ANALYSIS OF DETERMINANTS OF TRAVEL MODE CHOICE BETWEEN PRIVATE AND PUBLIC TRANSPORTATION IN AIZAWL CITY

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CERTIFICATE

This is to certify that the thesis entitled ***"Analysis of Determinants of Travel Mode Choice between Private and Public Transportation in Aizawl city"*** submitted to the Mizoram University for the degree of Doctor of Philosophy in Economics, is a record of research work carried by Lalrinkimi Pachuau, Registration No. MZU/Ph.D/626 dated 20.05.2014, under my supervision and guidance.

This thesis is the result of her own investigation into the subject and to the best of my knowledge, the work as a whole or part has not been submitted elsewhere to confer any degree.

DECLARATION

I, Lalrinkimi Pachuau, hereby declare that the subject matter of this thesis is the record of work done by me, that the contents of this thesis did not form base of the award for any previous degree to me or to the best of my knowledge to anybody else, and that the thesis has not been submitted by me for any research degree in any other University/Institute.

This is being submitted to the Mizoram University for the degree of Doctor of Philosophy in Economics.

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I express my sincere thanks to all the authors of the books and journals I referred for my work. Their work helped me to carry out the research work with a better understanding.

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Date _____ LALRINKIMI PACHUAU

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MST	-	Mizoram State Transport

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Today about 80% of the world's population live in urban areas (UITP, 2005). Urbanization is taking place in the recent past at a rapid rate in India. Population residing in urban areas in India, according to 1901 census, was 11.4%. This count increased to 28.53% according to 2001 census, and crossing 30% as per 2011 census, and 31.16% of the Indian population live in urban areas (PTI, 2012) as of now. Public transportation (PT) plays an important role in achieving sustainability, efficient mobility and high quality of urban life.

Transport is a service seldom in demand for its own characteristics. In the last decades the levels of mobility have increased substantially all over the world. In essence, public transport and private car are the most important and remarkable transport modes to travel within the city. The private car has some advantages over public bus transport, as also do public bus over private cars. At present, several car manufacturing companies are producing very attractive cars for the people. On the other hand, government sectors are taking initiatives to encourage the people to use public buses. Thus, it is imperative to decide which transport mode should be promoted and encouraged through policy formulations.

Nowadays, many factors are related to choosing a particular mode of transportation .It is vital to understand the travel behavior and the reasons for choosing one mode of transport over another. However, travel behavior is complex and multidimensional. People consider the characteristics, advantages, disadvantages and costs of the different modes to make a trip. Moreover, the choice of one specific transport mode can vary over time, according to the type of journey and the nature of the destination. To meet the travel demand, many people use both public transport and personalized vehicles. In both stated preference and stated choice experiments, each combination of an attributes can be defined as an alternative in the sense of defining or representing a product of service specification or otherwise which may not figure as a choice variable.

Davidson (1973) and Louviere et.al. (1973) published a seminar paper in transportation which alerted us to the use of methods for evaluating an individual's response to combinations of levels of attributes of modes of transport which are not observed, but which represent achievable level of service. Wide spread interest in this

approach to travel behavior , however, was slow developing due to greater interest in the development of discrete choice models activity approaches to the study of the continuous sequences of human actions over a period of time (Hensher and Stopher 1979).Louviere and Hensher showed how a preference experiment (i.e. a number of alternative mixes of attributes) could be used further to include choice experiments in which an individual chooses from among fixed or varying choice sets.

The urban transport systems have an enormous impact on the way people travel. However, increased urbanization and population growth, urban expansion, dispersal of amenity and activity have increased the demand for and dependence on motorized transportation. Consequently, urban transportation problems like congestion, accidents, environmental degradation and urban sprawl have increased. Sustainable transport development plans are thus replacing the routine approach of building more roads to alleviate congestion with an integrated transport system which is affordable, space and resource-efficient, and minimizes environmental impacts and transport nuisances (Menckhoff, 2002). As a consequence, encouraging and improving public transport system in developing and the developed world has got wider attention and has become a central issue in transport planning.

1.2 SIGNIFICANCE AND SCOPE OF THE STUDY

Mode choice models have always formed a critical part in analyzing the travel demand of a study area. In the travel demand model, the choice is for the mode used for travelling between a particular origin zone and a particular destination zone. Discrete choice models offer the solution to study the modal choice when individuals have to select an option from a finite set of alternatives. The probability of individuals choosing a given option is a function of their socio-economic characteristics and the relative attractiveness of the option. The factors influencing the choice of a mode may be classified into three groups:

- Characteristics of the trip maker (his/her socio-economic characteristics, trip decisions, etc);
- Characteristics of the journey (purpose, time of day when the journey is made);
- Characteristics of the transport facility.

It is not unusual to observe different car ownership level among different countries or different regions within a country or state with similar income level. The difference of car ownership among regions with similar income levels may be explained in a number of ways. Gioliano and Dargay (2006), for example, compared the private vehicle ownership level between the US and the Great Britain, and suggested that difference in demographics, income and cost of private vehicle ownership and use between the two countries may explain the differences in travel as well as private vehicle ownership. Liu and Ingram (1999) observed the strong correlation between growth of vehicle ownership and road infrastructure. Population growth, urbanization along with economic development has also been identified as factors influencing car ownership by other researcher (Riley 2002). However, it is interesting to find out if our observation of such inconsistence between private vehicle ownership and income level can be supported by solid statistical evidence, and more importantly, to find out which factors account for the divergence of income impact, why these factors may differ from region to region within the same country, and how they interact to influence car ownership. In regards to private motor ownership; Factors that may reduce income effect may include costs and quality of public transport services, taxis, costs of car ownership, quality of road infrastructure.

The purpose of this thesis is to contribute to the understanding of how local public transport demand is affected by different factors. The focus of this study is to examine the cause of preference of public transportation over private or vice versa by passengers. Considering the increased use of public transportation by individuals and especially by those who also own private vehicles, it is important to understand what

causes this preference of one means over the other and the personal benefits involved with it.

The subject matter of this study pertains to the population of Aizawl city, Mizoram. The data is based on the usage of public or private transportation by individuals irrespective of their ownership of private vehicles. The sample includes respondents who are teachers, high school and college teachers taken separately, of all age groups, different educational backgrounds, as also different income levels who are mobile, belonging to Aizawl city and around.

The study examines only the demand side factors influencing travel decisions. The supply side aspects, relating to public transports are taken as given. A study of this kind is beneficial to many parties like the government in its policy implication and also to the private entities as it is directed towards reduced travel expense. Insight of the mechanisms of the travel decision process will benefit governments to formulate policies that better address consumer's needs in transport. The study will also enable public transport managers to understand their consumer's needs preference and psyche. Furthermore, since no study of this nature has been conducted for the city of Aizawl, the present study will contribute to the birth of a recorded empirical work. It will also lead to further, deeper, more significant research in the area.

1.3 REVIEW OF LITERATURE

A brief overview of the available literature is presented here though a detailed review of literature is presented in the second chapter. The literature review highlights the research gap and issues necessary to pursue the study further.

Theory provides the basis for conceptual models, consisting of the behavior of interest and the factors that explain that behavior, the ways in which these variables are defined, and the assumed relationships between them, that researchers use as an essential guide to their efforts. A cost benefit analysis could have been used. But instead, stated preference theory is applied as it serves a much more significant purpose in this particular field of study. Stated preference (Catherine Hakim, 2000)

techniques originate from the field of experimental economics and rely heavily upon the assumptions of economic rationality and utility maximization. The choices made by the respondents can be used to infer how they value different attributes. The origins of utility theory can be traced to the philosophy of utilitarianism dating back to Jeremy Bentham in 1789 (Hargreaves Heap, 1992). Bentham's concept of utility was defined in hedonic terms, by the pleasure that it produces (Kahneman, 1994). Others have interpreted utility as 'want ability' (Fisher, 1918). Kahneman(1994) suggests that: 'Economic analysis is more congenial to wants and preferences than to hedonic experiences, and the current meaning of utility in economics and decision research is a positivistic version of want ability utility is a theoretical construct inferred from observed choices.'

Fouracre, Maunder (1987) in their study 'Travel Demand characteristics in three medium sized Indian cities' who took into their study three Indian cities namely Patna, Vadodara and Jaipur aim to assess the extent to which travel behavior in medium sized cities of India is affected by the type of public transport system used. The main conclusions drawn were that while travel patterns are broadly similar in medium sized cities where the level of service of the public transport system is high; there is some evidence that small differences in trip making can be partly attributed to differences in public transport costs. Trip rates were shown to be highly dependent on the structure of the household. Other factors such as income and vehicle ownership have less influence. Household expenditure on public transport is largely influenced by household income, vehicle ownership and the cost of public transport.

Hensher and Louviere (1983) demonstrated the usefulness of experimental design procedures to help understand how attributes interact to influence choice; regarding individual's preferences for international fares. Results show that the leisure- related journeys tend, other things being equal, to yield additional utility as age increases, and non-leisure (business) travel tends to have relatively less utility as age increases.

Kockelman (1998) in his study evaluates several demand system based on flexible specifications of indirect utility, travel-related goods, linked to theory of maximum utilization. The results suggest that income has little effect on demand for discretionary activities and also indicate that total travel time expenditures fall with increasing travel times not just its income.

Danielis& Rotaris (1999) in their paper evaluated the use of the stated preference technique to analyze freight transport demand. The objective is to identify the contribution of the analysis of hypothetical data to the understanding of freight transport markets as opposed to the results obtained by using observed, revealed preference data. The studies show that different goods have different needs (and constraints) and that the attractiveness of rail use varies largely among regions and corridors. Operators are willing to switch to the rail service only if compensated with high freight discounts, with the exception of unitized exports.

Carlson (2003) analyzed the business passengers' mode choice behavior between Gothenburg and Stockholm in Sweden using stated preference survey. He has analyzed the willingness to pay for different attributes of the competing modes

Nurdden, Rahmat, Ismail (2004) in their study aimed to evaluate policies and strategies that can help to formulate, model shift of transportation mode from private car to public transportation and to predict the future model shift. The findings of this research can be concluded that the travel time, travel cost, distance of home to public transport and distance from home to work are contributing factors that influence the modal shift.

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Anderson and Stradling (2004) investigated attitudes towards car use and modal shift in Scotland using postal questionnaires. They identified the importance of convenience as a factor which influences transport mode choice. They also identified a divergence in "willingness" to change. They found that some people are able and willing to change transport modes, while others are less willing.

Uba (2005) in his study aimed to determine the major priorities (values) that lead to individual choice and decision to car ownership and to understand external factors (social and anthropological) that influence individual decisions to car ownership . The study findings suggest that individual as well as social factors combine to influence eventual decision to purchase and use cars. Individuals rationalize car consumption as a necessity. At the same time, the car for Lagos residents is imbued with social meanings that support its increased use. While residents appear to be aware of the unsustainable implications of this mode of consumption, they are skeptical of a better future for the overall transport and environmental situation of the city.

A study based on ten focus groups was conducted by Guiver (2007) to investigate opinions towards bus and car travel. He found a divergence between the attitudes of people who had firsthand experience of a transport mode and those without. Generally, buses were discussed by car drivers in terms of worst-case scenarios in which respondents focused on the intrusion of other people who appear to induce a sense of violation of integrity"(Guiver, 2007), p.237). In contrast, car drivers discussed cars as safe and private allowing the user to control the immediate environment. It was concluded that policy makers should focus on improving negative critical incidents as they are discussed more amongst users than everyday bus performance.

Park and Ha (2006) have analyzed the impact of opening the Korea Train Express between Seoul and Daegu on the air traffic demand. They have discussed several case studies on high speed railroads. It has been observed that the service variables are important when assessing transport services.

Ortuzar and Simonetti (2008) have estimated mixed stated and revealed preference models for analyzing the mode choice between airline and a fictitious high speed train between Santiago and Concepcion in Chile. The researchers conducted have been mainly on issues regarding environmental concerns on the use of private transport and also cost of travel and time.

Zurich (2008) in his study attempted to find out the factors influencing public bus transport demand and the role of monetary and non-monetary variables. The study

observed that there is a negative relationship between public bus transport demand and income, as also between private vehicle ownership and public bus transit demand. The most significant variable influencing demand was access to the public bus transport network, which was included as a variable describing the quality of service.

Anwar (2009) in his paper investigated the latent attitudes of the trip makers concerning modal choice between private car and public transport and the advantages and disadvantages of these two modes as a choice. He found out that sometimes, people use private cars because they do not have the true information about the use of public transport.

Badland, Garrett, Schofield (2010) in their study aimed at investigating the relationships between car parking, public transport, travel behavior, and health outcomes for adults. They found that work-related commuting appears to be a product in-part of convenience and accessibility constraints; when a public transport stop is proximal people are more likely to travel *via* that mode, whereas having car parking available at the worksite is positively associated with work-related car travel.

Mukala & Chunchu (2011) analyzed different models for the mode choice of commuters travelling between Guwahati and different metropolitan cities in India, using stated preference method. The results of the study indicated that travel time, income and travel cost play an important role in the mode choice decision for the inter-city transport and that woman are more sensitive to time and men are more sensitive to cost.

Buehler & Pucher (2012) gave a detailed analysis of public transport demand in Germany and the USA, using uniquely comparable national travel surveys from2001/2002 and 2008/2009 for both countries

The above review of literature highlights selected studies conducted on mode choice. The major issues raised in the selected studies are given as under:

- Trip rates were shown to be highly dependent on the structure of the household. Other factors such as income and vehicle ownership have less influence.

- Household expenditure on public transport is largely influenced by household income, vehicle ownership and the cost of public transport.

- Leisure- related journeys tend, other things being equal, to yield additional utility as age increases, and non-leisure (business) travel tends to have relatively less utility as age increases.

- Travel time, travel cost, distance of home to public transport and distance from home to work are contributing factors that influence the modal shift.

- Convenience is a factor which influences transport mode choice, as also a divergence in "willingness" to change. Some people are able and willing to change transport modes, while others are less willing.

- Individual as well as social factors combine to influence eventual decision to purchase and use cars. Individuals rationalize car consumption as a necessity.

- Car drivers regarded cars as safe and private allowing the user to control the immediate environment.

- Service variables are important when assessing transport services.

- Accessibility, environmental concerns, travel time, travel cost and income are contributing factors to mode choice.

From these various writings we can see that some of the authors have focused on prices, fares, environmental issues to use of private transport etc., and explored the subjects on transport demand.

1.4 STATEMENT OF THE PROBLEM

Last two decades have witnessed the dramatic increase in motor vehicles in Mizoram, especially in that of the urban regions of the state. A closer inspect on data can easily reveal that passenger vehicles, especially private passenger vehicles, are the major contributor to the growth of vehicle fleet. Indeed, the growth in vehicle fleet in the last two decades is accompanied by a sharp increase in the share of privately owned passenger vehicles among all passenger vehicles, and the share of passenger vehicles among private vehicles.

It is well established that income is the primary impetus to automobile ownership, and income is used as the only explanatory variable in many car ownership forecast models (e.g. Button *et al.* 1982; Dargay and Gately 1999; Dargay 2001). Mizoram also experienced rapid income growth during the last few years.

The choice of means of transportation, private vehicle or public transportation by individuals involves a study of the combination of different sciences such as psychology, socio-psychology, anthropology and economics. Several attributes such as convenience, safety, less stressfulness, reduced travel time, environmental concerns play a significant role in the consumer making rational choices .These overall preference factors are then decomposed into the perceived utility valuation associated with the attribute levels used to describe the travel alternatives and choice behavior. It is essential to understand the dynamics of means choice and the interplay of social factors, economic factors and personal characteristics that affect the final commuting decision by individuals.

Therefore, this study attempts to examine the factors influencing the mode choice, private or public in connection to means of transportation. The study also attempts to

understand the economic benefits of commuting by public transport as well as private vehicles; highlighting, which would benefit better the economic policies and undertakings of the state.

A fundamental premise of economic science is that if consumers are well informed, the stated preferences, and that their choices reflect individual's preferences. It is also possible to deduce from choice behavior, or from carefully phrased questions about preferences, whether transportation improvements or other public policy initiatives are socially desirable (Mc Fadden, 1997).

All the empirical studies mentioned above have on various dimensions of transport facilities particularly related to environmental concerns on private vehicle use, information asymmetry or rather the lack of information on public transportation and their benefits. Researchers on road transport have been done mainly on the need of substitution of private for public transport, related to transportation policy Nurdden et.al (2007), Nilsson & Kuller (2000) on environmental concerns, while some has focused merely on travel cost in terms of money use alone as Davies (2010). However, none of the research works has focused on both the extent of demand or supply issues of the people choosing public transport over private transport or vice-versa, as well as the factors determining the choice of means of transport in terms of personal benefits related to public transportation users in and around the city of Aizawl. These research gaps have become the basis of this study. There arises a need to analyze whether demand side or supply side variables determine the mode choice of the people of Aizawl in this study, where the interest of study is on public transport means – buses, taxis, etc users over private vehicles.

1.5 OBJECTIVES OF THE STUDY

The objectives of the study are as presented below:

1) To identify the most commonly used mode of transportation of the people in and around the city of Aizawl (with reference to High School and college Teachers).

2) To find out the mode choice of the people of Aizawl city (with reference to High School and college Teachers) – the preferences of either public over private transportation or vice versa.

3) To analyze the factors affecting the preferences of public or private transports- the study attempts to understand the influence of various social, economic and personal factors that influence travel choice of passengers.

4) To examine the nature and extent of the use of public transportation Vis-à-vis private transportation in and around Aizawl city.

1.6 RESEARCH DESIGN AND METHODOLOGY

This study is exploratory and descriptive in nature. It describes characteristics of the population or phenomena under study.

1.6.1 Sources of data:

Primary data is used to obtain information on the individual's choice towards the means of transportation used. It will be obtained through a structured questionnaire survey method through a *random sampling* approach which had been chosen and used to insure the adequate representation. This is to attain a sample representative of the travel behavior of population of the study area. In order to determine the sample size, the applied method was set to accept an error of about 5percent and confidence level of 95 percent. The sample size also depends on nature of units, population and study, number of variables, groups and sub-groups to be studied, intended depth of analysis, precision and reliability of results required, level of expected non- response, size of questionnaire and population and available resources randomly administered among public transportation Users in and around the city of Aizawl. The data collected from the surveys was categorized on the basis of traveler type, i.e. mode choice and mode captive users. The total sample size is further affected by the total number of choice scenarios and the number of choice alternatives in a given scenario .Considering the above factors, a sample size of 240 is drawn using purposive sampling method, the focused group being High School and College Teachers.

The study drew from various secondary sources including state and government data sources which includes-

- Department of Economics and Statistics, Government of Mizoram

- Central Library, Mizoram University

- Census of India

Various books, journals and magazines were also consulted in relations to specific topics within the purview of this research.

1.6.2 Tools of analysis:

This study analyzes data using econometric tools. It used descriptive statistics to show relationships between different variables and also to describe the variables. This discrete choice model is based on the framework developed by McFadden (1973) under the assumption that the decision maker maximizes her/his expected utility function, which is characterized by Gumbel's distributed random errors. Charts and tables will be used to enhance presentation of findings. A Logit model of regression fulfilled the structure and necessary information is extracted. On the basis of this information, the analysis and interpretation is made. The present paper wishes to contribute to a better understanding of the role played by these factors by an analysis of a stated preference experiment conducted with the population of Aizawl.

1.6.3 Important variables used in the study

The study consists of dependent and independent variables as given:

The dependent variable is choice of means of transportation.

The independent variables included gender, time issue (bus service time and time of travel), comfort level (security, comfort and independence of private vehicle, crowdedness of bus and likeness for driving), accessibility and flexibility (inconvenience due to access distance of bus stops, public transportation networks limitations), cost saving (taxi fares),accessibility and flexibility (inconvenience due to access distance of bus stops, public transportation networks limitations), and lastly other factors, given as others for the respondents to specify.

1.7 CHAPTERIZATION

The remainder of the study is divided as below:

CHAPTER I: Introduction

The first chapter gives the introduction of the entire research. This includes the statement of the problem, a brief history of the subject.

CHAPTER II: Literature Review

The second chapter provides the framework of the study and different works conducted by past researchers on the study of transportation and its related topic.

CHAPTER III: Background of Mizoram's Transport System and Overview of the socio-economic profile of Mizoram

The third chapter deals with the background which is a detailed discussion of transportation related issues. This is viewed with special reference to urban Mizoram and randomly selected population of commuters in the city of Aizawl. It includes the introduction and context for the present study.

CHAPTER IV: Mode Choice, Analysis of the factors affecting preferences.

The fourth chapter presents a descriptive analysis of the various variables used in the study thus revealing the empirical results to satisfy the earlier mentioned objectives.

CHAPTER V: Analysis of the changing mode of transportation

CHAPTER VI: Conclusion and Findings and Suggestions

This chapter summarizes the study, outlines concluding observations and evaluates the policy implications that can be drawn from the study.

CHAPTER 2

REVIEW OF LITERATURE

2.1 INTRODUCTION

Transport is part of the daily rhythm of life. Mobility is a fundamental human activity and need, but is restricted by the friction of distance. As a complex industry in terms of land use, employment and functions, transport is a major factor interlinked with the environment and with the spatial distribution and development of all other forms of economic and social activity. Economic theories, methods and perspectives contribute significantly towards an understanding of transport and their eventual solution. An attempt has been made in this study to examine and analyze the nature of shift of privately owned vehicles and government owned vehicles in Mizoram, especially with reference to Aizawl city. The shift pertaining to government owned vehicle; the shift in the nature of vehicles on road, an increase or decrease. The study traced the growth/decline trend line of registered vehicles on road over a period of ten years given the influence of the economic environment- taxes and transport policies etc. The study also traced the trend line growth/decline in revenue collected through the Mizoram State Transport system over the years, questioning gains from the Mizoram Transport Department, productivity and influence of Government and economic policies.

2.2 THEORY

Theory provides the basis for conceptual models, consisting of the behavior of interest and the factors that explain that behavior, the ways in which these variables are defined, and the assumed relationships between them, that researchers use as an essential guide to their efforts. A cost benefit analysis could have been used. But instead, stated preference theory is applied as it serves a much more significant purpose in this particular field of study. Stated preference (Catherine Hakim,2000) techniques originate from the field of experimental economics and rely heavily upon the assumptions of economic rationality and utility maximization. The choices made by the respondents can be used to infer how they value different attributes. The origins of utility theory can be traced to the philosophy of utilitarianism dating back to Jeremy Bentham in 1789 (Hargreaves Heap, 1992). Bentham's concept of utility was defined in hedonic terms, by the pleasure that it produces (Kahneman, 1994). Others have interpreted utility as 'want ability' (Fisher, 1918). Kahneman(1994) suggests

that: ‘Economic analysis is more congenial to wants and preferences than to hedonic experiences, and the current meaning of utility in economics and decision research is a positivistic version of want ability utility is a theoretical construct inferred from observed choices.’

2.3 MODE CHOICE

Hensher and Louviere (1983) demonstrated the usefulness of experimental design procedures to help understand how attributes interact to influence choice; regarding individual’s preferences for international fares. Results show that the leisure- related journeys tend, other things being equal, to yield additional utility as age increases, and non-leisure (business) travel tends to have relatively less utility as age increases.

Barf, Mackay, Olshavsky (1982) in their work “A selective review of travel-mode choice models” highlighted the major advances in mode-choice modeling. Several developmental trends were identified concerning the specification of the travel-time and travel-cost variables, the specification of consumer variables, and model construction. Use of cognitive and behavioral variables also was discussed.

Fouracre, Maunder (1987) in their study ‘Travel Demand characteristics in three medium sized Indian cities’ who took into their study three Indian cities namely Patna, Vadodara and Jaipur aim at assessing the extent to which travel behavior in medium sized cities of India is affected by the type of public transport system used. The main conclusions drawn were that while travel patterns are broadly similar in medium sized cities where the level of service of the public transport system is high; there is some evidence that small differences in trip making can be partly attributed to differences in public transport costs. Trip rates were shown to be highly dependent on the structure of the household. Other factors such as income and vehicle ownership have less influence. Household expenditure on public transport is largely influenced by household income, vehicle ownership and the cost of public transport.

Madan,Groenhout(1987) through their work" Modelling Travel mode Choices for the Sydney work trip" developed a mode choice model explaining the binary split of travel to work by private car or public transport. Non-linear transformations in an important explanatory, employment density at place of work, were used to improve model performance for trips to high density zones. Correlations between utilities were permitted, and observed to be significant at around 0.75.

Kockelman (1998) in his study evaluates several demand system based on flexible specifications of indirect utility, travel-related goods, linked to theory of maximum utilization. The results suggest that income has little effect on demand for discretionary activities and also indicate that total travel time expenditures fall with increasing travel times not just its income.

Danielis& Rotaris (1999) in their paper evaluated the use of the stated preference technique to analyze freight transport demand. The objective is to identify the contribution of the analysis of hypothetical data to the understanding of freight transport markets as opposed to the results obtained by using observed, revealed preference data. The studies show that different goods have different needs (and constraints) and that the attractiveness of rail use varies largely among regions and corridors. Operators are willing to switch to the rail service only if compensated with high freight discounts, with the exception of unitized exports.

Nilsson, Kruller (2000) in their work "travel behavior and environmental concern" aimed to apply concepts from models of attitudes and pro-environmental behavior on private car driving in an urban environment and also to compare environmental attitudes and knowledge of people living in areas with high respectively low levels of traffic pollution. It was found that when it comes to environmental impact caused by actual behavior, it was more dependent on the individual's background and resources.

Carlson (2003) analyzed the business passengers' mode choice behavior between Gothenburg and Stockholm in Sweden using stated preference survey. He has analyzed the willingness to pay for different attributes of the competing modes

Anderson and Stradling (2004) investigated attitudes towards car use and modal shift in Scotland using postal questionnaires. They identified the importance of convenience as a factor which influences transport mode choice. They also identified a divergence in "willingness" to change. They found that some people are able and willing to change transport modes, while others are less willing.

Nurdden, Rahmat, Ismail (2004) in their study "Effect of transportation policies on Modal Shift from Private Car to Public Transport in Malaysia" aimed to evaluate policies and strategies that can help to formulate, model shift of transportation mode from private car to public transportation and to predict the future model shift. A survey was carried out on users of private and public (both bus and urban train transport) (n=1200). A binary logit model was developed for the three alternative modes, car, bus and train. This study found that age, gender, car ownership, travel time, travel cost, household size and income are significant factors in influencing the individual's choice of transportation. The findings of this research can be concluded that the travel time, travel cost, distance of home to public transport and distance from home to work are contributing factors that influence the modal shift.

Johanssons, Heldt (2005) in their study "Latent variables in a Travel Mode Choice: Attitudinal Behavioral Indicator variables" used survey data to construct and test the significance of five individual specific latent variables – environmental preferences, safety, comfort, convenience and flexibility - postulated to be important for modal choice. Whereas the construction of the safety and environmental preference variables is based on behavioral indicator variables, the construction of the comfort, convenience and flexibility variables is based on attitudinal indicator variables. Their main findings were that the latent variables enriched discrete choice model outperforms the traditional discrete choice model and that the construct reliability of the "attitudinal" latent variables is higher than that of the "behavioral" latent variables. Important for the choice of travel mode are modal travel time and cost and the individual's preferences.

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Uba (2005) in his study aimed to determine the major priorities (values) that lead to individual choice and decision to car ownership and to understand external factors (social and anthropological) that influence individual decisions to car ownership . The study findings suggest that individual as well as social factors combine to influence eventual decision to purchase and use cars. Individuals rationalize car consumption as a necessity. At the same time, the car for Lagos residents is imbued with social meanings that support its increased use. While residents appear to be aware of the unsustainable implications of this mode of consumption, they are skeptical of a better future for the overall transport and environmental situation of the city.

Park and Ha (2006) have analyzed the impact of opening the Korea Train Express between Seoul and Daegu on the air traffic demand. They have discussed several case studies on high speed railroads. It has been observed that the service variables are important when assessing transport services.

A study based on ten focus groups was conducted by Guiver (2007) to investigate opinions towards bus and car travel. He found a divergence between the attitudes of people who had firsthand experience of a transport mode and those without. Generally, buses were discussed by car drivers in terms of worst-case scenarios in which respondents focussed on the intrusion of other people who appear to induce a sense of violation of integrity (Guiver, 2007).In contrast, car drivers discussed cars as safe and private allowing the user to control the immediate environment. It was concluded that policy makers should focus on improving negative critical incidents as they are discussed more amongst users than everyday bus performance.

Ortuzar and Simonetti (2008) have estimated mixed stated and revealed preference models for analyzing the mode choice between airline and a fictitious high speed train between Santiago and Concepcion in Chile. The researchers conducted have been mainly on issues regarding environmental concerns on the use of private transport and also cost of travel and time.

Zurich (2008) in his study attempted to find out the factors influencing public bus transport demand and the role of monetary and non-monetary variables. The study

observed that there is a negative relationship between public bus transport demand and income, as also between private vehicle ownership and public bus transit demand. The most significant variable influencing demand was access to the public bus transport network, which was included as a variable describing the quality of service.

Anwar (2009) in his paper investigated the latent attitudes of the trip makers concerning modal choice between private car and public transport and the advantages and disadvantages of these two modes as a choice. He found out that sometimes, people use private cars because they do not have the true information about the use of public transport.

Badland, Garrett, Schofield (2010) in their study aimed to investigate the relationships between car parking, public transport, travel behavior, and health outcomes for adults. They found that work-related commuting appears to be a product in-part of convenience and accessibility constraints; when a public transport stop is proximal people are more likely to travel *via* that mode, whereas having car parking available at the worksite is positively associated with work-related car travel.

Imran & Chayne (2010) in their study " Attitudes and behavior in relation to Public Transport in New Zealand's non- metropolitan regions revealed considerable diversity in people's travel needs , but also some similar experiences in terms of lack of choice and difficulty using the extremely limited alternatives to private vehicles. As a result of these difficulties and the generally poor quality of infrastructure and service, public transport was often viewed very negatively. However, people often willingly shared transport (e.g. families transporting children from more than one household to children's activities; people sharing a vehicle to travel to work outside the town; patients using a health shuttle) because of the economic (and other) benefits. This suggested that there was scope to promote shared and flexible transport. This research has highlighted the need for better understanding of the travel behavior and the wider social and economic needs of residents of rural areas. In addition, it draws attention to the benefits that would be gained from improving transport services between rural and urban areas. Social exclusion and socio-economic disadvantage are likely to be exacerbated by entrenching dependence on private transport. With an

ageing population, there is likely to be growing demand for, and potential to operate, flexible transport services that offer a range of solutions to transport disadvantage. As well as meeting the needs of an ageing population, such services would provide benefits for the working age population, especially those who need to travel from rural to urban areas. Furthermore, the viability and vitality of small towns could be enhanced through developing a transport system that is matched with resident's needs and overcomes any residual resistance to public transport.

Mukala & Chunchu (2011) analyzed different models for the mode choice of commuters travelling between Guwahati and different metropolitan cities in India, using stated preference method. The results of the study indicated that travel time, income and travel cost play an important role in the mode choice decision for the inter-city transport and that woman are more sensitive to time and men are more sensitive to cost.

Buehler & Pucher (2012) gave a detailed analysis of public transport demand in Germany and the USA, using uniquely comparable national travel surveys from2001/2002 and 2008/2009 for both countries

The above review of literature highlights selected studies conducted on mode choice. The major issues raised in the selected studies are given as under:

- Trip rates were shown to be highly dependent on the structure of the household. Other factors such as income and vehicle ownership have less influence.

- Household expenditure on public transport is largely influenced by household income, vehicle ownership and the cost of public transport.

- Leisure- related journeys tend, other things being equal, to yield additional utility as age increases, and non-leisure (business) travel tends to have relatively less utility as age increases.

- Travel time, travel cost, distance of home to public transport and distance from home to work are contributing factors that influence the modal shift.

- Convenience is a factor which influences transport mode choice, as also a divergence in "willingness" to change. Some people are able and willing to change transport modes, while others are less willing.

- Car drivers discussed cars as safe and private allowing the user to control the immediate environment.

- Accessibility, environmental concerns, travel time, travel cost and income are contributing factors to mode choice.

2.4 Concluding remarks:

- From these various writings we can see that some of the authors have focused on prices, fares, environmental issues to use of private transport etc., and explored the subjects on transport demand. Trip rates were shown to be highly dependent on the structure of the household. Other factors such as income and vehicle ownership have less influence. Household expenditure on public transport is largely influenced by household income, vehicle ownership and the cost of public transport.Leisure- related journeys tend, other things being equal, to yield additional utility as age increases, and non-leisure (business) travel tends to have relatively less utility as age increases. Travel time, travel cost, distance of home to public transport and distance from home to work are contributing factors that influence the modal shift.Convenience is a factor which influences transport mode choice, as also a divergence in "willingness" to change. Some people are able and willing to change transport modes, while others are less willing.Individual as well as social factors combine to influence eventual decision to purchase and use cars. Individuals rationalize car consumption as a necessity.Car drivers discussed cars as safe and private allowing the user to control the immediate environment.Service variables are important when assessing transport services.

CHAPTER 3

BACKGROUND OF MIZORAM'S TRANSPORT SYSTEM AND OVERVIEW OF THE SOCIO-ECONOMIC PROFILE OF MIZORAM

3.1 Introduction

It is a matter of great academic interest to undertake an analysis of the status and position of the Mizoram State Transport System, which will help us in the study of the working of the State's transportation system as a whole and its contribution to the Economy in general. The status of the state's transportation System is mainly obtained from the data as collected through various sources as the Encyclopedia of Mizoram and The Mizoram Statistical Handbook.

The chapter is thus broadly divided into two parts. The first section shows an overview of the socio-economic profile of Mizoram, so that a better understanding of Mizoram as a State and an Economy is presented. The second section focuses on the background and status of The Mizoram State Transport System.

3.2 Socio-Economic Profile of Mizoram

3.2.1 Topography:

The topography of Mizoram is not very different from its other north eastern neighbors. Mizoram topography is conspicuous with the presence of hills and mountain ranges. The tall green hills are molted with free flowing rivers. The eastern side of the state is situated at higher altitude than the western side of the state. The average height of the Mizoram hills is approximately 900 meters. The tallest among the hills is the Phawngpui- Blue Mountain with a height of 2210 meters. (Encyclopedia of Mizoram, pp.36) Mizoram is situate between 21°58' N to 24°35' N latitude and 91°15' E to 93°29' E longitude covering an area of 21,081 sq.km. The length of the state from north to south is 277km and the width from east to west is 121 km. Mizoram is flanked by Manipur state and Cachar District of Assam in the north, Chin Hills of Myanmar in the east, Chittagong Hills of Bangladesh and Tripura state in the west and on the south Arakan Hills of Myanmar. Mizoram shares its borders over a stretch of 123 km with Assam, 66 km with Tripura and 95 km with Manipur. The international border with Bangladesh extends over 318 km and over 404 km with Myanmar.

The hill slope are steep and are separated by rivers which flow either towards the north or to the south creating deep gorges in between the hill ranges.

3.2.2 Climate:

Mizoram enjoys a pleasant climate. It is generally cool in summer and not very cold in winter. During winter, the temperature varies from 9°C to 21°C and in summer it varies between 21°C to 30°C. From the Bay of Bengal, the southwest monsoon visits the state around May, lasting up to September. The annual rainfall is fairly heavy and distributed evenly, and the average annual rainfall of Mizoram is 2500 mm. Thunderstorm with heavy downpour during April to May is common (Encyclopedia of Mizoram, pp.464).

The upper part of the hills is, predictably cold, cool during the summer, while the lower reaches are relatively warm and humid. Storms break out during march-April, just before or around the summer. The four months between November and February are winter in Mizoram which is followed by the spring. The storms come in the middle of April to herald the beginning of the summer. The mercury starts rising and the hills come under the cover of a haze. The three months from June to August are known as the rainy season. The climate is at its moderate best in the two autumnal months, September and October, when the temperature moves between 19 to 24 centigrade degree Celsius.

3.2.3 Demography:

The original racial stock in Lushai Hills was Mongoloid or Tibeto Burman origin. The "Lushai" the principal tribe invaded this territory in early 19th century. "Sailo" is the principal clan amongst the Lushais. The Mizo Society has maintained its ethno-cultural values and is highly organized and disciplined (Encyclopedia of Mizoram).

3.2.4 Languages

Mizo is the official language and the most widely used language for verbal interactions, but English, being important for education, administration, formalities and governance, is widely used. The Duhlian dialect, also known as the Lusei, was the first language of Mizoram and has come to be known as the Mizo language. The language is mixed with other dialects like the Hmar, Mara, Lai, Paite, Gangte, etc. Christian missionaries developed the Mizo script. Writing is a combination of the roman script and hunterian transliteration methodology with prominent traces of a phonetics-based spelling system. There are 25 letters in the alphabet: a, aw, b, ch, d, e, f, g, ng, h, i, j, k, l, m, n, o, p, r, s, t, Ṭ, u, v, z. Mizo is one of the languages with official status in India (at the state level). Hindi is a compulsory subject for all students up to eighth standard and has a growing usage.

3.2.5 Religion in Mizoram:

The main religion in Mizoram is Christianity. The religion of Christianity plays an important role in shaping the socio-cultural life of the people of the State. The people of this state are strong followers of Christianity. The majority of population is Protestants. One of the significant aspects associated with the Christian religious group of Mizoram is the Mizoram Churches. The Christian often make huge donations to these churches. The popularity of the Christian religion in Mizoram can be understood from the statistical fact that about 83.81 % of the total population of the State in the year 1981was Christian by faith. The denominations of Mizoram church include many different groups like the United Penticostal, Welsh Presbyterian, Seventh - day Adventist, Salvation Army, London Baptist, Roman Catholic, Sabbath Church and also the sects created by the Jews and other cult leaders. Each denomination has a separate clergy. There are also some other religious groups in Mizoram, which can be termed the minority religious groups. The people of these groups follow the religions of Buddhism, Judaism, Hinduism and Islam. An important fact about the Jew population of Mizoram is that about half of the total Jew population of Indian lives in the state (Encyclopedia of Mizoram).

3.2.6 Cultural and Historical Background:

Mizoram was inhabited by the tribal groups of Tibeto- Burmese race. During the period 1750-1850 migrations led to settlements in the hills. The tribal groups were governed under a hereditary chieftainship. The Lushais are the most predominant tribe besides a few others like Pawi, Lakher, Chakma, Riang. Agriculture is the main occupation of this region. During the British period, Mizoram became a part of the territory of the British India in 1891though the administration of the villages was left to the local chieftains. The influence of the British also lead to mass conversion into Christianity. After independence of India, Mizoram continued to be part of Assam. In 1966 the Mizos resorted to the use of armed struggle to put forth their demands to set up a homeland. It was in 1986 that peace was established and Mizoram joined the main stream with the Indian Union (Encyclopedia of Mizoram).

3.2.7 People:

The inhabitants of Mizoram are known by the generic name of Mizo, which literally means people (mi) of the hills (zo). There are a number of separate tribes under the general ethnic broad group of Mizo. Mizos included the following tribes- Ralte, Paite, Dulien, Poi, Sukte, Pankhup, Jahao, Fanai (Molienpui), Molbem, Taute, Lakher, Dalang, Mar, Khuangli, Falam (Tashous), Leillul and Tangur(Encyclopedia of Mizoram).

Historians believe that the Mizos are a part of the great wave of the Mongolian race spilling over into the eastern and southern India centuries ago. Their sojourn in western Burma, into which they eventually around seventh century, is estimated to last about two centuries. They came under the influence of the British missionaries in the 19th century, and now most of the Mizos are Christians. One of the beneficial results of missionary activities was the spread of education. The missionaries introduced the roman script for the Mizo language and formal education. The cumulative result is high percentage 95 % (as per national sample survey 1997-98) which is considered to be highest in India. The Mizos area distinct community and the social unit was the village. Around it revolved the life of a Mizo. Mizo village is usually set on the top of a hill with the chief's house at the centre and the bachelor’s dormitory called zawlbuk, prominently. In a way the focal point in the village was

the zawlbuk where all young bachelors of the village slept. Zawlbuk was the training ground, and indeed, the cradle wherein the Mizo youth was shaped into a responsible adult member of the society**.**

3.2.8 Mizoram ethnicity:

Mizoram ethnicity comprises a variety of social elements like the different tribal groups, religions, rituals and festivals. The people of this region have kept alive their age-old socio-cultural lineage. Their colorful and bright clothes and traditional customs are still in use at this hilly part of India. The state of Mizoram has a number of ethnic groups, which constitute the basic structure of Mizoram society. The names of the major ethnic groups of the state are Pawis, Lushais, Raltes, Paihtes, Hmars, Maras,Pangs and Kukis. One of the fascinating aspects of Mizoram ethnicity is their ethical code. The focus of the ethical code of the Mizos is the *tlawmngaihna*. This term implies that each person who belongs to this is cordial, helpful, soft-hearted and sociable. The ethnic character of Mizoram is clearly felt in the dances and festivals of the region (Encyclopedia of Mizoram).

The diversity of tribal groups reflects the historical immigration patterns. Different tribes and sub-tribes arrived in the present Mizoram, in successive waves and settled down in different parts of the state. Further, as they arrived, there were raids, fear of raids and inter-tribal feuds. The resulting isolation and separation created numerous tribes and sub-tribes. The Mizo people usually suffix their descriptive given names with their tribe.

Other than tribal groups, other ethnic groups inhabit Mizoram. For example, Nepal (Gorkhas) were encouraged to settle in Aizawl area and other parts of Mizoram during the British colonial times. Thousands of their descendants are now residents of Mizoram.

3.2.9 Social life:

The fabric of social life in the Mizo society has undergone tremendous changes over years. Before the British moved into the hills, for all practical purposes the village and the clan formed units of Mizo society. The Mizo code of ethics or dharma moved around '*tlawmngaihna*", an untranslatable term meaning on the part of everyone to be hospitable, kind, unselfish and helpful to others. Tlawmngaihna to Mizo stands for the compelling moral force which finds expression in self-sacrifice for the service of the others. The old belief, Pathian is still used in term of God till today. The Mizos have been enchanted to their new-found faith of Christianity with so much dedication and submission that their entire social life and thought-process underwent transformation as guided by the Christian church organization and their sense of values has also undergone drastic change. The Mizos are a close-knit society with no class distinction and no discrimination on grounds of sex. Ninety per cent of them are cultivators and the village exists like a big family. Birth of a child, marriage in the village and death of a person in the village or a community feast arranged by a member of the village are important occasions in which the whole village is involved **.**

3.2.10 Economy of the state:

The economy of Mizoram is largely dependent on agriculture. The agrarian economy accounts for the livelihood of more than 70% of the state's populace. The craggy hilly terrains are not conducive to cultivation of crops. However, a regular distribution rainfall for the whole year through and the fertile temperate soils has resulted in the springing up of dense forests enveloped in lush foliage. In spite of the rugged terrains, the favorable climatic conditions and the rich soil have led to extensive jhum cultivation in the state. Horticultural crops are grown for economic purposes. Agriculture forms the primary sector in the economy of Mizoram. Thus all subsidiary industries also happen to be agro-based. Mizoram houses a small repository of minerals. Thus mining also contributes to a small part of the economy. In fact, majority of the mines in Mizoram dig up the hard tertiary rocks that are used as building materials. A large number of small scale industries that sell exquisite bamboo works as well. As handlooms made apparels also contribute to the state's economy (Encyclopedia of Mizoram, pg 76).

Mizoram gross state domestic product (gsdp) in 2011-2012 was about 6991 crore (us$1.1 billion). The state's gross state domestic product (gsdp) growth rate was nearly 10% annually over 2001-2013 period. With international borders with Bangladesh and Myanmar, it is an important port state for Southeast Asian imports to India, as well as exports from India.

The biggest contributors to state's gross domestic product growth are agriculture, public administration and construction work. Tertiary sector or service sector continued to have the largest contribution to the gsdp with its share hovering between 58 per cent and 60 per cent during the past decade.

