads embedded with permanent structures on either sides which would be too expensive to be rooted out; the too numerous vehicles on road made more so because of the increase in private motoring, apart from the fact that the long stretch of road passing through the city also happens to be the National Highway connecting parts of Assam plus being a vital supply route since, there is no other alternative means of transportation other than roadways such as railways, in Meghalaya. The roads being narrow, there cannot be any segregation of the slow and fast moving vehicles. Hence they have to be parked on both sides of the narrow roads. Many a times we find vehicles virtually crawling and in peak hours those who walk on foot reach earlier. Further the large influx of people from rural to urban areas; and the far too-small proportion of land

allotted to transport land-use (roughly 15.76 per cent or 670 hectares out of 10,373 hectares — Master Plan Shillong Area) has made urban transport the problem that it is today.

Efficient land use and location planning can help in optimization of transport effort, but land use planning proved to be a failure in Shillong as well as other Indian cities unlike in the west where it was definitely more effective. This could well be a lack of far-sightedness in the minds of our planners who failed to visualise how far our city would grow. The narrow streets and lanes with sharp curvatures and permanent structures on both sides of the road, the alarming growth of vehicle population with the same size of roads as it was twenty years ago call for the use of flyovers, or over passes or bye passes. Thus land use planning should be regarded as an alternative to solution involving new transport technologies.

1.3. Objective of the Study

A survey of research and literature on transportation, revealed that meaningful studies have not been made so far in Shillong. Hence it was felt desirable to fill the gap at least partially.

Specifically, the following are the objectives of the study :

1) To review the development of transport in the state since its inception to the present day.

2) To find out the demand for public transportation in Shillong city.

3) To suggest various measures by which the problem of the transportation in the city can be solved to a certain extent.

1.4. Presentation of the Study

In the process of analysing the aforesaid problem, we would like to chapterize the study under the following :

Chapter-II — Review of Literature — This chapter is devoted to research and literature on transportation in India and abroad. A further classification is attempted to discuss separately studies on different aspects like history and role, policy, planning, energy, investment, cost rate structure, safety, etc.

Chapter-III — State of Transport in Meghalaya — Here we have made a historical study of the development of passenger transportation in Meghalaya with special reference to Shillong from the olden days to the present. We have also made a detailed analysis of goods transportation in the state. Finally, since about 80 per cent of our population live in the rural areas, we have also made a study of rural transport scenario in the state.

Chapter-IV — Data Base, Methodology and Analysis — As an attempt to study the demand for public transportation in Shillong, both primary and secondary data has been collected and compiled to give us a direct though rough idea about the state of transport system in the city. State level data like the number of vehicles on road, the progress of the transportation department, the number of vehicles registered in Meghalaya, the number of routes covered, etc. were obtained from the Office of the Commissioner of Transport, the Meghalaya Transport Corporation and the District Transport Office, Shillong. The P.W.D. and the Planning Department, Government of Meghalaya, gave us other vital information required for our analysis.

A questionnaire had been designed to collect relevant information about the family size, monthly income, number of trips made by the respondents, distance from home to the nearest bus stand, market educational institutions, bank, etc., frequency of service and expenditure incurred on transportation.

Econometric models have been designed to estimate the demand for passenger-transportation as well as to study the relationship among the concomitant variables besides understanding the influence of the exogenous variable upon the endogenous variable.

Chapter-V — Conclusion — In this chapter, we briefly review the main findings and highlight various suggestion by which the problem of transportation in the city can be solved to some extent.

We honestly believe that this type of study will highlight the problem of Shillong transportation and as such help the planning process to carry on work on those lines which need rapid development.

Chapter—II

REVIEW OF LITERATURE

2.1. Introduction

Transport is a fundamental pre-condition for the take-off of an economy. "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." Since it constitutes an important item of infrastructure for economic growth, a great deal of effort has been made in the research and documentation on the subject. Following is a brief review on the research and literature on different aspects of transportation, both within and outside the country. A further clarification is attempted to discuss separately studies on different aspects like history and role, policy, planning, forecasting, investment, performance, safety etc.

2.2 Studies Abroad

2.2.1 History and Role

Since time immemorial, means of transport have been changing according to changed conditions and particular requirements. In the days of yore, human beings themselves transported their commodities from one place to the other. This had rather become a custom that the male used to carry his weapons and the female the load of a number of

commodities on her head. As Eaton (1925) says "perhaps it was woman who, on seeing a forked branch lying broken from a tree, figured that a heavy load could be put on the branch and dragged with less difficulty than when carried across human shoulders." In those old days roads did not exist, and people used to walk along tracks. As a result of progress in trade and commerce, pack animals began to be used which travelled in caravans. Even in that stage of economic development roads did not exist, but wide tracks were automatically made due to the movement of hundreds of animals together. Dogs, oxen, horses, camels etc. were used as beasts of burden, and even today in some parts of the world, their importance has not diminished.

Before industrial revolution - The transition from subsistence farming to commercial farming and the growth of the manufacturing activities in towns before the industrial revolution took place, widened the scope for the development of the means of transport. Wheeled traffic could be accommodated after the latter were technically much improved. Even in the 18th. century the condition of the English roads were very unsatisfactory. Mr Arthur Young wrote in 1760 about roads in Oxfordshire as being "in a condition formidable to the bones of all who travelled on wheels." It was very difficult for coaches to move smoothly on roads. The number of passengers who travelled by coach in 1763 between London

and Edinburg was estimated by Mr Landner at not more than 25 per month. Even when roads in England were much developed, the number did not exceed 140 per day in 1835.

Industrial revolution and after - When the industrial revolution took place on the European continent, workers had to travel daily to and from the factories, which increased local passenger movements by rail. At the same time the development of industry and trade required speedy movement of goods. Though at this stage the four forms of transport (road, rail, air and water) were developed yet the old forms of transport were still required by men to serve the purpose of transportation.

In the 20th. century the outstanding feature of transport is the development of mechanical transport which on account of its fast speed, has facilitated the movement of men and materials over long distances. The circle of movement widens with an improvement in speed. To quote the observation made by Mr Lardner (1850) in this connection - "It is evident that any improvement in transport which will double its speed, will double the radius of this circle, an improvement which will treble its speed, will increase the same radius in a three-fold proportion. Now, as the actual area or quantity of soil included within such a radius is augmented, not in the simple ratio of the radius itself, but in the proportion of its square, it follows that a double speed will give a

four-fold area of supply, a triple speed a nine-fold area of supply, and so on. How great the advantages, therefore, are which in this case attend increased speed, are abundantly apparent."

More than a century ago, due importance was not attached to transport because people generally believed that only manufacturing industries, banking and agriculture could develop national economies. As Mr Callender (1909) has observed, "Historians have generally failed to appreciate the importance of this factor in American development. Much more attention has been given to the growth of manufacture, to currency and banking system but none of these matters has exerted the title of the influence upon our economic growth that has come from improvements in transportation. In fact since 1815 one most conspicuous economic achievement have depended directly upon this factor."

Colin (1972) analysed the transport revolution by private operators in Britain. He noted that 200 years ago, the revolution took the form of development of a nation wide system of canals. A hundred years ago it was the creation of a national railway network. This time the revolution was not the emergence of motorized road transport as such but the facility it has brought with it, viz. the chance of every family to have or aspire for his own car and for every industrial and commercial firm to run its own fleet of

freight lorries. He also observed that private vans and lorries are used extensively in retail and other distribution work. As a result private operators account for 70 per cent of the total amount spent on freight transport in Britain which is roughly about seven cents of the total cost of sales.

Stokes (1968) commenting on the effects of the Tajaries - Valencia highway in Venezuela notes that in the areas of Valencia and Maracan "the highway had the effect of shifting the role of the city from that of a processor of local production into national manufacturing centre dependent heavily on national markets of supply and demand." He further showed that in Equador, the upgrading of the Santo-Domingo Esmeralda road to a paved all-weather road, 174 km. highway would bring 17,000 hectares of "new land" under cultivation. Similar figures can be quoted in other areas in less developed countries, it is quite a usual phenomenon to have regions where land is not being productively used due to insufficient accessibility both for approaching it and carrying away the product.

Lunback (1976) in a study of three rural areas in Peninsular Malaysia mentions that after the opening of new roads in Megat Dewa areas, the influence of the traditional doctor had decreased sharply and clinic attendance increased. Improved accessibility increases the potential for

communicating information and ideas by enabling more direct contacts between rural population and regional or national centres.

According to Ogburn (1946), "Transport the de facto barometer of economic, social and commercial progress has transformed the entire world into one organized unit. It carries ideas and inventions to the people of different countries, and has considerably contributed to the evolution of civilization."

According to Prof. Lamer (1979) the construction of new transport infrastructure is of prime importance for the rapid development of an under-developed area. He showed that the construction of the Adriatic Highway in 1960, as well as the construction of other modern routes (in Opuzen) and the construction of railways has given these villages (Primosten and Hercegnovi) the opportunity for the development of agriculture so that by 1961 immigration to other regions has ceased and population started to rise.

Lowe (1959) gave a fascinating account of the transportation and communication system in Japan during the Tokugawa period (1600 - 1686) and pointed out how the main features of this system laid the basis for Japanese modern development in the field of transportation.

Inoue (1969) discussed the role of transportation in quickening the tempo of rapid economic growth and urbanization in Japan.

According to Dr. G. Gannopoulos (1979), due to the construction of 130 km. highway from Korinth to Pateas in 1972, land uses in a 2 km. highway had changed from predominantly agricultural to approximately 10 per cent light manufacturing and another 10 per cent various other land uses (primarily hotels) within the first three years of the opening of the highway. He also observed that the opening of new transportation lines increased the export potential of the region and made production more market oriented rather than subsistence oriented. In certain regions of Greece, for example, he observed that where the agricultural products were the main output of the region, the general provision of an adequate road network serving these areas meant an increase in the tonnage of exported agricultural products which primarily were left in the field due to the inability to carry them in time and with the right cost of their potential market at home and abroad.

Hajerstand and Henntorp (1976) showed that increased mobility in public transport has two effects. Firstly, given the same extent and spatial distribution of activities as before, travel time is reduced so that more activities may be accommodated in the time budget. Secondly, because of the

lower expenditure of time per unit of distance, the distance to possible places of activity is increased, so that spatial dispersion of activity becomes greater.

2.2.2 Policy

Though transport policy is a very vast subject, very little attempt has been paid to study its relevant aspects. Payne (1975) observed that the European transportation system was evolved on the concept of free competition analysing the major implication of the Treaty in Rome on Transportation.

The broad policy issues governing the role and functioning of the World Bank in building up infrastructure for transportation in developing countries were examined by Ratter (1973). He observed that one-third of the World Bank lending since its inception in 1946 has been on the transport sector.

Quin's study (1974) brought to light the hazards of community legislation in U.K. passenger transport industry. The rationale for statutory regulations on the transport of potentially dangerous commodities was examined by Bealbey (1974).

Smith (1975) provided rich insights into the problems faced by local government in administering public transport and provided modus operandi for a rechange in policy and administrative set up.

Ribat (1975) examined the interaction between government and private sector in planning and developing a multi-model transportation model.

Joy (1974) suggested an ideal framework of objectives to evolve a proper policy for promoting a healthy transportation network.

The study conducted by the organisation of Economic Cooperation and Development (1971) reveals that Paris exhorted the need for governmental legislation granting protection against urban traffic noise.

Adverting to common transport policy Featherstone (1974) called for comprehensive harmonization of the influence of state on transport operation through appropriate legal and other regulations.

The guidelines consisting urban expansion needs on transportation requirements were considered by Poole (1974). His study confined to Stockholm dealt with different aspects of regional planning.

Rudgers (1977) stressed that since transport is for the people it should cater for changes of the people's need. He says there should be more financial support for buses and less for road construction.

In 1976 and 1977, there was a significant development in transport policy in the U.K. with the publication in April 1976 of a Consultation Document (Department of Environment,

1976) which sets out current governmental thinking on transport policy as the basis for discussion and comments. After receiving comments the government published a policy statement in the form of a White Paper in July 1977. This approach based on consultation was a new departure for transport policy making although it has been in other spheres (e.g. speed limits) in the U.K., but White Papers on transport policy have been a regular feature of the post-war period.

In this context, the Consultation Document is also notable in several respects, for its contents, summarized by Lee (1977). It suggests that subsidies be reduced although not eliminated and that the remaining subsidies be directed towards services providing a basic need (e.g. in a rural area) or towards income redistribution objectives, which the Consultation Document claims, would entail eliminating certain rail subsidies (e.g. those to long distance commuters in London).

2.2.3 Energy

Ongut (1979) studied the transportation system of Turkey and pointed out that 70 per cent of goods transport and 90 per cent of passengers are carried out through the road transportation which uses very expensive imported energy. The critical energy situation seriously influenced not only transportation system but also transportation

volumes. Since the possibility of transferring people or goods from one system to another was fairly limited, the energy problem creates other problems such as reduced demand in transportation. Such falls in demand affect the distribution of products which in turn brings major changes and variations in prices. He suggested that the growing transportation requirement in Turkey should be met not only through road transportation but through new railways and increase in maritime services.

An OECD study sponsored by Leach (1973) indicated that in view of the minimum estimates of ultimate conventional oil reserves, the growth in gasoline demand was liable to cause serious tension on the oil market owing to the inevitable imbalances in consumption. Studies conducted by the Hudson Institute of Technology showed that the rapid rise in energy consumption and particularly the demand for fuels are liable to give rise to serious problems.

Bayliss (1975) says of the petroleum products consumed in the transport sector about 70 per cent is used for passenger movement and 30 per cent for freight movement and over four-fifth of the total consumption in the transport sector is accounted for by road transport.

The Netherlands Road Transport (1977) carried out an overall study at the request of the Commission of the

European Communities, to work out the energy consumption for each means of transport, both for passenger and for goods.

The Commission of the European Communities (1974) suggested to limit oil consumption where it can economically be replaced by other energy sources.

In a highly aggregative study by Malliaris and Strombotne (1973) energy efficiency calculations for individual modes were made by dividing the total national passenger miles of each mode by the fuel consumed by each mode, and similarly for ton miles. On the basis of these calculations, it was suggested that the movement of 50 per cent inter-city road freight to rail would lead to a 3.4 per cent fuel consumption.

In a purely theoretical study, Baumgartner (1973) showed that "cars consume between two to five times more petrol than the fuel required by a first and second class express train, and the energy consumption of rail is generally two to four times less than that of lorries carrying the same volume of transport."

According to a survey conducted by Battelle (1974), "the consumption of energy per passenger mile (of the bus) is often lower than or the same order as that of the train and is three to four times lower than that of the private car. A heavy goods train is also remarkably efficient. It seems hardly disputable that on average the train uses four times

less energy than the lorry per ton transported.

According to Foley (1973), rail transport is about four times as efficient in energy terms compared to roads. On longer journeys there is a greater advantage to rail in terms of its fuel costs.

Studies by Edwards and Bayless (1971) have shown that there are substantial economies of scale associated with large goods vehicles - on average a 10 per cent rise in vehicle - only results in a 7 per cent increase in operating cost with fuel economies being one of the constituent savings. Although, therefore, there may be environmental grounds for preventing the growth in large freight vehicles, from the energy aspect this movement towards large vehicles should be encouraged.

Ribat (1975) suggested that a combination of pricing and fuel rationing is the best solution. There are two ways of implementing such a policy, either all motorists can be allowed to buy an equal amount of petrol at the regular price, i.e. they would be given petrol coupons for the amount and any additional petrol can be bought at much higher prices, or petrol coupons can be made legally transferable. Both systems would be aimed at achieving the identical saving, and under this constraint the second system is preferable to the first. If the consumer is allowed to sell all or part of his petrol to motor himself or sell his

coupons at more than regular prices of petrol and use the income to do something preferable to motoring.

A number of studies have been carried out in the United States in recent years on price elasticity of petrol varying from a single equation model to seven equation models. In spite of the diversity in the model specifications the results have been remarkably similar and without exception have shown demand for petrol to be inelastic in both the short and long-run.

The Rand Corporation (1974) five equation models used various dependent variables (car price, car ownership per household, vehicles travelled by households) and showed the price elasticity of demand for petrol was -0.37 .

Research carried out at Lockheed and General Motors of U.S.A. (1971) reveals that hydrogen can sometimes be used as an alternative form of energy, and its use in aircraft could have advantage of 22 per cent of energy utilization.

Rogers (1974) explains how urban transportation planning can be used to conserve energy.

2.2.4 Planning

The studies on metropolitan transportation received wide attention.

Jones (1974) explored the development and application criteria to evaluate metropolitan transportation planning. He also reviewed the past attempts on the subject.

Stuart (1969) analysed the problems in urban transportation planning with the aim of mathematical programming.

Hutchenson (1975-76) made an indepth study of the urban transport strategic planning with a systematic framework. He also evaluated the recent advancement in the subject and estimated travel demand created by a given land and traffic arrangement.

Lauchlen (1975) described the typical characteristics of city in regard to its transportation infrastructure.

Thomas traced that through out history societies have devised ideal parameters for the cultural and physical organization of their urban places and advocated the need for the organization of land transportation system.

Parkinson (1971) studied the transportation structure in Cardiff in late sixties and evolved a Master Plan projecting upto 2001 AD and enumerated guidelines for public transportation policy.

William Bingle (1964) observed that in urban areas the resource allocation process for transportation was complicated by the rapid growth of cities and presented a case for balanced transportation planning in metropolitan areas.

A study conducted by the Ministry of Transport (1966) in London highlighted the need for planned improvement of

urban road system to ensure free flow of traffic at reasonable speed. The measures suggested by it include (i) prohibiting or restricting on primary district distributors, (ii) taking urgent action to provide off-street parking accommodation, and (iii) constructing secondary means of access to enable goods to load and unload at nearby points.

Marc's (1969) dissertation stressed on land-use planning from the transport view-point.

Another study by Derbyshire (1974) focuses on the application of transportation planning for rationalised pattern of land-use.

Samuel (1966) examined the problems in appraising the economic impact of a transportation improvement.

Fredric (1975) analysed that public transportation received better attention in several studies and researches on transportation planning.

McKinley (1975) developed five alternative state - plans for the funding of public transportation in Colorado.

Lim's study (1974) presented a case for integrating urban freight transportation planning with economic and land-use planning.

According to Lamer (1979) in drafting general socio-political plans, regional planning is gradually becoming more and more important. The expansion of the capacities of the

transport infrastructure must be planned in connection with the needs of the transport system. Special attention must be paid on seeing whether improvements in traffic flow can only be obtained by the new infrastructure. This is particularly important as a new infrastructure is often very expensive and lower prices and higher quality can also be obtained under specific conditions by a whole range of other resources, e.g. by better use of the existing infrastructure, national transport policy etc.

2.2.5 Investment

Transport, constituting an important element of infrastructure, its influence on economic development does not require any exaggeration. Consequently, expenditure on transportation services are viewed as investment for augmenting economic growth. Alexander (1975) estimated that in U.K., the share of transport in GDP was 15 per cent and 11 per cent of the consumer expenditure were accounted for by transportation costs.

Charles (1967) examined the economic and social effects of investment in transportation. However, he conceded that cost-benefit analysis of social infrastructure projects like transportation facilities in underdeveloped areas is rather difficult. Consequently he asserted infrastructural investment are based more on faith than anything else.

Charles made another study in which he developed an equity evaluation model for urban transportation cost-benefit appraisal.

Gillinder (1975) reviewed, cogently the important contribution to the study of the problems raised by investment in transport and the use of cost-benefit analysis.

The lack of a sound theory on the prerequisite and the workings of economic development processes when effecting transport investment has been much deplored, particularly by British and American authors (1975).

With regard to the use of transport investment as perhaps, the most important traditional of regional development policy since mercantalism, the words of Hans A. Alder, Chief Transport Economist at the World Bank, are still true. It is frequently assumed that all transport improvement stimulate economic development. The sad truth is that some do, and some do not, and that even some of those that do may not be economically justified in the sense that there may be better investment opportunities (1979).

Giannopoulos (1979) observed that transport investment can have wide ranging effects both for the users of the facility and the regions as a whole. The magnitude and extent of these effects depend of course on the nature of the investment itself, but the same transport improvements can have different effects in different regions on countries.

Giannopoulos further observed that transport investment on regional economy can be both positive and negative depending on a number of factors which exert their influence within the particular regional or national levels of each country. The positive effect mainly comes from the fact that transport improvements in general lead to a reduction in the total resources required to produce and distribute a given volume and pattern of economic output and thus they release resources which increase output and stimulate further regional economic growth. Negative effects such as environmental damage, unbalanced national growth pattern through over expansion of some regions has been pointed out by him.

Jacob (1977) says some countries have adopted the principle of applying cost-benefit analysis, before taking any decision on investment. This does not necessarily mean that investment thereupon becomes a reflection of economic needs but the improvement of the decision-making process has undoubtedly helped to eliminate or postpone certain projects. He further observed that investment policy with regards to inland waterways, roads, railways, urban transport systems, airports etc. has been viewed from an analytical angle and has thus led to duplication of investment. He showed that on the Antwerp-Brussels-Charleroi corridor a motorway, and a

pipeline for refined products operate side by side in addition to airport facilities.

Hicks-Kaldor (1977) postulate states that a project is a good thing if its benefits exceeds its costs to the community, provided that the winners can compensate the losers.

Further exposition of the principles of cost-benefit analysis has been given in Mishani's cost-benefit analysis (1975).

Harrison's "The Economies of Transport Appraisal" (1974) provides a useful link between theory and the practical applications of cost-benefit analysis to transport investment.

Sugden and William's "The Principles of Practical Cost-Benefit Analysis" (1978) is an introductory text on the subject.

There is the Report of the Advisory Committee on Trunk Road Assessment under the Chairmanship of Sir George Leitch (Department of Transportation, 1977) which offers a most lucid analysis of the problems in applying cost-benefit analysis to trunk road schemes. It includes a number of sensitivity tests and makes recommendations for improvements in a number of the Department of Transport evaluation procedures.

The ideal practice in an investment appraisal is to discount all the cost and benefit to yield a unique net present value, but it is not always possible to calculate such a scene. One obvious problem is that the future is uncertain, so that the analyst must accept the possibility of a range of outcomes rather than a unique solution. Since transport investments are typically long lasting, it is especially important to take account of risk and uncertainty, an area that is a major subject in economies with extensive literature (e.g. Horne 1977, Biomwick 1976).

Barker and Buttons (1979) case study in cost-benefit analysis gives analysis of five cases including the Victorian Line and the Third London Airport.

2.2.6 Demand Analysis

Several studies have been made by several authors on traffic forecasting.

The demand for transportation by individuals and the community for urban transportation was studied by Kelly (1974). He has tested some new transportation demand models, viz. a traditional binary choice and model split, to examine the influence exerted by a few economic variables on consumer travel choices.

Sasuka (1974) estimated the demand for barge transportation. He suggested some forecasting models for estimating the future output for firms utilising coal as a

factor of production, estimating the effects of future technological alteration on coal demand and then calculating the future demand for coal to be furnished in 1980 and using discriminant analysis for improving the mode section.

The methodology used by Norbert (1969) for predicting urban travel demand is somewhat different from that of others. He analysed the similarities in personal characteristics and urban environment. He observed that these will form a basis for predicting urban travel demand. The study was carried out by using the results of a survey of 1018 residents of the San Francisco Bay Area.

The model developed by Chese Econometric Associates (1974) was designed to forecast demand for different types of car. The demand for public transit in Montreal was studied by Faredy Marc (1971). He has taken up two markets, viz. adults and school children, for forecasting the public transit trips by using monthly time series data on relevant variables.

An econometric model of demand for transportation was developed by James (1969). He viewed the demand for transportation as an application of general theory of substitute goods when the demand for each individual product depends upon the supplies of other competing products as well as the overall demand for general class of goods. The central assumption of this study is that each of the quality attributes can and should be expressed as a cost associated

with shipment of goods. Using this assumption an econometric model of the transportation market is developed. The idea is thus converted into an empirical form, and estimating equations are derived. Equations of these modes of transportation expressed the transport rate as a function of product as well as transport attributes.

Quite a few studies have been made to predict the future demand for urban area transportation. The report submitted by Martin (1961) and others presents the results of a pilot study into the current principles and techniques of predicting future demand for urban area transportation. This report is essentially a compendium of the presently available and utilized methods for predicting urban transportation demand.

Alexander (1964) made a demand forecast for North Atlantic Travel for the year 1975. The author felt that the socio-economic, psychological, technological, political and functional factors affect the demand for North Atlantic Travel. He has also taken into account the factors like rising consumer income, reduced fares, longer vacations, fashions, social prestige, culture and education. He made projections for two base periods, i.e. 1948-1963 and 1959-1963. To arrive at the total forecast of 75, the statistical projections were modified subjectively by qualitative and quantitative factors.

The demand for public transportation was studied by Sullivan (1974). He has developed a model to predict the amount of use that would be made of any new service that might be introduced. The author has adopted the standard produce mix problem to the transport situations and developed short cut ratios for evaluation.

A market model of transportation demand at industrial cities was studied by Dawson (1974). His study analysed the factors which influence the volume of trunk inducement from urban manufacturing sites. He proposed a marketing model utilising data gathered by a personal survey of trunk movement over a period of one month.

According to Kessel and Afheldt (1977), demand for transport is increasingly regarded as a partial aspect of an overall social and transport system. Simple forecast are replaced by system forecast. Evaluation of the consequences of particular conditions of demand is added to the forecasting of demand. So in addition to the problems of forecasting there are problems of evaluation. This means that more is demanded of the techniques. They also added that purpose of travel is one of the most important feature in the analysis and forecasting of demand, it is by the factor that individual behaviour as respect model choice, length of journey, duration of journey and the incidence of demand in tune is very largely determined.

In the OECD study, it was reckoned that between 1970 and 2000 private short trips would increase by 90 per cent and holiday traffic by 63 per cent. Business traffic was expected to rise by 188 per cent, this however being relatively evenly spread over the week and the year. On the other hand, it was expected that traffic problem as regards leisure trips would worsen, particularly at the beginning and end of holiday periods and at the weekends.

K. Bez's study (1979) is devoted to the theory and estimation of demand for passengers and freight transportation in the Netherlands. He says that demand for travel is a function of income, prices, population and the number of cars in circulation which in turn is a function of income.

2.2.7 Pricing

A remarkable amount of studies have been carried on pricing transportation services.

Armins (1974) dealt with the economies of transportation system with major focus on pricing. The study presented a minimal cost design and cost allocation to users in transportation network. A non-linear approach was suggested in pricing.

A study by Bayliss and Edwards (1970) of freight charges in the U.K. showed that consignment weight was far

the most significant factor determining road and rail charges, accounting, in fact, for about four-fifth of the variance. In another study on operating cost in road haulage, Edwards and Bayliss showed that hours on road were a much more important factor in determining costs than mileages worked.

Tyson (1975) considered the issue of raising the bus fares at the peak hours. He also studied the effects of differential bus fares in Greater Manchester for the period 1970-75. The factors accounting for fare differentials were (i) number of passengers travelling, (ii) length of the journey, and (iii) time when they travel. The study was based on passenger travel one day before and one day after the policy change. The data was collected from way bills. The study revealed that surcharge on the fares during the peak periods did not have any adverse impact on the traffic.

Karl (1969) suggested five major alternative pricing policies for railways marginal costs pricing, marginal cost, a uniform increment price discrimination, out of the pocket cost pricing and fully distributed pricing.

Paul (1973) made an economic analysis of the future air transportation requirement of Niagara frontiers and suggested the application of regional cost pricing to landing service to reduce congestion in airports.

The Highway Research Board (1973) examined the relevant issues to price subsidy in urban transportation.

Andrew (1968) considered some aspects of the decision making process in rate fixation.

Hinkle (1968) compared the cost differentials between district owned and private owned transportation services.

Kentner (1972) showed that the primary aim of changing the use of infrastructure is to make the user bear the cost of congestion which he causes. However, this definition gives scope for possible interpretations of the idea of road pricing. Kentner gives few distinct interpretations: (i) a general levy for the use of infrastructure directed as costs, (ii) a levy for use bringing supply and demand into balance, and (iii) a special levy designed to reflect the congestion cost caused.

S. Glaister (1976) thoroughly investigated congestion pricing for seasonal peaks in the context of the Channel Tunnel. He concludes "it seems rather that either price variation as a method of mitigating the problem has not accrued to them or the gains to be had from such policies are grossly underestimated."

In a study by Little and Mcleod (1972), the British Airport Authority has devised a pricing policy for the use of airports which is based on the principle of congestion pricing ("always charge enough to avoid excess demand").

Heggie (1974) points out that the price elasticity of demand for port service is very slight. He says that there is nothing to prevent the introduction of congestion pricing for the use of port facilities.

Many efforts have been made to translate noise nuisance and air pollution into money terms. The study of the Third London Airport (1979) is only one of many in which certain rules were proposed for treating such factors in such a way that they would neatly fit into a regular cost-benefit analysis.

Klassen (1981) says that road pricing should be one of the elements of general pricing system, in which not only activities in the sphere of traffic but all negative effects on the environment should also be taken into account.

Thomson (1967) has discussed the feasibility of parking charges and daily licenses in Central London and estimated the charges necessary for both schemes, suggesting a supplementary parking fee charge of about 4 per cent per hour or a daily license fee of 30 p. per day as optimal for Central London at 1964 price levels.

The Transport and Road Research Laboratory has worked on both technical and economic problems of direct charging. A summary of its work and of alternatives to the present pricing system can be found in Maycock (1972).

