CHAPTER I

INTRODUCTION
1.1.0 Background of the Proposed Research

The research on transport modelling, planning and development being conducted to-date in developing economies had its origin in the earlier studies undertaken for United States of America, the main objective being to alleviate problems associated with urban population growth, rapid increase in motor vehicle ownership and usage, and at the same time, utilizing the full range of transport modes available for urban movement [15] [16] [4].

Mitchell and Rapkin [64] expounded the theory that various kinds of activities based on land (land use), "generated" different amounts and kinds of traffic flows. This approach brought fundamental changes in research and understanding of transportation. It shifted the emphasis from the research of road traffic flows to the research of activity development patterns that give rise to the flows. In this context, they underlined that the most basic level of action for long term guidance and manipulation is control of the land use development patterns that is represented by regional origins and destinations.

In Chicago, Area Transportation study, empirically tested the validity of the alternative proposition that transportation is a function of regional land use patterns and emphasized how much attention was focussed on the traffic transportation elements of the problem, viz "--- what then is the dominant objective of a transport facilities plan? It is to reduce travel frictions by the construction of new facilities so that people, goods and vehicles --- can move about within the regional areas as rapidly as possible in a manner consistent with limitation of cost and safety" [15] [16].

Thereof, it has been observed and established that land use development pattern in a given region is a function of traffic generation or attraction. The reciprocal proposition that transportation is a function of economic development is also true. This interdependence has been considered a key-note for modern transport planning [106] [54]. Herewith, the process for conducting these studies was developed and is still evolving to provide systematic

* The numbers in brackets [ ] are as per references in the bibliography.
methods for solving regional transportation problems of developing countries. In this context, the fundamental premise which underlies these studies and the present research is that some future planning year equilibrium condition of a regional economy is a meaningful state to attempt to predict and evaluate.

In the case of developing economies, the role of transportation has been considered as that of a “catalytic” in overall development programmes. In this sense, the provision of transport facilities was assumed to be sufficient condition in itself to open up a region, stimulate economic growth and improve social conditions with its area of influence. In actual situation efficient pricing of regionally separated location activity requires that the differences between the prices of homogeneous goods at different locations should not exceed the marginal cost of transporting these goods. In this context, provision of transport facilities determine the pattern of economic growth and whether the factors of production would be more optimally matched [Louis Leferber 1965] [60].

Sarna [93] [94] [95] observed that there was an enormous growth of traffic in regional areas, more especially in urban centres of the Indian economy. However, the concerned authorities have no doubt been taking steps to tackle the challenging traffic and transportation problem but unfortunately the facilities for traffic being created have always been witnessed as an unending process and has naturally led to deterioration of traffic and economic development conditions in most Indian regional economies. However, the past experience shows that spot improvement and improvement in transportation facilities for handling regional growth of traffic will not by themselves yield the desired results and solve the problem over a period of time. Therefore, what is needed is that this problems should be tackled at the basic regional level itself. In this context, regional traffic being the function of land use patterns, the development of landuse activities must be carried out in such a manner that the generation of traffic demand is minimised. A considerable research has already been done as regards this study in developed countries and generation models, distribution models, assignment models and evaluation procedures have been established [Martin 1961] [65].
It is therefore, a paradox that the models used for planning regional transportation facilities and stimulating economic growth in developing economies are largely derived from the earlier studies devised in developed countries. Otherwise, there was no alternative which existed for developing countries to use though some success has been claimed for the same models. Despite all these studies, it was observed that the principles of urban transport planning can be adopted for regional transport planning analysis as well with due modification.

As discussed earlier, the critical problem in most Indian regional economies is inadequacy of transport infrastructure which is further aggravated by increasing demands of inter and intra-regional traffic due to rapid growth in Agricultural Sector, Industrial Sector, Population and Employment. Realising this need, the Indian government decided to step up the investment schemes and programmes for development of regional road transport facilities to provide accessibility to all regional villages, production and consumption centres respectively. One of the most important objectives in India’s five year development plan is to bring about a progressive reduction of regional inequalities in the pace of development.