As of 2013, according to the reserve bank of India, 20.4% of total state population is below poverty line, about same as the 21.9% average for India. Rural poverty is significantly higher in Mizoram, with 35.4% below the poverty line compared to India’s rural poverty average of 25.7; while in urban areas of Mizoram, 6.4% are below the poverty line.

Mizoram has a highly literate work force, with literacy rate of nearly 90% and widespread use of English. The state has a total of 4,300 kilometers of roads of which 927 kilometers are high quality national highways and 700 kilometers of state highways. The state is developing its kolodyne river for navigation and international trade. Mizoram's airport is at the capital city of Aizawl. The state is a power deficit state, with plans to develop its hydroelectric potential. After agriculture, the major employer of its people includes handloom and horticulture industries. Tourism is a growing industry. In 2008, the state had nearly 7,000 registered companies. The state government has been implementing special economic zones (sezs) to encourage economic growth.

3.2.11 Political and Administration:

The Mizoram state legislative assembly has 40 seats and the village councils are the grassroots of democracy and leadership in Mizoram. The state has a chief minister, council of ministers with a portfolio of ministries responsible for different priorities and role of the government.

There are three autonomous district councils (adcs) for ethnic tribes in Mizoram, namely Chakma autonomous district council (in the southern part of state, bordering Bangladesh), Lai autonomous district council (ladc) for Lai people in southern part of the state, and Mara autonomous district council (madc) for Mara people in the southern-eastern corner.

There are eight districts in Mizoram. A district of Mizoram is headed by a deputy commissioner who is in charge of the administration in that particular district. The deputy commissioner is the executive head of the district, responsible for implementing government regulations, the law and order situation in the district, as well as being responsible for tax collection for the government. A superintendent of police is responsible for the police administration of each district. These officials work with the village councils in each .

.3.2.12 Districts of Mizoram

When Mizoram became a union territory on 21 January 1972, it was divided into three districts: Aizawl, Lunglei and Chhimtuipui. Later five more districts were carved out of the erstwhile three districts. Mizoram has a total of 8 districts. A district of Mizoram is headed by a deputy commissioner who is over all in-charge of the administration in that particular district. He has to perform triple functions as he holds three positions: at once he is the deputy commissioner, the district magistrate and the collector. As a deputy commissioner he is the executive head of the district with multifarious responsibilities. As the district magistrate he is responsible for maintaining the law and order situation in the district. As the collector he is the chief

revenue officer of the district, responsible for revenue collection and recovery. The police administration in the district is under the control of superintendent of police (sp). To decentralize the authority in administrative setup, a district is divided into one or more subdivisions, further divided into thesis and blocks (Encyclopedia of Mizoram). The districts of Mizoram reflect the unique traditional heritage and cultural ancestry of the region that has percolated to the modern era from the ancient times. Easily accessible by roads, the eight districts of Mizoram are well connected by good roads, railways and air. The state government of Mizoram takes special measures to develop the backward regions of the districts. Headed by experienced ministers and administrative officials, the districts of Mizoram have helped to raise the standard of living.

Champhai:

Champhai district of Mizoram covers a total area of 3186 sq.km. The district of Champhai holds a total population of 1, 01,389, according to the census of 2001. Champhai is a commercial town located near Myanmar border, 194 kms from Aizawl. Set on an altitude of 1678 meters, the town overlooks a patch of flat land which happens to be the largest plain area in the state and also commands a good view of the adjoining hill ranges of Myanmar from which the forefathers of the Mizos immigrated ages ago. The breezy hills around here are lush and strewn with beautiful rhododendron blossoms. Within a few kilometers away are some villages of historical significance where the age-old Mizo way of life is still preserved. The town is 27 kms from zokhawthar, the border township through which the indo-Myanmar trade is being conducted and hence Champhai is an ideal shopping place for various imported goods. The town is also a convenient base for trekking and visiting landmarks and historical places in the vicinity including rih dil, the legendary lake located 5 kms within Myanmar which is associated with the Mizo animist religion of yore. (Encyclopedia of Mizoram). Popularly referred to as the Rice Bowl of the state of Mizoram, Champhai earn its revenues from the agricultural products. (Encyclopedia of Mizoram). Blessed with the natural splendor, Champhai attracts several tourists from far and wide who are enthralled with the captivating sight of the place (Encyclopedia of Mizoram).

Aizawl: Aizawl is the most important administrative district of Mizoram with its headquarters located at Aizawl city. The district is situated between the Tlawng river valley in the west and Tuirial river valley in the east. The district is home to the Mizo tribes who are said to have migrated from Myanmar's chin hills 300 years ago. Aizawl, the capital city of Mizoram is the political, commercial, educational and cultural hub of the state. Today it houses all important government offices, the state assembly house and the civil secretariat. It also offers some worth visiting spots including some beautiful churches and markets (Encyclopedia of Mizoram). Spread over a total area of 3576sq.km, Aizawl is administratively divided into three major subdivisions of Sakawrdai SDO (S), Saitual SDO (S) and Aizawl SDO (S).The important towns of the district of Aizawl are Aibawk, Saitual, Darlawn, Aizawl, Phullen and Tlangnuam.the district of Aizawl is easily accessible by road and air. The well maintained roads of the district connect it with the rest of the state of Mizoram. The district of Aizawl has 59.49 % of the forest area. Aizawl boasts of a vast resource of minerals of limestone, coal and crude oil which has helped to strengthen the economic base of the state of Mizoram. By air: Aizawl, the capital of Mizoram is connected to Kolkata, (1 hr),Imphal (30 min) and Guwahati with regular/weekly flights. Indian airlines and some private airlines operate flights to/from Aizawl on weekly basis.The nearest railhead is Silchar (Assam) about 184 km away from Aizawl. National highway no. 54 connects Aizawl with rest parts of the country via Silchar. Buses and taxis are available from Silchar to Aizawl (6-8 hrs). Night bus services are also available. Aizawl is also accessible by road from Shillong and Guwahati. Aizawl is 506 km from Guwahati by road .

Kolasib:

One of the prominent districts of Mizoram, Kolasib encompasses a total area of 1383 sq.km. Kolasib is an administrative district of Mizoram with its headquarters located at Kolasib town. There are some worth visiting sites in and around the district which include Dampa wildlife sanctuary and Tlawng river.it is bounded by Cachar district and Hailakandi district, Assam on the north and North West respectively. On the south and east by Aizawl district, Mizoram and on the south west by Mamit district, Mizoram. The location of the district occupies an important site as it is the main

stream of road communication from other state of Mizoram. National highway no. 54 passes through the middle of the district from north to south direction. The only rail head in the state located at Bairabi. The only centre for military counter insurgency & jungle warfare school in the country is located at Vairengte, which is the largest and well known to the whole of Asia as well as in the world (Encyclopedia of Mizoram). Kolasib district is divided into three major sub divisions of Vairengte SDO (S), Kawnpui SDO (S) and Kolasib SDO (S) for convenience of district administration. Kolasib is easily reachable by well maintained roads, railway tracks and air. Lengpui airport of Aizawl is the nearest airport. It is well connected with Guwahati, Silchar and Kolkata, through Vayudoot service.The nearest railway station is Silchar railway station (Encyclopedia of Mizoram).

Lunglei

The district of Lunglei encompasses a total area of 4,538 sq.km (Encyclopedia of Mizoram). Lunglei is the second largest city of Mizoram and is also the headquarters of Lunglei district in southern Mizoram. It is an ideal base for nature lovers for exploring the surrounding areas which are rich in flora and fauna, hamlets and landmarks linked with folklores and legends. A 175 kms drive from Aizawl, Lunglei is loftier than Aizawl, perched at an altitude of 1222 meters. An engraved image of Buddha found near Mualcheng village, about 50 kms from the town remains an enigma till date since no other Buddhist relics has been found elsewhere in the state (Encyclopedia of Mizoram).The district of Lunglei has been further divided into major sub divisions of Hnahthial SDO (S), Lunglei SDO (S) and Tlabung SDO (S) for the administrative convenience of the district officials. As of 2001 India census, Lunglei had a population of 47,355. Males constitute 52% of the population and females 48%. Lunglei has an average literacy rate of 84%, higher than the national average of 59.5%: male literacy is 84%, and female literacy is 83%. In Lunglei, 14% of the population is under 6 years of age.

Lawngtlai:

Lawngtlai is one of the eight administrative districts of Mizoram with its headquarters at Lawngtlai town. The districts shares common boundaries with Lunglei and Saiha district in the north and south respectively. It is located in the southern most part of Mizoram having common international borders with Bangladesh in the west and Myanmar in the East Lawngtlai district has some peculiarity. There are two autonomous district councils within the district namely the lai autonomous district council (ladc) and the Chakma autonomous district council (cadc) with their headquarters at Lawngtlai and Kamalanagar respectively. These two autonomous regions are administered in accordance with the provisions of the sixth schedule of the constitution of India.

Mamit:

Spread over 3026 sq.km, Mamit is one of the prominent districts of Mizoram. Situated at a distance of 112 km from the capital of Mizoram. Mamit is an administrative district of Mizoram with headquarters at Mamit town. The district is bounded on the north by Hailakandi district of Assam state, on the west by north Tripura district of Tripura state and Bangladesh, on the south by Lunglei district and on the east by Kolasib and Aizawl districts. The district occupies an area of 3025.75 km². Mamit town is the administrative headquarters of the district. In 1985 Mamit district became home to Dampa tiger reserve, which has an area of 500 km² (Encyclopedia of Mizoram). Comprising of three major sub divisions, mamit district is divided into Kawrthah SDO (S), Mamit SDO (S), and West. Phaileng SDO (S) for administrative convenience. Mizos living in Mamit are known for their traditional folk and community dances like Khuallam, Chheih lam, Sarlamkai and Cheraw. Various local handicrafts, toys and shawls can be easily found in the small markets in the town. The bamboo pop-up gun is a popular tribal item available in the region. This gun is made using bamboo, which forms the barrel.

Saiha :

Saiha district is situated on the southernmost fringe of the north-eastern region of India and is bordering Myanmar on the eastern and southern side. Administratively, it is divided into two blocks- Saiha and Tuipang. Saiha block has 37 village councils and Tuipang block has 41 village councils. The district area comes under Mara autonomous district councils under the sixth schedule of the constitution of India. The councils function like mini- legislative assemblies with powers to pass their own laws and rules, subject to ratification by the administrator. Saiha is the capital town of the Maraland autonomous district council. It is the third most developed and also the third most populous town in Mizoram state apart from the state capital - Aizawl and Lunglei. It is also the capital of the third largest tribe - the Maras in Mizoram. It is one of the eight district headquarters in Mizoram and the seat of one of the first three Christian mission fields in Mizoram.

Serchhip:

Serchhip spreads over a total area of 3576 sq.km (Encyclopedia of Mizoram). Serchhip is the headquarters town of Serchhip district in the Indian state of Mizoram, and also the headquarters of Serchhip Sadar subdivision. It lies in the central part of mizoram, and 112km away from the state capital city of Aizawl. The district has the highest literacy all over india. The origin of the name comes from citrus trees found on top of the first hill of the then Serchhip village. The word meaning of ser-chhip is 'citrus-on-top'. In addition to the former Serchhip village, the town area now included new Serchhipand Chhiahtlang villages .Agriculture is one of the important occupation. Being situated near mat river valley, Serchhip is the main producer of cash crops in Mizoram, famous for its cabbages and mustards. It lies between the two very important rivers of mat and Tuikum. River Tuikum is a public drinking water for Serchhip and river mat is irrigation water for Zawlpui, the rice bowl of Serchhip. The annual temperatures range from a high of 34°c to a low of 10°C.The Serchhip district is divided into three major sub divisions of North Vanlaiphai SDO (S), Serchhip SDO(S) and Thenzawl SDO (S) for the convenience of district administration (Encyclopedia of Mizoram). Lengpui airport, located at a distance of 154 km from Serchhip town provides connection with Kolkata Netaji Subhash Chandra Bose international airport, Guwahati airport and Imphal airport. Air India, kingfisher

airlines, jet airways are the three regular airlines which operate flights to and from Lengpui airport. The north east shuttle also links the state with Guwahati. Serchhip is connected by road with Silchar through national highway 54, with agartala through national highway 40 & with Imphal through national highway 150.taxis, auto rickshaws and town buses are available public transports in Serchhip.

3.2.13 Industry

Mizoram faces difficulties in the advancement of industries. Lack of transport infrastructure is one of the major drawbacks. Other problems faced by the state include shortage of electricity, capital, telecommunication and export market access.

Mizoram has two industrial estates at Zuangtui and Kolasib. Another software technology park is being established in Mizoram university campus. The state government has acquired 127 acres of land in Khawnuam for development of the indo-Myanmar border trade township.

A school campus in Mizoram

3.2.14 Education

The first primary school was set up in 1898 at Aizawl by Christian missionaries. The state has long enjoyed higher literacy rates than average literacy rates for India. In 1961, the literacy was 51%. By 2011 census, it had reached 92%, compared to 74% average for India. Mizoram is second only to Kerala. There were 3,894 schools in Mizoram as of 2012. Of these, 42% are publicly owned and managed by central/state

governments, 28% are private without government subsidies, 21% are private with government subsidies, and the rest are primary and middle schools that are government financed run by three autonomous district councils of Mizoram. The teacher-pupil ratio is about 1:20 for primary, 1:9 for middle school, 1:13 for high, and 1:15 for higher secondary schools. There are several educational establishments under the umbrella of the ministry of education, including universities, colleges and other institutions. Within Mizoram University, there are 29 undergraduate departments including 2 professional institutions affiliated with the university. The state had 22 other colleges, and the total college enrollment was approximately 10,600 students in 2012. Other well known institutes are national institute of technology Mizoram, icfai university, Mizoram, college of veterinary sciences & animal husbandry, Selesih, Aizawl, Mizoram and regional institute of paramedical and nursing Aizawl.

3.2.15 Energy

Mizoram is not self-sufficient in power. In 2012, the state had a demand for 107 mw of power, but had an effective installed capacity of only 29.35 mw. To bridge the gap, it purchased electricity from the national grid of India.

Of the total installed power generation capacity, all 29.35 mw came from hydel. The state also has 22.92 mw of thermal power and 0.50 mw of diesel generating set as of march, 2012. The thermal and diesel generating stations were kept on standby mode owing to their high cost of operation, and because it was cheaper to buy the power from India's grid than to operate these standby units.

The hydroelectric power potential of Mizoram was assessed to be about 3600 mw in 2010 and about 4500 mw in 2012. If even half of this is realized, the state could supply all its citizens and industry with 24/7 electricity, as well as earn income from India's national grid. The topography of Mizoram hydroelectric resources is ideal for power projects. The following rivers are suited for hydel projects with minimal

impact on its biosphere - Tuivai, Tuivawl, Tlawng, Tut, Serlui, Tuirial, Kolodyne, Tuichang, Tuipui, Tiau and Mat. Beyond the major rivers, Mizoram has many small but perennial streams and rivulets with ideal condition for developing micro/mini and small hydroelectric projects. The state has proposed projects to attract private investments on build, own, operate and transfer (boot) basis with financial assistance in rehabilitating its citizens were they to be affected by the project. The largest proposed project is expected to be on kolodyne (460 mw), and there are dozens of small to micro projects that have been identified .

3.2.16 Transport infrastructure

The winding roads of Mizoram (top), and a close up of a road near Aizawl.

The state is the southernmost in India's far northeast, placing Mizoram in a disadvantageous position in terms of logistical ease, response time during emergencies, and its transport infrastructure. Prior to 1947, the distance to Kolkata from Mizoram was shorter; but ever since, travel through Bangladesh has been avoided, and traffic loops through Assam an extra 1,400 kilometers to access the economic market of west Bengal. This remoteness from access to economic markets of India is balanced by the state's closeness to Southeast Asian market and its over 700 kilometers of international boundary .

Road network: In 2012, Mizoram had a road network of around 8,500 kilometers (5,300 mi) including unsurfaced village roads to surfaced national highways; and there were 106,000 registered motor vehicles. The village roads are primarily single lane or unmetalled tracks that are typically lightly trafficked. Mizoram had 871

kilometers of national highways, 1,663 kilometers of state highways and 2,320 kilometers of surfaced district roads. All of Mizoram's 23 urban centers and 59% of its 764 villages are connected by all weather roads. However, landslide and weather damage to these roads is significant in parts. The state is connected to the Indian network through Silchar in Assam through the national highway 54. Another highway, nh-150 connects the state's Seling, Mizoram to Imphal, Manipur and nh-40a links the state with Tripura. A road between Champhai and Tiddim in Burma has been proposed and is awaiting cooperation from the Burmese authorities .

Airport: Mizoram has an airport, Lengpui airport near Rizal and its runway is 3,130 feet long at an elevation of 1,000 feet. Aizawl airport is linked from Kolkata – a 40-minute flight. Inclement weather conditions mean that at certain times the flights are unreliable. Mizoram can also be reached via Assam's Silchar airport, which is about 200 kilometers (120 mi), around 6 hours) by road to Aizawl.

Railway: There is a rail link at Bairabi rail station but it is primarily for goods traffic. The nearest practical station to Mizoram is at Silchar in Assam. Bairabi is about 110 kilometers (68 mi) and Silchar is about 180 kilometers (110 mi) from the state capital. The government is now planning to start a broad gauge Bairabi Sairang railway connection for better connectivity in the state.

Helicopter: A helicopter service by Pawan Hans has been started which connects the Aizawl with Lunglei, Lawngtlai, Saiha, Chawngte, Serchhip, Champhai, Kolasib, Khawzawl and Hnahthial.

Water ways:Mizoram is in the process of developing water ways with the port of akyab sittwe in Burma along its biggest river, Chhimtuipui. It drains into Burma's Rakhine state, and finally enters the Bay of Bengal at Akyab, which is a popular port in Sittwe, Burma. The Indian government considers it a priority to set up inland water ways along this river to trade with Burma. The project is known as the Kaladan multi-modal transit transport project. India is investing $103 million to develop the Sittwe port on Burma's northern coast, about 160 kilometers (99 mi) from Mizoram. State peace and development council of Burma has committed $10 million for the venture. The project is expected to be complete in 2015, and consists of two parts. First, river Kaladan (or Kolodyne, Chhimtuipui) is being dredged and widened

from the port at Sittwe to Paletwa, in chin province, adjacent to Mizoram. This 160 km inland waterway will enable cargo ships to enter, upload and offload freight in Paletwa, Myanmar; this is expected to be complete in 2014. As second part of the project, being constructed in parallel includes a 62 km two-lane highway from Paletwa (also known as Kaletwa or Setpyitpyin) to Lomasu, Mizoram. Additionally, an all weather multilane 100 km road from Lomasu to Lawngtlai in Mizoram is being built to connect it with the Indian national highway 54. This part of the project is slated to be complete by 2015. Once complete, this project is expected to economically benefit trade and horticulture exports of Mizoram, as well as improve economic access to 60 million people of landlocked northeast India and Myanmar.

Transport:

Roads: Mizoram is connected through National Highway 54. NH- 150 connects the state with Seling, Mizoram to Imphal, Manipur. NH-40 A links the state with Tripura. A road between Champhai and Tiddim in Burma will soon connect the two countries.

Air Service: Mizoram has only one airport, Lengpui Airport, near Aizawl and this airport can be reached from Kolkotta by Air is 40 minutes. Mizoram is also accessible from Kolkotta via Silchar Airport, which is about 200 km from the state capital of Mizoram.

Railway: Mizoram can be easily reached by train at Bairabi rail station or via Silchar. Bairabi is about 110 km, where Silchar Airport is about 180 km from the state capital.

Water Ways: Mizoram is in the process of developing water ways with the port of Akyab Sittwe in Burma along Chhimtuipui River. India is investing $103 million to develop the Sittwe port on Burma's northern coast, about 160 km from Mizoram. Military government of Burma committed $10 million for the venture, which is part of the Kaladan Multipurpose project (Encyclopedia of Mizoram, pg 11).

3.3 Performance of Mizoram State Transport

3.3.1 Overall Performance of Mizoram State Transport

Table 3.1: Overall Performance of Mizoram State Transport

		year									
Sl.no	**Items_of_activities**	**2004-05**	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**	**2013-14**
1	Fleet_Strength(MST)	59	55	29	28	60	54	55	33	35	35
2	No_of_route_covered	25	27	29	22	21	22	23	21	18	18
3	Distance_covered (route length)km	3115	2913	3507	3806	3082	3082	3082	2460	2522	1507
4	Average_daily_passenger	356	344	345	349	400	376	286	231	176	150
4	No_of_buses_operated(Serviceable)					54	52	49	31	33	30

Source: Mizoram Statistical Handbook 2004-2014

From the table 3.1, it can be seen that the fleet strength has decreased substantially over the years from 2004 to 2014; as also the number of route covered. The distance covered in kms have also reduced over the years from 3115 kms in 2004-2005 to almost its half i.e. 1507 kms in 2013-2014.

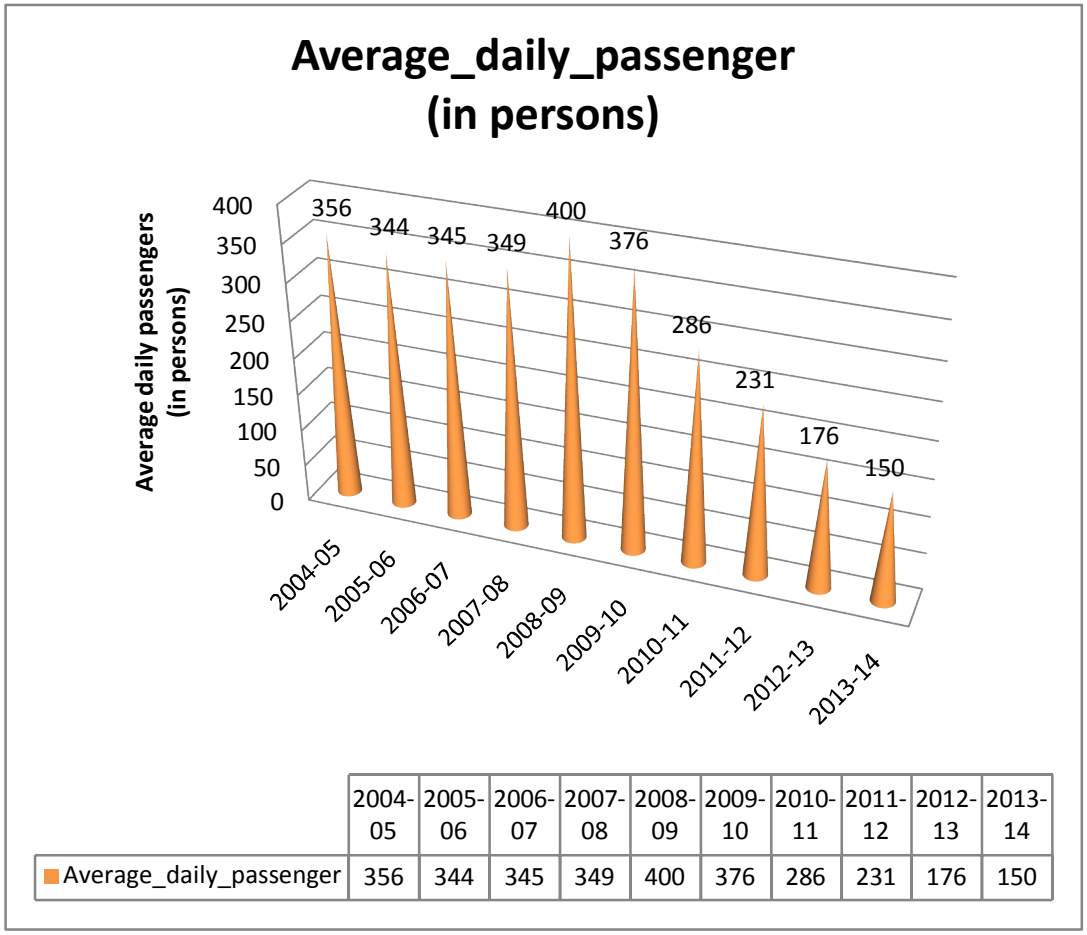
The average daily passenger has also decreased since to more than its half from 2004-2014.

This reduction in the number of average daily passenger is due to the increase in privately owned vehicle for transportation. Also, the availability of other means of

transportation such as maxi cabs and sumo services have led to its considerable decrease.

3.3.2 Average Daily Passenger (MST)

Figure 3.1 showing Average Daily Passenger (MST) per year from 2004-2014



	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Average_daily_passenger	356	344	345	349	400	376	286	231	176	150

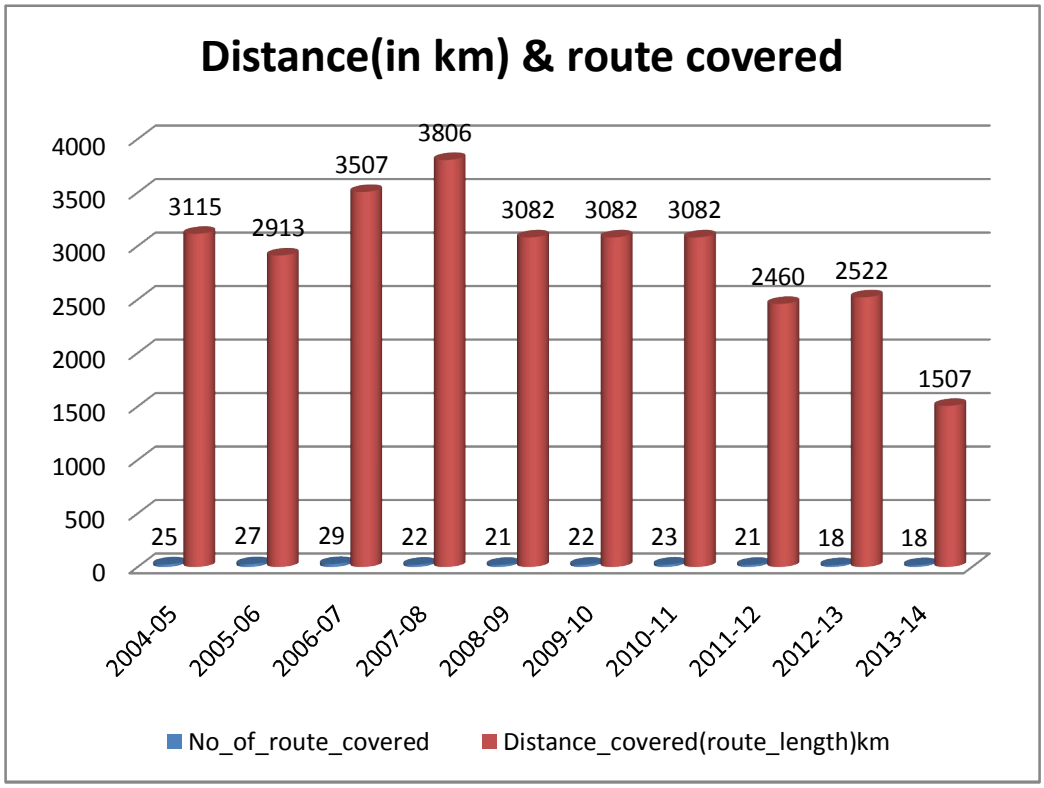
Source: Mizoram Statistical Handbook 2004-2014

The reduction in the use of MST buses have decreased tremendously from 2004-05 (356 persons) to 2013-14 (150 persons) daily. In a span of 10 years, i.e. from 2004-2014, the number of daily passengers was an all time high in the year 2008-2009 with 400 passengers daily. As evident from figure 3.1, we can analyze that the average number of passengers daily from the year 2004-2014 is 301.3 i.e. 301 persons.

The Mizoram State Transport buses have shown a gradual decline in its use over the years. This is primarily due to the increased number of other means of transportation which are basically substituted by privately owned maxi cabs for public use, sumos and privately owned buses, especially in the case of Aizawl city.

3.3.3 Distance and Route covered by MST

Figure 3.2 showing Distance and Route covered by MST buses per year (2004-2014)

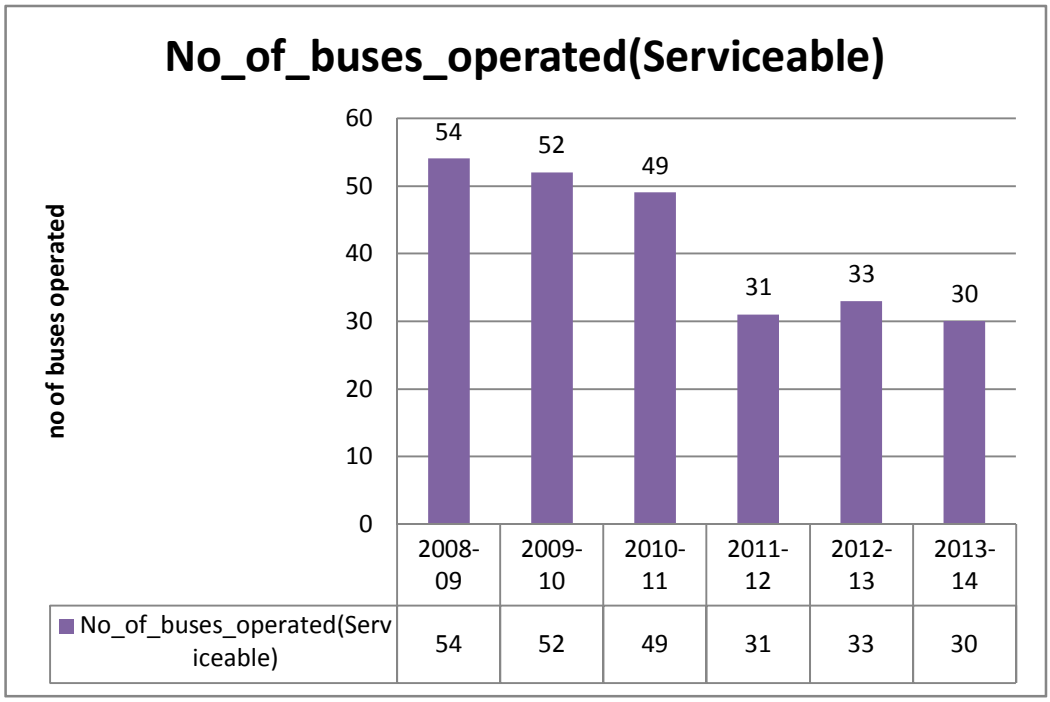


Source: Mizoram Statistical Handbook 2004-2014

The distance covered by MST (Mizoram State Transport) buses have significantly decreased over the years in a span of ten years (2004-2014), from 3115 to 1507; a dip to half of its 2004 level. The same goes for the number of routes covered by the buses, where it declines gradually over the years.

3.3.4 Number of Buses serviceable

Figure 3.3 showing the number of buses serviceable between 2008 -2014 (MST)



Source: Mizoram Statistical Handbook 2008-2014

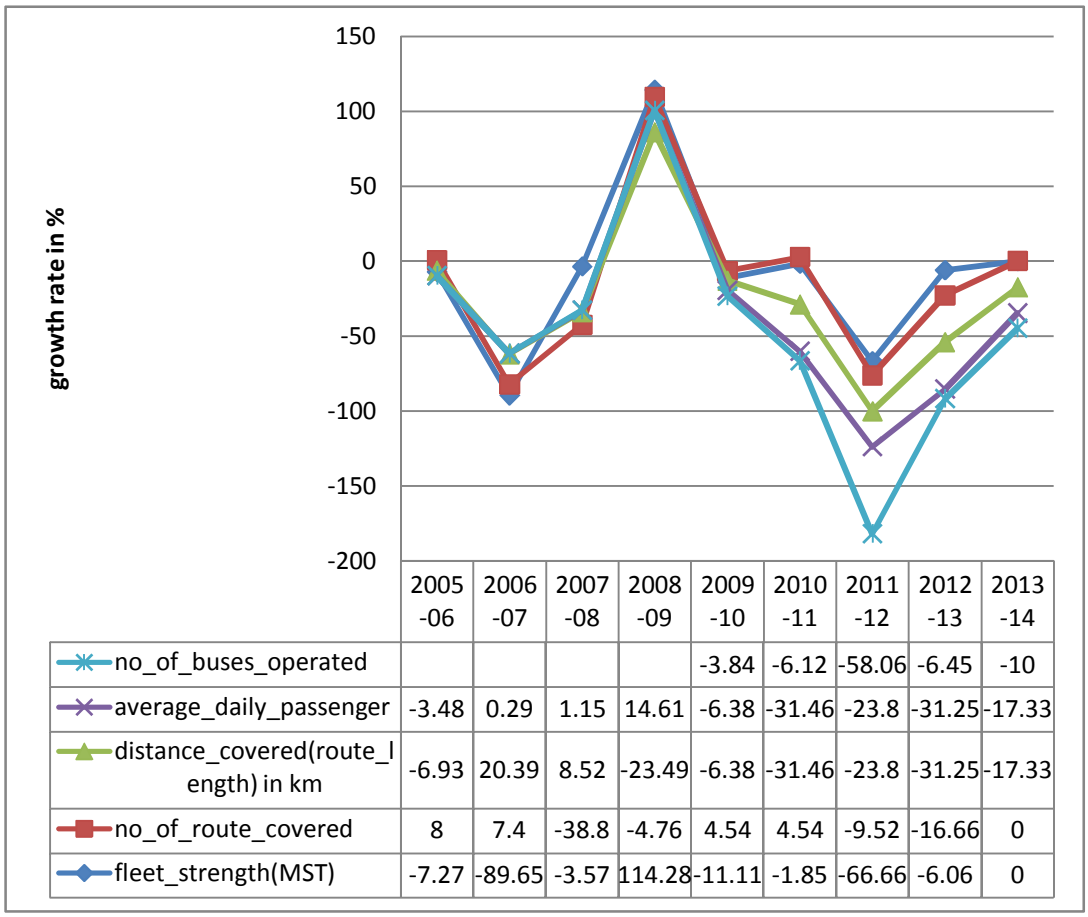
The number of buses operated between the years 2008 to 2014 have shown a gradual decline with every passing year. The decline rate was highest in the year 2011-2012, 56.73%, which was from 49 buses in 2010-2011 to 31 buses in 2011-2012. The average number of buses operated in a span of 7 years i.e. 2008-2014 is 41.5 i.e. 42 buses a year.

3.4 PERFORMANCE OF MIZORAM STATE TRANSPORT AS A WHOLE: (SUMMARIZATION)

The fleet strength has decreased substantially over the years from 2004 to 2014; in tandem with number of routes covered. The distance covered in kms has also gone down over the years from 3115 kms in 2004-2005 to almost its half i.e. 1507 kms in 2013-2014.

The average daily passenger has since then decreased to more than its half from 2004-2014.This reduction in the number of average daily passenger is due to the increased number of privately owned vehicle for transportation. Also, the availability of other means of transportation such as maxi cabs and sumo services have led to it's considerably decreases. The reduction in the use of MST buses have reduced tremendously from 2004-05 (356 persons) to 2013-14 (150 persons) daily. In a span of 10 years, i.e. from 2004-2014, the number of daily passengers was an all time high in the year 2008-2009 with 400 passengers daily. The average number of passengers daily from the year 2004-2014 is 301.3 i.e. 301 persons.

Figure 3.4 -Growth rate of the Performance of Mizoram State Transport (MST)



	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
no_of_buses_operated					-3.84	-6.12	-58.06	-6.45	-10
average_daily_passenger	-3.48	0.29	1.15	14.61	-6.38	-31.46	-23.8	-31.25	-17.33
distance_covered(route_length) in km	-6.93	20.39	8.52	-23.49	-6.38	-31.46	-23.8	-31.25	-17.33
no_of_route_covered	8	7.4	-38.8	-4.76	4.54	4.54	-9.52	-16.66	0
fleet_strength(MST)	-7.27	-89.65	-3.57	114.28	-11.11	-1.85	-66.66	-6.06	0

Source: Mizoram Statistical Handbook 2004-2014

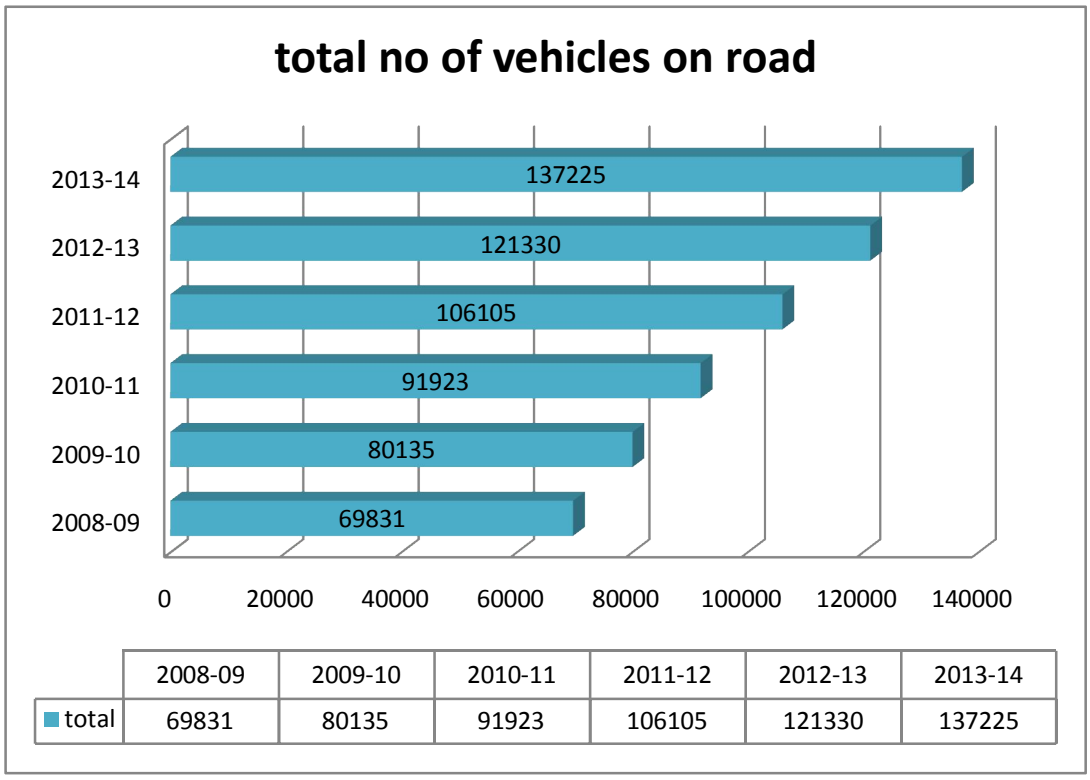
The Mizoram State Transport buses have shown a gradual decrease in its use over the years. This is primarily due to the increased number of other means of transportation which are basically substituted by privately owned maxi cabs and

motor cabs for public use, sumos and privately owned buses, especially with reference to Aizawl city.

The distance covered by MST (Mizoram State Transport) buses have significantly decreased over the years, a span of 2004-2014, from 3115 to 1507; a decrease to its half by 2014. The same goes for the number of routes covered by the buses, where it declines gradually over the years. The number of buses operated between the years 2008 to 2014 have shown a gradual decline with every passing year. The decline rate was highest in the year 2011-2012, 56.73%, which was from 49 buses in 2010-2011 to 31 buses in 2011-2012. The average number of buses operated in a span of 7 years i.e. 2008-2014 is 41.5 i.e. 42 buses a year.

3.4.1 NUMBER OF VEHICLES ON ROAD:

Figure 3.5 showing the total number of vehicles on road per year from 2008-2014 in Mizoram

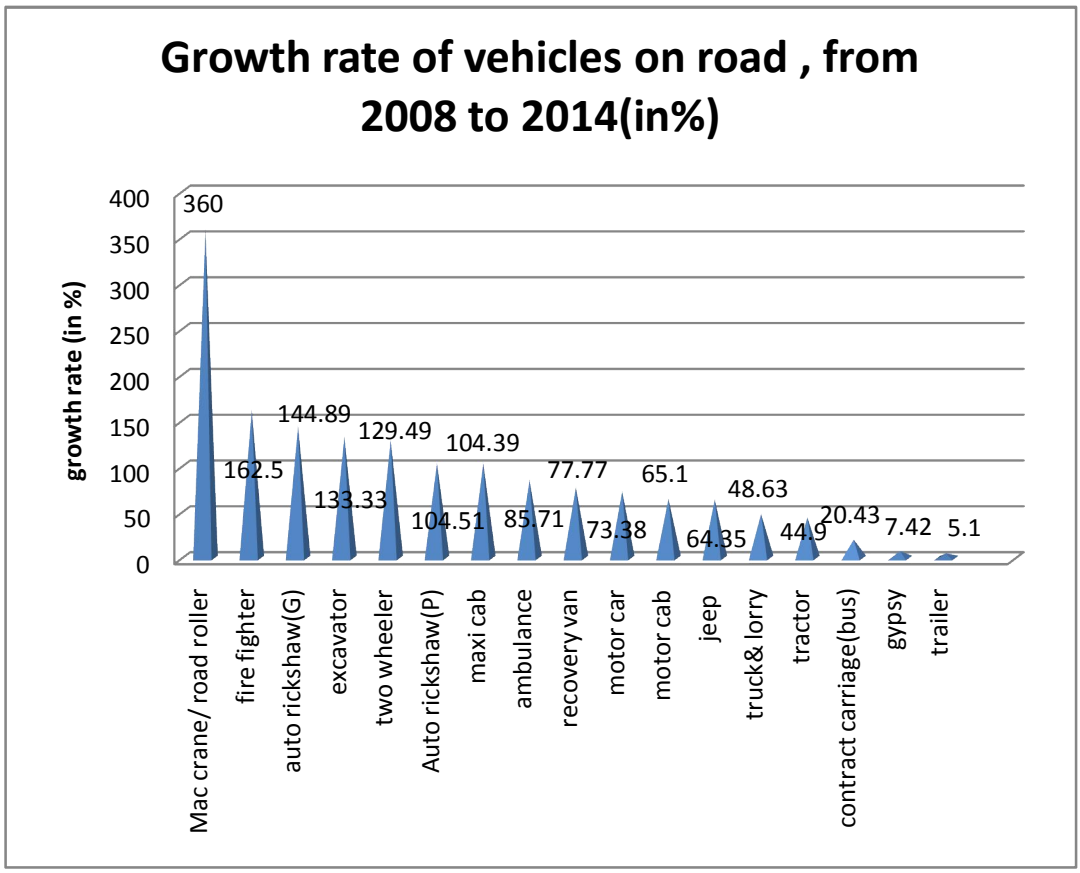


Source: Mizoram Statistical Handbook 2008-2014

The total number of vehicles on road in 2008-2009 was 69831 whereas in 2013-2014, it came to 137225, an increase in the number of vehicles in Mizoram by 67394 which is an increase of almost to a double (96.51%) over a span of 6 years.

The number of vehicles on road shows an increasing trend from 2008-2014. The growth rate in 2009-2010 was 14.75 %, in 2010-2011, the growth rate was 14.71%, in 2011-2012, the growth rate was 15.42%, in 2012-2013, it was 14.34%, in 2013-2014, and the growth rate was 13.10%. The average growth rate for the year, 2009-2010, 2010-2011, 2011-2012, 2012-2013, and 2013-2014 was 14.64 %.

