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Msc Thesis in road & transport engineering stream

Title: Assessment of Urban Transport Mobility using Trip Distribution methods: Case Study (Megenagna-Legehar) Addis Ababa

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DECLARATION

I certify that research work titled Assessment of Urban Transport Mobility with Trip Distribution Methods: Case study Megenagna-Leghar Addis Ababa is my own work. The work has not been presented elsewhere for assessment, where material has been used from other sources it has been properly acknowledged / referred.

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ABSTRACT

Addis Ababa keeps expanding horizontally as a result of increase in wealth and population, the city has faced some problems like congestion, poor access to work place, education, health and other services due to lack of properly planned urban transport and lack of improved transport modes, mobility in the city which has becomes a big issue. This study is designed to assess urban transport mobility with trip distribution methods to calculate expected number of trips between origin and destination zones, to identify factors that affect personal trip production with respect to travel pattern and finally to forward recommendations based on the analysis made to improve the urban transport planning system. In order to solve the stated problems and meet the objectives both primary and secondary data were collected. In relation to secondary data, related documents were reviewed. Regarding primary data, expected numbers of trips between two zones were estimated using gravity model. The total number of estimated trips was 360,672 trips/day and the actual trips that were counted were 3,450 trips/day. To balance these two trips, calibration constant was calculated. Questionnaires were distributed to different population groups randomly and were analyzed using SPSS software. Semi structured interviews were used to collect data related to transport planning system. As a result study identify parameters that can affect urban mobility with regard to trip person production based on the travel behavior and socio economic activities like income, household size, educational back ground, number of employees, travel time, number of trips, trip purposes and transport expenses. Incomes people earned had significant influence on the type of transportation they frequently used, which is also an implication of their daily expense for transport. Urban transport challenges regarding population growth, inadequate urban transport planning and fast growth in urbanization resulted in congestion, poor mobility and accidents. Lastly, the study recommends that there has to be a policy that coordinates urban and transport planning policies to make an integrated transport land use systems which reduce the distance travelled, time taken and use of personal vehicles along with increasing accessibility through proper land allocation for different activities and government must plan new policy to decrease migration from rural areas to the city for different purpose by providing sufficient services at home town. Additionally, the study recommends the use of high capacity vehicles can improve urban mobility and traffic rules enforcement must have conducted to reduce traffic accidents.

Keywords: Sustainable Transport Panning, Traffic forecasting models, Mobility measures

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LIST OF ABBREVIATIONS

3D's-, Density, Diversity and Design

AU- African Union

CWW -Compressed Work Week

ESs - External Stations

GDP- Growth Domestic Product

HOV -high occupant vehicle

LRT -Light Rail Transit

NMT -Non Motorized Transport

O-D - Origin-Destination

SOV - Single Occupancy Vehicles

SPSS - Statistical Package for the Social Science

TDM-Transport Demand Management

TAZs - Traffic Analysis Zones

UNECA -United Nation Economic Commission for Africa

CHAPTER ONE

1. INTRODUCTION

1.1 Back ground of the Study and Problem Formulation

Today, Addis Ababa is facing huge challenges emanating from years of poor coordination in its existing urban systems. Transport is one of these components of the urban system, which is responsible for bridging the gap between areas of production and consumption, as well as creating a medium for spatial interaction, continues to be in these challenges. The lack of properly planned urban transport in Addis-Ababa is manifested through the low degree of efficiency of urban mobility that is now observed in almost all of the city's center, sub-centers and other major traffic corridors. Urban mobility, which is increasingly becoming inefficient in Addis Ababa and resulting in congestion, can be viewed as a function of various components of urban transport system problems. These elements are traffic management, and transport infrastructure. Congestion is becoming a common experience in all the different parts of the city due to lack of consistent concerted efforts from the various stakeholders and policy makers. It is also in part a result of the numerous socio-economic factors whose combined effect is to increase the pull factor of the city of Addis Ababa and hence resulting in an ever increasing population. This in turn makes the battle to curb the gap between the demand for an efficient urban transportation system and the city's ability for its provision, a seemingly perpetual one.

Mobility in the developing world is often characterized by travel demand that far exceeds supply (Anderson.S, &Ungemah, D.1999). The city of Addis Ababa is not an exception to this reality. Demand for urban public transport services are growing in the same way as in other Third-world cities (Davidson, 2007). "Mobility" refers to the movement of people and goods. This recognizes both automobile and transit modes, but still assumes that movement is an end in itself, rather than a means to an end.Mobility perspective defines transportation problems in terms of constraints on physical movement, and so favors solutions that increase motor vehicle system capacity and speed, including road and parking facility improvements, transit and ridesharing improvements, high-speed train, aviation and intermodal connections. It gives little consideration to walking and cycling except where they provide access to motorized modes, since they represent a small portion of person-miles. From this perspective, the best way to benefit non-

drivers is to improve motorized transport, including automobile, transit and taxi modes, with more modest consideration of walking and cycling. Sustainable mobility requires several measures and continuous action: planning, infrastructure development, modal integration, traffic management, economic sustainability of infrastructures and efficient fleet managements, etc. Mobility planning is one of the key steps which determine many other implementation and management factors in the cycle of sustainable mobility.

Sustainable urban transportation is a current and critical urban issue all over the world. It aims to ensure better and healthier means of transportations meeting the individual and community mobility needs by reducing the social and environmental impacts of the mobility (Parkin, J., Wardman, M., & Page, M. 2008). Sustainable urban transportation planning provides not only a good mobility of transport but also plays decisive role in reducing the climate change by minimizing the emission of carbon to the atmosphere. In developing countries, cities are growing fast and their development is determined by the level of the interaction they can have at inter-urban and intra- urban levels. These interactions are facilitated by means of urban transportation. If there is no transportation there is no activity and economic development. Hence, whether planned or not the needs of urban transportation has been catered by the available means and types (big capacity bus /articulated bus, minibus, three wheel, two wheel, etc). The major question one should ask is that whether this way of responding to the urban transportation is improving or aggravating the mobility problem? Most of the time responses are given on the infrastructure development level than on the planning. What are the planning responses which can bring sustainable urban mobility?

Transport system is an important part of a city and success in insuring mobility can even be an indication of how well the city really is organized. Transport is a common element used by all city majors in the world while talking about being a 'world class city'. But as Addis Ababa keeps expanding horizontal as a result of increase in wealth and population, mobility in the city becomes a big issue. And the failure to provide well-functioning public transport causes growing social, economic as well as environmental problems in the city. These points emphasize the needs to recognize the effects of transport in any land use planning in urban areas and integrate the policies. Transport is the engine of social and economic activities. The provision of competent and efficient transportation system is of paramount importance for the cities especially in the modern area of globalization and information age where cities are the centers of

urbanization and propellers of national and global economies. Addis Ababa, the capital city of Ethiopia, is the heart of social, political and economic activities of the country and is the 4th largest diplomatic center in the world as the city is a seat of the United Nation Economic Commission for Africa (UNECA) and the African Union (AU). Addis Ababa is experiencing a fast paced urbanization which imposes intense pressure on the urban infrastructures, particularly on transport. Urbanization is a challenge which when coupled with congestion and automobile oriented-development practices intensifies the magnitude and dimension of urban problems across cities of the world, particularly in developing cities like Addis Ababa. Addis Ababa is already in peak pressure of providing competent transportation infrastructures and services that can absorb the pressing demand of the ever growing population. In light of this, the city is striving to overcome the current transport problems and the inevitable future challenges through the introduction of Light Rail Transit (LRT).

1.2 Statement of the Problem

It is clear that behind every research, there is a problem for which the causes and solutions need to be studied. With regard to this specific paper ,the basic problem is low sustainable urban mobility system in Ethiopia with particular reference to Addis Ababa city due to lack of properly planned urban transport system, lack of consistent concerted efforts from various stake holders and due to numerous socio economic factors congestion was common in the city. Addis Ababa like most African cities has been experiencing huge population increases. This is mainly due to the fast growth in urbanization. The lifestyle of the city dwellers is changing where people prefer to travel by different types of vehicles and being automobile oriented to move from place to place within the city, problems like congestion, poor access to work place, education, health and other services due to lack of improved transport modes, lack of smooth traffic flow, lack of infrastructure for Non Motorized Transport (NMT) (for walking and bicycle), and high rate of traffic accidents have faced.

1.3 Objectives of the Study

1.3.1 General Objective of the Study

The general objective of the study is to assess urban transport mobility using Trip distribution method that measure urban mobility by trip number per day and to answer a series of questions

about future travel patterns which affect urban mobility and identify parameters to be considered in transport planning for future forecasting.

1.3.2 Specific Objective of the Study

i) To show relationships between land use character and socio economic activities with travel patterns.

ii) To measure urban mobility between two zones by predicting expected number of trips between two zones.

1.4 Research questions

To achieve the purpose of the study, therefore, this research paper attempts to answer the following questions

1) What are the factors that affect person trip production in Addis Ababa city?

2) What are urban transport challenges in Addis Ababa city?

3) In what quantities the trips are originating in or destined for particular traffic analysis zone?

1.5 Significant of the Study

The significance of this study for transport planners is to develop models by translating all the necessary information on existing travel patterns and land use character profiles into profile of future transport requirements for the study area to make sustainable urban transport planning. The study is beneficial also for academicians and researchers who conduct similar researches on improving urban transport mobility with different models and also support policy makers in their effort to address similar problems.

1.6 Limitation and Scope of the Study

This study is not totally free of limitations. There were some problems that limited the findings of the study to talk in absolute terms. These include serious time restrictions, poor documentation of data, frequent meetings, trainings, some respondents were not willing to full fill the questioner forms and busy work schedule forced the researcher to waste additional time to get them from sub cities. There was also scarcity of financials. Moreover, the study was based on available information from primary and secondary sources in parallel to the literature reviews .The

researcher was not limited only with questionnaires and interviews, survey field data collection was also conducted.

1.7 Organization of the Thesis

This thesis was arranged into five chapters. The first chapter contains the introduction part, which comprises background of the study, statement of the problem, research questions, and objectives of the study, significance, scope and limitation of the study. The second chapter highlights related literatures like mobility definitions, factors that affect accessibility and mobility, urban transport challenges, parameters that affect urban mobility, traffic demand forecasting models and traffic demand management methods. The third chapter introduces research methodologies. In this chapter study design, data sources, methods of data collection, methods of data analysis and outline of the study included. Results and discussions presented in the fourth chapter. Finally, the last chapter concluded the thesis and forwarded recommendations.

CHAPTER TWO

2. LITREATURE REVIEW

2.1 Introduction to Mobility

Mobility refers to physical movement, measured by trips, distance and speed, such as person-miles or person- kilometre for personal travel and ton-miles or ton-kilometre for freight travel. All else being equal, increased mobility increases accessibility: the more and faster people can travel the more destinations they can reach.

Conventional planning tends to evaluate transport system quality primarily based on mobility, using indicators such as average traffic speed and congestion delay (Litman 2001). However, efforts to increase vehicle traffic speeds and volumes can reduce other forms of accessibility, by constraining pedestrian travel and stimulating more dispersed, automobile-oriented development patterns. Improving high occupant vehicle (HOV) travel and favour it over driving can reduce congestion increase personal mobility (person-miles of travel) without increasing vehicle mobility (vehicle-miles of travel).

In transport, mobility is defined as the ability to move from place to place and is measured by the number of trips made by a person per day (Vasconcellos, 2001) whilst 'personal mobility' refers to the use of personal transport; a car or a motorcycle or other non-motorized. (Mosseley et al 1977) define accessibility as 'mobility for opportunities' that is mobility which allows the person to get to the desired destinations. That is why accessibility is not just the ability to overcome space but the ease with which one reaches destination merit for its own sake. Whilst many journeys are necessary and many of them are too far for walking or cycling, they need to be made with mechanical transport. So very often, in defining the function of transport, the view that transport exists to serve the people's needs is accepted without debate.

2.2 Factors that Affect Accessibility and Mobility

2.2.1 Transportation Demand and Activity

Transportation demand refers to the amount of mobility and accessibility people would consume under various conditions. Transportation activity refers to the amount of mobility and accessibility people actually experience. People typically make 2-4 daily trips outside their home, with higher levels of demand for people who commute to school or jobs, care for dependents (such as children or disabled adults), and have higher incomes (ITE 2003). Some people, particularly those with disabilities, tend to have significant latent travel demand, that is,

they would like to take more trips outside their homes Travel demand can be categorized in various ways (Mattson 2012).

- Demographics (age, income, employment status, gender, etc.)
- Purpose (commuting, personal errands, recreation, etc.).
- Destination (school, job, stores, restaurants, parks, friends, families, etc.). These can be divided into common destinations (goods and services available at many locations) and unique destinations (activities at a particular destination, such as a friend's house).
- Time (hour, day, season).
- Mode (walking, cycling, automobile driver, automobile passenger, transit passenger, etc.). Mode share (the portion of trips made by different modes) is affected by factors such as vehicle availability, the quality of alternative modes and community design.
- Distance (from origin to destination and from origin to access each mode, such as walking distance to transit stations).

Most people consider a certain amount of mobility desirable including walking, cycling, driving and public transit (Handy, 1993). People enjoy certain travel activities, such as drives in the countryside, holiday trips. Even utilitarian trips, such as errands and commuting, may be longer than necessary due to travel enjoyment. However, travel time research indicates that most people would prefer to devote less time to travel ("Travel Time Costs," Litman 2006a).

2.3 Urban Transportation Challenges

Urban transport is the movement of people and goods within urban areas using the technologies such as buses and trains. The challenges of urban transportation occurring in the urban cities are the result of globalization, urbanization, fiscal decentralization and economic transition. The notable challenges facing urban transport Include, long commuting, traffic congestion and parking difficulties, the inadequacy of public transport, difficulties for non-motorized transport, loss of public space, accident and safety, environmental impacts and energy consumption, land consumption and freight distributions. Location of the cities comprises different levels of accommodation and concentration of economic activity, which is pronounced to be among the complex structures that are supported by transportation systems (Rodrigue, 2009). When the city is large consists of complex structures, and the potential of disruption is very high if this

Complexity is not well managed. The notable urban transportation problems arise when transportation infrastructures due to various reasons that cannot meet the requirement of the demand for urban mobility. This is the major challenge to the transportation systems and inefficiency of the systems (World Bank, 2002). Transportation is the hub most growing cities to enhance productivity and control the economy; hence effective and efficiency measures must be employed before the changes have resulted in severe damage because the movement of labor, consumers and freight from origin to destination depends on the effectiveness of the transportation systems. Most of the theories addressing the challenges facing urban transport have been developed by economists basing on the income growth. (Meyer,1993) states that the urban transport systems in developing countries shift as income grows to higher quality and more costly transportation modes while in poorer cities, the shift is from foot powered modes to motorized public transport. He argues that the situation is different in developed nations where people shift from public transportation to the private automobile. Unfortunately, these models are developed as if human problems of the urban design have unique solutions in which an expert can discover and execute (Scott, 1998)Even though, urban transport plays a big role in maximizing the rate of mobility of an urban population, it also has its own problems which are being observed in most cities nowadays. The urban transportation problem is actually a complex bundle of inter related problems. These problems can be grouped into three major categories: congestion, mobility and other additional impacts.

2.3.1 Congestion

Congestion causes increased costs for travelers and freight movement, loss of time, accidents, and psychological strain. (Handy, 1997) This is not simply congestion of transit vehicles during peak hours, congestion of pedestrian on sidewalks as well as congestion of bicycle. Congestion is neither a new phenomenon nor a role effect of automobile. “As soon as the increase of population is created a demand for wheeled traffic in Rome, the congestion became intolerable. One of Julius Caesar’s first acts on seizing power was to ban wheeled traffic from the center of Rome during the day…. Just as motor car congestion now affects small towns as well as big ones, so the increase of animal-drawn vehicles impeded circulation everywhere. Hence Claudius extended Caesar’s prohibition to the municipalities of Italy; and Marcus Aurelius, still later, applied it without regard to their municipal status to every town in the Empire” (Lewis Mumford, 1991) Congestion is what most people find objectionable about traveling in cities. It is the most

common complaint. If there were no congestion, most people would be happy with their cars, and transportation would not be a widely discussed problem.

2.3.2 Mobility

Sustainable mobility requires, among other things, acceptable levels of environment impact, and costs of development and operation of transportation system etc.Three main inferences can be made from these ideas.

I. The first inference is that sustainable mobility is significantly transportation supply dependent. The better and more sustainable the supply characteristics of a transportation system, the higher will be the level of mobility of peoples.

II. The second inference is that current levels of people mobility in many developing cities can be said to be low and unsustainable largely because of inadequate transportation supply characteristics. The inadequacy of transportation supply in many countries manifests mainly through inadequate public transportation services, low productivity and level of ride ability of facilities and high level of transportation related environmental impacts. For example, in many cities, it is difficult to move around by any mode of transportation without physically and/or mentally exhausted in the process. Thousands of people wait for hours at public transportation stops while public transportation vehicles are unable to get to them because they are stuck in queues on the roads. In addition, walkways are often non-existent or in very poor condition. In places where there are walkways, pedestrians are often forced to walk on the streets due to market and trading activities occurring on the walk ways. Traffic delays are ubiquitous and rides by any vehicle are uncomfortable, unsafe and expensive because of inadequate law enforcement and presence of large crevices on many roads. Furthermore, there is little or no classification of roads in general and inadequate distributor and access roads in particular in many cities. Also, based on the results of studies such as (TRRL, 1998) the efficiencies of major roads in many cities seem to range between 5 to 25 percent.

III. The third inference is that sustainable mobility can be engineered. That is, mobility can be sustainably enhanced through appropriate design and management of the facilities and the services they provide. In general mobility is one of the structural elements which influence the transformation of urban systems. Transport is discussed either as a spatial interaction or as a stage in the marketing process that bridges the gap between points of

production and points of consumption. Transport plays probably the most important role in shaping the general structure and urban land use spaces and hence urban transport plays a crucial role in maximizing the degree of mobility. *(*Akinyemi, 1998)

2.3.3 Ancillary Impacts

The ancillary impacts of a transportation system or the externalities make up the third aspect of transportation problem. These are: land use (urban sprawl), energy consumption, environmental impact, land consumption, aesthetics, accidents, and disruption of urban fabric.

2.4 Main factors influencing Urban Mobility Patterns

According to (Neimeier, 1997) Conceptual framework of the main land use and transport system factors, as well as constraints, likely influence travel.

2.4.1 Land Use System:

i. Density

ii. Diversity

iii. Design

2.4.2 Transport System:

i. Service level / quality

ii. Availability

iii. Price

2.4.3 Characteristics of travel:

-Distance, Time and Frequency Mode

Although it is fair to say that within the research field of the influence of land use on travel patterns most authors believe that land use has influence on travel behavior, no consensus is to be found on the main land use factors influencing travel patterns. Even in the absence of a consensus, Density, Diversity and Design stand out from the analyzed land use factors, not only for being frequently considered in this research field but mainly for being those for which most frequently influence on mobility patterns could be found. These three factors are called by (Cervero and Kockelman, 1997) as the 3D's of land use influence on travel behavior. It seems reasonable to consider density, diversity and design as the potential main factors of land use influencing travel behavior. Nevertheless, other land use characteristics, such as, proximity to urban centers, settlement size, job-housing balance, provision of local facilities and services were also considered in empirical studies on the influence of land use on urban mobility, and in some

cases found to be relevant Studies evaluating the main factors of transport system influencing travel choice are hard to find. It is reasonable to believe that the influence of the transport system is considered as a fact. Aware of these limitations but also of the importance of understanding the main factors influencing travel behavior these were identified within the main transport system aspects on which current Transport Demand Management policy measures (considering transport measures) act.

2.5. Travel Demand Models

Travel forecasting models are used to predict changes in travel patterns and the utilization of the transportation system in response to changes in regional development, demographics, and transportation supply. Modeling travel demand is a challenging task, but one that is required for rational planning and evaluation of transportation systems (L.R. Kadiyali, 2004).