The problem of regional disparities has several dimensions and any attempt to reduce such disparities would call for concerted action on several fronts. Thus, special programmes would need to be formulated for the backward regions and these would have to be incorporated with the overall national development plan programmes in order to achieve the desired objectives [50].

It is recognized that planning for regional transport facilities will require a very large investment and therefore, the programme of planning these facilities must be staged. It will be useful to review the earlier measures and programmes that have been taken and are proposed to be taken so as to understand the magnitude of the problem.

1.1.1 Earlier Efforts and Programmes

Planning for regional road transport facilities is the responsibility of concerned state governments and financial allocation for these purposes are made in the state development plans. However,
in recent past the state allocations were also supplemented with funds channelled through
central government sponsored schemes and programmes [75] [84].

The Indian government has undertaken two major programmes for development of regional
road transport facilities. These programmes are: (i) Command Area Development Programme
and (ii) Minimum Needs Programme. There are also a number of other programmes undertaken
by Indian government where the element of planning of road transport facilities can be
seen. These programmes includes crash schemes for regional programmes such as Integrated
Rural Development Programme (IRDP), National Rural Employment Programme (NREP),
Rural Landless Employment Guarantee Programme (RLEGP) and Tribal Areas Development
Programme (TAD).

The emphasis in these programmes is not only on regional road transport development but
also development of other sectors of regional economy. In this context, we will describe
in some details the Command Area Development Programme and Minimum Need Programme
as what follows:

(i) Command Area Development Programme

This programme was started in 1977 with 55 community development projects. The programme
was later extended to cover the entire national economy. The extended programme was
called the National Extension Service under which the entire nation was divided into 5026
blocks with each block covering approximately an area of 620 square kilometres including
110 villages with a total population of 1,00,000.

The functions of the block administration as pointed out by B. Mukerjee are “to be responsible
for the overall development of the area in its change”. More specifically the functions
areas described as “the block schematic budget, laying down a uniform pattern of development
of regional-infrastructure such as road transport linkages, schools, irrigation, digging of
wells and tanks, had the idea behind it of promoting basic level of amenities and services
for the areas” [74] [87]
(ii) Minimum Need Programme

This programme was started in 1978 with an objective to lay down norms to link all the villages with population of 1500 or more through all weather roads. It was also stipulated that 50 percent of the regional villages with population 1000 to 1500 should also be linked. The objective was to connect hilly, tribal, coastal and desert areas, through the cluster roads to regional villages in order to match with population.

In this case, to derive full benefits of regional investments to be made in road transport development, therefore, there is need to adopt earlier scientific models already established in developed countries to minimize transport costs and maximize benefits from regional roads and other infrastructure facilities.

The Planning Commission of India also observed that "it will be necessary to formulate integrated development programmes on the basis of assessment of the resources endowment and the quality and coverage of existing regional road transport development and other infrastructure facilities. In these programmes high priority was given to create and expand basic economic and social infrastructure covering transportation, communication, credit market centres, education, health and administrative improvement" [79] [84].

From this observation, it is clear that in order to ensure the regional development of backward areas, the existence of at least minimum level of regional road transport plan within available resources is a must.

Central government policies, was also designed to provide incentives schemes to these programmes for development of regional undeveloped areas in the Indian economy. Consequently, state governments have also adopted these measures aimed at reducing regional disparities. However, a general assessment of the progress made in the light of these measures shows that the regional imbalances in the activity and industrial growth have not been corrected to the extent required. Even within states, the activity development and industries tend to
gravitate towards existing regional urban centres and the backward areas remaining substantially untouched. The incentive schemes for attracting some industries towards backward areas have not been able to prevent this tendency to an adequate extent [50].