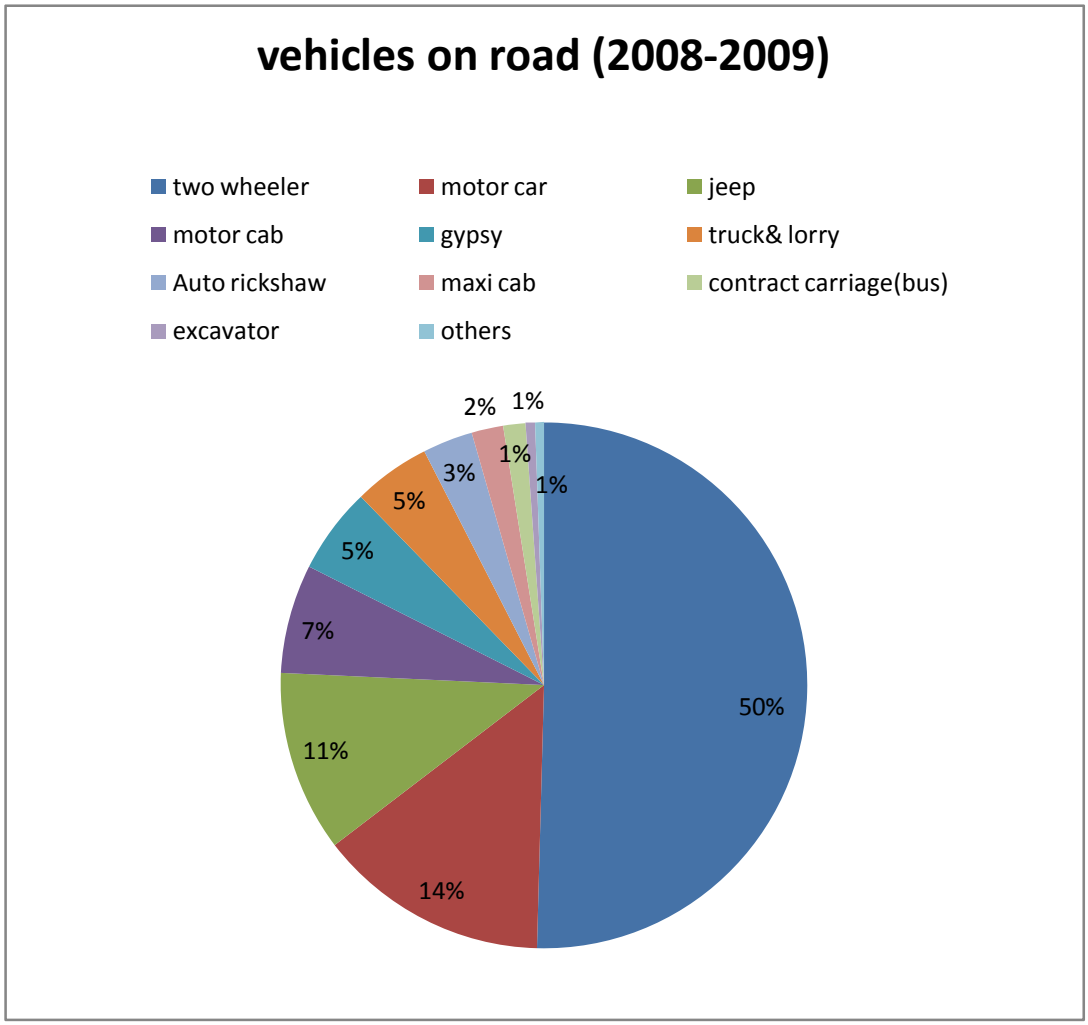
Figure 3.6 showing the Growth rate of vehicles on road, 2008 to 2014 (in %)



Source: collated from Mizoram Statistical Handbook, 2008-2014

Although the Road roller is not the most in numbers on road in Mizoram, its growth rate comes to 360%, the highest among vehicles on road in Mizoram between 2008 and 2014. The minimum growth rate occurs in trailers, a mere 5.1% in 2008-2014.

Figure 3.7 showing vehicle distribution on road 2008-09 (in %)

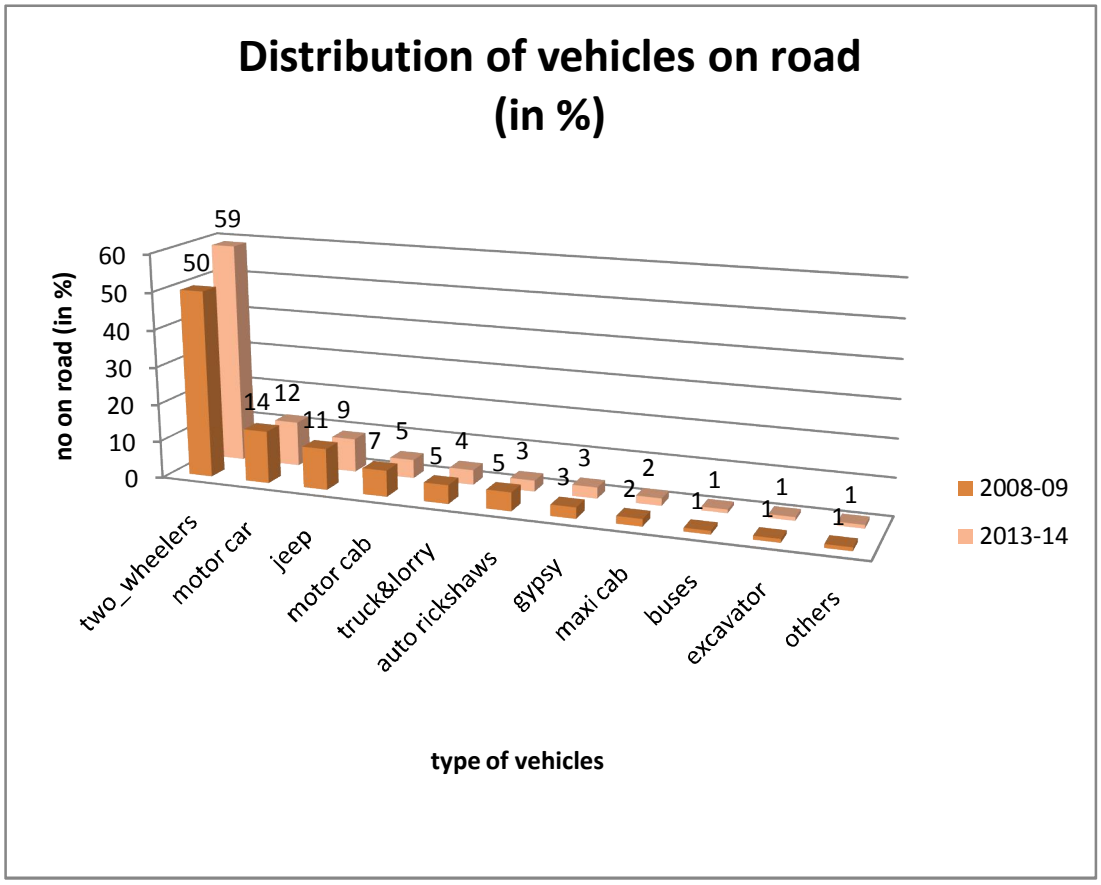


Source: collated through Mizoram Statistical Handbook 2008-2014

In 2008-2009, as displayed in the pie chart, the majority, 50% of the total vehicle on road was that of two wheelers. The percentage of two wheelers on road was very large as compared to other vehicles. The second highest vehicle in the distribution was the motor car, 14% of the total distribution. 11% of the total vehicles on road in 2008-09 were the jeeps followed by motor cars with 7%. 5% on road were the trucks &Lorries

and auto rickshaws each and gypsies with 3%, maxi cabs with 2%; buses and excavators with 1% each the remaining 1% by others including ambulances, fire fighters, recovery vans, tractors, trailers, Mac cranes and prison vans.

Figure 3.8 showing comparison of distribution of vehicles on road 2008-09 and 2013-14(in %)

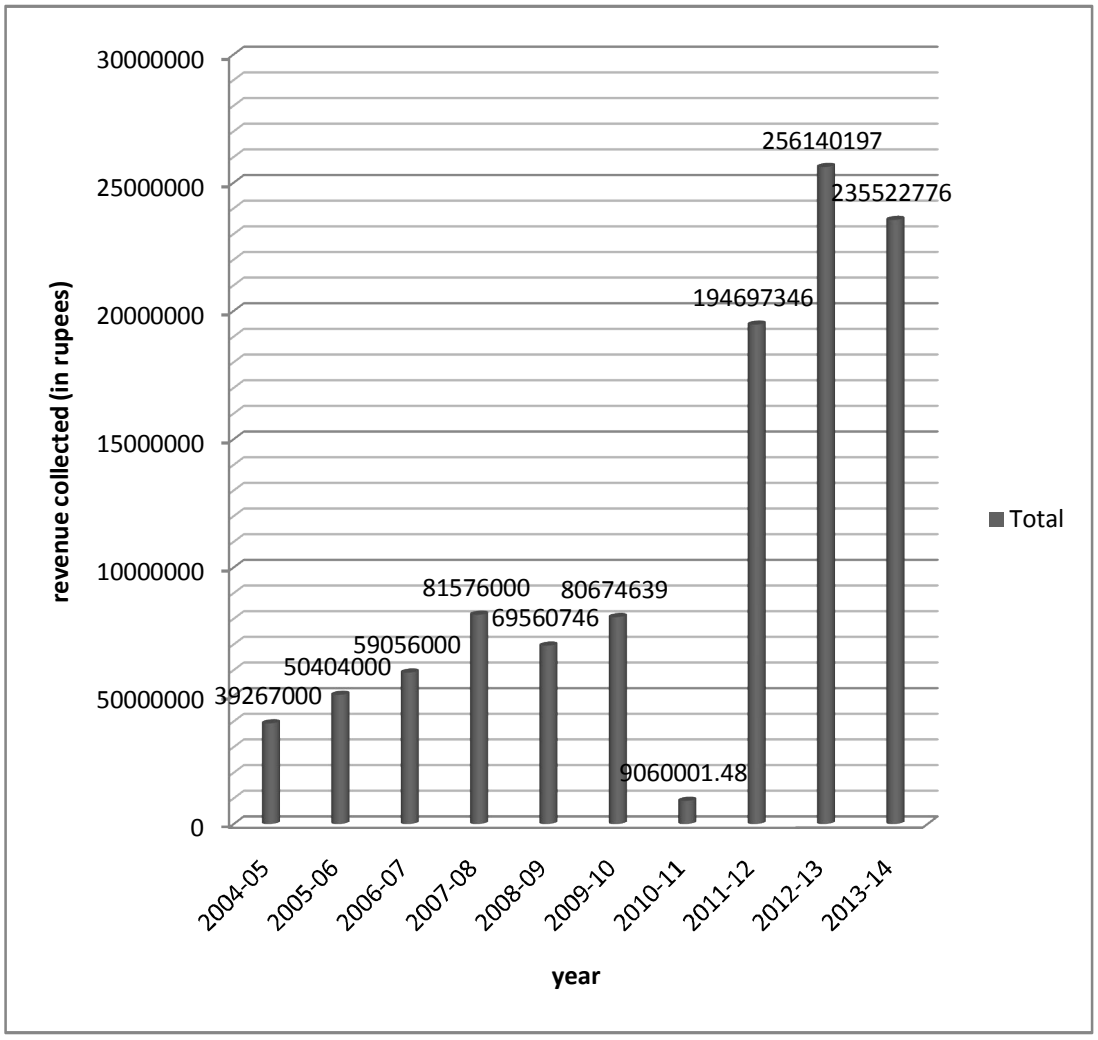


Source: collated from Mizoram Statistical Handbook

Form figure 3.8, it can be seen that two wheelers contribute most to the population of vehicles on road, both in 2008-09 and 2013-14, both significantly at 50%.

3.4.2 REVENUE COLLECTED FROM MOTOR VEHICLES:

Figure 3.9 showing the total revenue collected from motor vehicles 2004-2015 (in rupees)

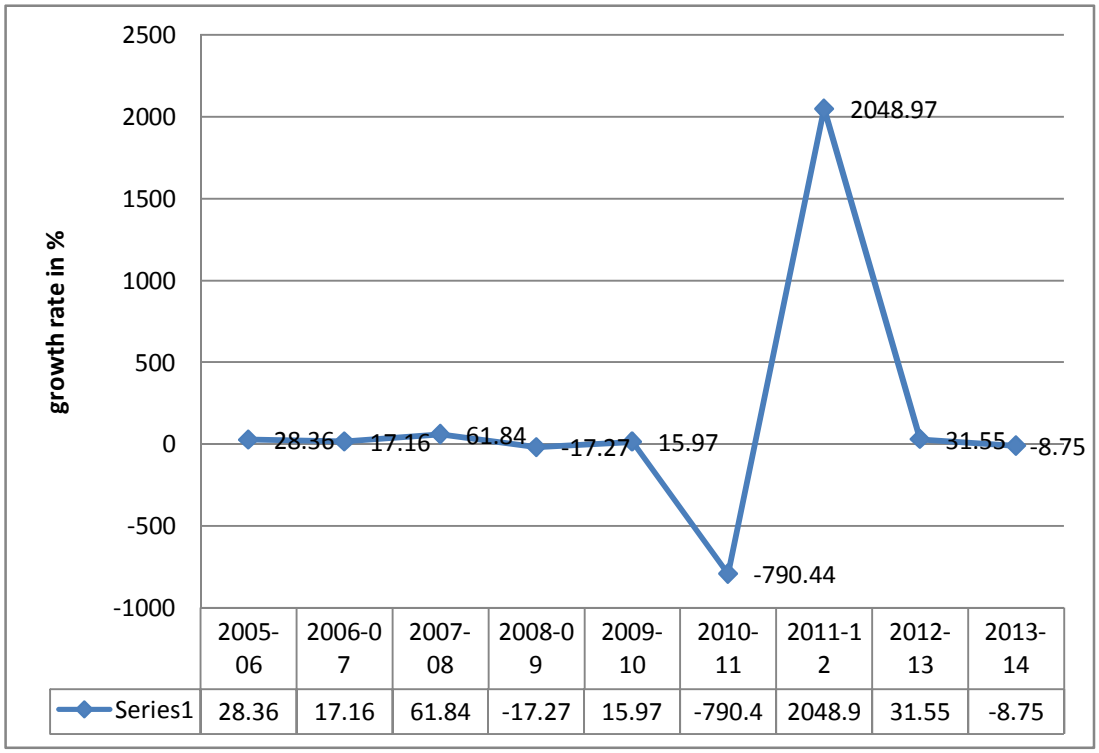


Source: Mizoram Statistical Handbook 2004-2014

Over a period of ten years, 2004-2014, the total revenue collected from motor vehicles by the Mizoram State Transport department increased from Rs.3926700 in 2004 to Rs.235522776 in 2014; the increase comes to a whopping 500% in a span of

10 years. The total revenue collected in 2014 was around six times to that of the total revenue collected in 2004.

3.4.2.1 Growth Rate of Total revenue collected from motor vehicles 2004-2015 (in rupees)



Source: Mizoram Statistical Handbook 2004-2014

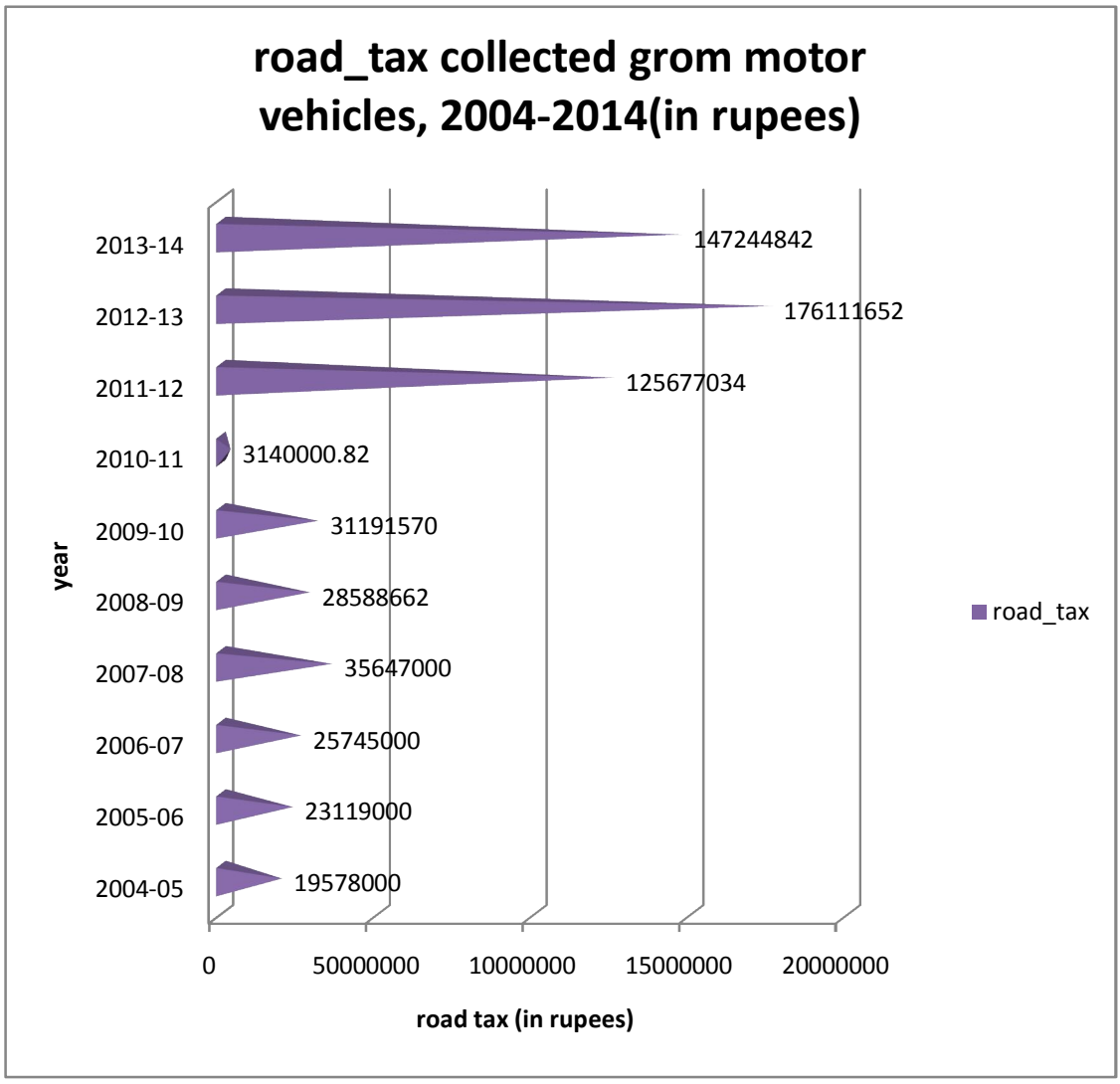
Figure 3.10 -Growth Rate of Total Revenue Collected from Motor Vehicles during 2005-2014

The states revenue grew substantially over the years, with the implementation of rules and regulations concerning transportation and its system; fines and fees regarding policy implications. Over a period of ten years, 2004-2014, the total revenue collected from motor vehicles by the Mizoram State Transport department increased tremendously, which contributed greatly to the states revenue. The total revenue collected in 2014 was around six times higher than the total revenue collected in 2004.There has been a massive increase of revenues collection from road tax (from

Rs.19578000 in 2004 to Rs.147244842 in 2014, a 652% increase over a span of 10 years).The growth rate of road tax was exceptionally high in 2011-2012; a growth rate of 3902% as compared to the decline rate of 893% the previous year 2010-2011. The reason for this exceptionally high growth rate was due to the recovery of the backlogs due in 2010-2011 during the fiscal year road tax. The earlier decline in revenues from road tax was well recovered in the next year, which put the revenues collected through road tax back on track, in line with a certain pattern. Over a span of 10 years i.e.2004-2014, there was an increase in revenues collected through fees and fines by 53.35%;There was an all time low in the revenues collected through fees and fines between the years 2010-2011, the revenue collected through fees and fines was an all time high between the years 2011-2012; with traffic duties more vigilant . Over a span of 7 years, the revenue collected through passengers and goods increased by 130.71%. With the advent of urbanization, movement of people and goods is greatly enhanced for business trips and the like, thus the increased use of vehicles for transportation by individuals and freight carriage.

3.4.3 Total Road Tax Collected From Motor Vehicles

Figure 3.11 showing total road tax collected from motor vehicles, 2004-2014 (in rupees)

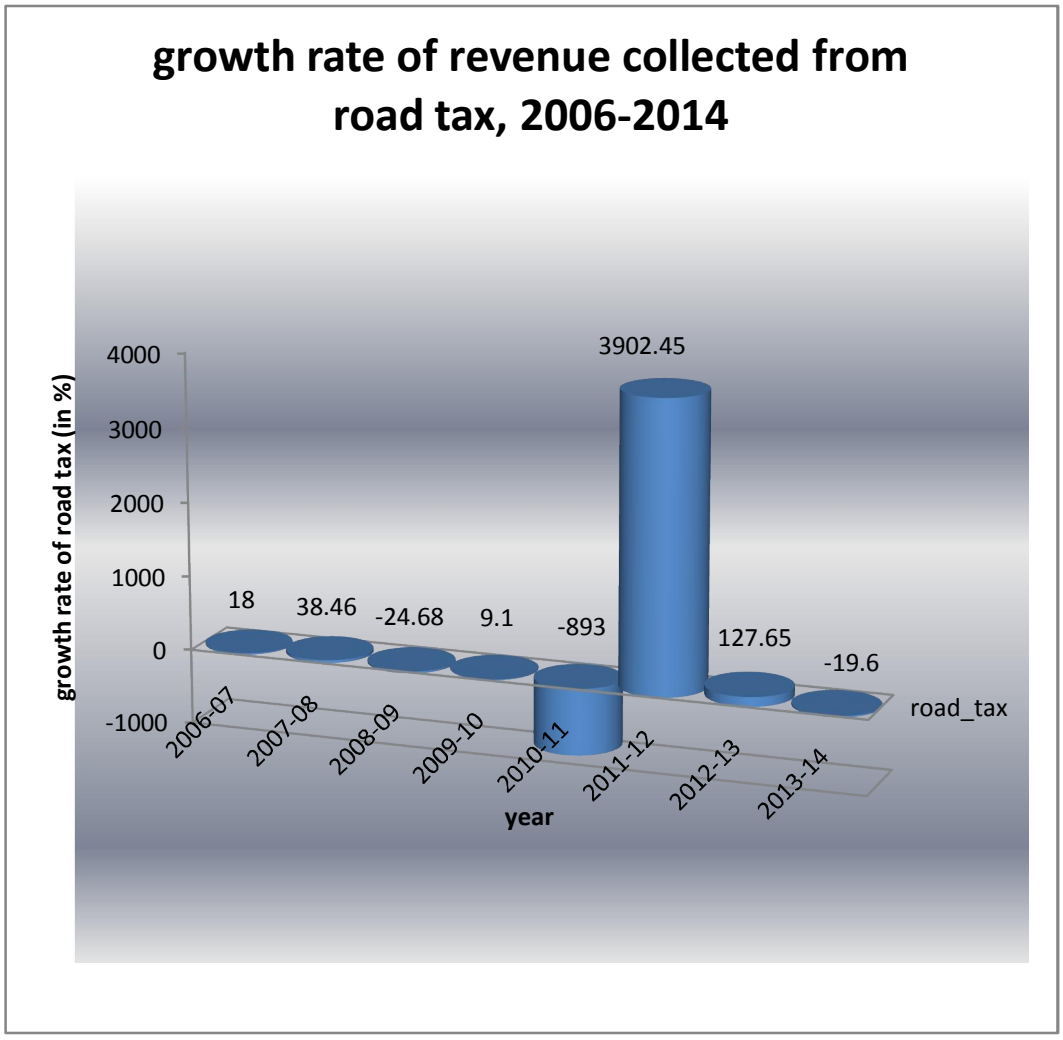


Source: Mizoram Statistical Handbook, 2004-2014

There has been a massive increase of revenues collected from road tax; from Rs.19578000 in 2004 to Rs.147244842 in 2014, an increase by Rs.127666842 which is in percentage-wise, a 652% increase over a span of 10 years. The total tax-revenue collected in 2014 was around six times of the amount collected in 2004.

3.4.3.1 Growth rate of revenue collected from road tax

Figure 3.12- Growth rate of revenue collected from road tax, 2006-2014

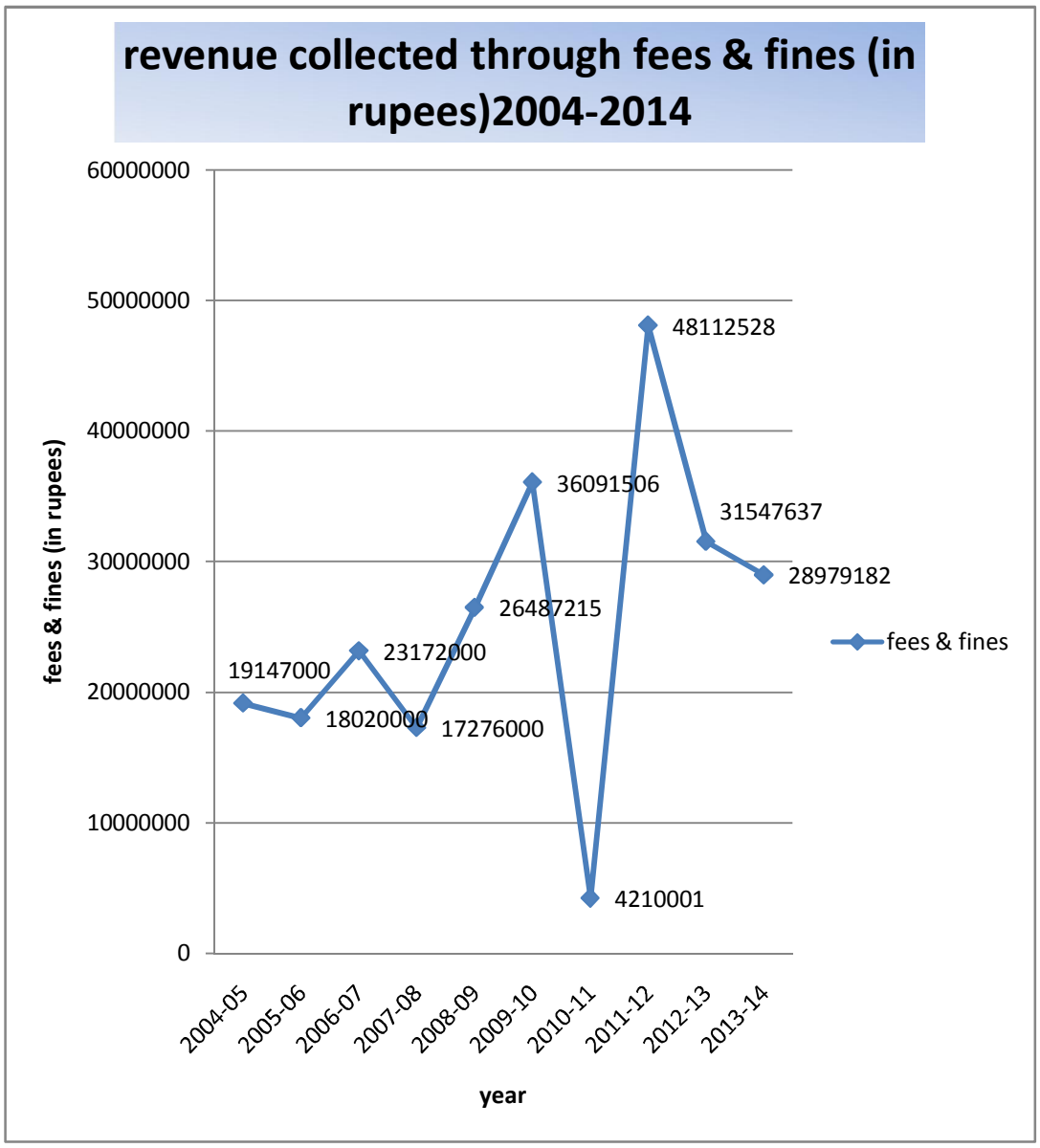


Source: collated from Mizoram Statistical Handbook 2004-2014

The growth rate of road tax was exceptionally high in 2011-2012; a growth rate of 3902% as compared to the decline rate of 893% the previous year 2010-2011. The reason for this exceptionally high growth rate by thousands was due to the recovery of the backlogs due in 2010-2011 in revenues collected through road tax. The earlier decline in revenues from road tax was well recovered in the next year, which put the revenues collected through road tax back on track, in line with a certain pattern.

3.4.4 Revenue collected through fees & fines

Figure 3.13 showing revenue collected through fees & fines (in rupees) 2004-2014

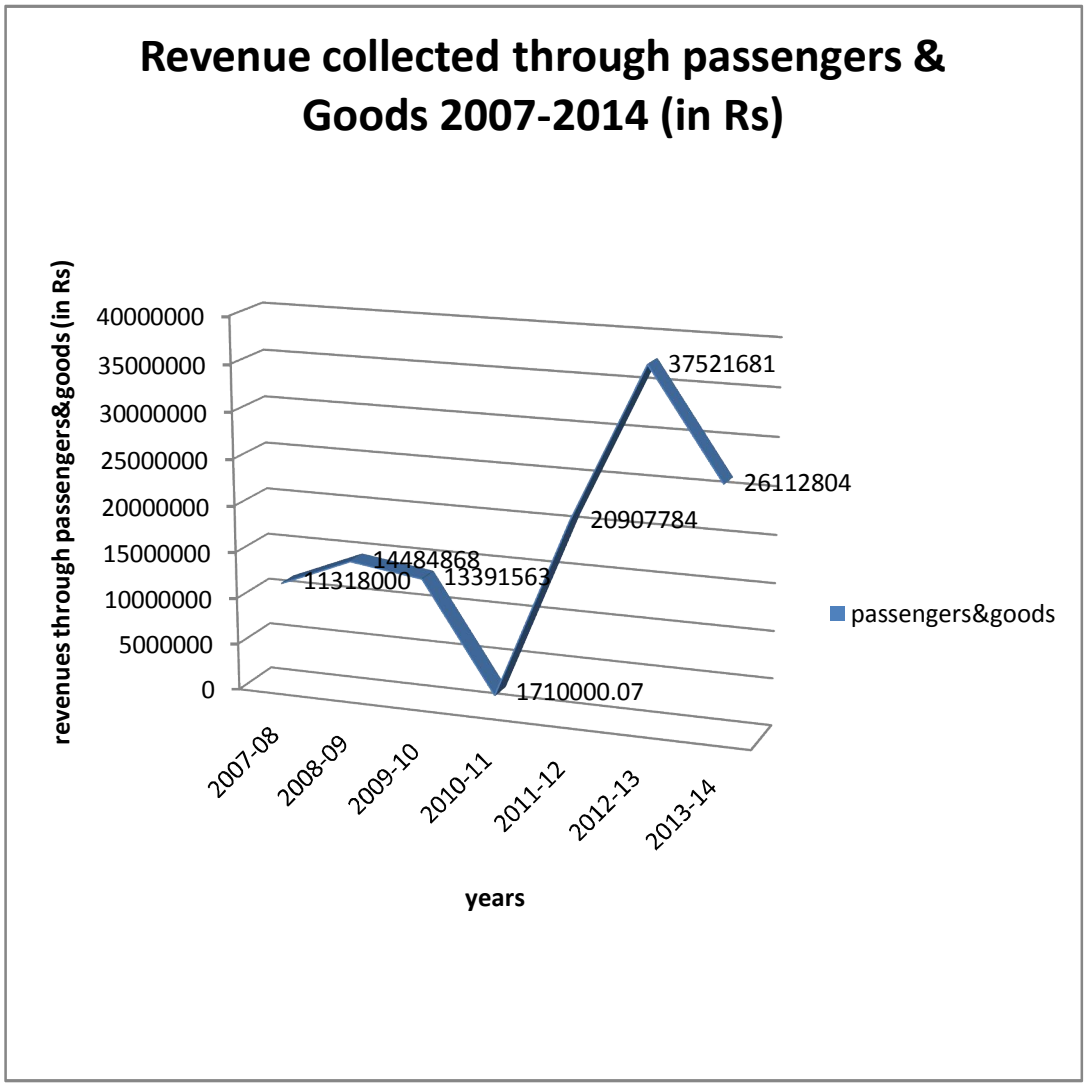


Source: Mizoram Statistical handbook, 2004-2014

Over a span of 10 years i.e.2004-2014, there was an increase in revenues collected through fees and fines by Rs. 9832182 which is by 53.35%; Rs 19147000 in 2004 to Rs. 28979182 in 2014. There was an all time low in the revenues collected through fees and fines between the years 2010-2011, a mere Rs. 4210001. From 2004-2014, the revenue collected through fees and fines was an all time high between the years 2011-2012 i.e. Rs 48112528.

3.4.5 Revenues collected through Passengers & Goods

Figure 3.14 showing revenues collected through Passengers & Goods, 2007-2014 (in Rs)



Source: Mizoram Statistical Handbook 2008-2014

Over a span of 7 years, the revenue collected through passengers and goods increased from Rs. 11318000 to Rs. 26112804 in 2014. The increase was by 130.71%.

3.5 Concluding remark:

What can be inferred from the study is that there has been an increase in the revenue collected from the transport department over time; a substantial increase in revenues collected through road tax, fees & fines and passenger and freight transportation charges over the years. Revenue collected through road tax stands the most significant increase followed by taxes from passengers and goods and thirdly through fees and fines.

Two wheelers remain to be the largest member of vehicles on road.The reason for it being so is not far to seek; the economical use as a means of transportation and to avoid delay in street congestion.

CHAPTER 4

MODE CHOICE,

ANALYSIS

OF THE FACTORS AFFECTING PREFERENCES

4.1 INTRODUCTION:

Transport is part of the daily rhythm of life. Mobility is a fundamental human activity and need, but is restricted by the friction of distance. As a complex industry in terms of land use, employment and functions, transport is a major factor interlinked with the environment and with the spatial distribution and development of all other forms of economic and social activity. Economic theories, methods and perspectives contribute significantly towards an understanding of transport and their eventual solution.
Transport is a central dimension of the national and global production systems that are reshaping the world, and is therefore a topic of universal interest and importance. Transport industries exist to provide for the movement of people and goods, and for the provision and distribution of services; and transport thereby fulfils one of the most pervasive activities in any society or economy." There is no escape from transport…" (Munby, 1986). In advanced countries, modern transport systems involving rail, road and air networks are generally well developed; global economic integration relies upon efficient maritime transport; and the development of the less-developed parts of the world is substantially dependent upon transport. "Even in the world most remote and least developed of inhabited regions; transport in some form is a fundamental part of the daily rhythm of life: (Hoyle, 1973).

All transport systems, however, are capable of improvement: more extensive, faster and above all more efficient services are constantly in demand but there are increasing calls for transport to become less environmentally harmful and more sustainable (Black, 1996; Whitelegg, 1993). It follows that "almost every transport decision is a public issue" (Munby, 1968); and that transport is "an enormously varied, exciting and controversial area of study" (Whitelegg, 1981).

The study of transport is not the sole prerogative of any one academic discipline, and transport is too important to be left entirely in the hands of its practitioners. Transport by its very nature, lends itself to multidisciplinary study and to interaction between those who operate or use transport systems and those who seek to analyze them. Economic theory plays a leading role in transport study.

4.2 The characteristics and scope of Transport Economics:

Transport is a keystone of civilization. The spread of production, trade and ideas and the economic ascendancy of mankind all depend upon movement. Personal mobility is one of democracy's most valued freedoms, and a surprisingly high proportion of our income is devoted to our movement and to the movement of the goods that we buy. Transport economics is basically a branch of applied microeconomics. While it uses many standard techniques of economic analysis, it faces a number of special problems and characteristics that justify its consideration as a specific branch of the discipline. The demand for transport is a derived one, and each journey is unique in time and space; it cannot be stored or transferred- and from these seemingly a simple statement follows a host of implications. The simple canons of market economics cannot be applied to transport for a variety of reasons. Since journeys are unique in space and time monopoly is likely to arise in varying degrees; especially when technological change offers an advantage to a particular mode or where economies of scale affect one mode more than another. The danger that a monopoly will restrict output and force up price is well known, although sometimes the only means to realize economies of scale is to accept monopoly but constrain its behavior by statute. In the short run the degree of monopoly may be intense as the user has no alternative; but as the time span lengthens, so does choice, and the user may seek alternative modes, routes and sources of supply of the goods that he seeks or even other destinations that will satisfy the purpose of his trip (Dalvy, Stubbs &Tyson, 1980).

The external effects of transport also warrant intervention. Pollution and congestion are both real costs imposed on the community by the users of transport, but they are not reflected in the private costs met by the individual user. Social decisions, should, however, make allowance for these costs, and they should also recognize the need to preserve certain public goods that are not priced in the market but are accepted as legitimate concerns for community planning and decision. Intervention may also be important where the individual fails to perceive the full economic implication of his own defective decisions (Dalvy, Stubbs&Tyson, 1980).

Enhanced mobility is an attribute of an increasing globalization of the world space economy. In all societies, environments and economics the movement of goods and people, as well as capital and ideas, is a necessary element in functional and developmental terms. The transport industries constitute, basically, a response to these activities and needs; transport facilities are normally provided in response to, rather than in anticipation of, demand; as in all demand-led industries there can rarely if ever be a perfect match between the transport facilities and services required or desired by a population or economy and the available infrastructure at a particular time (Hoyle&Knowles, 1998).

In developed countries the mobility gap is widening, especially in rural areas, between the growing majority with regular access to a private car and the minority who are entirely dependent on declining public transport for access to shops, medical services, families and friends (Mosely, 1979). However, a continuous increase in personal mobility is unsustainable and fiscal measures are already in use in some countries to dampen demand for transport (Black, 1996; Whitelegg, 1993). Unconventional transport modes and community transport systems provide responses to transport demand in a variety of circumstances (Nutley, 1990). Demand for transport is in a sense of function of available facilities and services; people always want more than they can have. Similarly, the services and facilities provided are clearly a function of demand, for unless demand exists or is anticipated there is no point in providing them.

It is important to consider the degree of intermodal choice available to an individual, group or society. The selection of a specific transport mode for a particular purpose depends upon a range of factors including the range of modes available, their relative cost, safety factors and convenience. In some areas, however, relatively few modes are available and therefore choices are severely restricted. Very broadly, a relative lack of intermodal choice characterizes less- developed countries and areas, while people in more advanced parts of the world usually have a much wider choice available. The restrictive impact of limited transport availability is a major factor affecting the development process in poor countries, while conversely the availability of a wide range of models facilitates socio- economic progress in more prosperous regions (Hoyle, Smith 1998).

In economic terms, travel is an intermediate good, because demand for travel is derived from the demand for other spatially separated goods and services. Thus one travels in order to engage in work or otherwise. Apart from sightseeing and some types of holiday, rarely do people travel simply for the sheer pleasure of the trip. Like other goods and services, travel has a cost. When an individual makes a trip, he or she values the destination activity sufficiently to incur the trip cost.

The cost of travel usually has two components, time and money. Time spent travelling is time not spent doing other things, hence those who value their time highly will be willing to spend more money in order to save time by using a faster mode (Hoyle et.al 1998). Research has shown that the value of time is positively correlated with wage rates or income levels (Small, 1992); hence as real income increases over time, the demand for faster modes of travel also increases.

The urban personal movement is controlled by the principle of distance decay, whereby we attempt to minimize the cost of inconvenience of travel for a given purpose. Another principle is the conditioning of individual travel behavior by personal circumstances which dictate the need and ability to engage in particular activities. Daniels and Warnes (1980) have developed a hypothetical scheme of movements. Urban travel pattern is mostly controlled by 'travel demand'. Travel demand can be examined at the level of individuals or households or at the level of population segments. For this, models have been developed by Chaplin (1975) and Hagerstrand (1970). Chapin (1974) conceptualizes activity patterns as an outcome of demand and supply, demand being the motivation to take an action, and supply being the opportunity to do so. Motivation or desire to act depends on the person's household role and individual characteristics. Opportunity depends on the availability of resources required to act, and on the perceived value on the act. Hagerstrand's (1970) work focuses on the interplay of space and time, since activity locations are distributed in space and time, time resources are required in order both to access locations as well as to participate in the activity itself. Hagerstrand identified three categories of time and space constraints that affect activity opportunities.

i) Capability constraints describe the limits of the physical system, the transportation technology available and the fact that one can only be in one place at a given time.

ii) Coupling constraints describe the schedule dependences of activities, such as the hours of operation of stores, or an individual's work schedule.

iii) Authority constraints describe the legal, social or political limitations placed on access, such as the age requirement for a driver's license.

4.3 The Analysis of Demand

The selection of mode of travel by urban population is determined by purpose of the journey, its frequency, timing, length, characteristic participant and their economic status. The prevalent modes of transport, or in other words, modal choice in urban areas, are as follows:

Walking: In developing countries walking dominates urban transport for the poor, who walk most often and furthest, in India, for example, the lower income groups depend upon walking for almost 60 percent of all urban journeys (Saxena, 2005). Many of these walkers do not have a modal choice as such, for their poverty denies them the opportunity to use anything else but their feet. Even when buses are available they are frequently full, so that even many of the not-so-poor cannot actually use them. But reluctant walkers are still travelers in the urban system and planning must recognize that walking is, and will remain, a perfectly valid form of transport for most people. It is one that is entirely appropriate for many types of urban trips and it is often the most efficient, both for the walker and for the urban transport system as a whole.

Non-motorized vehicles: In industrialized countries the pedal cycle is the principal vehicle in the category, but it rarely accounts for more than 10 percent of the modal split. It is in developing countries that non-motorized vehicles assume dominance as a

means of mobility, though there is much variability between countries in the particular vehicles used.

Private cars: In the industrial world the car is now the leading mode for all categories of journey. It is more popular because of its flexibility, personal convenience and the status that ownership confers. John Adams (1981) has calculated that the 59 poorest countries of the world, containing over 60 percent of its population, together own fewer cars than the American city of Los Angeles. The potential for future growth in the number of cars is thus enormous, although there are strong environmental and social reasons why current growth rates cannot continue for much longer. For the time being, though, the headlong dash towards global mass car ownership continues unabated.

Public transport:

Bus-based system: They are of particular importance in developing countries, where they are intensively used, with the largest Indian cities, for example, having up to 40 percent of trips made by bus. However, many vehicles are old and unreliable and although fares are low, they are still too high for many people. The flexibility and low cost of bus operation and maintenance, together with the prior existence of the necessary roadways, mean that buses are likely to remain firms favorites in cities in both industrialized and developing societies. The problems lie in clearing the road space of cars so that the advantages of the bus can be properly exploited.

Rail- based system: New rail development can only be justified if there is a high potential ridership, so metros are typical of cities of more than a million people, though by no means do all such cities have them.

Taxis and informal modes: They have high unit costs, especially of labor and fuel, and thus tend to be used principally by those on higher incomes and for business travel. There is also an 'informal' sector of a kind in developed countries in the form of 'car-pools' and 'van pools', whereby existing drivers share their vehicles (Saxena, 2005).

4.3.1 The influence of income on the demand for transport:

Economic theory suggests that the demand for goods and services depends largely upon consumer's income and the price of the particular good or service relative to other prices. The demand for travel in general is clearly dependent on the income of the traveler, but income also affects the choice of modes. Meyer, Kain and Wohl (1965) have observed that the income elasticity of demand was substantially positive for transport by private car but inconsequential or even negative for public transport. Moreover, the price elasticity of demand and cross- elasticity between modes appeared to be relatively less important. The reasons for the preference for the private car that manifested itself so strongly during the third quarter of this century are quite plain. In most cases the car possesses great as advantages, especially in its flexibility (Stubbs et.al, 1980).

Numerous analysis of the demand fo**r** public transport, particularly sub urban bus travel, has been conducted. Their significance is readily apparent. Operators and transport authorities need to know the pattern of demand in order to organize their short run operational planning and also for longer run staffing and investment policies. Knowledge of demand is also vital for effective financial forecasting by the operator, who may seek to break even financially by altering the levels of fares or by adjusting the provision of services. It is also essential for the establishment of transport policy in general, in that the sensitivity of users to increase in the frequency and reliability of services may be influential in decisions such as whether to introduce bus lanes.