Transportation planning involves the decision-making process for potential improvements to a community's roadway infrastructure. To aid in the decision-making process, several computer-based and manual tools have been developed. Two of these key tools are (P.H. Wright, John Wiley & Sons Inc, 1996).

a) Travel demand forecasting models for implementing the four-step urban planning process

b) Travel rate indices for providing congestion and delay information for a community.

The four-step urban planning process is comprised of the following: Trip Generation, Trip Distribution, Mode Split, and Traffic Assignment (L.R. Kadiyali, 2004)

2.5.1. Trip Generation

Trip generation is the first step in the conventional four-step transportation planning process, widely used for forecasting travel demands. It predicts the number of trips originating in or destined for a particular traffic analysis zone (Honolulu, Hawai, 1981) .Trip generation uses trip rates that are averages for large segment of the study area. Trip productions are based on household characteristics such as the number of people in the household and the number of vehicles available. For example, a household with four people and two vehicles may be assumed to produce 3.00 work trips per day. Trips per household are then expanded to trips per zone. Trip attractions are typically based on the level of employment in a zone. For example a zone could be assumed to attract 1.32 home based work trips for every person employed in that zone. Trip generation is used to calculate person trips.

2.5.2Trip Distribution Models

Given the production and attraction of various zones described above, the next step is to develop formulas that describe how trips from any origin are distributed among the various destinations; i.e., to reduce the Origin Destination pattern to some simple equation involving the productions and attractions of the zones and perhaps a few other quantities such as the distance or cost of travel from an origin to a destination.

Once trip production and attractions have been determined for each zone, the next step carried out by the conventional model is to distribute the trips, i.e. to specify to what destinations and in what quantities the productions of a zone will be sent, and from what origins and it what quantities the attractions of a zone will be satisfied. The output of a trip distribution model is a matrix of Origin Destination flows, such that the total flows leaving each zone are equal to the zonal productions and the total flows entering each zone are equal to the zonal attractions. In some cases the trip distribution model may modify the productions and attractions output by the trip generation model in order to ensure that flows are balanced, i.e., that the trips leaving a zone equal the trips entering it.

Two trip distribution models are in common use in national and regional transport studies. The traffic model assumes that the growth in interchanges between two zones is proportional to the product of the growth in production in the origin zone and the growth in attractions in the destination zone. It is thus a growth factor model which modifies an existing trip distribution pattern (trip matrix) in accordance with zonal trip end growth rates.

A variation of this procedure was used in the Transport system corridor analysis of freight flows. Growth factors for O-D (Origin-Destination) flows were calculated on the basis of analysis of individual commodities and applied directly to the corresponding elements of the base year O-D matrix.

The gravity model, on the other hand, assumes that the total interchanges between two zones is proportional to the product of the total production at the origin by the total attractions at the destination and includes a factor which brings into play the service offered by the network between origin and destination. It calculates a trip matrix directly from zonal trip ends without requiring input and modification of an existing trip matrix.

A variation of the gravity model sometimes used in planning studies is known as the direct demand model. Direct demand models forecast in a single step the flow from a particular origin

zone to a particular destination zone; thus they correspond exactly to the notion of a demand function. A direct demand model was calibrated and used by the transport system for the prediction of inter-zonal passenger trips. The classical gravity model assumes that the total trip-making between any two zones is proportional to the productions at the origin, the attractions at the destination and a function which depends on network service between origin and destination:

Tij = K Pi Ajf(cij)

Where Tij is the volume of trips flowing between origin and destination ij;

Pi is the trip production at i

Aj is the trip attraction at j

Cij is the dis-utility of travelling from i to j

F (.) is a function to be determined; and

K is a constant

When f(.) is specified as a closed-form mathematical function, it is often referred to as a resistance function. Sometimes it is specified instead as a table containing function values corresponding to different ranges of cij; in this case the function is usually referred to as the table of friction factors or f-factors. Pi and Aj are deprived from a trip generation model.

Gravity model is a classical transportation model which was originally developed as a "law of social physics" analogous to Newton's law of gravitation for physical system.

The gravity model is a simple attempt to treat two basic factors affecting the amount of flow or inter-action between any two points: population and distance, the greater the population of the two centers, the greater the interaction and the greater the distance, the lesser the interactions i.e. it is directly proportional to the product of their population (Pi Pj) and inversely proportional to the distance between them (dij).

$$Tij=\frac{pipj}{dij}$$

Experience shows that there are two necessary adjustments to the model. The first is to adjust the Pi Pj/dij figure by a constant so that the order of magnitude of the two sets of numbers will be compatible. For instance if the gravity model result averaged four times greater than the observed, an appropriate constant will be K=1/4. Thus the new model will be

$$Tij=\frac{Kpipj}{dij}$$

The second modification of the basic model is to insert a distance exponent n as follows:

$$Tij=\frac{K(pipj)}{dijn}$$

This is because studies show that traffic (intercity) passenger tends to decline with distance raised to power rather than with distance multiplied by some constant.

The model has lately been modified by increasing attractive forces by the use of income (per capita) etc and the impedance factor by travel time, travel cost, schedule frequency or a generalized cost. The attractive and impedance force of the model have descriptive utility and is used by most planners to predict traffic, but their theoretical meaning is not clear. The theoretical meaning is now provided by utility maximization of based on micro economic theory.

When using the model for freight, the attractive forces become surplus of ij and population of ij or GDP and distance for international flow and interurban shopping

i.e.

$$Tijk = Pijk \sum_{j=1}^{z} Tjk$$

$$Tjk=\frac{ejk}{dij}$$

$$P(Cij)= \frac{Sj}{dijn}$$

Where P (Cij) is the probability of a consumer going from origin i to destination j

Sj = the size of the shopping center

Urban travel demand within urban areas, expected travel between zones is calculated by a **gravity model** of the form:

$$Tij=\frac{\frac{(Dij+C)Aj*Gi}{Dijn}}{\sum_{j=1}^{z} Dijn}$$

Where

Tij = expected number of trips between zones i and j

Gi = number of trips generated in zone i

Aj = number of trips attracted to zone j

Dij = road distance between zones I and j (in km)

Z = number of zones and

C, n = calibration constants

For work trips between the existing zones in Addis Ababa, C = 15 and n = 1.3.

2.5.3 Modal Split

Mode choice analysis is the third step in the conventional four-step transportation planning model. Trip distribution's zonal interchange analysis yields a set of origin destination tables which tells where the trips will be made; mode choice analysis allows the modeler to determine what mode of transport will be used (L.R. Kadiyali, 2004). Mode choice is one of the most critical parts of the travel demand modeling process. It is the step where trips between a given origin and destination are split into trips using transit, trips by car pool or as automobile passengers and trips by automobile drivers. A utility function measures the degree of satisfaction that people derive from their choices and a disutility function represents the generalized cost that is associated with each choice (Edward Arnold, 1974). The most commonly used process for mode split is to use the 'Logit' model. This involves a comparison of the "disutility" or "utility" of travel between two points for the different modes that are available. Disutility is a term used to represent a combination of the travel time, cost and convenience of a mode between an origin and a destination. It is found by placing multipliers (weights) on these factors and adding them together (Honolulu, Hawai, 1981)

2.5.4 Trip Assignment

Trip assignment, traffic assignment or route choice concerns the selection of routes (alternative called paths) between origins and destinations in transportation networks. It is the fourth step in the conventional transportation planning model. Mode choice analysis tells which travelers will use which mode. To determine facility needs and costs and benefits, we need to know the number of travelers on each route and link of the network (L.R.Kadiyali, 2004). Once trips have been split into highway and transit trips, the specific path that they use to travel from their origin to their destination must be found. These trips are then assigned to that path in the step called

traffic assignment (Honolulu, Hawai, 1981). The process first involves the calculation of the shortest path from each origin to all destinations (usually the minimum time path is used). Trips for each O-D pair are then assigned to the links in the minimum path and the trips are added up for each link.

2.6 Transport Demand Management (TDM) as means of Improving Urban Transport Mobility

2.6.1 Forms and Benefits of TDM Strategies

The main objectives of TDM strategies are to identify the role of various TDM measures, establish priorities and identify resources and responsibilities for implementing those measures. This paper provides a brief description of each measure, explains the advantages and disadvantages of each TDM measure, the applicability of the measures and where and how those measures could be implemented and comments in regard to certain key parameters such as costs, benefits and effectiveness in achieving TDM objectives and issues (Auckland Regional Council, 2000). The TDM measures will encourage people to use the most appropriate method of travel for their journey, to persuade car users to be less dependent on their cars and to raise awareness of the environmental and social impact of car use. Employer-based TDM strategies include private-sector programs and services that encourage employees to change their commuting practices, incentives that make publicly provided travel modes more attractive, disincentives to solo commuting and employer management policies that offer employees flexibility in travel mode choices. Taxing and pricing related TDM strategies affect the cost of transportation and thereby provide monetary disincentives to some travel behaviors.

Public policy and regulation related to TDM strategies include restrictions and regulations that govern private vehicle use and provide political support and guidance to new institutional relationships. These TDM strategies include smart growth which influences the timing, location, pattern, intensity and budgeting of development, especially where state law provides for smart growth tools so as to reduce the need for transportation facilities as well as address environmental, social and fiscal issues (OKI 2030 Regional Transportation Plan, 2004).

TDM support strategies include parking management and parking fees, employee transportation coordinators at area employers, rideshare matching, incentives and subsidies, marketing and promotions, guaranteed ride home, intelligent transportation systems, on-site information and

amenities. The following are the explanations of different types of TDM measures that have been widely acknowledged by transport planners and policy measures across the world.

2.6.1.1 Alternative work Schedules (or variable work hours)

Alternative work schedule or variable work hours may take different effective forms such as Flextime, Compressed Work Week, Staggered shifts etc (VTPI, 2005a; 2005b). Flextime allows employees some flexibility in their daily work schedules. For example, rather than all employees working from 8:00 to 4:30, some might work 7:30 to 4:00, and others 9:00 to 5:30. Compressed work week (CWW) let the employees work fewer but longer days, such as four 10-hour days each week (4/40), or 9-hour days with one day off every two weeks (9/80). Similarly, staggering reduces the number of employees arriving and leaving a worksite at one time. For example, some shifts may be 8:00 to 4:30, others 8:30 to 5:00, and others 9:00 to 5:30. This has a similar effect on traffic as flextime, but does not give individual employees as much control over their schedules.

Flextime and CWW are usually implemented as an employee and manager option (both employees and their managers must agree). They may vary from day-to-day or week-to-week, depending on circumstances. Of course, not all jobs are suitable for alternative schedules. Positions that require employees to provide service at a particular time and place demand a rigid schedule (Anderson &Ungemah, 1999). Not all workers want to use flextime due to personal preference or the need to match schedules with other family members. This program aims to reduce peak-hour congestion by spreading the travel demand at the peak.

There are a number of options to alter the schedules of the commuters. One of those options is working staggered hours which require employees to start and end work at different times, which could have a significant effect on reducing peak congestion, particularly at large sites with a few employers. Another option is flextime or variable-time programs. Employees can work during a core period, for example from 9:00 a.m. to 3:00 p.m., and can fulfill other obligations during the hours outside this period. However, to be effective beyond a local area, an alternative work schedule requires broad coverage of different parties. If there are a huge number of employers in an area, applying alternative hour programs would be difficult without a coordinator. Another option is to institute a 4-day work week. This option suggests different employees off on

different days and longer work hours on their working day. It could reduce the weekday ridership on transit by those employees in areas where transit use is high. Similarly, the application of personal computer and telecommunication networks will increase the number of home workers who may not need to leave their home or neighborhood to travel to work. This option has the same effect as a 4-day work week on the transit ridership.

2.6.1.2 Ridesharing or Carpooling

Carpools can be informal, formed by a group of individuals or they can be formal, formed by a public agency. Carpooling is efficient for long trips and for participants who have the same work schedule. Carpoolers are not available to run errands before or after work or during lunch time or to have a car for daytime emergencies. A carpool is a good option for compatible participants. In vanpools the vehicle is larger and carries more people than a carpool (Britton, 2000).

The advantages and disadvantages of carpools are also applied to vanpools. However, the use of carpooling is limited because of reasons such as some of the vehicles on the roads are trucks, which generate disproportionate congestion and are not carpool material; some vehicles already have many occupants; those who form carpools do not take all their vehicles off the road, because a vehicle is needed for the carpool itself, and finally carpool formation is particularly difficult if large numbers of employees do not work at the same site (Zupan, 1992). Some innovative ridesharing programs have been proposed to encourage motorists to share rides for individual trips, creating a cross between hitchhiking and taxi service. Some involve pre-registering motorists and riders to increase security, and establish standard reimbursement rates. In a few locations, casual carpoolinghas developed, in which motorists pick up riders at established stops in order to take advantage of HOV lanes (Britton, 2000). Dynamic ridesharing means that an independent organization matches passengers with drivers for individual trips (as opposed to regularly scheduled trips), using telephone and computer technologies King County Metro has incorporated special event ride matching into its regional rideshare program (www.rideshareonline.com).

2.6.1.3 Parking management

Parking management through parking pricing is one of the most effective TDM strategies. This approach could place emphasis on free use of parking close to an office building by carpoolers

and vanpoolers while single occupancy vehicles (SOVs) pay for parking. Another approach is paying each employee a transportation benefit while charging for parking at the site so that people, who walk, use a bike or pool-vehicle can save this benefit while SOV users pay for parking (Zupan, 1992). Adoption of parking ratio could be an option in this regard.

Parking ratio is the ratio of parking spaces to office floor space. Usually this ratio is set in suburban areas at four spaces per 1000 ft2 of office floor space, assuming that the average employee occupies 250 ft2 and one parking space is needed for each employee (Hanks & Lomax, 1991). However, adoptions of these ratios are out of date because the average office space per employee has risen. Moreover, discouraging the use of non-official spaces will not make the number of spaces artificially expand. Lower ratios can be used where transit is widely available; this effectively controls unnecessary driving (Deakin, Harvey, Pozdena&Yarema, 1996)

2.6.1.4 Preferential treatment for HOV

Another strategy of TDM is to provide high occupancy vehicles (HOVs) with an advantage over SOVs on congested roadways (Bertini, 2005). Preferential treatment for HOVs has many forms. The simplest one is separate reserved lanes for buses, carpools and vanpools. SOVs are allowed in the lane to make turns. Usually curb lanes are also used and some merchants will lose street parking for their customers. Agreement must be made with those merchants.

HOVs lane could be a contra-flow lane taken from the traffic flowing in the opposite direction. Contra-flow lanes also could be effective if the volume of HOV traffic is sufficient to be self-enforcing, and if the removal of a lane does not create traffic congestion in the minor-flow direction. Care must be taken to prevent or minimize the danger of head-on collisions. By using reversible lanes, contra-flow lanes could be used in each direction for morning and afternoon peaks.

2.6.1.5 Congestion pricing

The basic principle is that where and when a commodity is most scarce, its use should be curbed through increased prices that will lower the demand of the commodity in that place and time (Zupan, 1992). Therefore, congestion pricing could be charged to discourage people from using

their own vehicles. This type of pricing has the potential to reduce the need for new highway capacity, improve air quality, relieve peak traffic congestion, increase the use of high-occupancy vehicles, reduce automobile use in highly congested urban environments, raised revenue for much needed transportation improvements and establish a rational pricing system following sound economic principles (Zupan, 1992). Different alternative congestion pricing schedules need to be examined by identifying their effective application on the basis of the time of day, day of the week, vehicle occupancy and vehicle type (automobile, small truck, tractor-trailer) (Zupan, 1992). When pricing each tested plan, the impacts on traffic congestion and of potential revenue also could be estimated (Deakin et al., 1996).

2.6.1.6 Land use and zoning

The density, location and type of developed land determine how people will travel. Residential and employment densities above certain levels are necessary to support public transit (Zupan, 1992). The designs of new developments have ignored the needs of transit riders, bicyclists and pedestrians (World Bank, 1996). The recent analysis of over 250 designs submitted to the international City Design Competition shows that only 12% of the design provided transit-friendly features (Bertini, 2005). To improve transit option, buildings could be clustered to make it possible for a bus to serve more people with one stop, bus stops could be closer to building entrances with sharply reduced building setbacks, bus stops could be connected with buildings by sidewalks, bus shelters and bus stop signs could be provided and pull-offs for buses could be designed into the roadway system. Land zoning regulations should include those transit-friendly concepts to induce the people to shift toward transit, bicycling and walking.

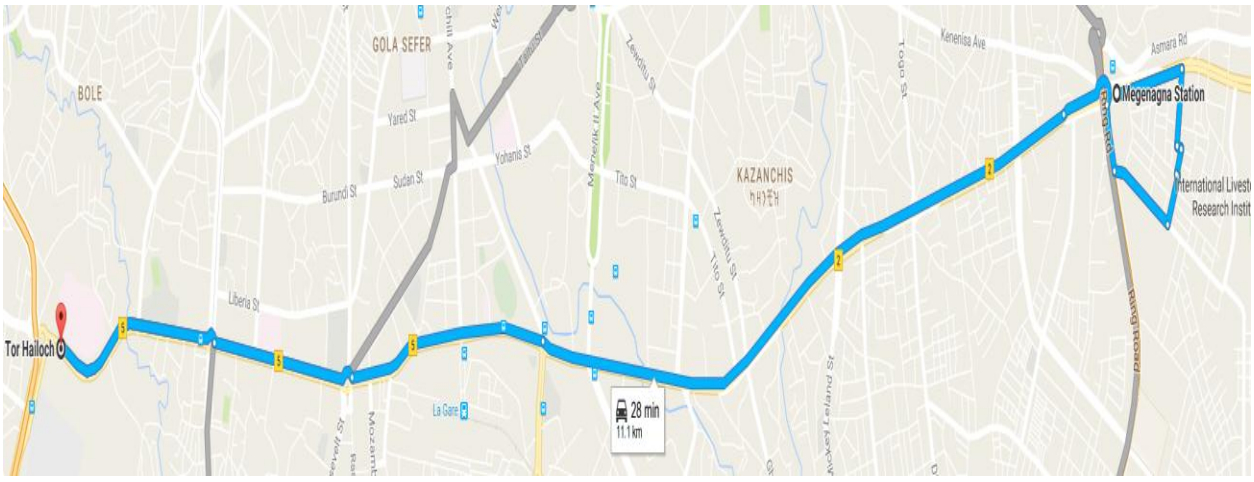
CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1. Description of Study Area

Addis Ababa, which is the capital city of Ethiopia, has an expanded area of over 540 sq.km and is situated at an altitude of about 2500 meters above sea level .Addis Ababa, is located at 9°1′ 48″ N latitude and 38°44′ 24″ E longitude, (Central statistics agency). Administratively, the city is subdivided into 10 sub cities and 99 kebeles. Addis Ababa is also an unofficial capital city of Africa, largely due to the fact that it hosts various international organizations such as the African Union, United Nations and so on. The transport network of Addis Ababa is characterized by poorly maintained roads, streets and sidewalks coupled with occupation of sidewalks by economic and human activities, subsequent use of vehicle lanes by pedestrians for walking, mounting buses, and taxis. Overall, the city transport system suffers from many inadequacies. Traffic on the roads is increasing while the major routes in the city are still few in number. The primary roads of the city include two east-west and north-south axial, a newly built ring road and a number of other roads and also Light Rail Transit (LRT).figure1 below illustrates east – west road axis study area was included here.