Despite of these efforts and programmes, the solution to the problem of regional traffic growth and transport facility development are not yet been fully utilized. In other words, it is observed that regional transport investment required is very large and the resources available are too scarce of that is required to be invested. Hence, there is need to ensure that every investment is well planned for regional transportation and development. In this context, the policy makers and planners in charge of implementation must have the necessary concepts and models related to regional transport planning and development to ensure that every investment is put to the best use [85] [105].

1.1.2 The Present Study

In this study, transportation models were adopted for two reasons. The first one is to describe regional transport variables that we need to model and second is to utilize the models in some empirical application. The first can be observed by most researchers [85] [105] as useful and the second one is the true core of our interest for regional transportation investment and development. These models were empirically tested for Bharuch region of Gujarat state in India so as to incorporate and investigate the following issues.

i) Whether there is any relationship between regional road transportation and various activity development over space?

ii) What are the magnitudes of regional traffic volumes? Where do they originate from and the major final destinations? Are they likely to change? How? Are the regional traffic homogeneous?

iii) What are the current road transport capacities of each regional zones? Where and how to determine the future deficiencies in relation to anticipated traffic flow patterns?
iv) What are the possible alternative plans suggested? What will be its future conditions, benefits and impact?

v) How should the governments and non-government organisations efficiently allocate their resources in regional transportation investment and development?

In this study, therefore, an attempt is made to carry out a research to get the possible answers to these issues, in developing economies particularly India, as the existing resource endowment and activity development patterns in the regional economies are not in balance with the present transport facilities.

1.2.0 The Methodology Resolution of the Problem

In this study are have zoned Bharuch region into eleven internal and six external zones for the purpose of ease in data collection, modelling and analysis. This exercise has been carried out on the basis of homogeneous geographical locations in terms of landuse development patterns, population distribution, employment, service activities and urban centres that could attract and generate traffic zone-wise. Here, a cross-sectional relationship between zonal number of traffic generation and various activity development in the study year 1991 was modelled to examine the earlier propositions already established. We further modelled zone-wise total traffic matrix (17 x 17) of origin-destination (O-D) and obtained expected future transport requirements for the planning year 2041 in Bharuch region. This analysis is expected to reflect a wide range of alternative transport investment plans for regional transportation efficiency and development.

Thus, the present study proceeds through two methods of analysis:

i) Descriptive analysis of the various existing and future zone-wise land use development patterns, population distribution, activity categories, freight and passenger traffic generation and zonal transport development variables of Bharuch region. This analysis is carried out with the help of zone-wise secondary data collected from different census reports, road transport statistics, and economic reviews published by the institutions of the
concerned region as well as government organisations such as Gujarat State Road Transport Corporation (GSRTC) Bharuch Division (GSTC) and Non-governmental Organisations (NGO).

ii) Quantitative analysis: After the collection and assimilation of the required secondary data zonewise, some quantitative models such as regression and correlation analysis were applied in order to examine the relationship between zonal number of traffic generation and various activity development categories related to the study year 1991. In zonal land use transport modelling we adopted Lowry-Garin analysis model to identify Bharuch’s activity location allocation over space and consequently obtain zone-wise traffic volume matrix (17 x 17) expected for the planning year 2041 with 41 linkages in Bharuch region and outside zones. After obtaining the possible traffic volumes matrix for 2041. As shown in Appendix B the procedures for land use transport modelling has been carried out for calibration of the model and alternative plans expected at the end year 2041 and related impact on regional transport efficiency and economic development, was evolved.

Therefore, this study combines cross-sectional and O-D zonewise matrix analysis for Bharuch is expected regional traffic growth requirements and development covering the study year 1991 and the planning year 2041.