4.3.2 The rise in car use and decline in use of other modes:

The car provides people with unprecedented levels of mobility; as per- capita income rises, people use their resources and take advantage of this mobility to live, work, shop and conduct leisure pursuits where they most prefer. Rapid and convenient mobility also allows people to conduct busy, time-pressured daily activity schedules. Rising car use has been supported by larger economic trends that have increased per-

capita income and favored employment as well as population decentralization. As the decentralization process advances and land-use patterns become more complementary to the car, other modes become less competitive. Consequently, rising car use has been accompanied by declines in both public transit use and soft modes. The social, environmental and financial consequences of these trends are of course significant. Growing reliance on the private car may not be sustainable; a large portion of the world's known energy resources are consumed by transport; air and water pollution are causing damage to human health and to the natural environment; and the economic vitality of central cities may be threatened. Developing alternative concepts of "sustainable cities", and specifying more clearly the social costs of transport, has consequently become major objectives of planning and policy research (Giuliano, 1998).

4.3.3 Personal travel:

Analyses of modal choice for personal trip-making involve a complex range of factors and employ highly sophisticated methodologies. Mode selection for inter-urban travel is influenced by journey purposes, overall trip length, travel costs, timing of trip and the range of transport options available. The business and commercial trips that account for a large proportion of all inter-urban travel involve complex multipurpose movement patterns, and the car is invariably selected as the most convenient mode, an obvious choice given the extensive practice of providing employees with company cars. Social and recreational trips at the inter-urban scale rely heavily upon the car, as total costs for a family will be much lower than those for rail or coach if only the car movement expenses are taken into account in the selection process. Inter-urban express coaches usually cater for those without access to private transport and without the financial resources or desire to patronize the faster air or rail modes. Passenger choice of a public mode also now takes into account the quality of travel information and communications, and technical innovations such as high-speed rail and computerized on-line reserve systems (Capello and Gillespie, 1993).

4.4 Urban transport problems:

In towns and cities of the developed world, the principal problems are caused by usage of private car, which creates severe congestion on often inadequate road

systems and had led to a sharp decline in the patronage of public transport. Car ownership levels are very low in cities of the developing world and public transport services are also grossly inadequate, with inner areas congested with motorized vehicles and pedestrians.

The nature and scale of transport problems vary with size and shape of the urban area, the balance between use of private and public transport, and the level of road and public- transport infrastructure that exists. One major contributing factor is the tendency for an increasing separation of home and the most common destinations, resulting in a higher level of personal trip-making and lengthier journeys. These in turn impose greater demands upon road and public- transport systems that are already nearing or exceeding their capacity (Hanson, 1995 a, b) .Traffic problem is thus one of the most common problems encountered to some extent in almost all urban areas. To this must be added pollution and other related environmental issues, and the complex problem of equity in terms of personal accessibility for the different groups within urban society.

Congestions: Traffic congestion occurs when urban transport networks are no longer of accommodating the volume of movements that use them. The location of congested areas is determined by the physical transport framework and by the patterns of urban land use and their associated trip-generating activities. Levels of traffic overloading vary in time, with a well-marked peak during the daily journey-to-work periods. One factor contributing to congestion in developing world cities is the uncontrolled intermixing of motorized and animal or human- drawn vehicles. The proliferation of pedal and motor cycles causes particular difficulties (Simon, 1996).

Public- transport decline: one common difficulty directly attributable to the growth of car usage is the decline in public- transport patronage. The resultant reduced revenues often inevitably lead to lower frequencies and higher fares, which in turn further discourage the use of services, producing a cyclic effect which, unless arrested, can result in the virtual elimination of public transport in smaller towns and a substantial rationalization in cities. There are also marked reductions in the use of public transport outside the peak periods, and the concentration of traffic into the latter creates serious problems for operators when attempting to provide the most

efficient services in terms of staff and vehicle deployment. Demands during the peak cannot be satisfactorily accommodated, and at other times patronage is often insufficient to justify the provision of services.

Parking Difficulties: The provision of adequate car parking space within or on the margins of central business districts for city workers and shoppers is a problem that has serious implications for land-use planning. (Roberts, 1981).
Changing land-use patterns: The increasing trends towards sitting retailing complexes, leisure centers and business parks on the peripheries of major urban areas have also created new transport problems (Hall, 1989).

City problems in developing countries: The difficulties faced by urban populations in the developing countries are often far greater than those encountered in the western world. They include rapid traffic growth, poorly maintained transport infrastructure, inefficient operations, a mix of old and new transport technology, ineffective traffic management and enforcement, inadequate public-transport services, transport problems of the poorest groups, high accident rates and weak institutional support for transport facilities (Dimitriou, 1992). Many of these problems are shared with industrialized countries, but in the developing world the opportunities for implementing solutions are fewer. Although rising car ownership is a feature of urban expansion, most journeys are still made either on foot, by bur or, to a more limited extent, by rail. The extension of low-income immigrant settlements on city fringes exerts increasing pressure on already inadequate bus services. This problem of expanding demand would be more serious if it were not for the fact that low disposables incomes prevent many workers from making regular use of public transport (Roth, 1984). For example, in Indian cities, the cost of using public transport, expressed in terms of GDP per capita, can be four times those in the UK, and in Delhi up to 36 percent of disposable income can be spent on bus travel (White, 1990). Those who can afford to use buses endure long, slow, uncomfortable trips on poorly maintained vehicles and heavily congested roads, and wherever practicable urban migrants try to live as closely as possible to their workplaces. Purchase of new buses and the maintenance to a satisfactory standard of existing vehicles is frequently

hampered by a shortage of foreign currency. It is not unusual for between 60 percent and 80 percent of a fleet to be out of service because of a lack of spare parts and skilled mechanics, yet a 70 percent level of availability is generally seen as the minimum acceptable to ensure satisfactory services (Dimitriou, 1990b). These inadequacies in the formal public-transport sector have encouraged t expansion of paratransit modes which flourish legally and otherwise, on urban areas where larger buses cannot operate in the narrow streets.

The transport-deprived groups: Urban communities contain several clearly defined groups who experience considerable difficulty in securing acceptable levels of mobility and of accessibility to essential daily or periodic facilities. The elderly, the sick and disabled, those on low incomes and those below the legal driving age are those most commonly disadvantaged in this respect. The numbers of persons who suffer transport deprivation, being described as the "transport-poor", are increasing; in the UK six million people, or about 12 percent of the adult population, suffer from some form of disability, and by 2025 some 20 percent will be aged over 65, with at least two million over 80 years old (Oxley and Benwell, 1985).

Environmental problems: No urban street is free from the effects of engine fumes and these almost certainly contribute towards the formation of smog. As traffic increases, however, atmospheric pollution will also increase. Ecologists believe that the rapid increase in the number of vehicles on our roads which has taken place without (as yet) any real restriction is fast developing into an environmental crisis. Exhaust fumes are the major source of atmospheric pollution by the motor vehicle.

Off- Peak Inadequacy of Public Transport: If public transport operators provide sufficient vehicles to meet peak-hour demand there will be insufficient patronage off-peak to keep them economically employed. If on the other hand they tailor fleet size to the off peak demand, the vehicles would be so overwhelmed during the peak that the service would most likely break down(Saxena &Rawat, 2005).

4.5 Models- the decision making framework:

Two principal limitations affect an individual's travel behavior. First, travel demand, unlike the demand for other commodities, is a 'derived demand'; travel is normally demanded not for its own sake but as a means of consuming some other good or service. A trip maybe made because a household member wishes to buy commodities or service or to obtain other satisfactions (e.g. to purchase food, to visit friends, to earn income). Second, in the short run the travel decisions of the individual are subject to his residential location, workplace, car ownership or availability, and the availability of various modes at his residential location. However, in the long run, factors such as location and car ownership are also decision variables. Furthermore, the attributes of transport system may influence these decisions.

One of the essential requirements of a travel demand model is that the model be behavioral. A behavior model seeks to describe the causal relationships between socio economic and transport system attributes on the one hand and trip making on the other. the objectives of such models is to explain why travel decisions vary as conditions change; otherwise it is not possible to predict how the traveler will behave if his individual circumstances change or the terms upon which the competing alternatives are offered to him change. In short, only by explaining the causal relationships can the model be used to forecast the future changes in the performance of the transport system. The conventional models of travel demand separate the demand function into trip generation and attraction, trip distribution, model split and route assignment. Observations are zonally aggregated, parameters of the demand functions are usually estimated by using single equation estimation methods; origins or flows of travel demand have been determined by relating output to price, income and other variables (Stubbs et.al,1980).

4.5.1 Modal Choice Models :

On the other hand, Modal choice models represent attempts to develop relationships that determine what share of total traffic will use each mode, with attention usually centered on the split between car and public transport. While modal split models have

figured in both urban and interurban demand studies, they have been more sophisticated, in both the choice of variables included and the estimation techniques used, in urban transport studies (Stubbs et.al, 1980).
These studies can be

4.6 Road Transport in India:

As per the motor vehicles statistics maintained by the Government of India, the annual rate of growth of motor vehicles in India was around 9.7 percent during the last decade (CIRT 2005). From 19177 million vehicles in 1990, the population increased to 58863 million in 2002. Traffic composition in India is of a mixed nature: there is a wide variety of both slow and fast moving vehicles. The modal split indicates that in 1990 about 65.7 % of total vehicles were two-wheelers, which increased to 70.1% within one decade. Percentage share of private vehicles (two wheelers and cars taken together) has also increased during 1990s (from 79.7 percent in 1990 to 82.6 percent in 2000). This is primarily because growth rate in two wheeler population is higher than that of other vehicles (CIRT 2005).

Another notable feature of vehicle population has been that between 1990 to 2000, two wheeler and car (including jeeps and taxis) grew at a rate of 10.4 and 8.4 percents per year respectively, whereas the growth rate in bus population was 6.5 percent per annum. During the same period, goods vehicle grew at a rate of around 8 percent per annum. Although total bus population in India is growing at modest rate of around 6.5 percent per annum, its growth in private sector is far greater than in the public sector. During 1990s, number of buses under the control of State Transport Undertakings (STUs) grew at a rate of around 1 percent per annum whereas private sector bus population grew at a rate of around 8.6 percent per annum. In the absence of an adequate and efficient public transport in India, a large number of private and para-transit modes have entered into the market to meet the travel demand. Such a proliferation of vehicles results in acute congestion, inordinate delays, serious accidents, high energy consumption particularly of fossil fuels, and intense pollution of the environment (N.Bhatta, 2008).

The level of travel demand in India is increasing substantially over the years. Three factors contribute to this. The first is the increase in population. The second factor is the mobility rate, that is, average trips per person per day. Mobility rate in India is continuously increasing over the years. For example, in Delhi, average number of trips per person per day has increased from 0.49 percent during 1969 to 1.10 during 2001 (Table-1). The third factor contributing to travel demand is the increase in trip length due to increase in the physical expansion of the city and town.

Table 4.1: Average number of trips per person per day

purpose	1969	1981	2001(estimated)
Work	0.29	0.35	0.45
Education	0.08	0.10	0.15
others	0.12	0.27	0.50
All purpose	0.49	0.72	1.10

Source: Ranganathan (1995)

A serious consequence of such a development is steep rise in demand for transport in almost all the cities in India. Tata Energy Research Institute (TERI), New Delhi, estimates this to increase from 335 Billion Passenger-Kilometers (BPKm) in 1991 to 1905 BPKm by 2001 for selected seventeen towns as per its study. RITES have estimated 462 million passengers trips per day (mptd) by 2016, for the class I cities (1,00,000 plus population) alone (CIRT 2005).

4.7 SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENTS- High School Teachers

Using a number of very varied indicators (intensity and variety of car use, knowledge of road signs, etc.); factors such as sex, social class and occupation, level of education and residential environment, explains the different attitudes towards motoring of young, old or even middle aged drivers.

GENDER DISTRIBUTION

58% of the total sample size is males and 42 % of the respondents are females.

AGE:

Another variable rarely taken into account in transport studies and yet of considerable significance is age. Its importance becomes particularly clear and significant when examined in relation to figures for private car ownership. It is clear than the young people who have bought cars at an early age today will not give them up as they grow older.

33% of the respondents are below 30 years of age, 45% between the age 31-40 years and 20% between the age 41-50 and finally 2 % above the age of 50 years.

MARITAL STATUS:

57% of the sample respondents are married and 43% are unmarried.

POSITION IN THE HOUSEHOLD:

With respect to their position in the household,25% of the respondents are the head of the family, whereas 28% are the mother in the family; 23% the unmarried son of the family and 24% the unmarried daughter of the family.

FAMILY SIZE:

A sample size of 120 individuals was taken, where 10% of the respondents have a family size of up to 2 members. 53% of the respondents have a family size of 3 to 5 members, 26% of the respondents have a family size of 6 to 8 members and 11% of the respondents have a family size of 9 members and above.

Number of children (below 14 years):

In a sample of 120 Government school teachers, 41 % of the total sample of respondents have no children as family members;45% of the total sample of respondents have up to 2 children (below 14 years) family members, 12% of the respondents have 3-5 children as family members, 2 % have 6 and above children as members.

Number of Adolescent (14-18 years):

72 % of the respondents do not have any adolescent family members; whereas 26 % of the respondents have between 1-2 adolescent family members and 2% of the respondents have a number ranging from 3-5 adolescents in the family.

Number of Adults (above 18 years):

Out of a total of 120 individual respondents, 35% came from a family who has up to 2 adult members; 48% from a family of 3-5 adult members and 14 % from a family of 6-7 adult members and the remaining 3% from a family of 8 and above adult members.

Number of working/ earning members in the family:

59% of the respondents have upto 2 earning members in the family; 38% having 3-5 earning members and the remaining 3% have 6 and above earning members in the family.

Number of students in the family:

13% of the respondents have no student family members; 58% have 1 to 2 student family members whereas 27 % of the respondents have 3-5 student family members and 3% have 6 student members and above.

Personal Income:

13% of the respondents have a monthly income of less than or equal to Rs.15000 and 42% have a monthly income between Rs. 15001- Rs. 35000; 21% have an income of between Rs. 35001- Rs.45000 monthly and 17%, a monthly income between Rs.45001- Rs. 65000. 7% of the total respondents have a monthly income of above Rs. 65000.

The average personal income of the sample is Rs. 33405.

Household Income:

9%Rs. of the sample respondents have a monthly household income less than or equal to Rs. 30000; 21% have a monthly household income between Rs. 35001-Rs.50000, 39% between Rs. 50001- Rs. 80000; 15% between Rs 80001-Rs. 11000, 8% between Rs.110001-Rs.150000 and the rest 8% with a monthly household income of Rs.150001 and above.

The average household income of the sample is Rs. 98000.

4.8 TRANSPORTATION AS CONSUMPTION AND THE HIGH SCHOOL TEACHERS AS CONSUMERS

Status of the respondents in relation to driving:

21% of a sample of 120 respondents does not own private vehicles in the household. 38% of the sample respondents have 2-wheeler license and drive themselves; 8% of the respondents have a four-wheeler license and drive themselves; 12% of the respondents have both two and four wheelers license and drive themselves. 17% of the respondents do not know how to drive and also do not have license to drive , however use members of the household as drivers to drive them around intra city travel and a mere 4% of the non-driving, non-licensed respondents employ drivers to drive them around.

Amount of money spent on transportation for travel within the city a month by the individual respondents:

18% of the respondents spend less than Rs.500 for intra-city travel in a month; 44% between Rs.501-Rs.1500, 18% between Rs. 1501- Rs.2500, 11% between Rs. 2501-Rs.3500 and 9% spend Rs.3501 and above for monthly intra-city travel.

The average intra-city travel expense of the sample is around Rs.2500 monthly.

Amount of money spent on transportation for travel within the city a month by the individual respondents on privately owned vehicles:

Out of a sample of 120 respondents, 18% do not own private vehicles; as such their expenditure on private vehicle maintenance is Rs.0 monthly. 7% of the total sample spends between Rs.1-Rs. 500 monthly, 30% of the respondents spend between Rs.501-Rs.1500. 31% spend between Rs.1501-Rs.3000 monthly and 14% spend above Rs.3000 monthly.

The average expenditure on management of privately owned vehicles of the sample is Rs.2600 monthly.

Amount of money spent on transportation for travel within the city by the individual respondents on travelling by public vehicles in a month:

Out of a sample of 120 respondents, 29% spend Rs.0 as they do not travel at all by public transportation. 36% of the respondents spent between Rs.1-Rs.500. 22% spending between Rs.1501-Rs.3000 a month; 10% spent Rs.1501-3000 and the remaining 3% of the respondents spend Rs 3000 and above monthly.

The average monthly expense on the use of public transportation for intra-city travel is Rs.693 per individual.

Average percentage of Individual monthly income spent on intra-city transportation

An average of around 7.48% of their monthly income is spent on intra-city transportation by the respondents.

Private vehicle ownership

82% of the respondents were from a household which has private vehicles accessible for their use; the remaining 18% however do not own vehicles.

Number of vehicles owned by the respondent's household:

Of the total 120 respondents, 36% own one vehicle, either two wheelers or four wheelers. 46% have two or more vehicles in the household and 18% own none.

Type of vehicles owned by the respondents' household:

36% of the sample respondents own two wheelers only; 12% own four wheelers; 33% own both two wheelers and four and 18% own none.

Kind of public transport used by the respondents:

A majority of 38% of the sample respondents use both bus transit as well as non-bus transit like taxis and motor-cabs. 11% of the total use bus as a means of public transport and 23% use the non-bus transit such as taxis and motor cabs while 28% of the sample respondents do not use public transport at all.

Use of public transportation by the sample respondents who are in a position to travel by private vehicles and the underlying reasons

Reason 1: Convenience

38% of the respondents attributed convenience of public transport system to its use. The issue of parking came into highlight when dealing with private vehicles, thus the use of taxis and buses as a means to commute within the city. Parking space is a major problem which is rampant especially in a congested land space as Aizawl.

Reason 2: Personal Preference

32% of the respondents attributed personal preference to their use of the public system. It was found out that the stress of driving, health-related issues and the need to multitask were the main reasons behind their preference.

Reason 3: Cost Saving

28% of the respondents attributed cost of private vehicle management to their use of public transport. The cost of management of privately owned vehicles becomes a burden with respect to oil price, road taxes, fines and fees, driver salaries etc.

Reasons other than private vehicle ownership for the non-use of public transportation by respondents:

Reason 1: high fare of public transport especially taxis and motor cabs:

30% of the respondents feel that the taxi fares are too high and unreasonable, which results in most the non- use of public transport altogether. They feel it is better to own two wheelers at the least to minimize transportation cost while taking care of the inconveniences existing in the use of four-wheeled private vehicles; some feel it is still beneficial to employ a salaried driver than use the taxis and motor cabs. This is especially in wide existence among the working females of the household.

Reason 2: Inconvenience, flexibility and time issues:

45% of the respondents attribute inconvenience, flexibility and time issues to their non-use of public vehicles, especially the bus transit which is fairly inflexible in relation to point or place of pick-up and dropping at the desired destination. The bus stops are not at some places desirable and far off from the settlements which make its boarding difficult.

Intra-city travel destinations where the respondents who own private vehicles prefer to use public transportation:

Shopping: Shopping as a destination is where the respondents who own private vehicles prefer to use public transportation. The reason being due to traffic congestion

and limited parking spaces in the city. People who own private vehicles especially four wheelers would rather travel by taxis or buses to avoid such inconveniences. 56% of the respondents responded to the use of public transportation for shopping and the like.

Individuals who own private vehicles mostly prefer travelling by their own vehicles. Cases for the use of public transport include travelling intra-city for *work*, where 11% of the respondents prefer public transportation. The respondents use purely public transportation for round trips to and fro work or otherwise use private and public transportation for the trips being made to and fro. Another travel destination is that of travel for *educational purpose* whereby 10% of the respondents are likely to travel by public transportation due to convenience and time saving. Intra city travelling for *social events* by respondents, mostly in groups also allow for public transportation use, which accounts for preference over private by 18% of the sample respondents. *Health visits* also contribute to preference over private transportation by 18% of the respondents.

4.9 SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENTS-College Teachers

GENDER DISTRIBUTION

43% of the total sample size is males and 57 % of the respondents are females.

Age:

6% of the respondents are below 30 years of age, 36% between the age 31-40 years and 33% between the age 41-50 and finally 25% above the age of 50 years.

Marital status:

89% of the sample respondents are married and 11% are unmarried.

Position in the household:

In relation to position of the individual respondents in the household, 39% of the respondents are the head of the family, whereas 48% are the mother in the family; 5% the unmarried son of the family and 8% the unmarried daughter of the family.

FAMILY SIZE:

A sample size of 120 individuals was taken, where 4% of the respondents have a family size of up to 2 members. 54% of the respondents have a family size of 3 to 5 members, 31% of the respondents have a family size of 6 to 8 members and 10% of the respondents have a family size of 9 members and above.

Number of children (below 14 years):

In a sample of 120 Government school teachers, 34 % of the total sample of respondents have no children as family members;42% of the total sample of respondents have up to 2 children (below 14 years) family members, 24% of the respondents have 3-5 children as family members.

Number of Adolescent (14-18 years):

77 % of the respondents do not have any adolescent family members; whereas 19 % of the respondents have between 1-2 adolescent family members and 3% of the respondents have a number ranging from 3-5 adolescents in the family and the remaining 1% has above 6 adolescents in the family.

Number of Adults (above 18 years):

Out of a total of 120 individual respondents, 32% came from a family who has up to 2 adult members; 52% from a family of 3-5 adult members and 13 % from a family of 6-7 adult members and the remaining 3% from a family of 8 and above adult members.

Number of working/ earning members in the family:

74% of the respondents have up to 2 earning members in the family; 25% having 3-5 earning members and the remaining 1% have 6 and above earning members in the family.

Number of students in the family:

14% of the respondents have no student family members; 40% have 1 to 2 student family members whereas 44% of the respondents have 3-5 student family members and 2% have 6 student members and above.

Personal Income:

29% of the respondents have a monthly income of less than or equal to Rs.60000 and 38% have a monthly income between Rs. 60001- Rs. 90000; 20% have an income of between Rs. 90001- Rs.120000 monthly and 13%, a monthly income of above Rs. 120000.

The average personal income of the sample is Rs. 84150

Household Income:

11%Rs. of the sample respondents have a monthly household income less than or equal to Rs. 70000; 16% have a monthly household income between Rs. 70001- Rs.90000, 24% between Rs. 90001- Rs. 110000; 25% between Rs 110001-Rs. 15000, 17% between Rs.150001-Rs.200000 and the rest 7% with a monthly household income of Rs.200001 and above.

The average household income of the sample is Rs. 147000.

4.10 TRANSPORTATION AS CONSUMPTION AND THE COLLEGE TEACHERS AS CONSUMERS

Status of the respondents in relation to driving:

13% of a sample of 120 respondents does not own private vehicles in the household. 28% of the sample respondents have 2-wheeler license and drive themselves; 16% of the respondents have a four-wheeler license and drive themselves; 18% of the respondents have both two and four wheelers license and are driving themselves. 23% of the respondents do not know how to drive and also do not have license to drive , however use members of the household as drivers to drive them around intra city travel and a mere 7% of the non-driving, non-licensed respondents employ drivers to drive them around.

Amount of money spent on transportation for travel within the city a month by the individual respondents:

23% of the respondents spend less than or equal to Rs.1000 for intra-city travel in a month; 28% between Rs.1001-Rs.2500, 25% between Rs. 2501- Rs.4000, 19% between Rs. 4001-Rs.6000 and 5% spend Rs.6001 and above for monthly intra-city travel.

The average intra-city travel expense of the sample is around Rs.3016 monthly.

Amount of money spent on transportation for travel within the city a month by the individual respondents on privately owned vehicles:

Out of a sample of 120 respondents, 8% do not own private vehicles; as such their expenditure on private vehicle maintenance is Rs.0 monthly.14% of the total sample spends between Rs.1-Rs. 1000 monthly, 27% of the respondents spend between Rs.1001-Rs.2000. 21% spend between Rs.3501-Rs.5000 monthly and 10% spend above Rs.5001 monthly.

The average expenditure on management of privately owned vehicles of the sample is Rs.3034 monthly.

Amount of money spent on transportation for travel within the city by the individual respondents on travelling by public vehicles in a month:

Out of a sample of 120 respondents, 31% spend Rs.0 as they do not travel at all by public transportation. 32% of the respondents spent between Rs.1-Rs.500. 20% spending between Rs. 501-Rs.1500 a month, 9% between Rs.1501-3000 and the remaining 8% of the respondents spend Rs 3000 and above monthly.

The average monthly expense on the use of public transportation for intra-city travel is Rs.862 per individual.

Average percentage of Individual monthly income spent on intra-city transportation

An average of around 3.58% of their monthly income is spent on intra-city transportation by the respondents.

Private vehicle ownership

92% of the respondents were from a household which has private vehicles accessible for their use; the remaining 8% however do not own vehicles.

Number of vehicles owned by the respondent's household:

Of the total 120 respondents, 34% own one vehicle, either two wheelers or four wheelers. 58% have two or more vehicles in the household and 8% own none.

Type of vehicles owned by the respondents' household:

17% of the sample respondents own two wheelers only; 23% own four wheelers; 52% own both two wheelers and four and 8% own none.

Kind of public transport used by the respondents:

31% of the sample respondents use both bus transit as well as non-bus transit like taxis and motor-cabs. 10% of the total use bus as a means of public transport and

another 31% use the non-bus transit such as taxis and motor cabs while 31% of the sample respondents do not use public transport at all.

Use of public transportation by the sample respondents who are in a position to travel by private vehicles and the underlying reasons

Reason 1: Convenience

50% of the respondents attributed convenience of public transport system to its use. The issue of parking came into highlight when dealing with private vehicles, thus the use of taxis and buses as a means to commute within the city. Parking space is a major problem which is rampant especially in a congested land space as Aizawl.

Reason 2: Personal Preference

26% of the respondents attributed personal preference to their use of the public system. It was found out that the stress of driving, health-related issues and the need to multitask were the main reasons behind their preference.

Reason 3: Cost Saving

25% of the respondents attributed cost of private vehicle management to their use of public transport. The cost of management of privately owned vehicles becomes a burden with respect to oil price, road taxes, fines and fees, driver salaries etc.

Other Reasons other than private vehicle ownership for the non-use of public transportation by respondents:

Reason 1: Inconvenience, flexibility and time issues:

48% of the respondents attribute inconvenience, flexibility and time issues to their non-use of public vehicles, especially the bus transit which is fairly inflexible in relation to point or place of pick-up and dropping at the desired destination. The bus

stops are not at some places desirable and far off from the settlements which make its boarding difficult.

Reason 2: Inaccessibility and lack of security and independence

26% of the sample respondents attribute inaccessibility and lack of independence as their non-use of public transportation. Inaccessibility with regards to absence of bus-stop and taxi stands within immediate reach. Lack of independence, personal space and personal safety and security add up to the non-use of public transport.

Intra-city travel destinations where the respondents who own private vehicles prefer to use public transportation:

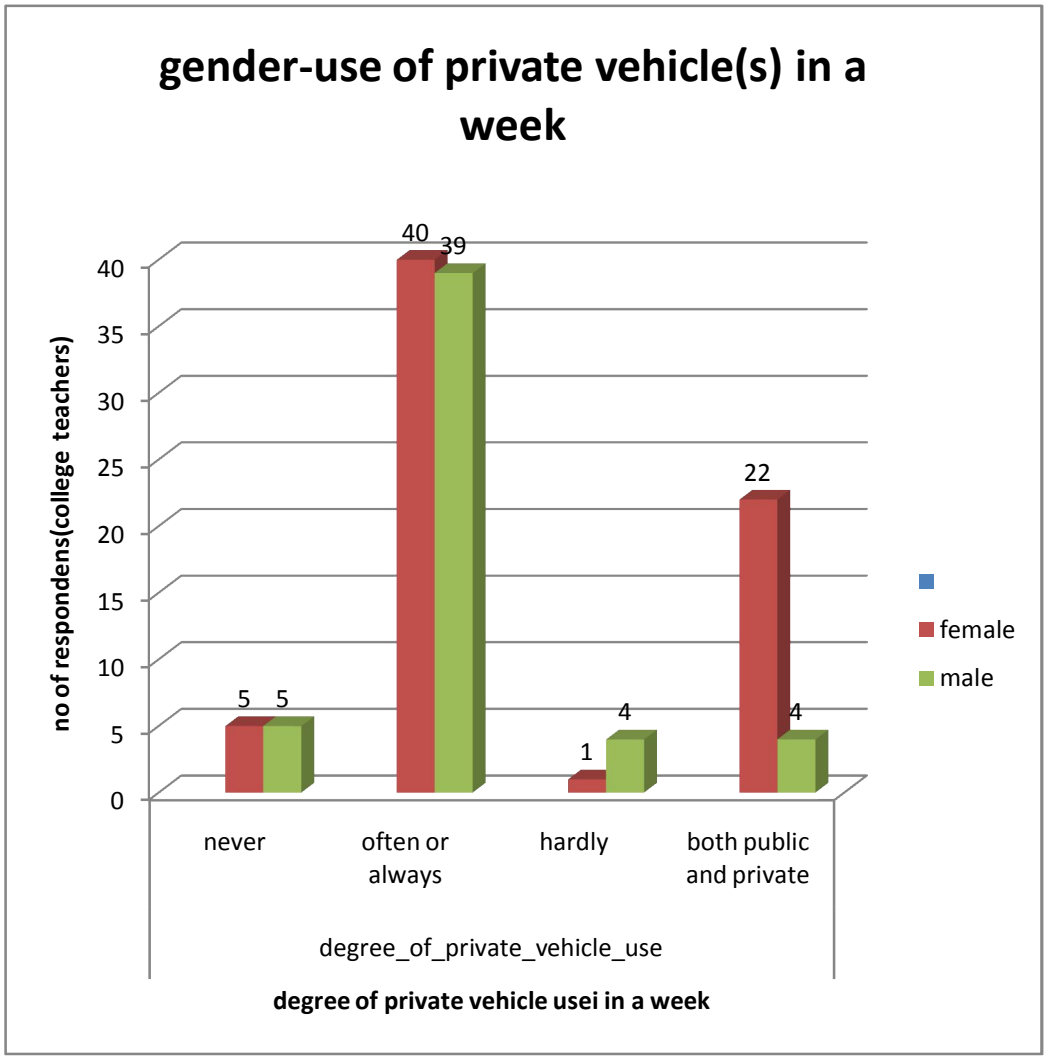
Shopping: Shopping as a travel destination is where the respondents who own private vehicles prefer to use public transportation instead of their own vehicles. The reasons being due to traffic congestion and limited parking spaces in the city. People who own private vehicles especially four wheelers would rather travel by taxis or buses to avoid such inconveniences. 30% of the respondents responded to the use of public transportation for shopping and the like.

Individuals who own private vehicles mostly prefer travelling by their own vehicles. Cases for the use of public transport include travelling intra-city for *work*, where 8% of the respondents prefer public transportation. The respondents use purely public transportation for round trips to and fro work or otherwise use private and public transportation for the trips being made to and fro. Another travel destination is that of travel for *educational purpose* whereby 9% of the respondents are likely to travel by public transportation due to convenience and time saving. Intra city travelling for *social events* by respondents, mostly in groups also allow for public transportation use, which accounts for preference over private by 10% of the sample respondents. *Health visits* also contribute to preference over private transportation by 9% of the respondents.

4.11 ANALYSIS OF FACTORS-COLLEGE TEACHERS

4.11.1 Gender-use of private vehicles in a week

Figure 4.1 showing distribution of respondents of gender and use of private vehicle in a week

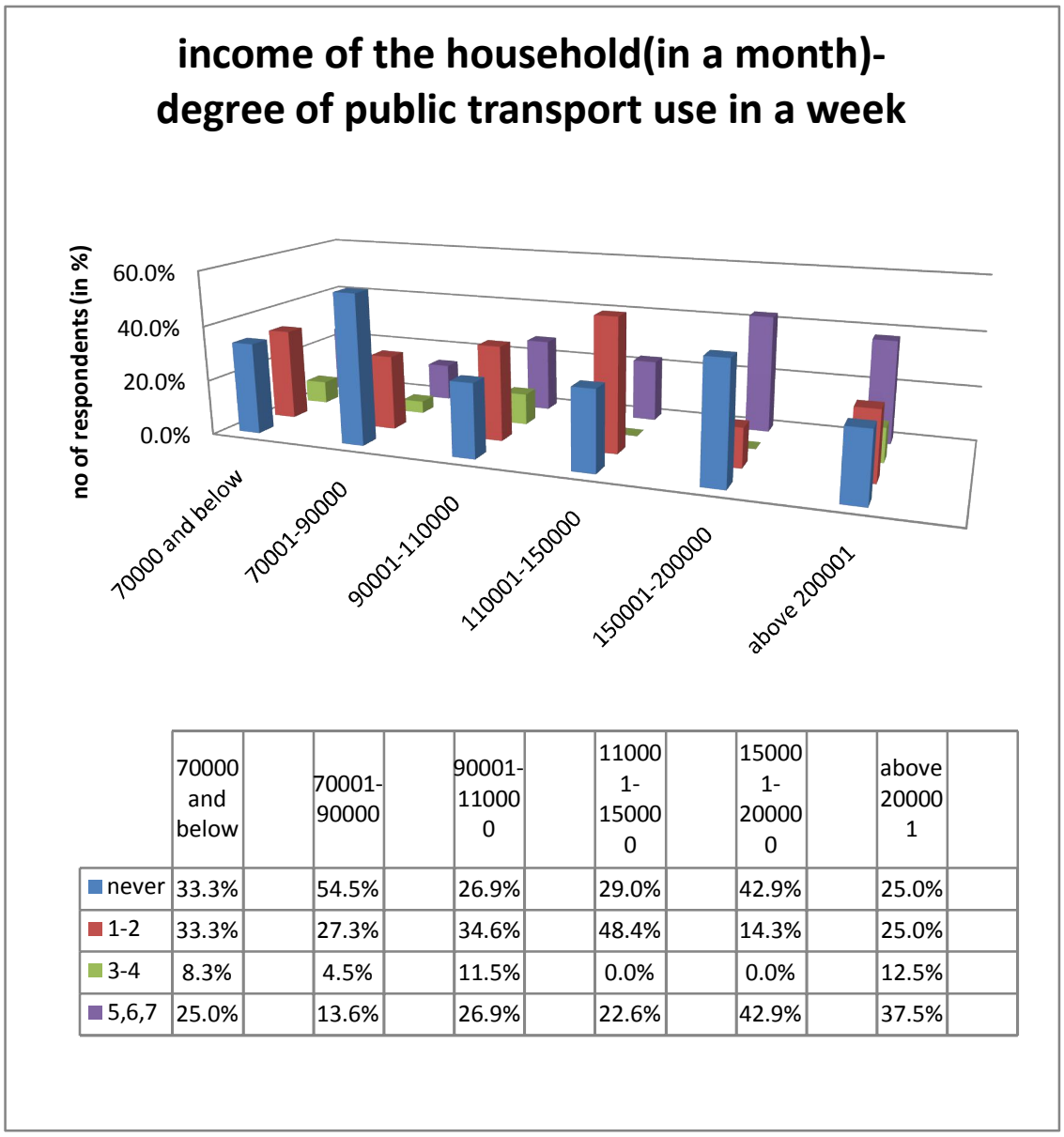


Source: collated from work

Figure 4.1 shows that majority of the respondents often or almost always travel by private transportation. Both genders are almost alike in their degree of use of the private means of transportation.

4.11.2 Total_household_income in a month * use of public transportation in a week- Cross tabulation

Figure 4.2 showing distribution of respondents in relation to Total_household_income in a month and use of public transportation in a week- Cross tabulation



	70000 and below		70001-90000		90001-110000		110001-150000		150001-200000		above 200001	
never	33.3%		54.5%		26.9%		29.0%		42.9%		25.0%	
1-2	33.3%		27.3%		34.6%		48.4%		14.3%		25.0%	
3-4	8.3%		4.5%		11.5%		0.0%		0.0%		12.5%	
5,6,7	25.0%		13.6%		26.9%		22.6%		42.9%		37.5%	

Source: Collated from field work

As can been seen from the chart, households with monthly income Rs.70000 and below, 25%of the respondents use the public mode on a daily basis, 14% for income group between Rs.70000-Rs 90000, 27% by respondents in the income group between Rs.900001-Rs.110000; 23% in the income group Rs.110001-Rs.150000, 43% by respondents from the income group Rs.150001-Rs.20000 and 36% from the income group Rs. 200001 and above.

We can thus say that a lot of people from the higher income group still use the public transport despite the many limitations.

4.11.3 Total household income in a month * how many private vehicles owned- Cross tabulation

Table 4.2 showing- distributions of respondents in relation to Total household income in a month and how many private vehicles owned- Cross tabulation

total_household_income * how many Cross tabulation					
		how many vehicles in the household			Total
		0	one	two or more	
total_household_income	70000 and below	3	5	4	12
		25.00%	41.70%	33.30%	100.00%
	70001-90000	2	5	15	22
		9.10%	22.70%	68.20%	100.00%
	90001-110000	2	11	13	26
		7.70%	42.30%	50.00%	100.00%
	110001-150000	2	13	16	31
		6.50%	41.90%	51.60%	100.00%
	150001-200000	1	6	14	21
		4.80%	28.60%	66.70%	100.00%
	above 200001	0	1	7	8
		0.00%	12.50%	87.50%	100.00%
Total		10	41	69	120
		8.30%	34.20%	57.50%	100.00%

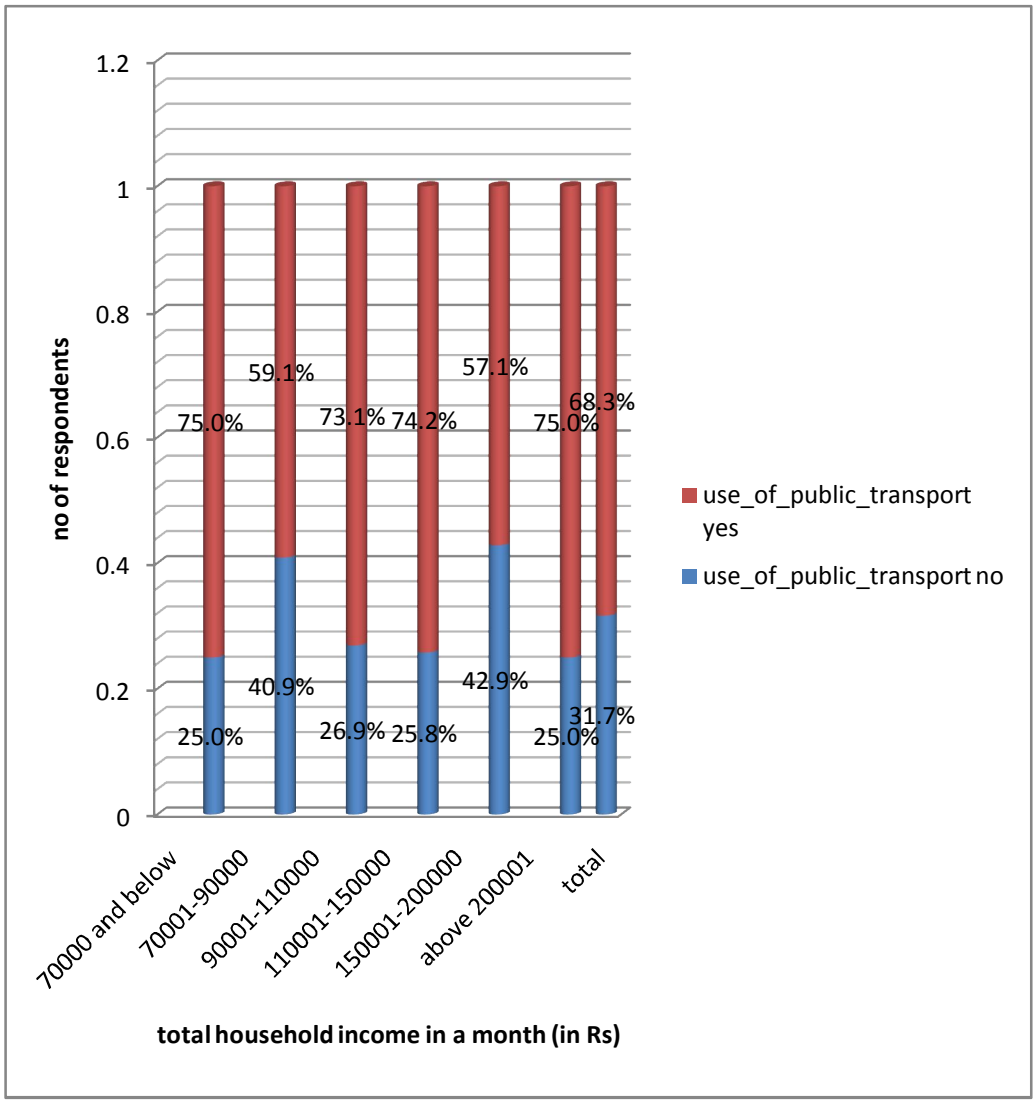
Source: collated from field work

From table 4.2, we can see that, as more the total monthly income of the household, the more the number of vehicles owned by the household. The number of private vehicle owned by the household increase moderately with the increase in total household income, whereby the type of vehicles owned may also add to the degree of ownership. A whopping 88% of the

household earning above Rs 200001 a month own two or more vehicles to be used by the household.

4.11.4 Total_household_income in a month * use of public transportation in a week- Cross tabulation

Figure 4.3 showing distribution of respondents in relation to Total_household_income in a month and use of public transportation in a week- Cross tabulation



Source: collated from fieldwork

From figure 4.3, it can be seen that, the percentage of use of public transport to non-use is more in each level of income group. Even among the household with high incomes, use of the public transport as a means of commute is still valid, however its degree of use is a different thing.

4.11.5 Total household income *Expenditure on commute in a month (in Rs) Cross tabulation

Table 4.3 showing distribution of respondents in relation to total_household_income and Expenditure on commute in a month (in Rs) Cross tabulation

total_household_income * commuting cost Cross tabulation							
		Total commuting cost in a month (in Rs)					Total
		1000 and below	1001-2500	2501-4000	4001-6000	above 6000	
total_household_income (in Rs)	70000 and below	5	4	1	2	0	12
		41.7%	33.3%	8.3%	16.7%	0.0%	100.0%
	70001-90000	6	11	4	0	1	22
		27.3%	50.0%	18.2%	0.0%	4.5%	100.0%
	90001-110000	7	5	8	6	0	26
		26.9%	19.2%	30.8%	23.1%	0.0%	100.0%
	110001-150000	2	11	6	6	6	31
		6.5%	35.5%	19.4%	19.4%	19.4%	100.0%
	150001-200000	6	2	6	6	1	21
		28.6%	9.5%	28.6%	28.6%	4.8%	100.0%
	above 200001	2	0	4	2	0	8
		25.0%	0.0%	50.0%	25.0%	0.0%	100.0%
Total		28	33	29	22	8	120
		23.3%	27.5%	24.2%	18.3%	6.7%	100.0%

Source: collated from fieldwork

From the table 4.3, it can be seen that from the household income group, Rs.70000 and below, majority (41.7%) of the respondents spend Rs. 1000 and below a month on commuting cost in a month. Also, it can be seen that, the amount of money income spent on commute a month lies mainly below Rs. 4000. Only a few percentages of the respondents spend more than Rs.4000 a month on commute.

4.11.6 Total household income * degree of pvt vehicle use (in a week) Cross tabulation

Table 4.4 showing distribution of respondents in relation to Total_household_income and degree_of_private vehicle use (in a week) Cross tabulation

total_household_income * degree_of_private_vehicle_use Cross tabulation						
		degree_of_private_vehicle_use				Total
		0	often or always	hardly or never	both public and private	
total_household_income	70000 and below	3	7	0	2	12
		25.0%	58.3%	0.0%	16.7%	100.0%
	70001-90000	2	14	1	5	22
		9.1%	63.6%	4.5%	22.7%	100.0%
	90001-110000	2	18	0	6	26
		7.7%	69.2%	0.0%	23.1%	100.0%
	110001-150000	2	21	3	5	31
		6.5%	67.7%	9.7%	16.1%	100.0%
	150001-200000	1	16	0	4	21
		4.8%	76.2%	0.0%	19.0%	100.0%
	above 200001	0	3	1	4	8
		0.0%	37.5%	12.5%	50.0%	100.0%
Total		10	79	5	26	120
		8.3%	65.8%	4.2%	21.7%	100.0%

Source: collated from field work

From table 4.4, it can be seen that most of the respondents use the private vehicle on a daily basis, especially by the respondents with monthly household income between Rs.70000-200000. Most use the private to public for commute. However, respondents from household having income Rs.200001 and above use both private and public transport for commute on a regular basis; the public vehicle use mostly being taxis, which are affordable only among higher income groups as the rate is fairly expensive for use on a regular basis.