Figure 1below illustrates east –west axis Road Network from Megenagna to Tor Hailoch



Due to the topography, unplanned and uncontrolled growth of the city, certain areas of Addis Ababa are without coverage by transport network suitable for vehicular traffic. These include slums and shanty quarters but also blocks with permanent housing and other facilities. At the same time there are some streets and roads in the urban center built properly and with

grandiosity. However, some of these roads do not actually have any useful links to the other existing road network and thus, carry only little traffic. The traffic in Addis Ababa in general, is characterized by features that are common to many metropolitan cities of the developing world. Some of these common features include:-

• Very high proportion of pedestrian trips for short distances were observed

• Small number of vehicles in origin to rich destination compared to the population of Addis Ababa

• 'Live' transport of meat, especially around special holiday

3.2. Study design and participant selection strategy

Sequence of the methodologies used was that, first literature review was made to assess relevant documents related to the urban transport mobility, factors that affect accessibility and mobility, some documents that explain about mobility definition for detail understanding and recommendation for improving urban mobility transport was reviewed.

Secondly based on the literature reviewed personal travel characteristics based on their demand to travel can affect the traffic and finally it can affect mobility either in positive or in negative sides based on the parameters that have considered. To get personal information on the travel characteristics, research questionnaire was used to collect both qualitative (exploratory) data on brief feedback on urban transport system due to mobility using open ended questionnaire and quantitative data on personal travel behavior was collected using both open ended and closed questionnaire. Respondents were selected using simple random sampling method for questioner from different group of population which has used different mode of transportation and respondents for interview was selected based on their activities related to transport planning, controlling bodies like Addis Ababa Traffic Management Office were selected in order to get well organized data and core ideas for this research.

3.3. Data Sources

The primary data needed for the study was travel behavior of road user and was gathered via questionnaire survey from the passengers of Addis Ababa city and drivers as well. These stake holders were selected due to their interaction with surrounding; they may be confronted with new ideas that may have important impact on sustainable urban transport due to their common sense. Since road users were native to most of the practices of transport planning researcher forced to interview others whom that have wealth of experience and knowledge about transport planning

and were held with the Addis Ababa Transport Authority experts, management bodies .Survey field data were also held. To supplement the research information, secondary data was collected from the Addis Ababa Transport Authority from weekly traffic back office reports, as well from Thesis and unpublished literatures.

3.4. Sampling Techniques and Sample Population

To address those critical research questions identified in this research, simple random sampling methods were used. This type of random sampling were selected from different population group based on their confounder variable participated in the study. Stakeholders were selected for in depth analysis about the existence, cause and effects of urban transport e problem in the country. The selected stake holders are based on their direct relation with urban transportation system, their well-organized data recording system, their understanding about the entire processes and about the transportation system in general so that these stakeholders can point us the major causes and the possible effects of transport in all stages.

Sampling size of 5-10% of the total population of each stakeholder has been considered. Stake holders were different population groups including students and all population which used transport system. The chosen percentages depend on the time constraints, trustworthiness of the respondents or richness of the data and representativeness of the stakeholder.

Concerning the sampling technique, simple random sampling technique is used to select a participant from each group in which each element have an equal and non-zero chance of selection, though random selection does not always produce a sample that is representative of the population. Therefore the samples were selected randomly. On the other hand semi-structured interviews were also conducted which is done by directly approaching the appropriate personnel to get a detailed explanation of the current situation.

3.5. Data Collection Instruments

Instruments used for data collection in this study were questionnaire, interviews, direct field survey observations and document analysis. Using these instruments, both quantitative and qualitative data were collected. The detailed activities performed in administering the instruments of data collection are presented as follows.

3.5.1 Questionnaire Surveys

Both closed choice and open ended questionnaires were prepared to collect primary data and in general it had three parts. (**See Appendix I**)

The first part of this survey deals with the socio-economic characteristic of the subjects of the study. The designed data for this section of the questionnaire comprises of sex, occupation, age, average monthly income, household size, and average daily transport expenditure. The ultimate purpose of this data is to analyze the socio-economic status of the subjects in order to know the basic issues in play in the decision making with regards to trip production and attraction. Closed choice questionnaires was used here in order to collect the quantitative data regarding trip production and attraction which can be expressed in number or percent based on the socio-economic characteristic of the subjects.

The second part deals with the travel behavior of the subjects, the design data used for this part includes mode of transport used, purpose of travel, average number of trips per day, origin and destination of trip, time of travel and frequency mode. Both closed and open ended questionnaires were used to collect qualitative and quantitative research data which was used to get in depth information on characteristics of travel and number of trips originating or destined for particular traffic analysis zone.

Lastly, a set of questions, which were aimed at getting a brief feedback about the current status of different transport system modes relatively with mobility. Open ended questionnaire was used to gain core information. Questionnaires were distributed and collected personally which were completed on the spot because it is less expensive and can be applied easily unlike postal and online questionnaire distribution system which faces some restrictions.

3.5.2. Interview (face to face interview)

Since the specific research questions that we aimed to achieve research objectives were already predetermined Semi-Structured interviews were used to ask respondents in particular order. Since interview method does not use to cover large population, respondents for interview were selected based on their professional activities related to transport planning, controlling bodies for both transport mobility and accessibilities and expertise that have conducted similar research to get well organized data and core ideas for this research. The Addis Ababa Transport Authorities and the local officials within the study area were interviewed. Oral questions were administered to yield the information on existing transport system relative to mobility, factors affecting sustainable urban mobility due to the personal trip production, problems faced due to lack of sustainable urban transportation and proposed solutions to the problem .Data were collected using both note book to make respondents feel free and tape recorder to record the reliable responses. **(See Appendix II)**

3.5.3 Direct field Survey Observations.

Field survey was the dominant method of data collection in this study using base map and check list. Here, traffic counting was held for motorized and non-motorized transport modes, according to the vehicle classification to identify trip numbers at the origin and destination. Traffic were counted two times per day at peak hours (time for entrance and exist to school and work) for one week at each traffic analysis zones (TAZs) for consecutive 2 hours 12:30-2:30 at morning and 10:00-12:00 at night time with interval of 15 minutes. Traffic data between counted and collected from secondary data were observed to have gaps. This was because secondary data did not include traffics like pedestrian , train, motor cycles and bicycle modes, automobiles ,heavy vehicles and vehicles that give service for both governmental and privet sectors. Distances between origin and destination were measured from road network map using AutoCAD. These data were used as inputs for the calculation of the expected total trip number between origins and destinations. The data collection techniques stated above were supplemented by observation. It was also used to identify the existing transport modes, traffic accumulation or congestion during peak hour. Field survey was conducted manually and with the help of photographs and videos of the proposed area (areas assigned for traffic counting at Megenagna intersection and at

Estifanous to include traffic both from Shiromeda and Bole and Meskel Adebabay to count traffic from Kality. **(See appendix IV)**

3.5.4. Secondary data Analysis

Secondary data that were collected from Thesis, unpublished documents and back office reports from the Addis Ababa transport authority were used to compare the transport system, traffic count reports and urban mobility events over time and give an expert opinion.

3.5.5. Mathematical Modeling (Gravity Model)

As it is expressed in the title the urban mobility was assessed by one of the trip distribution methods called Gravity Model. The Gravity Model was used over Growth Factor Model because Growth Factor Models was utilized primarily to update existing matrices for external trips since it cannot incorporate measures of level of service.Here, relationship of trip numbers with population density on areas and distances between them were predicted. Density and distances were causal effects and finally the possible outcomes or expected total trip numbers were predicted and mobility was measured. The study area was composed of Traffic Analysis Zones (TAZs). Interaction with areas outside the cordon was defined via external stations (ESs) that effectively serve as doorways for trips into, out of and through the study area. Both trips that were collected from internal (trips with both ends in the study area) and external (trips with one end outside the study area) were used for calculation method, all in one because the origin of trips from external stations was not known clearly and since this trips were external trips ,Growth Factor Method also was not used here because data on the zonal growth rate with the external stations was not found, However since it affects the study area, trips from external stations were added to the trips of study area directly. Mobility can be described by travel distance and speed; Gravity Model accounts travel between zones by measuring travel distance for different purpose of trips based on the trip generation data that were required through questionnaires.

3.5.6. SPSS (Statistical Package for the Social Science)

Statistical package for the social science (SPSS) is the most widely used software for the statistical analysis of quantitative data. In this study the SPSS software was used to analyze data acquired through the questionnaire which were used to determine factors that affect personal travel behavior. All the responses of participants for each question were put in to the SPSS

software and the percent of each response was calculated and ranked. As a result, parameter with high percentage means it will affect the person trip production highly.

3.6 Procedure of Data Collection

Before the actual data collection begins, permission was granted by the Addis Ababa City Administration and concerned bodies. Next, training was provided to data collectors, Data was collected under close supervision of the researcher.

3.7. Method of Data Analysis

To analyze data, descriptive statistics such as frequency and percentage was computed. Descriptive statics were compute to determine associations between variables. The researcher organized a channel, the questions, which is qualitative open ended, and prepared the essential materials like notebooks and others. The major analysis, however, was set up right away after all the essential information was collected through the stated tools earlier. Data were edited to assure that figures or expressions were accurate. To decide reliability of the data, all evidences were checked one by one for appropriate information. Likewise, for data errors such as neglected questions, unclear answers and unsuitable reply, essential measures were taken like removal of the questionnaire, only canceling the particular question, etc. large data were reduced to smaller analyzable units through the creation of categories and concepts that was derived from the data using such coding system some of the qualitative data was quantified. Following the categorization of data, they were put into categories or classes, which is commonly exclusive. Then, some of that raw data were entered into computer as data file. Also, to decide the compatibility of survey data, the collected data were compared with secondary data. Percentages were used to explain the personal characteristics of the respondents and to show the disparity in response among different group of respondents.

CHAPTER FOUR

Results and Discussion

4.1 Expected number of tips between zones

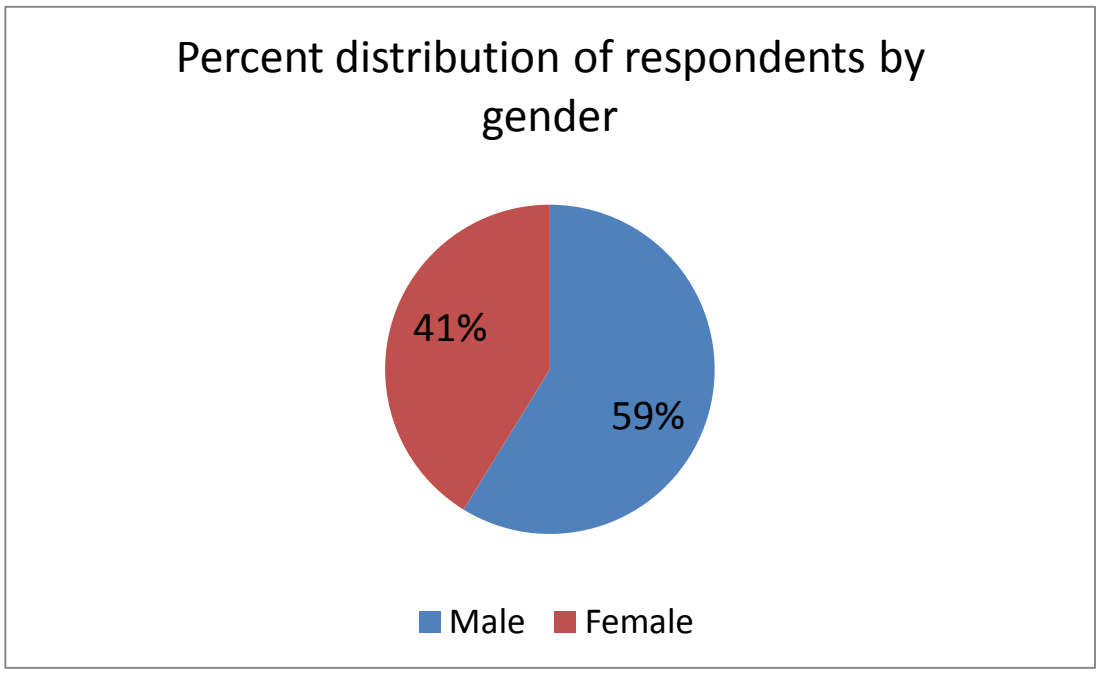
4.1.1 Trip Generation

Trip generation is the first step in the conventional four-step transportation planning process widely used for forecasting travel demands. Trip generation analysis provides the planner with the number of trip productions and trip attraction that each zone will have by considering character of land use (sex, income, age, household size, car ownership, purpose of trip, etc). Parameters resulted from SPPS are discussed below.

4.1.1.1 Factors that affect Person Trip Generation

A. Sex of Respondents

Figure 2 below illustrates Percentage distribution of Respondents by gender



Source: Survey Data, 2017

As presented above in fig 2, among total number of respondents 59% of respondents were males and 41% were female respondents. The sample survey was taken from the road users that used different modes of transportation for their purpose of trip at selected area. These respondents used different modes for their trip purpose like taxi, Higer bus, Shegerbus, Star alliance, Ambesa bus, Public bus, Shared taxi, Railway, Motor, Automobile and walking

B. **House Hold Size**

Table 1 below presents the Percentage distribution of respondents by household size

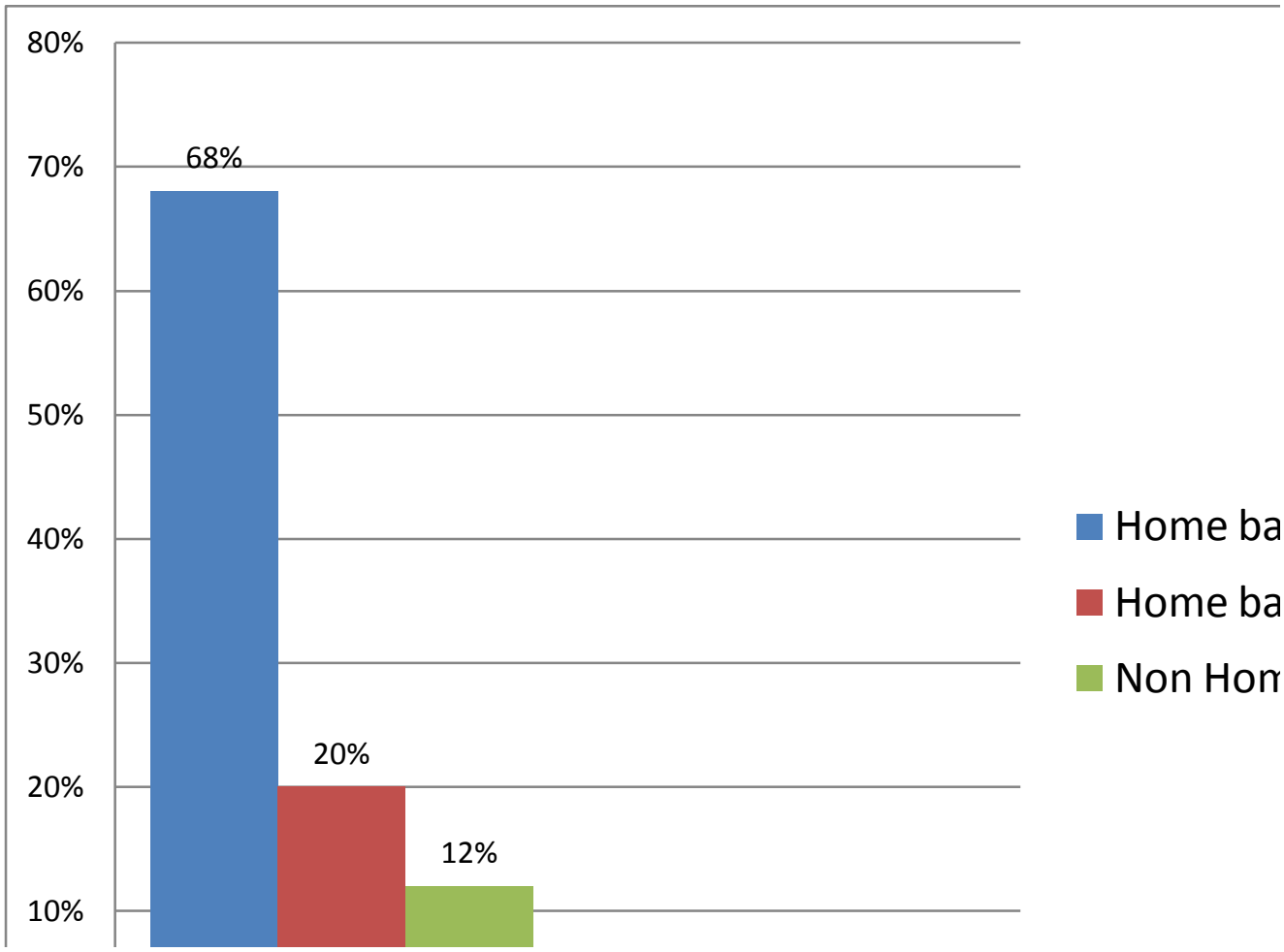
House Hold Size	Frequency	Percent (%)
1	69	53
2-4	45	34
5-7	13	10
8-10	4	3
>10	0	0
Total	131	100

Source: Survey data, 2017

Household has significant role in both increasing and decreasing travel demand which affects person trip production. As household size increases the demand to travel also increases and vice versa. These house hold size finally can affect urban mobility by increasing or decreasing number of trips based on vehicle ownership per household. From the Table 1 above, it indicates that respondents with a single family individual have dominant percentage which was 53%, respondents with family size 2-4 was 34%, 10% was with family size 5-7 and 3% was with family size 8-10.

Purpose of Trip Generated

Figure3 below presents percentage distribution of trip based on trip purpose



Source: Survey Data, 2017

Figure 3 above show that the trips that have been generated and attracted to the destination point can be classified based on the purpose of trip that the respondents have used it in the study area. In this regard, the home based work trips were dominants and covered 68% while 20% of the total trips were generated by students for (Educational) purposes, 12% of the total trips were non-home based trips which included work to shop trips, school to library trips etc. Finally, it can be concluded that, people were engaged in activities, mainly work, school, shop, social recreation etc, but the vast majority of trips were generated by people going to work and to school.

D. Travel Time

Table 2 below presents Percentage distribution of time taken to arrive destination point with respect to mode of transportation used

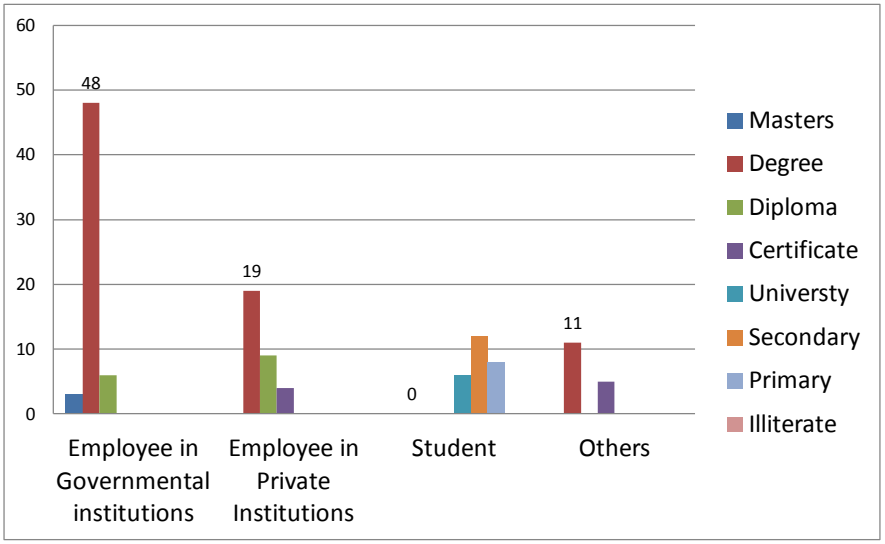
Time taken to arrive destination	**Mode of transportation used**	**Frequency**	**Percent (%)**
<30 minutes	Auto mobiles	22	17
30 minutes - 60 minutes	Taxies and Addis Ababa light Rail Transition	56	43
60minutes - 90 minutes	Motorcycle and Public buses	35	27
90 minutes - 120 minutes	Higer buses and City buses	18	13

Source: Survey data, 2017

Travel time negatively affect trip generation as travel time increases (long distance between origin and destination), trip generation decreases due to delays and travel costs they waste. Table 2 shows that time taken to arrive at destination point from common point of origin but using different mode of transportation. As shown in the table 2 above 43% of respondents agreed that Taxies and Train take 30 minutes – 90 minutes to arrive destination while 27% of the respondents agreed that Motorcycles and public buses take 60 minutes-90 minutes to arrive at destination point, 17% of the respondents agreed that it take only 30 minutes to arrive destination point with automobiles and lastly 13% agreed that higer buses and city buses take 90minutes - 120 minutes to arrive destination point. Based on the travel time, researcher concluded that people most of the time used mode of transportation which takes less time to arrive at destination including their comfort based on their incomes. Generally, most respondents used taxies and Addis Ababa light rail transformation mode of transport for their trip purpose and this can be told as trip generation are increased with taxies and trains due to their time taken to arrive destination point and these mode of transportation can make number of trips than others. Travel time mostly can affect modal split forecasting model.