In the 1976 Consultation Document, the Department of the Environment has considered that changes in the existing taxation system should be used to help to equalize the ratios of revenue to the cost of road provision, that charges on heavy goods vehicles should be increased to cover environmental costs and the traffic congestion should be dealt with not by pricing but by direct restraint (e.g. bus priorities, control of parking provision, banning cars from central areas). These schemes suffer from many of the criticisms of parking charges and supplementary licences, but they might at least offer improvement on the present situation in the short term when road pricing and supplementary licensing are too complex and too expensive to be justifiable for most cities, at least in the next decade (Department of Environment, 1976).

Research by Tyson (1975) in Greater Manchester has revealed that the price elasticity of demand of off-peak traffic was almost unity. Thus a deficit on peak operations could be eliminated by a fare increase, while a surplus in the off-peak could probably be eliminated by a fare reduction. Tyson's original study of peak cost (1971) concludes that an increase of 20 per cent in peak fares, with constant off-peak fares would be needed to eliminate the cross subsidization and meet the pricing principle.

Mohring and Turvey (1975) have suggested that price should equal the short-run marginal cost of individual passenger's journey comprising the cost of the ticket and of stopping the bus to allow passengers to go on and off.

Munbys study (1968) contains several papers of pricing problems.

Beesley (1973) has analysed both subsidies and road pricing in considerable depth and provided the best recent survey of both issues.

The Consultation Document (Department of Environment, 1976) includes an interesting appraisal of policy options and the results of considerable research on matters such as allocation of track costs and their implication for pricing.

2.2.8 Performance

The working of different transport system have received considerable attention and consequently some research studies have been made on their performance.

In a study conducted by Foley and Bouladon (1973-74), it was observed that rail was about four times as efficient as road in the use of fuel for the movement of freight, and that in passenger transport, bus and rail were similar and both were superior to car.

Thomas (1979) and his colleagues have made a comprehensive study on the performance appraisal of urban

transportation system and provides a framework for cost-benefit analysis of the operation of a transportation system.

Reeks (1976) tested out six principal factors which influence the degree of reliability of a transport system. They are equipment, maintenance, personal and industrial relations, operational plan, external influence and organisation.

Harrison (1974) examined the new techniques for controlling transport operations.

Ward (1975) studied fleet utilization for the nature and characteristic of a personal rapid transit system.

John evaluated the rail road passenger service for the period 1950-65 and compared the working of Atchinson, Topekar, Santa Fe with South Pacific Company. The study identified the reasons why the Santa Fe continued to provide passenger service while the Southern Pacific did not, and appraised the profitability of the two undertakings.

Some case problems in transport management with major focus on performance were presented in the work of Baker and Germane (1978). It covered diverse topics like selection of equipment, locational selection, allocation and scheduling of equipment, pricing, merchandising, marketing research advertising, control finance, labour relations and organisation.

The Annual Bulletin of Transport Statistics for Europe shows that in USSR in 1972, 77 per cent of ton mileage worked was by rail, in 1968 the respective figures for both were 79 per cent. This substantial divergence in the tonnage and ton mileage proportions is typical of a number of East European countries.

Several studies carried out in U.S. by Mayer, Kain and Wohl (1979) aimed at working out the traffic threshold beyond which railway system would prove more economical than bus.

The Austrian survey (Schuster, 1978) shows for example, that where the journey to the shops is less than 1000 metres, about 95 per cent of the shopping is done on foot and only about 5 per cent by car. On the other hand, where the distance is over 1000 metres, only about 28 per cent of the shopping is done on foot and 72 per cent by car.

According to Klaesen (1977) comparing the generalized transportation costs of private car and public transport, he observed that particularly for the smaller distances, the private car is preferred to public transport, because of its low time cost, inspite of its high money costs, while for long distances, public transport is often preferred because it is cheap in relation to travel time.

In their research into long distance day trips in the recreational zones of south-west England, Edwards and Denniss (1976) analyse the influence of car ownership and

improvements in the road network on the number of trips. In household with cars, the average number of trips is 2 to 3 times than of households without, and 5 times as great in case of trips over 25 miles. According to their calculations, improvement in road network between 1970 and 1975 brought about 11 per cent to 17 per cent increase in traffic.

K. Bez in his thesis "Demand for Energy for Transportation in the Netherlands" (1978) says that the size of consignment and the type of commodity is considered to be the most influential factor for choosing a mode of transportation. For bulky goods, rail and ships are the most favoured means of transportation. On the other hand, he says that experiences with freight transportation in the Netherlands (in land) does not clearly support the view that the type of commodity is the most important factor determining modal choices. The records show that since the sixties, the share of ton-km for road transportation exceeds that of water and rail transportation put together. Only a small portion of agricultural products was transported by rail, about 60 per cent to 80 per cent of the ton-km for the agricultural products was road borne. In 1960, of other goods, about 18 per cent went by rail, 40 per cent by road and 41 per cent by water. Between 1960 and 1970, the share of road transportation increased from 40 per cent to 54 per

cent, and as a result, both rail and water transportation lost, viz. 10 per cent and 3 per cent respectively.

2.2.9 Safety

Though transportation is one of the most important contributor to economic development, yet it is often associated with hazards on human life.

Hunter (1975) made an incessant plea for proper understanding of good and evil aspects of the role of modern transport systems contribution to the quality of human life.

Johnson (1975) exhorted that the accident statistics for any city is a measure of the performance of traffic management in that city and cautioned against the tendency to allow things to drift.

Among the research institutes engaged in pioneering research work on accident prevention in transportation, mention should be made about the Road Research Laboratory in Oxford University. The Laboratory is carrying out research on various aspects on safety in transportation. The Transport Group at the Laboratory helps to answer questions like what kinds of transport system are best suited to British needs and can the adverse effects on road transport be mitigated, the Engineering Group examines questions like how can the road system be best planned, built and maintained and the Traffic and Safety Group answers questions like how can the road system be used most efficiently and safely. The present

work at the Laboratory may be broadly defined as an extended study of the methods for safe, efficient and convenient movement of people and goods. The continuing growth in road traffic explains the importance in having the most effective road network to carry the expected traffic with greater safety.

Walter (1943-53) analysed the trends in motor vehicles accident rates and motor vehicle insurance costs in Maryland.

In his study Prof. Kolaric (1975) observed that continuous barometer readings on the line from Belgrade to Kosovo Polje, the locomotive crew is subject to a pressure of 42' for 6 hours of the journey, and then has to start another journey from Kosovo Polje after only 2½ hours rest. Such changes have an adverse effect on human equanimity at work at times when complete concentration is demanded. They also aggravate certain complaints. The research showed that there was some correlation between certain weather condition and traffic accidents.

Dr. Her Nando (1975) observed that 57 per cent of the death due to traffic accident in urban areas of Spain was pedestrians. Accident suffered by the pedestrians and the anxiety that some people suffer when crossing the street, are factors in favour of "pedestrian only zone."

According to Transport and Road Research Laboratory, U.K. (1979), it is estimated that road accidents accounted

for about 17 per cent of all deaths in developing countries. There are also accidents causing serious physical and mental disability to victims. Growth in the rate of such accidents particularly in big cities and in highways has been of grave concern and has helped create greater awareness of road safety regulations.

Glimar (1975) says that the creation of models for the installation of signalling and automatic block working produce increased line capacity and greater safety. Many railway undertakings have already introduced either a method relying on fixed installations (fixed signals for every block) or train through circuiting.

Rebat (1975) says of the constraints which man will have to adopt in the future and the conflicts of interest that he will have to resolve, the first to come in mind is that of transport safety, since this is clearly a matter of life and death. Public opinion has been made alive to these problems and demands increasingly safe transport. But this desire is reflected in various restrictions and legal, technical and medical regulations, e.g. are speed limits, traffic bans, stricter conditions for the issue of driving licences, improved infrastructure, equipment and vehicles, automatic braking and warning systems, automatic coupling of railway wagons, more specific train traffic signs and signals, the use of increasingly sophisticated often costly

apparatus, requiring more highly skilled man power, strict medical inspection and so on. He further says that transport workers are often drawn from the rural areas and this is an important cause of accident as in 80 per cent of the cases, the primary cause is human failure, i.e. negligence of safety rules, drunkenness, reduced alertness, deficiencies in sense perception or bodily control.

Johnson Victor (1958) in his book "Traffic management in Cities" examined the problem of safety in transportation in cities.

Cantilly (1954) made a statistical evaluation of traffic accidents severity.

2.3 Studies in India

2.3.1 History and Role of Transportation

According to Srivastava (1953) Indian history abounds in references to road construction activity undertaken in the past and the road policy adopted by different rulers. Excavations at Mohenjodaro and Harrappa, have established beyond doubt, that the Indians were adept in the art of road building even 4,000 years B.C. Kautilya, the celebrated economist of the Mauryan period, has observed that in his times city roads were 24 feet wide, roads leading to battle

fields and villages were 48 feet wide, and those leading to the burial grounds 7½ feet in width.

In the reign of Chandra Gupta Maurya, there was a transport department, and a grand trunk road connected Patna with the North-West Frontier Province. Mr Strato confirms that the two Greek travellers, Megasthenes and Iristathenes travelled in northern India along this road. During the regime of Emperor Ashok there were good roads in India, a mention of which has creditably been made by the Chinese traveller, Fahein. Muhammad Tughlaq had constructed a trunk road from Delhi to Daulatabad which, according to Ibn Bhaluta, was traversed in 40 days. Sher Shah was very famous for the construction of roads. A monumental volume *Tarikhe-Shershahi* reveals that in his times, roads were looked after and managed by the state. He had constructed several roads of which the roads from (1) Punjab Fort to East Bengal upto Sunargaon, (2) Agra to Burhanpur, (3) Agra to Jodhpur and Chittor, and (4) Lahore to Multan were very important.

Road construction in British period - Srivastava says "although roads were built principally from the administrative and strategic stand points, yet it must be admitted that the pace of road construction activity was accelerated with the advent of the British rule in India. The East India Company - mainly a commercial corporation did not evince any interest in road making. Lord William Bentinck

revived the idea of constructing roads by connecting Peshawar, Delhi and Calcutta. In his times, military boards used to look after their maintenance. It was only during the regime of Lord Dalhousie that a Central Public Works Department was created. In 1855, such departments were created in provinces also, eliminating military boards. The Report of the Royal Commission on Agriculture in India (1928) remarked that "alongwith railway construction, also road building was necessary to feed the railways, leading to a demand, which remains today far from being completely satisfied, for bridged and metalled roads at right angles to the railways and giving access to them in all the seasons of the year."

The progressive policies of Lord Mayo and Lord Rippon acted as a stimulus to road development in India as local affairs came under the direct control of local boards. During the Second World War road construction activity increased. It was considered urgent to repair and build new roads in the frontier for the movement of military and materials.

Road development in modern period - Though the first motor vehicle was driven on Indian roads in the year 1898, yet until the First World War a good number of vehicles did not ply on Indian roads. While the history of road development in India goes back to the early ages, organized efforts at road development at the national level in the

recent past may be traced to the year 1929, when the Jayakar Committee considered schemes for improvements of the road system in a comprehensive manner. It was on the recommendations of the committee that the role of the Central Government in this regard to the development of road system was recognized. Later in 1943, Chief Engineers in charge of road system in the country met at Nagpur to consider requirements of the road system over a twenty five year period beginning December 1943. The Nagpur Plan classified roads as national Highways, State Highways, District roads and village roads and prescribed standard norms and targets for road development of various categories. Soon after Independence, the pace of road development in the country was enhanced so as to achieve the targets of the Nagpur Plan, but there were serious deficiencies in respect of road surface, cross drainages, bridges, etc., and as such the second attempt for preparing road development plan on an all-India basis was started in 1958, and the 1961 and 1981 Road Development Plan, known as the Bombay Plan, was formulated, with a target to achieve an over all density of 32.5 km. of roads per 100 sq. km. of area, 44 km. of roads for developed agricultural area, 19 km. for semi-developed areas and 12 km. for underdeveloped areas.

According to Dhakharia (1971) increased tempo of economic development has necessitated improvements in the

infrastructure for the mobility of man and materials, cheaply, efficiently and quickly every day. Transportation is an essential infrastructure in the development of economy and every rupee spent on its development has a multiplier effect on the economy.

Dr. Pathak and Tiwari (1981) says that transport is the basic element of infrastructure of economic development. There is need for according high priority to transport sector in India from the size of the country as well as from the geographical dispersed natural resources. Thus the basic necessity to achieve the social and economic objective of the National Plans for economic development and social reconstruction is the provision and maintenance of adequate and efficient transport.

According to Mehta (1952), the most important factor which contributed to the initial concentration of cotton textiles industry at Bombay was the availability of excellent transport facilities both in regard to raw materials and consumers market.

According to Amba Prasad (1960), transportation is an indispensable part of culture as the hallmark of civilisation.

According to the New Popular Encyclopedia, "The road is of the greatest fundamental institutions of mankind. Its history dates back to the dawn of recorded history and

beyond. It develops with man's advance, it retrogrades with the breakdown of a social order. A people without roads would be people without intercourse with the outside world, without the attributes of civilization. Man - the road builder, thus cannot be separated from man - the builder of civilization."

That economic development requires adequate and efficient transport services is axiomatic. Sinha (1959) in his thesis studies about the inter-relationship between transport and economic planning.

Balsara (1972) traced the evolution of the public conveyance system in Bombay alongwith the rapid urbanization and industrialization of the present day metropolitan city.

Ramanadhan (1948) studied about the role and problems of nationalized road transport undertakings.

Writing about the road transport system, Mathew (1972) was critical about the step-motherly treatment given to road transport as compared to railways in India. He further highlighted the complementary role of roadways and railways and suggested coordination between the two through (i) taxation, (ii) regulation, (iii) unification, and (iv) nationalization.

Tiwari (1946) and Shajwalker (1958) have studied about history, role and problems of railways in modern India.

There are also few studies about the history and role of air transport in India. Dhekney (1949) studied about the evolution of commercial air transport in India during 1944-49.

2.3.2 Policy

Transport policy is a vast subject and it includes economic planning with reference to transport sector, issues of investment, finances, nationalization, organizational problems etc., but very little attempt has been made in India to study its various aspects.

Singh's (1973) study is based on transport policy relating to investment. He asserted that the transport policy of a socialist society has some basic features. First, development of transport is to be coordinated with the needs of rapid economic development. Second, the public sector has to come forward for catering to the needs of the quick, time-saving transport to the urban and rural people. Third, there is progressive nationalization of the private sectors, and the pre-industrial means of transport, driven by animal and manpower are replaced by power-driven vehicles. Fourth, in response to the low income of the masses, priority is to be given not to the so-called "people car" but to the inexpensive and quick public transport and inexpensive scooters, autocycles and bicycles for private use. These

features also provide the framework for investment in transport in socialist countries like India.

Some studies have dealt with the rationale of nationalization of transport undertakings. The problems of loss of revenue by nationalized transport undertakings were considered in a seminar (1974).

The association of transport vehicle manufacturers and operation also deliberated on the shape of the transport policy at various seminars. For instance, the motor industries association made valuable suggestions concerning road development plan in the fifth Five Year Plan (1975).

Carlin (1967) illustrated the usefulness of a sectoral approach to developmental constraint on the transport sector of the Indian economy. He analysed the constraints on some of the major sub-sectors on different modes of transport and concluded that the best way to coordinate transport policy is by the operation of competitive market force.

Ghosh (1967) explained a model for optimum pattern of regional production and exchange of commodities between various regions of India. He claimed that the model would minimize the national cost in the transport sector. Taking transport capacity as a constraint, he compared actual and optional flows.

Ramanadhan (1957) in his book "Nationalized Road Service in Andhra Pradesh", shows some evidence on the

efficiency of road-rail coordination resulting from the organisational, integration of road-rail services. He also studied the economics of rail-road policy in India and contrasted it with the public policies generally adopted in different countries, specially U.K. and U.S.A. He suggested the creation of a Transport Commission to take charge of the Transport Policy in its entirety.

Rao (1968) conducted a survey of the traffic potential of Andhra Pradesh and recommended for the setting up of State Sponsored Corporation to make finances available to private motor transport operators at reasonable rates of interest.

In evolving of an integrated transport system the NTPC (1980) members recommended that in India we are primarily guided by the realization that transport agencies are not competitive, but complement and supplement to each other. The measurement of resource costs is one of the broad approximations in this direction. They say that it is to their being complementary rather than substitute which should be the aim in India, where each agency is inadequately developed and there is ample scope for all to advance within the overall resource constraint. Further they say that the three central issues to be considered in evolving an integrated framework for transport policy are (i) determination of the size of total transport investment,

i.e. quantum of resources - capital, foreign exchange, scarce materials and manpower - which should be devoted to development of transport sector as a whole, (ii) distribution of these resources between various modes of transport, and (iii) tariff for transport services, taking into account the return on investment made therein.

They further added that in framing a long term transport policy for the country, one should not ignore the adverse impact of transport on environment. In India there is a general lack of concern about environmental implications in regard to growth of transport, especially of road traffic. The problem is acute in our cities when travelling vehicles generate noise, fumes and other hideous visual intrusions, and result in accidents, personal stress and physical damage to the fabric of urban society. Where heavy lorries use approach roads or roads in residential areas, conditions worsen for the people. They said that much can be done to mitigate these nuisances. For example, appropriate regulations on lorry size and weight, noise and fumes can be an effective protection against environmental pollution. Similarly, sound traffic management and parking policies can reduce traffic congestion in the urban areas and bring about significant environmental gains. Effective land-use policies, which may promote desirable shifts in population and employment, can also improve the quality of urban

environment. They suggested that in our inter-city routes there is also a great opportunity for improving the quality of environment by planting trees and providing adequate wayside amenities, and the members urged upon the authorities, especially the State Government and local bodies to devise schemes for safeguarding the environment both on urban and inter-urban routes and integrate them with planning for development of a future national transport system.

The NTPC study pointed out that a major handicap faced in framing an integrated transport policy in India is lack of reliable data on inter-regional traffic flows and comparative transport costs by different modes. A few surveys were conducted in the past to fill these data gaps, but none of them was comprehensive enough to provide meaningful information for evaluation of transport proposals for regional economic analysis. Recently, however, the Planning Commission entrusted to Rail India Technical and Economic Services Limited (RITES) to study on comparative modal costs and traffic flows as part of a U.N.D.P. Transport Policy Planning Project. Information collected for this study has given us valuable insight into the pattern of commodity flow by the three modes of transport, namely rail, road and coastal shipping, and thus comparative movement costs.

2.3.3 Energy

The transport sector uses mainly a third of the country's total commercial energy and more than half of its oil supplies. Among the principal modes of transport only the railways use all the three forms of commercial energy, i.e. coal, petroleum and electricity. All other modes, including road, air transport, and coastal shipping, depend total on petroleum fuel for traction energy. Rail and road together account for as much as 95 per cent of fuel oil used in the transport sector.

According to the projection of the Working Group on Energy Policy (1978), India's export earnings are expected to increase to Rs.20,823 crores by the year 2000-01 A.D. of which 74 per cent are likely to be spent on oil imports, and they projected a grim solution of India's balance of payments position by the end of the century due to its rising oil imports.

The NTPC (1980) recommended that as India has limited oil resources, electricity which can be obtained from a variety of sources, ranging from nuclear fuels to hydro and solar energy should be used.

Little systematic evidence is available on energy intensities of different modes of transport in India. Earlier work in this area are the studies on energy intensities of road and inland waterways by H.C.Malhotra and NCAER (1974).

A study on energy was assigned on K.K.Murthy of National Institute of Training in Industrial Engineering (NITIE)(1978) at Bombay. Dr. Murthy's study has provided us with upto date and systematic information on energy intensities of rail and road transport. He did not examine evidence for waterways or coastal shipping. The NITIE finding show that a single occupant has the highest energy consumption, as opposed to suburban train which has the lowest. The broad conclusion which emerge from NITIE study are that for freight elective traction, railways is the most efficient form of transport in terms of energy consumption followed in that order by railways, driven by diesel traction, pipeline, inland waterway transport, diesel truck and railways on steam traction.

Studies by Kadiyali, Viswanathan, Bajpai and Sharma (1982) has demonstrated that considerable economy in fuel is possible by driving the vehicles at optimum speeds, and also an improvement in the smoothness of road can bring about considerable economy in fuel consumption.

In a research project sponsored by the World Bank and the Government of India, controlled experiments were conducted to determine the fuel consumption of trucks. The objective was to evolve a mathematical relationship between fuel consumption and the factors likely to effect the same. The paper describes the study carried out and presents the

results. It has been shown that speed and power of the vehicles and roughness of road affect the fuel consumption significantly. The results can be used in selecting optimum speeds for running the trucks and to choose appropriate geometric standards for roads with a view to save fuel.

As part of the Road User Cost Study, a research project jointly sponsored by the World Bank and the Government of India, fuel consumption experiments were conducted on an Ambassador car, Premier Padmini car and Mahindra diesel jeep. The objective was to establish a relationship between the fuel consumption and important factors such as speed, roughness of the surface and rise and fall along the longitudinal profile of the road. The experiments have established very high correlation between the fuel consumption rate of the above three vehicles and speed, roughness and vertical profile. The results have proved that there is an optimum speed for each vehicle at which the fuel consumption is minimum and driving at speeds lower or higher than the optimum results in a very high fuel consumption. The results have also proved that fuel economy is possible by improving the roughness of the roads and the vertical profile.

According to Dodiya (1980), rail road and air transportation consume 80 per cent of commercial energy and is the single largest sector in the use of petroleum based

energy. The cost of petroleum products is growing very rapidly. Moreover, the crude oil reserves may not be available in the required quantity. Our country is already dependent on imported oil and will continue to be so as our proven reserves are very limited. Even our coal reserves are not sufficient to meet the projected demands at 400 million tonnes per annum by 2000 A.D. Growth in thermal generation and of hydel generation is already receiving priorities in our national plans and will ensure adequate power. Electric traction though based on indigenous available resources is more economical in use of energy source compared to diesel traction. It is, therefore, necessary to consume energy, even under electric traction in operation. Road transport consumes more than 80 per cent of the diesel oil in the country and is fully dependent on oil as no viable substitute exists at present. Alternative road transport based on electricity needs to receive utmost attention.

Studies by Kisan and Agarwal (1980) show that diesel buses require petroleum products and a major portion of these products is imported. This causes a heavy drain of our foreign exchange resources. But the electric trolley buses do not require petroleum products and depend only on electricity which is produced by coal and replenishable hydel reserves.

According to Vishwamitter and Srivastava (1981) mobility communication and energy are essential ingredients

to the process and sustenance of urban civilization and development. Mobility promotes communication and both involve a dependence on energy in some form or the other. In this paper micro and macro aspects of urban structure are highlighted to indicate how each level has the inherent possibility of influencing transportation planning and functioning. Also the emphasis of the paper is to focus on the possibility of achieving an order of urban structure and land uses that promote a conservation on energy without losing desired levels of urban/functional efficiency.

Hashim's (1981) paper evaluates the relative economics of steam, diesel and electric tractions of Indian railways. Unlike the studies done with the main purpose of finding out the break-even level of traffic between diesel and electric tractions on the high density route, the present study tried to evaluate the relative economics with a more comprehensive approach. It was related to the Northern Railways. For examining the relative economics of the modes of traction, the differentiating operating and capital costs (both financial and economic) were evaluated per unit of transport output. It was concluded on the basis of the economic cost, that steam traction should be continued on low density routes of Indian railways and electric traction should be extended on all the other routes, whereas the use of diesel traction should be kept to its minimum.

2.3.4 Planning

Realising the importance of planning in transport, we find that various studies were carried out in the field.

Prakasan (1975) analysed the problems of transport planning consequent upon rapid metropolitan development. A regional survey of Andhra Pradesh was made at the instance of the Planning Commission to assess the existing facilities in different modes of transport. The study was made in response to overcome a situation where proper coordination in the transport system became difficult in view of the consideration of different modes of transport in isolation. The study made useful suggestions for devising ways and means for affecting a rational allocation of traffic among different modes of transport.

The NCAER studied various aspects of organization and planning of the Road Transport in Delhi Region. However, it was confined to goods transport only.

The Madras Metropolitan Development Authority proposed a Master Plan for Madras, projecting until 1991, for an estimate doubling of the population, construction of satellite towns and improvement in the traffic system connecting certain important places were recommended.

A study on Simla Region was carried out with a coordinated approach of economic development and transport planning.

In another study of urban transportation in Madras, Viswanathan (1972) suggested that better town planning is a prerequisite to ease the transportation bottlenecks.

The spatial pattern of interaction in Vijaywada city of Andhra Pradesh were studied by Prakashan Rao (1968) and his colleagues. The frequency, distance travelled and modes of transportation were analysed.

Srinivasan (1970) and his colleagues analysed the short-comings in the existing route systems in the public bus passenger transport in Delhi. For route recognition, a plan was worked out with the following criteria: (i) Route should be capable of meeting travel desires with minimum of inner-changes, (ii) Route should be normally cited beyond rather than at the conveying points of city centre, (iii) Route system should be such as to enable the trips to be presumed in not more than 60 minutes of journey time, (iv) Routes should be preferably kept off from highly congested and inaccessible places though one or two routes may be allowed to cater into those areas, and (v) All the neighbouring places of a locality should gradually be linked with it by direct routes.

Srinivasan (1972) considered the administrative and financial aspects of urban transport system and suggested replanning of the routes and schedules to maximize the utility of the existing equipment. He also reviewed the

research work done in India on urban traffic problems and observed that traffic planning techniques such as traffic projections, distribution, model split and assignment are yet to be developed. He also noted that considerable amount of research and development work in this field has been carried out in developed countries but cannot be applied directly to India due to differences in the traffic and other conditions prevailing here.

Bhardwaj (1960) made a study of the techniques of railway transportation planning.

Suryanarayana and Srinivasan (1967) conducted an origin destination study in Bangalore, by using home interview techniques. Certain travel characteristics were analysed by them. In a study of the inter-city origin destination travel in Delhi, Srinivasan analysed the choice and mode of transport.

Singh and Sundaram (1968) studied the problems of transport planning from the investment point of view keeping in mind the scarce resource position.

Patankar (1961) studied the relationship between growing sizes of cities and pattern of inter-urban transportation as a business proposition in specific urban areas.

Viswanathan (1968) observed that alignment of sub-urban expansion will have to be planned in advance from the

transport point of view - otherwise, he cautioned that colonies will develop deep in hinter land and require to be served by unprofitable bus routes.

Advani (1974) analysed the alarming problem of traffic growth in Bombay and observed that the time taken to reach the destination will be an important yardstick to assess the efficiency in scheduling. It will also influence the quality of service and the amount of fare charged.

The Metropolitan Transport Team of Planning Commission (1968) has recommended a series of measures for optimising the capacity of the existing mass transit facilities and preventing future deterioration of difficult traffic situation in the metropolitan area of Bombay. Addition to large capacity carrying buses, particularly double-deckers in sufficient numbers, establishing buses on certain short distance routes where heavy flows of traffic are present with few intermediate stops are the major recommendations made by the Team.

In a study of the traffic assignment techniques, the School of Planning and Architecture, New Delhi (1974-75) observed that the route choices of vehicular traffic are governed by length of travel, safety in travel and environmental factors on roads. It was suggested that traffic assignment on public transport system should incorporate weighted delays experienced at intersections, exchange points

and bus stops for achieving better loading forecasts and higher efficiencies in operation.

Viswanathan (1972) studied the problems of metropolitan road traffic enforcement and suggested four regulatory devices, viz. (i) control traffic movement and highway use, (ii) control on access, (iii) control on vehicle use and check of vehicle condition, and (iv) staggering of work hours.

The Metropolitan Transport Project of Railways (MTPR) has conducted techno-economic and engineering studies of the network of mass rapid transit system for Delhi urban area. The Town and Country Planning Organisation has collaborated with MTPR in carrying out the necessary studies. A concept plan for Delhi urban area for the year 2001 has been developed indicating the possible directives of growth including population and urban form of distribution of economic population and economic activities, estimate for inter-zonal trips movement pattern and assignment of trips on the transportation network.

A study of the parking problems in New Delhi was made by Joginder Lal (1960). He conducted field surveys for the assessment of parking demand of private vehicles to find out maximum number of short time parkers, all day parkers and all urgent parkers.

According to Sarkar (1981), in India, in transportation planning - views of the citizens are not effectively utilised during the planning process. This paper describes why effective citizen's participation is important in transportation planning so that a consensus for action can be reached. Though it is very easy to conclude that citizens must be included in the planning process, it is a very difficult job to find out a programme where democratic goals are achieved without affecting the efficiency of the project. Without having some practical experience in executing citizen participation programme it is very difficult to have true knowledge of the problem. In this paper an attempt has been made to broadly touch some points which should be kept in mind to achieve democratic efficiency.

2.3.5 Investment

In India, the study of transport investment is very scanty. A study published in the Mobile Journal (1972) analysed the plan investment on road transportation in the first quarter century of the planning in the country.

Palkivala (1972) pointed out that the investment in public sector outlays declined from 8.6 per cent in the first plan to 5.6 per cent in the fourth plan. He also observed that 30 per cent of the villages in the country were neglected except Punjab where all the villages were connected by roads. He suggested that as in the developed countries

like Japan and West Germany, the income from roads should be spent on their maintenance and improvement.

Meenakshi Sundaram (1972) observed that the demand for transport grows faster than that of the gross national product and recommended criteria for guiding investment policy.

According to NTPC report, "the central issue of investment policy is to allocate total resources assigned for transport development between agencies of transport system to meet transport needs of the economy at minimum cost to the society."

