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Ethiopian Institute of Architecture, Building Construction and City Development
Addis Ababa University

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ETHIOPIAN INSTITUTE OF ARCHITECTURE, BUILDING CONSTRUCTION AND CITY DEVELOPMENT

FACTORS AFFECTING THE PUBLIC TRANSPORTATION MODAL CHIOCE IN URBAN MOBLITY IN ADDIS ABABA:

THE CASE OF YEKA SUB CITY

BY

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APRIL, 2022

ADDIS ABABA, ETHIOPIA

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The Case of Yeka sub city

A Thesis Submitted to Ethiopian Institute of Architecture, Building Construction and City Development, Addis Ababa University for Partial Fulfillment of Master's Degree in Urban Planning

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Advisor: Birhanu Girma (PhD)

April, 2022

Addis Ababa, Ethiopia

Declarations

I, the signatories state and verify that, this research is my own original work and has never been presented in any institution for an award of degree at any level. Likewise, all of the data and sources of data used in this research are in accordance with scientific methods and guidelines presented by the institution.

Addis Ababa, Ethiopia

April, 2022

Author: Fentahun Abebe Dbebe

Id No: GSR/1520/12

_____

Signature

Confirmation

I approve that, Fentahun Abebe Dbebe have carried out the research entitled "Factors Affecting Public Transportation Modal Choice in Urban Mobility in Addis Ababa: In Case Of Yeka Sub City" under my supervision and advise. I also state that the work is sufficient for the partial fulfillment for an award of master's degree in urban planning.

Dr. Birhanu Girma (PhD) _____ _____

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Approval

Thesis Title:

Factors Affecting Public Transportation Modal Choice in Urban Mobility in Addis Ababa:

The Case of Yeka Sub City

Degree: Masters of Urban Planning

Author: Fentahun Abebe Dbebe

ID No.: GSR/ 1520/12

Date: April, 2022

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Acknowledgment

First of all, I would like to thank God for this blessing. Then, I am deeply grateful and indebted to Dr. Berhanu Girma, my advisor, for his encouragement, suggestions, scholarly guidance insights and comments. Then I also thank the entire Addis Ababa road and transport Authority Staff members for their positivity in allowing me to access very important documents as well as facilitating my stay at the agency for more than one month to explore all of the agency's departments. I also want to thank all of the passengers participated in this research that helped me to understand the factors of modal choice in better manner.

In addition to that, I express my greatest gratitude to my family and friends who had great contribution to my success in helping me to get through my education by understanding my life path I chose. My appreciation also extends to all of masters students at EiABC.

Abstract

The modal choice in Ethiopia varies from passenger to passenger due to different factors. The existence of modal choice creates different problems like delays, traffic accidents and traffic congestions etc. The general objective of this research was to analyze the factors that affect the modal choice in urban mobility in Addis Ababa; the case of the Yeka Sub-city. To achieve the above objective, the researcher used simple random sampling technique to select samples for both open and close ended questionnaire method, and purposive sampling for the semi structured interview method. The sample size of this study was 378 samples, from these samples 40 of them were interviewed, the remaining 338 respondents filled the questionnaires. This research is a mixed type of research, meaning that by using both quantitative and qualitative data describes the factors that affect the modal choice in urban mobility in Addis Ababa; in the case of the Yeka Sub-city. The research design of this research was concurrent research design means the collection of qualitative and quantitative data simultaneously, specifically Quantitative driven concurrent design (QUANT + quall) where used for this study. The study found out that Personal Information (gender, employment status, family size, and income status,), Characteristics of Trip (travel purpose, travel time, travel distance, and Transport cost), Psychological factors (attitudes towards buses, and attitudes towards buses) and characteristics of the transport facility (comfort, safety, and availability of vehicle) are statistically significant. In addition there are factors which are related with spatial data like availability of parks, urban land use type and design and network of roads which affects the modal choice .From the findings, 75.4%) of the participants used taxis (all taxies which carries 11_12 passengers), 24.6% of the participants used buses (both Sheger and Anbesa buses).So taxis were the most common mode of transport used in Addis Ababa especially in Yeka Sub city. The choice of transport modes affects the urban mobility because it is the means of traffic congestion ,dalliance ,accidents and other environmental problems related with mobility, especially the choice of taxis that aggravate those problems above than buses. To minimize this problem the government and concerned stakeholders should manage the transport system like Higer, Shger, and also and Anbessa bus in their safety and comfort to make it competitive to other transport modes; Supply adequate transportation modes especially supply buses which can enhance the transport service.