E.Job classification and Educational back ground

Figure4 below presents percentage distribution of respondents' job classification with respect to educational back ground



Source: Survey field, 2017

Number of employee and students in the study area will positively affected trip generation, which means as the number of the employees and students increase the trip generation and attraction to the production area, industry and school also increase based on the purpose of trips.

As shown in figure 4 above most respondents 57(44 %) were employees in the governmental institutions and 5% of them have Masters, 84 % have degrees and11% have diploma. Employees in private institutions were (24%) and of this 59% have degree, 28% have diploma and 13% have certificate.20% of the respondents were students and 46% of them attend secondary school, 31% attend primary school and 23% attend university school.16 % of respondents were in other category which includes owners and business men and women ,69% of them own degree and 31% have certificate.

From the figure 4 above, the total numbers of employees in both government and private institutions were 68% which were the majority of the respondent's job classification. The number of employee have both effects; in the case of more employees provided with company travel facility will obviously reduce the number of trips, whereas, if there are lower number of employees is there, providing combined transport facility may not be economical for the employer. So, it may increase the trips despite of lower number of employees.

F. Income and Age

Fiqure5 below presents percentage distribution of respondent's age with respect to their income

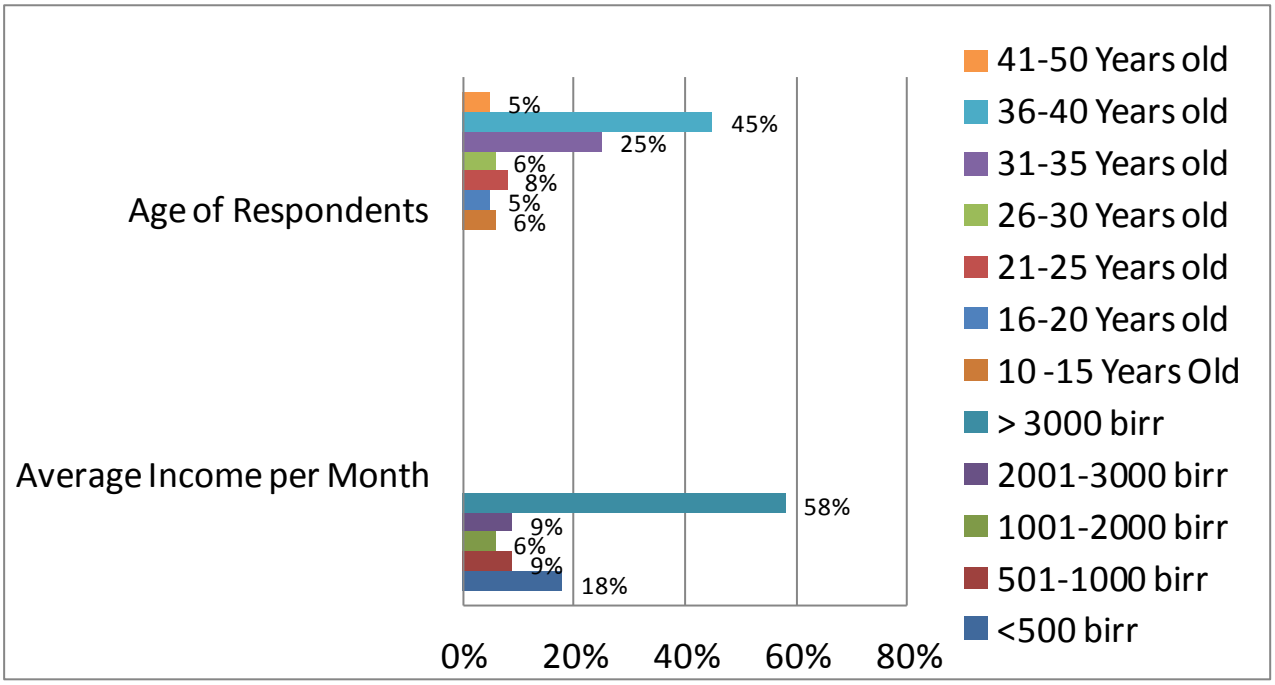


Figure 5 above shows that age of respondents with average monthly income and can be correlated. Most of the road users were within the age range of 36-40 years old with 45%, 31-35 years were 25%, 26-30 years old and 10-15 years old were 6% each, 16-20 years and 41-50 years were 5% each, and finally 21-25 years old were 8% of the total respondents.

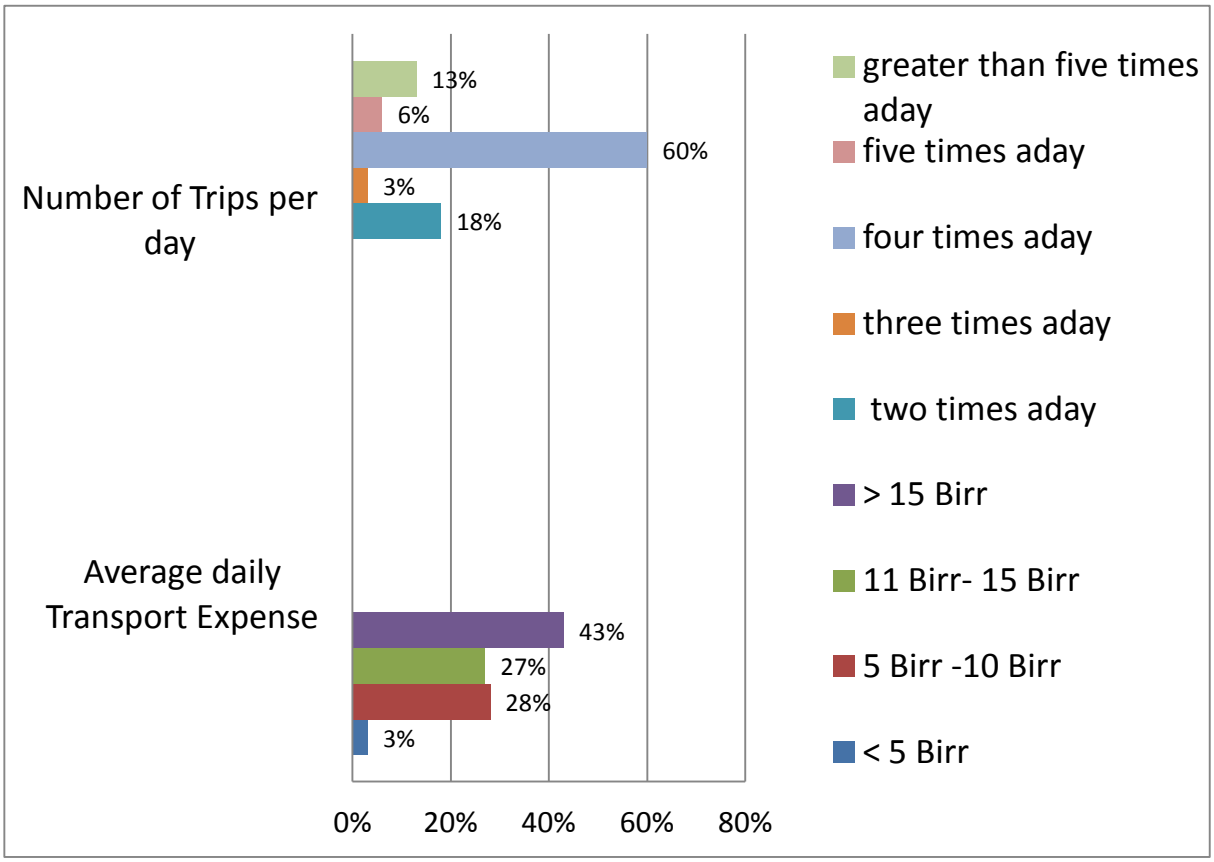
As mentioned above most of the respondents and road users were with the age range of 36-40 years old and the list percentage were respondents within of 41-45 years old. Age of employees also have mixed effects taking in to consideration that income is likely to increase with age

which makes personal vehicles affordable, on the other hand, with increase in age the effect of employee to make trips reduces.

Age and income of people in study area can affect trip generation. As the incomes of people increases after certain extent, if vehicles are affordable can be positively correlated with trips, higher position, the higher income and higher trips. On the other side 58% respondents earn above birr 3000 per month, 18% of the respondents earn less than birr 500 per month, 9% earn birr 2001-3000 per month and the same percentage earn birr 501-1000 per month and 6% earn birr -2000 per month.

G.Travel Cost and Number of Trips

Figure 6 below presents percentage distribution or number of trips with respect to transport expense per day



As shown in figure 6 above, 60% of total respondents made 4 trips per day for different purposes but the majority was for work and school as stated above, 18% made 2 trips per day while 13% made more than 5 trips per day. Respondents which made 5 trips per day and 3 trips per day were 6% and 3% respectively. Based on the analysis of the data and generated out puts, it is concluded that most students and employees made 4 trips per day to work and school, Due to similarity job and class schedules most of respondents made these trips at the time employee like civil servants, self-employed etc made their trips twice per day.

Travel cost is one of the factors that affect trip generation. From the survey data transport expenses by respondents was summarized as illustrated in figure 6 above that 43 % of the respondents expenses were greater than birr 15 per day for transportation, 28% spend birr 5-10 for transportation per day, 27% spend birr 11-15 and small proportion that is 3% spend less than birr 5 per day. This means monthly income is directly proportional to transport expenditure .Furthermore; the survey data indicated that average respondents spend 5-15% of their incomes on transportation.

True to current economic reality of the city, the amount of money people spend for transport per day is directly proportional to their rate of mobility and it further reinforces the significant role played by the public transport in getting people from one place to another in an economically viable way. It was observed from the survey that monthly income people earned had significant influence on the type of transportation they frequent used, which is also an implication of their daily expense for transport.

H.Starting and Ending time for jobs and schools

Figure 7 below illustrates percentage distribution of time to school and work

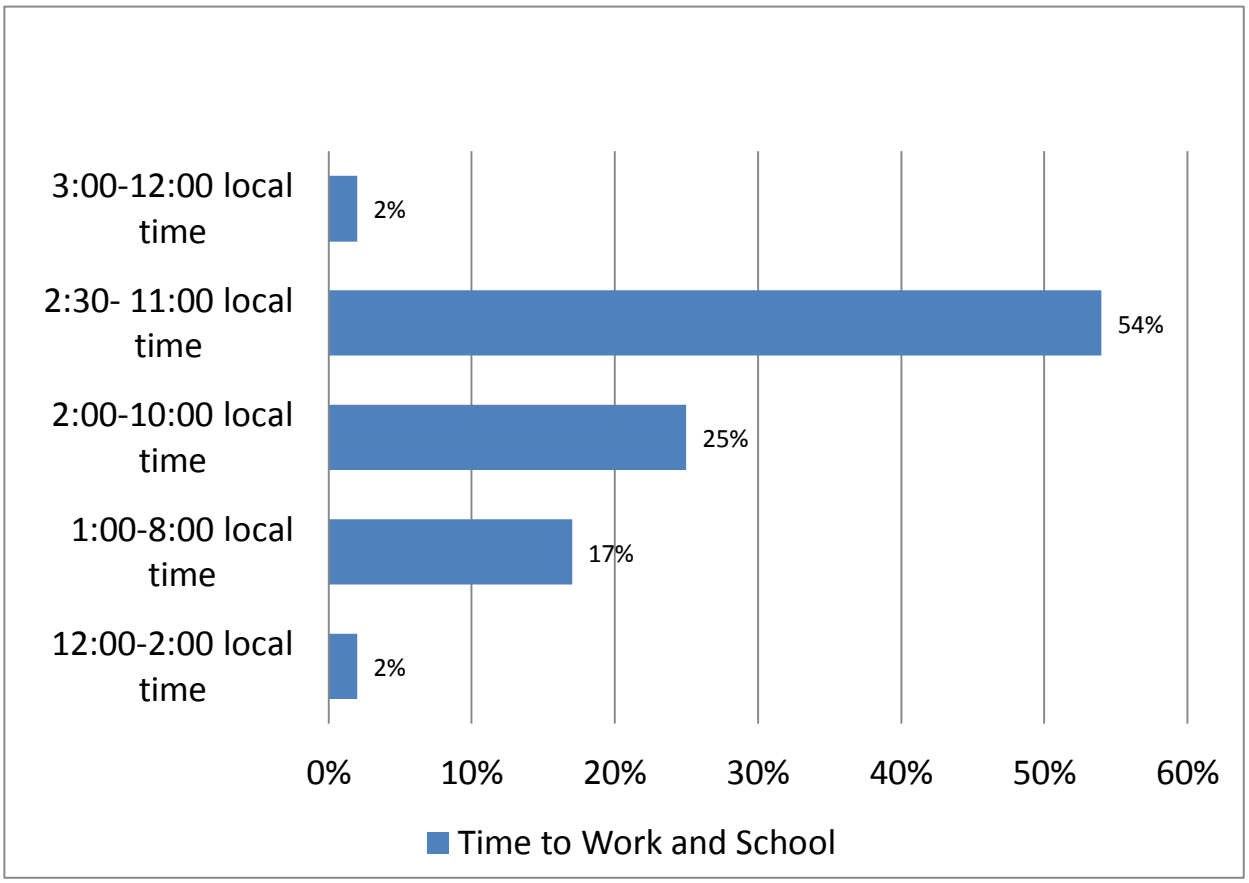


Figure 7 above indicates that most of the respondents, 54% go to school and works and return to their home at 2:30-11:00 local time. This time schedule is common for both students and employees. Due to these, the demand for transportation was high at this time, Respondents with the time for their work and school 2:00-10:00 were 25%, respondents with the time for their work and school 1:00-8:00 were 17%, respondents with the time for their work and school 12:00-2:00 and 3:00-12:00 were 2% each. Survey data reflects that time to get transportation easily is 12:00-1:00 at morning and after 2:00 at night.

4.1.2 Measurement of urban mobility with trip distribution mode

Given the production and attraction of various zones described above, the next step is to develop formulas that describe how trips from any origin are distributed among the various destinations; i.e., to reduce the Origin Destination pattern to some simple equation involving productions and attractions of the zones and perhaps a few other quantities such as the distance or cost of travel from an origin to a destination. Generally two basic categories of aggregate trip distribution methods predominate in urban transportation planning are

i. Growth Factor Method: this involves scaling an existing matrix and is used if the only information available is about general growth rate with the whole study area.

ii.Gravity Model: this explicitly relates flows between zones to inter-zonal impedance to travel. Typical inputs include distance, time or cost of travel between zones, and estimates of future levels of production and attractions.

Trips can be modeled at house hold or personal level, at trip generation stage, trips were modeled at personal level which means number of trips per person per day but at this stage, trips were modeled at zonal level using the Gravity Model over the growth factor method.

Urban travel demand within urban areas, expected travel between zones is calculated using the Gravity Model of the form shown below; this form was selected because, it was latest formula developed by L.R. Kadiyali, 2004 by considering travel distance and population growth with respect to their expected number of trip.

$$Tij=\frac{\frac{(Dij+C)Aj*Gi}{Dijn}}{\sum_{j=1}^{z} Dijn}$$

Where

Tij = expected number of trips between zones i and j

Gi = number of trips generated in zone i

Aj = number of trips attracted to zone j

Dij = road distance between zones i and j (in km)

Z = number of zones and

C, n = calibration constants for work trips between the existing zones in Addis Ababa, C = 15 and n = 1.3

These constancies were used for balancing of demand and supply in transportation in Addis Ababa and were calculated using the last 25 years data by different disciplines in the process of transport planning, sources were Addis Ababa road transport office and transport consulting offices in Addis Ababa.

Here, the trips generated and attracted were collected from Yeka Sub City traffic counting reports with respect to survey data counting, including all the transport modes that people and goods used to move from place to place. Trips attracted to destination zones were counted from all directions by making traffic analysis zone (TAZs), including road segments outside the study area which affect traffic flow of study area by involving one side of the trip.

Number of trips generated at the origin zone was trips that were collected in the study area with the origin point at Megenagna were 87,750 trips /month in average, and trips attracted to destination zone (Legehar), including both internal and external trips were, 18,450 trips/month. Here, traffics that were attracted to destination point outside the study area with different origin was observed and counted at the intersection point of Estifanous church but the main problem faced here was that origin of the trips was not clearly known .This phase permits the estimation of journey times, costs and distances for different modes of transport options. Here travel distance was taken as a measure of impedance and zone to zone distance was used in the calculation

Trips attracted to destination zone from its origin point and from other directions that was involved the road segments at one end within the study area was summarized in Table3 below.

Table 3 below illustrates number of trips attracted to destination zone from different origin

(See appendix III)

Origin of Trips from internal and external stations	**Number of trips attracted to destination zone (Legehar) per month**	**Percent of involvement (%)**
Megenagna(**I**)	10148 trips/month	55%
Bole(**E**)	5166 trips/month	28%
Shiromeda (**E**)	2029 trips/month	11%
Kality (**E**)	1107 trips/month	6%
Total	18,450 trips/month	100%

Note

I= Internal stations

E= External stations

Data that was collected using survey data collection method were used as primary inputs to calculate the expected number of trips between zone i and j and this were calculated by counting different trip numbers at different traffic zone analysis since the selected road segment were give access to many outside roads.

Gi=number of trips generated in zone i=2925 Trips/day

Aj=number of trips attracted to zone j=615 Trips/day

Dij=distance between zone i and j (in km) =5.5km

Z=number of zones=2

C, n=calibration constants for work trips= 15, 1.3 respectively

Substituting the input parameters from the above to the gravity model formula the expected number of trips between zone i and j was

$$Tij = \frac{\frac{(Dij+C)Aj*Gi}{Dijn}}{\sum_{j=1}^{z} Dijn}$$

Therefore, the expected number of trips between zone i and j were 360,672 trips/day. As shown above, actual trip figures and calculated trip figures are significantly different in magnitude and to constant calibration were used to balance.

$$\mathbf{K = \frac{Actual\ trip\ figures}{Calculated\ trip\ figures}}$$

$$\mathbf{K = \frac{3540}{360672} = 0.009815}$$

Actual trip figures = Calculated figures of trip $*$K

$= 360{,}672 * 0.009815 = 3540$

The distance effect is found through a calibration process which gives travel times to destinations from the model similar to that found from field data. "Distance" can be measured in several ways. The simplest way done was to use travel distance between zones as the measurement of travel time. Other ways might be to use a combination of travel time and costs such as tolls as the measurement of distance.

From the above gravity model variables which have direct and reverse relationship can affect the mobility, as the trips generated in the origin and attracted to destination increases and destinations are located closer together along road way can be increased and destination can be reached by walking due to reduced average distance to destination. This model predicts zone to zone trip interchanges and connects two known sets of trip ends but does not specify the precise route of the trip or the modal of travel used. The modal split is then decided on the basis of these relative times, costs and distances.