2.3.6 Demand Analysis

Several studies have been conducted in India on traffic forecasting but little has been made on projecting the traffic requirement of railways, waterways and airways. Several empirical studies on traffic forecasting have been conducted by some research organization and individual researchers. Prominent among them are Regional Transport Surveys conducted by NCAER for Mysore, Kerala, Madras and Pondicherry (1969). All these surveys assessed the future transport requirement of the region having regard to its potential for economic development. The passenger traffic projection have been based on the anticipated population and per capita income in the state. The estimate of goods traffic

have been made by separate projections of a number of important commodities such as coal, iron and steel, petroleum, cement, sugar, fertilizers etc. A historical review of the transportation situation of each individual modes of transport the nature, extent and disposal of agricultural and industrial production and per capita income have been made. On the basis of these projections, estimates of production and consumption were made by location of areas and predictions were made of the aggregate anticipated transportation taken by each mode. The anticipated traffic demands as the investment needed were worked out successfully.

Kalyanaraman and Sehgal (1968) have advocated two methods, (i) mechanical and (ii) analytical for estimating future road traffic. The mechanical methods simply project forward the past trends assuming that future experience is a direct function of past experience, analytical methods classify and analyse the several related components or influence the factors that have caused the historical trend pattern.

Nadkani and Deogirikar (1973) have assessed the demand for roads, as determined by economic factors like density of population and output. For this purpose, they have attempted a cross-section of all the districts in Maharashtra through multiple regression equations.

Srinivasan (1969) studied the transportation planning in Bangalore city. In this, an origin-destination study was conducted by house interview and for this purpose 41 zones with homogeneous land-use characteristics were taken. A total of 10,000 households representing 5 per cent of the universe were enumerated. The data collected from the study alongwith the data on passenger traffic was utilized for traffic projection and distribution.

A traffic forecast for highways were made by Prasad and Agarwal (1964). They analysed the population growth, agricultural construction, industrial production, per capita income and total mileage of roads for forecasting the transport requirements.

Dalvi (1966) reviewed the current methodology for forecasting the future urban travel as five main analytical stages, (i) land-use models, (ii) trip generation model, (iii) distribution model, (iv) assignment model, and (v) evaluation model. He contended that land-use model, among all, plays a critical part in the forecasting of the future urban travel demand and hence in the design of the future urban transport plan. He found that the present methods of land-use forecast are entirely unsatisfactory and suggested the mathematical programming method for the destination of optimal land-use pattern in urban space.

The University of Roorkee carried out investigation to study various procedures developed for the estimation of the travel demand (1974-75). A probability model for estimating travel demand was established using the travel data of Ahmedabad metropolitan area. The study showed the applicability of the mode choice to Indian cities. A classification technique has been developed with a view to predicting the vehicle using capability of an individual for the known values of socio-economic factors, vehicle parameters and transportation system factors.

Since the entire planning of transport depends on traffic forecast, the NEC commissioned RITES during 1984 for updating the survey data obtained from the NCAER study and also for obtaining fresh projections upto 1993-94.

Among those who perceived clearly the close relationship between traffic forecasting and transport planning, Mahajan (1972) stands out. He advocated correlation index method and growth formula for predicting the demand for transport.

2.3.7 Cost Rate Structure

Study of the cost-rate structure of transport has far reaching significance. Satyanarayana (1969) observed that the cost of service of road transport depends upon the size of the fleet, the vehicle condition, the length and road condition. His study attempted to find out the

interrelationship between the above mentioned factors on the basis of the data collected from a representative sample of motor vehicle operation in Andhra Pradesh. He observed that the size of the motor transport per unit was a fundamental factor influencing the cost of operations of motor transport industry.

Krishnamurty (1971) examined the external factors influencing road transport. He observed that insufficient traffic layout and control would increase the costs. A seminar on road transport in Madras observed that savings in operating costs should be passed on to the consumer and transport users in the form of lower fares and freight and consequently lower prices for foodgrains and other articles.

Mittal (1962-68) studied the railway freight policy since Independence.

Ramanadhan (1950) probed into the economics of rail-road policy. His dissertation of Indian Railway Finance provides an intensive analytical framework to understand the pattern of costs, rates, and profits in Indian Railways during the first half of the present century.

On the pricing policy, the NTPC members say that the first basic principle for pricing is that it must be cost based, the user to pay at least the full marginal resource cost of his transport. The more inelastic the demand, the greater is the opportunity for generating resources by

charging prices above the short-run marginal costs, and they say in no case would transport tariffs be lower than short-run operating costs. Another proposition is that all modes of transport should be treated equally for determination of an acceptable framework for pricing policy. They further say that once a pricing framework is designed and approved for transport agencies, there should be minimum intervention from the Government. They have suggested various pricing methods for controlling traffic in urban areas. These include daily or supplementary licensing, toll charge, metering for use of roads and parking fees.

There are some industry-wise studies on cost structure relating to transport sector. Gopalkrishna's (1969) work which analysed the cost composition of different types of cars manufactured in India.

The need for collection and publication of information on transport costs was highlighted by the Committee on Transport Policy and Coordination (CTPC).

The Ministry of Railways have a small cell within the Directorate of Statistics in the Railway Board for the study of costs. However, the studies carried by this cell are only intended to provide estimates of financial costs to enable the railways to assess the viability of their different operations.

2.3.8 Performance

As regards the performance of the transportation system, studies on road transportation abound, followed by railways. Performance of water and air transport have received very little attention.

Periera (1975) made an analysis of Pallavan Transport Corporation and observed that the Corporation like any other metropolitan transport service was incurring loss mostly due to leakage of revenue, the magnitude of which varies from 8 per cent to 15 per cent of the total revenue on a modest estimate. He stressed that the financial viability of the transport system is dependent on the integrity and efficiency of the checking staff.

Reviewing the performance of the BEST service, Shyambhag (1972) observed that city transport (Bombay) was uneconomical because a large number of fleet was required to be maintained to take care of peak hour traffic.

Ramakrishna Naidu (1967) undertook doctoral research on the working of the passenger road transport industry in the Chittoor district of Andhra Pradesh.

Krishnamurthy (1969) presented a diagnostic study of Andhra Pradesh Transport Corporation. He presented an outcome of the genesis of the corporation and statistics relating to variable costs, gross income, net income, cancelled trips and number of delayed trips for different districts in Andhra

Pradesh. The review of the sector-wise analysis of the corporation made him reveal the local factors that were responsible for the difference in the performance at different regions. He also suggested some measures for improving their performance.

Some studies on performance, laid focus on punctuality too. A transport industry, Ramen and Ramen Pvt. Ltd., (1966) issued a questionnaire to the public and obtained information on whether the buses start on right time and reach the destination at the scheduled hour, whether the drivers and conductors are politely disposed towards the commuters and whether tickets are issued to all and the amount clearly shown to them.

Venkaji Rao (1981) suggested the managerial problems of state transport undertakings with special reference to Mysore state. He identified certain administrative problems which came in the way of improving the performance of a state transport undertaking. They are (i) balancing the transport requirement of the community as against other facilities served, based on costs, income and availability of finance, (ii) dealing with peak-loads, (iii) the most efficient utilization of vehicles and staff on the basis of the moving of given loads of passengers, and (iv) envisaging of traffic planning in future.

Some researchers highlighted the use of modern techniques of management to evaluate the performance of transportation system. Chandan (1969) discussed the role of operations research techniques in improving the productivity in passenger transport industry.

The Mobile Journal (1968) highlighted the problems of suburban rail traffic and pleaded for the creation of an autonomous corporation for suburban railway with a handsome subsidy.

The 75th. Estimate Committee of the Parliament made a strong plea for a thorough study of capacity utilization in Indian Railways alongwith the analysis of demand and supply positions.

Manjula Singh (1973) observed in her study that in India the operating ratio (revenue expenditure) was always about 100 for rail and less than 80 for road transport and recommended a well coordinated road transportation system on the basis of such factors as assessment of demand for roads on vehicles requirement, distance from main roads, coordination of local bodies, land surfaces, regional development and employment considerations.

Valharajani (1973) inquired into the commercial operations of the railways and made elaborate suggestions.

Studying the performance of various modes of transportation, the NTPC (1980) observed that the railways

accounted for 89 per cent of the total freight traffic and 74 per cent of total passenger traffic in 1950-51. They found that most commodity movements are economical by road for shorter hauls upto 300 to 350 kms but beyond this range, cost advantage lies with railways. The high value commodities like tea, cotton textiles and cotton are, however, an exception to this, where the comparative advantage lies with road even for longer haulage. For commodities like perishable fruits, vegetables and small machinery, roads have comparative advantage over rail upto 450 kms. For some commodities such as fertilizer, coal, cement, livestock, sugar and steel tubes, comparative cost advantage for roads is upto 200 to 300 kms.

According to a study conducted by RITES, it is estimated that of the total inter-regional movement of freight traffic in terms of tonne-kms, railways carry 82 per cent and highways 18 per cent in 1977-78.

The CIRT, Pune (1980), studying on the performance indicators of major bus undertakings observed that in the case of DTC, losses were the highest but the fare was the lowest.

2.3.9 Safety

Though the problem of safety and environmental hazards are present everywhere, yet the studies carried on the field is very scanty.

Sharafuddin and Srinivasan (1968) examined the role of pedestrian in pedestrian safety. They suggested that "cross-walking", markings, flashing signals and railway barriers would regulate pedestrian and vehicular traffic and ensure greater road safety.

Dhar (1964) conducted certain tests for drivers at a driver's clinic in Delhi to identify the factors concerning drivers which can increase the propensity for unsafe driving causing accidents. The tests used were simple reaction time, complex reaction time, visual activity, speed judgment etc.

Srinivasan (1971) estimated that on average every year, 21 lakh persons were killed and 7.50 lakhs were injured in road accidents. He also studied the economic cost of road accidents. He assessed the cost of different types of road accidents in Delhi and also inquired into the malpractices in finalising road accident claims. The data for the study was collected from the records relating to 200 accidents by using stratified sampling techniques. The average compensation awarded was Rs.55,994 for a fatal accident, Rs.3,096 for a severe accident injury and Rs.525 for a slight accident injury.

Hingorani (1961) made an analysis of the traffic accidents in Delhi and other metropolis.

Rao (1972) identified the accident prone areas in the city of Vishakapatnam and made detailed suggestions to correct them into safety zones for traffic.

We find that most of the subsidies have been carried on the field of road accidents, though railways and air accidents are so high, yet there are rare studies on those modes of transportation.

The problem of overcrowdness, noise, fumes and accidents are studied by the NTPC (1980) and they recommended various measures to solve the problem. They observed that road accidents per vehicle-km is higher in Asian cities, including cities in India, than elsewhere in the world. Road accident casualties in terms of absolute numbers have increased from 38,800 in 1960 to 1.05 lakhs in 1976, with every sixth or seventh casualty being fatal. However, accident rate in relation to growth in motor vehicle has shown a decline from about eight accidents per 100 vehicles in 1960 to four in 1976. The measures suggested for road safety are adequate space for footpaths, provision of subways or overbridges and zebra crossing on busy roads and adequate cycle tracks in big cities. They suggested road safety education and legal measures. Intensification of road safety drives, driver's education and strict enforcement of traffic regulations, and accident prone section of road signs should increasingly be exhibited through visual aids.

The CRRRI is studying about research in highways engineering in various aspects of road traffic, safety and transportation.

Dr. Srinivasan and Dr. Mahesh Chand (1975) shows that alongwith an increase in population the number of vehicles and the number of accidents have gone up. The level of accidents varies greatly from one state to another state. In this way, their paper has been directed towards the computation of accident rate index (ARI) for the states of India. ARI has been computed through the use of a set of accident ratios which have been considered by assigning to them certain weights. The study has shown that Maharashtra is the highest accident risk state followed by Tamil Nadu and Kerala. Least accident risk states is Assam, followed by Punjab and Nagaland. The paper also identifies the factors which may influence the accident risk. Level of urbanization, proportion of three-wheelers and quality of roads are found to be the most predominant factor influencing risk accidents.

Talukdar and Justo (1981) by using the accident records maintained by the Traffic Police Department studied the accident rates in Bangalore city based on different factors such as population, number of vehicles, vehicle ownership, mobility and vehicle movement.

The above study shows that inspite of improper road network in Bangalore city, inadequate facilities for the

various traffic components and tremendous growth of human and vehicle populations, the accident rate (in terms of vehicles and population together) has not been alarmingly high as compared to other cities and other parts of the country. Moreover, it is heartening to note that the fatality rate has shown a decreasing trend during the period 1963 to 1979 though the total number of accidents have registered an increase year after year. This is obviously due to the increase in the number of vehicles on the roads, increase in vehicle movement or vehicular-kilometers and also increase in population without adequate increase in road facilities and enforcement personnel.

Some of the factors responsible for road accidents on rural highways in India are road geometry, pavement width, traffic volume and number of intersections per unit length of road. In a project study completed by the Central Road Research Institute, New Delhi, an investigation on a limited scale was undertaken to establish relationships between accident rates and some roadway and traffic volume factors. The study was taken up intensively on the Bombay-Pune road, which has a mixture of road geometry along its length. To supplement this study, another study on 34 roads in different parts of the country was also taken up. The analysis of data has clearly established that road geometry, width, number of

junctions and traffic volume determine accident rates to a significant extent.

Kadiyali and Gopalaswami (1983) has clearly shown that pavement width, curvature, vertical profile and frequency of junctions of a road are important factors that influence accident rates. By a careful selection of these characteristics while building new roads or while improving existing ones, the accident rate can be controlled.

According to S.P. Bagla (1993), road accidents are a matter of serious concern as they concern all. This is specially so when a majority of these road accidents are avoidable if the road users exercise caution and keep their temperament cool.

In the Fourth National Road Safety Week (January 1993), Jagdish Tytler, revealed that more than 70 per cent of the accidents are caused due to human error. He says that as the victims of road accidents are mainly pedestrians and two-wheeler drivers/pillion riders, it is necessary that the other road users have special consideration for them.

According to G.K. Pillai (1993), more than 57,000 lives were lost and over 3 lakhs injured due to road accidents in 1991. Such high causalities and injury figures are unacceptable and must be brought down. He says to do this, it is necessary that the concept of road safety of the consumers becomes a daily practice not only for other drivers of motor

vehicles but also for other users of the road, including pedestrians.

According to Dargan (1993), the vehicle density has shown an increase of about 30 times since 1950 and in about 2600 vehicles per lakh of population in 1993. The traffic density which was only 1.4 vehicles in 1950, three vehicles in 1980 has further gone up to 9 vehicles per hour on roads. Alongwith an increase in road vehicular population, it has also registered ten-fold increase in road accidents and more than 10 lakh persons have lost their lives in road accidents since Independence. On an average 155 persons die per day in road accidents in the country, in addition to 700 persons getting injured. There is an accident every second minute and a fatality on road every 9th. minute in India.

The Government of India is concerned with the alarming increase in the rate of accidents and for this purpose had set up a Road Safety Cell in the Ministry of Surface Transport in 1986 to collect, compile and analyze the accident figures and formulate necessary programmes and schemes so as to spread road safety consciousness among the road users with a view to arrest the rising trend of road accidents. The Cell has made maiden progress and has been taking measures by involving all concerned agencies, whether in the government or private, by way of organising National Safety Weeks, various types of competitions for target

groups, specially children, youngsters etc. A National Road Safety Week is being formulated with the objective to bring down accident rate drastically by the beginning of the 21st. century.

Though training research and development have vital role to play in the evolution of an efficient transport system, yet a review of the existing training and research facilities in the fields of transport shows that transport studies have been comparatively neglected. A few specialized institutes set up by the government with individual agencies of transport fulfill specific training and research needs of the concerned needs. However, there is no institution which can impart training to those who have to look at transport system as a whole and plan for its future development in a coordinate framework to undertake studies in transport problems from a common outlook and approach. The need for establishing such institutions at the national level have been strongly felt. The NTFC recommend an institute which could frame a common approach to the problems of transport. It would also attract experts of recognition to serve on its faculty to promote original research and impart first-rate training.

Chapter—III

STATE OF TRANSPORT IN MEGHALAYA

3.1 Shillong

Shillong, the capital of Meghalaya, has developed as an important administrative-cum-commercial centre not only for the entire state but as an extremely important town for the entire North Eastern Region. The total area covered by the Master Plan is 10,373.60 hectares. The Shillong Master Plan Area consist of Shillong Municipality, the township of Nongthymmai and Mawlai, the Cantonment and some of the neighbouring villages like Mawshabuit, Laitkor, Nongrah, Pynthorumkhrak, Mawroh, Mawtarar and the village of Nongkseh. In the north, the Master Plan extends upto the Barapani main dam, in the south beyond the Laitkor village, in the southwest upto the junction of Cherrapunjee and Nongstoin road, in the east upto Mawbynri village, and in the west beyond Umlyngka.

3.1.1 Population

Shillong has shown a steady increase in population in the past few decades except during 1961-71 when the growth of Shillong Standard Urban Area showed a downward trend and the growth rate was only around 20 per cent as against 78 per cent during 1951-61. Till 1951, Shillong was a Class II town. It became a Class I town only in 1961. The variation in the growth rate appears to be because of the change in the definition of Urban Area boundaries as the 1961 figures relates to the town group of Shillong while the 1971 figures

is for the Standard Urban Area. The growth of Shillong in terms of population is given in Table 3.1 below:

Table 3.1
Population Trends in Shillong, 1901-91

Year	Persons	Decade (variation in percentage)	Remarks
1901	9,621		
1911	13,639	+ 41.76	
1921	17,203	+ 26.13	Shillong Municipality
1931	26,536	+ 54.25	
1941	38,192	+ 43.93	
1951	58,512		
1961	1,15,160	+ 53.20	Town Group
1971	1,42,496	+ 42.32	Shillong
1981	1,74,703		Standard Urban Area
1991	2,23,366		

Source: 1. Census of Meghalaya, 2. Census of India

Shifting of the capital of Assam to Dispur in 1971 did effect the population of the town to some extent but establishment of new offices of the Central Government and other autonomous bodies, like North-Eastern Hill University, North Eastern Council, Indian Council of Agricultural Research, North Eastern Electric Power Corporation etc. had neutralized this impact on the population reduction.

There has been a population increase in the town where the population influx due to immigration has contributed immensely to thus push-up in the Shillong urban population. In fact, taking a bird's eye view of the actual increase in urban population, the lion's share has been in Shillong

proper than anywhere else in the North Eastern Region. However, no data on age specific migration is available to determine the quantum of in-migration, yet the in-migration is largely a function of adult and middle aged population from rural to the urban areas in search of better amenities. The present rate of in-migration is expected to reduce as more and more employment opportunities are made available in other growth centres in keeping with the policy of decentralization.

Table 3.2

Projection of Population of Shillong Master Plan Area by Age-Sex Composition

Year	0-14	15-29	30-59	60+	Total
1981	72,200	60,410	49,990	7,400	1,90,000
1991	86,970	73,470	60,785	8,775	2,30,000

Source: Census of India

3.1.2 Economic Base of Shillong

Shillong like any other hill town has developed principally as an administrative-cum-commercial centre and hence there is predominance of service sector over the other sectors of employment.

Labour Force - 47,133 persons out of an estimated labour force of 83,724 persons are gainfully employed. The participation rate among the females is high as in the hills,

women are expected to contribute to the family income by way of work in fields and offices.

Occupational Structure - The percentage of workers in the Standard Urban Area is about 11 per cent in the primary sector, 15 per cent in the secondary sector, and 74 per cent in the tertiary sector. It is, therefore, obvious that there is an imbalance of employment in the different sectors. Since in the Standard Urban Area it is difficult to increase the employment activities in the primary sector, where there are potentialities of employment especially in the field of small-scale industries such as manufacture of footwear, candles, wooden furniture and the like. This will reduce the imbalance in the employment pattern to a great extent.

3.1.3 Industrial Structure

A few service industries have developed in and around Shillong town. Mainly they are auto repair shops and saw mills. Due to lack of physical planning effort, these industries have come up indiscriminately even in the residential areas causing obvious inconvenience. The employment potential in service industries is not very high. Substantial amount of employment can be generated by diversification of industrial activities. Establishing small-scale industries like manufacture of footwear, wooden furniture and the like on a wider scale will employ more people in this sector. The total area under industrial use is

only 10 hectares which is only 10 per cent of the total Master Plan area. This clearly reflects that industrially, Shillong has not made much headway though there is enough potentiality for development of cottage and small-scale industries around the town.

3.1.4 Agriculture

Within the Standard Urban Area, there are a few paddy fields and agricultural farms which contribute to the economy of the area. No reliable information is available on the turnover of the agricultural produce. The total area under cultivation in the Standard Urban Area is 1,842 hectares. All lands under agriculture, horticulture, forest etc. are covered under this category of land use. Even within the Master Plan Area there are big chunks of land developed to agricultural use mainly for vegetable cultivation and orchards.

3.1.5 Trade and Commerce

Shillong has developed as a big commercial centre for the entire North Eastern Region. As typical of the city complex, the central business district is usually at the centre of the city and is also the core of many other institutions. Shopping activities have grown up tremendously within the city area. Bara Bazar continues to be the biggest wholesale and retail market in Meghalaya. Other shopping

centres like Police Bazar, Laitumkhrach, Polo Bazar have also grown substantially. However, there is a serious shortage of warehouses and storage spaces, particularly for goods of perishable nature which comes from outside the state and neighbouring villages. Although Shillong is one of the most important commercialized town of the North Eastern Region, it has only 50 hectares, i.e. 0.47 per cent of the total plan area under commercial uses. Hence the commercial areas are inadequate and congested.

3.1.6 Employment Projection

Employment in the primary sector was expected to decrease and it was expected that by 1991, nearly 20 per cent of workers would be in secondary and 70 per cent in the tertiary sectors. Government offices already seem to be saturated with working hands. However, considerable employment is likely to be generated under trade and commerce, commercial and financial institutions, marketing organisations, Chamber of Commerce etc. due to increased agricultural, industrial and business activities. Assuming that the workers to total population is maintained till 1981, then by 1991 nearly 70 per cent of the employment will be in the tertiary sector, 20 per cent in the secondary sector and only 10 per cent in the primary sector.

3.1.7 Community Facilities

Educational Facilities - The educational facilities are adequate and, in fact, Shillong has become an important educational centre for the whole of the North Eastern Region. The creation of the North-Eastern Hill University has added to the importance of Shillong as an educational centre. The development of educational facilities may be attributed to various Missions and philanthropic organisations. There are enough facilities for primary, secondary and college education. However, there is a concentration of educational institutions in the Laitumkhrach Ward, where most of the educational institutions are located, while in other areas like Mawlai, Upper Shillong, Lawsohtun, the educational institutions are neglected.

Recreational Facilities - Shillong is a famous tourist spot with a lot of recreational facilities, like the golf course at the Polo Grounds (the best in Asia), the Ward's Lake, the Umiam Lake, the Lady Hydery Park, six waterfalls of immense beauty within a very short distance. The Botanical Garden and the Laitkor areas provide excellent hiking places for the people.

3.2 A Historical Study of the Development of Public Transportation in Meghalaya with Special Reference to Shillong from Olden Days to Independence

Before reviewing the present position of transport facilities in Meghalaya, a brief survey of the development of

transport system in the state is furnished. It will help us to access the pace of development over a century which points out the present mad rush in transport compared to the limited facilities and use of transport system in the past.

David Scott was perhaps the first British administrator who wanted to open a route from Cherra to Guwahati in 1824. The chiefs agreed to grant the facilities of communication if they were granted some parcels of land in Sylhet. But his road project did not advance very far at that time because only a portion of the road in Assam would be covered in Cherra Raja's territory and the rest of it would have to traverse another chief's territory which extended from Cherra to Kamrup district of Assam. Later he discovered that the chief who owned that territory was the Raja of Nongkhliaw. Under these circumstances, the proposal to build the road from Sylhet remained in abeyance for the time being. Meanwhile he took an existing route through the territory of the friendly Raja of Jaintia to reach Guwahati from Sylhet (FSC, 1824). Later on Captain Rowlatt held that Shillong would be connected by the shortest possible route to Assam and it would also be accessible from Sylhet and Jaintia Hills. Jenkins (1861) was skeptical about the utility of the road proposed by Rowlatt. He thought that it could be used only for four winter months in a year as the terrain between Shillong and Guwahati was very malarious. A wagon road he

said might still be established for the native Mikirs. He felt that the best approach road to Shillong would be from Sylhet district in the south. The old road from Guwahati to Sylhet via Cherra was the only commendable link between the town and other parts of the region. In this connection, it may be worthwhile to mention here the course of the route from Cherra, which was the only connecting link between Shillong and Calcutta. The road from Cherra to Shillong would first cross the village Laitryngew and then to Lad Mawphlang. Two more villages of Laitsohpliah and Dympew-Mawkdok were to be crossed. Then through the valley of Kyrdemkhla one had to proceed to the village Laitlyngkot, from Laitlyngkot there were short cuts to Pamlakrai and from Pamlakrai people came down to the valley of Iewduh around Shillong town grew and developed (Tribal Occupation Mobility). The old road from Guwahati to Sylhet via Cherra suffered from the difficulty of surrounding the great river, the Kalapani. But the skepticism of Jenkins of the feasibility of an all-weather road from Shillong to Guwahati was, however, not shared by his successor, Henry Hapkinson. In 1862, General Showers observed that the station had been connected to Guwahati by a trace of road on the north constructed by Rowlatt. On the south Shillong was only 36 miles from Lakat in Sylhet which was served by good water communication. The only means of communication with Assam and Sylhet was the Guwahati-Cherra

road and its few arteries which served the Khasi Hills. The Government of Bengal approached the Government of India for the approval of the Guwahati-Shillong road whose terminus would be Guwahati in Assam and Chattach on the Surma in Sylhet. The political and commercial advantage of this road would far surpass the sum spent on it, for this would enable the government to exercise control "over the Cossyachs, Jyntheacs and other frontier tribes" (ASR, 1863). In anticipation of the approval of the Government of India, the development of the Shillong-Guwahati road was immediately undertaken and by 1865 the new cart road linking Shillong with Guwahati was formally opened for traffic.

The credit of introducing the first motor service between Shillong and Guwahati belonged to Khan Bahadur Kasimuddin Molla, son of Golam Hyder, who was a pioneer in many fields. Golam Hyder reached the first British service station in 1862 travelling to Chatak by boat from the Hoogly district of the present West Bengal and later to Cherra on foot. In 1888 his son Kasimuddin Moola secured a contract from the then British Government to run a horse drawn tonga service between Shillong station and Guwahati. Before the introduction of the tonga service, bullock carts used to cover the journey in three days. With the introduction of the tonga service, the journey of 64 miles up and down was carried in a single day. There were 12 stables along the road

so that every 5 or 6 miles, horses were changed for the sake of speed. The passenger freight was Rs.30 either way, though concessional rate was allowed to government officials. In 1906, Kasimuddin Molla, obtained the government permit to introduce the first motor service and placed a fleet of seven Alibon cars which ran on solid tyres on the road. A daily passenger tonga service between Shillong and Guwahati continued side by side with the motor service till 1910.

There has also been a well maintained motorable road which connected Shillong through Dawki and Pynursla with Sylhet since 1933 when the road was declared open by his excellency Sir Michael Keane, the Governor of Assam at that time. The same road also connected Shillong with Guwahati. The road, by linking Sylhet-Shillong-Guwahati, thus became the life line of communication. With the completion of the road, it took only 5 hours of pleasant journey time between Shillong and Sylhet which previously took a long period of 35 hours. Further, it also played an important role because of the fact that it connected all the major and important administrative centres both in the Surma and the Bramaputra Valley.

Realising the great importance that this road in the future would be able to secure the interest of the British living in both sides of the two important valley - Surma and Bramaputra, the British authorities did not hesitate to spend

a huge amount of money to the tune of Rs.33,19,661 in order to complete the difficult terrain from Umtyngngar (14th. mile junction) with the Cherra road to Sylhet.

In the Garo Hills one of the most formidable obstacle to the initial expansion of the British rule has been the absence of any transport and communication system. Though Tura was established as an administrative centre of the British in 1867, it was linked with interior villages through bridle paths (occasionally cleared during tours of different officials) and with a couple of hats of the border area (Dalu, Pootimarce) by cart roads (Esme, 1885). No river was found navigable by boat of even four tons burden. Only five rivers, the Krishna, Kalu, Bhogai, Netai and Someswari were navigable in their course within the hills for certain distance. But all of them had no boat traffic during the pre-British days except on the Someswari. It was reported that a bridle path joined Tura with Dhubri in the Assam Valley and there was a cart road to Dalu in the Mymensingh district (now in Bangladesh). In 1882, means of communication were afforded by 156 miles of navigable rivers, 37 miles of first class and 31 miles of second class roads (Hunter 1885). Later on another cart road between Tura and Rowmarighat on the Bramaputra was developed. Altogether 73 miles of cart road and 126 miles of bridle paths were maintained by the Public Works Department (PWD) in 1903-04 for a district of 3,140 sq.

miles area. The remaining areas were still the tracks made by the Garos from one village to another (Imperial Gazettes, Vol. VII, 1908).

With the creation of the state forest reserves since 1883, the forest department had to undertake development of certain roads for exploitation of forest resources. At times, lessees used to construct roads for the purpose. All the roads along the Garo Hills border with Goalpara and Kamrup had been initially developed by the forest contractors of the department. By 1940, about 50 miles of forest roads in different parts of the district were also developed besides maintaining those of about 40 miles.