4.11.7 Total household income * kind of public transportation used- Cross tabulation

Table 4.5 showing distribution of respondents in relation to Total_household_income and kind of public transportation used- Cross tabulation

total_household_income * kind_of_public_transport_used Cross tabulation						
		kind_of_public_transport_used				Total
		none	bus	non-bus	both	
total monthly household income (In Rs)	70000 and below	3	3	3	3	12
		25.0%	25.0%	25.0%	25.0%	100.0%
	70001-90000	9	3	5	5	22
		40.9%	13.6%	22.7%	22.7%	100.0%
	90001-110000	7	1	8	10	26
		26.9%	3.8%	30.8%	38.5%	100.0%
	110001-150000	8	1	11	11	31
		25.8%	3.2%	35.5%	35.5%	100.0%
	150001-200000	8	2	4	7	21
		38.1%	9.5%	19.0%	33.3%	100.0%
	above 200001	2	0	6	0	8
		25.0%	0.0%	75.0%	0.0%	100.0%
Total		37	10	37	36	120
		30.8%	8.3%	30.8%	30.0%	100.0%

Source: collated from field work

The respondents are fairly distributed in their use of public transport for commute where, 31% of the respondents do not use public transport. However from the table, it can be seen that, among the public transport users, solely non-bus users contributes a great deal and also users of both bus and non-bus; their proportion is about the same. The bus is rarely used independently by commuters.

4.11.8 Total household income * private vehicle ownership of the household- Cross tabulation

Table 4.6 showing distribution of respondents in relation to **Total_household_income and private vehicle ownership of the household- Cross tabulation**

total_household_income * vehicle ownership Cross tabulation				
		Private vehicle ownership		Total
		no	yes	
total monthly household income (in Rs)	70000 and below	3	9	12
		25.0%	75.0%	100.0%
	70001-90000	2	20	22
		9.1%	90.9%	100.0%
	90001-110000	2	24	26
		7.7%	92.3%	100.0%
	110001-150000	2	29	31
		6.5%	93.5%	100.0%
	150001-200000	1	20	21
		4.8%	95.2%	100.0%
	above 200001	0	8	8
		0.0%	100.0%	100.0%
Total		10	110	120
		8.3%	91.7%	100.0%

Source: collated from field work

From the table 4.6, it can be seen that, Except for the income group between Rs.70000 and below, the percentage of household not owning private vehicles is minimum. Especially in comparison to a 100% private vehicle ownership in households having monthly income of more than Rs.200001. from the table, it is likely that the more the income, the more likely the household own a private vehicle.

4.11.9 Total household income * preference of public over private transportation Cross tabulation

Table 4.7 showing distribution of respondents in relation to total household income and preference of public over private vehicle

total_household_income * prefer public_over_prvt Cross tabulation				
		Prefer public_over_prvt transportation		Total
		yes	no	
total_household_income in a month (in Rs)	70000 and below	2	10	12
		16.7%	83.3%	100.0%
	70001-90000	5	17	22
		22.7%	77.3%	100.0%
	90001-110000	5	21	26
		19.2%	80.8%	100.0%
	110001-150000	9	22	31
		29.0%	71.0%	100.0%
	150001-200000	6	15	21
		28.6%	71.4%	100.0%
	above 200001	3	5	8
		37.5%	62.5%	100.0%
Total		30	90	120
		25.0%	75.0%	100.0%

Source: collated from field work

From table 4.7, it can be seen that as the household income increases, there is a tendency for the respondents to prefer public transport over private, due to certain reasons which includes the affordability of the household members to hire taxis and other means, which has considerably high fares as compared to bus.

4.11.10 Monthly income * Expenditure on use of public transport in a month (in Rs) -Cross tabulation

Table 4.8 showing distribution of respondents in relation to **Monthly income and Expenditure on use of public transport in a month (in Rs) -Cross tabulation**

monthly household income (in Rs)	Expenditure on use of public transport in a month (in Rs)				
	0	1-500	501-1500	1501-3000	above 3000
70000 and below	25.0%	33.3%	25.0%	8.3%	8.3%
70001-90000	40.9%	22.7%	27.3%	9.1%	0.0%
90001-110000	26.9%	38.5%	23.1%	3.8%	7.7%
110001-150000	25.8%	48.4%	12.9%	9.7%	3.2%
150001-200000	38.1%	23.8%	9.5%	14.3%	14.3%
above 200001	25.0%	12.5%	25.0%	12.5%	25.0%
total	30.8%	33.3%	19.2%	9.2%	7.5%

Source: collated from fieldwork

From the table 4.8, it is seen that, as the household income increases, the spending on cost related to public transport use increases. However, on an average, 33% of the respondents spend between Rs1- 500 a month on the use of public transport.

4.11.11 Total household income * Type of vehicles owned - Cross tabulation

Table 4.9 showing distribution of respondents in relation to total_household_income and Type of vehicles owned – Cross tabulation

total_household_income * type Cross tabulation						
		type of vehicle owned				Total
		none	two wheeler	four wheeler	both	
total_household_income in a month (in Rs)	70000 and below	3	4	1	4	12
		25.0%	33.3%	8.3%	33.3%	100.0%
	70001-90000	2	5	3	12	22
		9.1%	22.7%	13.6%	54.5%	100.0%
	90001-110000	2	7	5	12	26
		7.7%	26.9%	19.2%	46.2%	100.0%
	110001-150000	2	2	8	19	31
		6.5%	6.5%	25.8%	61.3%	100.0%
	150001-200000	1	2	7	11	21
		4.8%	9.5%	33.3%	52.4%	100.0%
	above 200001	0	0	3	5	8
		0.0%	0.0%	37.5%	62.5%	100.0%
Total		10	20	27	63	120
		8.3%	16.7%	22.5%	52.5%	100.0%

Source: collated from field work

From table 4.9, it can be seen that four wheeler ownership increases with increase in household income, whereas for household with lower incomes, two wheeler ownership is common. The reason due to low cost of maintenance of two wheeler vehicles and the inability to purchase four-wheeled vehicles. Household with higher incomes own both two and four wheelers.

4.11.12 Total household income * Expenditure on private transport use and maintenance in a month (in Rs) -Cross tabulation

Table 4.10 showing distribution of respondents in relation to **Total_household_income and**

total_household_income * private_expendt Cross tabulation								
		Expenditure on private vehicle use and maintenance (in Rs)						Total
		0	0-1000	1001-2000	2001-3500	3501-5000	above 5000	
total_household_income (in Rs)	70000 and below	3	4	3	0	2	0	12
		25.0%	33.3%	25.0%	0.0%	16.7%	0.0%	100.0%
	70001-90000	2	4	11	4	0	1	22
		9.1%	18.2%	50.0%	18.2%	0.0%	4.5%	100.0%
	90001-110000	2	4	6	9	4	1	26
		7.7%	15.4%	23.1%	34.6%	15.4%	3.8%	100.0%
	110001-150000	2	2	7	6	9	5	31
		6.5%	6.5%	22.6%	19.4%	29.0%	16.1%	100.0%
	150001-200000	1	3	1	6	7	3	21
		4.8%	14.3%	4.8%	28.6%	33.3%	14.3%	100.0%
	above 200001	0	0	2	1	3	2	8
		0.0%	0.0%	25.0%	12.5%	37.5%	25.0%	100.0%
Total		10	17	30	26	25	12	120
		8.3%	14.2%	25.0%	21.7%	20.8%	10.0%	100.0%

Expenditure on private transport use and maintenance in a month (in Rs) Cross tabulation

Source: collated from field work

From table 4.11 it can be seen that, higher the total monthly household income, higher the expenditure on privately owned vehicles. The higher income groups are in a position to financially manage private vehicles, both two and four wheelers, in addition that in some households, personal drivers are employed.

4.11.13 Total household income * preference of private over public transportation -Cross tabulation

Table 4.11 showing distribution of respondents in relation to Total_household_income and preference of_private_over public transportation -Cross tabulation

total_household_income * prefer_prvt_ovr_public Cross tabulation				
		prefer_prvt_over_public transportation		Total
		yes	no	
total_household_income	30000 and below	9	3	12
		75.0%	25.0%	100.0%
	30001-50000	13	9	22
		59.1%	40.9%	100.0%
	50001-80000	36	14	50
		72.0%	28.0%	100.0%
	80001-110000	11	7	18
		61.1%	38.9%	100.0%
	110001-150000	9	1	10
		90.0%	10.0%	100.0%
	above150000	6	2	8
		75.0%	25.0%	100.0%
Total		84	36	120
		70.0%	30.0%	100.0%

Source: collated from field work

From table 4.11, it is seen that majority of the respondents prefer private transportation to public transport, however respondents from higher household income group also prefer public transportation as it is more convenient and time saving in certain circumstances.

4.11.14 Monthly income * use public transport- Cross tabulation

Table 4.12 showing distribution of respondents in relation to Monthly income and use of public transport in a week Cross tabulation

monthly_income * how often Cross tabulation

		How often do you travel by public transport in a week?				Total
		never	1-2	3-4	5,6,7	
monthly income (in Rs)	60000 and below	11	14	3	7	35
		31.4%	40.0%	8.6%	20.0%	100.0%
	60001-90000	18	15	3	9	45
		40.0%	33.3%	6.7%	20.0%	100.0%
	90001-120000	8	8	0	8	24
		33.3%	33.3%	0.0%	33.3%	100.0%
	above 120000	6	2	0	8	16
		37.5%	12.5%	0.0%	50.0%	100.0%
Total		43	39	6	32	120
		35.8%	32.5%	5.0%	26.7%	100.0%

Source: collated from field work

From table 4.12, it is seen that, lower income groups use public transport sparingly, however as the income increases, more of it is used on a daily basis, which when found out through survey is the use of taxis on a regular basis.

4.11.15 Monthly income * kind_of_public_transport_used Cross tabulation

Table 4.13 showing distribution of respondents in relation to monthly income and kind of public transportation used

monthly income * kind_of_public_transport_used Cross tabulation						
		kind_of_public_transport_used				Total
		0	bus	non-bus	both	
monthly income (in Rs)	60000 and below	10	4	10	11	35
		28.6%	11.4%	28.6%	31.4%	100.0%
	60001-90000	15	5	14	11	45
		33.3%	11.1%	31.1%	24.4%	100.0%
	90001-120000	6	0	8	10	24
		25.0%	0.0%	33.3%	41.7%	100.0%
	above 120000	6	1	5	4	16
		37.5%	6.3%	31.3%	25.0%	100.0%
Total		37	10	37	36	120
		30.8%	8.3%	30.8%	30.0%	100.0%

Source: collated from field work

From table 4.13, it is evident that there is hardly ever the use of bus as a means of transportation on a daily basis; especially in some level of income group, it is not used at all.

4.11.16 Monthly income-number of private vehicles in the household *cross tabulation

Table 4.14 showing distribution of respondent in relation to Monthly income-number of private vehicles in the household *cross tabulation

monthly income * how many Cross tabulation					
		No of private vehicles owned			Total
		0	one	two or more	
monthly income (in Rs)	60000 and below	2	9	24	35
		5.7%	25.7%	68.6%	100.0%
	60001-90000	4	13	28	45
		8.9%	28.9%	62.2%	100.0%
	90001-120000	3	11	10	24
		12.5%	45.8%	41.7%	100.0%
	above 120000	1	8	7	16
		6.3%	50.0%	43.8%	100.0%
Total		10	41	69	120
		8.3%	34.2%	57.5%	100.0%

Source: collated from fieldwork

As evident from table 4.14, a large portion of the respondents have households owning more than one private vehicle. The percentage is exceptionally high income group Rs.60001-90000, which is around 62% of the total respondents belonging to that particular income group, as also in comparison to the other level of income group.

4.11.17 Monthly income * commuting_cost_in_a_month -Cross tabulation

Table 4.15 showing distribution of respondents in relation to **Monthly income and commuting_cost_in_a_month Cross tabulation**

monthly income * commuting cost Cross tabulation							
		commuting cost in a month (In Rs)					Total
		1000 and below	1001-2500	2501-4000	4001-6000	above 6000	
monthly income (In Rs)	60000 and below	11	10	8	6	0	35
		31.4%	28.6%	22.9%	17.1%	0.0%	100.0%
	60001-90000	9	15	10	6	5	45
		20.0%	33.3%	22.2%	13.3%	11.1%	100.0%
	90001-120000	3	5	8	5	3	24
		12.5%	20.8%	33.3%	20.8%	12.5%	100.0%
	above 120000	5	3	3	5	0	16
		31.3%	18.8%	18.8%	31.3%	0.0%	100.0%
Total		28	33	29	22	8	121
		23.1%	27.3%	24.0%	18.2%	6.6%	100.0%

Source: collated from field work

From table 4.15, it can be seen that from the household income group, Rs.120000 and below, majority of the respondents spend Rs. 2500 and below a month on commuting cost in a month. Also, it can be seen that, the amount of money income spent on commute a month lies mainly below Rs. 4000. Only a few percentages of the respondents spend more than Rs.4000 a month on commute.

4.11.18 Monthly income-Degree of private vehicle use in month-cross tabulation

Table 4.16 showing distribution of respondents in relation to **Monthly income and Degree of private vehicle use in month-cross tabulation**

monthly income * degree_of_private_vehicle_use Cross tabulation

		degree_of_private_vehicle_use				Total
		0	often or always	hardly or never	both public and private	
monthly income	60000 and below	2	23	1	9	35
		5.7%	65.7%	2.9%	25.7%	100.0%
	60001 - 90000	4	30	2	9	45
		8.9%	66.7%	4.4%	20.0%	100.0%
	90001 - 120000	3	15	1	5	24
		12.5%	62.5%	4.2%	20.8%	100.0%
	above 120000	1	11	1	3	16
		6.3%	68.8%	6.3%	18.8%	100.0%
Total		10	79	5	26	120
		8.3%	65.8%	4.2%	21.7%	100.0%

Source: collated from field work

From table 4.16, it would be right to say that most of the respondents use private vehicles on a regular basis; a majority of 66% of the respondents belonging to different income groups uses their private vehicles for commute regularly.

4.11.19 Monthly income * Expenditure on use of public transport in a month (in Rs) -Cross tabulation

Table 4.17 showing distribution of respondents in relation to **Monthly income and Expenditure on use of public transport in a month (in Rs) -Cross tabulation**

monthly income * public_vehicle_cost Cross tabulation								
		Expenditure on public transport use in a month(in Rs)						Total
		0	1-500	1	501-1500	1501-3000	above 3000	
monthly income (In Rs)	60000 and below	10	12	0	6	6	1	35
		28.6%	34.3%	0.0%	17.1%	17.1%	2.9%	100.0%
	60001-90000	15	16	0	9	2	3	45
		33.3%	35.6%	0.0%	20.0%	4.4%	6.7%	100.0%
	90001-120000	6	9	0	4	1	4	24
		25.0%	37.5%	0.0%	16.7%	4.2%	16.7%	100.0%
	above 120000	6	3	0	4	2	1	16
		37.5%	18.8%	0.0%	25.0%	12.5%	6.3%	100.0%
Total		37	40	1	23	11	9	121
		30.6%	33.1%	.8%	19.0%	9.1%	7.4%	100.0%

Source: collated from field work

As can be seen from table 4.17, 33% of the total respondents spend around Rs. 500 or less on the use of public transport in a month. Income group above Rs 120000 spend a little more than just Rs. 500, where 25% falling in that income level spend between Rs.500-1500 a month. This may be due to the use of taxis for commute, which is much costlier than commute by bus.

4.11.20 Monthly income * Expenditure on use and maintenance of private vehicle in a month (in Rs) - Cross tabulation

Table 4.18 showing distribution of respondents in relation to **monthly income and Expenditure on use and maintenance of private vehicle (in Rs) - Cross tabulation**

monthly income * private_expendt Cross tabulation

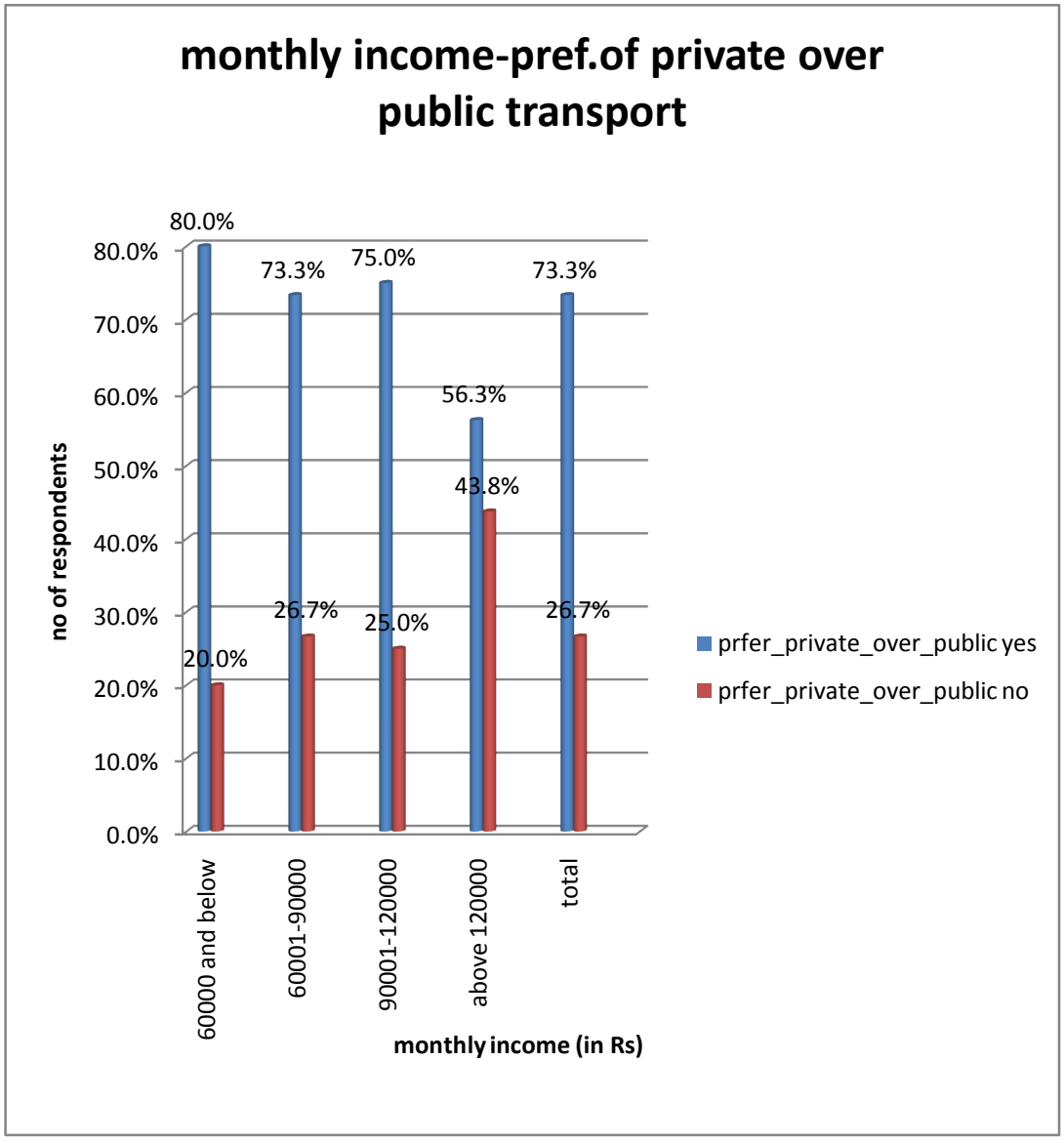
		Monthly expenditure on commute by private vehicle (in Rs)						Total
		0	0-1000	1001-2000	2001-3500	3501-5000	above 5000	
monthly income (in Rs)	60000 and below	2	6	11	8	5	3	35
		5.7%	17.1%	31.4%	22.9%	14.3%	8.6%	100.0%
	60001-90000	4	8	11	6	10	6	45
		8.9%	17.8%	24.4%	13.3%	22.2%	13.3%	100.0%
	90001-120000	3	0	6	8	4	3	24
		12.5%	0.0%	25.0%	33.3%	16.7%	12.5%	100.0%
	above 120000	1	3	2	4	6	0	16
		6.3%	18.8%	12.5%	25.0%	37.5%	0.0%	100.0%
Total		10	17	30	26	25	12	121
		8.3%	14.0%	24.8%	21.5%	20.7%	9.9%	100.0%

Source: collated from fieldwork

Expenditure on private vehicle maintenance and use is highest in income group Rs.120000 and above, Where 38% of the respondents belonging to that income level spend between Rs.3501-5000 a month. The higher the income, the higher the expenditure on private vehicle maintenance.

4.11.21 Monthly income * preference of Private over public transportation- Cross tabulation

Figure 4.4 showing distribution of respondents in relation to Monthly income and preference of Private over public transportation Cross tabulation



Source: collated from field work

From figure 4.4, it can be seen that there is majority preference of private transport at the different levels of income group, wherein as the income increases there is a slight tendency for the preference to shift towards public transport, however the percentage is meek.

4.11.22 Monthly income * private vehicle ownership- Cross tabulation

Table 4.19 showing distribution of respondents in relation to Monthly income and private vehicle ownership- Cross tabulation

monthly income * vehicle ownership Cross tabulation				
		vehicle ownership		Total
		no	yes	
monthly income	60000 and below	2	33	35
		5.7%	94.3%	100.0%
	60001-90000	4	41	45
		8.9%	91.1%	100.0%
	90001-120000	3	21	24
		12.5%	87.5%	100.0%
	above 120000	1	15	16
		6.3%	93.8%	100.0%
Total		10	110	120
		8.3%	91.7%	100.0%

Source: collated from field work

From table 4.19, it can be seen that 92% of the respondents own private vehicles. The rate of private vehicle ownership increases with increase in the monthly household income of the respondents. This could be due to greater affordability of the household to own private vehicles as the income increases.

4.11.23 Position in the household * preference of private over public transportation- Cross tabulation

Table 4.20 showing distribution of respondents in relation to Position**_in_the_household and preference of private over public transportation- Cross tabulation**

position_in_the_household * prfer_private_over_public Cross tabulation				
		prefer_private_over_public transport		Total
		yes	no	
position_in_the_household	father	40	7	47
		85.1%	14.9%	100.0%
	mother	36	21	57
		63.2%	36.8%	100.0%
	son	4	2	6
		66.7%	33.3%	100.0%
	daughter	8	2	10
		80.0%	20.0%	100.0%
Total		88	32	120
		73.3%	26.7%	100.0%

Source: collated from field work

From table 4.20, it can be seen that the greatest preference is for private vehicles irrespective of the position of the respondents in the household. 36% of mothers in the household prefer public over private transport.

4.12 ECONOMETRIC MODEL

The aim of this was to examine the relationship between college teacher's transport mode choices and utilities offered.

A binary logistic is used to understand the mode choice of the individuals.

A logistic model, commonly called the logit model is when the response variable is qualitative. A binary logit model is one whose dependent variable has only two

possible outcomes. The objective in such models is to find the probability of something happening. Hence it is called a probability model.

4.12.1 Variables used in the model

The dependent variable used to run the regression model is the choice of means of transportation used. Therefore, the individuals' decision in preferring private over public transportation is dependent on certain explanatory variables which are time issue (bus service time and time 0f travel), comfort level (security, comfort and independence of private vehicle, crowdedness of bus and likeness for driving), accessibility and flexibility (inconvenience due to access distance of bus stops, public transportation networks limitations), cost saving (taxi fares), and lastly other factors, givens others for the respondents to specify.

Certain variables have been dropped to avoid multicollinearity (Dropping Variable Method).

4.12.2 Predicted Value

Table 4.21 shows the level of prediction for the binary logistic model used. The overall percentage of yes and no that are predicted correctly.

Classification Table[a]

Observed			Predicted		
			prfer_private_over_public		Percentage Correct
			yes	no	
Step 1	prfer_private_over_public	yes	87	1	98.9
		no	1	31	96.9
	Overall Percentage				98.3

a. The cut value is .500

Source: collated from field work

Firstly, notice that the table has a subscript which states, "The cut value is.500".This means the probability of a case being classified into the "yes" category is greater than .500, then that particular case is classified into the "yes "category". Otherwise,

the case is classified as in the “no “category”. Whilst the classification table appears to be very simple, it actually provides a lot of information about the binomial logistic regression result, including:

a. The percentage accuracy in classification (PAC), which reflects the percentage of cases that can be correctly classified as “no” preference of public transport with the independent variables added (not just the overall model).
b. Sensitivity, which is the percentage of cases that had the observed characteristics, “yes” for private public transport preference, which were correctly predicted by the model.
c. Specificity, which is the percentage of cases that did not have the observed characteristic, “no” for preference of private transportation and were also correctly predicted as not having the observed characteristic that is true negatives.
d. The positive predictive value, which is the percentage of correctly predicted cases “with” the observed characteristic compared to the total number of cases predicted as having the characteristic.
e. The negative predicted value, which is the percentage of correctly predicted cases “without” the observed the observed characteristic compared to the total number of cases predicted as having the characteristic.

4.12.3 Case Processing Summary

Table 4.22 Case Processing Summary

Table Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	120	98.4
	Missing Cases	2	1.6
	Total	122	100.0
Unselected Cases		0	.0
Total		122	100.0

a. If weight is in effect, see classification table for the total number of cases.

Source: collated from field work

4.12.4 Dependent Variable Encoding

Table 4.23 Dependent Variable Encoding

Table Dependent Variable Encoding

Original Value	Internal Value
Yes	0
No	1

Source: collated from field work

4.12.5 Chi- Square:

Table 4.24 Tests of Model Coefficients

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	123.912	6	.000
	Block	123.912	6	.000
	Model	123.912	6	.000

Source: collated from field work

The Chi Square Test is used to collate the expected frequency and the observed frequency. The Chi- Square value is 123.912 and is highly significant at (.000) as seen in the table. The individual variables are analyzed through the interpretation of the Logit model.

4.12.6 Goodness of Fit

Under the Model Summary, we see that the -2 Log Likelihood statistics is 15.268. This statistic measure how poorly or efficiently the model predicts the decisions-the smaller the statistic, the better the model. The Cox &Snell R square can be interpreted like R Square in a multiple regression but cannot reach a maximum value of 1. The Nagelkerke R Square can reach a maximum of 1.

The Nagelkerke R Square depicts the goodness of fit as seen in Table
It denotes the variation in dependent variable due to independent variable. In this case R square=0.938

Therefore 93.8% of variation of dependent variable can be explained with the independent variables. The factors included in the model account for 93.8% of the variation for the Nagelkerke while Cox & Snell explained 64.4%.

Table 4.25 Model summary

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	15.268[a]	.644	.938

a. Estimation terminated at iteration number 20 because maximum iterations have been reached. Final solution cannot be found.

Source: collated from field work

4.12.7 Interpretation of the Logit model

In order to establish the relationship between the dependent and independent variables, the following table is used

TABLE 4.26 Variables in the Equation

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	gender(1)	.027	1.605	.000	1	.987	1.027
	time issues	-5.485	1.525	12.942	1	.000	.004
	comfort level	-21.372	6196.255	.000	1	.997	.000
	accsblty_flexibilty	-3.219	1.716	3.519	1	.061	.040
	saves money	-16.335	14201.854	.000	1	.999	.000
	other_resns	-19.572	40192.970	.000	1	1.000	.000
	Constant	3.827	1.569	5.949	1	.015	45.918

a. Variable(s) entered on step 1: gender, time issues, comfort level, accsblty_flexibilty, saves money, other_resns.

Source: collated from fieldwork

The Wald test ("Wald" column) is used to determine statistical significance for each of the independent variables.

The statistical significance of the test is found in the 'Sig' column. Based on the level of significance (sig.) and the intercept values (B) as seen in table. The regression equation is formed. If the significance level is lesser than 0.05, then the variable is highly significant. We can use the information in the "variables in the Equation" table to predict the probability of an event occurring based on a one unit change in an independent variable when all other independent variables are kept constant. The table shows that the odds of preferring private over public transportation("yes" category) is 1.027 times greater for males as opposed to females.

Time issues, has a negative result on the dependent variable (-5.485), but is highly significant (.000). This means that a unit increase in time issue as a factor will lead to a5.485 decrease in the dependent variable. This reveals that time issue in relation to transportation is highly significant to the choice of means of transportation. The

estimated co-efficient for time issue came out negative, implying that an increase in issues related to time management and related issue as a whole, was likely to decrease the use of public transport.

Flexibility and accessibility, has a negative result on dependent variable (-3.228), but is highly significant (.047). This means that a unit increase in flexibility and accessibility as a factor will lead to a 3.228 decrease in the dependent variable. This reveals that Flexibility and accessibility, in relation to transportation is highly significant to the choice of means of transportation. The estimated co-efficient for time issue came out negative, implying that an increase in issues related to Flexibility and accessibility as a whole, was likely to decrease the use of public transport.

From these results, we can see that factors such as Time-related issues (0.050) and Accessibility & Flexibility (0.001) added significantly to the model/prediction, but Gender (.792) and Money saving (.997) as a factor did not add significantly to the model.

4.13. ANALYSIS OF FACTORS- HIGH SCHOOL TEACHERS

4.13.1 Total household income in a month * how many private vehicles owned- Cross tabulation

Table 4.27 showing- distribution of respondents in relation to Total household income in a month * how many private vehicles owned- Cross tabulation

total_household_income * how many Cross tabulation						
		No of private vehicles owned				Total
		0	one	two or more	3	
total_household_income in a month (in Rs)	30000 and below	3	7	2	0	12
		25.0%	58.3%	16.7%	0.0%	100.0%
	30001-50000	6	10	6	0	22
		27.3%	45.5%	27.3%	0.0%	100.0%
	50001-80000	8	20	21	1	50
		16.0%	40.0%	42.0%	2.0%	100.0%
	80001-110000	5	3	10	0	18
		27.8%	16.7%	55.6%	0.0%	100.0%
	110001-150000	0	1	9	0	10
		0.0%	10.0%	90.0%	0.0%	100.0%
	above150000	0	2	6	0	8
		0.0%	25.0%	75.0%	0.0%	100.0%
Total		22	43	54	1	120
		18.3%	35.8%	45.0%	.8%	100.0%

Source: collated from field work

From table 4.27, we can see that, as more the total monthly income of the household, the more the number of vehicles owned by the household. The number of private vehicle owned by the household increase moderately with the increase in total household income, whereby the type of vehicles owned may also add to the degree of ownership where,75% of the household earning above Rs 150000 a month own two or more vehicles to be used by the household.

4.13.2 Total_household_income in a month * use of public transportation in a week- Cross tabulation

Table 4.28 showing distribution of respondents in relation to Total_household_income in a month and use of public transportation in a week- Cross tabulation

total_household_income * how_oftn Cross tabulation						
		Use of public transportation in a week				Total
		never	1-2	3-4	5,6,7	
total_household_income In a month (in Rs)	*30000 and below*	5	5	0	2	12
		41.7%	41.7%	0.0%	16.7%	100.0%
	30001-50000	7	8	1	6	22
		31.8%	36.4%	4.5%	27.3%	100.0%
	50001-80000	22	12	2	14	50
		44.0%	24.0%	4.0%	28.0%	100.0%
	80001-110000	2	6	1	9	18
		11.1%	33.3%	5.6%	50.0%	100.0%
	110001-150000	1	8	0	1	10
		10.0%	80.0%	0.0%	10.0%	100.0%
	above150000	1	5	0	2	8
		12.5%	62.5%	0.0%	25.0%	100.0%
Total		38	44	4	34	120
		31.7%	36.7%	3.3%	28.3%	100.0%

Source: collated from field work

From table 4.28, it is seen that, lower income groups use public transport sparingly, however as the income increases, more of it is used on a daily basis, which when found out through survey is the use of taxis on a regular basis. For income group Rs.80001- 110000, 50% of the respondents use it on a regular basis, after which there is a slight decrease in extent of use of public transport as the income increases.

4.13.3 Total_household_income *Expenditure on commute in a month (in Rs) Cross tabulation

Table 4.29 showing distribution of respondents in relation to total_household_income and Expenditure on commute in a month (in Rs) Cross tabulation

total_household_income * commuting_cost_in_a_month Cross tabulation							
		Expenditure on commute in a month (in Rs)					Total
		500 or below	501-1500	1501-2500	2501-3500	above 3500	
total_household_income	30000 and below	4	6	1	1	0	12
		33.3%	50.0%	8.3%	8.3%	0.0%	100.0%
	30001-50000	6	6	8	0	2	22
		27.3%	27.3%	36.4%	0.0%	9.1%	100.0%
	50001-80000	7	23	13	6	1	50
		14.0%	46.0%	26.0%	12.0%	2.0%	100.0%
	80001-110000	4	8	0	1	5	18
		22.2%	44.4%	0.0%	5.6%	27.8%	100.0%
	110001-150000	1	7	0	0	2	10
		10.0%	70.0%	0.0%	0.0%	20.0%	100.0%
	above150000	1	2	2	2	1	8
		12.5%	25.0%	25.0%	25.0%	12.5%	100.0%
Total		23	52	24	10	11	120
		19.2%	43.3%	20.0%	8.3%	9.2%	100.0%

Source: collated from field work

From table 4.29, it can be seen that from the household income group, Rs.110001-150000, majority (70%) of the respondents spend Rs. 1500 and below a month on commuting cost in a month. Also, it can be seen that, the amount of money income spent on commute a month lies mainly between Rs.501-1500 a month. Only a few percentages of the respondents spend more than Rs.3500 a month on commute.

4.13.4 Total household income * degree of pvt vehicle use (in a week) Cross tabulation

Table 4.30 showing distribution of respondents in relation to Total_household_income and degree_of_pvt_vehicle_use (in a week) Cross tabulation

total_household_income * degree_of_pvt_vehicle_use Cross tabulation						
		degree_of_pvt_vehicle_use (in a week)				Total
		0	often or always	hardly or never	both public &_pvt	
total_household_income (inRs)	30000 and below	3	6	1	2	12
		25.0%	50.0%	8.3%	16.7%	100.0%
	30001-50000	6	12	1	3	22
		27.3%	54.5%	4.5%	13.6%	100.0%
	50001-80000	8	32	4	6	50
		16.0%	64.0%	8.0%	12.0%	100.0%
	80001-110000	5	8	0	5	18
		27.8%	44.4%	0.0%	27.8%	100.0%
	110001-150000	0	6	1	3	10
		0.0%	60.0%	10.0%	30.0%	100.0%
	above150000	0	5	1	2	8
		0.0%	62.5%	12.5%	25.0%	100.0%
Total		22	69	8	21	120
		18.3%	57.5%	6.7%	17.5%	100.0%

Source: collated from field work

From table 4.30, it can be seen that most of the respondents use the private vehicle on a daily basis, especially by the respondents with monthly household income above Rs. 110000. Most use the private to public for commute.

4.13.5 Total_household_income * kind of public transportation used- Cross tabulation

Table 4.31 showing distribution of respondents in relation to Total_household_income and kind of public transportation used- Cross tabulation

total_household_income * kind_public_tranprt_used Cross tabulation						
		Kind of public_tranportation_used				Total
		0	bus	non-bus	both	
total_household_income in a month (in Rs)	30000 and below	3	1	4	4	12
		25.0%	8.3%	33.3%	33.3%	100.0%
	30001-50000	6	2	5	9	22
		27.3%	9.1%	22.7%	40.9%	100.0%
	50001-80000	22	2	10	16	50
		44.0%	4.0%	20.0%	32.0%	100.0%
	80001-110000	2	3	3	10	18
		11.1%	16.7%	16.7%	55.6%	100.0%
	110001-150000	1	3	3	3	10
		10.0%	30.0%	30.0%	30.0%	100.0%
	above150000	0	2	2	4	8
		0.0%	25.0%	25.0%	50.0%	100.0%
Total		34	13	27	46	120
		28.3%	10.8%	22.5%	38.3%	100.0%

Source: collated from field work

The respondents are fairly distributed in their use of public transport for commute where, 29% of the respondents do not use public transport. However from table 4.31, it can be seen that, among the public transport users, solely non-bus users contributes a great deal and

also users of both bus and non-bus; their proportion is about the same. The bus is rarely used independently by commuters.

4.13.6 Total household income * preference of private over public transportation -Cross tabulation

Table 4.32 showing distribution of respondents in relation to Total_household_income and preference of_private_over public transportation -Cross tabulation

total_household_income * prefer_prvt_ovr_public Cross tabulation				
		prefer_prvt_ovr_public transport		Total
		yes	no	
total_household_income in a month (in Rs)	30000 and below	9	3	12
		75.0%	25.0%	100.0%
	30001-50000	13	9	22
		59.1%	40.9%	100.0%
	50001-80000	36	14	50
		72.0%	28.0%	100.0%
	80001-110000	11	7	18
		61.1%	38.9%	100.0%
	110001-150000	9	1	10
		90.0%	10.0%	100.0%
	above150000	6	2	8
		75.0%	25.0%	100.0%
Total		84	36	120
		70.0%	30.0%	100.0%

Source: collated from field work

From table 4.32, it is seen that majority of the respondents prefer private transportation to public transport, however respondents from higher household income group also prefer public transportation as it is more convenient and time saving in certain circumstances.

4.13.7 Total household income *Average spending on private vehicle use and maintenance in a month (in Rs) - cross tabulation

Table 4.33 showing distribution of respondents in relation to total_household_income *Average spending on private vehicle use and maintenance in a month (in Rs) - Cross tabulation

total_household_income * avg_spndg_owned_vehicle Cross tabulation							
		Average spending on private vehicle use and maintenance in a month (in Rs)					Total
		0	1-500	501-1500	1501-3000	above 3000	
total_household_income (In Rs)	30000 and below	3	4	4	1	0	12
		25.0%	33.3%	33.3%	8.3%	0.0%	100.0%
	30001-50000	6	3	4	8	1	22
		27.3%	13.6%	18.2%	36.4%	4.5%	100.0%
	50001-80000	8	6	15	15	6	50
		16.0%	12.0%	30.0%	30.0%	12.0%	100.0%
	80001-110000	5	2	1	4	6	18
		27.8%	11.1%	5.6%	22.2%	33.3%	100.0%
	110001-150000	0	1	4	3	2	10
		0.0%	10.0%	40.0%	30.0%	20.0%	100.0%
	above150000	0	0	0	6	2	8
		0.0%	0.0%	0.0%	75.0%	25.0%	100.0%
Total		22	16	28	37	17	120
		18.3%	13.3%	23.3%	30.8%	14.2%	100.0%

Source: collated from field work

From table 4.33, it can be seen that, higher the total monthly household income, higher the expenditure on privately owned vehicles. The higher income groups are in a position to

financially manage private vehicles, both two and four wheelers, in addition that in some households, personal drivers are employed.

4.13.8 Total household income * Expenditure on public transport use in a month (in Rs) -Cross tabulation

Table 4.34 showing distribution of respondents in relation to **Total_household_income and Expenditure on public transport use in a month (in Rs) Cross tabulation**

total_household_income * publc_commute_expdt Cross tabulation							
		Expenditure on public transport use in a month (in Rs)					Total
		0	1-500	501-1500	1501-3000	abv 3000	
total_household_income in a month(in Rs)	30000 and below	4	6	1	1	0	12
		33.3%	50.0%	8.3%	8.3%	0.0%	100.0%
	30001-50000	6	10	3	2	1	22
		27.3%	45.5%	13.6%	9.1%	4.5%	100.0%
	50001-80000	22	10	12	5	1	50
		44.0%	20.0%	24.0%	10.0%	2.0%	100.0%
	80001-110000	2	6	7	2	1	18
		11.1%	33.3%	38.9%	11.1%	5.6%	100.0%
	110001-150000	1	5	3	0	1	10
		10.0%	50.0%	30.0%	0.0%	10.0%	100.0%
	above150000	0	6	0	2	0	8
		0.0%	75.0%	0.0%	25.0%	0.0%	100.0%
Total		35	43	26	12	4	120
		29.2%	35.8%	21.7%	10.0%	3.3%	100.0%

Source: collated from field work

From table 4.34, it is seen that, as the household income increases, the spending on cost related to public transport use increases. However, on an average, 36% of the respondents spend between Rs.1- 500 a month on the use of public transport.

4.13.9 Total household income * Type of vehicles owned - Cross tabulation

Table 4.35 showing distribution of respondents in relation to total_household_income and Type of vehicles owned - Cross tabulation

total_household_income * type Cross tabulation						
		Type of vehicles owned				Total
		0	two wheeler	four wheeler	both	
total_household_income in a month (in Rs)	30000 and below	3	6	0	3	12
		25.0%	50.0%	0.0%	25.0%	100.0%
	30001-50000	6	9	4	3	22
		27.3%	40.9%	18.2%	13.6%	100.0%
	50001-80000	8	22	6	14	50
		16.0%	44.0%	12.0%	28.0%	100.0%
	80001-110000	5	2	3	8	18
		27.8%	11.1%	16.7%	44.4%	100.0%
	110001-150000	0	3	0	7	10
		0.0%	30.0%	0.0%	70.0%	100.0%
	above150000	0	1	2	5	8
		0.0%	12.5%	25.0%	62.5%	100.0%
Total		22	43	15	40	120
		18.3%	35.8%	12.5%	33.3%	100.0%

Source: collated from field work

From table 4.35, it can be seen that four wheeler ownership increases with increase in household income, whereas for household with lower incomes, two wheeler ownership is common. The reason due to low cost of maintenance of two wheeler vehicles and the inability to purchase four-wheeled vehicles. Household with higher incomes own both two and four wheelers.

4.13.10 Monthly income * Expenditure on use and maintenance of private vehicle (in Rs) - Cross tabulation

Table 4.36 showing distribution of respondents in relation to **monthly income and Expenditure on use and maintenance of private vehicle (in Rs) - Cross tabulation**

monthly income * avg_spndg_owned_vehicle Cross tabulation							
		Expenditure on use and maintenance of private vehicle (in Rs)					Total
		0	1-500	501-1500	1501-3000	above 3000	
monthly income (in Rs)	15000 and below	2	3	5	4	2	16
		12.5%	18.8%	31.3%	25.0%	12.5%	100.0%
	150001-35000	11	9	14	16	1	51
		21.6%	17.6%	27.5%	31.4%	2.0%	100.0%
	35001-45000	2	2	5	8	8	25
		8.0%	8.0%	20.0%	32.0%	32.0%	100.0%
	45001-65000	3	2	4	7	4	20
		15.0%	10.0%	20.0%	35.0%	20.0%	100.0%
	above 65001	4	0	0	2	2	8
		50.0%	0.0%	0.0%	25.0%	25.0%	100.0%
Total		22	16	28	37	17	120
		18.3%	13.3%	23.3%	30.8%	14.2%	100.0%

Source: collated from field work

Expenditure on private vehicle maintenance and use is highest in income group Rs.35001-Rs.45000, where 32% of the respondents belonging to that income level spend above Rs. 3000 a month. The higher the income, the higher the expenditure on private vehicle maintenance.