Table 4 below presents mode of transport used with respect to mobility (Source: Survey field data)

Mode of transport with respect to mobility	**Frequency**	**Percentage %**
Auto mobile	67	51
Taxi	30	23
Addis Ababa light rail transmission	26	20
Higer bus, city bus and public bus	8	6

Table 4 above shows that people used different mode of transportation by considering different attributes like comfort, time, cost, mobility etc and this data were calculated by counting different vehicle classification based on their group and finally vehicle composition or percentage was calculated for each vehicle classification.

here the table summarizes that above 50% of the respondents agreed with auto mobiles are the fastest and comfortable than others, 23% agreed that taxi are the fastest, 20% agreed with trains are fastest than others and in opposite side almost negligible percent, 6% agreed that Higer bus are the fastest mode of transportation

Table5 below presents percentage distribution of mode of transport respondents used

(Source: Survey field data)

Mode of Transport	**Frequency**	**Percent (%)**
Taxi	53	40%
Automobile	13	10%
Star alliance	4	3%
Train	20	16%
Ambesa	7	5%
Higer bus	14	11%
Public bus	20	15%

Based on the respondents attribute needs like comfort, travel time (fastness), travel cost, and availability of the transport mode, respondents used different mode of transport to make their trips.40% of the respondents used taxi,16% used train,15%,11%and10% used public buss, higer bus, and automobile respectively.

Due to less availability of the modes, less percent of respondents that is 5% and 3% used Anbesa bus and Star Alliance bus respectively. Most respondents used taxi and train since most of them made their trips for work and school. The basic thing they consider was less travel time (mobility) to arrive to their destinations. From the Table above some respondents used public busses which were arranged by the governmental institutions for employees.

CHAPTER FIVE

Conclusions and Recommendations

5.1 Conclusions

Sustainable urban transportation is a current and critical urban issue all over the world. It aims to ensure better and healthier means of transportations meeting the individual and community mobility needs by reducing the social and environmental impacts of the mobility. Mobility planning is one of the key steps which determine many other implementation and management factors in the cycle of sustainable mobility.

Transportation planning uses the term 'models' extensively. The term models are used to refer to a series of mathematical equations that are used to represent how people travel. Travel demand occurs as a result of thousands of individual travelers making individual decisions on how, where and when to travel. These decisions are affected by many factors such as family situations, characteristics of the person making the trip, and the choices (destination, route and mode) available for the trip. Mathematical relationships are used to represent (model) human behavior in making these choices. Models require a series of assumptions in order to work and are limited by the data available to make forecasts. This study concluded that factors that affect travel demand can also affect trip generation and distribution either negatively or positively sides.

The following are the results of this research

- House hold sizes affect trip generation in positive way house hold size increases the demand to travel also increases and vice versa, this can be affected in relation to the vehicle ownership per house hold.

- Job classification have significant role to generate trip based on the purpose**.** People were making their trips for the purpose of work and school with 68% and 20% respectively. Finally activities of engagement were work, school, shop, social recreation etc, but the vast majority of trips, 88 % were work and school.
- Travel time affects trip distribution and modal splits take in to consideration the travel distance and speed as measurement of mobility between two zones. Generally, 43% of the respondents used taxis and train mode of transport for their trip purpose

with considering travel time taken to arrive destination point was between 30 minutes and 60 minutes and travel time can be used as a measure for modal split stage.

- Travel cost, the same as travel time affects trip generation in negative way .This shows that monthly income is directly proportional to transport expenditure. As income increases number of trips per day also increase. The survey data indicated that on the average respondents spend 5-15% of their incomes on transportation and most people make four times trips per day. It was observed from the survey that monthly income people earned had significant influence on the type of transportation mode they frequent used, which is also an implication of their daily expense for transport.
- Age of employees also have mixed effects taking in to consideration that income is likely to increase with age which makes personal vehicle affordable. On the other hand, with increase in age the demand of employee to make trips reduces.
- Regarding the percentage distribution the number of employees both in governmental and private institutions was 68%. The number of employee can have both effects; In case of more employees the employer may provide travel facility which will obviously reduce the number of trips. If the number of employees is low, providing combined transport facility may not be economical for the employer, so, it may increase the trips despite of lower number of employees.

- Expected numbers of trips between two zones were calculated using trip distribution method with gravity model and the estimated value was 360,672 trips/day and this was used as measure for the mobility at the study area within day and used as bench mark for different researchers to compare estimated and observed mobility and to make further study and develop models and calibration constants with help of software.

5.2 Recommendations

In order to improve urban transport mobility in Addis Ababa the following recommendation are proposed.

- Urban transport planning should be integrated both at the planning and implementation stages.
- Urban transport systems should be quick, affordable, safe, secure, reliable, comfortable, energy efficient and environmentally benign for every category of travelers.
- Transport system should reduce the distance travelled, time taken and use of personal vehicles along with increasing accessibility through proper land allocation for different activities. The proper allocation of land for different activities will help in reduce the travel demand trough reduced trip frequencies and trip distances. The compactness of the various activities will also promote walk and non-motorized transport.
- Where sufficient level of demand exists and justifies the use of high capacity vehicles (from mini bus to city buses) this can improve urban mobility.
- Providing carpool or ride sharing for participants who have the same work schedule and have long trips.
- Based on the interest of employees and employers using variable work hours, peak hour congestion can be reduced by spreading the travel demand at the peak.
- Underground rail ways or metros may have to expand over the entire city.
- Sidewalks must be widened in order to develop new space for pedestrians and fully segregated two way cycle tracks.
- One way road should be designed and used for the future
- Overpass roads must use for light vehicles like automobiles.
- To reduce traffic accidents, police must strength its enforcement, impose penalties under the law on traffic violators and further increase its current efforts such as alcohol testing.
- Use technologies for school and work purpose to reduce trip number based on the purpose of school and work.
- Parking management must have imposed.
- Government must devise new policy to curb migration from sub urban areas to the city for different purpose by providing different and sufficient services at home towns.

- There has to be a policy that controls the implementations of rules and regulations of both land use planning (urban planning) and transport planning policies to make integrated transport and land use systems.
- Since the disadvantage of transport system is environmental pollution urban transport planning should motivates vehicles with free or less release of carbon for the environment.

Future proposed areas of research

- Traffic forecasting method using traffic model
- Modeling of traffic generation using GPS and GIS
- Integrated urban and transport planning to decrease transport demand

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APPENDIX I -Questionnaires

Questionnaire Survey for MSc. Thesis

Prepared for **road users**

Thesis title: Assessment of urban transport mobility with tip distribution methods

Case study: Megenagna-Legehar Addis Ababa

General Information

This research survey is designed to fulfill an academic requirement for M.Sc. degree program in Road and Transport Engineering at Addis Ababa University. I can assure you that the research data will only be used for academic purposes. Your open and prompt response is highly appreciated.

Please give your response for the questions here under by putting a " ✓ " mark at your appropriate choice or by putting your answers in the space provided. You may use the back side of the paper if the space provided is not sufficient.

For any clarification on this questionnaire, please contact me on 0939489080 (Senait Abraha)

Thanking you in advance, for your invaluable cooperation.

Part I Background Information and Socio-Economic Status

1. Sex

- □ Male
- □ Female

2. Age

- □ 10-15 years old
- □ 16-20 years old
- □ 21-25 years old
- □ 26-30 years old
- □ 31-35 years old
- □ 36-40 years old

- 41-50 years old

3. Occupation

- Student
- Employee in government institution
- Employee in private institution
- Employer
- Other (specify if any)

4. Educational level

- No Schooling (illiterate)
- Basic education
- Primary education
- Secondary Education (grade 9-12)
- University
- Certificate
- Diploma
- Degree
- Other (specify if any)

5. Income per month

- <500birr
- 500 – 1000birr
- 1001 – 2000birr
- 2001 – 3000birr
- >3000birr

7. Family size

- 1
- 2 – 4
- 5 – 7

- 8 – 10
- >10

8. How much do you spend for transportation per day?

- <5birr
- 5 – 10birr
- 11 – 15birr
- >15birr

Part II Travel behavior of Subject

9. Which transport mode do you usually use?

- Walking
- Automobile
- Taxi
- Train
- Public buss
- Higer bus
- Ambesa bus
- Star alliance bus
- Motor

10. What is the purpose of your travel?

……
……

11. How many trips do you make per day?

- Twice
- Three times
- Four times
- Five times

- > Five times

12. Origin of trip ----------Destination ----------

13. Working hour from ---------- to ---------- local time

- 12: 00 – 2:00
- 1: 00 – 8:00
- 2: 00-10: 00
- 2: 30-11: 00
- 3: 00-12: 00
- Other (specify if any)

14. How long does it take you to reach destination from origin?

- < 30minutes
- 30 – 60minutes
- 60-90 minutes
- 90-120 minutes
- >120 minutes

15. At what time of the day do you get transportation easily?

- 12:00 - 1:00AM
- 2:00 – 3:00 AM
- 3:00 - 4:00AM
- After 4:00AM

Part III Feedback about current status of urban transport system

17. Is there any improvement of urban transportation mobility from time to time? And which mode of urban transport is best with respect to mobility?

……

……

……

18. What type of action you suggest to improving urban mobility problems?

……

……

……

አዲስ አበባ ዩኒቨርስቲ

አዲስ አበባ ቴክኖሎጂ ኢንስቲትዩት

ሲቪል እና ኢንቫይሮንመንታል ምህድስና ትምህርት ክፍል

እኔ በአዲስ አበባ ዩኒቨርስቲ በድህረ ምረቃ በመንገድ እና ትራንስፖርት ትምህርት ክፍል የምማር ተማሪ ስሆን በአዲስ አበባ ዙሪያ የከተማ ትራንስፖርት ችግሮችን በይበልጥ ከፍጥነት አንፃር ያለው ችግሮችን ጥናት የማደርግ ተማሪ ነኝ፡፡ የዚህ ጥናት ርዕስና ዋና አላማ የአዲስ አበባ ትራንስፖርት እንቅስቃሴና ምልልሶችን መዳሰስና ፍጥነትን በማሻሻል በጥናቱ ዙሪያ የሚያጋጥሙ ችግሮችን መፍትሄ መፈለግ ነው፡፡ ለዚሁም የምትሰጡት መልስ ለጥናቱ ውጤታማነት ከፍተኛ አስተዋፅኦ ያለው መሆኑን አስገነዝባለው፡፡ ስለዚህ መጠይቁን ሙሉ በሙሉ በተቻለ መጠን በሀቅኝነትን እና በመልካም ፍቃደኝነት መመለሳችሁ የጥናቱን አለማ ማሳካት እንደሚያስችል በትህትና እገልጻለሁ፡፡ እዚህ ለይ የተመለከቱት መረጃዎች ለትምህርታዊ ጉዳይ አላማ ብቻ የሚውሉ በመሆናቸው በከፍተኛ ታማኝነት መልሳችሁን እንድትሰጡኝ እጠይቃለሁ፡፡ የመልሶች ሚስጥራዊነት የተጠበቀነው፡፡ በመሆኑም ስም መፃፍ አያስፈልግም፡፡

ማንኛውም ግልጽ ያልሆነ ነገር ካለ እና ተጨማሪ መረጃ መስጠት ለምትፈልጉ በማንኛውንም ሰዓት በዚህ አድራሻ ማግኘት ትችላላችሁ፡፡

- ሰናይት አብርሃ 09 39 48 90 80

የሚከተሉትን ጥያቄዎች በተሰጠው አማራጮች “ ✓ ” በማድረግ እና ክፍት ቦታ በተሰጠው በፅሑፍ እንዲሞሉት በትህትና እጠይቃለው፡፡

1. *ፆታ*

- ☐ ወንድ
- ☐ ሴት

2. እድሜ

- ☐ 10-15 እድሜ
- ☐ 16-20 እድሜ
- ☐ 21-25 እድሜ
- ☐ 26-30 እድሜ
- ☐ 31-35 እድሜ
- ☐ 36-40 እድሜ
- ☐ 41-50 እድሜ

3. ሥራ

- ☐ የመንግስት ተቀጣሪ
- ☐ የግል ተቀጣሪ
- ☐ የግል ቢዝነስ
- ☐ ተማሪ
- ☐ ሌላ ካለ ይገለፁ

4/ የትምህርት ደረጃ

- ☐ ያልተማረ
- ☐ መሰረታዊ ትምህርት የተማረ
- ☐ አንደኛ ደረጃ
- ☐ ሁለተኛ ደረጃ
- ☐ ሰርተፍኬት
- ☐ ዲፕሎማ
- ☐ ዲግሪ
- ☐ ሌላ ካለ ይግለጹ

5. ደሞዝ (አማካኝ)

- ☐ ከ 500 ብር ያነሰ
- ☐ 501-1000 ብር
- ☐ 1001-2000ብር
- ☐ 2001-3000 ብር
- ☐ ከ3000 ብር በላይ

6. የቤተሰብ ብዛት

- ☐ ከ4 ያነሱ
- ☐ 4 - 6
- ☐ 6 - 9
- ☐ 9 -10
- ☐ ከ10 በላይ

7. በብዛት የሚጠቀዉት የትራንስፖርት አይነት

- ☐ እግር
- ☐ ታክሲ
- ☐ አንበሳባስ
- ☐ ሀይገርባስ
- ☐ እስታር ኣልያንስ ባስ
- ☐ ባቡር
- ☐ ሸገርባስ
- ☐ ፕብሊክባስ
- ☐ የቤት መኪና
- ☐ ሞተር

8. የስራ ወይም የትምህርት መግቢያና መውጪያ ሰዓት (ጥዋትና ማታ)

- ☐ 12፡00 – 2፡00
- ☐ 1፡00 – 8፡00
- ☐ 2፡00 – 10፡00
- ☐ 2፡30 – 11፡00
- ☐ 3፡00 – 12፡00
- ☐ ሌላ ካለ ይግለጹ

9. ለትራንስፖርት በቀን ስንት ብር ያወጣሉ

- ☐ ከ5 ብር በታች
- ☐ ከ5 –10 ብር
- ☐ ከ11 – 15 ብር
- ☐ ከ15 ብር በላይ

10. **ከየት ተነስተው እየሄዱ ነው?** መነሻ፡- _____ መድረሻ፡- _____

11. ትራንስርት ለማግኘት በስንት ሰዓት ቢወጡ በቀላሉ ያገኛሉ?

- ☐ ከጠዋቱ 12፡00 – 1፡00
- ☐ ከጠዋቱ 1፡00 – 2፡00
- ☐ ከጠዋቱ 2፡00 – 3.00
- ☐ ከጠዋቱ 3፡00 – 4፡00
- ☐ ከ4 ሰዓት በኋላ

12. ከመነሻ ስፋራ ወደ መድረሻ ቦታ ለመሄድ ስንት ጊዜ ይፈጅቦታል በስራ ሰዓት

- ☐ ከ30 ደቂቃ ያነሰ
- ☐ ከ30 – 60 ደቂቃ
- ☐ ከ60 – 90 ደቂቃ
- ☐ ከ90 – 120 ደቂቃ
- ☐ 120 ደቂቃ በላይ

13. በቀን ውስጥ ስንት ጊዜ ትራንስፖርት ይጠቀማሉ

- ☐ 2 ጊዜ
- ☐ 3 ጊዜ
- ☐ 4 ጊዜ
- ☐ 5 ጊዜ
- ☐ ከአምስት በላይ

14. ለምንድን ነው የሚጓዙት? ----------

15. የከተማ ትራንስፖርት አገልግሎት በፍጥነት ዙርያ ከጊዜ ወደ ግዜ ተሸሻለዋል?

የትኛው የመጓጓዝ ዓይነት ይመርጣሉ በፍጥነት ደረጃ?

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16. ምን ዓይነት እርምጃ መውሰድ አለበት ይላሉ የትራንስፖርት ችግሮችን ለመፍታት በተለይ የመንገዶችን መዘጋጋትን እና ፍጥነት በተመለከተ?

Appendix II

Interview Guide lines

Dear Sir/ Madam My name is Senait Abraha. I am undertaking a study on the assessment of urban transport mobility using trip distribution methods:case study Megenagna-Legehar Addis Ababa. I kindly request that to answer these simple questions honestly; the information you give is strictly for academic purposes and will be treated with maximum confidentiality.

I. The Interview questions listed below are guiding questions. There will be probing questions based on the answers that would be provided by the Interviewee to get more information associated with the study.

II. These interview questions will be translated into Amharic. When the Researcher gets the permission of the interviewee the interview will be tape-recorded. Then the researcher will transcribe the interview and her field notes first in Amharic, then after will summaries /narrate the Amharic transcribed document into English.

III. If the interviewee is not comfortable with tape-recording, the researcher will use her field notes to transcribe the interview.

1. How can we define urban transport mobility in Addis Ababa with current situation?

2. What factors can affect sustainable urban transport system?

3. How personal trip production can affect urban mobility?

4. What are problems faced due to lack of sustainable urban transport mobility?

5. How land use (urban planning) can affect urban transport system?

6. What is the cause for challenges of urban transport?

7. What measurements and recommendations used to improve urban transport system especially with respect to mobility?

Appendix III

Types of Vehicles and seating capacity in Addis Ababa

No	Types of Vehicles	Total number of Vehicles	Seat capacity
1	Minibus Taxis	9,200	12
2	Ambesa City Buses	1,006	100
3	Higer Midi Bus	461	27
4	Star Alliance Buses	25	45
5	Public Buses	219	45
6	Saloon Taxi	4,000	5
7	Supported White Minibuses	4,000	12
8	Supported Cross-Country Buses	400	75
9	Private Vehicles	116,220	-
10	Trucks	104,226	-
11	Passenger Buses entering the city everyday	5,357	-