The Jaintia Hills were left completely uncovered by roads. It had come under the British possession in 1835. The importance of a network of military roads in the Jaintia Hills was brought home to the British Government by repeated Jaintia outbreaks, and the government ordered the construction of 218 km. of roads in the hill areas. For connecting different areas of Jaintia Hills with Shillong (the capital of British Assam) and Jowai (the sub-divisional headquarter of Jaintia Hills), Jowai-Muktapur, Muktapur-Jaintiapur, Jowai-Mairang roads were constructed. Communication between Sylhet and Jaintia Hills were possible during the British days due to the presence of bridle paths, navigable rivers upto a certain point and roads. Though some

of the means of communication were in the crude form, yet they served a useful purpose in transportation of people and materials to and from the hills and plains.

As far as the bridle paths were concerned, we find the presence of such paths which connected Jowai from the hills with Jaintiapur in the plains of Sylhet; its length was 30¼ miles. S.M. Ali mentions the presence of such paths from Amchoi in Nowgong district leading to Jaintiapur. It passed southwards through Bar Amni Bar Rangkhohi, Umpanai, Maitiang, Jowai, Jarian and Muktapur into Jaintiapur. Dr. J.H.Hutton travelled along this track during his visit to Jaintiapur (Ali, 1954).

The rivers of Jaintia Hills were not much suitable for the purpose of navigation. In the Jaintia Hills, the Myntdu or Lubha being partially navigable, provided the means of communication between the hills and the plains of Sylhet.

As a result of the hectic road construction undertaken by the British, the chief township of the region, Shillong, Jowai and Cherra were connected by the modern means of communication with even the distant province of the British empire.

3.3 Transport Situation Since Independence

With the partition of the country, areas on the southern side of the state bordering Bangladesh lost their

traditional markets and this had a crippling effect on the economy of the state. In the Garo Hills, traditional supply lines were hitherto linked with rivers and roadways of Mymensingh and Rangpur (now in Bangladesh). Since these had to be closed because of strained Indo-Pak relations, linking of Tura with Goalpara, Guwahati and Dhubri had to be developed by constructing roads in the hills and the plains of the district and connecting them with National Highways and rail-heads of Assam. Further, owing to the partition, the districts of Cachar and Tripura were cut off from the rest of the country. Consequently, the Government of Assam made a beginning by constructing roads linking these border areas as well as Shillong with the districts of Cachar and Tripura via Jowai. An all-weather motorable road from Shillong to Jowai which was constructed went right upto Garampani and connected Silchar via Mahur and Haflong. The construction of the Shillong-Jowai road, and roads to Garampani and Dawki, was an important landmark of road construction in the region. Though the first motor vehicle was driven on India roads in the year 1898, until the First World War, a good number of vehicles did not ply on these roads. While the history of road development in India goes back to the early ages, organized efforts at road development at the national level in the recent past may be traced to the year 1929, when the Jayakar Committee considered schemes for improvement of the road

system in a comprehensive manner. It was on the recommendation of this committee that the role of the Central Government in this regard to the development of road system was recognized. Later in 1943, Chief Engineers in charge of road systems in the country met at Nagpur to consider requirements of the road system over a twenty five year period beginning December 1943. The Nagpur Plan classified roads as national Highways, State Highways, District Roads and Village Roads and prescribed standard norms and targets for road development of the various categories. In agriculturally developed areas, the target set was that no village should be more than 2 miles away from a road or more than 5 miles from a main road, the average distance from a main road being less than 2 miles. In non-agricultural and less developed areas, accessibility was to be within 5 miles from a road and not more than 25 miles from a mainroad, the average distance being 6 to 7 miles in most cases. Soon after Independence, the pace of road development in the country was enhanced so as to achieve targets of the Nagpur Plan; but there were serious deficiencies in respect of road surface, cross drainages, bridges, etc., and as such the second attempt for preparing the road development plan on an all-India basis was started in 1958, and the 1961-81 Road Development Plan known as the Bombay Plan was formulated, with a target to achieve an over-all density of 32.5 km. of

roads per 100 sq. km. of area, 44 km. of roads for developed agricultural areas, 19 km. for semi-developed areas and 12 km. for underdeveloped areas.

3.4 Transport Development in Meghalaya under various Plan Period

A general study of the progress of the transport system and their progressive development in the pre-plan period reveals a rather slow progress in this regard.

With the creation of the state, the government was concerned about the need for initiating action for formulation of a sound plan for economic and social development of the state. Interestingly, by examining the Five Year Plan data of individual units in North East India, one notices that until 1969, Meghalaya did not figure either in total plan expenditure or in the expenditure of the transport sector. Assuming that this expenditure has been lumped under Assam, while no such indication is available, one finds that the sector was shabbily treated.

The Fourth Five Year Plan - At the commencement of the Fourth Five Year Plan in April 1969, Meghalaya had a total road length of 2639 km., out of which 731 km. were surfaced, 1510 kms. gravelled and 398 km. were kutcha or earth roads. On 2nd. April, 1970 when Meghalaya was given the status of an

Autonomous State, the new state had to its credit 2786.68 km. of roads.

During the Fourth Five Year Plan, top priority was given to the development of a network of roads in the state as a means of creating an infrastructure for the development of the economy.

The following Table 3.3 indicates the different kinds of roads existing at the end of the Fourth Plan period.

Table 3.3

Roads in Meghalaya (in Kms.) during the Fourth Plan

Kinds of Roads	Roads on 31st. March, 1969	Anticipated at the end of the IVth. Plan	Achieved at the end of the IVth. Plan
1. Surfaced roads	731	900	948.47
2. Gravelled Roads	1510	2000	1451.81
3. Earth Roads	398	450	690.31
Total:	2639	3350	3090.59

Source: Supplement to the Budget Speech, 1975-76, made by Shri B.B.Lyngdoh.

The then Finance Minister of Meghalaya in his supplement to the Budget Speech, 1975-76, stated that the anticipated target of road development could not be achieved during the Fourth Plan mainly because of the scarcity of construction materials such as bitumen, cement, explosives,

steel ingredients, and also due to the shortage of technical skilled personnel.

Besides roads, a number of major and minor bridges and culverts were constructed during the Fourth Plan period.

The Plan outlay for Meghalaya in the Fourth Plan is given in Table 3.4.

Table 3.4
Fourth Plan Outlay for Meghalaya

Sector	IVth. Plan Outlay, 1969-74	Percentage to Total
		(Rs. in crore)
1. Agriculture & allied programme	7.86	20.68
2. Co-op & Community Development	2.38	6.26
3. Irrigation & Power	1.75	4.60
4. Industry & Mining	2.58	6.78
5. Transport & Communication	12.90	33.94
6. Social Service	8.24	21.68
7. Miscellaneous	2.99	7.86
Total:	38.00	

Source: Planning Department, Government of Meghalaya.

The details of the share going to transport and communication is given in Table 3.5.

Table 3.5

	4th Plan 69-74	Annual Plan 70-71	Annual Plan 71-72	Annual Plan 72-73	Annual Plan 73-74
1. Road	1215.00	280.00	325.00	256.00	300.00
2. Road Transport	50.00	5.00	5.00	15.00	21.00
3. Tourism	25.00	4.00	7.00	7.00	10.00

Source: Planning Department, Government of Meghalaya

The importance of transportation was fully recognized in Meghalaya during the Fourth Plan period and the share allocated to transportation was the highest during the plan period. As a result of this investment, road length increased to 3090 km. and the state achieved a road density of 14 km./100 sq. km.

By the end of the Fourth Plan, there were two National Highways in the state, viz. NH No.40 or the Jorabat-Shillong-Tamabil Road (the entire length of 168 km. of this road falls within Meghalaya, the road connects Jorabat in Assam/Meghalaya and Tamabil in the border of India and Bangladesh), and NH No.44 or the Shillong-Jowai-Badarpur-Agartala Road (only 174 km. of the total length of this road falls in Meghalaya).

Besides these two National Highways, the other important road length in the region during the plan period are:-

1. The Daura-Darugiri-Nangalbibra-Baghmara road. This road is in the East Garo Hills District, it runs from north to south, passes through the coal and limestone belts, and joins NH. No.37 at Dudhnai in Assam and Nangalbibra in Meghalaya. This road is being improved by the border road development board.

2. The Mawsynram-Balat-Maheshkhola road, the Dalu-Baghmara road and the Dalu-Purakhasia road. All these roads are of strategic importance and are developed by the Government of India under the strategic road programmes.

3. The Paikan-Bajengdoba-Tura-Dalu-Baghmara road. This 205 km. long road runs north to south through the Garo Hills, via Tura, and connects Paikan in Assam and Dalu and Baghmara and the border areas.

4. The Mendipathar-Phulbari road. This road connects Tura to Guwahati and Shillong.

5. The Shillong-Passi-Jowai-Garampani-Haflong road. The stretch of this road from Shillong to Passi, a length of 13 km., overlaps the NH. No.44.

6. The Shillong - Mawphlang - Mawsynram-Balat-Maheshkhola-Baghmara road. This is an important road which connects the borders to Shillong. The stretch of the road from Mawsynram to Maheshkhola is being improved under the strategic road programme.

7. The Umtyngar-Cherrapunjee-Shellia road. This road stretches for 23 km. of the Shillong-Umtyngar-Dawki-Tamabil route and connects Shellia to Shillong via Cherrapunjee.

8. The Umsning-Jagiroad route. This road connects Umsning on the Shillong-Guwahati NH. No. 40 in Meghalaya to Jagiroad on NH No.37.

9. The Shillong-Nongstoin-Tura road. This road is being developed as a major trunk road. It connects Shillong to Tura.

The Fifth Five Year Plan - The Fifth Five Year Plan of Meghalaya was drawn up with the following objectives.

(i) The spill-over schemes - It was necessary to ensure expeditious completion of the continuing schemes from the Fourth Plan which could not be completed due to various reasons. It was anticipated that all the spill-over schemes of the Fourth Plan would be completed by the first two years of the plan period and an amount of Rs.579 lakhs were provided for their completion. Most of the spill-over schemes of the Fourth Plan were completed by the end of the plan, and the remaining few were completed during the Sixth Plan period.

(ii) New Schemes - Priorities have been given to removing the deficiency in the existing system such as missing links, missing bridges, improvement of low grade surfaces etc. Meghalaya being a hilly region with heavy

rainfall, it was extremely difficult and wasteful to maintain unsurfaced roads. So it has been aimed to surface as many kilometers of road as possible consistent with the availability of funds.

As there was no Road Research Laboratory attempts were made to construct it during the plan period.

(iii) Stress was given to fulfill the minimum needs of providing all-weather road links to the villages with a population of 1000 and above.

The outlay and expenditure during the Fifth Plan is as given in Table 3.6 below:

Table 3.6
Outlay and Expenditure during Fifth Five Year Plan,
1974-75 - 1979-80

(Rs.in crores)		
Sectors	Outlays	Percentage
1. Agri & allied services	19.79	22.10
2. Cooperation	2.18	2.43
3. Water & Power development	20.09	22.43
4. Industries & Materials	5.36	5.98
5. Transport & Communication	18.84	21.04
6. Social & Community services	15.29	17.07
7. Eco. services	5.80	6.47
8. General services	2.18	2.43

Source: Annual Plan Document, Meghalaya

The share going to transport and communication in the Fifth Plan was 18.84 crores which is about 21 per cent of the total plan outlay. As a result of this outlay the length of road constructed during the period was as below (Table 3.7):

Table 3.7

Length of Road Constructed during Fifth Plan, Meghalaya

(in km.)

Year	Surfaced	Unsurfaced	Total
1974-75	993	2205	3198
1975-76	1028	2287	3315
1976-77	1354	2353	3707
1977-78	1422	2464	3886
1978-79	1487	2630	4117

Source: PWD, Meghalaya

In terms of physical targets it was proposed to achieve by 1979 a total road length of 5111 km., of which 1345 km. would be surfaced and 3200 km. would be gravelled and the rest earth roads, but the state achieved only 4117 km. of roads and thus fell far short of the proposed target.

The Sixth Five Year Plan - The Sixth Five Year Plan was set up with the following priorities in the transportation sector:

(i) *Spill-over schemes* - It was necessary to ensure expeditious completion of the continuing schemes from the Fifth Plan which could not be completed due to various reasons. There were 111 number of spill-over schemes with an estimated expenditure of 1523 lakhs. 61 of these schemes had been physically completed during the Sixth Plan. 10 schemes were completed during 1986-87 and by 1988-89, another 13 schemes were completed in all respects, and the remaining

spill-over schemes of the Fifth Plan could be completed only by the end of the Seventh Plan period.

(ii) New schemes - Priorities were given to remove differences in the existing system such as (a) Missing Link, (b) Missing bridges, (c) Remaining length of the spill-over schemes, (d) Replacement of weak and narrow bridges, and (e) Improvement of low grade section etc. Special attention has been given to surface as much length of road as possible with a view to making a percentage of 47 per cent of total road length as surfaced road.

During the Fifth Plan period, a Road Research Laboratory was established. This was not functioning as contemplated due to shortage of required technical staff and low allocation of funds. An amount of Rs.49 lakhs has been provided for research and development during the Sixth Plan.

It was anticipated that substantial employment facilities would be generated during the plan period.

The approved outlay for the Sixth Five Year Plan is given below in Table 3.8:

Table 3.8

Outlay for Sixth Five Year Plan, Meghalaya

(Rs. in crores)

Sectors	Outlays	Percentage
1. Agri & allied services	40.65	17.29
2. Cooperation	3.28	1.39
3. Irrigation	47.00	20.00
4. Industries & Materials	9.50	4.04
5. Transport & Communication	50.00	21.27
6. Social & Community services	69.67	29.64
7. Eco. services including BAPF	10.60	4.51
8. General services	4.30	1.82

Source: Annual Plan Document, Meghalaya

The proposed year-wise allocation achievement of the Sixth Plan can be seen from Table 3.9:

Table 3.9

**Draft Sixth Five Year Plan (1980-85)
Proposed Year-wise Allocation Achievement**

Year-wise	Proposed Allocation	Physical Achievement		
		New Const. (km.)	Imp/Black Topping (km)	Major/Minor Bridges (including MNP schemes)
1980-81	690.00	185.00	116.00	450.00
1981-82	828.00	222.00	139.00	540.00
1982-83	1018.00	273.00	171.00	660.00
1983-84	1283.00	344.00	215.00	830.00
1984-85	1655.00	444.00	277.00	1070.00

Source: Annual Plan Document, Meghalaya

By 31st. March, 1980 the state achieved a road density of 19.23 km./100 sq. km. According to the 20 year Road Plan

(Bombay Plan) drawn up for the country as a whole, the minimum requirement of motorable road in Meghalaya was 6289 km. by the end of 1981, but according to PWD sources there were 4145 km, and the length of the road fell short of the Bombay Plan by a large extent. The total road length increased to 5063 km. including 1863 km. of surfaced roads and achieving a road density of 22.57 km./100 sq. km. by the end of the Sixth Plan (1980-85). During the Sixth Plan period of 1981, the NH No.51 connecting Paikan and Dalu was extended to the Garo Hills upto the Bangladesh border.

The Seventh Five Year Plan - The Seventh Five Year Plan of Meghalaya was started with the following objectives:

1. Spill-over schemes - As already mentioned, 23 spill-over schemes of the Fifth Plan period was completed in the Seventh Plan, and for the 340 spill-over schemes of the Sixth Plan, an amount of Rs.537.59 lakhs had been earmarked. In 1988-89, there were still 162 spill-over schemes from the Sixth Plan of which 31 had been completed in all respects by the end of the period 1988-89. Though maximum thrust was given to complete all the schemes by the end of the Seventh Plan, 36 spill-over schemes had to be carried on to the Eighth Plan.

(ii) Various new schemes were also proposed during the plan period. 560 km. of new roads were expected to be constructed and 186 km. of existing roads were likely to be

surfaced. The broad outlay for the Seventh Plan period is given below in Table 3.10:

Table 3.10
Seventh Plan Outlay, 1985-90, Meghalaya

(Rs. in crores)

Sectors	Outlays	Percentage
1. Agri & allied services	74.95	17.03
2. Rural Development	12.08	2.74
3. Special Area Programme	10.00	2.27
4. Irrigation & Flood Control	11.60	2.63
5. Energy	71.50	16.25
6. Industries & Minerals	19.35	4.39
7. Transport	80.00	18.18
8. Science, Technology & Environment	1.70	0.38
9. General Eco. services	7.55	1.71
10. Social Service including Education	122.72	27.89
11. General services	28.55	6.48

Source: Planning Department, Meghalaya

As a result of the outlay of 80 crores in the transport and communication sector, the position of roads during the Seventh Plan is given in Table 3.11 below:

Table 3.11
Road Length during Seventh Plan, Meghalaya

(in kms.)

Year	Surfaced	Unsurfaced	Total
1985-86	2066	3073	5139
1986-87	2123	3095	5218
1987-88	2295.32	3103.99	5399.31
1988-89	2345	3184	5529
1989-90	2395	3224	5619

Source: PWD, Meghalaya.

It is seen that with the construction of 75 km. of new roads and the surfacing of 54 km. of existing roads during the first year of the Seventh Five Year Plan, the total road length of the state increased to 5139 km. including 2066 km. of surfaced road, achieving a road density of 22.90 km./100 sq. km. as on 31st. March, 1986. After the construction of another 80 km. of new roads during 1986-87, the total road length further increased to 5218 km. as on 31st. March, 1987, achieving a road density of 23.26 km./100 sq. km. This, however, included NEC and BRTF roads also. By the end of the Seventh Plan, the targetted road density of 24.90 km./100 sq. km. were achieved.

The Eighth Five Year Plan (1990-95) - The Eighth Plan was started with the following objectives:

Construction of 1020 km. of new roads, improvement including metalling and black topping of 425 km., construction of missing bridges of 2400 metres, reconstruction of weak bridges to permanent bridges, construction of 5 km. of ropeway and cable cars and finally achieving a road density of 29.44 km./100 sq. km. Besides these, adequate provisions for planning and research had been made in the Eighth Plan. The spill-over schemes from the Sixth Plan and Seventh Plan were taken up on a priority basis. During the plan period, 256 villages were to be connected on a priority basis.

The broad sectoral break-up of the outlay proposed for the Eighth Plan (1992-97) is indicated in Table 3.12 below:

Table 3.12
Eighth Plan Outlay (1992-97), Meghalaya

(Rs. in crores)

Sectors	Outlays	Percentage
1. Agri & allied services	155.40	15.10
2. Rural Development	40.12	3.89
3. Special Area Programme	15.58	1.51
4. Irrigation & Flood Control	56.50	5.49
5. Energy	103.00	10.00
6. Industries & Minerals	47.00	4.56
7. Transport	250.00	24.29
8. Science, Technology	3.50	0.34
9. General Economic services	30.00	2.91
10. Social Service including Education	268.00	26.04
11. General services	59.90	5.82

Source: Planning Department, Meghalaya

According to the National Transport Policy Committee, all states have to achieve a road density of 50 km./100 sq. km. in hill areas by the end of 2001 A.D. According to the direction of the Planning Commission, the state of Meghalaya has submitted a Master Plan to the Planning Commission with a target to cover a road density of 39.22 km./100 sq. km. by the end of 2001 A.D. From the above indication it is clear that the state will not be able to achieve the target of 39.22 km./sq. km. unless new schemes are taken up and plan allocation increased as prosperity and all round development of the state and augmentation of the resource, in a hilly

state like Meghalaya depends mostly on road communication. The new schemes will include those for the development of existing town roads, construction/reconstruction of missing bridges and culverts, and metalling, black topping and construction of a few important village roads.

At present there are three National Highways in the state, NH No.40, 44 and 51. The NH No.40 connecting Jorabat (Assam/Meghalaya) and Dawki, and NH No.44 connecting Shillong and Agartala pass through Meghalaya, and are important arteries not only for economic and social activities of the state through which they pass but also for the movement of goods and passengers to the neighbouring states. Besides, these two routes are strategically important because the area covered by them are in proximity to international border. NH No.51 connects Paikan and Dalu and serves the Garo Hills on the western part of Meghalaya. It is of strategic importance not only for economic development of the region, but because of its connection with the Bangladesh border. The length of the national highway has increased 334 km. in 1970-71 to 460 km. till date. In accordance with the 20 year Road Plan, by 1981 it was proposed to make national highways two way for roads, to connect missing links, to broaden narrow bridges and to reconstruct the weak bridges. It has been seen that road development in the hilly state is difficult, time consuming and costly. The average cost of new construction of

roads per km. in Meghalaya at 1986-87 rates is between Rs.6 to Rs. 7 lakhs and the cost of road construction at 1989 prices show that the construction of MDR and ODR require Rs.10 lakhs per km.

3.5 NEC Schemes for the Development of Transport and Communication in the State

Since its inception in 1973, the North Eastern Council (NEC) has allocated the maximum share of its outlay for the development of transport and communication in the North Eastern States. On the basis of a regional survey indicated by the Council, future projections of traffic load along with a visualization of the potential centres of growth especially in regards to market, urban areas and industrial development has become possible through schemes for construction and improvement of existing substandard roads of economic importance, bridges across major rivers, extension of railway network and survey for ropeway etc.

Roads - The following roads have been taken up by the NEC in Meghalaya under the Fifth Five Year Plan:

1. Jowai-Khanduli-Baithalangsa road.
2. Paikan-Bajengdoba road.
3. Agia-Mendipara-Tura road.
4. Mankachar-Garobadha road.

5. Nongstoin-Rongjeng road.

6. Cherra-Shillong road.

The (1) Mairang-Ranigodown road, (2) Mawsynrut-Hahim-Singra road, (3) Dhupdhara-Adhogiri road, (4) Darrangiri-Kharkutta road, (5) Krishnai-Mendipathar road, (6) Nidanpur-Fakinganj road, (7) Danua-Mendipathar-Dainadubi road, (8) Dkhiah-Moulsei-Haflong road, and (9) Rongsai-Bahengdoba-Borohara road were taken up by the NEC in Meghalaya under the Sixth Five Year Plan, under roads of regional importance. Under the roads of economic importance, the Mankachar-Purakhasia via Mohendraganj was taken up.

The improvement of the Shillong-Tura road, construction/improvement of the Amjong-Chibonga road, metalling and surfacing of Passi-Garampani road, improvement of Resubelpara-Krishnai-Charali road, improvement of the Bolbola-Sualmayi-Zorikakona road, improvement of the Malankona-Bandapara road were taken up by the NEC in its Seventh Plan for Meghalaya.

During the year 1990-91, an outlay of Rs.800 lakhs has been made available by the NEC for the road schemes falling within the boundaries of Meghalaya and financed by the Council. The physical targets for NEC road schemes during 1990-91 were metalling and black topping of 65 km., improvement and widening of 50 km. and construction of 46 bridges.

3.6 Passenger Transport in Meghalaya with Special Respect to Shillong

In the absence of other means of communication like in other states in India, road communication is the only means of transportation and helps greatly towards achieving socio-economic development in the state.

Pre-Independence Days - During the olden days as mentioned, people travelled on foot and important personnel were brought on horse back. Since there was no proper roads, people had to traverse long distances along narrow footpaths made of rough stone which were often very steep and slippery. Besides these it has been found that the people of the area used cane baskets woven in the shape of a chair to carry people on their back. It was usually a long cane basket with a seat in the middle where a person could sit. People could rest their feet on a board which was hung below the seat. There was a covering at the top made of cane and covered with a peice of cloth which served as protection from rain and sunshine.

The only commendable link between Shillong and other parts of the region was the Shillong-Cherra road. The Shillong-Guwahati road was opened for tongas or horse-driven carts and it was only in 1906 that motor services were introduced on the road.

Between 1866-1880 there were footpaths connecting Shillong with villages like Mairang, Jowai and Mawtawar.

As previously mentioned, communication between Jaintia Hills and other parts of the region was mainly through bridle paths, navigable rivers upto a certain point and roads. Two rivers, the Myntdu and Lubha being navigable, people travelled on boats and canoes to then plain areas of Sylhet. It has been found that people mainly had to walk on foot on their journey from one place to another. It was only in 1933 that a motorable road was declared open linking Shillong through Dawki and Pynursla with Sylhet, and it proved a big step in the development of transportation in the area.

As has already been pointed out earlier, the only means of contact of Tura in the Garo Hills with the outside world was through the bridle paths and cart roads. Dhubri in the Assam valley and Bajengdoba and Damra on the main road (now NH) were earlier connected with Tura by a bridle path, whereas Dalu on the Bangladesh border (then Bengal) by a cart road. Till the thirties, bullock carts on the fair weather roads provided the speediest means of transport over the human carriers. All these and the boats (on the short distance navigable rivers) could only serve the fringe of the problem. The metalled road called Tura-Dalu was constructed during the seventies to serve as a main and regular supply line of the administrative-cum-commercial centre of the

district. It has been noted that links with the Garo Hills in the olden days was mainly by cart roads. However, during the British rule, a motorable road was constructed linking Tura with Mankachar.

The post Independence and the planning era saw a big change in the mode and means of passenger transportation in the state. The various modes of passenger transport in Meghalaya can be described below:

3.6.1 Roadways

Roadways is undoubtedly the most important mode of transport in the state. Automobiles like cars, jeeps, buses, three-wheelers, scooters and motor cycles form the various means of mechanized transport used on roads. Besides cycles, bullock carts, pony carts and horse carts are the other popular means of transport in the rural areas of the state.

The number of vehicles on the road from 1971-72 to 1987-88 is shown in Table 3.13. During this period, the number of vehicles on the road in Meghalaya has increased from 7,237 in 1977-78 to 24,269 in 1987-88. One important thing to be mentioned here is that 80 per cent of these vehicles are in Shillong city. The number of vehicles varies from year to year, and it is seen that there was a decrease in its number in 1980-81 and 1981-82. The political agitation which had partially paralysed the state, the rising price of petrol or perhaps inflation may have had the effect of

Table 3.13

**Number of Vehicles on the Road in Meghalaya,
1971-72 to 1987-88**

(P= private; G = government)

Types of Vehicles	71-72	72-73	73-74	74-75	75-76	76-77	77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	
Truck	P	489	573	633	633	972	915	1063	1220	1232	1001	1292	1706	2137	2651	3398	3870	5451
	G	72	87	140	157	178	16	10	134	49	74	90	115	124	135	173	208	300
Bus	P	253	275	292	301	331	300	322	444	335	274	422	542	618	388	861	919	1182
	G	-	14	1	1	55	4	1	8	11	13	27	29	30	36	41	49	64
Cars	P	1103	1261	1501	566	1607	1731	1871	1997	1966	1787	1881	1979	2219	2190	2397	2604	3295
	G	49	48	130	155	208	10	13	26	37	148	166	171	187	198	218	255	575
Jeep	P	412	502	616	658	770	908	1057	1372	1175	999	122	1494	1743	1884	2361	2648	3237
	G	67	98	212	247	254	89	119	242	245	404	419	498	590	644	751	836	1443
Trailer	P	351	394	423	455	504	550	554	724	704	642	714	788	836	882	970	1117	1251
	G	19	29	19	36	37	25	26	35	34	83	95	115	120	143	146	151	265
Tractor	P	20	4	24	40	66	49	58	77	75	80	102	117	124	135	159	170	193
	G	8	9	11	21	62	18	26	45	19	28	38	43	43	45	39	45	120
Two Wheeler	P	531	559	722	973	1157	1406	1608	1915	1817	1699	1859	2342	2705	2868	3668	4417	5165
	G	27	23	20	20	54	5	10	8	20	42	46	50	56	56	62	75	186
Taxi-cab	P	348	368	377	368	390	456	501	527	531	583	645	718	843	944	1020	1182	1266
	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Others	P	57	89	105	117	123	35	39	26	27	28	31	46	52	64	266	271	135
	G	25	-	48	56	60	9	9	18	23	37	40	54	54	55	57	59	95
Total	P	3564	4025	4693	4111	5920	6350	7073	8302	7862	7093	8168	9732	11277	12006	15100	17278	21197
	G	267	308	581	693	908	176	214	516	438	829	921	1075	1204	1312	1487	1678	3048
Grand Total		3831	4333	5274	4804	6828	6526	7287	8818	8300	7922	7989	10807	12481	13318	16587	18956	24245

Source: Commissioner of Transport, Meghalaya.

discouraging non essential travel during the same period. It is once again observed that people preferred their own transport to public transport. The number of cars increased from 1,884 in 1977-78 to 3,870 in 1987-88, and the number of jeeps increased from 1,276 in 1977-78 to 4,720 in 1987-88. The number of two-wheelers have increased from 501 to 1,226 in 1977-78 and 1987-88 respectively. It is again found that the increase in the number of vehicles on the road was gradual till 1981-82, but since then it has increased tremendously and at a very rapid rate.

The number of vehicles registered in Meghalaya (Table 3.14) has increased from 7,193 in 1980-81 to 32,435 in 1990-91, and then to 41,935 in 1994-95 an increase of about six times from 1980-81 to 1994-95. The number of buses have increased from 309 in 1980-81 to 1,571 in 1994-95 and the number of minibuses have increased from 66 in 1988-89 to 253 in 1994-95. Cars have increased from 961 in 1980-81 to 5,245 in 1990-91, and then to 7,024 in 1994-95. The number of two-wheelers have increased from 1,812 in 1980-81 to 8,108 in 1990-91, and to 11,510 in 1994-95. Three-wheelers are also found to increase from 5 in 1984-85 to 172 in 1994-95. In 1988-89, there were 874 taxis plying in Shillong city and the number has increased to 1748 in 1994-95.