4.3.11 Total household income * private vehicle ownership of the household- Cross tabulation

Table 4.37 showing distribution of respondents in relation to **Total_household_income and private vehicle ownership of the household- Cross tabulation**

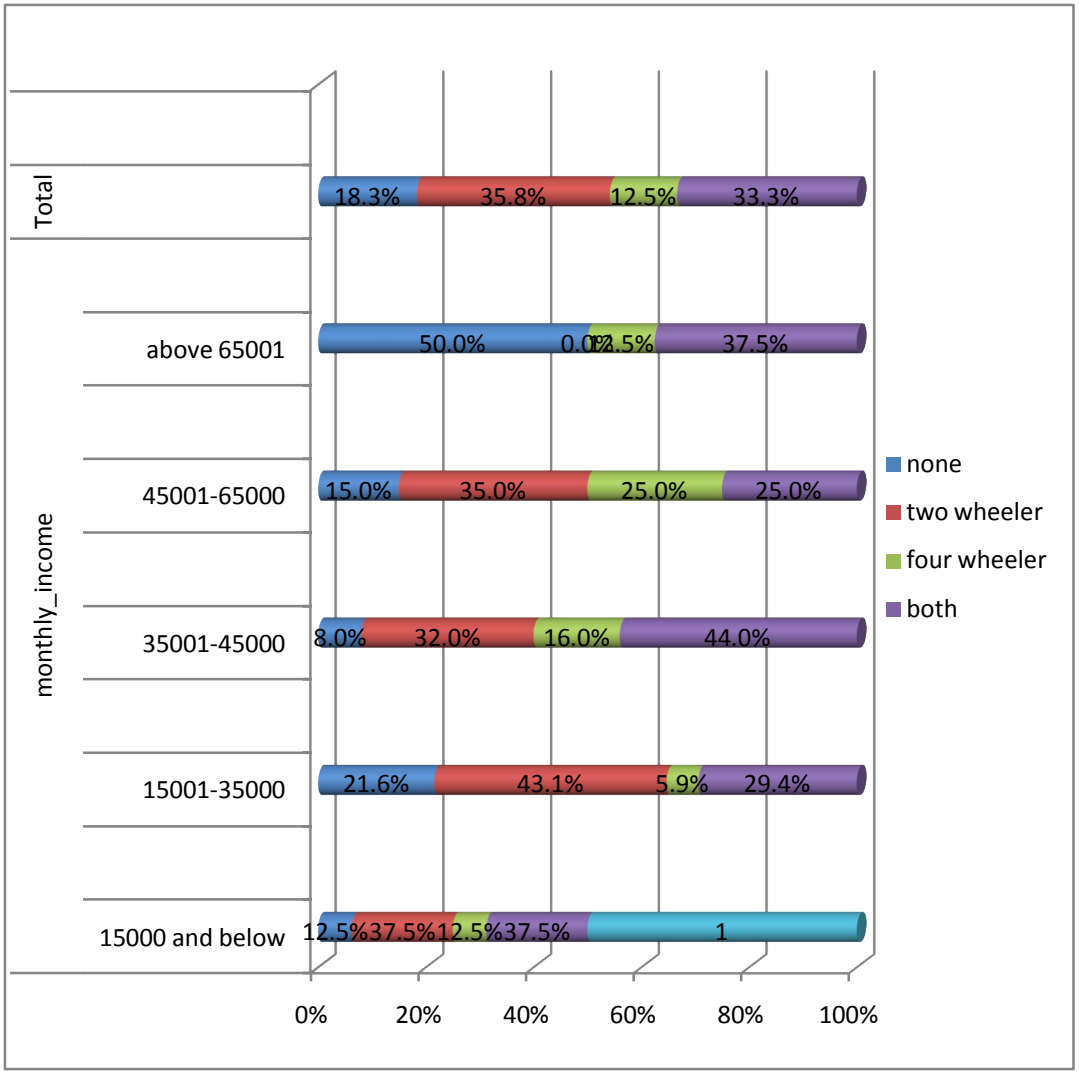
total_household_income * vehicle ownership Cross tabulation					
		Private vehicle ownership			Total
		no	yes	2	
total_household_income (in Rs)	30000 and below	3	9	0	12
		25.0%	75.0%	0.0%	100.0%
	30001-50000	6	16	0	22
		27.3%	72.7%	0.0%	100.0%
	50001-80000	8	41	1	50
		16.0%	82.0%	2.0%	100.0%
	80001-110000	4	14	0	18
		22.2%	77.8%	0.0%	100.0%
	110001-150000	0	10	0	10
		0.0%	100.0%	0.0%	100.0%
	above150000	0	8	0	8
		0.0%	100.0%	0.0%	100.0%
Total		21	98	1	120
		17.5%	81.7%	.8%	100.0%

Source: collated from field work

From table 4.37, it can be seen that 82% of the respondents own private vehicles. The rate of private vehicle ownership increases with increase in the monthly household income of the respondents. This could be due to greater affordability of the household to own private vehicles as the income increases. The ability to own comes into play.

4.13.12 Monthly income*kind of private vehicles owned-cross tablulation

Figure 4.5 showing distribution of respondents in relation to Monthly income and kind of private vehicles owned-cross tablulation



Source: collated from field work

From the figure 4.5, it can be seen that two wheelers make up most of the private vehicle owned in the households of the different income group. Respondents who own four wheelers also mostly own two wheelers.

4.13.13 Monthly income * preference of Private over public transportation- Cross tabulation

Table 4.38 showing distribution of respondents in relation to Monthly income and preference of Private over public transportation Cross tabulation

monthly income * prefer_prvt_ovr_public Cross tabulation				
		prefer_prvt_ovr_public transportation		Total
		yes	no	
monthly income (in Rs)	15000 and below	10	6	16
		62.5%	37.5%	100.0%
	150001-35000	36	15	51
		70.6%	29.4%	100.0%
	35001-45000	18	7	25
		72.0%	28.0%	100.0%
	45001-65000	16	4	20
		80.0%	20.0%	100.0%
	above 65001	4	4	8
		50.0%	50.0%	100.0%
Total		84	36	120
		70.0%	30.0%	100.0%

Source: collated from fieldwork

From table 4.38, it can be seen that as a whole, there is a70% of respondents preferring private over public transportation. There are a 50% of respondents from the income group Rs.65001 and above who prefer private transportation and another 50% who prefer public transportation.

4.13.14 Monthly income * Expenditure on use of public transport in a month (in Rs) -Cross tabulation

Table 4.39 showing distribution of respondents in relation to **Monthly income and Expenditure on use of public transport in a month (in Rs) -Cross tabulation**

monthly income * publc_commute_expdt Cross tabulation							
		Expenditure on use of public transport in a month (in Rs)					Total
		0	1-500	501-1500	1501-3000	abv 3000	
Monthly _income (in Rs)	15000 and below	1	10	1	3	1	16
		6.3%	62.5%	6.3%	18.8%	6.3%	100.0%
	150001-35000	16	20	11	3	1	51
		31.4%	39.2%	21.6%	5.9%	2.0%	100.0%
	35001-45000	10	5	5	4	1	25
		40.0%	20.0%	20.0%	16.0%	4.0%	100.0%
	45001-65000	8	6	4	2	0	20
		40.0%	30.0%	20.0%	10.0%	0.0%	100.0%
	above 65001	0	2	5	0	1	8
		0.0%	25.0%	62.5%	0.0%	12.5%	100.0%
Total		35	43	26	12	4	120
		29.2%	35.8%	21.7%	10.0%	3.3%	100.0%

Source: collated from field work

From table 4.39, it can be seen that spending on commute by public transport falls fairly below Rs.3000 a month. The highest spender being the respondents earning a monthly income of Rs.65001 and above.

4.13.15 Monthly income * private vehicle ownership- Cross tabulation

Table 4.40 showing distribution of respondents in relation to Monthly income and private vehicle ownership- Cross tabulation

monthly income * vehicle ownership Cross tabulation					
		Private vehicle ownership			Total
		no	yes	2	
monthly income (in Rs)	15000 and below	2	13	1	16
		12.5%	81.3%	6.3%	100.0%
	15001-35000	10	41	0	51
		19.6%	80.4%	0.0%	100.0%
	35001-45000	2	23	0	25
		8.0%	92.0%	0.0%	100.0%
	45001-65000	3	17	0	20
		15.0%	85.0%	0.0%	100.0%
	above 65001	4	4	0	8
		50.0%	50.0%	0.0%	100.0%
Total		21	98	1	120
		17.5%	81.7%	.8%	100.0%

Source: collated from field work

From table 4.40, it can be seen that 82% of the respondents own private vehicles. The reason for the non-ownership of respondents from higher income group is usually lack of garage, and also the fact that they are temporary residents of the place they are currently living in.

4.13.16 Monthly income * commuting_cost_in_a_month -Cross tabulation

Table 4.41, showing distribution of respondents in relation to **Monthly income and commuting_cost_in_a_month Cross tabulation**

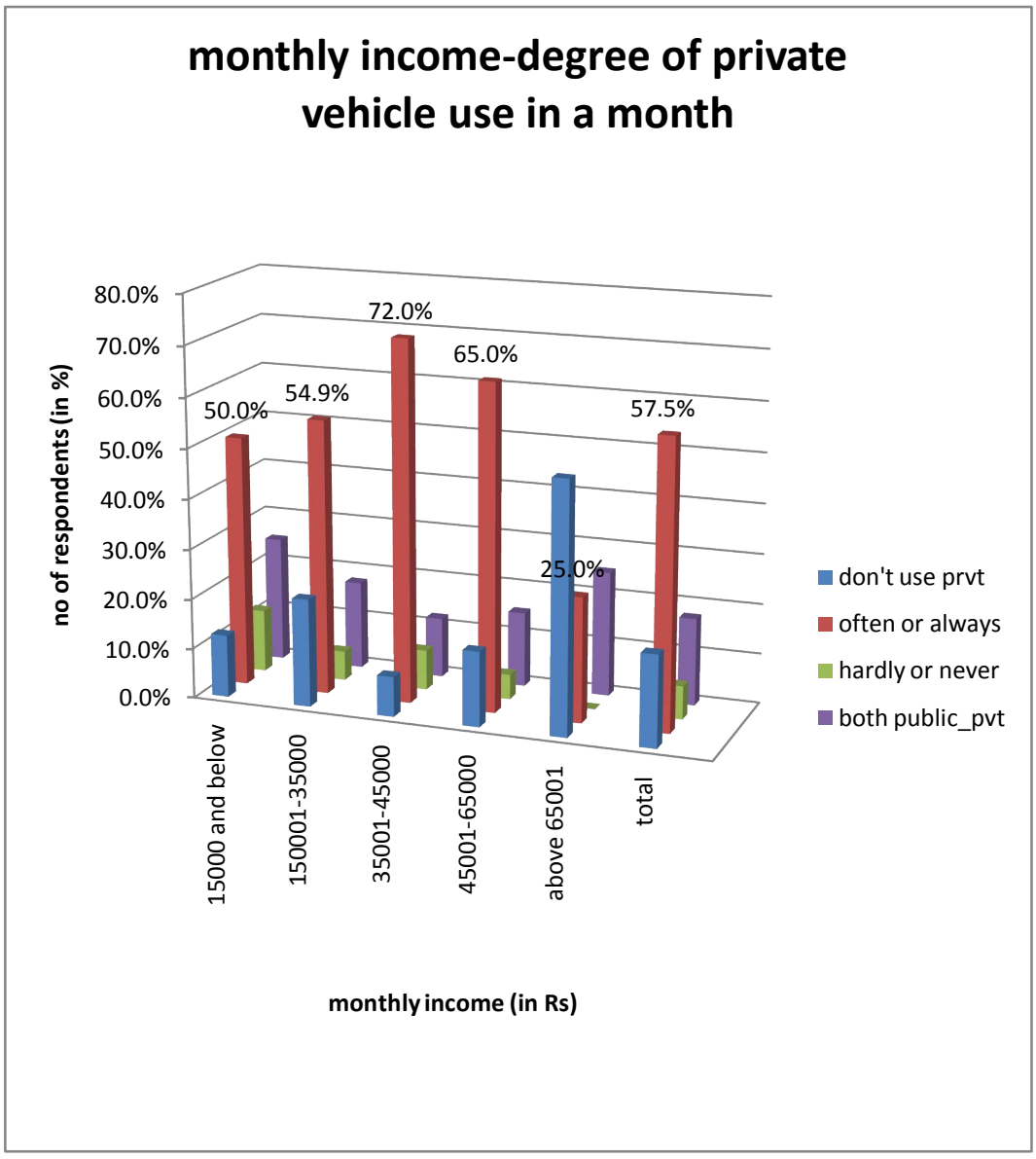
monthly income * commuting_cost_in_a_month Cross tabulation							
		commuting_cost_in_a_month					Total
		500 or below	501-1500	1501-2500	2501-3500	above 3500	
monthly income in a month (in Rs)	15000 and below	5	5	2	2	2	16
		31.3%	31.3%	12.5%	12.5%	12.5%	100.0%
	150001-35000	13	25	11	0	2	51
		25.5%	49.0%	21.6%	0.0%	3.9%	100.0%
	35001-45000	3	8	5	4	5	25
		12.0%	32.0%	20.0%	16.0%	20.0%	100.0%
	45001-65000	1	11	4	2	2	20
		5.0%	55.0%	20.0%	10.0%	10.0%	100.0%
	above 65001	1	3	2	2	0	8
		12.5%	37.5%	25.0%	25.0%	0.0%	100.0%
Total		23	52	24	10	11	120
		19.2%	43.3%	20.0%	8.3%	9.2%	100.0%

Source: collated from field work

From table 4.41, it can be seen that most respondents from different income groups spend around Rs. 501-1500 a month on commuting cost. 25% of the respondents falling in the category of monthly income Rs.65001 and above spend overRs.2500 a month on transportation cost.

4.13.17 Monthly income-Degree of private vehicle use in month-cross tabulation

Figure 4.6 showing distribution of respondents in relation to **Monthly income and Degree of private vehicle use in month-cross tabulation**



Source: collated from field work

From figure 4.6, it would be right to say that most of the respondents use private vehicles on a regular basis; a majority of 58% of the respondents belonging to different income groups uses their private vehicles for commute regularly. It is surprising to see that 50% of the high

schoolteacher respondents are not using private transport at all, in spite of them being from the higher income group, above Rs65001.

4.13.18 Monthly income * No of private vehicles owned Cross tabulation

Table 4.42 showing distribution of respondents in relation to monthly income and number of private vehicles owned Cross tabulation

monthly income * how many Cross tabulation						
		No of private vehicles owned				Total
		0	one	two or more	3	
monthly income (in Rs)	15000 and below	2	5	8	1	16
		12.5%	31.3%	50.0%	6.3%	100.0%
	15001-35000	11	17	23	0	51
		21.6%	33.3%	45.1%	0.0%	100.0%
	35001-45000	2	10	13	0	25
		8.0%	40.0%	52.0%	0.0%	100.0%
	45001-65000	3	10	7	0	20
		15.0%	50.0%	35.0%	0.0%	100.0%
	above 65001	4	1	3	0	8
		50.0%	12.5%	37.5%	0.0%	100.0%
Total		22	43	54	1	120
		18.3%	35.8%	45.0%	.8%	100.0%

Source: collated from field work

As evident from table 4.42, a large portion of the respondents have households owning more than one private vehicle i.e. 45%. However, there are some respondents in the high income group who do not own private vehicles at all. This is mainly because of the absence of parking space and also the temporary stay of the respondents.

4.13.19 Monthly income * use_public_transport- Cross tabulation

Table 4.43 showing distribution of respondents in relation to Monthly income and use_public_transport- Cross tabulation

monthly income * use_public_transport Cross tabulation				
		use_public_transport		Total
		no	yes	
monthly income (in Rs)	15000 and below	1	15	16
		6.3%	93.8%	100.0%
	150001-35000	16	35	51
		31.4%	68.6%	100.0%
	35001-45000	10	15	25
		40.0%	60.0%	100.0%
	45001-65000	8	12	20
		40.0%	60.0%	100.0%
	above 65001	0	8	8
		0.0%	100.0%	100.0%
Total		35	85	120
		29.2%	70.8%	100.0%

Source: collated from field work

As is evident from table 4.43, the respondents belonging to different income group use public transport to certain extent. 100% of the respondents belonging to income group Rs.65001 and above also use public transport in addition to private transport.

4.13.20 Position in the household * preference of private over public transportation- Cross tabulation

Table 4.44 showing distribution of respondents in relation to Position**_in_the_household and preference of private over public transportation- Cross tabulation**

position_in_the_household * prefer_prvt_ovr_public Cross tabulation				
		prefer_prvt_ovr_public transport		Total
		yes	no	
position_in_the_household	father	26	4	30
		86.7%	13.3%	100.0%
	mother	21	12	33
		63.6%	36.4%	100.0%
	son	22	6	28
		78.6%	21.4%	100.0%
	daughter	15	14	29
		51.7%	48.3%	100.0%
Total		84	36	120
		70.0%	30.0%	100.0%

Source: collated from field work

From table 4.44, it can be seen that the greatest preference is for private vehicles irrespective of the position of the respondents in the household. 36% of mothers in the household prefer public over private transport and 48% of the daughter respondents in the household prefer private transport.

4.14 ECONOMETRIC MODEL

The aim of this was to examine the relationship between high school teacher's transport mode choices and utilities offered.

A binary logistic is used to understand the mode choice of the individuals.

A logistic model, commonly called the logit model is when the response variable is qualitative. A binary logit model is one whose dependent variable has only two possible outcomes. The objective in such models is to find the probability of something happening. Hence it is called a probability model.

4.14.1 Variables used in the models

The dependent variable used to run the regression model is the choice of means of transportation used. Therefore, the individuals' decision in preferring private over public transportation is dependent on certain explanatory variables which are age of the respondents, time issue (bus service time and time 0f travel), comfort level (security, comfort and independence of private vehicle, crowdedness of bus and likeness for driving), accessibility and flexibility (inconvenience due to access distance of bus stops, public transportation networks limitations), cost saving (taxi fares), and lastly other factors, givens others for the respondents to specify.

Certain variables have been dropped to avoid multicollinearity (Dropping Variable Method).

4.14.2 Predicted Value

Table 4.45 shows the level of prediction for the binary logistic model used. The overall percentage of yes and no that are predicted correctly.

Classification Table[a]

Observed			Predicted		
			prefer_prvt_ovr_public		Percentage
			yes	no	Correct
Step 1	prefer_prvt_ovr_public	yes	83	1	98.8
		no	1	35	97.2
	Overall Percentage				98.3

a. The cut value is .500

Source: collated from field work

Firstly, notice that the table has a subscript which states, "The cut value is.500".This means the probability of a case being classified into the "yes" category is greater than .500, then that particular case is classified into the "yes "category". Otherwise,

the case is classified as in the “no “category”. Whilst the classification table appears to be very simple, it actually provides a lot of information about the binomial logistic regression result, including:

a. The percentage accuracy in classification (PAC), which reflects the percentage of cases that can be correctly classified as “no” preference of public transport with the independent variables added (not just the overall model).
b. Sensitivity, which is the percentage of cases that had the observed characteristics, “yes” for private public transport preference, which were correctly predicted by the model.
c. Specificity, which is the percentage of cases that did not have the observed characteristic, “no” for preference of private transportation and were also correctly predicted as not having the observed characteristic that is true negatives.
d. The positive predictive value, which is the percentage of correctly predicted cases “with” the observed characteristic compared to the total number of cases predicted as having the characteristic.
e. The negative predicted value, which is the percentage of correctly predicted cases “without” the observed the observed characteristic compared to the total number of cases predicted as having the characteristic.

4.14.3 Case Processing Summary

Table 4.46 showing case processing summary

Table Case Processing Summary

Unweighted Cases		N	Percent
Selected Cases	Included in Analysis	120	98.4
	Missing Cases	2	1.6
	Total	122	100.0
Unselected Cases		0	.0
Total		122	100.0

a. If weight is in effect, see classification table for the total number of cases.

Source: collated from field work

4.14.4 Dependent Variables Encoding

Table 4.47 Dependent Variable Encoding

Original Value	Internal Value
Yes	0
No	1

Source: collated from field work

4.14.5 Chi- Square:

Table 4.48 showing Tests of Model Coefficients

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	131.797	5	.000
	Block	131.797	5	.000
	Model	131.797	5	.000

Source: collated from field work

The Chi Square Test is used to collate the expected frequency and the observed frequency. The Chi- Square value is 131.797 and is highly significant at (.000) as seen in the table. The individual variables are analyzed through the interpretation of the Logit model.

4.14.6 Goodness of Fit

Under the Model Summary, we see that the -2 Log Likelihood statistics is 14.811. This statistic measure how poorly or efficiently the model predicts the decisions-the smaller the statistic, the better the model. The Cox &Snell R square can be interpreted like R Square in a multiple regression but cannot reach a maximum value of 1. The Nagelkerke R Square can reach a maximum of 1.

The Nagelkerke R Square depicts the goodness of fit as seen in Table 4.49.It denotes the variation in dependent variable due to independent variable. In this case R square=0.945

Therefore 94.5% of variation of dependent variable can be explained with the independent variables. The factors included in the model account for 94.5% of the variation for the Nagelkerke while Cox & Snell explained 66.7%.

4.14.7 Model Summary

Table 4.49 showing Table Model Summary

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	14.811[a]	.667	.945

a. Estimation terminated at iteration number 20 because maximum iterations have been reached. Final solution cannot be found.

Source: collated from field work

4.14.8 Interpretation of the Logit model

In order to establish the relationship between the dependent and independent variables, the following table is used

TABLE 4.50 showing Variables in the Equation

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	gender(1)	.417	1.582	.069	1	.792	1.517
	time_related_issues	-3.257	1.659	3.853	1	.050	.039
	comfort level	-19.303	12270.892	.000	1	.999	.000
	accblty_flexblty	-5.219	1.555	11.259	1	.001	.005
	moneysaving	-19.757	5387.135	.000	1	.997	.000
	Constant	3.701	1.536	5.802	1	.016	40.484

a. Variable(s) entered on step 1: gender, time_related_issues, comfort level, accblty_flexblty, money_saving.

Source: collated from field work

The Wald test ("Wald" column) is used to determine statistical significance for each of the independent variables.

The statistical significance of the test is found in the 'Sig' column. Based on the level of significance (sig.) and the intercept values (B) as seen in table. The regression equation is formed. If the significance level is lesser than 0.05, then the variable is highly significant. We can use the information in the "variables in the Equation" table to predict the probability of an event occurring based on a one unit change in an independent variable when all other independent variables are kept constant. The table shows that the odds of preferring private over public transportation("yes" category) is 1.517 times greater for males as opposed to females.

Time issues, has a negative result on the dependent variable (-3.257), but is highly significant (.050). This means that a unit increase in time issue as a factor will lead to a 3.257 decrease in the dependent variable. This reveals that time issue in relation to transportation is highly significant to the choice of means of transportation. The estimated co-efficient for time issue came out negative, implying that an increase in issues related to time management and related issue as a whole, was likely to decrease the use of public transport.

Flexibility and accessibility, has a negative result on dependent variable(-5.219), but is highly significant (.001)this means that a unit increase in flexibility and accessibility as a factor will lead to a 5.219 decrease in the dependent variable. This reveals that Flexibility and accessibility, in relation to transportation is highly significant to the choice of means of transportation. The estimated co-efficient for time issue came out negative, implying that an increase in issues related to Flexibility and accessibility as a whole, was likely to decrease the use of public transport .

From these results, we can see that factors such as Time-related issues (0.050) and Accessibility & Flexibility (0.001) added significantly to the model/prediction, but Gender (.792) and Money saving (.997) as a factor did not add significantly to the model.

4.15 Concluding Remarks:

Careful analysis also shows that the respondents prefer private transportation to public. This chapter also provides the empirical results of the data analysis. The logit model shows that of the variables affecting transport mode choice by individual among high school teachers that is most significant is accessibility and flexibility of the private transportation which was also observed in the preceding sections of the chapter. Also the variables affecting transport mode choice by individual among college teachers that is most significant is time issues; secondly, accessibility and flexibility of the private transportation which was also observed in the preceding sections of the chapter The small sample size, with little variability across the quantitative variables could be the reason of the low significance, yet high odd ratios.

CHAPTER 5

ANALYSIS OF THE CHANGING MODE OF TRANSPORTATION

5.1 Introduction

It is particularly important to look into the study and the stage of development attained by it when the analysis is carried out. The state had its highway networks constructed only in the late 20th century and even today it is far from being completed to the desired grade of modern highway systems. This being the case, there was not practically any motor cars plying the streets of the state capital nor were there fleets of maxi-cabs to find in the State highways in the 1950's. It was only at the turn of the new millennium, the population of car and public transport services picked up a momentum. This study would therefore be relevant and meaningful if the reference period is confined to the recent period of the state's economic transformation in the field of transportation. The following table shows the absolute rate of increase in passenger carrying vehicle in Mizoram over the last six years.

5.2 An Economic Analysis of Transport System in Aizawl, Mizoram

5.2.1 Total number of passenger carrying vehicle on road

Table 5.1 showing Total number passenger carrying vehicles on road per year (2008-2014)

Type of vehicle	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
two wheeler	35177	42812	50898	60278	70449	80729
motor cab	4697	5050	5594	6237	6954	7755
maxi cab	1297	1417	1654	1947	2271	2651
motor car	9883	10939	12140	13839	15561	17136
jeep	7785	8433	9232	10206	11275	12795
Gypsy	3706	3785	3855	3897	3960	3981
contract carriage(bus)	1003	1036	1088	1141	1187	1208

Source: Mizoram Statistical Handbook 2008-2014

It should be noted that the state department of Economics and Statistics regularly conducted census of the vehicle population and published the figure annually and our study is based on these official figures.

Reading of the above table 5.1 depicts that over the last six years, the vehicle population has been consistently and uniformly increasing.

Among the different types of vehicles, the contract carriage (bus) registered the lowest growth rate at just 2 percent per annum. On the other hand, the population of two wheeler increased at an annual growth rate of 18.1 percent on average. At this growth rate, it means that the number of two wheelers is doubling every four years.

In absolute terms, the increase of motor car is the second highest during the study period registering an average growth rate of 10.02 percent per annum. If this were the compounded growth rate in the number, the motor car population will be doubling every seven years. Other types of vehicles which are of less significance in terms of public or private transport services also recorded significant growth, all showing upward trend.

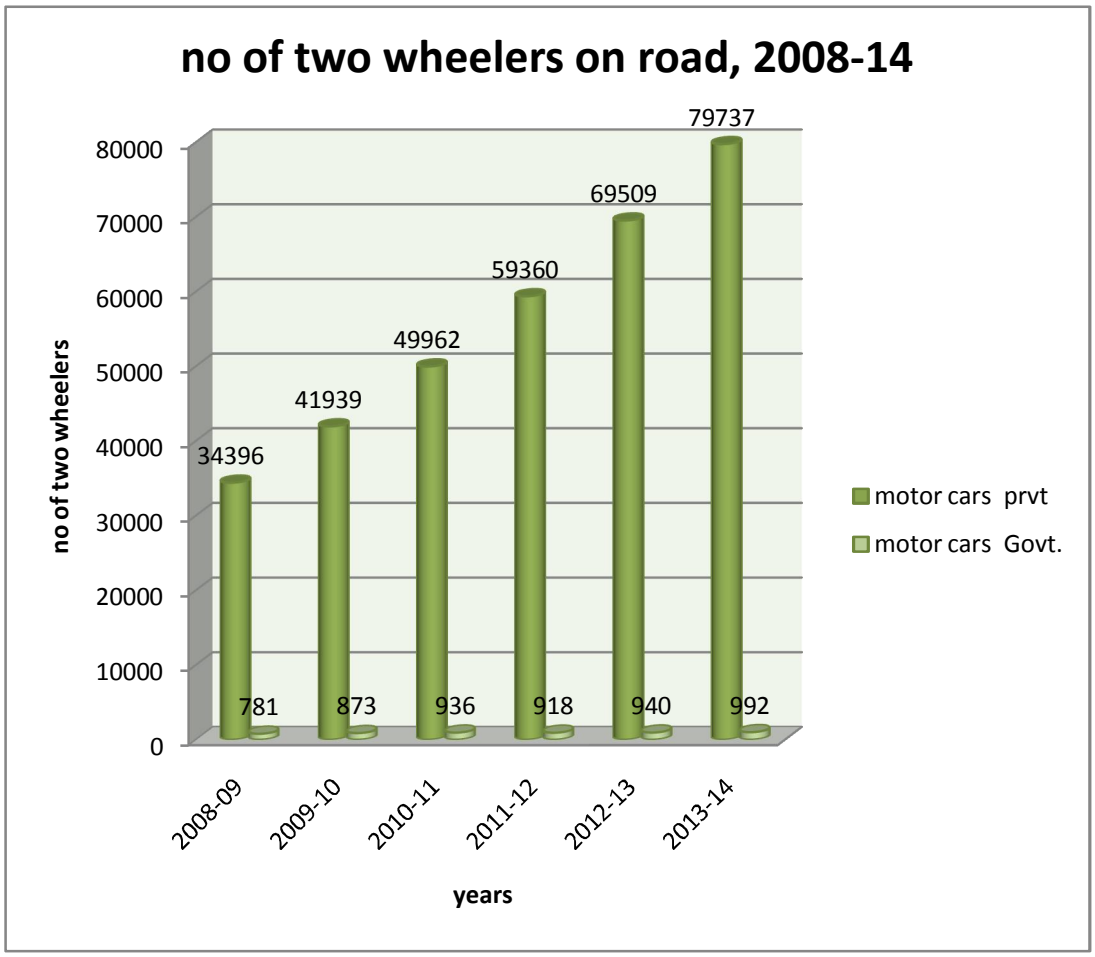
An important distinction could be drawn between private and government vehicles in the type of vehicles. The distinction mainly lies in the mode of deployment for transportation. Those vehicles belonging to the government are not accessible to the public and they cannot be counted as public transportation vehicle.

For the clearer presentation of each type of public transportation vehicles a graphical illustration is provided as follows:

5.2.2 TWO WHEELERS

5.2.2.1 Number of Two wheelers on road, Govt vs. privately owned

Figure 5.1 showing Number of Two wheelers on road, Govt vs privately owned (2008-2014)



Source: Mizoram Statistical Handbook (2008-2014)

There has been a significant increase in the number of two wheelers in Mizoram over the past few years. The breakup of the ownership of two wheelers has been given in Fig.5.1, the Government ownership of two wheelers and the private ownership.

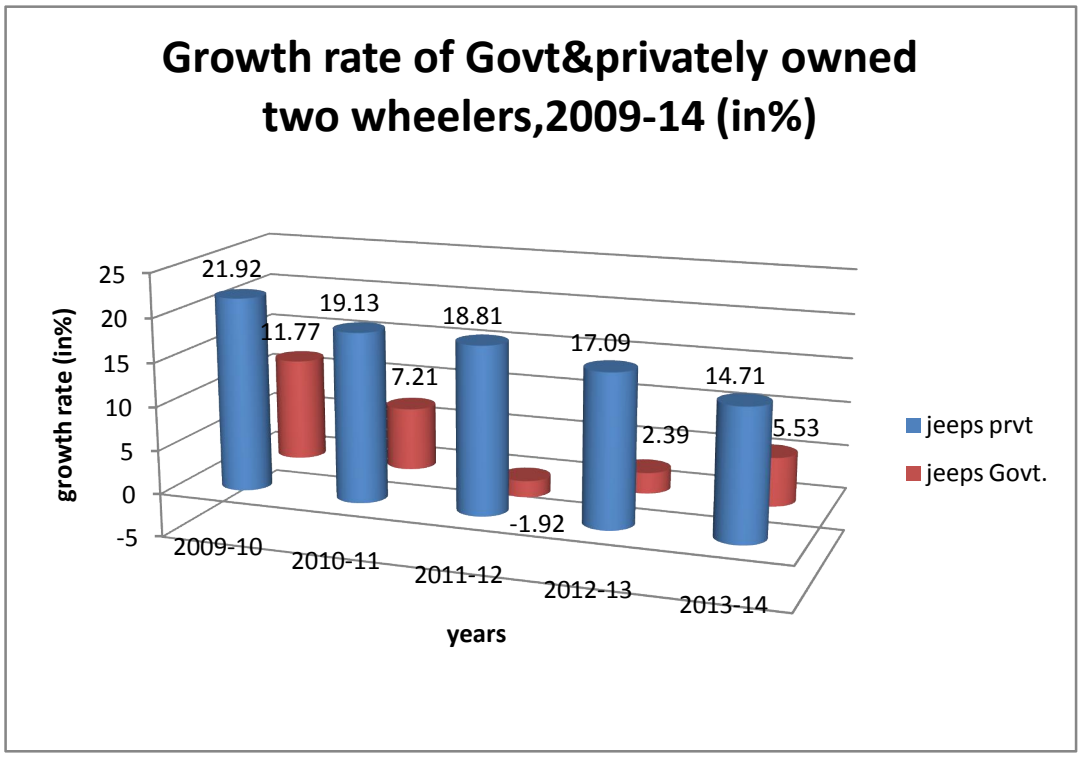
As according to the data given, the increase in two wheelers of the private ownership is higher than that of the government. Over a span of 6 years, from 2008 to 2014, private ownership of two wheelers have increased from 34396 in 2008 to 79737 in 2014, an increase in privately owned two wheelers by 45341 (131.82%).

The growth rate of privately owned two wheelers in 2009-2010 was 21.92%; 19.13% in 2010-2011, 18.81% in 2011-2012, 17.09% in 2012-2013 and 14.71% in 2013-2014. The average growth rate was 18.33 % for the years 2009-2014.

There has also been an increase in the number of government owned two wheelers over the years, where, as evident from the Fig5.1, however the growth has been substantially low, and at a point in time, there was a decrease in the number of government owned two wheelers. The growth rate for 2009-2010 was 11.77%, 7.21% in 2010-2011. There was a sudden decrease in number in 2011-2012, the rate of decline being 1.92%. in 2012-2013, the trend further moved to an increasing trend of 2.39% growth rate and 5.53% in 2013-2014.

5.2.2.2 Growth rate of two wheelers- Govt Vs Privately owned

Figure 5.2 showing Growth rate of two wheelers- Govt. Vs Private owned (in %)



Source: Collated from Mizoram Statistical Handbook 2008-2014

From Fig 5.2, it can be seen that the growth rate of privately owned two wheelers decrease over the years. However, there is a significant increase in the number of privately owned two wheelers on road, which can be seen from the fact that there is no negative growth value from 2009-2014.

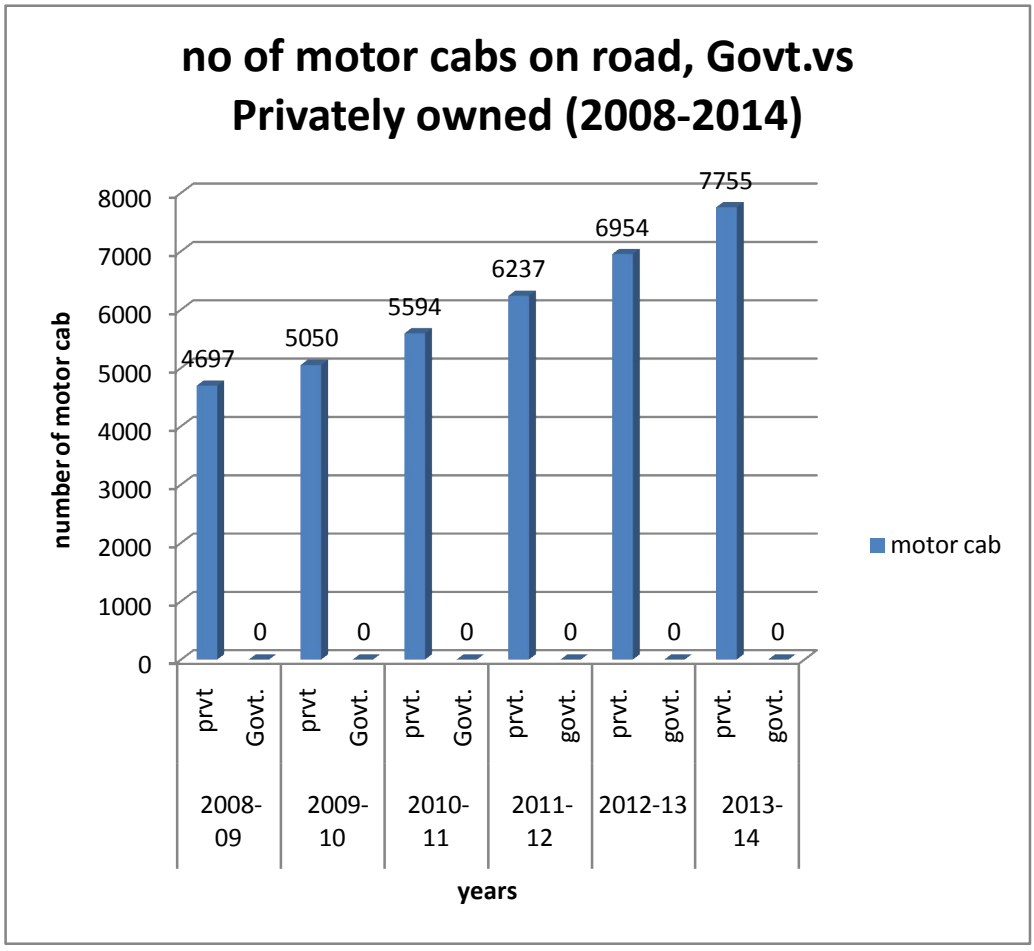
The growth rate of government owned two wheelers showed a different pattern. In 2011-2012, the number of government owned two wheelers decreased by 1.9% as compared to the previous year; however it increased the next year and forth.

The average growth rate of privately owned two wheelers is more than that of the government owned two wheelers. Although showing a declining rate of growth over the years, new registrations of two wheelers were made every year. This means that the rate at which the vehicles were being condemned and shunted was higher than the replacement rate.

5.2.3 MOTOR CABS

5.2.3.1 Number of motor cabs on road, Govt. Vs privately owned motor cabs on road

Figure 5.3 Showing No of motor cabs on road, Govt. Vs privately owned motor cabs on road (2008-2014)

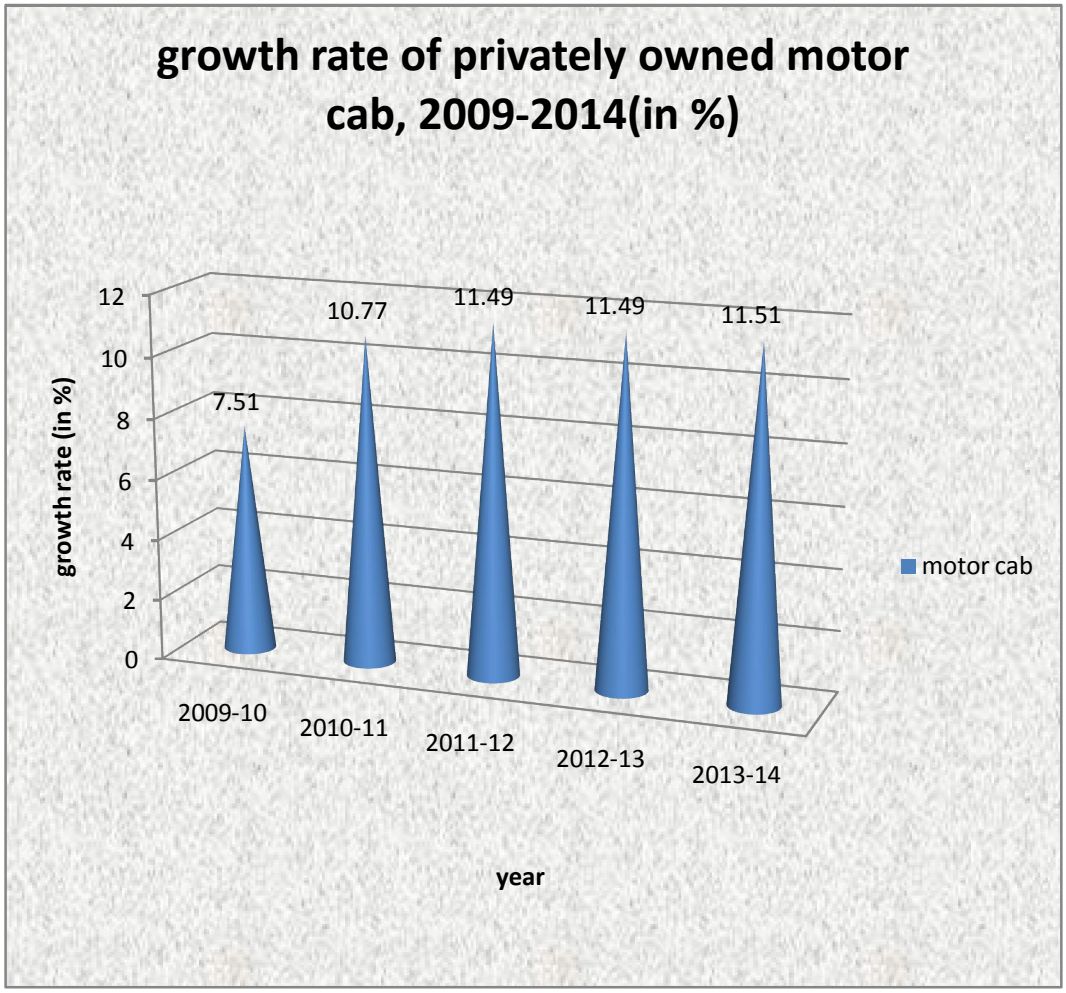


Source: Mizoram Statistical Handbook (2008-2014)

Figure 5.3 shows the number of Government and privately owned motor cabs on road, for the period spanning 2008-2014; an increase in the number by 3058 (65.10%) from 2008 to 2014. Motor cabs are not, at all purchased and used by the government. From 2008 till date, motor cabs do not come under the government undertaking and maintenance. There seems to be no record of government purchase of motor cabs for use.

5.2.3.2 Growth rate of privately owned motor cabs

Figure 5.4 showing the annual growth rate of privately owned motor cabs (2009-2014)



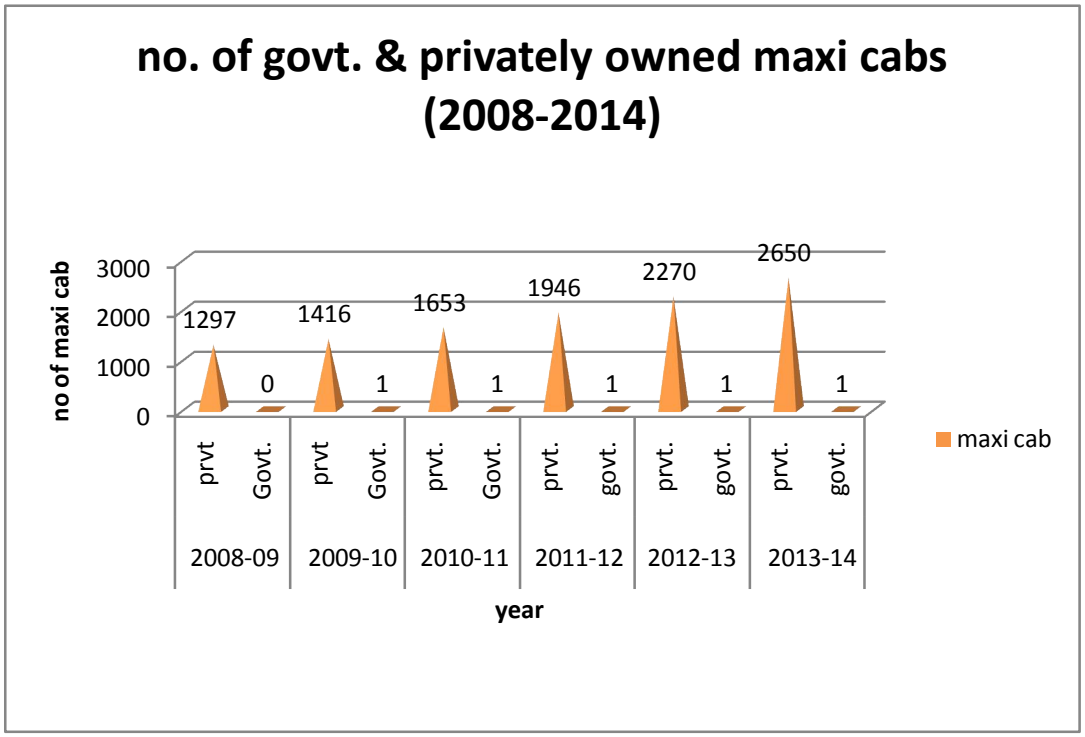
Source: collated from Mizoram Statistical Handbook 2008-2014

From Fig 5.4 it can be seen that the annual growth rate of privately owned motor cabs is increasing with time. The growth rate between the years 2010-2014 showed consistency maintaining a growth rate average of 11.3 %, i.e. around 11%. The consistent increase of motor cabs on road shows the motor cab steadily gains importance as a transportation for Mizoram as a whole especially in Aizawl city.