ተ.ቁ	የመለመሪ ስም			ርቀት	ኮድ 1 ታክሲ			ኮድ 3 ሚኒባስ				ሀይገር			ቀጥቀጥ			ፌዶራል			ፕብሊክ			ስንበሳ			ሸገር			ስሰያንስ			ስማካይ የተገኙች ብዛት	ስማካይ የቆይታ ጊዜ	መድረሻ ከፈለ ከተማ
	ሙሉ ስም	ሙ ተ ሳ ፊ ለ ያ	ሙ ያ ረ ሻ	ኪ ሜ ት ር	ስ ቀ ድ	ክ ንው ን	ስ/ የም ጊዜ	ስ ቀ ድ	ክ ንው ን	ስ/ የም ጊዜ	የመ ጫን ችሎ ታ	ስ ቀ ድ	ክ ንው ን	ስ/ የም ጊዜ	ስ ቀ ድ	ክ ንው ን	ስ/ የም ጊዜ	ስ ቀ ድ	ክ ንው ን	ስ/ የም ጊዜ	ስ ቀ ድ	ክ ንው ን	ስ/ የም ጊዜ	ስ ቀ ድ	ክ ንው ን	ስ/ የም ጊዜ	ስ ቀ ድ	ክ ንው ን	ስ/ የም ጊዜ	ስ ቀ ድ	ክ ንው ን	ስ/ የም ጊዜ			
1	ከብረት ዱልዱይ በፈረንሳይ	6 ኪሎ	4ኪሎ	6.0		69	8		46	8	12		0	5		0	5		0	1		14	4		0	2		6	4		0	6	3960	5:00	ስሬዳ
2	ከፈረንሳይ	በአፍንጮ በር	ጊዮርጊስ ማዘጋጃ			51	8		0	8	12		0	5		57			0	1		0	4		0	2		0	4		0	6	2448	5:00	ስሬዳ
3	ከፈረንሳይ	ጊዮርጊስ	ራጉኤል	6.3		26	8		11	8	12		0	5		0			0	1		0	4		24	2		0	4		0	6	1184	5:00	ሚ
4	ከፈረንሳይ	6ኪሎ	ጊዮርጊስ ቶታል	7.0		91	8		63	8	12		0	5		0			0	1		0	4		0	2		0	4		0	6	7392	5:00	ስሬዳ
5	ከፈረንሳይ ካራማራ	በ6ኪሎ	4ኪሎ	4.0		30	8		0	8	12		0	5		0			0	1		0	4		0	2		0	4		0	6	2880	5:00	ስሬዳ
6	ቤላ	በ6ኪሎ	ከምኒሊክ ት/ቤት	4.0		76	8		0	8	12		0	5		0			0	1		0	4		0	2		0	4		0	6	7296	5:00	ስሬዳ
7	ከቤላ	በ5ኪሎ	ራጉኤል ጫፍ	10.0		78	8		17	8	12		0	5		0			0	1		0	4		10	2		0	4		0	6	3040	5:00	ስ/ከተ ማ
8	ኢየሱስ	በ6ኪሎ	በ4ኪሎ	4.9		66	8		201	8	12		0	5		0			0	1		0	4		16	2		0	4		0	6	8544	5:00	ስሬዳ
9	ከጂያስፖሬ	በቀበና	6ኪሎ ዩኒቨርስቲ	4.4		306	8		142	8	12		0	5		0			0	1		2	4		0	2		0	4		0	6	43488	5:00	ስሬዳ
10	ከጂያስፖሬ	በቀበና ቁልስት	አውቶራ	8.5		307	8		0	8	12		0	5		0			0	1		0	4		0	2		0	4		0	6	29472	5:00	ስ/ከተ ማ
11	ከጂያስፖሬ	በቀበና ም/ሆስፒ	ፒያሣ	8.0		0	8		376	8	12		0	5		0			0	1		0	4		0	2		0	4		0	6	36096	5:00	ስሬዳ
12	ከመገናኛ	በካንቺስ	ሲኒማ ራስ	8.0		61	8		0	8	12		0	5		0			0	1		0	4		0	2		0	4		0	6	5856	10:00	ስ/ከተ ማ
13	ከመገናኛ	በካዛንቺስ	ጣና ገበያ	8.0		69	8		0	8	12		0	5		0			0	1		0	4		0	2		0	4		0	6	6624	10:00	ስ/ከተ ማ
14	ከመገናኛ	በካዛንቺስ ፍልውሃ	ሜክሲኮ	6.0		0	8		0	8	12		0	5		0			0	1		4	4		0	2		0	4		0	6	960	10:00	ዉጸታ
15	ከመገናኛ	በካዛቺስ 4ኪሎ	ፒያሣ	8.5		100	8		89	8	12		0	5		0			0	1		0	4		0	2		0	4		0	6	9072	10:00	ስሬዳ
16	ከመገናኛ	በካሳንቺስ ሃናና	4 ኪሎ	7.2		72	8		0	8	12		0	5		0			0	1		0	4		0	2		0	4		0	6	6912	10:00	ስሬዳ
17	ከመገናኛ	በፍልውሃ	ሰሙ/ ተሬ	9.6		73	8		0	8	12		0	5		0			0	1		0	4		0	2		0	4		0	6	7008	10:00	ስ/ከተ ማ
18	ከመገናኛ	በቀበና 4ኪሎ	ፒያሣ	8.0		341	8		0	8	12		0	5		0			0	1		0	4		0	2		0	4		0	6	32736	5:00	ስሬዳ
19	ከመገናኛ	በቀበና 4ኪሎ	ራጉኤል	9.0		232	8		0	8	12		0	5		0	5		0	1		0	4		0	2		0	4		0	6	22272	5:00	ስ/ከተ ማ
20	ከመገናኛ	በቀበና	ስላሴ ኮሲጅ	4.1		16	8		0	8	12		0	5		0			0	1		0	4		0	2		0	4		0	6	1536	5:00	ስሬዳ
21	ከመገናኛ	በቀበና 4ኪሎ	አውቶራ	9.6		143	8		0	8	12		0	5		0			0	1		0	4		0	2		0	4		0	6	13728	5:00	ስ/ከተ ማ

ቦሌ መ/ቅ/ጉ መጋቢት 18-23/2009 ዓ/ም

በየካ ክተማ ትራንስፖርት አገልግሎ ነይ የተሰማሩ ተሽከርካሪዎችን ብዛት፣አይነት፣የ ሪት እቅድና ክንውን የሚያሳይ ሪፖርት

የቅርንጫፍ ጽ/ቤት ስም :- የካ

ቀን: ከ4/8/09 እስከ እስከ 9/8/09 ዓ/ም

ቅጽ1: በክተማ ትራንስፖርት አገልግሎት ላይ የተሰማሩ ተሽከርካሪዎችን ብዛት፣አይነት፣የስምሪት እቅድና ክንውን የሚያሳይ ሪፖርት

የዕለት	የተሽከርካሪው ዓይነት																ማጠቃለያ									
	ኮድ 1 ሚኒባስ		ኮድ 3 ሚኒባስ		ሃይገር		ቅጥቅጥ		ሚትና ማታ በድጋፍ ሰጪነት								ሸገር		ፕብሊክ መደበኛ		አለያንስ		አንበሳ መደኛ		ድምር	
									የፌደ. ትራንስፖርት		ሸገር በልዩ		ፕብሊክ ሰርቪስ		ልዩ አንበሳ											
	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን
ሰኞ	960	518	968	392	170	46	39	15		13				32				29				5		37		
ማክሰኞ	960	498	968	347	170	36	39	11		11				32				29				9		29		
ረቡዕ	960	550	968	437	170	70	39	21		11				48				29				5		24		
ሐሙስ	960	521	968	435	170	68	39	21		18				46				28				7		32		
አርብ	960	506	968	415	170	32	39	18		18				15				26				6		32		
[illegible]	960	359	968	311	170	23	39	14		10				10				20				6		27		
ድምር		2952		2337		275		100		81				183				161				38		181		
አማካይ ድምር		492		390		46		17		14				31				27				6		30		
የተሽከርካሪዎች አማካኝ የምልልስ ጊዜ		8	8	8		5		5		1				9				4			4		5		0
የሳምንቱ አማካኝ የተጓዦች ብዛት		47230	38949			9200		590		980				7400				6400				1540		12		

ቅጽ2: ተሽከርካሪዎች በእቅዱ መሰረት ያልገቡበት ምክንያትና የተወሰደን መፍትሔ የሚያሳይ ሪፖርት

የተሽከርካሪ ዓይነት	ተሽከርካሪዎች በእቅዱ መሰረት ወደ አገልግሎት ያልገቡበት ምክንያት	የመፍትሄ ሃሳብ	የሚያስገኘው ውጤት
ኮድ 1 ሚኒባስ	በብልሽትና እረጅም እድሜ ያለገሉ ስለሆኑ፣መስመር ስለሚቆራርጡ	ቁጥጥር ማድረግ	የህዝቡ የሠልፍ ቆይታ ይቀንሳል
ኮድ 3 ሚኒባስ	መስመር ስለሚቆራርጡ የመናኸሪያ መርሃ ግብር ስለአላቸው ያለ ሠርቪስ ስለሚሠሩ	በአስቸኳይ ኮድ 3 ታፔላ መስቀል	" " "
ሃይገር	ያለ መስመር ስለሚሠሩ	የተሻሻለ ቁጥጥር ማድረግ	" " "
ቅጥቅጥ	ያለ መስመር ስለሚሠሩና መስመር ስለሚቆራርጡ	" " "	" " "
የፌደ. ትራንስፖርት	ተራ ሲደርሳቸው ከመናኸሪያ ስለሚወጡ	" " "	" " "
ፕብሊክ ሰርቪስ		" " "	" " "
ልዩ አንበሳ			

ማስታወሻ:- እቅድ ማለት የተመደቡ የተሽከርካሪዎች ብዛት ነው::

122,482

በየካ ክተማ ትራንስፖርት አገልግሎት ላይ የተሰማሩ ተሽከርካሪዎችን ብዛት፣አይነት፣የስምሪት እቅድና ክንውን የሚያሳይ ሪፖርት

የቅርንጫፍ ጽ/ቤት ስም ፡- የካ

ቀን: ከ11/7/09 እስከ እስከ 16/7/09 ዓ/ም

ቅጽ1: በክተማ ትራንስፖርት አገልግሎት ላይ የተሰማሩ ተሽከርካሪዎችን ብዛት፣አይነት፣የስምሪት እቅድና ክንውን የሚያሳይ ሪፖርት

የዕለት	የተሽከርካሪው ዓይነት																ተቋማት									
	ኮድ 1 ሚኒባስ		ኮድ 3 ሚኒባስ		ሃይገር		ቅጥቅጥ		ሚትና ማታ በድጋፍ ሰጪነት የፌደ. ትራንስ ፖርት		ሽገር በልዩ		ፕብሊክ ሰርቪስ		ልዩ አንበሳ		ሸገር		ፕብሊክ መደበኛ		አሊያንስ		አንበሳ መደኛ		ድምር	
	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን	ዕቅድ	ክንውን
ሰኞ	960	632	968	475	170	56	39	20		18								29		37		9		29		
ማክሰኞ	960	540	968	463	170	61	39	23		20								29		30		5		28		
ረቡዕ	960	614	968	485	170	68	39	21		18								29		32		6		21		
ሐሙስ	960	608	968	559	170	67	39	22		22								27		31		6		28		
አርብ	960	556	968	576	170	69	39	18		21								25		31		11		23		
ቅዳሜ	960	540	968	524	170	69	39	17		21								30		29		6		26		
ድምር		3490		3082		390		121		120								169		190		43		155		
አማካይ ድምር		581		514		65		20		6								28		31		7		26		
የተሽከርካሪዎች አማካኝ የምልልስ ጊዜ		8		8		5		5		1								4		4		4		5		
የሳምንቱ አማካኝ የተንገቦት ብዛት		55726		49344		13000		4000		420								6720		7440		1680		10400		

ቅጽ2: ተሽከርካሪዎች በእቅዱ መሰረት ያልገቡበት ምክንያትና የተወሰደን መፍትሔ የሚያሳይ ሪፖርት

የተሽከርካሪ ዓይነት	ተሽከርካሪዎች በእቅዱ መሰረት ወደ አገልግሎት ያልገቡበት ምክንያት	የመፍትሄ ሃሳብ	የሚያስገኘው ውጤት
ኮድ 1 ሚኒባስ	በብልሽትና እረጅም እድሜ ያለገሉ ስለሆኑ፣መስመር ስለሚቆራርጡ	ቁጥጥር ማድረግ	የህዝቡ የሠልፍ ቆይታ ይቀንሳል
ኮድ 3 ሚኒባስ	መስመር ስለሚቆራርጡ የመናኸሪያ መርሃ ግብር ስለአላቸው ያለ ሠርቪስ ስለሚሠሩ	በአስቸኳይ ኮድ 3 ታፒላ መስቀል	" " "
ሃይገር	ያለ መስመር ስለሚሠሩ	የተሻሻለ ቁጥጥር ማድረግ	" " "
ቅጥቅጥ	ያለ መስመር ስለሚሠሩና መስመር ስለሚቆራርጡ	" " "	" " "
የፌደ. ትራንስፖርት	ተራ ሲደርሳቸው ከመናኸሪያ ስለሚወጡ	" " "	" " "
ፕብሊክ ሰርቪስ		" " "	" " "
ልዩ አንበሳ			

ማስታወሻ:- እቅድ ማለት የተመደቡ የተሽከርካሪዎች ብዛት ነው::

የአዲስ አበባ ከተማ ትራንስፖርት ባለሥልጣን

በየካ ክተማ ትራንስፖርት አገልግሎት ላይ የተሰማሩ ተሽከርካሪዎችን ብዛት፣አይነት፣የስምሪት እቅድና ክንውን የሚያሳይ ሪፖርት

የቅርንጫፍ ጽ/ቤት ስም :- የካ ቀን፡ ከ11/6/09 እስከ እስከ 16/6/09 ዓ/ም

ቅጽ3፡ በሣምንቱ ውስጥ ትራንስፖርት ለማግኘት ያለውን አማካይ የቆይታ ጊዜ የሚያሳይ ሪፖርት

ዕለት	አጠቃላይ ተርሚናል ብዛት	ከ5 ደቂቃ በታች		ከ6-10 ደቂቃ		ከ11-15 ደቂቃ		ከ16-20 ደቂቃ		ከ21-25 ደቂቃ		ከ26-30 ደቂቃ			
		ብዛት	የተርሚናሉ ዝርዝር	ብዛት	የተርሚናሉ ዝርዝር	ብዛት	የተርሚናሉ ዝርዝር	ብዛት	የተርሚናሉ ዝርዝር	ብዛት	የተርሚናሉ ዝርዝር	ብዛት	የተርሚናሉ ዝርዝር	ብዛት	የተርሚናሉ ዝርዝር
40		21	የተርሚናሉ ስም በተያየዘው ፊፖርት ላይ ተገልፃል	11	የተርሚናሉ ስም በተያየዘው ፊፖርት ላይ ተገልፃል	6	የተርሚናሉ ስም በተያየዘው ፊፖርት ላይ ተገልፃል	2	የተርሚናሉ ስም በተያየዘው ፊፖርት ላይ ተገልፃል						
የሳምንቱ አማካይ															

ቅጽ4፡ የቆይታ ምክንያትና የተወሰደ መፍትሄ የሚያሳይ ሪፖርት

የቆይታ ምክንያትና የተወሰደ መፍትሄ የሚያሳይ ሪፖርት

የቆይታ ጊዜ	የቆይታ ምክንያት	የመፍትሔ ሃሳብ	የሚያስገኘው ውጤት
ከ5ደቂቃ በታች	የመንገድ ብልሽት	መንገድ ምቹ ማድረግ	የህዝብ እርካታ
ከ6-10 ደቂቃ	የመንገድ ብልሽት	የትራፊክ አባሎች በተሻለ እንዲሠሩ መድረክችን መክፈት	
ከ11-15 ደቂቃ	መንገድ መዘጋጋት	ስማጭ መንገዶችን መክፈትና መንገዶች እንዲጠገኙ ማድረግ	
ከ16-20 ደቂቃ	የተሳፋሪና የተሸከርካሪ ስሰመጣጣም	ስማጭ መንገዶችን መክፈትና መንገዶች እንዲጠገኙ ማድረግ	
ከ21-25 ደቂቃ			
ከ26-10 ደቂቃ			
ከ30 ደቂቃ በላይ			

ስምና ፊርማ የምሥራች ተስፋዬ

በአዲስ አበባ ትራንስፖርት ባለስልጣን
የህዝብ ትራንስፖርት መረጃ መሰብሰቢያ ቅፅ

የቅርንጫፍ ጽ/ቤት ስም፤ --ጉለሌ ቅ/ፅ/ቤት ቅ/ጽ/ቤት
ቀን፤ - 11/07/2009 እስከ 16/07/2009

ተ/ቁ	የመስመር ስም	መነሻ	መተላለፊያ	መድረሻ	የመንገዱ ርዝመት በኪ.ሜ/	ኮድ 1 ታክሲ			ኮድ 3 ሚኒባስ			ትዮትዮ			ፕሪሲስ			አንበሳ			ሸገር			አማካይ የተጓዦች ብዛት	አማካይ የቆይታ ጊዜ	መድረሻ ክፍለ ከተማ
						አቅድ	ክንውን	አማካይ የምልልስ ጊዜ	አቅድ	ክንውን	አማካይ የምልልስ ጊዜ	አቅድ	ክንውን	አማካይ የምልልስ ጊዜ	አቅድ	ክንውን	አማካይ የምልልስ ጊዜ	አቅድ	ክንውን	አማካይ የምልልስ ጊዜ	አቅድ	ክንውን	አማካይ የምልልስ ጊዜ			
1	ከሸሮሜላ- ቡናናሻይ	ሸሮሜላ	አስጨፋናስ	ቡናናሻይ	8.2	58	44	8	68	51	9	3	4	6	4	3	5	12	12	8	12	13	7	27720	7	ቂርቆስ
2	ከሸሮሜላ - ካሳንቺስ		6ኪሎ	ካሳንችስ	5.8	42	33	6	43	41	7													6708	3	ቂርቆስ
3	ከሸሮሜላ - አስቲደየም	ሸሮሜላ	4ኪሎ	አስተደየም	6.9	22	16	7	15	12	8													2832	4	ቂርቆስ
4	ከሸሮሜላ - ቁስቋም	ሸሮሜላ	ሳንባ ነቀርሳ	ቁስቋም	2.0	34	22	6																2640	7	ጉለሌ
5	ከሸሮሜላ - ሽሮሜኒኤል	ሸሮሜላ	አንጦጦ ማ	ሽንቁሩ ሚ.	9.4	23	14	6																1176	4	ጉለሌ
6	ከሸሮሜላ - መሳለሚያ	ሸሮሜላ	ጊዮርጊስ	መሳለሚያ	6.3	19	16	7	17	16	9													2880	4	አስተማ
7	ከሸሮሜላ -አዘዞ/ ተራ	ሸሮሜላ	ጊዮርጊስ	አዉቶብስ ተራ	5.5	37	23	6							2	2	6				1	1	5	2912	7	አስተማ
8	ከሸሮሜላ - ራጉኤል	ሸሮሜላ	ጊዮርጊስ	ራጉኤል	4.8	23	12	9	9	5	7													1776	5	አስተማ
9	ከሸሮሜላ - ኪሥሀረት	ሸሮሜላ	ጥምብሀር	ኪሥሀረት	2.5	10	8	7																960	3	ጉለሌ
10	6 ኪሎ - መናኛ	6ኪሎ	ምኒልክ ሆ.	መናኛ	4.7	41	32	6	26	21	9													5088	6	የካ
11	6 ኪሎ - ካሳንቺስ	6ኪሎ	4ኪሎ	ካሳንችስ	4.1	17	12	8	9	7	7													1452	4	ቂርቆስ
12	አዲሱገበያ - ፒያሳ	አዲሱገበያ	ሲሚዝጋጃ	ፒያሳ	3.3	34	20	6	5	3	7							4	1	4				2038	5	አራዳ
13	አዲሱገበያ - ጊዮርጊስ	አዲሱገበያ	ሲሚዝጋጃ	ጊዮርጊስ	2.8	12	7	6																672	8	አራዳ
14	አደሱገበያ - ኢሆቴል	አዲሱገበያ	ሲሆቴል	ኢሆቴል	4.3	38	26	7																2496	4	አስተማ
15	አዲሱ ገበ- አስኮ	አዲሱገበያ	ፔንዣት	አስኮ	7.1	16	12	6																864	3	ኮልፌቀ.
16	አዲሱገበያ - ተፈኔ	አዲሱገበያ	እግዜአርአብ	ተፈኔ	1.5	26	21	9																1764	3	ጉለሌ
17	አዲሱገበያ - ሱሉልታ	አዲሱገበያ	ፍተሽ ማዞያ	ሱሉልታ	19.7	48	32	5	220	172	6	1	2	3										17766	15	ሱሉልታ
18	ተፈኔ - ፒያሳ	ተፈኔ	ሾላ	ፒያሳ	3.9	24	15	6	48	42	4													5472	6	አራዳ
19	ተፈኔ - ጉርጊስ	ተፈኔ	ቾሱት	ጊዮርጊስ	3.5	10	6	4																648	4	አራዳ
20	ተፈኔ - ጎሽሬንጎ	ተፈኔ	ሾላ	ጎሽሬንጎ	4.3	23	12	7	12	6	6							2	1					1582	5	አስተማ
21	ተፈኔ - ኢሆቴል	ተፈኔ	ሾላ	ኢሆቴል	4.8	21	13	8																1092	4	አስተማ
22	ሽጎሊመ7 - አዉቶራ	ሽጎሊ መ7	ፓስተር	አዉቶብስተራ	4.7	42	32	7	20	19	7													4668	3	አስተማ
23	ሽጉሊ - መርካቶ	ሽጎሊ	ፓስተር	መርካቶ	4.8	21	13	8																936	6	አስተማ
24	ሽጉሊ መ7 - ፒያሳ	ሽጎሊመ7	መሶብቤት	ፒያሳ	7.0	19	12	9	31	24	7													3168	4	አራዳ
25	ሽጉሊ - ወሰፖቴል	ሽጎሊ	ሩፋኤል	ወሰጋ.ሆቴል	4.8	13	9	7																648	5	አስተማ
26	ድልበር - ፒያሳ	ድልበር -	ሲሚዝጋጃ	ፒያሳ	5.1	6	4	9	51	39	7				12	10	5	14	13	6	4	4	6	21602	4	አራዳ
27	ድልበር - ጎሽሬንጎ	ድልበር -	አዝዘያ	ጎሽሬንጎ	5.6	27	13	8	33	17	5													2520	5	አስተማ
28	ድልበር - ጉርጊስ	ድልበር -	ሲሚዝጋጃ	ጊዮርጊስ	4.6	4	3	6																216	4	አራዳ
29	ቶታል - ፒያሳ	ቶታል	ሲሚዝጋጃ	ፒያሳ	4.2	24	16	7																1344	6	አራዳ
30	መነን - ራጉኤል	መነን	ጊዮርጊስ	ራጉኤል	3.5	-	-																	0	0	አስተማ
31	መነን - መሳለሚያ	መነን	ጊዮርጊስ	መሳለሚያ	5.0	-	-		9	6	4													504	4	አስተማ
32	ሩፋኤል - ራጉኤል	ሩፋኤል	አፋፀርካ	ራጉኤል	3.7	23	20	8																1440	5	አስተማ
33	ሩፋኤል - ወሰጋ ሆቴል	ሩፋኤል	ጪመጸሪንጎ	ወሰጋ ሆቴል	4.8	13	8	6																576	4	አስተማ
	ድምር					770	26		616	482		4	6		18	5		32	27		17	18		128160		