Table 3.14

**Number of Vehicles Registered in Meghalaya,
1980-81 to 1994-95**

(P= private; G = government)

Types of Vehicles	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	
Truck	P	1032	1356	1706	2137	2651	3395	3870	5451	6038	6452	6949	7487	7869	8235	8558
	G	76	95	115	124	135	178	208	300	320	342	343	477	481	599	655
Bus	P	296	447	542	618	688	861	919	1182	1257	1284	1323	1356	1407	1445	1487
	G	13	25	29	30	36	41	49	64	64	65	69	79	79	82	84
Mini Bus	P	-	-	-	-	-	-	-	65	87	96	138	165	206	228	
	G	-	-	-	-	-	-	-	1	1	1	23	25	25	25	
Car	P	1805	1892	1979	2819	2190	2397	2684	3295	3713	4128	4575	5180	5997	5996	6306
	G	156	164	171	197	198	218	255	575	612	648	670	688	707	713	718
Jeep	P	1033	1276	1494	1743	1884	2361	2648	3259	3624	2906	4248	4464	4638	4755	4849
	G	411	437	498	590	644	751	836	1443	1589	1684	1715	1779	1833	1911	1988
Trailer	P	651	724	788	836	882	146	1117	1251	1357	1446	1506	1555	1594	1639	1675
	G	102	107	115	120	143	970	151	265	290	304	296	305	306	323	325
Tractor	P	85	108	117	124	135	159	170	193	204	219	230	234	234	236	238
	G	44	43	43	43	45	39	45	120	132	135	137	179	137	150	151
Two-wheeler	P	1768	1958	2342	2705	2868	3668	4417	5165	5934	6570	7905	8895	9751	10571	11252
	G	44	50	50	56	56	62	75	186	195	203	203	256	256	257	258
Three-wheeler	P	-	-	-	-	5	6	6	6	14	14	25	37	79	126	172
	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Taxi Cab	P	600	644	718	843	944	1020	1182	1266	874	855	1154	1657	1673	1724	1748
	G	-	-	-	-	-	-	-	-	538	599	709	758	831	851	874
Others	P	34	38	46	52	64	266	271	135	157	154	173	176	188	202	209
	G	43	46	54	54	55	57	59	95	102	132	108	126	126	135	135
Total	P	6304	8443	9732	11877	12311	14279	17284	21203	23735	24115	28893	31935	34006	35135	37596
	G	889	967	1075	1214	1312	2316	1678	3048	3305	4113	3542	9512	3950	5046	4339
Grand Total		7193	9410	10807	13091	13623	16595	18962	24251	27060	28228	32435	35847	37956	40181	41935

Source: Commissioner of Transport, Meghalaya.

In the last few decades, Shillong has experienced phenomenal expansion of population and economic activity resulting in various social and economic problems. The number of vehicles on the road and the registration of vehicles show the large growth of vehicles in the state. The most important thing to be mentioned here is that 80 per cent of the vehicles of the state are concentrated in Shillong city. Shillong is today one of the richest if one has to go by the number of vehicles on the road. But the size of the road is the same as it was twenty years ago. While business and economic activity has been concentrated in central areas, residential colonies have spilled over into suburbs, thus greatly adding to the intensity of commutation.

The most critical problem faced by the people of Shillong are inadequate, poorly designed outdated road system and overcrowded transport facilities. The enormous growth in the vehicle population as of today is not well matched with the suitable increase in road length. The National Highway No. 40 and 44 in the stretch passing through the Shillong city has far exceeded the point of optimality of road usage, thus breeding bottleneck to free and unimpeded movement of traffic. Frequent stoppages, slow movement and traffic hold-ups due to over congestion are frequent occurrences in the city. In Shillong, one encounters all modes of transport ranging from trucks, buses and cars to motor cycles, scooters

and pony carts. Traffic come criss-cross from roads, by-lanes, alleys and godowns, all are in a mad rush while plying on the road. The pedestrian's life is always in danger, leave alone the accidents. The roads being narrow, there cannot be any segregation of slow and fast moving vehicles. There are not enough parking space to accommodate the vehicles, and the narrowness of pavements are factors which further reduces the already very small road capacity, and make it next to impossible to expand the road width, even when it is so essential for Shillong's development. Besides, the roads are not only used as thorough-fares but as loading and unloading spaces and as access to the buildings. This causes a considerable amount of bottleneck hence reducing the capacity of the roads. Plague zones like Mawlonghat, Iewduh, Motphran, Laitumkhrak, G.S.Road and Rhino Hall-Barik-Dhankheti-Nongthymmai road, i.e NH No. 40, are the worst areas. For the public it is frustrating, and for the administration there is no way that they can do about the hazards. Further, schools, colleges and business establishments are found crowded on one side and unutilized on the other side and most of the vehicles too ply only on certain areas and the less important areas are neglected. Most of the areas of Lumparing, Lawsohtun and Malki have poor accessibility as proper motorable roads do not exist in those parts of the city.

Traffic in Shillong is mostly either fast vehicular traffic or pedestrians. The number of pony carts is not very big. There is a dominance of trucks and cars over other types of vehicles in the city which impose the greatest public costs, notably in terms of pavement wear and the need to provide considerable pavement strength.

In Shillong the Intermediate Public Transport (IPT) modes like mini buses, taxis, cars, motor cycles and scooters falling in the category between private mode and conventional bus transport, fulfill certain requirements of the town. The public bus transport, though cheap, suffers from inadequacy and inefficiency due to lack of sincere efforts both by operators and authorities. Taxis serve as an important intermediate public transport for inter-city travel and even for inter-city passenger movement supplementing bus transport. As the cost of travel by taxis is high, the general public cannot afford to use them except on very urgent use. Shared taxis of late have emerged as an important complementary mode on account of inadequacy of public bus transport, and many a times they stop at different points to lift customers and bring a huge number of vehicles, behind it to a grinding halt. Often taxis charge different fares from different people and refuse to go to certain areas at their will. Many a times, we find vehicles virtually crawling. In

peak hours, in certain areas, those who move on foot reach earlier.

Bus services in the city are also inadequate. In some parts of the city, we find bus services are very rare, like Laban, Polo bazar, Pynthorumkhrah, Lawsohtun and Upper Shillong, where we find hardly any bus service even once in an hour. The overcrowded bus with a large number of people standing on the footboard is a very common sight during the peak hours. Further terminal facilities are very inadequate and all these calls for improved and regular bus service for the commuters.

Further, the monocentric character of the region results in heavy dependence of under-equipped suburbs on the central core of the city, the widespread congestion in the city core is made more pronounced because the centre is a compulsory through-way for essential inter-regional linkages which are difficult to achieve otherwise, owing to the inadequate ring road facilities.

Again, lack of parking space in the city itself is also glaring and need to be seriously considered while conducting traffic planning in Shillong. The demand for parking space is bound to increase correspondingly to the increase in vehicle ownership, increase in population, growth of economic activities etc.

In Shillong, the land occupied by the category of transportation land-use is only 670 hectares out of the total of 10,373 hectares, presenting a very low percentage, indicating the inadequate land under this use. A well planned balanced city should have between 20 per cent to 25 per cent of developed land under such use, but in Shillong, it is only 15.76 per cent of the developed land. The extremely narrow road and pedestrian pathway, areas without any vehicular road, the missing links, the inadequate parking and terminal facilities points out to this low percentage. Besides, most of the important commercial activities like shops, banks and other such institutions have developed along the national Highways, and since these roads are devoid of uniform road width, it has caused considerable constriction. The sum total of the problem to meet the increased demand for transportation, is the absence of further scope to widen the roads. If at all it is to be done, it would involve demolition of houses by hundreds. The penalties for road offense are either so small or nil that people are not afraid of repeating offense after offense. Nowhere in this country are traffic rules flouted as they are in our idyllic state.

3.6.1.1 State Owned Transport (Meghalaya Transport Corporation)

In Meghalaya, major development schemes and programmes falling under the Road Transport sector are implemented by

the Meghalaya Transport Corporation (MTC). The private operators of transport service in the state are not properly organized and are unable to serve the people at the desired level since their sole aim is to maximise returns on investment, i.e. profit, within the shortest possible time. They are not keen to operate on such routes which have got low occupancy and less returns. As such, only alternative road transport system in the state is the Meghalaya Transport Corporation.

In Meghalaya State Transport undertaking services commenced in May 1972. Prior to the bifurcation of the joint Assam-Meghalaya State Road Transport Corporation in June 1976, the transport service on National Highways in Meghalaya were a monopoly of the joint corporation. The MSTU was converted into MTC in October 1976.

Plan Allocation for State Transport Sector - Upto the end of the Fourth Plan, the MSTU operated passenger services on six routes, namely the Shillong-Cherra-Shella, the Shillong-Mawsynram-Lawbah, The Shillong-Nongstoin, Jowai-Nartiang and the Tura-Dalu-Baghmara route covering 718 km. The remaining road length was left to the private operators and this for more than one reason resulted in under utilization of the capacity created in a number of roads. The main reason in this regard have been the inadequate private sector fleet, the rugged terrain and harsh monsoons, the

higher cost of operations and the comparatively lower profit. These were linked to one another with the cumulative effect with private sector services that had become highly concentrated only in some of the routes.

It was, therefore, also the aim of the State Plan to secure further utilization of the capacity of road length. The allocation for road transport in the Fourth Plan was Rs.50 lakhs. There was no expenditure during 1967-71 as Meghalaya was then a part of Assam. In 1970-71, 1971-72, 1972-73 and 1973-74, an amount of Rs.8.74 lakhs, Rs.5 lakhs, Rs.15 lakhs and Rs.21 lakhs were provided for road transport. The number of vehicles increased from 35 in 1972-73 to 52 in 1973-74.

The Fifth Plan had an outlay of Rs.638 lakhs for the development of road transport. The Shillong-Tura road was expected to become a major highway in the state early in the Fifth Plan, providing a direct link of the administrative headquarters of Khasi and Garo Hills. The Shillong-Tura-Garampani road was expected to be developed into an inter-state highway early in the Fifth Plan, linking Meghalaya and North Cachar Hills of Assam.

With the coming up of Meghalaya, the important routes were taken up by Meghalaya from Assam. The Shillong-Guwahati including the Shillong-Cherra service were taken up by the MTC. Since the passenger traffic on this route was then to

increase at the rate of 10 per cent per year, it was necessary to purchase 10 new buses to meet the increased passenger traffic. Another three routes with a total of 283 km. came over to Meghalaya as a result of the division. They were (1) Shillong-Tamabil, (2) Shillong-Jowai, and (3) Shillong-Sonapur section of the Shillong-Silchar route. In 1975-76, passenger services were introduced in the Shillong-Mawkyrwat, Tura-Williamnagar, Nangalbibra-Dianadubi and Jowai-Dawki routes covering 277 km. From 73 vehicles in 1974-75 it increased to 105 in 1979-80. The routes covered by the MTC increased from 14 in 1975-76 to 28 in 1979-80. The length covered by it increased from 1,467 km. to 2,893 km. over the same period. The total number of buses required in Meghalaya till 1975-76 was 386. Taking the annual growth rate of 6 per cent, the number of buses in Meghalaya would be 550. The total vehicles per day increased from 7,832 in 1977-78 to 13,340 in 1979-80, and the number of passenger carried daily increased from 3,775 in 1977-78 to 6,330 in 1979-80, with a stable occupancy ratio of 75 per cent during the same period. At the end of the Fifth Plan, the MTC had incurred a loss of Rs.21.06 lakhs, its revenue earning being Rs.103.46 lakhs and its expenditure being Rs.124.52 lakhs.

With a lot of developmental activities already underway and future development schemes being planned for the state as a whole, development in the various areas of the state are

expected to be speeded up in the Sixth Plan. Traffic was expected to increase by 20 per cent per annum between 1980-81 to 1984-85. There are many areas in the state which have not been connected by road links and no regular transport service had been provided, due to shortage of fleet. Even on the existing routes, transport service was very inadequate. During the plan period the provision for the maximum number of buses had been proposed for meeting the growth in traffic on the existing roads and for taking all services in the Garo Hills, and also for opening up new services in the rural areas. The fleet strength was supposed to increase from 86 buses and 30 trucks as on 30th. June, 1980 to 190 buses and 85 trucks by 1984-85. Total vehicles per day was expected to increase from 13,340 in 1979-80 to 24,500 in 1982-83. During the Sixth Plan, 24 new routes with a total length of 3,128 km. was covered by the MTC.

The approved outlay for the Road Transport sector for the Seventh Plan (1985-90) was Rs.1200 lakhs. This outlay was entirely meant for capital contribution to the MTC. During the plan period, the fleet strength of the corporation was proposed to be increased to a reasonable limit of 142 in 1988-89. It is also running city bus services in Shillong and Tura. The corporation is also operating school bus service at subsidized rates to the school going children of greater Shillong. Apart from this, the corporation provided

for various inter-state services like Shillong-Dimapur and Shillong-Dharmanagar. The Shillong-Siliguri services is also expected to start soon. During the plan period it has been found that there were 82 per cent of fleet utilization and 110 km. per vehicle per day.

In the Eighth Plan (1990-95), the outlay should have been Rs.1672 lakhs at 80 per cent in the nominal and Rs.1207 lakhs in actual terms. However, due to the liberalization of the permit system for transport operation, the state government decided to have a plan of Rs.750 lakhs only for the corporation during the Eighth Plan. Only the critical on-going schemes and schemes that are essential to reap maximum benefits from the existing operations and infrastructure have been accommodated within this limited proposed allocation. The schemes have been designed to reach maximum benefit to the rural population. The various schemes for the improvement of passenger facilities and bringing up more routes under its purview will generate 17,833 persons days employment, of which 50 per cent of employment will only be for the rural areas. It was perceived that during the plan period there would be 80 per cent of fleet utilization which was expected to rise to 90 per cent during the Ninth Plan period.

Since its inception, the cumulative loss sustained by the MTC upto 31st. March, 1990 was Rs.16.91 crores, during the Seventh Plan alone the total loss had been Rs.9.72

crores. The resource gap during the Seventh Plan period alone was on average Rs.10 lakhs approximately initially per month. This has been basically due to operations on uneconomic routes on social considerations mainly in the interest of rural population by providing reliable means of transport to the urban areas. The resource gap at present will be on operations at 82 per cent fleet utilization and 60 per cent of occupancy ratio will be around Rs.8 million per month. The gap can be removed down to Rs.5 million per month if fleet utilization can be improved to 95 per cent and occupancy ratio at 85 per cent during the Eighth Plan period.

Meghalaya, specially Shillong, a land of unsurpassed scenic beauty, finds a lot of tourists visiting the state. Since 1977, the tourist visiting the state have increased tremendously (Table 3.15).

Most of the tourists reach Shillong, the major tourist centre, by bus and taxis. The Meghalaya Tourism Development Corporation has at present eight small and big coaches for carrying passengers in and out of the state. It was proposed that every year at least two small coaches would be inducted in the fleet over the next five years. Various inter-state services like the Shillong-Dimapur, Shillong-Dharmanagar, Shillong-Silchar-Karimganj and Shillong-Jorhat carry the tourists in and out of the state.

Table 3.15
Number of Tourists Visiting Meghalaya

Year	Indian	Foreign	Total
1977	4484	426	4910
1978	3534	566	4100
1979	3402	576	3978
1980	2324	252	2576
1981	2323	7	2330
1982	3619	8	3627
1983	3309	4	3313
1984	14338	19	14357
1985	65371	121	65492
1986	65767	142	65909
1987	178858	194	179052
1988	155474	328	155802

Source: Director of Tourism, Meghalaya

3.6.2 Air Transport

Since Meghalaya has no Indian Airlines flights, the NEC proposed that all the state capitals in the region should be connected to each other through Guwahati and Shillong by Vayudoot flights. A proposal for the introduction of helicopter services in the North East in a phased manner was planned by the Ministry of Home affairs. The skeleton Vayudoot service linking Shillong with Calcutta has also been suspended recently.

3.6.3 Railways

The NEC also carried out a survey for the construction of a railway line between Guwahati and Byrnihat during the

Fifth Plan, but the scheme could not be taken up due to the non-finalization of the terminal point by the Government of Meghalaya. A railway out-agency run by the MTC has been set up in Shillong to facilitate reservation of railway tickets for the people of the area. In 1990-91, another out-agency has been established at Tura to facilitate reservation of railway tickets for the people of Garo Hills.

3.6.4 Ropeways

The construction of the Siju-Patharigitham ropeway of about 12 km. in Garo Hills has been taken up by the NEC at a cost of Rs.5.50 lakhs. The ropeway is to save the current industrial plants of the region. The NEC has so far agreed to take up the feasibility shortly of the ropeway project from upper Shillong to Barapani during the Eighth Plan.

Further, the introduction of electric trolley and electric buses in Shillong has been under the recent NEC plan.

3.7 **Goods Transportation in Meghalaya with Special Reference to Shillong from the Olden Days to the Present**

3.7.1 Olden Days

Khasi Hills - The chief product of the Khasi Hills were oranges, bay leaves, pepper, potato, turmeric, pulses, peaches etc. The Khasis sold some agricultural produce and some minerals to other states. Two principal items of daily

necessities, rice and salt, were scarce in the hills, the former because it was not produced in adequate quantity in the hills and the latter was not produced at all and hence the tribe was entirely dependent on the trade with the plains from where alone the supply of those articles could be obtained. The forest products had only local markets and hence were of very insignificant value in the hills, but they had great demand in the plains. Lish (1838) observed that Khasi "Merchant Kings" used to take up their residence in the villages near the frontier of Sylhet to take full advantage of trade with the plains. In view of the importance of trade with the people of neighbouring countries, the chiefs sought concessions for opening up markets in the former jurisdictions, sometimes acknowledging political supremacy of the foreign sovereigns. The principal hats in the plains of Sylhet to which the Khasis resorted for trade were Pandua, Panatit in the Laur Paragana and the Jaintiapur. In the 18th. century, Pandura was fast growing into a market for trade with the Khasis and even the company's authorities regarded it as an "object worth the attention" (Hamilton, 1989).

On the Assam side of the Khasi Hills, the traditional markets for trade with the hillmen were Burdwar, Rani and Sonapura. Lish observed that considerable intercourse was carried on by the Khasis with the Assamese who supplied them with clothes of different kinds such as Moonga and Silk.

Speaking of the trade between the plains and these hills after the establishment of the British rule in the Khasi Hills, Lish stated, "Thus merchandise has been augmented, their articles of trade are more valued, and a greater demand has been erected for their produces."

Khasi traders were once famous for their iron and iron goods which they exported to Sylhet and Kamrup. Lindsay, the Collector of Sylhet, who was probably the first European to visit the Khasi Hills, was very interested for personal reasons in their trade prospects, reported that the Khasis produced "Excellent malleable iron ... superior to any made in Europe." From Watt's (1896) account, it appears that the iron industry had died out altogether by 1890, but Gourdon (1904) evaluating a few years later, contradicts this in stating that the once important iron industry was in the process of dying out but had not completely disappeared. It would be that due to the costly process of smelting, people forgot the process completely now. Therefore, now iron and steel have to be imported for home use.

In 1858, Allen noted that the cultivation of potato had become general throughout the Khasi Hills from Maharam to the confines of Jaintia Hills, and the average export alone in a year was 50,000 mounds. In 1868, Carregy reported that the cultivation was "every day increasing", and so widespread was the potato cultivation, that in addition to local

consumption, there was an export of 80,000 mounds, one and a half times more than estimated by Mills. In 1872, Bivar reported that even more increase of production which he computed at 1,85,000 mounds a year. In 1799, Raitt Inglis, a British time trader, who was laying the foundation of a large boat building factory at Chattak on the banks of the Surma to transport lime from the Khasi Hills in June 1848, halted at Pandua and was a witness to disembarkation of lime, coal and potatoes from large fleets of country boats crowding the narrow creeks. Oranges occupied a second position, after potatoes, in the export sector, the main market centres being Theria, Bhalagunj, Byvong, Shella, Thyllab, Phali, Mawdon, Rengua and Balat. Oranges used to be exported to Sylhet by the river Chattak and Sylhet was the main centre from where oranges were consigned to different parts of Bangladesh and Calcutta. After the construction of the road connecting Shella and the neighbouring villages with Cherra and Shillong, oranges were marketed to Shillong. Shella market was situated just on the Shella river. This was the main water route by which limestone and oranges were exported and it has been mentioned that twenty boats were normally found piled on the market days. In 1853, Mills gave a more detailed account of the export and import. He reported that the minor export of the hills consisted of tezpat, betelnuts, betel leaves, spices and a small quantity of good quality rice,

though it was not grown sufficiently for the people. But the most remarkable feature of Khasi export was potato, followed by oranges. A large quantity of minerals was also exported. Besides iron and limestone, a new item was added to the export list, viz. coal. Among the imports, Mills mentioned "considerable quantity of rice, salt, tobacco, dried fish, oil, corals, brass and copper utensils, clothes of all description, cattle and goat." It appears that gradually moonga and silk of Assam had ceased to be articles of commerce, while foreign clothes were imported on a large scale. Meanwhile, both exports and imports rose by leaps and bounds. In addition to items of export mentioned by Mills, five new articles, stic lac, honey, bee wax, ivory and Indian rubber were added by Allen. The imports had also increased considerably. The major items of import were rice, salt, oil, tobacco, sugar, fresh and dried fish. Besides livestock, poultry, clothes, brass pots and coral beads, import of gold and silver were remarkable. Towards the close of the period 1876-77, according to Hunter, of the new items of exports, mention may be made of chillies, turmeric, black pepper, jack fruit, lime, pineapple and hides. Tezpat, betel leaves and nuts, bee wax, Indian rubber and other hill products continued to be exported on a higher scale. Articles of native consumption such as crushed rice, coconut, oil, eggs, earthenware, molasses, nails, onion and kerosene oil were

exported. Some articles meant obviously for the Europeans and native soldiery of Shillong, namely European stone, tea and coffee, wine, atta and flour were also among the imports. The highest quantity of imported articles for native consumption was rice (2,05,000 mounds), followed by fish (35,900 mounds) and salt (12,000 mounds) respectively.

With the expansion of exports and imports, the pattern of trade also changed. Prior to the British occupation, the hillmen carried a considerable trade with Assam. In 1858, it came down to a paltry sum of Rs.15,000 only in both exports and imports. By far the greatest portion of the trade of the people of these hills was carried on with the district of Sylhet and Bengal. The causes of the concentration of their trade with Bengal was not far to seek. The chief merchandize of the district had their emporium in Bholagunge and Chattak in Sylhet. The Khasi potato, orange and lime which became the principal articles of commerce were grown only on the uplands of Sylhet border and hence easily accessible from the south. These Khasi products were sold under the trade mark Sylhet in Calcutta where they had large markets. In the trade with Bengal, the district always maintained a favourable balance of trade.

In 1858, the value of exports of Bengal was Rs.7 lakhs and the imports was only 3.50 lakhs, a half of the value of the former. In the estimates of 1875-76, the total value of

exports was Rs.1,721,761 and that of imports was Rs.1,617,455, the balance in favour of over a lakh of rupees. The trade of the district continued to increase and the balance at the close of the period was always favourable. With the favourable balance of trade which was continuously expanding, the profit had also gone up increasingly from 1858 when Allen stated that the profit from the exports data alone was Rs.7,79,705 and from imports Rs.44,325 (Allen).

The trade of the district remained mainly in the hands of the natives. The profit from the trade and commerce went entirely to the hill people.

The unprecedented expansion of trade was rendered possible because of the improvement of the system of transport. The early mode of transport of the people of these hills was the rugged hill track and carriage of goods on human backs by means of baskets, the thoppa tied on the forehead, for carriage of articles to the plain's markets, women and children were often employed. The job of carrying was done by the women folk, and sometimes they had to traverse a long distance of about five miles with a load commonly exceeding 30 kg. along narrow footpaths made of rough stone which were often very steep and slippery. Lindsay was struck with surprise by the sight of women carrying heavy loads of iron to Pandua. It was believed that the system of human carriage of goods contributed to their shorter life and

kept down the population. After the British conquest, the local authorities pressed the government for the improvement of the Guwahati-Sylhet road established by David Scot. Although intended to serve as a means of military communication, it became the principal highway of commerce of the Khasi Hills. The proposal to introduce animal transport in place of human carriage of goods was discussed for long - Pimberton (1837) thought that it was possible even on the steep Guwahati-Nongkhlaw road to Sylhet, though the local officials were not agreed to it. All doubts were set at rest after the road with easy gradient from Shillong to Guwahati was constructed as it was designed to serve as a cart road. With the opening of this road the wheeled carts drawn by ponies and bullocks were introduced. The Shillong-Guwahati road with its numerous feeder roads, was connected with the great river ports of Guwahati and Chattak from where steamships carried men and merchandize of the whole of the North Eastern Region to Calcutta. In fact, it was by this system of transport, the staples of commerce of the Khasi and Jaintia Hills found their way into the markets of Bengal.

Garo Hills - The Garos had no closed economy in the absolute sense, at least since the days written accounts of their intercourse with the neighbouring plains are available. There had been as many as 24 hats (markets), 14 on Goalpara border and 10 on the border of Mymensingh, to which they used

to frequent for exchanging their products with those of the plain areas. Deals used to be carried on mainly on the system of barter. They paid the hats tolls to the estate holders in terms of cotton and exchanged the rest of the stock for "salt, kine, hogs, goats, dogs, cats, fowls, ducks, fish (dry and fresh), tortoises, rice and extract of sugarcane for eating, for tobacco and betel nuts for chewing, for some hoes and spinning wheels, for some brass wares and monihari (grocery) goods as ornaments, for some silk, endi and cotton clothes" (Mactin, 1838). Likewise lac, agarwood and to a smaller extent, chillies, ginger, honey and birds used to be exchanged. Cotton was the staple product of the Garo Hills and this fact was an important factor behind the British annexation of the Garo Hills. In the early part of the nineteenth century, Garo cotton found its way into Europe and Japan to be used with wool for the manufacture of carpets. In an exhibition held in London in 1862, 79 samples of Garo cotton were displayed. In December 1874, Garo cotton was sent to the Economic Museum of Calcutta. In 1873, 14,000 mounds of cotton were brought down to different frontier hats and exported to Bengal. In 1881, about 30,000 mounds of cotton was exported (Imperial Gazettee, 1885). Martin estimated that about 60,000 mounds of cotton used to come from the Garos frequenting markets of Howraghat, Muchpara, Kalpara and

Kalumulupara. In 1874, about 1,436 mounds of lac were exchanged at Darra, Jura and Neebari hats.

At the last century and till recently, Garo cotton held the reputation of being one of the best grade cotton largely exported outside India. Cotton brought from the hills were exported in hundreds of boats to other places.

It has been witnessed that bullock carts plying on the Tura-Dalu road used to pick up their betelnuts, coconuts and other vendible vegetables from the villagers on Fridays for sale at the weekly Tura market, the main centre of the Garo Hills, on Saturdays. Bullock carts and human beings were the carriers of goods along this road since the seventies.

Lack of well developed roads compelled a producer to walk for several miles, often involving an overnight stay on the journey. The heavy load was carried on his back. On his arrival, he was often unlucky to dispose off the load for want of customers. The interior weekly markets in the hills were monopolized by the agents of big capitalists in the city centres, and offered very little price for his product. The poor cultivator felt so much tired to carry back the load home, that he had to sell them at a throw-away price. This was witnessed in the Garo Hills even in the present century in the late 60's.

As already mentioned no river was found navigable by boats of even 4 tons burden, and the main way of transporting

the products on foot, which was too tedious and time consuming to encourage the cultivators to grow more than their own consumption. The absence of a well-developed transport system slowed down the progress of marketing and consequently hampered the growth of cash crops in particular and agricultural crops in general.

It may be worthwhile to mention that exchange and trade were not confined to the frontier hats alone, but were led into certain parts of the interior. Saramphang on the South-East Garo Hills harboured a hat since long before the British-Garo contact. Since the introduction of the British rule, there has been an increasing interaction of hat formations and trading mobility of the Garos within the hills. After the destruction of one of the biggest frontier hats, Pootimari, in the earthquake of 1897, Garobadha was developed into a hat. A decade later, Tura had formed the nucleus of a ventral hat (Esme, 1885) and now has become a very important centre of trade and commerce in the Garo Hill District of Meghalaya.

Jaintia Hills - It is seen that the Jaintia kingdom covered a large tract of plain territories in the northern and southern frontiers, upto Nowgong in the north and Sylhet in the South. The kingdoms being extended right upto the plains of Bangladesh, the Jaintia people had, therefore, a direct contact with the plain people in the southern part of the

frontiers. Trade between the two was not a one-sided affairs, but rather there was an equal exchange of goods and commodities from both the sides. Thus besides trade in limestone, and orange, potatoes tezpatta and timber fuel was exported from the Jaintia Hills in exchange for rice and dry fish from the plains. As regards to the presence of market centres which helped in extensive exchange of goods and commodities between Jaintia Hills and Sylhet district, mention has been made of few markets, namely Nartiang, Raliang, Sutnga and Shangpung in the Hills and Borkhat, Kulakhat, Iaplem, Mulakan and Jaintiapur in the Plains.

During the British days fast development of trade and commerce was possible because of the presence of different types of communication, like the bridle paths, navigable rivers upto a certain point and roads. Though some of the means of communication were in the crude form, yet they served a useful method of transportation of materials to and from the hills and plains. Through these bridle paths the people from the hills walked a long distance carrying their goods on head load. This was the traditional way the people transported the products from one place to another and from one market to another for sale of the same.