1.2.1 Mathematical Reasoning behind the Models

The models in this study represent real world system which involves the already established mathematical formulation, calibration and validation of road transport planning analysis expected in the future economic development and efficiency in developing countries with special reference to Bharuch regional systems. The conceptual origin of the models have been described and mathematical formulation of the problem in relation with regional transport planning variables are represented and analysed with available computer programmes. If the solutions of these models are not workable in the present study region then heuristic models will be provided, where the errors involved are not very high. As a result of this,
models are required so that they enable planners or policy makers to manipulate a number of regional policy alternatives without expensive experimentation on the real-world system and assess the effects of these alternatives expected on the regional transport development and efficiency. The need for such models arise because.

i) When the possible alternative solutions are obtained, "best" alternative plan must be selected and implemented. Since without implementation, the solutions are rendered useless.

ii) They investigate the makeup of existing and future transportation systems with respect to activity interaction patterns within the study region, to enable future policy analysis for efficiency and development.

iii) They have to be implemented by people who may not have exposure to sophisticated systems. In fact, the approach must clearly outline what type of data to gather, source of data, tailoring the data in the format, logic of the solution procedures, the nature of solutions, what the solutions signify, how they will be interpreted and what the course of action would be augmented.

1.3.0 Objectives of the Present Research

i) To critically study the recent concepts and models related to regional transport planning analysis and empirically test them, whenever feasible, for Bharuch region.

ii) To examine a cross-sectional relationship of different modes of road transport with respect to various regional activity development for the study year 1991 and confirm them with the earlier established proposition.

iii) To estimate the existing and future activity development patterns of movement of goods and passenger traffic expected at end year 2041.

iv) To determine a regional transport matrix that will be used to obtain existing and future feasible transport solutions for regional development and efficiency.
v) To formulate the alternative transport strategies to serve the future transport requirements of regional efficiency.

1.4.0 Limitations of the Study

The present study has been carried out with the view of the following limitations:

i) The study is confined to regional road transport modelling, planning and policy analysis with respect to integrated activity development patterns that could influence existing and future passenger and freight movement in the study region for future efficient alternative plans and development.

ii) The models adopted in this study are exclusively derived from the principles of urban transport planning analysis devised for developed countries with duemotifications. Otherwise there was no alternative in existence for developing economies to use.

iii) The sources of data and information in the study is exclusively built on secondary survey. Primary survey could not be undertaken due to finance and time constraints. Due to these constraints (finance and time) the present study could not be undertaken for Kenyan regions where the author belongs. Therefore, the study was carried out abroad. However, the procedures and principles of this study represent all regions in developing economies for future research.

1.5.0 The Organisation of the Study

This study starts with an introductory chapter (the present chapter) in which various theoretical aspects and propositions of the study problem have been highlighted as well as the methodology resolutions of the present problem are provided. This chapter has been intended to workout as a background base of the study.

Chapter II, contains the literature survey of the theoretical concepts of region and problems in transport investment of regional development relevant to this study.
Chapter III, includes the theoretical models to regional transport planning analysis and their viability for Bharuch regional transportation and decision making.

Chapter IV, contains a descriptive study of Bharuch's existing development patterns and related activity development over space zonewise. This chapter creates an environment for our empirical modelling and their contributions to regional planning and development in the subsequent chapters.

Chapter V, contains transport planning process in which delineation has been adopted to zone Bharuch's traffic zones and forecast of future transport planning patterns in terms activities.

Chapter VI, includes an attempt to study the empirical relationship on the determination of zonal traffic generation or attraction with respect to various activity development in Bharuch region. And this has been worked out with the help of a double logarithmic regression model. This chapter attempts to examine Mitchell and Raphin's hypothesis as stated in the earlier Chapter I (section 1.1.0) and theoretically discussed in Chapter III (section 3.2.0).

Chapter VII, contains land use transport models application in activity development location and allocation for Bharuch region and demand for transportation expected in the planning year 2041 of the study region. And this has been worked out with the help of Lowry-Garin solution model. This model has been theoretically discussed in chapter III (section 3.5.0) and empirically adopted in this chapter.

Chapter VIII, contains major findings made out of the study, and strategies recommended in order to achieve the expected regional transportation efficiency and development to be implemented by the authorities concern. Due to time constraint, the remaining part of this study is also included in this chapter as future research.