መረጃዉን የሞላዉ ስም ፍሬ-ማርያም ፊ. ..... ቀን 23/07/09 መረጃዉን ያጸደቀዉ፡- ስ..... ፈርማ ..... ቀን .....ቸ

ተ.ቁ	የመስመር ስም			ርቀት በኪሜ	ኮድ 1 ታክሲ			ኮድ 3 ሚኒባስ			ሀይገር			ቅጥቅጥ			ፌደራል			ፕብሊክ			ስንበሳ			ሸገር			ስልያንስ			ስማካይ የተጓገሮች ብዛት	ስማካይ የጭይታ ጊዜ	መድረሻ ከፈለ ከተማ
	መነሻ	መድረሻ			ስቅድ	ክንውን	ስ/የሃመ ጊዜ	ስቅድ	ክንውን	ስ/የሃመ ጊዜ	ስቅድ	ክንውን	ስ/የሃመ ጊዜ	ስቅድ	ክንውን	ስ/የሃመ ጊዜ	ስቅድ	ክንውን	ስ/የሃመ ጊዜ	ስቅድ	ክንውን	ስ/የሃመ ጊዜ	ስቅድ	ክንውን	ስ/የሃመ ጊዜ	ስቅድ	ክንውን	ስ/የሃመ ጊዜ	ስቅድ	ክንውን	ስ/የሃመ ጊዜ			
1	ከብረት ፋልዱይ በፈረንሳይ	6 ኪሎ	4ኪሎ	6.0	37	12	8		8	8		0			0	5		0			2	4		0			1	4		0		3996	5:00	ስራዳ
2	ከፈረንሳይ	በአፍንጮ በር	ጊዮርጊስ ማዘጋጃ		24	9	8		0	8		0			12	5		0				4		0			0			0		9727	5:00	ስራዳ
3	ከፈረንሳይ	ጊዮርጊስ	ራጉኤል	6.3	18	7	8		3	8		0			0			0				4		4			0			0		5006	5:00	ስ/ከተማ
4	ከፈረንሳይ	6ኪሎ	ጊዮርጊስ ቶታል	7.0	27	15	8		7	8		0			0			0				4		0			0			0		6261	5:00	ስራዳ
5	ከፈረንሳይ ካራማራ	በ6ኪሎ	4ኪሎ	4.0		7	8		0	8		0			0			0				4		0			0			0		3744	5:00	ስራዳ
6	ቤላ	በ6ኪሎ	ከምኒሊክ ት/ቤት	4.0	15	18	8		0	8		0			0			0				4		2			0			0		7446	5:00	ስራዳ
7	ከቤላ	በ5ኪሎ	ራጉኤል ሚሩ	10.0	26	12	8		2	8		0			0			0				4		0			0			0		4231	5:00	ስ/ከተማ
8	ቂየሱስ	በ6ኪሎ	በ4ኪሎ	4.9	19	9	8		26	8		0			0			0				4		1	5		0			0		7408	5:00	ስራዳ
9	ከጂያስፖራ	በቀበና	6ኪሎ ዩኒቨርስቲ	4.4	41	52	8		33	8		0			0			0			1	4		0			0			0		16836	5:00	ስራዳ
10	ከጂያስፖራ	በቀበና ቱደስት	አውቶራ	8.5	52	53	8		0	8		0			0			0				4		0			0			0		30624	5:00	ስ/ከተማ
11	ከጂያስፖራ	በቀበና ም/ሆስፒ	ፒያሣ	8.0	78	2	8		34	8		0			0			0				4		0			0			0		10374	5:00	ስራዳ
12	ከመገናኛ	በካሳንቺስ	ሲኒማ ራስ	8.0	14	9	8		0	8		0			0			0				4		0			0			0		5184	10:00	ስ/ከተማ
13	ከመገናኛ	በካሳንቺስ	ጣና ገበያ	8.0		9	8		0	8		0			0			0				4		0			0			0		5088	10:00	ስ/ከተማ
14	ከመገናኛ	በካሳንቺስ ፍልውሃ	ሜክሲኮ	6.0		0	8		0	8		0			0			0				4		0			0			0		964	10:00	ወደታ
15	ከመገናኛ	በካሳንቺስ 4ኪሎ	ፒያሣ	8.5	21	17	8		11	8		0			0			0				4		0			0			0		8145	10:00	ስራዳ
16	ከመገናኛ	በካሳንቺስ ሃናና	4 ኪሎ	7.2	22	12	8		0	8		0			0			0				4		0			0			0		6720	10:00	ስራዳ
17	ከመገናኛ	በፍልውሃ	ስሠ/ተራ	9.6	21	11	8		0	8		0			0			0				4		0			0			0		6432	10:00	ስ/ከተማ
18	ከመገናኛ	በቀበና 4ኪሎ	ፒያሣ	8.0	78	56	8		0	8		0			0			0				4		0			0			0		32160	5:00	ስራዳ
19	ከመገናኛ	በቀበና 4ኪሎ	ራጉኤል	9.0	65	38	8		0	8		0			0			0				4		0			0			0		22080	5:00	ስ/ከተማ
20	ከመገናኛ	በቀበና	ስላሲ ኮሌጅ	4.1	2	4	8		0	8		0			0			0				4		0			0			0		2016	5:00	ስራዳ
21	ከመገናኛ	በቀበና 4ኪሎ	አውቶ/ተራ	9.6	42	26	8		0	8		0			0			0				4		0			0			0		14784	5:00	ስ/ከተማ
22	ከመገናኛ ሚዛን	በ22 አጠፋኖስ	በናና ሻይ			0	8		0	8		0			0			0				4		0			0			0				ወደታ
23	ከመገናኛ ሚዛን	በስስታድየም	ሚክሲኮ ተሻሪደ	7.0	25	17	8		63	8		31	5		0			0			26	4		0			4	4		0		55291	10:00	ወደታ
24	ከመገናኛ ሚሩ	ስዋይ ባንኮኒርማ	ጣና ገበያ	8.0	14	4	8		16	8		0			0			0				4		0			0			0		5857	5:00	ስ/ከተማ
25	ከገብርኤል መሣለሚያ	በኮሲድ	መገናኛ	6.6	14	1	8		18	8		0			7			0				4		6	5		0			0		16670	5:00	የካ
26	ኦተቤ ካራ	ከሳምበረት	ከምኒሊክ ት/ቤት	9.1	14	14	8		0	8		0			0			0				4		2	5		0			0		6294	10:00-15:00	ስራዳ
27	ኦተቤ ካራ	በሳምበረት	መገናኛ/ደ ፖስፖራ	9.0	10	22	8		77	8		0			0			20	1			4		0			11	4		0		40938	10:00-15:00	የካ
28	ካራ	ኢልፎራ ሠሰን	መገናኛ	4.1	13	14	8		35	8		0			0			0				4		0			0			0		28328	10:00-15:00	የካ

ከመጋቢት 4 እስከ 9/2009 ዓ/ም
ሣምንታዊ ሪፖርት

ተ.ቁ	የመስመር ስም	ርቀት በኪ.ሜ	ኮድ 1 ታክሲ			ኮድ 3 ሚኒባስ			ሀይገር			ቅጥቅጥ			ፌደራል			ፐብሊክ			አንበሳ			ሸገር			አልያንስ			አማካይ የተጓጉዞች ብዛት	አማካይ የቆይታ ጊዜ	መድረሻ ከፊለ ከተማ
			አቅድ	ከንውን	አ/የም ጊዜ	አቅድ	ከንውን	አ/የም ጊዜ	አቅድ	ከንውን	አ/የም ጊዜ	አቅድ	ከንውን	አ/የም ጊዜ	አቅድ	ከንውን	አ/የም ጊዜ	አቅድ	ከንውን	አ/የም ጊዜ	አቅድ	ከንውን	አ/የም ጊዜ	አቅድ	ከንውን	አ/የም ጊዜ	አቅድ	ከንውን	አ/የም ጊዜ			
12	ከመገናኛ በቀበና 4ኪሎ ፒያሳ	8	78	316	8																									30336	0:05	አራዳ
13	ከመገናኛ በቀበና 4ኪሎ ራጉኤል	8.6	65	213	8																									20448	0:05	አ/ከተማ
14	ከመገናኛ በቀበና ስላሴ ኮሌጅ	4.1	2	10	8																									960	0:05	አራዳ
15	ከመገናኛ በቀበና 4ኪሎ አውቶብስ ተራ	9.6	42	131	8																									12576	0:05	አ/ከተማ
16	ከመገናኛ ጫፍ በአድዋ ድልድይ ባንኩዲርማ ጣና ገበያ	7.9	14	25	8		115	8																						6711	0:05	አ/ከተማ
17	ከመገናኛ ሚዛን በ22 አጢፋናስ ቡናና ሻይ ሜክሲኮ ተግባረድ	6.0	25	98	8		341	8		164	5								140	5					15	5				24289	0:10	ልደታ
18	ከመገናኛ በካንቺስ ሲኒማ ራስ	8.0	14	60	8																									5760	0:10	አ/ከተማ
19	ከመገናኛ ሚዛን በጥ/አንበሳ በካዛንቺስ ጣና ገበያ	8.2	22	57	8																									5472	0:10	አ/ከተማ
20	ከመገናኛ በካዛንቺስ ፍልውሃ ሜክሲኮ	5.5																	6	5										1800	0:10	ልደታ

ቦሌ ትራንስፖርት . 21 - 07 - 2009 - 27 - 07 - 2009.

ተ.ቁ	የመስመርስም	መነሻ	መተላለፊያ	መድረሻ	የመንገድ ርዝመት(ኪ.ሜ)	ኮድ 1 ታክሲ			ኮድ 3 ሚኒባስ			[illegible]			[illegible]			[illegible]			[illegible]			[illegible]			[illegible]			[illegible]			[illegible]	[illegible]	መድረሻ ክፈለከተማ
						አቅድ	ክንውን	አማካይ የምልልስ ጊዜ	አቅድ	ክንውን	አማካይ የምልልስ ጊዜ	አቅድ	ክንውን	አማካይ የምልልስ ጊዜ	አቅድ	ክንውን	አማካይ የምልልስ ጊዜ	አቅድ	ክንውን	አማካይ የምልልስ ጊዜ	አቅድ	ክንውን	አማካይ የምልልስ ጊዜ	አቅድ	ክንውን	አማካይ የምልልስ ጊዜ	አቅድ	ክንውን	አማካይ የምልልስ ጊዜ	አቅድ	ክንውን	አማካይ የምልልስ ጊዜ			
1	ከሰሚት	ከሰሚት	በኮንደሚኒየም	የተባበሩት	4.0	-	-	9	27	18	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		5	ቦሌ
2	መገናኛ	ከመገናኛሚዛን	በሳሚትለስላሳ	ሳሚ/ ኮንዶሚኒ	10	28	19	8	66	63	8	-	-	-	-	-	-	-	-	-	-	-	-	6	3	2	2	1	2	-	-	-		5	ቦሌ
3	መገናኛ	መገናኛሚዛን	ሳሚት	ወረዳ 10 ጤናጣቢያ	9.2	-	-	8	23	15	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		5	ቦሌ
4	መገናኛ	ከሙሉጌታሀንፃ	አ/ኢምፔሪያል	ገ/መኃይል	6.9	-	-	8	0		8	-	-	-	-	-	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-	-		5	ቦሌ
4	መገናኛ	ከመገ/ሚዛ	በሲኤምሲ	አያት	12.5	19	10	8	83	44	9	-	-	-	-	-	-	-	-	-	-	-	-	3	3	2	-	-	-	-	-	-		4	ቦሌ
5	ከሰሚት	ከሳ/ኮነዶሚኒየም	በጎሮ ት/ቤት	ገርጂ መ/ኃይል	7.2	30	27	6	20	17	7	-	-	-	-	-	-	-	-	-	5	4	1	2	2	2	-	-	-	-	-	-		5	ቦሌ
6	መገናኛ	ከሙሉጌታሀንፃ	በጎሮት/ቤት	ሥላሴማዞሪያ	6.7	3	2	6	60	51	7	-	-	-	-	-	-	-	-	-	5	3	1	-	-	-	2	2	2	-	-	-		5	ቦሌ
8	አያት	ከአያትአደባባይ	በገቡሚካኤል	አራ/ሰፈራአደባባይ	7.3	-	-	8	17	11	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		5	ቦሌ
9		ከራዳኮሌጅ	በሳፋሪት/ቤትድ/ሆቴል	መገ/ ዘC/ት/ቤት	6.5	-	-	8	65	43	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		6	ቦሌ
10	ከቦሌ	ከቦሌድልድይ	በኒየላሞተር	ሙሉጌታሀንጻ	4.1	51	33	8	5	2	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		5	ቦሌ
11	ከቦሌ	ከቦሌድልድይ	በዮሴፍ	ሳሪስአቦ	50	7	4	6	50	30	7	-	-	-	-	-	-	-	-	-	-	-	-	3	2	2	-	-	-	-	-	-		5	ቦሌ
12	ከቦሌ	ከቦሌድልድይ	በዮሴ/ቃ/ ማሰልጠኛ	ቃ/ ማሰልጠኛ	13.1	-	-	7	49	14	7	-	-	-	5	5	3	-	-	-	5	2	1	3	2	2	-	-	-	-	-	-		6	ቃሊቲ
13	ከቦሌ	ከሰፈራአደባባይ	በአይስቲመንድር	ቱሉ /ምቱ ኮ/የም	14	4	3	7	66	52	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		5	አቃቂቃሊቲ
14	ከቦሌ	ከቦሌድልድይ	በኤምፔሪያል	ገርጂመ/ኃይል	43	60	50	6	44	30	6	-	-	-	-	-	-	-	-	-	-	-	-	2	1	1	-	-	-	-	-	-		5	ቦሌ
15	ከቦሌ	ከቦሌድልድይ	በጊዮንሆቴል	ፒያሳማዘጋጃ	8.8	11	8	7	14	12	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	5	2	-	-	-		5	አራዳ
16	ከቦሌ	ከቦሌድልድይ	በስጢፋኖስ	ሚኒሊክ ት/ቤት	7.6	6	4	7	12	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		5	አራዳ
17	ከቦሌ	ከቦሌድልድይ	በአስተዲየም	ቡናናሻይ	6.7	32	28	7	88	63	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		5	ቂርቆስ
18	ከቦሌ	ከቦሌድልድይ	በኮሜርስመስኪድ	አውቶቡስተራ	9.8	15	9	8	14	9	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		5	አዲስከተማ
19	ከቦሌ	ከቦሌድልድይ	በኮሜርስ	ሲኒማራስ	3	13	12	6	43	36	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		5	አራዳ
20	ከቦሌ	ከቦሌድልድይ	በአትላስ	ካሳንችስሃናን	19	71	63	8	16	8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		5	ቂርቆስ
21	ከቦሌ	ከቦሌድልድይ	ቡቴሌ መ/ዓለም	22 ሜፍ	6	26	18	8	6	4	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		5	ቦሌ
22	ከቴሌ መ/ዓለም	ከቴሌ መ/ዓለም	በካሳንቺስ	ጣናገበያ	13	11	9	9	13	10	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		5	አዲስከተማ
23	ከቴሌ መ/ዓለም	ከቴሌመ/ዓለም	በ22ካሳንችስ 4ኪሎ	ፒ/ሲኒ/ ኢትዮ	9.3	73	63	9	23	19	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		5	አራዳ
24	ከቦሌሚካኤል	ከቦሌሚካኤል	በጊዮርጊስ	ማርያምማዞሪያ	4.5	9	6	-	33	20	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		10	ቦሌ
25	ከቦሌሚካኤል	ከቦሌሚካኤል	በጊዮንሆቴል	ፒያሳማዘጋጃ	7.3	-	-	-	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-		5	አራዳ
26	ከቦሌሚካኤል	ከቦሌሚካኤል	በኮሜ/ መስኪድ	አውቶቡስተራ	9.5	20	17	-	19	-	-	-	-	-	-	-	-	-	-	-	--	-	-	-	-	-	-	-	-	-	-	-		5	አሲስከተማ