In the Jaintia Hills, two rivers Myntdu or Lubha being navigable provided the means of communication between the hills and the plains of Sylhet where goods were also

transported by means of canoes. Against their background it may be mentioned that the rivers of Jaintia Hills were not very much suitable for the purpose of navigation but canoes penetrate for a short distance into the hills from the districts of Sylhet. The Myntdu was navigable for canoes carrying 25 to 30 mounds as far as Lahalein but was dangerous when the river was swollen during summer months. The river Surma itself after entering the British territory on the north had a number of chief confluents in the Khasi and Jaintia hills like the Peijain, Bagpani and Jaduhota (Report of the Administration of North-East India).

Besides the above mentioned bridle paths and river communication, Jaintia hills and the Sylhet plains were also linked by roads. There has been a well-maintained motorable road connecting Shillong through Dawki and Pynursia with Sylhet since 1933 and this road later on became a life line of trade and commerce for the people of the area. Sylhet had a great demand for betel nut, betel leaves, bay leaves and oranges besides other horticultural products. Oranges were exported to Sylhet, and from Sylhet the traders exported them to Chattak and Calcutta via the river port of East Bengal (Now Bangladesh). The presence of road communication opened a better avenue for the people of the area to transport their produce outsidess.

3.7.2. Goods Transportation after the Partition of the State

Trade which flourished along the international border came to stand still after the partition of the country. The border area runs over a length of 496 km. from Dona, Malidhar in Jaintia Hills in the east of Mahindraganj in the Garo Hills in the west and thence northwards from some distance towards Mankachar. In the Khasi and Jaintia hills the border area covers a length of 6100 sq. km. and in the Garo Hills a land area of about 2050 sq. km. covering 20 per cent of the state area 23 per cent of the state population. The economy of the people of the border area entirely depended on Bangladesh but the partition of the country closed the door to their traditional markets and the traditional source of supply of their essential commodities. It has been mentioned that the value of the goods exported to Khasi and Jaintia Hills alone during the pre-partition days amounted to Rs.2.5 crores.

Transportation of produce from the farmyard to the marketing centre is the greatest problem of the mountainous state; mainly in the border areas. The problems of the people living in the border areas have been examined by various communities from time to time. Immediately after partition, a high powered committee headed by Shri Iyengar, the then Secretary to the Ministry of Home Affairs was

appointed in 1952. The Committee recommended the construction of a network of roads to facilitate the transportation of the agricultural produce of the border areas as well as for subsidizing the food stuffs. Both short and long-term measures were introduced. The short-term measures include feeder roads, improvement of foot track, link road and means of river crossing designed to formulate better use of the existing facilities. As part of the long term measures, inaccessible areas was planned to be opened up by the construction of arterial roads to such areas.

The producers mainly bring the commodities on the back in bamboo baskets from the villages to hat walking long distance through difficult terrain. Many villages and interior areas are, however, connected with jeepable roads and produces coming to the market in overloaded jeep is a common sight. In some of the market bazar buses are used for transporting the produce from village to hats and hats to other markets. These buses are also generally overcrowded and perishable commodities are often damaged extensively in the process of being transported by jeeps and buses.

With the objectives to ameliorate the suffering of the people in the Border Areas and to rejuvenate, the once prosperous economy, the Border Area Development Programmes were implemented as a distinct item in the State Five Year Plan. The Border Area Marketing Scheme have been introduced

by the Government to give relief to the border people. The scheme envisages giving, subsidized transport facilities to group of cultivators, growers and co-operatives in the Border Areas in transporting agricultural produces by providing trucks at subsidized rate to the markets within and outside the state.

The transportation cost being high in the hilly town it inflates the price of commodities. Inadequate transportation facilities together with careless handling lead to great loss and damages of agricultural produce in transit. The low internal consumption of different horticultural crops - fruits, in particular, resulted in huge marketable surplus from the growers' point of view. From estimates made by Wadia (Journal of NEC, August 1977, over 80 per cent of pineapple, crop and about 60 per cent of citrus fruits are considered as surplus. There is no organized marketing agency both in public and co-operative sectors, giving rise to dependence of the growers on the mercy of private traders, with very uneconomic return (about 10 per cent of its retail price) on their produce. Also the cost of transportation both inside and outside for export to important marketing centres being very high, the marketing of their produce becomes very difficult with very low grower's share of the consumers price. Estimates made by Wadia in 1974 showed that the cost of transportation of one tonne of citrus fruit from

Shillong to Calcutta market was around Rs.210 while from Jowai to Calcutta it was around 246.

A commentary entitled "Meghalaya Newsletter" in the Calcutta Statesman, dated August 2, 1971, held this view "the present volume of trade and output is a trickle compared to pre-Independence figures, since the economy was oriented towards East-Bengal plains and the available riverine facilities. Worse still, there was no one to lift the produce in the absence of communication to alternative markets in the rest of India. With the opening of a few vital roads alternative markets were found, but transporting the produce to the focal points posed a problems. Transport by headloads, was primitive and possible only in the non-monsoon period".

During the Seventh Five-Year Plan, there was a fleet of 13 trucks, 2 bazar buses and 2 mazada trucks for the purpose of goods transportation for the border people. Against an allocation of Rs.47.30 lakhs an expenditure of Rs.50.32 lakhs was incurred in the scheme during the Seventh Five-Year Plan.

During the plan period 17 bridges, 97 culverts, 12.60 km. of border roads and 24.50 km. of metalling and black topping were carried out for giving relief to the people of the areas.

In order to maintain an effective fleet of vehicles and to provide meaningful assistance to the people, it was

proposed to purchase 10 more trucks during the Eight Five-Year Plan and to increase the number of vehicles in the fleet and to replace old and worn out vehicles. During 1991-92 Rs.13 lakhs has been spent for maintenance of fleet of vehicles consisting of 15 truck, 1 bazar bus and 1 truck. In 1993-94 an amount of Rs.22 lakhs was expected to be spent in full. With a view to link about 50 villages in the border areas, an amount of Rs.1040 lakhs has been proposed for the Eighth Plan.

3.8. Special Features of Rural Transportation in Meghalaya

For a state with agricultural economy like ours, and with 80 per cent of the population living in the rural areas, a system of roads, serving the rural areas is one of the basic requirement for the development to quicker its pace. Farm production depends heavily on the way with which a variety of inputs can reach the rural areas and the resultant produce move out to centre of consumption. It has been noticed that switch over to modern method of cultivation depends very largely on the proximity of an area to an all weather road. Mobility, therefore, is a key factor to the development programme and brings to focus the need for a well-developed network of arterial and rural roads.

Rural roads are defined as one which passes through the rural areas. According to this definition the proportionate

share of rural roads in total road length is likely to be quite large in our state. The arterial system comprising within it National Highways, State Highways and State PWD's often pass through the outskirts of the rural areas, but the network joining arterial with interior villages are not adequately developed. In principle it is to be accepted that all human settlement require to be provided with at least some form of an all-weather access road as a basic infrastructure facility. Rural roads of course cannot be justified by the volume of traffic that they are expected to bear but the basic issue concerning road planning, particularly in rural areas is to arrange for maximum accessibility with given resources and as far as practicable with local resources.

Mechanized form of transport is a very rare phenomenon in the rural areas of Meghalaya. Carts driven by animal power, namely bullock and horse carts are sometimes the only means of transport in the state, both for goods and passenger traffic. The horse/pony and the bullock carts are used as multipurpose vehicle, and are used by the owners to transport farm produce, fodder, firewood, fuel, fertilizers and seeds vegetable construction materials and a variety of consumer goods between village and market centres. By the side of operation and speed the bullock carts has traditionally been operating in rural areas as an extremely useful means of

transport. This is because it mostly operates in rural areas where there are either Kutcha or no roads. These carts have added significance in the rural areas due to severe energy crisis. The National Transport Policy Committee suggested that apart from energy considerations, due to their convenience and flexibility of operations, bullock carts, as a complementary means of transport in the rural areas must be encouraged.

The state being predominantly hilly, bullock carts are used only in a few plain areas of the state specially in Garo Hills whereas in the Khasi and Jaintia Hills, it is the pony or horse cart which is normally used for goods and passenger transport. It is found that people normally travel on foot, carrying their goods either on their head or back. This is the traditional way of how people transported their products from one place to another and from one market to another for sale of the same.

In Meghalaya it is observed that the majority of the people are far off from the basic amenities of life. Due to the paucity of recent published data, on problems of rural transportation, we get most of our information from the Economic Census 1977.

It is observed that only 9.35 per cent of the village in the state have got a bus stop within the village and 41.88 per cent of the villages in Meghalaya have got a bus stop

beyond 10 kms. of the village. It is observed from the Economic Census that only 12.29 per cent of the villages in Meghalaya are located on a metalled road, and in the West Khasi Hills district around 70.60 per cent of the village are situated at a distance of 10 kms. from metalled road. Only 3.67 per cent and 11.74 per cent of the villages have a market and hat respectively within the village, while 48.66 per cent of the villagers had to go more than 10 kms. for a market. As there are no rail communication in the state, only 0.37 per cent of the villages were within a distance of 6-10 kms. away from the nearest railway station (Table-3.16-3.20).

Table-3.16

**Distribution of Villages by Nearest Distance from the
Amenity by Districts**

BUS STOP

Sl. No.	Name of the District	Number of villages in the district	Percentage of villages having the amenity at distance of				
			Within the village	Within 1-2 kms.	Within 3-5 kms.	Within 6-10 kms.	Beyond 10 kms.
1.	East Khasi Hills	1,220	14.34	10.49	12.54	20.57	42.06
2.	West Khasi Hills	660	04.24	04.55	08.18	16.67	66.36
3.	Jaintia Hills	389	12.85	09.25	17.99	17.74	42.17
4.	East Garo Hills	540	04.07	06.67	14.26	26.85	48.15
5.	West Garo Hills	1,790	08.60	14.41	22.74	23.46	30.79
State Total		4,599	9.33	10.60	16.55	21.64	41.88

Source: Economic Census, Meghalaya.

Table-3.17

Distribution of Villages by Nearest Distance from the
Amenity by Districts

METALLED ROAD

Sl. No.	Name of the District	Number of villages in the district	Percentage of villages having the amenity at distance of				
			Within the village	Within 1-2 kms.	Within 3-5 kms.	Within 6-10 kms.	Beyond 10 kms.
1.	East Khasi Hills	1,220	18.44	09.84	10.82	17.30	43.60
2.	West Khasi Hills	660	03.64	04.09	06.67	15.00	70.60
3.	Jaintia Hills	389	15.68	11.05	13.11	17.48	42.68
4.	East Garo Hills	540	10.56	07.22	16.11	27.96	38.15
5.	West Garo Hills	1,790	11.06	12.63	19.50	21.06	35.75
State Total		4,599	12.29	9.89	14.42	19.70	43.70

Source: Economic Census, Meghalaya.

Table-3.18

**Distribution of Villages by Nearest Distance from the
Amenity by Districts**

MARKET

Sl. No.	Name of the District	Number of villages in the district	Percentage of villages having specified amenity within (Kms.)				Beyond 10 kms.
			Within the village	Within 1-2 kms.	Within 3-5 kms.	Within 6-10 kms.	
1.	East Khasi Hills	1,220	04.02	07.21	09.75	16.39	62.63
2.	West Khasi Hills	660	04.09	04.55	09.24	17.27	64.85
3.	Jaintia Hills	389	05.91	06.68	11.31	26.48	49.62
4.	East Garo Hills	540	04.44	07.96	16.48	40.93	30.19
5.	West Garo Hills	1,790	02.57	10.73	22.74	25.42	38.56
State Total		4,599	3.67	8.24	15.66	23.77	48.66

Source: Economic Census, Meghalaya.

Table-3.19

**Distribution of Villages by Nearest Distance from the
Amenity by Districts**

HAT

Sl. No.	Name of the District	Number of villages in the district	Percentage of villages having the amenity at distance of				
			Within the village	Within 1-2 kms.	Within 3-5 kms.	Within 6-10 kms.	Beyond 10 kms.
1.	East Khasi Hills	1,220	10.98	13.20	17.46	22.87	35.49
2.	West Khasi Hills	660	31.06	04.24	11.36	17.27	36.07
3.	Jaintia Hills	389	08.48	10.03	16.71	40.36	24.42
4.	East Garo Hills	540	05.19	08.15	22.22	35.00	29.44
5.	West Garo Hills	1,790	07.82	16.59	29.39	27.93	18.27
	State Total	4,599	11.74	12.37	21.72	26.94	27.23

Source: Economic Census, Meghalaya.

Table-3.20

**Distribution of Villages by Nearest Distance from the
Amenity by Districts**

RAILWAY STATION

Sl. No.	Name of the District	Number of villages in the district	Percentage of villages having the amenity at distance of				Beyond 10 kms.
			Within the village	Within 1-2 kms.	Within 3-5 kms.	Within 6-10 kms.	
1.	East Khasi Hills	1,220	00.00	00.00	00.00	01.39	98.61
2.	West Khasi Hills	660	00.00	00.00	00.00	00.00	100.00
3.	Jaintia Hills	389	00.00	00.00	00.00	00.00	100.00
4.	East Garo Hills	540	00.00	00.00	00.00	00.00	100.00
5.	West Garo Hills	1,790	00.00	00.00	00.00	00.00	100.00
	State Total	4,599	00.37	99.63

Source: Economic Census, Meghalaya.

3.8.1 Development of Rural Roads during the Various Plan Periods

The fifth plan programme for road development envisages linking important villages and outposts in the border areas with the civil sub-division at Simsangiri, the district headquarters at Nongstoin, and the district town of Jowai. A network of roads connecting market and villages, areas served by special projects such as industrial units, irrigation and power projects, mining areas and tourist centres were proposed to be taken up during the plan period.

The Planning Commission during the fifth plan had suggested to prepare schemes for road development in rural areas, taking into consideration the following instructions:

1) All the villages with population above 1500 should be connected by roads.

2) In tribal areas with even population less than 1500, road construction work should be taken up.

The Rural Roads Decade (1970-80) was launched by the Government and it is gratifying to note that the state government had agreed to set apart 2 per cent of the total outlay on road development for rural roads. Local resources would also be mobilised; and priority would be given to roads leading to market town.

During the Sixth Plan, stress was given to fulfill the minimum needs by providing all-weather road link to villages with a population of 500 and above and to a cluster of

village with population ranging from 1000-1500. It was expected that most of the villages with smaller population and scattered in the interior would shift to the roadside in order to avail the facilities provided by road communication. As per 1981 census, Meghalaya has 4902 villages, out of which, only 2112 villages have been connected by roads at the end of the Sixth Plan period (1980-1985), considering in terms of population only 54 per cent of the total rural population, thus leaving about 46 per cent of them yet to be provided with minimum road communication facility as at the beginning of the Seventh Plan.

With an outlay of Rs.6800 lakhs for roads and bridges under the State's Plan, which is inclusive of Rs.1008 lakhs of the minimum needs programme it was anticipated that a total of 2252 villages would be connected by roads during the Seventh Plan period.

During 1985-86, 27 villages covering a population of 0.12 lakhs have been covered. The target of covering 2250 villages by 1990 were achieved at the end of the plan period. During the Seventh Plan seven mobile vans were purchased for supply of essential commodities to the rural far-flung inaccessible areas of the state to ensure that the needy people get the essential commodities at a reasonable price. An amount of Rs.1.30 lakhs was proposed for the financial year 1992-93.

At the beginning of the Eighth Plan there were 2652 villages yet to be connected by roads. Due to paucity of funds and manpower constraint, the department proposed to connect the villages on the basis of population and accordingly 256 villages are expected to be connected during the plan period. Keeping in view the large number of micro sized habitats of the State, and with a view to consolidate such habitats for adequate utilization of development infrastructure, the Eighth Plan provides that steps be taken to encourage voluntary regrouping of such micro sized habitats for formulation of model villages where the full package of development infrastructure can be provided by the state. Further, as there are a large number of village in the border areas where the construction of road seems uneconomical, besides that there is likely ecological disturbance which could emerge as due to road construction, therefore, the proposal of ropeways have been considered in the plan, subject to economic viability.

3.8.2 Construction of Rural Roads Programme (CRRP)

The programme for the construction of Rural Roads was introduced during 1990-91 for the purpose of the implementation of the rural road schemes in the Assembly-constituency wise, with the active co-operation and participation of the people, both in planning of the schemes

and at the execution stages. The expenditure in 1990-91 for the programme was Rs.112.25 lakhs.

If we are to implement the recommendation of the NTPC, more than 2600 villages will have to be connected by roads during the period 1990-2001 A.D., this would definitely imply a very heavy investment on the state.

A look at the over all scenario shows that most of the people living in the rural areas find the basic amenities of life far away from their reach, as mechanized form of transport is a very rare sight in the village. Most of the village roads are no more than bridle path standard and non-usable throughout the year, since bridges and culverts have not been built and some roads are too narrow and unsurfaced which cannot be used during the rainy season. Further, an important factor to be mentioned is that the villages are scattered all over and sometimes some villages are found to have only about 5 to 10 families, and therefore, it is commercially not viable to build all-weather road which is quite understandable because everything cannot be done on humanitarian ground. If these villages could be reorganized as in Mizoram, which was done during the insurgency time, then a lot of improvement could be made.

Though the construction of rural roads provide some formidable problem, development of rural roads would be justifiable on economic, social and political considerations.

In principle it is to be accepted that all human settlement require to be provided with at least some sort of all-weather access road as basic infrastructure facility. Depending on the resource position and the overall activity level of different areas, a step by step approach is therefore called for.

According to the NTPC, rural roads should link the largest number of villages with the maximum population. Although rural roads fall in the state sphere of activity, yet there are several aspects relating to rural roads which need constant attention of the central government. The creation of a Rural Roads Committee at the centre would go a long way in bringing about development to the State. The Committee considered the feasibility of integrating the rural roads programme with the overall strategy and content of the IRDP. They view that integration of rural roads with IRDP would be a rational and correct way of approaching the problem. The primary advantage of such an integration would be that claims of smaller villages for a road which have little or no alternative facility would not be ignored as it is likely under the present criteria. By providing an essential communication link to villages on economic justification, an integrated programme will help in optimising rural development efforts.

They admitted that since the integration of rural roads with IRDP would require a huge amount of funds, the private transport operations should be encouraged to make roads and as a result they should be allowed to operate bus services on these routes for 3 to 5 years without payment of road tax.

Since it is not possible to connect all villages in a short time, a cluster of villages with a growth point should be the objective of motorable road development. Apart from these, ropeways should be encouraged to connect the inner inaccessible areas to bring more and more villages within the communication map of the country.

Chapter—IV

**DATA BASE, METHODOLOGY
AND ANALYSIS**

4.1. Introduction

This chapter lays emphasis on data and its source. Considering our topic, "An Econometric Analysis of Demand for Public Transportation in Shillong", the state level data like the number of vehicles on road, number of vehicles registered in Meghalaya, the progress of the transportation department, the length of roads, the number of routes covered, etc. could be obtained from the office of the Commissioner of Transport, the District Transport Office, the Meghalaya Transport Corporation, the PWD and the Ministry of Transport. But when we dwindle down to the micro level, we find that the secondary data do not throw adequate light in our analysis, considering the fact that our prime objective is to find out whether the transport in the city serve the people adequately or not, taking into account their demand for transport, their capability of spending on transport, etc. primary data had to be collected from the residents of the city directly, which serves to give us a fair idea, if not a very precise one, of the state of urban transport in our city.

Primary data giving us information about the family size, monthly income, number of trips made by various modes, the purpose of journey, occupation structure, the frequency of transportation service, nature of the fare, expenditure on transportation per day and the problems faced during travelling throws much light in our analysis.

Since we intend to cover up as much as possible the different locations of the city, taking into account the financial constraints, and more so, it is an one man task, therefore, we confine ourselves to interview 500 households in nineteen different localities of Shillong.

4.2. Data Base : Primary Data

Primary source of information or first hand accounts of experimentation and investigation which include interviews, questionnaire and even eye witness occurrences are related in this particular section.

With regard to the questionnaire aspect, it proved to be cumbersome and sometimes the information so collected seems highly probable as some people are quite reluctant to let out, for instance, their monthly income and expenditure incurred.

We have not followed strict sampling Techniques in the case of stratification. We may call that our sampling method is purposive and we covered some clusters. The data were taken from the following areas : 1) Laitumkhras, 2) Police Bazar, 3) Bara Bazar, 4) Mawkhar, 5) Mawlai, 6) Jaiaw, 7) Laban, 8) Nongthymmai, 9) Mawprem, 10) Lumparing, 11) Malki, 12) Polo Ground, 13) Jail Road, 14) Umpling, 15) Rilbong, 16) Motinagar, 17) Laitkor, 18) Upper-Shillong, and 19) Happy Valley.

Finally, these data were tabulated, which are presented here :

Table-4.1
Family Monthly Income Range of the Respondents

Family Monthly Income Range (Rs.)	No. of families
Below 500	18
500-1000	40
1000-1500	68
1500-2000	80
2000-2500	105
2500-3000	69
3000-3500	42
3500-4000	28
4000-4500	27
4500-5000	10
5000-5500	9
Over 5500	4
Total	500

From the table of the family monthly income of the respondents, we find the mean family income was Rs.2319 and Standard Deviation was Rs.1157.

Table-4.2

Age Distribution of the Respondents Family Members with
Respect to Family Income

Monthly Income	Age < 5 years	5-10 years	Above 10 years
Below Rs.500	12	10	65
500-1000	60	48	210
1000-1500	50	70	180
1500-2000	40	45	112
2000-2500	80	70	246
2500-3000	30	40	150
3000-3500	24	34	120
3500-4000	10	18	29
4000-4500	15	22	38
4500-5000	17	20	25
5000-5500	20	12	54
5500 and above	22	15	69

Again from the table on the age distribution of the respondents family members we find that only a little over 18 per cent were less than five years of age, about 19 per cent of the respondents were between the age of 5-10 years, and more than 62 per cent of the respondents were above 10 years of age.

Table-4.3

Table Showing the Purpose of Travel by the Respondents Distributed Over the Range of Monthly Family Income

Income Range (Rs.)	Purpose of Travel/Day				
	Service	Business	Education	Pleasure	Others
Below Rs.500	11	5	12	10	18
500-1000	52	24	48	18	33
1000-1500	43	20	45	14	27
1500-2000	37	27	30	16	36
2000-2500	65	35	42	32	39
2500-3000	40	20	36	18	18
3000-3500	47	18	42	20	15
3500-4000	15	12	18	7	9
4000-4500	18	15	27	13	12
4500-5000	22	10	21	15	21
5000-5500	16	12	24	11	18
Above 5500	15	10	21	15	16
Total	381	208	366	189	262

From the table-4.3 we have estimated the percentage of trips according to the purpose. It is found that most of the trips are for essential purposes, say 27 per cent of the trips are generated due to services, and 26 per cent of the trips are made for attending educational institutions. Only

about 15 percent, 13 per cent and the remaining 19 per cent of the trips are made for the purpose of business, pleasure and others respectively. About 1.6 trips are made by each person including small children who do not pay but have a right to a seat. There is hardly any other attraction except a few cinema halls and a few natural beauty spots, therefore, the trips made for pleasure are mainly for social visits.

Table 4.4

Showing the Choice of Mode by the Respondents Classified According to Income Categories

Monthly Income (Rs.)	Bus	Taxi	2-Wheelers/ Cars	Others
Below Rs.500	16	5	2	1
500-1000	54	12	3	5
1000-1500	43	10	1	7
1500-2000	34	25	4	3
2000-2500	65	37	7	9
2500-3000	37	43	11	5
3000-3500	28	51	8	11
3500-4000	11	33	10	6
4000-4500	12	27	12	4
4500-5000	8	12	21	-
5000-5500	7	8	29	-
Above 5500	11	15	17	10

From the table 4.4 on the choice of mode of respondents we find that 24 per cent of the respondents with a monthly income of Rs.3000 and above, travel by taxi, whereas about 76 per cent of the people in the lower income group travel by bus. Again we found that about 46 per cent of the respondents with income group below Rs.3000 per month use taxi as one of the modes of transportation. We also found that about 22 per cent of the people in the lower income group and about 77 per cent of the people in the higher income group use two-wheelers.

Table 4.5

Showing Frequency Distribution of Expenditure on Transportation According to Level of Monthly Income

Monthly Income (Rs.)	No. of Families	Expenditure (Rs.)	Per Capita Expenditure (Rs.)	Ratio of Transport Expendi- ture to Income
Below Rs.500	18	61	3.38	0.12
500-1000	40	116	2.90	0.15
1000-1500	68	315	4.63	0.25
1500-2000	80	408	5.10	0.23
2000-2500	105	398	3.79	0.18
2500-3000	69	465	6.73	0.17
3000-3500	42	475	11.30	0.15
3500-4000	28	521	18.60	0.14
4000-4500	27	567	21.00	0.13
4500-5000	10	604	60.40	0.13
5000-5500	9	669	74.33	0.13
Above 5500	4	800	200.00	0.14

Again from the Table-4.5 on the family expenditure on transportation we found that the percentage expenditure per

month varies from minimum of Rs.2.90 to a maximum of Rs.200. This shows that families with a lower income group spends very little on transportation compared to families with higher income group. Most of the trips made by people with a median income of less than Rs.3000 spend upto Rs.6.73 per person on transportation, mostly on necessary trips. The families with higher income group, that is Rs.3000 and above per month spends as little as Rs.11.30 to as much as Rs.200.00 per person on transportation.

Table 4.6

Showing the Average Distance Travelled per day by the Respondents and their Family Members

Distance (Km.)	Frequency of Travellers
1-3	586
4-6	460
7-9	408
10-12	225
13-15	243
16-18	206
19-21	210
22-24	192
Over 24	79
Total	2609

Table 4.7

Showing the Range of Distribution of Important Economic and Other Establishments from the Residences of the Respondents

Range of Distribution	Market	Educational Institutions	Bank	Hospital	Post Offices
1-2	86	84	92	54	158
2-3	48	60	52	52	50
3-4	64	50	60	40	44
4-5	48	30	50	38	26
5-6	44	32	36	34	42
Over 6	99	232	198	270	168

Usually most of the institutions upto high school standard are situated within the distance of 4 kms. at the most. We also see that business is confined from petty to big institutions, and the central business district is within the perimeter of Shillong city. Similarly, most of the central and local state government offices are located in an around the centre of Shillong. We mentioned earlier that 66 per cent of the total trips are generated with Shillong as its destination. These 66 per cent trips consisted of the trips made for the purpose of services, business and education. Again we have to note the fact that some of the best educational institutions of North East India are located in Shillong, therefore there are always a large number of

days scholars, who might come from a distance of more than 20 kms. We could judge this from the frequency distribution of the distance travelled. If a frequency curve is drawn, it would start at the top and then decline slowly, due to the locational characteristics of the institutions and other economic activities.

As has been noted earlier that regional imbalance is more pronounced when most of the economic activities are concentrated within Shillong city. Besides, the access to the rest of the country of the states like Tripura, Mizoram and Arunachal in the North East is via Shillong or Shillong-Gauhati route. Therefore, the importance of Shillong is more as an intermediate terminal to reach Guwahati which has all the available modes of transportation to go to any part of India. Naturally, most of the important markets, banks, hospitals, nursing homes and educational institutions are located in Shillong. We found that the maximum economic distance from the point of centre of any particular specified business activities is more than 6 kms. About 38 per cent of the respondents are located 3 to 4 kms. away from these important activities and 62 per cent live 5 kms or more beyond them.

Table 4.8

Showing Time Taken to the Reach Bus Stop or the Point of Accessibility to the Transport Service

Time (Minutes)	No. of Respondents
2-5	94
5-8	118
8-11	56
11-14	38
14-17	36
Over 17	158
Total	500

We have enquired whether the respondents were satisfied with the frequency of service from their experience of waiting at the designated bus stops. The response are recorded as in the Table 4.9 below :

Table 4.9

Frequency of Transportation Service according to the Level of Monthly Income of the Respondents

Monthly Income (Rs.)	Waiting Time	Regular Frequency	Irregular Frequency
Below Rs.500	10	12	6
500-1000	17	60	29
1000-1500	20	51	20
1500-2000	10	45	20
2000-2500	15	59	32
2500-3000	20	23	35
3000-3500	10	18	18
3500-4000	10	12	21
4000-4500	15	17	17
4500-5000	20	25	25
5000-5500	21	32	35
Above 5500			

Time is considered to be an important cost and attractiveness of the means of travel. Where the modal choice relates to only the road transportation and the demand is much higher, than the supply, that is, efficiency is a matter of opinion. In the long run both the private and the public operators do not care much to keep their services running in time. It is also found that the city buses in Shillong do not issue tickets and hide the actual income. The operators in order to carry the maximum number of passenger that the bus permits, stop all along the route and lift passengers. Therefore, the waiting time is longer than the scheduled waiting time. We also see that the point of access from the respondents residence is longer due to the serpentine lay out of the roads in the city.

Next we wanted to know whether the public was aware of the so-called 'privatisation', and we asked them whether they were satisfied with State Transport services or transport by private operators. The data collected is shown in table-4.10.

On the response of the choice of the operators we have to mention a few points. The MTC runs a few buses within the city, and most of its buses are reserved for inter-city and long distance travel. We find that the private operators under the banner of Shillong City Bus Owners' Association, operates transportation services within the city. About 80 per cent of the trips are covered by these buses, and the

rest by taxis and by MTC buses. Hence in this case the choice is limited. Overcrowding is a common characteristic of the private buses. Therefore, it is quite probable that the percentage of respondents who favour State Transport would be higher.