5.2.4 MAXI-CABS

5.2.4.1 **No. of Govt. & privately owned maxi cabs on road**

Figure 5.5 showing no. of Govt. & privately owned maxi cabs on road (2008-2014)



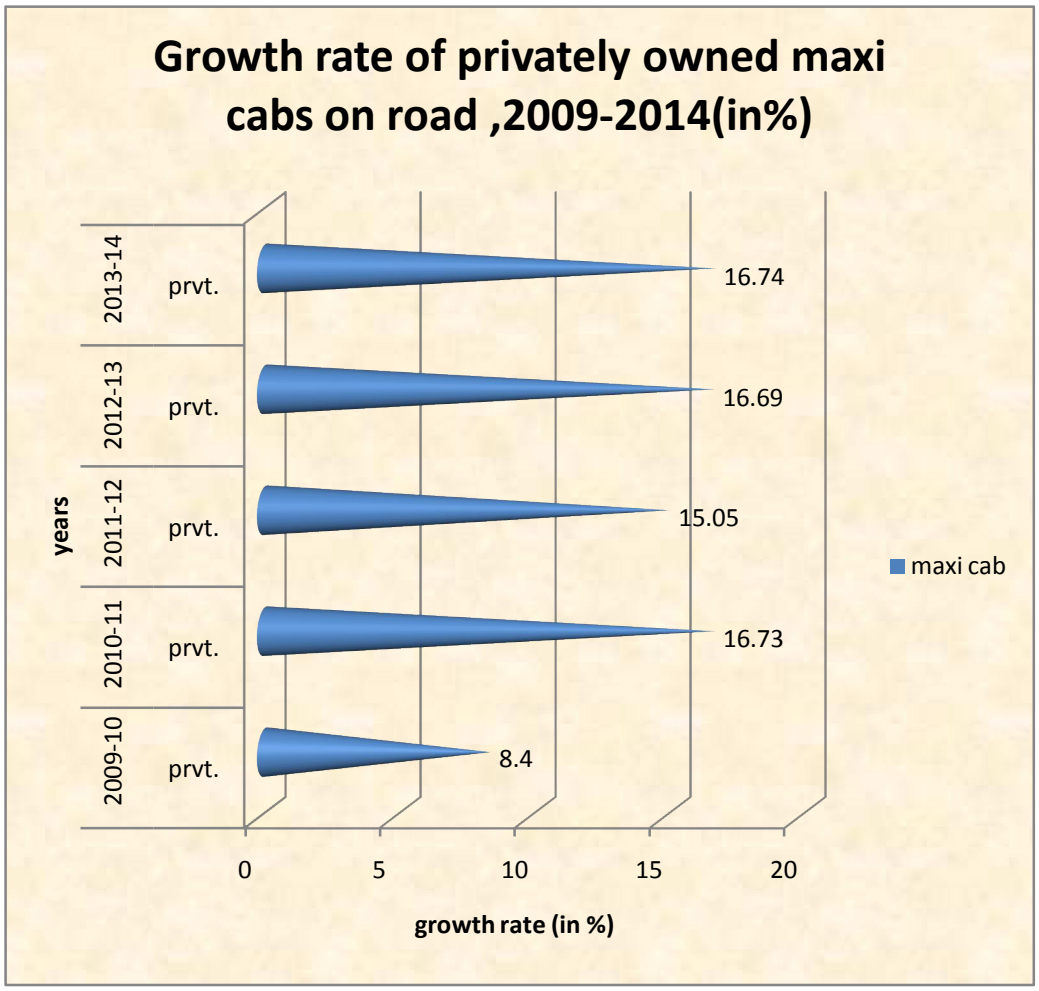
Source: collated from Mizoram Statistical Handbook, 2008-2014

A remarkable change has been observed in the use of maxi cabs as passenger carrying vehicle. Now, a good number of villages in Mizoram have run their own transport network of maxi-cabs to meet the escalating demand for passenger carrying vehicles. Maxi-cab can be said to have the right size suited to hilly roads which are narrow and steep and it has virtually replaced other means of passenger carriage. The ownership and management is entirely at the hand of private operators. As indicated in the chart, the number of maxi cabs which stood at 1297 in 2008-09 had risen to 2651 in 2013-14, registering an increase of 104.3 percent. As per the record of the

department of Economics and Statistics, there was just one maxi cab owned and operated by the state government in 2014.

5.2.4.2 Growth rate of privately owned maxi cabs

Figure 5.6 showing growth rate of privately owned maxi cabs on road (2009-2014)



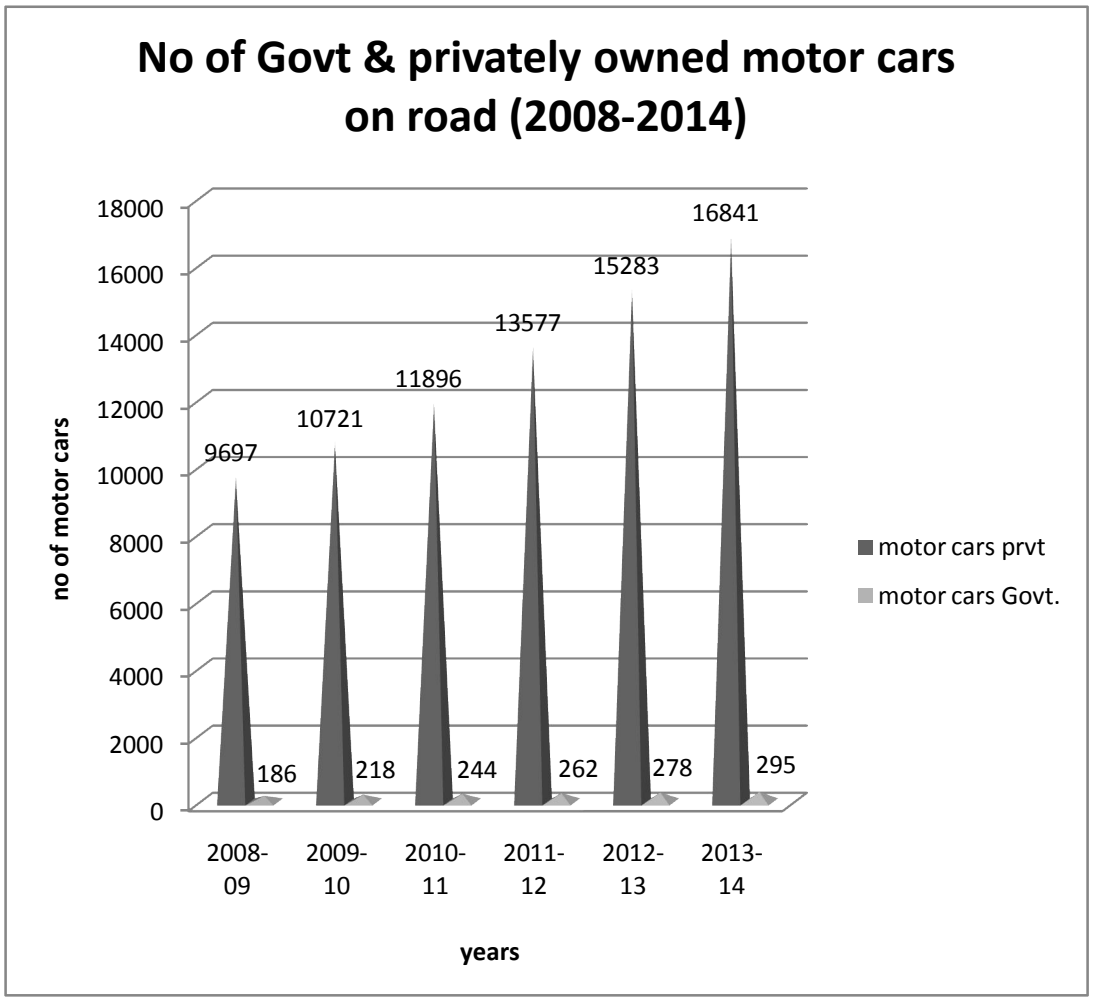
Source: Collated from Mizoram Statistical Handbook 2008-2014

The average growth rate of privately owned maxi cabs between 2009-2014 is 14.72%. The growth rate in 2010-2011 was doubling of the previous year growth rate and from 2011 onwards, the steady state of growth around 16 percent had been obtained as shown in the chart above.

5.2.5 MOTOR CARS

5.2.5.1 No. of govt. and privately owned motor cars on road

Figure 5.7 showing no. of govt. and privately owned motor cars on road (2008-2014)



Source: Mizoram Statistical Handbook (2008-2014)

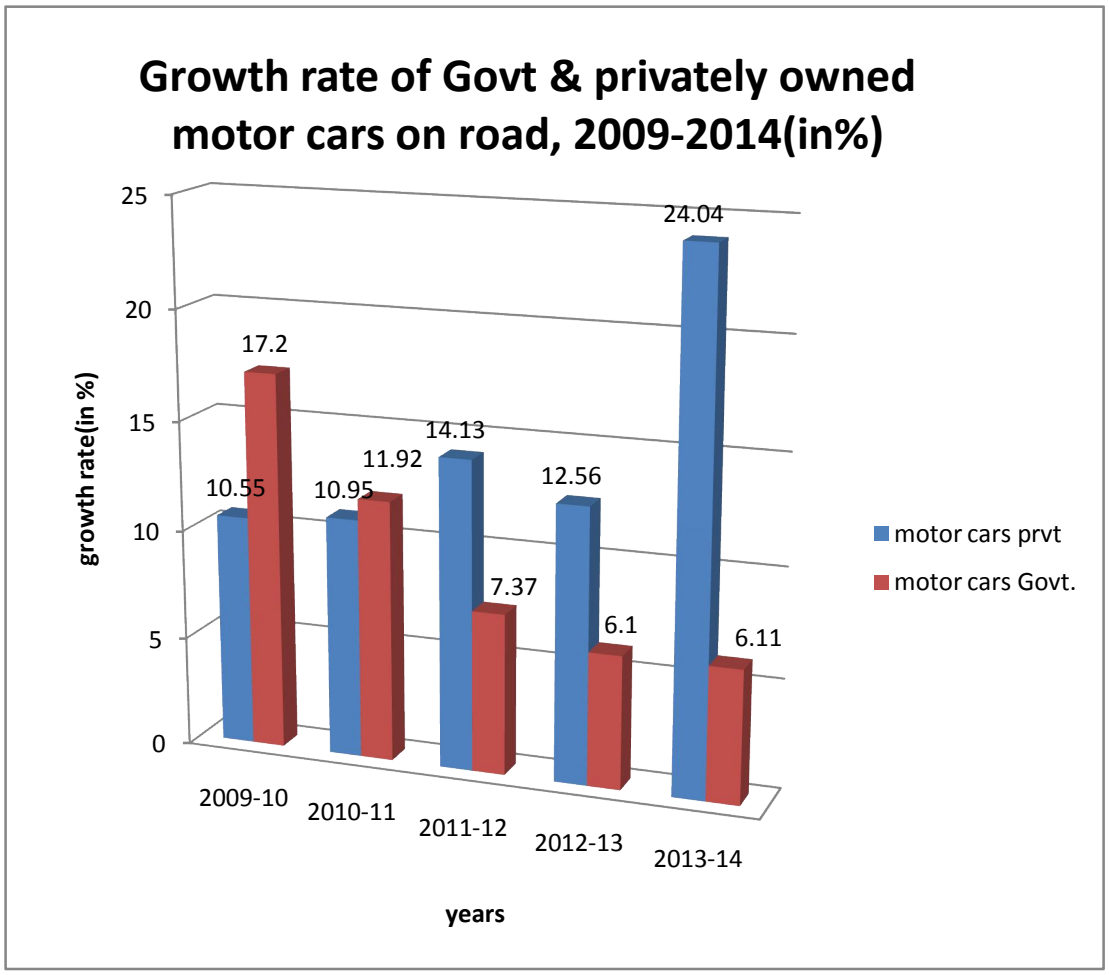
The number of privately owned motor cars has increased considerably over the years from 9697 in 2008-2009 to 16841 in 2013-2014, an increase by 7144 cars, or an increase of 73.7% over a period of six years.

Government owned motor cars on road are comparatively less as compared to those owned by privates. Thus, publicly owned motor cars accounted for 1.7% in 2014.

Government owned motor cars increased over the years from 186 9n 2009-210 to 295 in 2013-2014.

5.2.5.2 Growth rate of govt. & privately owned motor car on road

Figure 5.8 showing growth rate of govt. & privately owned motor car on road (2019-2014)



Source: collated from Mizoram Statistical Handbook 2008-2014

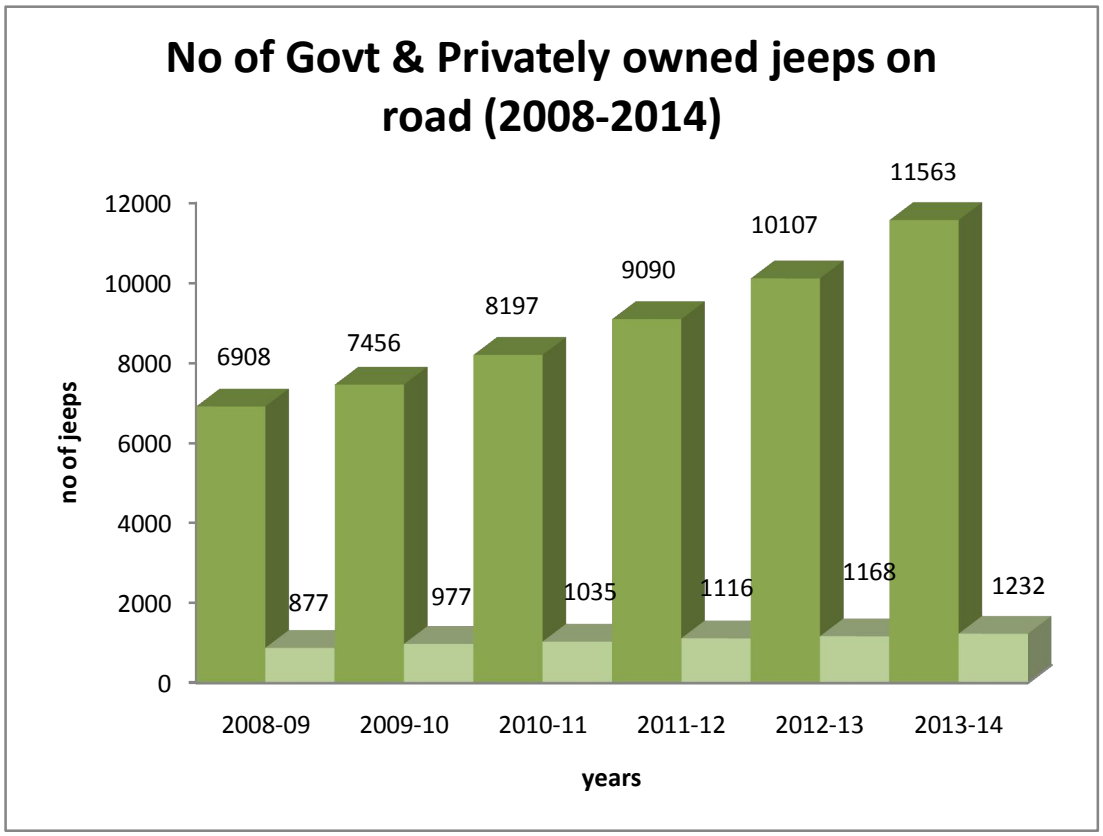
The yearly growth rate of privately owned motor cars, though fluctuated, showed an accelerated rate of growth over the years, where it increased from 10.55% in 2009 to 14.3% in 2011-12. There was a slight decline in growth rate the next year; however the growth rate almost doubled itself the next year.

In contrast, the Government owned motor cars showed a decelerated growth rate over the years from 17.2% in 2009-2010 to 6.11% in 2013-2014.

5.2.6 JEEPS

5.2.6.1 No. of govt. &privately owned jeeps on road

Figure 5.9 showing no. of govt. &privately owned jeeps on road (2008-2014)



Source: Mizoram Statistical Handbook 2008-2014

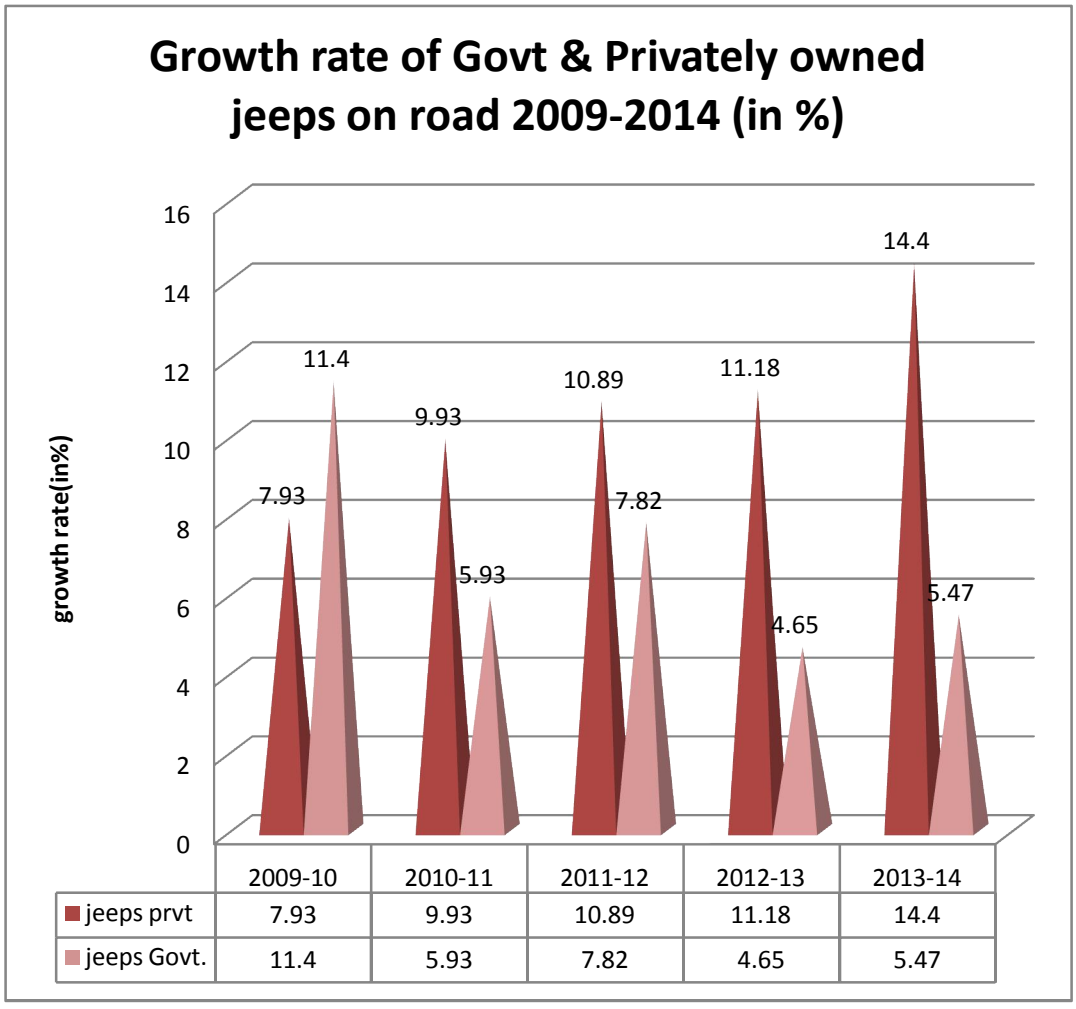
The number of privately owned jeeps on road has increased over the years, much like other vehicles. The increase from 2008 to 2014 is 2651 which is by 35.55%.

There is also an increase in the number of government owned jeeps by 191 jeeps over a period of six years, which is by 19.54%.

The percentage increase of privately owned jeeps is, as depicted in the above bar-diagram, higher than that of the government owned jeeps.

5.2.6.2 Growth rate of Govt. & privately owned jeeps on road

Figure 5.10 showing the respective growth rate of Govt. & privately owned jeeps on road (2009-2014)



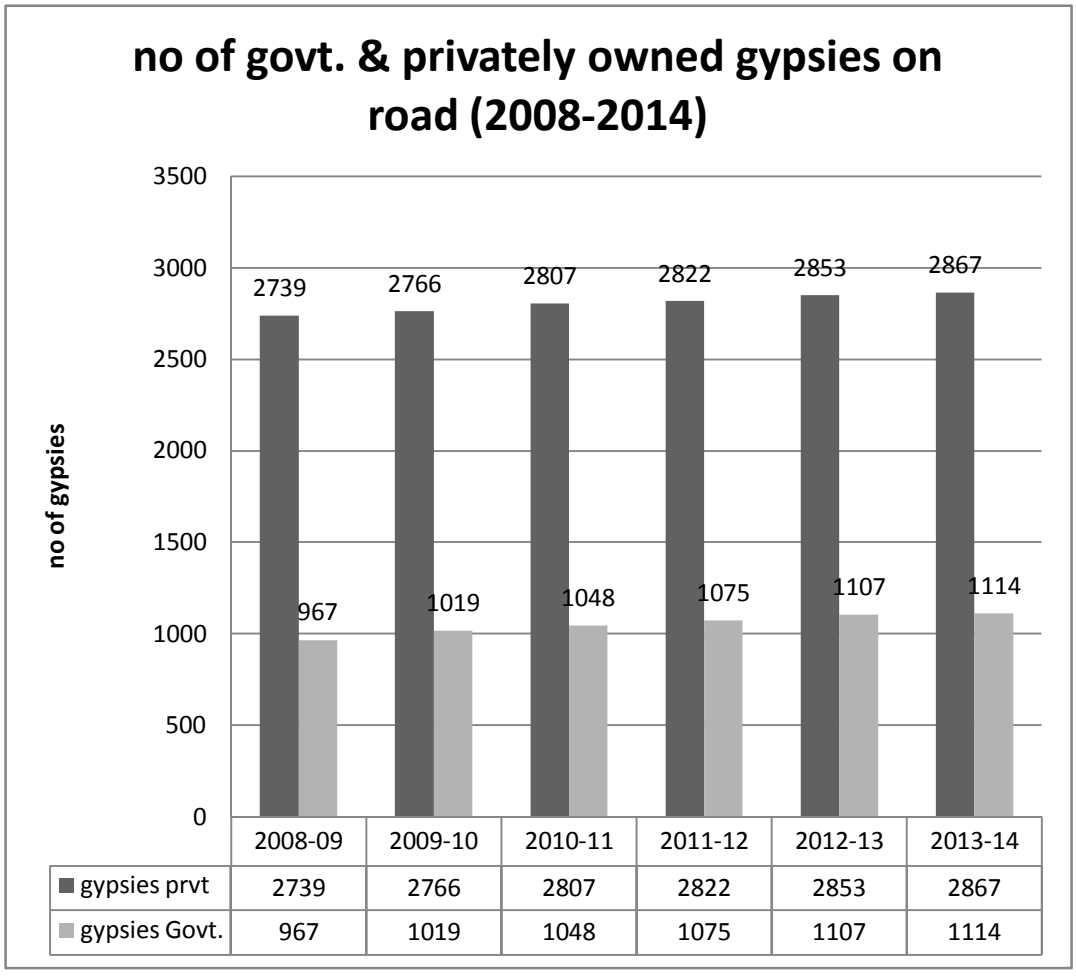
Source: collated from Mizoram Statistical Handbook 2008-2014

It is depicted in the above figure 5.10 that privately owned jeeps increased at an accelerated yearly growth rate while the growth rate for government owned jeep appeared to decelerate.

5.2.7 GYPSIES

5.2.7.1 No of govt. & privately owned gypsies on road

Figure 5.11 showing the no of govt. & privately owned gypsies on road (2008-2014)



Source: Mizoram statistical Handbook 2008-2014

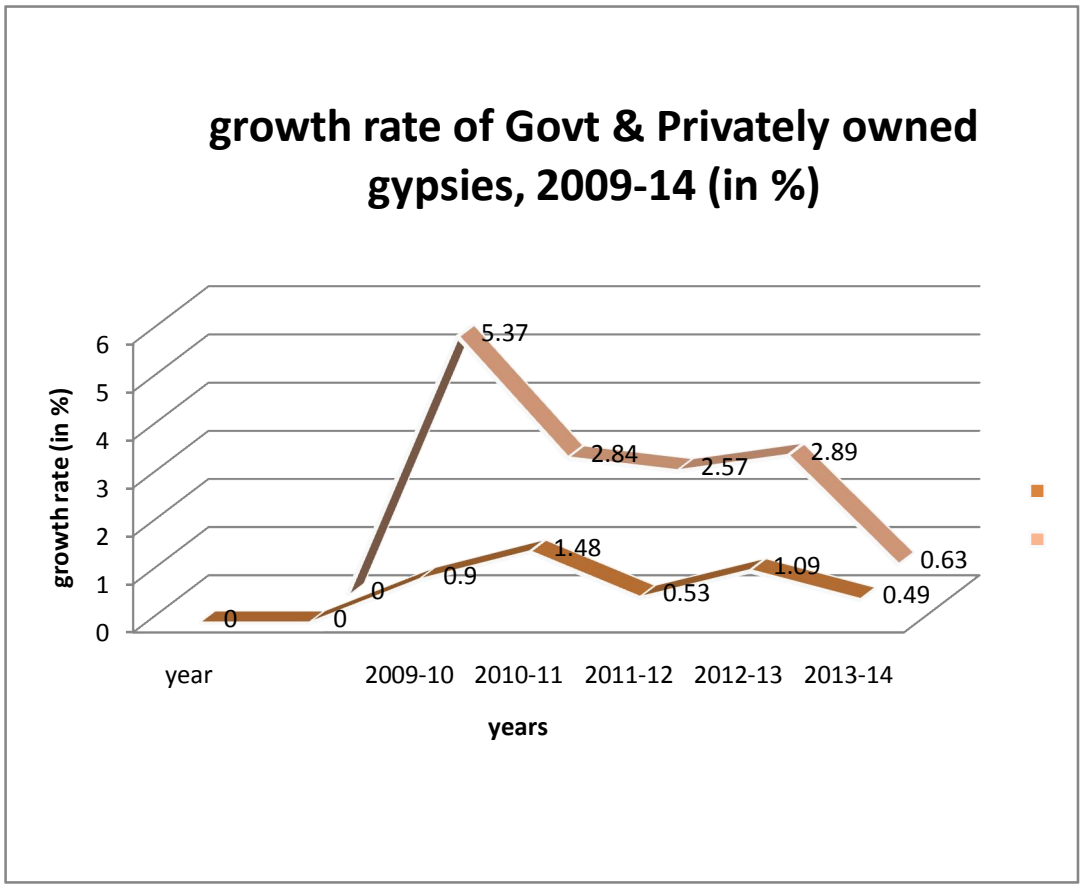
As shown in the figure 5.11, there were nearly a constant number of gypsies on road from 2008-2014. The numbers have neither grown drastically nor have decreased

between 2008-2014; the number remained more or less the same over a span of six years. Both private and government owned gypsies maintained a steady state of growth. The increase in government owned gypsies from 2008 to 2014 was by 114, an average of 19 gypsies per year in a span of six years, whereas for the government owned gypsies, the increase between 2008-2014 was by 147, an average of 25 gypsies per year.

The number of privately owned gypsies on road is more than double of the government owned gypsies on road each year.

5.2.7.2 Growth rate of Govt. & privately owned gypsies

Figure 5.12 showing the growth rate of Govt. & privately owned gypsies (2009-2014)



Source: collated from Mizoram Statistical Handbook

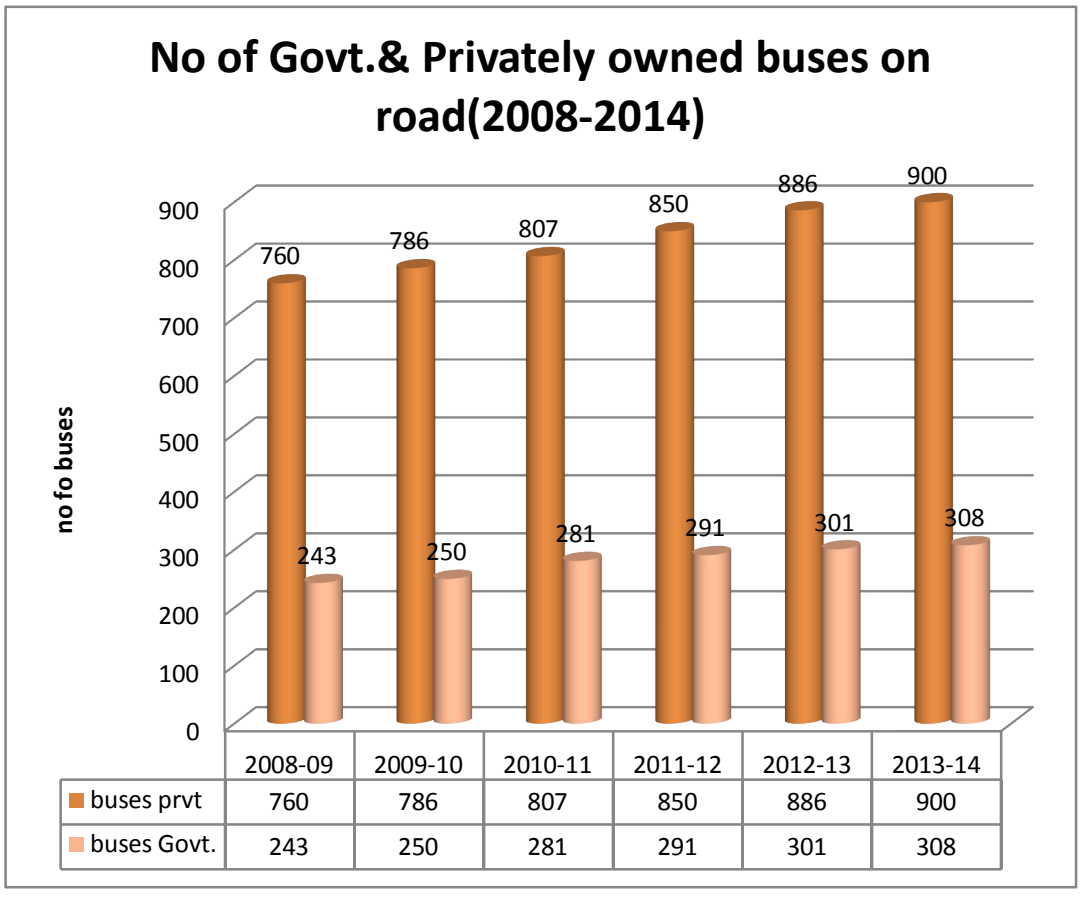
In the years 2009-2014, the growth rate of government owned gypsies was the highest in 2009-2010, 5.37% as compared to 2.84% in 2010-2011, 2.57% in 2011-2012, 2.89% in 2012-2013 and 0.63% in 2013-2014. The growth rate of government owned gypsies declined significantly over the years to less than a 1% growth rate in 2013-2014; the average being 2.52%.

The growth rate of privately owned gypsies over the years has also been very low. The average growth rate from 2009-2014 was at a bare minimum of 0.89%.

5.2.8 BUSES

5.2.8.1 No of government & privately owned buses on road

Figure 5.13 showing no of government & privately owned buses on road (2008-2014)



Source: Mizoram Statistical Handbook, 2008-2014

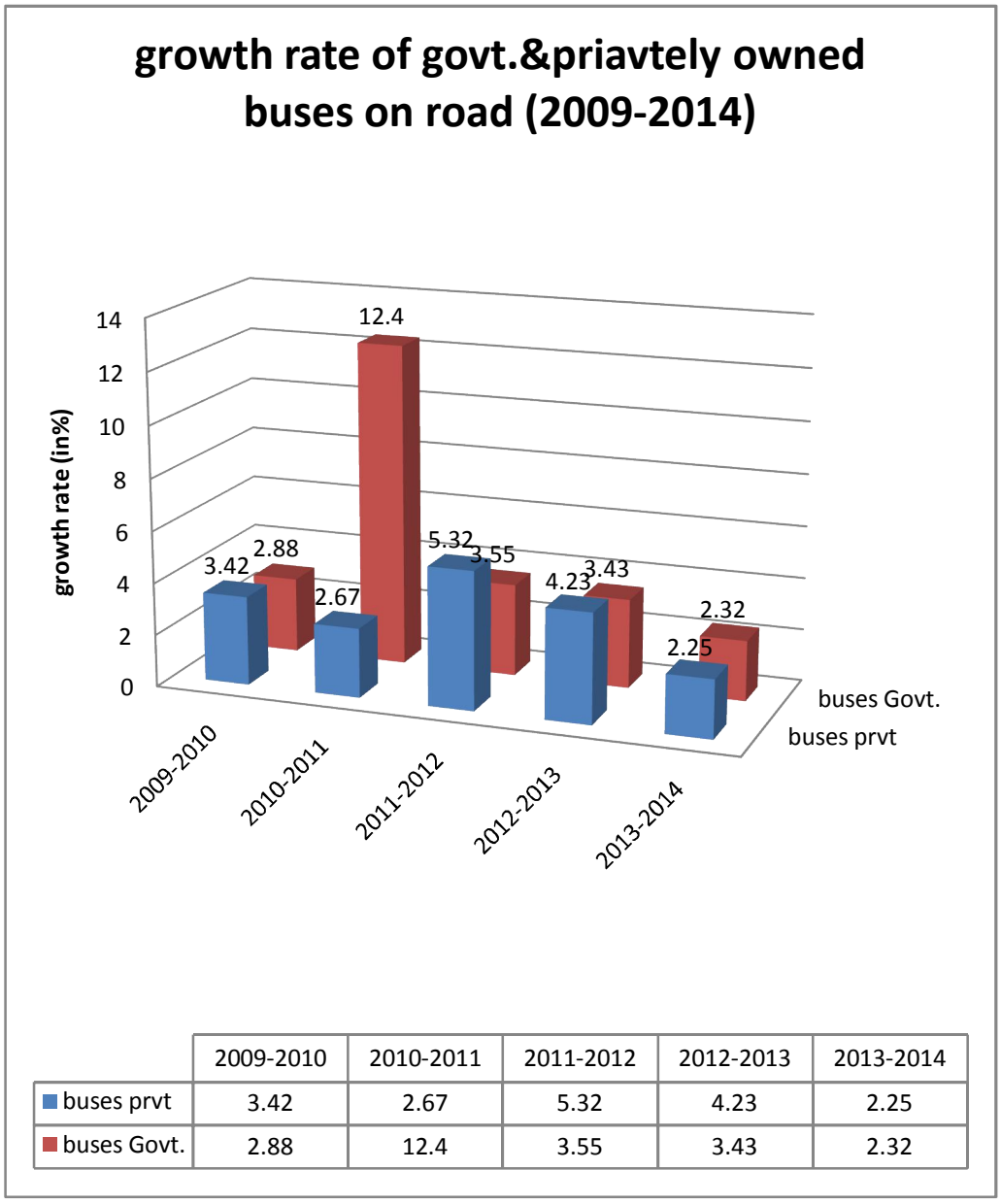
The number of privately owned buses increased steadily from 2008 to 2014. The average increase was by around 29 buses per year, with an increase from 760 in 2008 to 900 buses in 2014, a 19.21% increase over a period of six years.

Over a period of six years, 2008-2014, the number of government owned buses has increased, but the increase has been subtle; from 243 in 2008 to 308 in 2014, a percentage increase of 26.79%. The average increase per year from 2008-2014 was by 27 buses.

The number of privately owned buses on road has been significantly higher than that of the government owned buses. Roughly one-third of the buses on road are of government owned buses.

5.2.8.2 Growth rate of govt. & privately owned buses on road

Figure 5.14 showing growth rate of govt. & privately owned buses on road (2009-2014)



	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
buses prvt	3.42	2.67	5.32	4.23	2.25
buses Govt.	2.88	12.4	3.55	3.43	2.32

Source: collated from Mizoram Statistical Handbook 2008-2014

The growth rate of government owned buses was particularly high in 2010-2011, 12.4% in comparison with the growth rate of 2.88% in 2009-2010. 3.55% in 2011-2012, 3.43% in 2012-2013 and 2.32% in 2013-2014. The average growth rate of government owned buses yearly from 2009-2014 was 4.91%.

The growth rate of privately owned buses in 2009-2010 was 3.42% which declined to 2.67% in 2010-2011. However, the growth rate moved up to 5.32% in 2011-12 and 4.23% in 2012-2013. It again decreased to 2.25% in 2013-2014. The annual average growth rate came to 3.57% during the period from 2008 through 2014.

5.3 Growth of passenger carrying Motor Vehicles

To analyze growth of motor vehicles, the entire passenger carrying vehicles in Mizoram is divided into two-government-owned and private-owned vehicles. The government has clubbed the vehicles into motor Cars, Maxi cabs, Motor cabs, jeeps & gypsies.

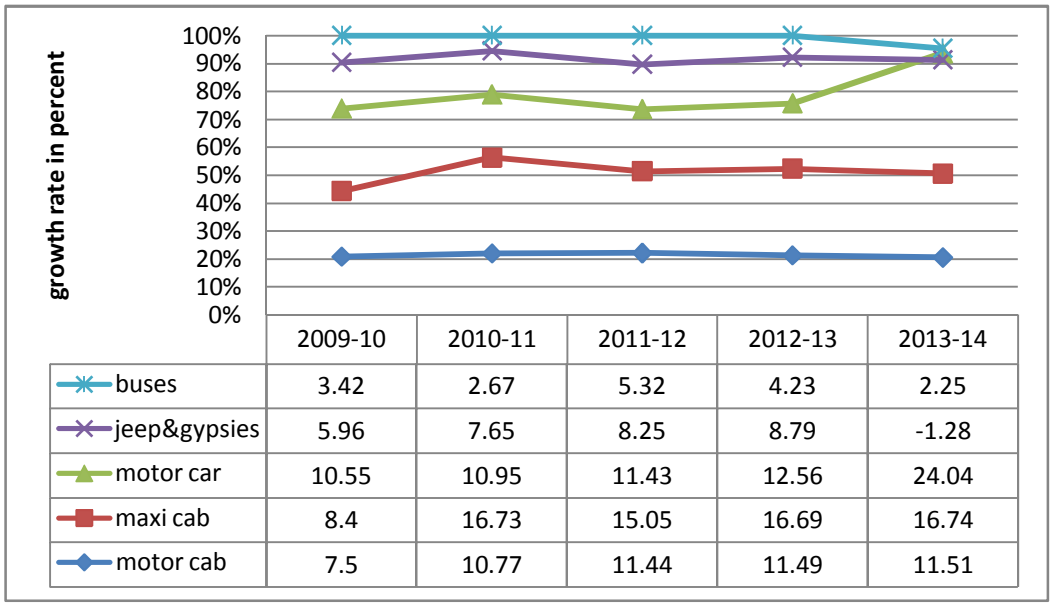
"Maxi-cab" means any motor vehicle constructed or adapted to carry more than six passengers, but not more than twelve passengers, excluding the driver, for hire or reward."Motor-cab" means any motor vehicle constructed or adapted to carry not more than six passengers excluding the driver for hire or reward; "motor car" means any motor vehicle other than a transport vehicle, omnibus, road-roller, tractor, motor cycle or invalid carriage; "motor cycle" means a two-wheeled motor vehicle, inclusive of any detachable side-car having an extra wheel, attached to the motor vehicle; (THE MOTOR VEHICLES ACT, 1988 NO. 59 OF 1988 [14th October, 1988.)

5.3.1 Growth of private-owned passenger carrying vehicles on road

The number of privately owned motor cars , motor cab, ie., taxis excluded has increased considerably over the years from 9697 in 2008-2009 to 16841 in 2013-2014, an increase by 7144 cars, which is an increase by 73.5% over a period of six years. The average growth rate came to 13.90% between the years 2008 -2014. The rapid increase of taxi is due to the liberal policy of the government to issue operation permits without considering what the road system in the sprawling Aizawl city can bear. As a result, there has been severe congestion of traffic in the city.

The average growth rate of privately owned maxi cabs between the years 2009-2014 is 14.72%. The growth rate in 2010-2011 was doubling to the growth rate in 2009-2010, thereafter it maintained a steady growth rate of around 16%.The

unrestricted issue of vehicle permit by the government especially for the taxis contributes to a certain degree the increase of taxis on road. It is also a matter of evolving urbanization which led to the demand of public transport like taxis as such for everyday commute by individuals engage in different work-fields and students for the journey to and fro the learning institutions. Use of private motor cars is highly substituted for reasons of convenience.



	2009-10	2010-11	2011-12	2012-13	2013-14
buses	3.42	2.67	5.32	4.23	2.25
jeep&gypsies	5.96	7.65	8.25	8.79	-1.28
motor car	10.55	10.95	11.43	12.56	24.04
maxi cab	8.4	16.73	15.05	16.69	16.74
motor cab	7.5	10.77	11.44	11.49	11.51

Source: Mizoram Statistical Handbook 2008-2014

Figure 5.15. Growth Rate of Private-Owned Passenger Carrying Vehicles on Road, 2008-2014, Aizawl

In comparison to Taxi and Maxi Cab, the popularity of Bus as a commercial vehicle has greatly diminished in the recent past. The growth rate of privately owned buses in 2009-2010 was 3.42percent which declined to 2.67percent in 2010-2011. However, there was an increase in 2011-2012, 5.32 percent and 4.23% in 2012-2013. It again decreased to 2.25 percent of growth rate in 2013-2014. The average growth rate came to 3.57percent yearly from 2008-2014.

The data on the annual growth rate of privately owned motor cabs showing increasing increment during the five-year period and a sudden jump to 24.04 percent in 2013-14. Excluding the outlier, the growth rate in the four year period was around 11 percent

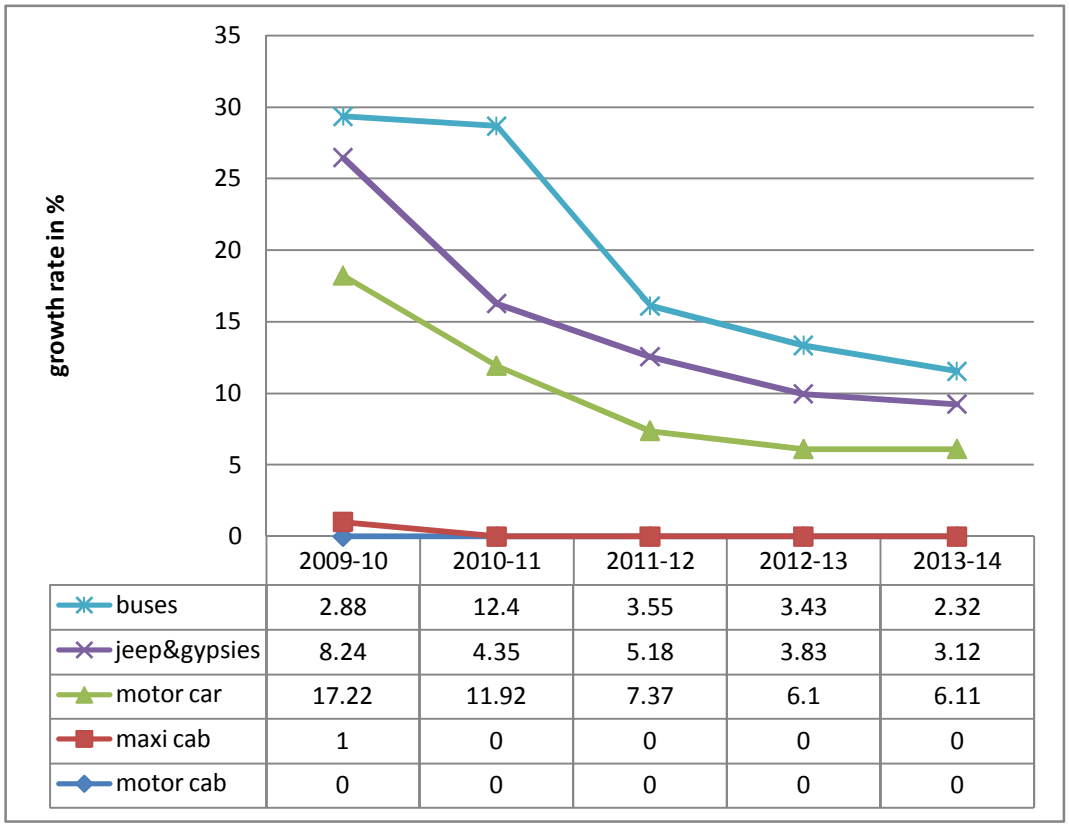
per year. In a very important sense, this is an indication that the number of families which can afford to own motor cab have become an important means of transportation in Mizoram and especially in Aizawl city. Since taxis also come under the classification of motor cab, the additional ownership of it adds to the increase of motor cabs over the period. Another significant type of transport choice is provided by gypsies and jeeps. They are heavily used in the interior parts of villages where road connections are in a deplorable state. They are both used as passenger and goods traffic to a great extent in rural areas. Also their use is rampant by households to visit their farms, which mostly are in the outskirts connected barely by ill-constructed roads and pathways, where it is almost impossible for luxury cars to pass through. Jeeps and gypsies are highly adaptable to uses in such rough roads.