ተ.ቁ	የመስመር ስም			ኪ.ሜ	ኮድ 1 ታክሲ			ኮድ 3 ሚኒባስ				ዘይገር			ቅጥቅጥ			ፌደራል			ፕብሊክ			ስንበላ			ሸገር			ስልያንስ			ስማካይ የተጓዦች ብዛት	ስማካይ የቅደታ ጊዜ	ሙድረሻ ከፈለ ከተማ
	ሙነሻ	ሙተሳፈስያ	ሙድረሻ		ስቅድ	ክንውን	ስ/የም ጊዜ	ስቅድ	ክንውን	ስ/የም ጊዜ	የሙጫንችኦታ	ስቅድ	ክንውን	ስ/የም ጊዜ	ስቅድ	ክንውን	ስ/የም ጊዜ	ስቅድ	ክንውን	ስ/የም ጊዜ	ስቅድ	ክንውን	ስ/የም ጊዜ	ስቅድ	ክንውን	ስ/የም ጊዜ	ስቅድ	ክንውን	ስ/የም ጊዜ	ስቅድ	ክንውን	ስ/የም ጊዜ			
22	ከመገናኛ ሚዛን	በ22 ስጢፋኖስ	ቡናና ሻይ			96	8		531	8 12			231	5		0			0	1		113	4		0	2		26	4		0	6	18710.4		ወዶታ
23	ከመገናኛ ሚዛን	በስስታድየም	ሚክሲኮ ተገጣይድ	7.0		0	8		0	8 12			0	5		0			0	1		0	4		0	2		0	4		0	6	0	10:00	ወዶታ
24	ከመገናኛ ጫፍ	ስሞል ሚንኩዲርማ	ጣና ገበያ	8.0		24	8		126	8 12			0	5		0			0	1		0	4		0	2		0	4		0	6	7200	5:00	ስ/ከተማ
25	ከገብርኤል መሣለሚያ	በኮሲጅ	መገናኛ	6.6		6	8		143	8 12			0	5		40			0	1		0	4		37	2		0	4		0	6	3576	5:00	የካ
26	ኮተቤ ካራ	ከላምበረት	ከምኒሊክ ት/ቤት	9.1		88	8		0	8 12			0	5		0			0	1		0	4		8	2		0	4		0	6	4224	10:00-15:00	ስራዳ
27	ኮተቤ ካራ	በላምበረት	መገናኛ/ዲያስፖራ	9.0		151	8		514	8 12			0	5		0			100	1		0	4		111	2		66	4		24	6	13280	10:00-15:00	የካ
28	ካራ	ሌሀፍራ ጠሰን	መገናኛ	4.1		48	8		386	8 12			0	5		0	5		0	1		0	4		0	2		0	4		0	6	20832	10:00-15:00	የካ
29	በመም/ኮ /ኮተቤ	በላምበረት	ከ4ኪሎ ፒያሣ	9.1		9	8		19	8 12			168	5	2	11	5		0	1		7	4		35	2		0	4		0	6	873.6	10:00	ስራዳ
30	የካ አባዶ	በጠሰን ካራ	ዲያስፖራ	11.0		64	8		274	8 12			0	5		0	5		0	1		0	4		12	2		42	4		26	6	8505.6	10-15:00	ስ/ከተማ
31	ከአባ ኪሮስ	በስያት	ቦሌ አራምላ	9.0		0	8		0	8 12			24	5		0	5		0	1		0	4		0	2		0	4		0	6	0	20:00	የካ
32	ከአባ ኪሮስ	በስያት	አያት ጨፌ	7.0		0	8		0	8 12			6	5		0	5		0	1		0	4		0	2		0	4		0	6	0	20:00	የካ
33	ከአባ ኪሮስ	በስያት	መገናኛ	12.5		60	8		241	8 12			22	5		0	5		0	1		0	4		6	2		12	4		0	6	7944	20:00	የካ
34	ከአያት አደባባይ	መሪ	መገናኛ	8.7		35	8		181	8 12			0	5		0	5		0	1		0	4		0	2		0	4		0	6	6912	5:00	ወዶታ
35	መሪ	በጉዴድ ሾላ	መገናኛ	7.4		0	8		0	8 12			0	5		0	5		0	1		0	4		0	2		0	4		0	6	0	5:00	ወዶታ
36	ከሾላ ገበያ	በቀበና	ፒያሣ	8.3		99	8		35	8 12			0	5		0	5		0	1		0	4		0	2		0	4		0	6	6432	5:00	ስራዳ
37	ከምኒሊክ ሆስፒታል	በ6 ኪሎ ጊዮርጊስ	ራጉኤል ቤ/ክ	4.9		114	8		37	8 12			0	5		0	5		0	1		0	4		20	2		0	4		0	6	4832	6:00	ስ/ከተማ
38	ከምኒልክ ሆስፒታል	ጊዮርጊስ	አውቶቡስ ተራ	5.0		235	8		0	8 12			0	5		0	5		0	1		0	4		0	2		0	4		0	6	22560	5:00	ስ/ከተማ
39	ከላምበረት መናኸሪያ	ዲያስፖራ ቀበና	አውቶ/ተራ	10.9		113	8		233	8 12			0	5		0	5		0	1		0	4		0	2		0	4		0	6	16608	5:00	ስ/ከተማ
40	ከላምበረት መናኸሪያ	በመገናኛ አድዋ ድልድይ	ቡናና ሻይ	8.0		19	8		47	8 12			0	5		0	5		0	1		0	4		0	2		0	4		0	6	3168	5:00	ወዶታ
			ጠ/ድምር			3368	8		3712	8 12			451	5		108			100			120			279			152			50		187440		
			ስማ/ድምር			561			618				75			18			17			20			47			25			8				

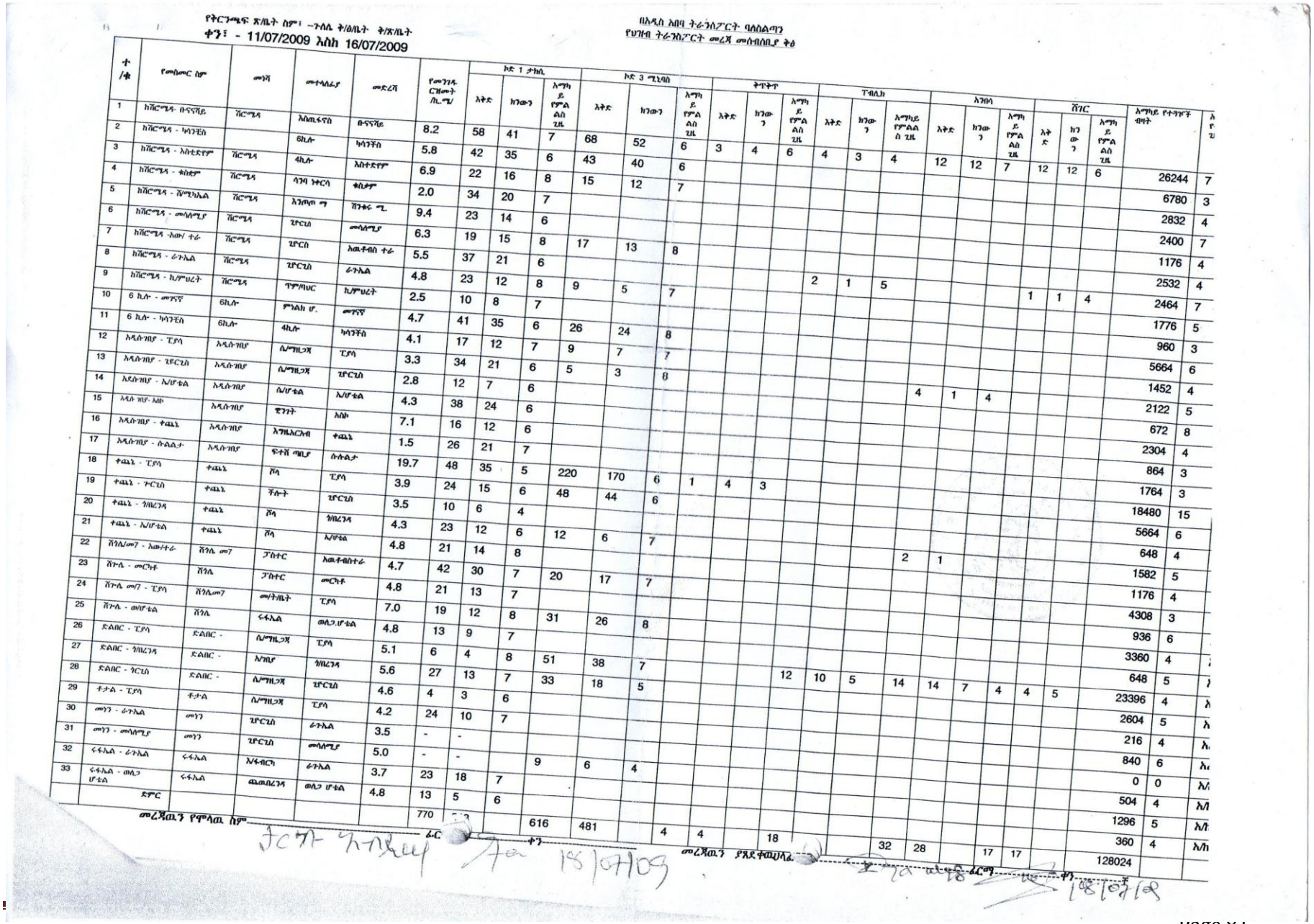
ጰ

በአዲስ አበባ ትራንስፖርት ባለስልጣን
የህዝብ ትራንስፖርት መረጃ መሰብሰቢያ ቅጽ

የቅርጫፍ ጽ/ቤት ስም..... 18/07/2009-23/07/2009

ቀን.....

ተ.ቁ	የመስመር ስም	መነሻ	መተላለፊያ	መድረሻ	የመንገዱ ርዝመት(ኪ.ሜ)	ኮድ 1 ታክሲ			ኮድ 3 ሚኒባስ			ሀይገር			ቅጥቅጥ			ፈደራል			ፐብሊክ			
						አቅድ	ከንውን	አማካይ የምልልስ ጊዜ	አቅድ	ከንውን	አማካይ የምልልስ ጊዜ	አቅድ	ከንውን	አማካይ የምልልስ ጊዜ	አቅድ	ከንውን	አማካይ የምልልስ ጊዜ	አቅድ	ከንውን	አማካይ የምልልስ ጊዜ	አቅድ	ከንውን	አማካይ የምልልስ ጊዜ	አቅድ
1	ከሰሚት	ከሰሚት	በኮንደሚኒየም	የተባበሩት	4			9	27	18	9													
2	መገናኛ	ከመገናኛ ሚዘን	በሳሚት ለስላሳ	ሳሚ/ ኮንዶሚኒ	10	28	19	8	72	63	8													
3	መገናኛ	መገናኛ ሚዘን	ሳሚት	ወረዳ 10 ጤና ጣ	9.2			8	27	15	8													
4	መገናኛ	ከሙሉጌታ ህንፃ	አ/ኢምፔሪያል	ገ/መንይል	4.9	70	61	8	44	36	8													
4	መገናኛ	ከመገ/ሚዛ	በሲኤምሲ	አያት	12.5	19	10	9	87	44	9													
5	ከሰሚት	ከሳ/ኮነዶሚኒየም	በጎሮ ት/ቤት	ገርጂ መ/ንይል	7.2	35	27	7	23	23	7													6
6	መገናኛ	ከሙሉጌታ ህንፃ	በጎሮ ት/ቤት	ሥላሴ ማዘሪያ	6.7	3	2	7	65	54	7				5	3	4				5	1	2	5
8	አያት	ከአያት አደባባይ	በንግ ሚካኤል	አራ/ሰፈራ አደባባ	7.3			9	17	11	9													
9		ከራዳ ኮሌጅ	በሳፋሪት/ቤትድ/ሆቴል	መግ/ ዘር/ት/ቤት	65			9	65	49	9													
10	ከቦሌ	ከቦሌ ድልድይ	በኒየላ ሞተር	ሙሉጌታ ህንጻ	4.1	50	33	9	5	2	9													
11	ከቦሌ	ከቦሌ ድልድይ	በዮሴፍ	ሳሪስ አቦ	50	7	4	7	50	30	7													2
12	ከቦሌ	ከቦሌ ድልድይ	በዮሴ/ቃ/ ማሰልጠኛ	ቃ/ ማሰልጠኛ	13.1			7	49	14	7				5	5	3				5	2	1	2
13	ከቦሌ	ከሰፈራ አደባባይ	በአይስቲ መንድር	ቱሉ /ምቱ ኮ/የም	14	4	3	7	65	56	7													
14	ከቦሌ	ከቦሌ ድልድይ	በኤምፔሪያል	ገርጂመ/ንይል	43	69	50	6	43	30	6													1
15	ከቦሌ	ከቦሌ ድልድይ	በጊዮን ሆቴል	ፒያሳ ማዘጋጃ	8.8	11	8	7	14	12	8													
16	ከቦሌ	ከቦሌ ድልድይ	በስጢፋኖስ	ሚኒሊክ ት/ቤት	7.6	6	4	7	12	7	8													
17	ከቦሌ	ከቦሌ ድልድይ	በአስተዳደያም	ቡናናሻይ	6.7	36	28	7	88	71	8													
18	ከቦሌ	ከቦሌ ድልድይ	በኮሜርስ መስኪድ	አውቶቡስ ተራ	9.8	15	9	8	14	9	7													
19	ከቦሌ	ከቦሌ ድልድይ	በኮሚርስ	ሲኒማ ራስ	3	16	12	6	43	36	7													
20	ከቦሌ	ከቦሌ ድልድይ	በአትላስ	ካሳንችስ ሃናን	19	72	63	8	19	8	8													
21	ከቦሌ	ከቦሌ ድልድይ	በቴሌ መ/ዓለም	22 ሜፍ	6	26	18	8	6	4	9													
22	ቦቴሌ መ/ዓለም	ከቴሌ መ/ዓለም	በካሳንቺስ	ጣና ገበያ	13	11	9	9	13	10	7													
23	ከቴሌ መ/ዓለም	ከቴሌመ/ዓለም	በ22ካሳንችስ 4ኪሉ	ፒ/ሲኒ/ ኢትዮ	9.3	72	63	9	28	19	7													
24	ከቦሌ ሚካኤል	ከቦሌ ሚካኤል	በጊዮርጊስ	ማርያም ማዘሪያ	4.5	9	6	8	33	27	9													
25	ከቦሌ ሚካኤል	ከቦሌ ሚካኤል	በጊዮን ሆቴል	ፒያሳ ማዘጋጃ	7.3				28	26	7													
26	ከቦሌ ሚካኤል	ከቦሌ ሚካኤል	በኮሜ/ መስኪድ	አውቶቡስ ተራ	9.5	21	17	5	19	17	7													
27	ከመገናኛ	ከመገናኛ	በቀለበት ዮሴፍ	ሳሪስአቦ /ቅጥቅ	41				41	39	8				41	33	3							
28		ከሰፈራ ድልድይ	በኤምፔሪያል	መገናኛ	8				8	7	8													
29	ድምር				491.6	510	385		879	694		0	0	0	46	28		0	0	0	5	2		16



የትርንጫፍ ጽ/ቤት ስም፣ ጉሎሌ ቅ/ዕቢት ቅ/ጽ/ቤት
ቀን፣ - 11/07/2009 እስከ 16/07/2009

በአዲስ አበባ ትራንስፖርት ባለስልጣን
የህዝብ ትራንስፖርት መረጃ መሰብሰቢያ ቅፅ

ተ/ቁ	የመስመር ስም	መነሻ	መተላለፊያ	መድረሻ	የመንገዱ ርዝመት /ኪ.ሜ/	ኦድ 1 ታክሲ			ኦድ 3 ሚኒባስ			ቅጥቅጥ			ፕብሊክ			አንበሳ			ሸገር			አማካይ የተጓጓዦች ብዛት	አ
						እቅድ	ክንውን	አማካይ የምልልስ ጊዜ	እቅድ	ክንውን	አማካይ የምልልስ ጊዜ	እቅድ	ክንውን	አማካይ የምልልስ ጊዜ	እቅድ	ክንውን	አማካይ የምልልስ ጊዜ	እቅድ	ክንውን	አማካይ የምልልስ ጊዜ	እቅድ	ክንውን	አማካይ የምልልስ ጊዜ		
1	ከሸሮሜዳ- ቡናናሻይ	ሸሮሜዳ	አስጪፋናስ	ቡናናሻይ	8.2	58	41	7	68	52	6	3	4	6	4	3	4	12	12	7	12	12	6	26244	7
2	ከሸሮሜዳ - ካሳንቺስ		6ኪሎ	ካሳንችስ	5.8	42	35	6	43	40	6													6780	3
3	ከሸሮሜዳ - አስቲደየም	ሸሮሜዳ	4ኪሎ	አስተደየም	6.9	22	16	8	15	12	7													2832	4
4	ከሸሮሜዳ - ቀበቶም	ሸሮሜዳ	ሳንባ ኑዮርሳ	ቀበቶም	2.0	34	20	7																2400	7
5	ከሸሮሜዳ - ሸ/ሚካኤል	ሸሮሜዳ	እንጦጦ ማ	ሸንቁሩ ሚ	9.4	23	14	6																1176	4
6	ከሸሮሜዳ - መሳለሚያ	ሸሮሜዳ	ጀሞርስ	መሳለሚያ	6.3	19	15	8	17	13	8													2532	4
7	ከሸሮሜዳ ኣውሮ/ ተራ	ሸሮሜዳ	ጀሞርስ	አዉቶብስ ተራ	5.5	37	21	6							2	1	5				1	1	4	2464	7
8	ከሸሮሜዳ - ራንኤል	ሸሮሜዳ	ጀሞርጊስ	ራንኤል	4.8	23	12	8	9	5	7													1776	5
9	ከሸሮሜዳ - ኪ/ሆሀት	ሸሮሜዳ	ጥምብሀር	ኪ/ሆሀት	2.5	10	8	7																960	3
10	6 ኪሎ - መናናኛ	6ኪሎ	ምኒልክ ሆ.	መናናኛ	4.7	41	35	6	26	24	8													5664	6
11	6 ኪሎ - ካሳንችስ	6ኪሎ	4ኪሎ	ካሳንችስ	4.1	17	12	7	9	7	7													1452	4
12	አዲሱገበያ - ፒያሳ	አዲሱገበያ	ሲ/ማዚጋጃ	ፒያሳ	3.3	34	21	6	5	3	8							4	1	4				2122	5
13	አዲሱገበያ - ጀሞርጊስ	አዲሱገበያ	ሲ/ማዚጋጃ	ጀሞርጊስ	2.8	12	7	6																672	8
14	አደሱገበያ - ኢ/ሆቴል	አዲሱገበያ	ሲ/ሆቴል	ኢ/ሆቴል	4.3	38	24	6																2304	4
15	አዲስ ገበያ- አስኮ	አዲሱገበያ	ፔንታት	አስኮ	7.1	16	12	6																864	3
16	አዲሱገበያ - ተዉኔኔ	አዲሱገበያ	አማዚአርአብ	ተዉኔኔ	1.5	26	21	7																1764	3
17	አዲሱገበያ - ሱሉልታ	አዲሱገበያ	ፍተሽ ማዚያ	ሱሉልታ	19.7	48	35	5	220	170	6	1	4	3										18480	15
18	ተዉኔኔ - ፒያሳ	ተዉኔኔ	ሸላ	ፒያሳ	3.9	24	15	6	48	44	6													5664	6
19	ተዉኔኔ - ጦርጊስ	ተዉኔኔ	ችሎት	ጀሞርጊስ	3.5	10	6	4																648	4
20	ተዉኔኔ - ገ/ዘረጋዳ	ተዉኔኔ	ሸላ	ገ/ዘረጋዳ	4.3	23	12	6	12	6	7							2	1					1582	5
21	ተዉኔኔ - ኢ/ሆቴል	ተዉኔኔ	ሸላ	ኢ/ሆቴል	4.8	21	14	8																1176	4
22	ሸጎሌመ7 - አውሶተራ	ሸጎሌ መ7	ፓስተር	አዉቶብስተራ	4.7	42	30	7	20	17	7													4308	3
23	ሸጉሌ - መርካቶ	ሸጎሌ	ፓስተር	መርካቶ	4.8	21	13	7																936	6
24	ሸጉሌ መ7 - ፒያሳ	ሸጎሌመ7	መ/ቅዱስ	ፒያሳ	7.0	19	12	8	31	26	8													3360	4
25	ሸጉሌ - መ/ሆቴል	ሸጎሌ	ሩፋኤል	መስጋ.ሆቴል	4.8	13	9	7																648	5
26	ድልበር - ፒያሳ	ድልበር -	ሲ/ማዚጋጃ	ፒያሳ	5.1	6	4	8	51	38	7			12	10	5	14	14	7	4	4	5		23396	4
27	ድልበር - ገ/ዘረጋዳ	ድልበር -	አገሀያ	ገ/ዘረጋዳ	5.6	27	13	7	33	18	5													2604	5
28	ድልበር - ጎርጊስ	ድልበር -	ሲ/ማዚጋጃ	ጀሞርጊስ	4.6	4	3	6																216	4
29	ቶታል - ፒያሳ	ቶታል	ሲ/ማዚጋጃ	ፒያሳ	4.2	24	10	7																840	6
30	መነን - ራንኤል	መነን	ጀሞርጊስ	ራንኤል	3.5	-	-																	0	0
31	መነን - መሳለሚያ	መነን	ጀሞርጊስ	መሳለሚያ	5.0	-	-																	504	4
32	ሩፋኤል - ራንኤል	ሩፋኤል	እፋብርካ	ራንኤል	3.7	23	18	7	9	6	4													1296	5
33	ሩፋኤል - መስጋ ሆቴል	ሩፋኤል	ዉዉበረንዳ	መስጋ ሆቴል	4.8	13	5	6																360	4
	ድምር					770			616	481		4	4	18	32	28		17	17					128024	

መረጃዉን የሞላዉ ስም ፊር ተን መረጃዉን ያጸደቀዉ/ላፊ ፊርማ ቀን