Table 4.10

Opinion Favouring Private and Public Transport Service according to the Level of Income

Monthly Income (Rs.)	Favoured Private Transport	Favoured State Operators
Below 500	9	17
500-1000	13	9
1000-1500	21	6
1500-2000	10	11
2000-2500	35	28
2500-3000	42	39
3000-3500	7	47
3500-4000	11	4
4000-4500	9	3
4500-5000	10	8
5000-5500	12	17
Above 5500	21	22

We also collected the opinion of the bus users. This information is consolidated in Table 4.11.

Table 4.11

**Opinion Regarding the Fare of Transportation Service
Classified according to Family Monthly Income**

Monthly Income (Rs.)	Opinion	
	Moderate	High
Below Rs. 500	10	14
500-1000	48	26
1000-1500	34	20
1500-2000	38	22
2000-2500	44	42
2500-3000	32	12
3000-3500	12	4
3500-4000	20	6
4000-4500	16	6
4500-5000	16	4
5000-5500	22	4
Above 5500	30	7

When we wanted to know the opinion of the people regarding bus fare we found that 66 per cent of the respondents said that the bus fare was moderate, while 34 per cent of the respondents said that the bus fare was high. However, some of the respondents did not have any opinion

regarding bus fare or they may be indifferent to the fairness of the fare.

In response to the question of comfort of travel which is one of the chief characteristics of the public mode of transportation, we find the response as such.

Table 4.12

**Opinion Regarding Comfort of Transportation Service
Classified according to the Income of the Respondents**

Monthly Income (Rs.)	Crowded	Moderate
Below Rs.500	8	12
500-1000	56	20
1000-1500	42	18
1500-2000	36	15
2000-2500	60	25
2500-3000	24	20
3000-3500	36	14
3500-4000	16	6
4000-4500	21	10
4500-5000	14	6
5000-5500	17	6
Above 5500	18	8
Total	348	160

When we wanted to know whether the transport services were crowded or not, we found that 68.5 per cent of the respondents said that the transport facilities were crowded and 31.5 per cent said that it was moderate.

Apart from the questionnaire type of study, a direct study of the trend of moving vehicles or vehicles on road in Shillong city is also conducted. The traffic figures compiled on the basis of volume at various junctions such as Barik, Dhankheti, Don Bosco, Fire Brigade, IGP, Kacheri, Police Bazar and Bara Bazar exhibit the huge demand for transportation in the city. The heavy rush is more apparent during the peak hours such as between 8.30 to 11.30 A.M. and between 3 to 6 P.M. The above focal point have been selected for traffic volume compilation because they happen to be the junction of various offices, educational centres and business establishments. Further, the concentration of traffic - urban and through, on/or along these junctions is heavy, some being junctions where the National Highway passes through. Taking one point - Barik as an illustration and according to the first hand data compiled by counting the number of vehicles that passes through it we can see the huge demand for transportation in the city. In the time span of a minute it was observed that 47 cars pass over Barik area, 41 over Dhankheti point, 36 over Laitumkhras area, 49 over Fire Brigade area and 43 vehicles pass over Nongthymmai area.

These data are based on actual observation by the investigator during the morning peak period, that is from 8.30 to 11.30 A.M. It was also observed that 37 vehicles passed over Kacheri, 42 over IGP Point and 53 passed over Police Bazar area during the same peak period. Again it was observed that 44 passed over Barik Point, 53 over Dhankheti, 46 over Don Bosco and 41 over Fire Brigade during the evening peak period that is from 3 A.M. to 6 P.M. 56 vehicles passed over Police Bazar, 41 over IGP Point and 46 over Kacheri Point during the same peak period. These are average figures for a period of fifteen days, observed by the investigator during the month of April-May in Shillong. These figures clearly reveal the heavy demand for transportation. Of course, one thing to be mentioned here is that the number of vehicles would be much less if the observations were taken in the month of December-January, when all the educational institutions remain closed in the city, and the climatic conditions make the people prefer to remain indoors.

4.3. Other Sources of Data

State level data, like the number of vehicles on road, the number of vehicles registered in Meghalaya, the length of roads, the progress of transport sector, were obtained from the P.W.D. Shillong, the Directorate of Economics, Statistics and Evaluation, and the Meghalaya Transport Corporation. For

data with respect to Meghalaya State Transport Corporation in particular, and Meghalaya Transport Sector in general, we solely depended on MSTC's Administrative Report, State Planning Commissions document and information collected from the Transport Commissioner's Office. The only flaw in these data were that some of them were not up-to-date, and we had to estimate them either by degressing or regressing.

In the case of passenger-km. we did not know what length of the entire route the passengers travel or the fare they pay in any day. If we had data on passenger-km., instead of the passengers carried, we could find the expected revenue from the rate schedule. We have knowledge of distance of each and every route but we do not know the distance between trip origination and trip destination for the respective users of MTC service. In order to know the actual revenue earned by the MTC not only information of the fragmented trip length is essential but the extent of unrecorded earnings by the operators and the loss of revenue to the state which impose additional burden on state subsidy is also important.

Next, we wanted to evaluate the cost of wear and tear in the form of repair and replacements. The MTC had maintained data on the cost of repair and replacement but these data were not properly kept. If we assure that there is a definite pattern, and that 'breakdown' follow some type

of probability distribution, then we need data for day-to-day incidence of breakdown.

Thus to study the efficiency of the transport corporation, we need to analyse administrative cost, man-bus ratio, the distribution of buses according to age, actual number of vehicle-km. serviced dead kms., the number of drivers maintained in the pay role, etc.

Further, dead-km. and the consumption of diesel, angles of road in a hilly area, slope angles, wind velocity are all found to play a definite role in the enhanced consumption of energy.

The information collected from the MTC is given below:

Table 4.13
Showing Passengers carried Per Bus by the MTC

Year	No. of Vehi- cles	Pass/Day	Pass/Veh/ Day	Unutilized Vehicles	Estimated Loss of Passengers/ Day
1981	117	3930	33.58	45	1511
1982	117	3815	32.60	41	1336
1983	121	4288	35.43	42	1488
1984	131	2103	16.05	56	1984
1985	131	4274	32.62	62	2022
1986	124	4395	35.44	32	1134
1987	131	5678	43.34	62	2687
1988	142	5279	37.18	21	7807
1989	167	6639	39.75	17	675
1990	183	5968	32.61	62	2021
1991	168	5644	33.59	55	1847
1992	176	5630	31.99	76	2431
1993	191	7592	39.74	94	3735
1994	203	7123	35.43	91	3224

In this table we present the fleet size and the number of passengers carried per day by the MTC since 1981. We have also shown the number of unutilized vehicles per day. We then calculated the estimated loss of passengers to the MTC due to breakdown. We can see that there is a loss of passengers to the tune of 35 to 50 per cent per day.

Table 4.14
Utility and Repair of MTC Vehicles

Year	No. of Vehicles	% Utilised	Modified %	No. of Vehicles Used	No. of Vehicles for Repair
1985	131	45	53	69	62
1986	124	68	74	92	32
1987	131	60	68	69	62
1988	142	77	85	121	21
1989	167	82	90	150	17
1990	183	58	66	121	62
1991	168	59	67	113	55
1992	176	49	57	100	76
1993	191	44	51	97	94
1994	203	47	55	112	91

We wanted to find whether the vehicles were unutilized or were lying idle due to breakdown. Here the first conclusion gives the fleet size and the second conclusion gives the percentage of vehicles utilized. Then we compared the data on the number of vehicles for repair. Then we estimated the percentage of vehicles utilized in column 3. We thought that the number of unutilized vehicles would be equal to the number of vehicles in the repair shop. But we found that column 6 gives us a different picture. This does not reflect the view that non-utilization of a vehicle means that the vehicle needs repair.

Table 4.15

Analysis of Break-Downs

Year	Fleet Size		No. of Break-Downs	Break-Down per Bus	Break-Down per Effective lakh Km.	Accidents
	U	NU				
1981	72	45	429	5.97	.106	28
1982	76	41	401	5.27	.101	42
1983	79	42	310	3.92	.081	35
1984	75	56	273	3.64	.069	29
1985	69	62	359	5.20	.090	36
1986	92	32	198	2.15	.045	17
1987	69	62	249	3.60	.056	25
1988	121	21	418	3.45	.085	48
1989	150	17	495	3.30	.081	48
1990	121	62	652	5.38	.105	19
1991	113	55	626	5.53	.105	25
1992	100	76	533	5.33	.100	13
1993	97	94	600	6.18	.103	13
1994	112	91	674	6.01	.113	17

In the above table we have estimated the break-down per bus per effective-vehicle-km. We have data on fleet size, effective-vehicle-km. and number of break-downs. From these data we calculated the percentages of breakdowns and the number of accidents. Here we find that the number of break-downs in the recent years are increasing, whereas the number of accidents are decreasing. This cannot be explained without the access to some other vital information.

Table 4.16
Employment in M.T.C.

Year	No. of Empl- yees	Salaries (Rs. in lakh)	No. of Empl- yees per bus	Ratio of salary to traf- fic earn- ing	Traffic earning (Rs. in lakh)	Total earn- ings (Rs.in lakh)
1981	810	101.72	6.92	0.70	143.68	147.59
1982	824	105.80	7.04	0.63	166.10	168.67
1983	851	95.55	7.03	0.50	187.39	192.04
1984	888	129.43	6.77	0.73	176.13	201.78
1985	904	151.69	6.90	0.80	189.52	213.04
1986	941	182.45	7.58	0.81	223.58	235.28
1987	968	215.85	7.38	0.88	242.66	277.83
1988	988	231.20	6.95	0.79	290.36	518.88
1989	1014	355.66	6.00	1.11	318.28	543.50
1990	1043	482.00	5.69	1.35	354.96	581.04
1991	1071	630.00	6.37	1.56	402.06	644.85
1992	1099	741.00	6.24	2.07	357.53	627.61
1993	1128	980.00	5.90	2.41	406.25	776.17
1994	1158	1022.00	5.76	2.23	457.00	957.00

In Table-4.16 we present the employment, traffic earnings and the salaries paid to the staff. The other columns are estimated with the help of available data. This table reveals one important fact that upto 1991 the earnings is more than expenditure on salaries and in the later period it is the reverse.

Table 4.17

Table of MTC Revenue

Year	No. of Pass. (lakhs)	Revenue earned (Rs. in lakhs)	Revenue/ Pass (Rs. in lakhs)	Loss of Pass. for Non-Utility	Loss of Revenue (Rs. in lakhs)	Realizable Revenue (Rs. in lakhs)
1981	1434.45	397.34	.276	551.51	152.21	549.55
1982	1392.47	229.75	.165	487.64	80.46	310.21
1983	1565.12	374.06	.238	543.12	129.26	503.32
1984	750.62	228.18	.304	724.16	220.14	448.32
1985	767.59	213.04	.277	738.03	204.43	417.47
1986	1560.01	235.28	.151	413.91	62.50	297.78
1987	1604.17	277.83	.173	980.75	169.66	745.27
1988	2072.47	518.88	.250	2849.55	712.38	1231.36
1989	1926.84	543.50	.282	246.37	69.47	612.97
1990	2423.23	581.04	.239	737.66	176.30	759.34
1991	2178.32	644.85	.296	674.15	199.54	844.39
1992	2060.06	627.61	.304	887.31	269.74	897.35
1993	2054.95	776.17	.377	1363.27	513.95	1290.12
1994	2098.81	791.25	.377	1176.76	443.63	1234.88

In the above table, we present the statistical analysis of revenue earned by MTC. Here we see that columns 2 and 3 are the published data of the MTC. Then in column 4 we calculated revenue per passenger (Rs. in lakhs); the loss of passengers due to idle buses, and the resultant loss of revenue were also calculated by the investigator. This gives

us some idea why the Meghalaya Transport Corporation has to depend on Government subsidy. Since this thesis does not go beyond its scope of estimation of demand, we did not take those aspects of administrative lapses or inefficiency on the part of state owned transport corporation. We know that many of nationalised bus services show loss rather than profit due to mismanagement which indulges corruption. We here look only from one angle that is the unutilized vehicle, but the way side passengers payment is unaccounted for because no tickets are issued to them. In the case of price, there is hardly any disparity between the price charged by MTC and the private operators.

Table 4.18

Revenue Earned and Lost by the MTC

Year	Revenue Earned (lakhs)	Loss of Rev.due to Non-Utility	Revenue due to Dead Km.	Total (Rs. in lakhs)	Expected (Rs. in lakhs)	Balance
1981	397.34	152.21	.082	549.63	243.92	+305.70
1982	229.75	80.46	.080	310.29	279.41	+ 30.88
1983	374.06	129.26	.089	503.41	369.50	+133.91
1984	228.18	220.14	.084	448.40	370.21	+ 78.19
1985	213.04	204.43	.086	417.56	394.17	+ 23.39
1986	235.28	621.50	.089	856.87	456.29	+400.58
1987	277.82	169.66	.092	447.57	526.68	- 79.11
1988	518.88	712.38	.079	1231.34	602.23	+629.11
1989	543.50	69.47	.051	613.06	744.97	-131.91
1990	581.04	176.30	.056	757.40	750.20	+ 7.20
1991	644.85	199.54	.066	844.45	816.15	+ 28.30
1992	627.61	269.74	.057	897.41	863.64	+ 33.77
1993	776.17	513.95	.067	1290.19	804.16	+486.03
1994	791.25	443.63	.066	1234.95	892.51	+342.44

In Table-4.18, we present a similar type of analysis wherein we included the dead-km. for the purpose of calculating the loss of revenue. Although the loss of revenue due to dead km. is very small, in order to present a balance, we found that except for the years 1987 and 1989, in all the other years, the balance is positive, but the growth does not possess a steady trend.

Table 4.19
Coverage by MTC (in Km.)

Year	Effective Km. Covered (lakh)	Dead Km. (lakh)
1981	4181.765	1.75
1982	4893.412	1.60
1983	4741.864	1.51
1984	4384.912	1.49
1985	3987.476	1.47
1986	4371.306	1.42
1987	4403.823	1.42
1988	4994.098	1.34
1989	6138.624	0.85
1990	6158.999	0.86
1991	5949.393	0.89
1992	5311.179	0.73
1993	5831.073	0.84
1994	6243.071	0.79

In Table-4.19, we present the effective length of kilometre covered and also the dead kilometre. The figures in both the cases from 1981 to 1984 are estimated by the investigator.

Table 4.20
Estimation of Vehicle-Kilometre

Year	Expendi- ture/ (lakhs)	No. of Vehi- cles	Km. covered (lakhs)	No. of Passen- gers (lakhs)	No. of used Vehi- cles	No. of Vehicle- Km (lakhs)
1981	243.92	117	4181.765	1434.45	70	292,723.5
1982	279.41	117	4893.412	1392.47	65	318,071.5
1983	369.50	121	4741.864	1565.12	70	331,930.2
1984	370.21	131	4384.912	750.62	77	337,638.1
1985	394.17	131	3987.476	767.59	69	275,135.4
1986	456.29	124	4371.306	1560.61	92	402,159.6
1987	526.68	131	4403.823	1604.17	69	303,863.5
1988	602.23	142	4994.098	2072.47	121	604,284.8
1989	744.97	169	6138.624	1926.84	150	923,793.6
1990	750.20	183	6158.994	2423.23	121	745,237.7
1991	816.15	168	5949.393	2178.32	113	672,281.1
1992	863.64	176	5311.179	2060.06	100	531,117.0
1993	804.16	191	5831.073	2054.95	97	565,613.7
1994	849.27	203	6243.071	2098.81	112	699,223.9

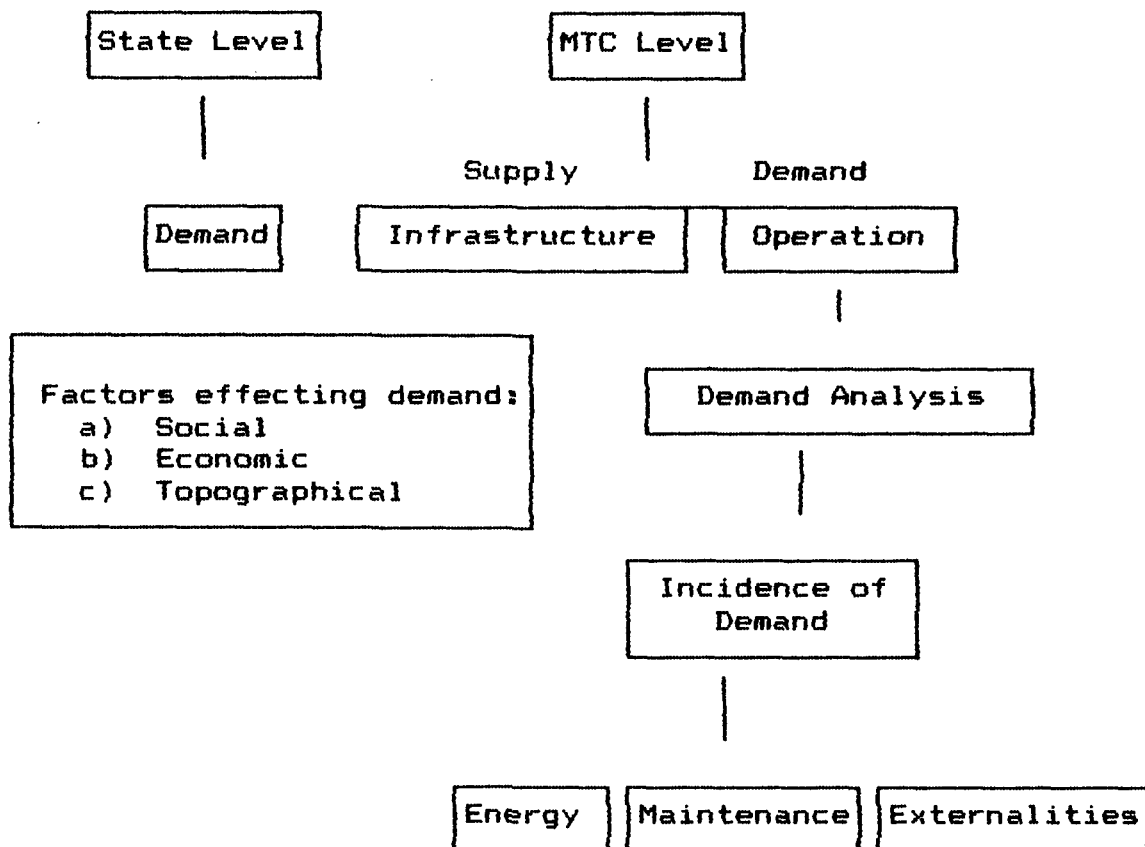
Finally in Table-4.20, we estimate the vehicle-kilometre using the data on length of kilometres covered, the number of passengers, the number of utilized vehicle and the occupancy rate. Since we shall estimate the demand for fuel, therefore, we need to define as well as to estimate the vehicle-kilometre, which is calculated using the formula :

$$\frac{\text{No. of passengers} \times \text{No. of kilometres covered}}{\text{Occupancy rate/Vehicle}}$$

Now, in the next section, we shall present the methodology.

4.4. Methodology

We shall discuss the methodology in two parts, one part will be on demand analysis of passenger transportation in Meghalaya, and its other part will be on the performance of Meghalaya Transport Corporation. The schematically can be laid down as follows :



Demand is explained by the socio-economic indicators of the consumers, namely income, price for the use of transport and sometimes the price of using the competing modes.

Throughout the empirical analysis of transport demand it was confirmed that with the rise of income, there is a rise of travel expenditure of the consumer. It also happens that with a rise in income certain degression takes place in the use of public mode of transportation as it is seen that consumers who can afford a car prefer to travel either by their own car or taxi. This is more probable in the urban areas where the roads and other amenities like repair service are more adequate. This shift from public mode to private mode is not caused by the cost differentials, but by such factors as comfort, efficiency and time saving aspect of private means of transport; but if we take into account the social cost which is usually borne by the public, the cost of using the private mode of transport is higher than that of public mode of transportation.

We may further point out that some other factors like level of education, distribution of economic and business centre, rise in the growth of GNP, employment to total population ratio, distance of recreation centres, commercial centres from the residential areas, etc. are also important factors of determining demand for passenger transportation.

In the case of cars, in addition to the cost of depreciation of car values, the price of petrol/diesel, licence and other cost like parking, figure prominently in the demand function.

The modes of passenger traffic differs from other models since demand for passenger traffic are the genetic source for providing the other demand models. The shoppers use the mode of transport to meet the other demand for households commodities, the people go to office because there is demand for employment, the students and teachers use modes of transportation to satisfy their demand for education. Likewise the growth of GNP is the sum total growth of sectoral products and all these growth are possible only due to movement of goods and other factors of production.

Thus, demand model ought to be treated as behavioural. It is an end result of many behavioural divisions effected by socio-economic conditions, the attributes of the various modes of transportation, and finally whether to make the trip or not.

The travel demand models tend to emphasize the impediment of space and time between the passengers and the attractiveness of the location. Therefore, a global model for demand for passenger transportation overlooks the details of spatial characteristics of the zone of origination of the trip and the zone of destination of the trip. It is

sometimes easier to identify the problems of passenger transportation when traffic is studied among one specific centre of economic activity and the zones attracted by it. In this case, the choice of mode, reason for selecting particular mode, reason for making the trip and finally the nature of the consumer, i.e. the passenger, should all be distinctly evaluated. This is why, in the recent years there are a number of different types of models, although one may tempt to call them as designated global models. These are :

- a) Trip Generation and Attraction
- b) Trip Generation
- c) Model Split
- d) Route Assignment
- e) Models of Inter-City Passenger Demand
- f) Abstract Mode Models
- g) Modal Choice Models
- h) Spatial Models.

The models mentioned above have some structural variations and almost all in its operational stage behave as if one is independent of another. We have already mentioned the main socio-economic independent variable which determines the common demand for passenger transportation.

In the trip-generation models, specially used to study urban passenger traffic, at first models are used to estimate the trip generation. On the basis of trip origination and

trip destination/trip end models are estimated, and with this kind of two-way nature the results may be cross-checked. The most important independent variable used for trip generation are socio-economic characteristic of the zone. However, one drawback of the trip generation model is that it does not incorporate the supply variable which is a constraint to the trip generation. These models take into consideration the population of the zone, population density, car ownership, family income, number of persons employed. These models assert that the trip frequency is independent of physical transport constraints. In the trip attraction model land use variables are included (Stubbs et al., 1980).

In the trip generation models unlike the other demand models, the zonal characteristics get the utmost importance.

Along with trip-generation model we have to mention the model for Trip Distribution. Sometimes this models is called constrained gravity model or the opportunity model. The gravity model may be written as :

$$T_{ij} = aZ_iZ_jf(P_{ij}) \quad \dots\dots\dots (4.1)$$

where T_{ij} = the number of trips between origin i and destination j .

a = constant

Z_i = the socio-economic characteristics of the i th zone.

Z_j = the socio-economic characteristics of the j th zone.

P_{ij} = the price paid for using the mode of transportation.

The socio-economic characteristics of the variable may be specified as population or family size, median family income, level of education, level of urbanization and the economic distance between the residential colony to the post offices, banks, offices, hospitals and business areas. Though the price paid by the consumer of the transport services may be a generalised conformed price such as the actual fare, time cost, convenience, etc. but all these may not be quantitatively defined.

We would like to present the opportunity model here. This model is based on the assumption that the number of trips generated in the origin is proportional to the number of opportunities at the destination zone and inversely proportional to the number of intervening opportunities. This is a probabilistic model in the sense that the person using any mode of transportation has a prior knowledge that the destination will be chosen. In fact, this model theoretically may differ from the trip generation model but end result would be the same and it is written as

$$dP = L [(1-P(V))] dV \quad \dots \quad (4.2)$$

where

$P(V)$ = the probability that a trip will terminate by the time V possible destinations are made

dP = the probability that a trip will terminate when dV possible destination are being considered.

V = number of possible destinations.

L = chance factor that a possible destination may be accepted.

This model, in our opinion has one draw back, the probability that a destination being accepted by a traveller is either based on his past behaviour or on his supposition that he would accept that destination in the near future. The decision to make a journey and to select any particular mode of transportation is based on personal probability of the traveller, therefore, one need not go into such details when other econometric models are operationally feasible without shadow of doubt.

On the other hand, the model split models are very straight forward and based on the logical assumption of market share :

$$Q_{ij}^k = \frac{T_{ij}^k}{T_{ik}^M} = \frac{e^{-\alpha P_{ij}}}{\sum_{m=1}^K e^{-\alpha P_{ij}}} \dots\dots (4.3)$$

where Q_{ij}^K = proportion of travellers using mode K between zones i and j.

T_{ij}^K = the number of trips between i and j by using mode K.

T_{ij}^M = the number of trips between i and j using all modes of transportation.

P_{ij} = the generalised cost of travel.

$M = 1, 2, \dots, K.$

Here, we assume that the number of travellers and the number of trips are synonymous. Bez has estimated the number of travellers by each mode of transportation namely railways, buses, taxis, using Dutch data by the simple econometric techniques without mentioning the modal split model.

In the multi-equation Trip Demand mode, the following factors are taken as exogenous :

1) the choice of location of employment, residence or commercial complex.

2) housing consumption

3) car ownership

4) frequency of pleasure or social call trips

5) modal choice

6) choice of destination when alternative is available, and

7) route choice if possible.

These variables are not otherwise included in a specific type of demand function where only the per capita disposable income and price are included.

The model for inter-city travel demand is gaining importance, when we consider the services rendered by nationalised or state owned transport operators. Many private operators also enter into this business in large numbers when the state owned transport corporation fail to provide adequate and efficient transport services. We know from our experience that due to irregular and infrequent services of the State Transport Corporation, 70 per cent of the would be travellers, travel by using private mode of transportation.

The following type of model was adopted to study the operation of four major inter-city travel modes in the North-East Corridor of the USA (Meyer et al., 1971).

$$\log D_{ij}^{mp} = \log K_{mp} + e_m \log (E_i E_j) + \sum_{pq} P_{ij}^{pq} \log P_{ij}^{pq} + \sum_{pq} T_{ij}^{pq} \log T_{ij}^{pq} + Y_{mp} \log Y_i + a_{mp} \log A_j + u \dots (4.4)$$

where D_{ij}^{mp} = Number of trips between i and j, using mode m for p purposes.

E_i, E_j = employment in city i and j.

P_{ij}^{pq} = one way cost of travel between i and j using mode q for p purpose.

T_{ij}^{QP} = Travel time by using mode q.

Y_i = per capita income in the i th city.

A_j = attractiveness of the city.

The other symbols associated with the variables are the respective elasticities of these variables.

The attraction factor in the case of business travel is the product of employment in the cities. But this model has some serious draw backs -

1) The number of exogenous variable are large and also some of them are recounted.

2) When the demand for travel by using mode m is considered as dependent variable, the independent variables relating to cost of travel and travel time are only with respect to competing mode. We know that in the conventional demand models the price of competing goods is included in addition to the price of the good for which the demand is estimated. What would be the implication as a result of this omission ?

3) The exogenous variable A is not properly defined. Could this alone be the level of output as the model builder suggest ? We think we can put a number of shopping centres, central offices, institutions, recreation centres, the ratio of used to vacant land, etc. And finally we could guess there will be problem of multi-collinearity, since some variables are accounted more than once.

The other types of models are the Abstract Mode Models and Modal Choice Models. These models in fact do not bear anything new. All models are based on the theory of utility and it is for the consumer to maximize his utility by selecting those items with distinct qualitative characteristics. Quendt and Baumol first coined the Abstract Mode Model (Quendt et al., 1966). It is assumed that consumers have preference over one mode to another. Abstract mode theory presupposes 'modal neutrality', that mode is chosen purely for its characteristics like speed, frequency of service, comfort and cost. The type of model conceived is as follows :

$$T_{ij}^k = a_0 (P_i)^{a1} (C_{ij})^{a2} (P_j)^{a3} (C_{ij}^k)^{a4} (H_{ij})^{a5} (H_{ij}^k)^{a6} (D_{ij}^k)^{a7} (Y_{ij})^{a8} \dots \dots \dots (4.5)$$

where T_{ij}^k = number of trips between j and i using kth mode.

- P_i, P_j = population in i and j cities.
- Y_{ij} = per capita income.
- H_{ij} = least travel time.
- H_{ij}^k = least travel time using mode k.
- C_{ij} = least travel cost.
- C_{ij}^k = least travel cost of kth mode divided by least travel cost between i and j.
- D_{ij}^k = departure frequency of kth mode.

The empirical evidence of these models show that they are operationally simple yet in some cases, pooling of data of different modes to estimate demand by using a single linear equation is doubtful.

On the other hand, in the model choice models, the idea was originally struck to predict transport requirement using public transport and other private modes to arrive at a discriminant function. Though there is specific difference in formulation of the models, the basic outcome is similar. They all give desired end results. Thus, the multiplicity in models do not make the demand estimation progressively more comprehensive as compared to others.

The travel demand models do not always conform to classical derived model from the utility concept. Like any other commodity of consumption, the services of transportation may not differ but we could see in almost all travel demand models attractiveness of the mode, distance between the zones, the special characteristics of the zones including the population and opportunity cost are all incorporated into the model. The conventional demand function for any commodity may be written simply as :

$$T = f(Y.P) \quad \dots\dots\dots (4.6)$$

This was the model actually used by Bez to analyse the demand for transportation for entire Holland. He did use the

price actually paid by the traveller for the journey. In case of demand for travel by car, he calculated price by taking into consideration depreciated value of the car, price of diesel/petrol licence fees, road taxes and parking cost. His analysis reveals that for global analysis of travel data, the conventional models based on utility theory serve the purpose (Bez, 1978).