5.3.2 Growth pattern of government-owned passenger carrying vehicles, 2008-2014

Motor car: Government-owned motor cars on road are comparatively less as compared to those owned by privates. The difference comes in thousands. Government owned motor cars increased over the years from 186 in 2009-2010 to 295 in 2013-2014. The average growth rate of the motor car came to 9.74% from 2008-2014. The government's officials as well as the departments are following the entitlement norms of using motor cars to carry out official duties, hence a moderate increase in its consumption; however the increase over the years is minimal.

On the other hand, government-owned buses and jeeps & gypsies are declining . The growth rate of government owned buses was specifically high in 2010-2011, 12.4% as compared to a growth rate of 2.88% in 2009-2010. 3.55% in 2011-2012, 3.43% in 2012-2013 and 2.32% in 2013-2014. The average growth rate of government owned buses yearly from 2009-2014 was 4.91%. The average growth rate of jeeps & gypsies from 2008-2014 came to be 4.94%.However, as compared to other vehicles, the increase in number of gypsies is lesser over the years. This could be mainly due to the use-substitution of jeeps & gypsies by motor cars and motor cabs. Jeeps and gypsies were of major use by the Government's officials, which have been gradually replaced by other form of motor cars in the past few years, and as a result of which there has been a decline in the number.

Interestingly, there has been just one Government owned maxi cab, from 2009-2014. Maxi cab services are mainly under private undertakings in Mizoram. Moreover, Motor cabs are not, at all purchased and used by the government. From 2008 till date, motor cabs do not come under the government undertaking and maintenance. There seems to be no record of government purchase of motor cabs for use.



	2009-10	2010-11	2011-12	2012-13	2013-14
buses	2.88	12.4	3.55	3.43	2.32
jeep&gypsies	8.24	4.35	5.18	3.83	3.12
motor car	17.22	11.92	7.37	6.1	6.11
maxi cab	1	0	0	0	0
motor cab	0	0	0	0	0

Source: Source: Mizoram Statistical Handbook 2008-2014

Figure 5.16 Growth Rate of Government-Owned Passenger Carrying Vehicles, 2008-2014

5.3.3 Growth of Government- and Privately-owned motor vehicles on road during 2008-2014

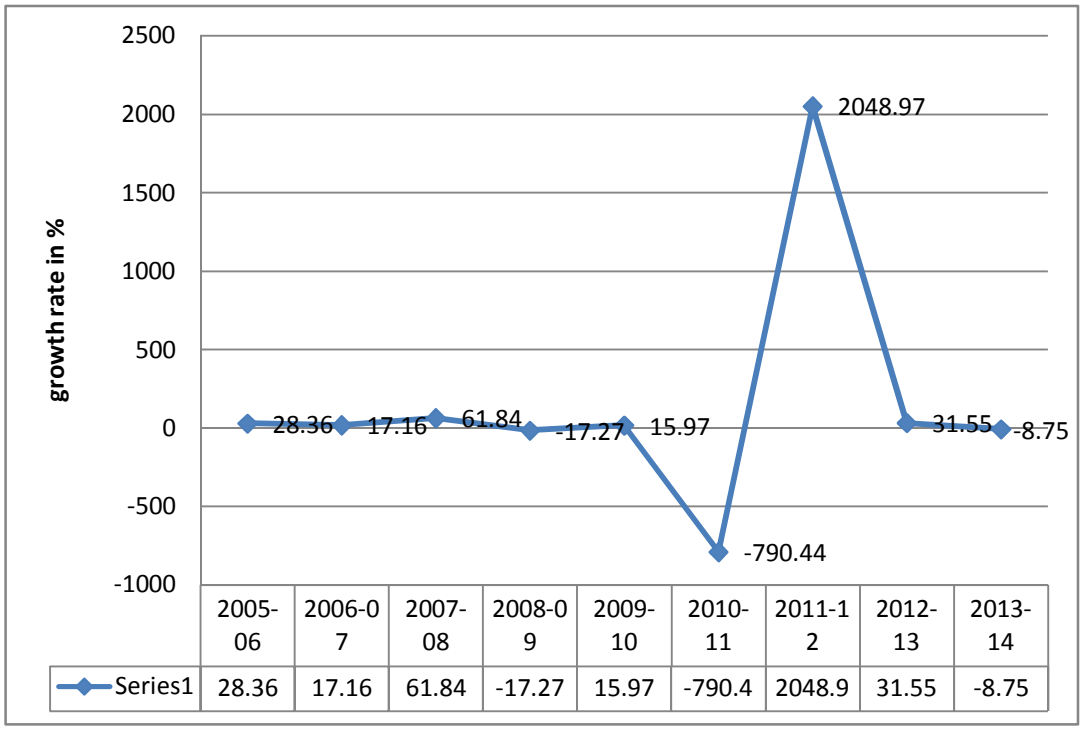
The lowest growth rate among the motor vehicles during the study period was the Bus. The average growth rate was 3.79 %. After it reached a maximum in 2010-11 (5.01 %), it declined gradually until it reached 1.76 % in 2013-2014. Bus as a means of transport has been greatly substituted by the increased use of private vehicles, especially the two wheelers. Although the bus is still widely used, they are being extensively substituted by maxi cabs especially for travelling in and out the city to far off villages or towns within or outside the state.

It is clearly perceptible from the table that the growth rate of motor car is consistently the highest among the government owned passenger carrying vehicles. The average growth rate from 2009 to 2014 was 10.02 %. The highest growth occurred during 2011-12 (13.99) while the lowest growth rate was found during 2013-14 (10.12).

In comparison to Bus and Motor car, the growth rate of maxi cab showed a significant increase in growth rate over the years, (with a growth rate of 8.46% in 2009-2010 to a growth rate of 16.72% in 2010-2011; increasing to 17.71% in 2011-2012, declining to 16.64% in 2012-2013 and to 16.73 % in 2013-2014). The number of maxi cabs in general has increased over the years. As seen from the figure, there is an increasing trend of number of maxi cabs on the road from 1297 in 2008-2009 to 2651 in 2013-2014. The increase is by 1354 maxi cabs, which is a 104.39% increase from 2008-2014. There has been a significant demand of passenger & freight carrying vehicles including sumos in the state over the years, which include the use of the maxi cab for travelling intra-state as well as inter-state.

The motor cab has also shown an increasing trend over the years inclusive of the taxis which serves an occupational importance for many as well as an income generation; an increase both in the demand and supply side, a characteristic of a growing economy and the changing modal choice over the years (where the average growth rate came out to 10.55% between 2009-2014).

5.4 Total revenue collected from motor vehicles 2004-2015 (in rupees)



Source: Mizoram Statistical Handbook 2004-2014

Figure 5.17 Growth Rate of Total Revenue Collected from Motor Vehicles during 2005-2014

The states revenue grew substantially over the years, with the implementation of rules and regulations concerning transportation and its system; fines and fees in connection with the imposition of penalty. Over a period of ten years, 2004-2014, the total revenue collected from motor vehicles by the Mizoram State Transport department increased tremendously, adding greatly to the states revenue. The total revenue collected in 2014 was around six times to that of the total revenue collected in 2004.There has been a massive increase of revenues collected from road tax (from Rs.19578000 in 2004 to Rs.147244842 in 2014, a 652% increase over a span of 10 years).The growth rate of road tax was exceptionally high in 2011-2012; a growth rate of 3902% as compared to the decline rate of 893% the previous year 2010-2011. The reason for this exceptionally high growth rate by the thousands was due to the recovery made in 2010-2011 in revenues collected through road tax, which was strictly carried out to ensure a lifetime tax payment at one go. The earlier decline in

revenues from road tax was well recovered in the next year, which put the revenues collected through road tax back on track, in line with a certain pattern. Over a span of 10 years i.e.2004-2014, there was an increase in revenues collected through fees and fines by 53.35%; There was an all time low in the revenues collected through fees and fines between the years 2010-2011, the revenue collected through fees and fines was an all time high between the years 2011-2012; owing to the greater vigilance of authority. Over a span of 7 years, the revenue collected through passengers and goods increased by 130.71%. With the advent of urbanization, movement of people and goods is greatly enhanced for business trips and the like, thus the increased use of vehicles for transportation by individuals and freight carriage.

5.5 Performance of Mizoram State Transport (MST)

The fleet strength has decreased substantially over the years from 2004 to 2014; in tandem with the number of routes covered. The distance covered in kms have also reduced over the years from 3115 kms in 2004-2005 to almost its half i.e. 1507 kms in 2013-2014.

The average daily passenger has also decreased since then, also decreased more than to its half of its level. This reduction in the number of average daily passenger is due to the increased number of privately owned vehicle for transportation. Also, the availability of other means of transportation such as maxi cabs and sumo services have led to its considerable decrease.

In 2003-04, on average, 356 passengers availed daily the services of MST bus and this had gone down to 150 passengers per day in 2013-14. According to the data of the state government, the maximum number of passengers availing MST bus service was recorded in 20008-09 at 400 passengers daily on average. As a whole, the state transport department handled daily a traffic of roughly 301 passengers during the period from 2004-2014 whereas the trend has been declining too. In this situation, it would be better for the state to scrap its entire fleet and let the private enterprise take over the management. It is beyond the state budget can bear to pay the salary and maintenance of personnel and vehicles under the state transport department.

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
no_of_buses_operated					-3.84	-6.12	-58.06	-6.45	-10
average_daily_passenger	-3.48	0.29	1.15	14.61	-6.38	-31.46	-23.8	-31.25	-17.33
distance_covered(route_length) in km	-6.93	20.39	8.52	-23.49	-6.38	-31.46	-23.8	-31.25	-17.33
no_of_route_covered	8	7.4	-38.8	-4.76	4.54	4.54	-9.52	-16.66	0
fleet_strength(MST)	-7.27	-89.65	-3.57	114.28	-11.11	-1.85	-66.66	-6.06	0

Source: Mizoram Statistical Handbook 2004-2014

Figure 5.18: Growth rate of the Performance of Mizoram State Transport (MST)

The Mizoram State Transport buses have shown a gradual decrease in its use over the years. This is primarily due to the increased number of other means of transportation which have substituted for the government buses and their second generation mode of transportation includes privately owned maxi cabs and motor cabs for public use, sumos and privately owned buses, especially with reference to Aizawl city.

The distance covered by MST (Mizoram State Transport) buses have significantly decreased from 3115 in 2004 to 1504 in 2014, incurring a decline of its fleet a little below to its fleet strength. The same goes for the number of routes covered by the buses, where it declines gradually over the years. The number of buses operated for the years 2008 to 2014 have shown a gradual decline with every passing year. The decline rate was highest in the year 2011-2012, 56.73%, which was from 49 buses in 2010-2011 to 31 buses in 2011-2012. The average number of buses operated in a span of 7 years i.e. 2008-2014 is 41.5 i.e. 42 buses a year.

5.6 Concluding remarks

The preceding analysis made it clear that there has been significant growth in the number of privately owned vehicles including commercially operated ones while the government owned vehicles have been reduced drastically in number. What is implied by this trend is possibly, in the first place, that the government did not perform well in providing public transportation. This being so, it is inevitable for the private operators to come up with a changed outlook and to supplement the function of the government. Moreover, the emergence of a new mindset under the sweeping change of post-reform development strategy and the rising level of living standard has led to a shift in the individual choice of means of transport. In the second place, as more and more households have been lifted out of poverty and merged with the middle income class, their choice of transport mode has also undergone a shift from crowded public transport to more comfortable private vehicles. A good many middle-income family can now afford to avail high cost transport services provided by the private enterprises. This is evident from the track record of transport operations in the state over the last ten years. We have shown that during the past seven years the maxi cab achieved the highest growth rate followed by the motor cab, the jeep and gypsy in descending order, while the minimal growth rate is achieved by the public transport bus owned and operated by the government.

As shown in the table 5.1, the motor car has the most member of passengers travelling by it followed by the jeep and gypsy, the maxi-cab and lastly by the bus. The main reason behind the poor public transportation usage and over dependency on private cars is because most travelers prefer cars that are more cost and time effective than an unplanned public transport system.

CHAPTER 6

FINDINGS AND CONCLUSIONS AND SUGGESTIONS

6.1 Introduction

The purpose of this thesis is to contribute to the understanding of how local public transport demand is affected by different factors. The focus of this study is to examine the cause of preference of public transportation over private or vice versa by passengers. Considering the increased use of public transportation by individuals and especially by those who also own private vehicles, it is important to understand what causes this preference of one means over the other and the personal benefits involved with it.

The subject matter of this study pertains to the population of Aizawl city, Mizoram. The data is based on the usage of public or private transportation by individuals irrespective of their ownership of private vehicles. The sample includes respondents who are teachers, high school and college teachers taken separately, of all age groups, different educational backgrounds, as also different income levels who are mobile, belonging to Aizawl city and around.

The study examines only the demand side factors influencing travel decisions. The supply side aspects, relating to public transports are taken as given. A study of this kind is beneficial to many parties like the government in its policy implication and also to the private entities as it is directed towards reduced travel expense. Insight of the mechanisms of the travel decision process will benefit governments to formulate policies that better address consumer's needs in transport. The study will also enable public transport managers to understand their consumer's needs preference and psyche. Furthermore, since no study of this nature has been conducted for the city of Aizawl, the present study will contribute to the birth of a recorded empirical work. It will also lead to further, deeper, more significant research in the area.

The findings based on the recourse of the study made in the earlier sections are discussed in the following sections: The state department of Economics and Statistics regularly conducted census of the vehicle population and published the figure annually and our study is based on these official figures.

This chapter presents the key findings and observations of the study.

6.2 General Trend of the Vehicles on road

6.2.1 Passenger carrying vehicles:

Among the different types of vehicles, the contract carriage (bus) registered the lowest growth rate at just 2 percent per annum. On the other hand, the population of two wheeler increased at an annual growth rate of 18.1 percent on average. At this growth rate, it means that the number of two wheelers is doubling every four years. In absolute terms, the increase of motor car is the second highest during the study period registering an average growth rate of 10.02 percent per annum. If this were the compounded growth rate in the number, the motor car population will be doubling every seven years. Other types of vehicles which are of less significance in terms of public or private transport services also recorded significant growth, all showing upward trend.

6.2.1.1 Two wheelers:

There has been a significant increase in the number of two wheelers in Mizoram over the past few years. There is a breakup of the ownership of two wheelers, the Government ownership of two wheelers and the private ownership.

The increase in two wheelers of the private ownership is higher than that of the government. Over a span of 6 years, from 2008 to 2014, private ownership of two wheelers have increased from 34396 in 2008 to 79737 in 2014, an increase in privately owned two wheelers by 45341 (131.82%). The growth rate of privately owned two wheelers in 2009-2010 was 21.92%; 19.13% in 2010-2011, 18.81% in 2011-2012, 17.09% in 2012-2013 and 14.71% in 2013-2014. The average growth rate was 18.33 % for the years 2009-2014.There has also been an increase in the number of government owned two wheelers over the years, however the growth has been substantially low, and at a point in time, there was a decrease in the number of government owned two wheelers. The growth rate for 2009-2010 was 11.77%, 7.21% in 2010-2011. There was a sudden decrease in number in 2011-2012, the rate of decline being 1.92%. in 2012-2013, the trend further moved to an increasing trend of 2.39% growth rate and 5.53% in 2013-2014.

The growth rate of privately owned two wheelers decrease over the years. However, there is a significant increase in the number of privately owned two wheelers on road, which can be seen from the fact that there is no negative growth value from 2009-2014. The growth rate of government owned two wheelers showed a different pattern. In 2011-2012, the number of government owned two wheelers decreased by 1.9% as compared to the previous year; however it increased the next year and forth. The average growth rate of privately owned two wheelers is more than that of the government owned two wheelers. Although showing a declining rate of growth over the years, new registrations of two wheelers were made every year. This means that the rate at which the vehicles were being condemned and shunted was higher than the replacement rate.

6.2.1.2 Motor cabs:

The number of Government and privately owned motor cabs on road, for the period spanning 2008-2014; showed an increase in the number by 3058 (65.10%) from 2008 to 2014. Motor cabs are not, at all purchased and used by the government. From 2008 till date, motor cabs do not come under the government undertaking and maintenance. There seems to be no record of government purchase of motor cabs for use. The annual growth rate of privately owned motor cabs is increasing with time. The growth rate between the years 2010-2014 showed consistency maintaining a growth rate average of 11.3 %, i.e. around 11%. The consistent increase of motor cabs on road shows the motor cab steadily gains importance as a transportation for Mizoram as a whole especially in Aizawl city.

6.2.1.3 Maxi-cabs:

A remarkable change has been observed in the use of maxi cabs as passenger carrying vehicle. Now, a good number of villages in Mizoram have run their own transport network of maxi-cabs to meet the escalating demand for passenger carrying vehicles. Maxi-cab can be said to have the right size suited to hilly roads which are narrow and steep and it has virtually replaced other means of passenger carriage. The ownership and management is entirely at the hand of private operators. The number of maxi cabs

which stood at 1297 in 2008-09 had risen to 2651 in 2013-14, registering an increase of 104.3 percent. As per the record of the department of Economics and Statistics, there was just one maxi cab owned and operated by the state government in 2014. The average growth rate of privately owned maxi cabs between 2009-2014 is 14.72%. The growth rate in 2010-2011 was doubling of the previous year growth rate and from 2011 onwards, the steady state of growth around 16 percent had been obtained.

6.2.1.4 Motor cars:

The number of privately owned motor cars has increased considerably over the years from 9697 in 2008-2009 to 16841 in 2013-2014, an increase by 7144 cars, or an increase of 73.7% over a period of six years. Government owned motor cars on road are comparatively less as compared to those owned by privates. Thus, publicly owned motor cars accounted for 1.7% in 2014. Government owned motor cars increased over the years from 186 9n 2009-210 to 295 in 2013-2014. The yearly growth rate of privately owned motor cars, though fluctuated, showed an accelerated rate of growth over the years, where it increased from 10.55% in 2009 to 14.3% in 2011-12. There was a slight decline in growth rate the next year; however the growth rate almost doubled itself the next year. In contrast, the Government owned motor cars showed a decelerated growth rate over the years from 17.2% in 2009-2010 to 6.11% in 2013-2014.

6.2.1.5 Jeeps:

The number of privately owned jeeps on road has increased over the years, much like other vehicles. The increase from 2008 to 2014 is 2651 which is by 35.55%. There is also an increase in the number of government owned jeeps by 191 jeeps over a period of six years, which is by 19.54%.The percentage increase of privately owned jeeps is, higher than that of the government owned jeeps.

6.2.1.6 Gypsies:

There were nearly a constant number of gypsies on road from 2008-2014. The numbers have neither grown drastically nor have decreased between 2008-2014; the number remained more or less the same over a span of six years. Both private and government owned gypsies maintained a steady state of growth. The increase in government owned gypsies from 2008 to 2014 was by 114, an average of 19 gypsies per year in a span of six years, whereas for the government owned gypsies, the increase between 2008-2014 was by 147, an average of 25 gypsies per year. The number of privately owned gypsies on road is more than double of the government owned gypsies on road each year. In the years 2009-2014, the growth rate of government owned gypsies was the highest in 2009-2010, 5.37% as compared to 2.84% in 2010-2011, 2.57% in 2011-2012, 2.89% in 2012-2013 and 0.63% in 2013-2014. The growth rate of government owned gypsies declined significantly over the years to less than a 1% growth rate in 2013-2014; the average being 2.52%.The growth rate of privately owned gypsies over the years has also been very low. The average growth rate from 2009-2014 was at a bare minimum of 0.89%.

6.2.1.7 Buses:

The number of privately owned buses increased steadily from 2008 to 2014. The average increase was by around 29 buses per year, with an increase from 760 in 2008 to 900 buses in 2014, a 19.21% increase over a period of six years. Over a period of six years, 2008-2014, the number of government owned buses has increased, but the increase has been subtle; from 243 in 2008 to 308 in 2014, a percentage increase of 26.79%. The average increase per year from 2008-2014 was by 27 buses. The number of privately owned buses on road has been significantly higher than that of the government owned buses. Roughly one-third of the buses on road are of government owned buses. The growth rate of government owned buses was particularly high in 2010-2011, 12.4% in comparison with the growth rate of 2.88% in 2009-2010. 3.55% in 2011-2012, 3.43% in 2012-2013 and 2.32% in 2013-2014. The average growth rate of government owned buses yearly from 2009-2014 was 4.91%. The growth rate of privately owned buses in 2009-2010 was 3.42% which declined to 2.67% in 2010-2011. However, the growth rate moved up to 5.32% in 2011-12 and 4.23% in 2012-

2013. It again decreased to 2.25% in 2013-2014. The annual average growth rate came to 3.57% during the period from 2008 through 2014.

The motor vehicle population in Mizoram is thus rising with higher shares of personalized vehicles. Within the personalized vehicles as well, the share of two wheelers is very high. This composition of vehicle population coupled with high growth rates of personalized vehicles has caused serious problems of congestion, accidents and pollution. This raises an important issue; in order to ensure good mobility, should we encourage the personalized vehicles to grow as they are doing now by providing adequate road space or should the greater use of public transport be encouraged. Though the data on road space utilization and pollution in the state is not available, going by national averages, the public transport utilizes much lesser road space and causes less pollution compared to the personalized transport. A shift from personalized transport to the public transport would also ease the problem of energy consumption, emissions, congestion, and road safety.

The transport policy has therefore to support investments in facilities that would wean people away from the use of personal vehicles rather than build facilities that would encourage greater use of personal motor vehicles. This would also require a tax and fee regime that discourages the ownership and use of personalized vehicles.

The increased vehicle population is often attributed to two factors. First, with liberalized licensing regime coupled with availability of easy finance, the ability of the middle class to own a vehicle improved substantially. Second, lack of comfortable, reliable and safe public transport system. Frequent irregular stops for passenger loading and unloading and lack of dedicated bus lanes contribute to serious traffic congestion and increased fuel consumption. These features increase the journey and waiting time and vehicles are often overcrowded, resulting in increased preference for personalized transport.

Traffic congestion is described as the situation that arises when the transport networks are loaded with traffic more than its economic capacity (Reddy er.al.2000). The level of traffic congestion in urban transport networks is found to vary with time of the day attaining maximum level during the peak hours when the journeys to the working places occur. Besides causing delay and enhanced emissions, congestion is responsible for enhanced out of pocket expenses and economic losses. The high

growth rates of vehicle population in the state are causing a serious concern in terms of parking spaces and congestion.

In relation to environmental concerns of the road transport, many people in developing countries such as India and Aizawl in particular, because of lifestyle, economic condition and occupation spend large amount of time in close proximity to road traffic and so are exposed to harmful emissions. The problem is further aggravated by traffic congestions which reduces travel speeds and in turn leads to environmental and economic problems. Fuel consumption increases as a result and so are the vehicle emissions, which further exacerbates air pollution and increases the noise level.

6.2.2 Revenue collected from motor vehicles:

The states revenue grew substantially over the years, with the implementation of rules and regulations concerning transportation and its system; fines and fees in connection with the imposition of penalty. Over a period of ten years, 2004-2014, the total revenue collected from motor vehicles by the Mizoram State Transport department increased tremendously, adding greatly to the states revenue. The total revenue collected in 2014 was around six times to that of the total revenue collected in 2004.There has been a massive increase of revenues collected from road tax (from Rs.19578000 in 2004 to Rs.147244842 in 2014, a 652% increase over a span of 10 years).The growth rate of road tax was exceptionally high in 2011-2012; a growth rate of 3902% as compared to the decline rate of 893% the previous year 2010-2011. The reason for this exceptionally high growth rate by the thousands was due to the recovery made in 2010-2011 in revenues collected through road tax, which was strictly carried out to ensure a lifetime tax payment at one go. The earlier decline in revenues from road tax was well recovered in the next year, which put the revenues collected through road tax back on track, in line with a certain pattern. Over a span of 10 years i.e.2004-2014, there was an increase in revenues collected through fees and fines by 53.35%.There was an all time low in the revenues collected through fees and fines between the years 2010-2011, the revenue collected through fees and fines was

an all time high between the years 2011-2012; owing to the greater vigilance of authority. Over a span of 7 years, the revenue collected through passengers and goods increased by 130.71%. With the advent of urbanization, movement of people and goods is greatly enhanced for business trips and the like, thus the increased use of vehicles for transportation by individuals and freight carriage.

6.2.3 Performance of Mizoram State Transport (MST)

The fleet strength has decreased substantially over the years from 2004 to 2014; in tandem with the number of routes covered. The distance covered in kms have also reduced over the years from 3115 kms in 2004-2005 to almost its half i.e. 1507 kms in 2013-2014.

The average daily passenger has also decreased since then, also decreased more than to its half of its level. This reduction in the number of average daily passenger is due to the increased number of privately owned vehicle for transportation. Also, the availability of other means of transportation such as maxi cabs and sumo services have led to its considerable decrease.

In 2003-04, on average, 356 passengers availed daily the services of MST bus and this had gone down to 150 passengers per day in 2013-14. According to the data of the state government, the maximum number of passengers availing MST bus service was recorded in 2008-09 at 400 passengers daily on average. As a whole, the state transport department handled daily a traffic of roughly 301 passengers during the period from 2004-2014 whereas the trend has been declining too. In this situation, it would be better for the state to scrap its entire fleet and let the private enterprise take over the management. It is beyond the state budget can bear to pay the salary and maintenance of personnel and vehicles under the state transport department.

6. 3 Analytical Results of college teachers in relation to their mode choice:

6.3.1 Majority of the college teacher respondents often or almost always travel by private transportation. It can be concluded that both genders are almost alike in their degree of use of the private means of transportation. 36% of mothers in the household prefer public over private transport.

6.3.2 A little more than 25%of the respondents with household income Rs.70000 and below use the public mode on a daily basis, 14% of respondents with household income group between Rs.70000-Rs 90000, 27% by respondents in the household income group between Rs.900001-Rs.110000; 23% in the household income group Rs.110001-Rs.150000, 43% by respondents from the household income group Rs.150001-Rs.20000 and 36% from the household income group Rs. 200001 and above. We can thus say that a lot of people from the higher income group still use the public transport despite the many limitations.

6.3.3 Except for the respondents with individual income group between Rs.70000 and below, the percentage of household not owning private vehicles is minimum. Especially in comparison to a 100% private vehicle ownership in households having monthly income of more than Rs.200001. The number of private vehicle owned by the household increase moderately with the increase in total household income, whereby the type of vehicles owned may also add to the degree of ownership. A whopping 88% of the household earning above Rs 200001 a month own two or more vehicles to be used by the household. A large portion of the respondents have households owning more than one private vehicle. The percentage is exceptionally high in income group Rs.60001-90000, which is around 62% of the total respondents belonging to that particular income group, as also in comparison to the other level of income group. Four wheeler ownership increases with increase in household income, whereas for household with lower incomes, two wheeler ownership is common. The reason is due to low cost of maintenance of two wheeler vehicles and the inability to purchase four-wheeled vehicles. Household with higher incomes own both two and four wheelers. It can thus be concluded that the more the income, the more likely the household own a private vehicle. The more the total monthly income of the household, the more the number of vehicles owned by the household.

6.3.4 From the household income group, Rs.70000 and below, majority (41.7%) of the respondents spend Rs. 1000 and below on commuting cost in a month. From the household income group, Rs.120000 and below, majority of the respondents spend Rs. 2500 and below a month on commuting cost in a month. Also, it can be seen that, the amount of money income spent on commute a month lies mainly below Rs. 4000. Only a few percentages of the respondents spend more than Rs.4000 a month on commute. However, on an average, 33% of the respondents spend between Rs. 1-500 a month on the use of public transport. 33% of the respondents spend around Rs. 500 or less on the use of public transport in a month. 25% of the respondents earning Rs 120000 and above individually spend between Rs.500-1500 a month. This may be due to the use of taxis for commute, which is much costlier than commute by bus. Higher the total monthly household income, higher the expenditure on privately owned vehicles. The higher income groups are in a position to financially manage private vehicles, both two and four wheelers, in addition that in some households, personal drivers are employed. Expenditure on private vehicle maintenance and use is highest in individuals earning Rs.120000 and above, where 38% of the respondents belonging to that income level spend between Rs.3501-5000 a month. Thus, it can be concluded that higher the income, the higher the expenditure on private vehicle maintenance. As income increases, commuting cost increases. As the household income increases, the spending on public transport use increases.

6.3.5 Most of the respondents use the private vehicle on a daily basis, especially by the respondents with monthly household income between Rs.70000-200000. Private vehicles are used more frequently as compared to public means. However, respondents from household having income Rs.200001 and above use both private and public transport for commute on a regular basis; the public vehicle use mostly being taxis, which are affordable only among higher income groups as the rate is fairly expensive for use on a regular basis. A majority of 66% of the respondents belonging to different income groups use their private vehicles for commute regularly. The respondents are fairly distributed in their use of public transport for commute where, 31% of the respondents do not use public transport. Among the public transport users, solely non-bus users contribute a great deal and also users of both bus and non-bus; their proportion is about the same. Thus it can be concluded that bus is

rarely used independently by commuters. Lower income groups use public transport sparingly. As the household income increases, there is a tendency for the respondents to prefer public transport over private, due to certain reasons which includes the affordability of the household members to hire taxis and other means, which has considerably high fares as compared to bus.

The college teacher's respondents are not in favor of using the bus as a means of commute, only a mere minimum percentage of the lot use bus-transit. However most of the public transport user commutes by non-bus transits such as taxis, that is, 31% of the total respondents. The taxi is the most popular means of commute among the public transport.

Majority of the college teacher respondents spend between Rs. 1000- 2000 a month on transportation for travel within the city. An average of around 3.58% of their monthly income is spent on intra- city transportation. Majority of the college teachers own both two and four wheelers. Shopping as a travel destination is where the respondents who own private vehicles prefer to use public transportation instead of their own vehicles. The reasons being due to traffic congestion and limited parking spaces in the city. People who own private vehicles especially four wheelers would rather travel by taxis or buses to avoid such inconveniences.

6.3.6 Econometric model analysis:

6.3.6.1 The binary logit model shows that, of the variables affecting transport mode choice by college teachers, the most significant is time issues; secondly, accessibility and flexibility of the private transportation which was also observed in the preceding sections of the chapter. The small sample size, with little variability across the quantitative variables could be the reason of the low significance, yet high odd ratios.

6.3.6.2 The dependent variable used to run the regression model is the choice of means of transportation used. Therefore, the individuals' decision in preferring private over public transportation is dependent on certain explanatory variables which are gender of the respondents, time issue (bus service time and time 0f travel), comfort level (security, comfort and independence of private vehicle, crowdedness of

bus and likeness for driving), accessibility and flexibility (inconvenience due to access distance of bus stops, public transportation networks limitations), cost saving (taxi fares), and lastly other factors, given as others for the respondents to specify. Certain variables have been dropped to avoid multicollinearity (Dropping Variable Method).

6.3.6.3 The Nagelkerke R Square depicts the goodness of fit. It denotes the variation in dependent variable due to independent variable. In this case R square=0.938.Therefore 93.8% of variation of dependent variable can be explained with the independent variables. The factors included in the model account for 93.8% of the variation for the Nagelkerke while Cox & Snell explained 64.4%.

6.3.6.4 Based on the level of significance (sig.) and the intercept values (B), the regression equation is formed. If the significance level is lesser than 0.05, then the variable is highly significant. Time issues, has a negative result on the dependent variable (-5.485), but is highly significant (.000). This means that a unit increase in time issue as a factor will lead to a5.485 decrease in the dependent variable. This reveals that time issue in relation to transportation is highly significant to the choice of means of transportation. The estimated co-efficient for time issue came out negative, implying that an increase in issues related to time management and related issue as a whole, was likely to decrease the use of public transport. Flexibility and accessibility, has a negative result on dependent variable (-3.219), but is highly significant (.061). This means that a unit increase in flexibility and accessibility as a factor will lead to a 3.219 decrease in the dependent variable. The binary logistic model demonstrated that the most significant variable affecting the commuter's mode choice is the time issue-factor. The other factor being the Flexibility and accessibility factor; The estimated co-efficient for time issue came out negative, implying that an increase in issues related to Flexibility and accessibility as a whole, was likely to decrease the use of public transport.

6.4 Analytical result of high school teachers in relation to their mode choice:

6.4.1 82% of the respondents own private vehicles. This could be due to greater affordability of the household to own private vehicles as the income increases. 75% of the household earning above Rs 150000 a month own two or more vehicles to be used by the household. The reason for the non-ownership of respondents from higher income group is usually lack of garage, and also the fact that they are temporary residents of the place they are currently living in. it can thus be conclude that as more the total monthly income of the household, the more the number of vehicles owned by the household. The rate of private vehicle ownership increases with increase in the monthly household income of the respondents. A large portion of the respondents have households owning more than one private vehicle i.e. 45%. Four wheeler ownership increases with increase in household income, whereas for household with lower incomes, two wheeler ownership is common. The reason due to low cost of maintenance of two wheeler vehicles and the inability to purchase four-wheeled vehicles. Household with higher incomes own both two and four wheelers. Two wheelers make up most of the private vehicle owned in the households of the different income group. Respondents who own four wheelers also mostly own two wheelers. It can be concluded that the number of private vehicle owned by the household increase moderately with the increase in total household income.

6.4.2 Majority (70%) of the respondents with household income Rs.110001- 150000 spend Rs. 1500 and below a month on commuting cost. Also, it can be seen that, the amount of money income spent on commute a month lies mainly between Rs.501-1500 a month. Only a few percentages of the respondents spend more than Rs.3500 a month on commute. Most respondents from different income groups spend around Rs. 501-1500 a month on commuting cost. 25% of the respondents falling in the category of individual monthly income Rs.65001 and above spend over Rs.2500 a month on transportation cost. The higher income groups are in a position to financially manage private vehicles, both two and four wheelers, in addition that in some households, personal drivers are employed. Expenditure on private vehicle maintenance and use is highest in respondents with individual income falling between Rs.35001- Rs.45000, where 32% of the respondents belonging to that income level spend above Rs. 3000 a month. The higher the personal income, the higher the expenditure on private vehicle

maintenance. As the household income increases, the spending on cost related to public transport use increases. However, on an average, 36% of the respondents spend between Rs1- 500 a month on the use of public transport. Spending on commute by public transport falls fairly below Rs.3000 a month. The highest spender being the respondents earning an individual monthly income of Rs.65001 and above.

6.4.3 Between high school teachers alone, Lower income groups use public transport sparingly, however as the income increases, more of it is used on a daily basis, which when found out through survey is the use of taxis on a regular basis. For income group Rs.80001- 110000, 50% of the respondents use it on a regular basis, after which there is a slight decrease in extent of use of public transport as the income increases. Most of the respondents use the private vehicle on a daily basis, especially by the respondents with monthly household income above Rs. 110000. Most use the private to public for commute. The respondents are fairly distributed in their use of public transport for commute where, 29% of the respondents do not use public transport. However, among the public transport users, solely non-bus users contribute a great deal and also users of both bus and non-bus; their proportion is about the same. The bus is rarely used independently by commuters. Majority of the respondents prefer private transportation to public transport, however respondents from higher household income group also prefer public transportation as it is more convenient and time saving in certain circumstances. There are 70% of respondents preferring private over public transportation. There are a 50% of respondents from the income group Rs.65001 and above who prefer private transportation and another 50% who prefer public transportation. As many as 58% of the respondents belonging to different income groups uses their private vehicles for commute regularly. However, it is surprising to see that 50% of the high schoolteacher respondents are not using private transport at all, in spite of them being from the higher income group, earning above Rs65001 a month as salary. The greatest preference is for private vehicles irrespective of the position of the respondents in the household. 36% of mothers in the household prefer public over private transport and 48% of the daughter respondents in the household prefer private transport.

Majority of the high school teachers spends between Rs.500-1500 a month on transportation for travel within the city. An average of 7.48 percent of their monthly income is spent on such travel. The most type of vehicle owned by high school teachers is the two wheeler. Shopping as a travel destination is where the respondents who own private vehicles prefer to use public transportation instead of their own vehicles. The reasons being due to traffic congestion and limited parking spaces in the city. People who own private vehicles especially four wheelers would rather travel by taxis or buses to avoid such inconveniences.

6.4.5 Econometric model analysis:

6.4.5.1 The logit model shows that of the variables affecting transport mode choice by high school teachers that is most significant is time issues; secondly, accessibility and flexibility of the private transportation which was also observed in the preceding sections of the chapter. The small sample size, with little variability across the quantitative variables could be the reason of the low significance, yet high odd ratios.

6.4.5.2 The dependent variable used to run the regression model is the choice of means of transportation used. Therefore, the individuals' decision in preferring private over public transportation is dependent on certain explanatory variables which are age of the respondents, time issue (bus service time and time 0f travel), comfort level (security, comfort and independence of private vehicle, crowdedness of bus and likeness for driving), accessibility and flexibility (inconvenience due to access distance of bus stops, public transportation networks limitations), cost saving (taxi fares), and lastly other factors, given as others for the respondents to specify. Certain variables have been dropped to avoid multicollinearity (Dropping Variable Method).

6.4.5.3 The Nagelkerke R Square depicts the goodness of fit .It denotes the variation in dependent variable due to independent variable. In this case R square=0.945.Therefore 94.5% of variation of dependent variable can be explained with the independent variables. The factors included in the model account for 94.5% of the variation for the Nagelkerke while Cox & Snell explained 66.7%.

6.4.5.4 Based on the level of significance (sig.) and the intercept values (B), the regression equation is formed. If the significance level is lesser than 0.05, then the variable is highly significant. Time issues, has a negative result on the dependent variable (-3.257), but is highly significant (.050). This means that a unit increase in time issue as a factor will lead to a 3.257 decrease in the dependent variable. This reveals that time issue in relation to transportation is highly significant to the choice of means of transportation. The estimated co-efficient for time issue came out negative, implying that an increase in issues related to time management and related issue as a whole, was likely to decrease the use of public transport. Flexibility and accessibility, has a negative result on dependent variable(-5.219), but is highly significant (.001)this means that a unit increase in flexibility and accessibility as a factor will lead to a 5.219 decrease in the dependent variable. This reveals that Flexibility and accessibility, in relation to transportation is highly significant to the choice of means of transportation. The estimated co-efficient for time issue came out negative, implying that an increase in issues related to Flexibility and accessibility as a whole, was likely to decrease the use of public transport. The binary logistic model demonstrated that the most significant variable affecting the commuter's mode choice is the Flexibility and accessibility factor. The other factor being the time issue-factor; The estimated co-efficient for time issue came out negative, implying that an increase in issues related to Flexibility and accessibility as a whole, was likely to decrease the use of public transport.

6.5 SUGGESTIONS

The findings from the study suggest some policy implications which have bearing on the transport system catering to middle-income families.

i) The study reveals that a choice has been made on the use of public transport over private car travel. To assist in the achievement of maximum utility, settlement plans should have circulation systems or movement layouts which make all dwellings accessible to public transport or rather public transport accessible to all settlements. Specifically, special emphasis has to be put on designing routes and exclusive bus lanes, and

providing traffic priority for buses, faster connections, and more frequent and reliable departures, among other measures intended to reduce travel time. Large benefits can be obtained from a program aimed at reducing congestion.

ii) Development of public transport-

- Measures to improve public transportation must be taken. Transportation as a public service must be made accessible to all; ensuring security especially for the female population and children. The quality of service offered also needs to be looked into.

- Private sector involvement is essential for provision of efficient services at competitive fares. However, governments need to prepare platform for the private firms to come in. it requires policy formulation in three major areas: price regulations, quality standards and access regulations.

- Promoting equity and welfare through concessional facilities to the weaker sections and remote areas.

- Public transport subsidies are a form of positive restraints which can encourage use of public transport by private vehicle owners. Subsidizing the public transport can be achieved in two ways: cash subsidy for operation and tax incentives to the public transport operators. While the first one is considered to be inefficient and also puts strain on the fund-starved governments, the tax concessions have found favour with governments in many countries.

iii) Public transport travel distances and times for work trips should be limited. This means that new settlements should be located close enough from the major work destinations. Further, as a general guideline, settlements should rather be located as close as possible to places of work and other urban activities so as to facilitate trips by bicycle or on foot. Where this is not possible, settlements should be located close enough to work

destinations to enable public transport vehicles to make two or more trips from the settlement to the work place or school in peak-hour periods.

iv) Since the aim is to determine which characteristics are more relevant to contributing to the preference of public to private modes of transportation, we rather concentrate on the relative importance of each attribute. We therefore conclude that a program aimed at reducing congestion and pollution during peak hours should focus on increasing the cost of private transport and providing faster and more reliable public transport. The possibility of separating public transport by creating a parallel service that provides a more expensive but faster service is one potential alternative to detract customers from private transportation.

v) A better arrangement of land use i.e. of places of origin and destination of trips. In fact a more reasonable distribution of the population and functions of a city, or of a larger area, might diminish trip lengths or even change some of the trips into walking trips. The daily trips of buses at rush hours, in Aizawl may be mentioned as an example. Such trips could be reduced considerably by a more reasonable distribution of schools in each neighbourhood.

vi) Improve methods of communications- improved methods of telecommunications might create the proper conditions for the substitution of certain trips by communications. However, in this case also, the percentage of the reduction cannot be important, because it will concern only certain categories of trips, especially the business trips.

vii) Making enough provisions for parking. Very often towns, market complexes, and industrial areas are planned without taking into consideration the transport requirements. Creation of an agency to coordinate and oversee the working of the system may also be highly useful.

viii) Vehicle pollution serves a threat to the environment.

- Taxing the polluters for the privilege of polluting should affect their economic behaviour. The behaviour modification maybe based on incentives rather than constraints. The polluter is then free to choose the most suitable means of reducing emission. However, in order to levy such a tax, the regulator will require knowing the exact pollution caused by each vehicle, which may be difficult because the source is mobile and in large number. Therefore, it is recommended imposing a tax on the polluting goods such as the fuel in this case.

- Moral suasions can be helpful in situations where the polluters are not identified so that they can be subjected to other direct control measures like taxes and subsidies.

ix) Traffic management-

- The existing parking space in the city should be made available to people with most need of it.
- Road space allocation to high occupancy vehicles. Providing a special priority to bus services in the road usage. A bus can carry 30 times as many passengers as a car, in only the times the road space. Also, as it is used more by the poor, it facilitates travel by the poor.
- Limiting entry to environmentally sensitive areas.

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