The Scandinavian transport economists tempted to use the probability theory for estimating the gravel demand. The idea was based on the concept of average traveller whose behaviour is representative for a group of travellers. To this average traveller, they assigned some behaviour qualities. It was also assumed that this average traveller knew about the quality of services of other modes of transportation. Thus the traveller is offered a number of trip alternatives, thus his probability of choosing a mode of transportation can be represented by

$$P_{ijK} = P_{i,K(J)} \cdot P_{i,j,K(m)} \cdot P_{i,jK,m(l)} \dots\dots (4.7)$$

Thus the probability of choosing a mode of transportation from travelling i to j using m mode of transportation through l route is the product of the probabilities of selecting jth destination, choosing mth mode and taking lth route. And the number of travellers going

from i to j for purpose K , using mode m , taking l route would be

$$P_{i,K}(j,l,m) = N_{ik} \cdot P_{i,j,K}(l,m) \quad \dots\dots (4.8)$$

where N_{ik} = the number of travellers generated from zone i for the purpose k .

Using the relations (4.7) and (4.8), the total number of travellers is estimated by

$$T = \sum_j \sum_i \sum_k \sum_l \sum_m N_{ik} P_{ik}(l,m) \quad \dots\dots (4.9)$$

In this type of model the choice of mode, route, perhaps of travel as well as origin and the destination are built into the corpus of the model. This model is also known as generalised model for comprehensive trip distribution.

The opportunity model is, on the other hand, a class of models, which takes into account the trip opportunities, given as

$$T_{ij} = T_i A_{ij} / \sum A_{ij} \quad \dots\dots\dots (4.10)$$

with $A_{ij} = e^{-k h o (1 - e^{-k h j})} \quad \dots\dots\dots (4.11)$

introducing (4.11) into (4.10) yields

$$\begin{aligned} T_{ij} &= T_i A_{ij} / \sum A_{ij} \\ &= T_i e^{-k h o (1 - e^{-k h j})} \quad \dots\dots\dots (4.12) \end{aligned}$$

Where

T_{ij} = the number of trips from i to j

A_{ij} = attractiveness

h_j = predicted number of trip opportunities.

h_0 = predicted volume of destination closer to zone i than to zone j .

k = parameter.

The above model is incorporated with the attractiveness of the zone rather than the attractiveness of the mode of transportation. The model according to us has one limitation that is the means to estimate the predicted values of h_0 and h_j . This model may be restricted to a defined area and not probably for finding the estimates of trips of district or a state.

There are some other models which we are not presenting here. We would like to confine ourselves to the models that have been used for analysing both primary and secondary data.

4.5. Methodology Adopted

In the foregoing sections we already mentioned some problems of secondary data - relating to the Meghalaya Transport Corporation. Since this corporation is highly subsidized, we have to recourse to some other statistical measures to find out the causes of loss of revenue. Thus our analysis will be divided into three parts :

1) Statistical Interpretation of Meghalaya Transport Corporation data.

2) Econometric Analysis of Meghalaya Transport Corporation data.

3) Econometric Analysis of primary data.

The econometric models that we used are for the MTC data,

$$\text{Pass-Km} = a_0 + q_1 \text{ Income} - a_2 \text{ Price} + u \quad \dots\dots (4.13)$$

Expenditure Analysis (E) :

$$E = a_0 + a_1 \text{ Fuel} + a_2 \text{ Repair cost} + a_3 \text{ Tyre Cost} + a_4 \text{ Admn Cost} + u \quad \dots\dots (4.14)$$

Energy Consumption Analysis (F) :

$$F = a_0 + q_1 \text{ Veh-Km} + U \quad \dots\dots (4.15)$$

Employment Analysis (M) :

$$M = a_0 + a_1 \text{ Fleet size} + a_3 \text{ Pass-Km} + a_4 \text{ Earnings} + u \quad \dots\dots (4.16)$$

Repair Cost Analysis (R) :

$$R = a_0 + a_1 \text{ Pass-Km} + a_2 \text{ Earnings} + u \quad \dots\dots (4.17)$$

Tyre Cost Analysis (T) :

$$T = a_0 + a_1 \text{ veh-km} + u \quad \dots\dots (4.18)$$

Accidents Analysis (A) :

$$A = a_0 + a_1 \text{ veh-km} + u \quad \dots\dots (4.19)$$

In model (4.13) we try to estimate the demand for pass-km. which is considered to be a function of the deflated income of the passengers and the price paid for the transport service. This model deals with the aggregate demand for using MTC service.

In model (4.14), we estimate the expenditure incurred annually for the operation of transport. We think that the sum total cost should be compared of mainly fuel cost, repair cost and administrative cost. Since the topography of Meghalaya is hilly and there is hardly a kilometre in one stretch without climbing or going down and the roads are not in perfect condition, therefore, both fuel cost and repair cost are higher than in the plains. Besides, we know that the man-vehicle ratio is high - it is about 6 persons per vehicle, therefore the administrative cost is another very important influencing factor.

In the case of estimating the demand for fuel we considered only one variable in the veh-km and we did not take into account the waiting time along the routes for the incoming and outgoing passengers.

Regarding the estimation of employment we considered fleet size and the amount of earnings as the principal exogenous variable.

In the case of analysing the repair cost, we took it as a function of pass-km. and earnings.

In the case of accidents the most important exogenous variable would have been the a) the age of the bus; b) the length of service of the driver; c) the age of the driver; d) visibility index and traffic density, but we took only the veh-km. as we did not find the other data with the MTC.

Econometric Analysis of Primary Data

We have adopted the following models for analysing the primary data :

$$\text{Pass-km.} = a_0 + a_1 \text{ Income} + u \quad \dots \quad (4.20)$$

$$\text{Travel Expenditure} = a_0 + a_1 \text{ Income} + u \quad \dots \quad (4.21)$$

In the model (4.20) the price variable is omitted because the survey data was done in a short span of time, and in a short period there cannot be much price variation. We also find that the passengers use different modes for transportation like buses, jeeps, cars, two-wheelers, etc. and the composite price is very difficult to ascertain as different modes of transportation change different price for transportation.

The model (4.21) is an Engel type demand function. We may, of course, fall into a pit of multi-collinearity if we use travel expenditure as a function of pass-km. and income. We could also use another model by pooling cross section data with time series data and in that case the evidence is that

the new disturbance term will not have the same property and the estimates of the parameters will not be consistent and efficient.

The statistical interpretations of the data are given along with the tables.

4.6. Empirical Equations

Empirical equations relating to data of Meghalaya Transport Corporation :

Following are the results of the econometric analysis :

M.T.C.

1) Pass-Km

$$= .5955 + .0071Y - .0072P$$

(3.480) (.841)

$$R^2 = .751 \quad DW = 1.043$$

$$\log \text{Pass-Km} = .4318 + 1.3988 \log Y - 1.4252 \log P$$

(4.129) (1.446)

$$R^2 = .798 \quad DW = 1.124$$

2) Expenditure

$$= 1.723 - 3.076F + 1.51RP - 1.734TC + 1.104AC$$

(.4791) (2.514) (.1894) (7.944)

$$R^2 = .995 \quad DW = 2.866$$

$$\log \text{expenditure} = -.3237 - .3310 \log F - .0014 \log RP$$

(.6959) (8.639)

$$-.0704 \log TC + 1.226 \log AC$$

(.1352) (4.038)

$$R^2 = .977 \quad DW = 2.676$$

3) Energy = .4841 + 2.2867 Veh Km.
(10.4176)

$$R^2 = .9004 \quad DW = .810$$

log energy = .9179 + 2.0314 log Veh Km
(9.570)

$$R^2 = .884 \quad DW = .721$$

4) Employment

= 663.8 + .9384FL + .0264 Pass-Km + .2850 E
(.679) (.425) (2.02)

$$R^2 = .922 \quad DW = .881$$

5) Repair Cost

= 7.834 + 2.412Pk + .1016 Earnings
(.1560) (5.770)

$$R^2 = .934 \quad DW = 1.430$$

6) Tyre Cost

= .017 + .674 Veh Km
(8.58)

$$R^2 = .859 \quad DW = .984$$

7) Accidents

= 44.47 - 33.885 Veh Km
(-1.452)

$$R^2 = .149 \quad DW = 1.584$$

It may be noted that the empirical demand functions for estimating the demand for pass-km by MTC buses is a best fit by accounting 75 per cent of total variance by regression coefficient. The signs of the estimates of the parameters are also correct. The only draw back is that the estimate of the

price parameter is not significant, whereas the estimate of the income parameter is significant. The income elasticity

$$\frac{\text{Change in Pass-Km}}{\text{Change in Income}} \cdot \frac{\Sigma \text{Income}}{\Sigma \text{Pass-Km}}$$

and the price elasticity

$$\frac{\text{Change in Pass-Km}}{\text{Change in Price}} \cdot \frac{\Sigma \text{Price}}{\Sigma \text{Pass-Km}}$$

are both elastic which implies that no matter what the price to be paid and what the income of the consumer may be, travel is very essential for all.

In the empirical function for expenditure estimation, we assumed that there is a positive influence of every exogeneous variables in estimating expenditure, but we found only the repair and administrative cost happen to be positively responded but not the fuel and tyre cost. We could also see that the numbers of persons/bus is about six and definitely the administrative cost will rank high. The estimate of repair cost parameter is statistically significant at 5 per cent level, whereas the estimate of the parameter of administrative cost is significant at 1 per cent level. Also R^2 shows that the equation is a best fit. DW statistics show that there is no auto-correlation in the disturbance term.

In the estimate of the demand for energy, both the linear and log linear equations show the best fit with

$R^2 = .90$. The estimate of the parameter of vehicle-kilometre is significant at 1 per cent level but DW statistics shows that there is auto-correlation in the disturbance term.

The employment function is also a best fit with $R^2 = .92$. There is auto-correlation in the disturbance term. None of the estimates of the parameters are significant which is one of the most important statistical quality for efficiency, and there is definitely more than the required number of employees in the MTC.

In the case of empirical Repair Cost function we found high $R^2 = .93$ but there is auto-correlation in the disturbance term. The estimate of the parameter of earnings is highly significant although the estimate itself is not large compared to the estimate of passenger-kilometre.

The empirical equations for estimating Tyre Cost with $R^2 = .85$ is a best fit, with auto-correlation present in the disturbance term. However, the phenomenon of auto-correlation is often present in the analysis of time series data. The estimate of the parameter of vehicle-kilometre is very highly significant.

Finally, we present the accident empirical equation which is not worth producing, but for the sake of information it is presented. We also mentioned in the previous section

that the accident could be functionally related to some other variables about which we could not get any data.

Interpretation of Econometric Results using Primary Data

We have altogether 19 equations relating to each locality surveyed. In our analysis of travel expenditure the estimates of the parameters of income comes out to be with positive signs which we expected. The estimates bearing double asteriks are highly significant, whereas, with one asterik are significant at 5 per cent level, using as usual the t-statistics :

$$t = \frac{\hat{a}_1}{\sqrt{v(\hat{a}_1)}}$$

But we cannot say the same thing in the case of equations (12), (17) and (19). This may be due to a number of factors such as 1) sampling error; 2) the irregular behaviour of income variable and 3) insufficiency of input data. But we may be sure from this analysis that income is a highly influencing variable for inducing demand for travel. Though, in the process of model building we thought of incorporating educational status of the family but we run into some problems - there is no family in which everybody is literate or illiterate. Also the standard of education of the family

members vary from nursery to M.A. Therefore, it becomes difficult for us to separate that portion of travel expenditure either spent by literate or illiterate.

We note with satisfaction that R^2 the coefficient of determination is nearly equal to .50 or more, therefore, all the equations fit moderately and most of them have the best fit. R^2 signifies what proportion of variance of the dependent variable is accounted by regression sum of squares of the total variance of the same variable. Statistically, R^2 has a range of values from 0 to 1, although, we may not lay so much importance to R^2 as we do so in the case of estimates of the standard errors of the estimates of the parameters. It follows from the fundamental assumptions of regression model that the estimates of the parameter be the best linear unbiased estimates. From the t values we can infer that the estimates except in the case of equations mentioned above all have required minimum variance property. Therefore, we may say that the model is viable and statistically reliable.

We have also estimated the double log-linear version of the models. Although this type of model is not usually preferred to simple linear model, it can be shown that log-linear model yields constant elasticity, e.g.

$$TE = a_0 \gamma^{\alpha 1}$$

$$\frac{\delta TE}{\delta Y} = a_0 a_1 Y^{a_1-1}$$

$$\begin{aligned} \text{and elasticity} &= \frac{\delta TE/TE}{\delta Y/Y} = a_0 a_1 Y^{a_1-1} \cdot \frac{Y}{TE} \\ &= \frac{a_0 a_1 Y^{a_1}}{a_0 Y^{a_1}} = a_1 \end{aligned}$$

where

TE = Travel expenditure

Y = Income

a_1 = Elasticity.

In the case of log-linear equations we found almost the similar results. We found that demand for travel inter alia the travel expenditure is income elastic. Also we mentioned elsewhere in this chapter that people usually travel when they have to; the car ownership is nearly negligible. The elasticity varies from .05 to 1.4. Since the respondents belong to greater Shillong city having easy access to city buses, they can travel at a moderate cost.

Primary Data

Travel Expenditure (Survey Data)

The Model : Travel Expenditure = $\hat{a}_0 + \hat{a}_1$ Income + u

Independent Variables

Sl.No.	Constant	Y(Income)	R ²	DW
1.	202.9336 (11.8401)	.08368 (9.6813)	.8538	2.3535
1a.	2.2592 (6.5755)	.4837 (11.0093)	.8347	2.1160
2.	142.3489 (4.1812)	.0633 (6.4531)	.5979	1.6634
2a.	1.5654 (2.0823)	.5300 (5.6591)	.5335	1.6516
3.	.7753 (.8738)	.6169 (5.6455)	.5323	2.0862
3a.	142.3489 (4.1812)	.06336 (6.4531)	.5979	1.6634
4.	105.5520 (3.0267)	.0657 (6.9241)	.6313	1.9841
4a.	.7753 (.8738)	.6169 (5.6455)	.5323	2.0862
5.	101.8334 (2.6094)	.0600 (5.5327)	.5313	1.6003
5a.	.8507 (1.0385)	.5979 (5.8753)	.5611	1.6649
6.	59.8867 (1.6432)	.0754 (4.8954)	.7736	1.784
6a.	.5505 (1.9083)	.7753 (3.6123)	.7801	1.7324

Sl.No.	Constant	Y(Income)	R ²	DW
7.	43.8541 (4.2385)	.4132 (3.2643)	.4936	1.6893
7a.	1.6781 (8.0624)	.0532 (5.0139)	.4635	1.7832
8.	73.4211 (5.8873)	.3547 (2.3587)	.5135	1.9342
8a.	.41171 (7.8322)	.0641 (2.4954)	.4753	1.7342
9.	103.4154 (6.8933)	.0891 (3.8453)	.6154	1.8511
9a.	.9243 (.8453)	.3584 (3.5821)	.6173	1.7894
10.	63.4981 (11.4176)	.1526 (4.321)	.4732	1.6671
10a.	.8743 (8.1413)	.2741 (3.2532)	.5004	1.7325
11.	93.4154 (6.7832)	.0743 (3.2141)	.4934	1.6932
11a.	.9843 (5.4176)	.3743 (3.1527)	.5141	1.7893
12.	54.1982 (10.9345)	.0732 (1.6541)	.4783	1.5831
12a.	.6243 (8.4311)	.4107 (1.9324)	.4915	1.6647
13.	165.4965 (5.7031)	5.2287 (6.0748)	.5061	1.6814
13a.	1.9772 (3.0917)	.4746 (5.9072)	.4920	1.6662

Sl.No.	Constant	Y(Income)	R ²	DW
14.	64.6593 (2.2863)	.0597 (5.6544)	.4920	1.6439
14a.	-1.0471 (1.1763)	.8170 (7.0621)	.6018	1.5054
15.	18.20667 (1.3430)	.0590 (9.7880)	.7160	2.0541
15a.	-1.4394 (2.0478)	.8343 (9.0041)	.6808	1.9249
16.	15.8299 (.6045)	.0601 (5.4346)	.5224	1.5897
16a.	1.2885 (1.0199)	.8119 (4.9206)	.4727	1.7267
17.	52.3479 (10.3547)	.0483 (1.6294)	.4932	1.6453
17a.	.7325 (6.3431)	1.4536 (2.0032)	.5104	1.7604
18.	62.9743 (5.4783)	.0094 (1.6407)	.6124	1.5683
18a.	.7832 (3.8524)	1.2351 (2.0734)	.6432	1.7114
19.	170.3251 (5.4645)	.0814 (1.3479)	.4935	1.6832
19a.	.6893 (4.6673)	1.3254 (3.4720)	.5106	1.7844

Note : Equations at serial numbers marked with 'a' are double logarithm equations.

Passenger-Kilometre (Survey Data)

$$\log \text{ Pass-Km} = \hat{a}_0 + \hat{a}_1 \log \text{ Income}$$

1.	$\log \text{ Pass-Km} = 4.811 + .2365 \log Y$ (3.127)	$R^2 = .2895$ DW = 2.299
2.	$\log \text{ Pass-Km} = 3.418 + .3915 \log Y$ (3.625)	$R^2 = .2674$ DW = 1.226
3.	$\log \text{ Pass-Km} = 1.359 + .6768 \log Y$ (7.701)	$R^2 = .6213$ DW = 1.993
4.	$\log \text{ Pass-Km} = -.2930 + .8533 \log Y$ (9.870)	$R^2 = .7469$ DW = 1.665
5.	$\log \text{ Pass-Km} = -1.153 + .8894 \log Y$ (4.640)	$R^2 = .4436$ DW = 1.673
6.	$\log \text{ Pass-Km} = 1.246 + .6554 \log Y$ (6.664)	$R^2 = .6218$ DW = 1.984
7.	$\log \text{ Pass-Km} = 3.269 + .3993 \log Y$ (3.798)	$R^2 = .3483$ DW = 1.221
8.	$\log \text{ Pass-Km} = 4.260 + .2781 \log Y$ (2.975)	$R^2 = .2403$ DW = 2.184
9.	$\log \text{ Pass-Km} = 2.023 + .5595 \log Y$ (2.566)	$R^2 = .1904$ DW = 1.631
10.	$\log \text{ Pass-Km} = 1.140 + .8912 \log Y$ (5.805)	$R^2 = .5552$ DW = 1.800
11.	$\log \text{ Pass-Km} = -.6340 + .8182 \log Y$ (8.428)	$R^2 = .6514$ DW = 1.759
12.	$\log \text{ Pass-Km} = -.4899 + .8405 \log Y$ (8.846)	$R^2 = .7034$ DW = 1.1914
13.	$\log \text{ Pass-Km} = 3.390 + .3738 \log Y$ (3.776)	$R^2 = .2837$ DW = 2.013
14.	$\log \text{ Pass-Km} = .6793 + .8072 \log Y$ (7.531)	$R^2 = .6934$ DW = 1.937
15.	$\log \text{ Pass-Km} = .4350 + .8192 \log Y$ (7.631)	$R^2 = .7641$ DW = 1.973

16.	$\log \text{Pass-Km} = .7934 + .8954 \log Y$ (7.854)	$R^2 = .8131$ DW = 2.180
17.	$\log \text{Pass-Km} = 1.345 + .8321 \log Y$ (6.312)	$R^2 = .5739$ DW = 1.7983
18.	$\log \text{Pass-Km} = -.5947 + .7931 \log Y$ (4.560)	$R^2 = .6213$ DW = 1.841
19.	$\log \text{Pass-Km} = 1.341 + .6631 \log Y$ (6.831)	$R^2 = .6014$ DW = 1.793

Next we have estimated the demand for passenger-kilometre. We have first calculated the passenger-kilometre by using the information on trips per person and the average distance of the trips by the family, and this in turn gave us the aggregate passenger-kilometre for each family. We have adopted here the log linear version of the empirical regression coefficient, and finally we estimated for all the 19 different points of survey. We have found that signs of the parameters are correct, but R^2 in the equations, namely 1,2,7,8,9 and 13 is so small that it does not guarantee the empirical regression function as a best fit. As we have mentioned earlier that R^2 should be at least .50, but in these equations R^2 ranges from .19 to .34, but still we present these equations for the sake of completeness. On the other hand, we have satisfactory t values even for these equations, and when the parameters are statistically significant they are more reliable estimate of the parameters. Therefore, we have ignored the small values of

R^2 because for prognosis purposes estimates of the parameters have to be reliable. DW statistics show there is auto-correlation in the disturbance term. We are satisfied with equations 3, 4, 6, 11, 12, 15, 16, 17, 18 and 19 as they are equation of best fit with high values of R^2 , and the estimates of the parameters of income are also highly significant. Though there is auto-correlation in the disturbance term, but some of these equations we can ignore because our data is a cross section data. Only in case of time series data DW statistics should be given importance by transforming both the dependent and independent variable with the help of auto regression coefficient. In fact, some empirists do not at all calculate DW statistics for cross section data. We found that income elasticity of the demand for passenger-kilometre varies from .23 to .89, and therefore the demand for travel may be considered to be income elastic. A composite price could have given a different picture of the employment equation, but on the other hand estimation of the demand for passenger-kilometre with a non-uniform price may give us wrong interpretation of the econometric results. Therefore, we confine ourselves to this kind of analysis. Many demand analyst, of course, prefer to work only with income, though the method of pooling cross section data with time series data are occasionally used but the parameters happen to have the properties of minimum variance.

Therefore, we confine to only cross section analysis of data with income as the only explanatory variable.

Chapter—V

CONCLUSION

Development of modern means of transport is a measure of civilization and economic development of a nation. The national government in all countries irrespective of the economic systems they adopted, embarked on a massive state towards the development of transport infrastructure commensurate with the requirements of the economy and the available resources. Naturally, a great deal of effort has been made and is being made in research and documentation on the subject.

A review of important studies on different aspects of the subjects revealed that urban and metropolitan transportation was studied by several researchers in several countries to forecast the demand for transportation. In India, though a few researches were undertaken, they lacked depth and comprehensive coverage. This study cannot fill the gap but can be considered as a step in that direction.

We have seen from our empirical investigation, using both primary and secondary data, that demand for transport is increasing everyday due to various reasons. These factors are :

- i) Increase in economic activities from original centre Shillong to other district headquarters.
- ii) Increase in the number of educated people.

iii) Institutions of higher learning are mostly concentrated in urban areas.

iv) Growth in state income.

v) Rapid rate of population growth.

vi) Improvement in the field of agricultural marketing specially in finished goods.

With the growing expansion of the city, more people, more activities, etc. there is the resultant growth in demand for transport too, which of course, must be complemented with an extension of infrastructure and infrastructural facilities. Being a common experience of almost all expanding and growing cities, increased aspects in demand for food, for transport etc. the sphere is normally one of the shortage of supply not meeting the demand. As a consequence, urban transport is beset with many increasing difficulties, such as easy passage, obstruction, congestion, etc. Thus a balance must be struck between the demand and supply of infrastructure and in doing so, care must be taken such that the capacity of the existing infrastructure may be better utilized.

Shillong is already overcrowded with a large number of vehicle on its road, and any effort to increase the number of vehicles to meet the increasing demand will create congestion in all important areas of the city, as the sum total of the problem is the absence of further scope to widen the roads.

If at all it is to be done it would involve demolition of houses by hundreds. The penalty for road offence are either so small or nil, that people are not afraid of repeating offence after offence. Encroachments like unauthorised use of pavements and roads add to the confusion.

The scene of urban transportation system can present a much more improved outlook with the perfect co-ordination of transport and landuse planning. Optimal landuse planning is a long drawn out and costly process, the results of which, are unlikely to be available for immediate relief to urban transport problems. This does not imply that attention should not be paid to restructuring landuse planning, the point to be emphasized is that while steps should be taken immediately their impact would be felt only after two decades or so. Secondly, dispersal of population and economic activity within the city would lead to better distribution of trips and reduce congestion in central areas but in such a case total transport requirement of the area are likely to increase. This in turn calls for strengthening and expansion of transport facilities.

With virtually no scope for widening roads the fast growing traffic highlights the need for strengthening public transport in the city. It is only through quick, efficient and economic public transport facilities that commuters can

be diverted from using personalized modes of transport to public transport system.

Preferential treatment should be given to public transport such as buses with the possible reservation of lanes for them alone, and the construction of proper tracks for pedestrians, to ensure their safe and unhindered commuting, when on foot.

The existing road laws such as vehicle licensing, speed regulations, anti-accident measures, access to main roads, noise and pollution, etc. be reviewed from time to time keeping up with the trend, and the changes made public as early as possible, keeping an open mind to the need for effective enforcement of the law.

To discourage private users from cluttering the road during the peak hours, differential pricing technique may be adopted. Congestion tax may be imposed in the congested area or the Central Business District (CBD).

Enabling the coming up of small shopping centre in different localities to meet the daily needs of the public would help in the reduction of unnecessary demand for travel.

Further, if we can decentralize the work places and other such institutions to nearby suburbs, the heavy concentration of people and hence demand could be greatly reduced. A ring-road may prove to be most convenient under

the circumstances. The decentralization would help in reducing road traffic, specially during the peak hours.

Improved traffic management methods should be given priority. Proper traffic cells should be organised for carefully studying traffic problems on all arterial roads, major intersections and terminals for adoption of suitable remedial measures.

Further elimination of traffic hazards largely depends on the efficiency of regulating and controlling the public transport system. Such hazards will not go unless the traffic police is empowered to penalise those obstructing roads and pavements. The penalty should be deterrent. There should be some judicial sanction under which the police can realise the penalty for a particular offence on behalf of the courts.

There is also a need to construct sufficient number of fly-overs at major traffic intersections, to enable the traffic to flow without detention. A local cess may be improved on all vehicles and fuel as supplementary of road tax to finance the construction of these fly-overs.

The flow of traffic is not uniform throughout the day, rather it is during the peak period that the situations really worsens. If the traffic flow is spread over longer hours, the intensity of overcrowding may be significantly reduced. This may be attained by resorting to such measures

like fixing different timings for different organisations, and activities for example educational centres may be opened at 7 a.m., markets and shopping centres at 8 a.m., bank and offices at 9 a.m. and accordingly be closed at different timings. Further, arrangement of different weekend holidays for different institutions and activities will no doubt help in spreading traffic in a more even manner and thus reduce demand to some extent.

Town planning, traffic planning and road development should be undertaken in a practical way with a creative imagination such as development of suitable road system, development of appropriate vehicle stand and construction of loading and unloading platform of goods traffic on the outskirts of the city, which is a must and which would deter the heavy lorries from entering the city areas. The entrance and plying of big vehicle in the city itself is hazardous made especially more pronounced because of the topography of the region. This suggestion may thus be taken in real earnestness. The narrow lanes with just passenger traffic minus the goods traffic especially during the daily commuting hours of the inhabitants of the city would definitely lower the degree of congestion in the city.

There is also an urgent need to educate the general public and drivers of cars, buses, trucks, etc. of the simple truth of courtesy in living together in an environment, the

utter indifference of the pedestrians and the adventuring motor cyclist, which constitute a frightening phenomenon in our traffic behaviour.

So as to reduce travel demand, there should not be a one-city centre but perhaps, a whole series of commercial centres ringed with residential ones striving for a lower intensity in the mad-rush from home to work places, to educational institutions to the shopping centre, etc.

In concluding, it is obvious, that urban transport planning should breed both short-term as well as long term or perspective planning. The long-term planning should embrace as far as possible all the relevant factors such as nature and volume of present and future traffic, the need to control accidents and the noise and environmental pollution, not foregoing the constraints which may be financial and physical.

Considering all such problems associated with Shillong urban transportation, all relevant steps should be taken for their rectification and appropriate modification of the road system in the city, which should not be divorced from human welfare. In fact the major goals of transport in the region must be "to develop a safe, convenient, efficient and publicly owned transportation system which optimise accessibility for all persons and goods with minimum disruption to the environment."

This theoretical approach to the study of "An Econometric analysis of demand for public transportation in Shillong", perhaps host many a shortcoming. The study is beset with such difficulties as the stipulated time allotted for the purpose, the half hearted response of the public in transmitting information into the questionnaire type of enquiry etc. However, we honestly believe that this type of study will not only bring out the problems of increased demand for transportation in the city, but will also help the town planners to solve the problems to a certain extent. However, the traffic problem in Shillong is a complicated one, unless all the agencies involved co-operate, the rule of law would be a distant dream.

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APPENDIX

TRANSPORTATION SURVEY SCHEDULE

1. Name of the area :
2. Name of the respondent :
3. Family size :

	Male	Female
Age 0-5 years	
5-10 years	
Above 10 years	

4. Family monthly income

Occupation Structure

	Service	Business	Others
Number of people		

- 5a. Number of trips made by mode :

	Bus	Truck	Taxi	Jeep	Car	2-wheeler	Others
No. of Trips							

- 5b. Average distance travelled/person :

6. Purpose of journey :

Service	Business	Education	Pleasure	Travel	Others
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14. Means of communication best suiting the area :

Bus	Taxi	2-wheeler	Others
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By type

15. Expenditure on transportation per day :

16. Problems faced during travelling :

Irregularity	Overcrowding	Others
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17. Opinion regarding improving transportation facilities :

1)

2)

3)