Keywords: Urban mobility, Modal choice. Binary logistic regression

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Acronyms and Abbreviations

ARTA: Addis Ababa Road Transport Authority

CSA: Central Statistics Agency (Ethiopia)

GIS: Geographic Information System

PT; public transportation

Chapter One: Introduction

This research tried to present the need for undertaking a study on the factors affecting modal choice in urban mobility. Accordingly, it starts with contextualizing the problem by presenting background information so that the reader can have a good understanding of the focus of the study. Next to the background of the study the document extended the research problem, shows research questions and objectives, the significance of the study, delimitation (scope) of the study, limitations of the study, organization of the paper, the definition of terms or concepts, ethical considerations are explained sequentially under chapter one .

1.1. Background of the Study

Transportation is one of the strong sectors helping people's activities because without any movement it is impossible for them to fulfill their needs. People's wants are closely related with social and economic collaboration. People are doing activities in different places due to biological needs, societal obligations, and individual needs (Eriksson, 2008).Transport might be an industry responsible for loading or transferring people and goods from one place to another. Without it, a country's trade, its progress, and even its everyday life would be impossible. In effect, associations between the members of a community, between cities, regions and countries depend upon the supply of transportation (White, P.2009). The urbanization process raises meaningfully the request for urban transport also rises. Urban transport has an excessive role in the conversion of society and facilities modernization at large. The demand for urban moving is affected by the size of the city and population (Mulu, 2015).

People's uses transport for different purposes, like working activity, education activity, social activity, and recreation activity via transport modes. The movement of people or goods from one to another is done via transport modes. Transport modes are designed to either carry passengers or freight; however, most modes will carry a mix of each (Jean-Paul Rodrigue, 2006). Primarily there are three kinds of transport modes; land (road, rail, and pipelines), water (shipping), and air. But in developing countries, especially land based transportation activity is the dominant one, from land transportation, transportation via public transport and private transport modes on the roads holds the largest share of transportation activities (Mulu, 2015).

Every transportation mode has key operational and business benefits and properties. However, latest demand is impacted by integrated transportation systems that need flexibility within the individual use of every mode. As a result, modal competition exists at numerous degrees and takes many dimensions (Jean-Paul Rodrigue,et.al, 2013).

Transportation has an influence on the urban spatial structure and is shaping urbanization. Through urbanization, fundamental changes in the socio-economic environment of human activities have been observed. What drives urbanization is a complex mix of economic, demographic, and technological factors. Urbanization has been shaped by transport infrastructures, such as roads, transit systems, or simply walkways. Consequently, there is a wide variety of urban forms, spatial structures, and associated urban transportation systems. Urbanization is occurring in accordance with the development of urban transport systems, particularly in terms of their capacity and efficiency (Gilles Duranton, 2012).

Addis Ababa depends on its transportation system for its existence. The system permits people to reach work, school, health and social services, shopping, recreational, cultural, and sports events, visit friends and family. When we speak of modern transportation in the Ethiopian context, the reign of Emperor Menelik holds a cardinal place. Using his close relationship with the government of Austria, Emperor Menelik imported the roller, one of the technological products of the time, circa 1885-1887, Gregorian calendar. According to the records, after the roller was transported to Addis Ababa, Menelik had a 45-Kilometer stretch of road built through the combined labor of the military and the civilian population, while the roller was simultaneously put to work on this same road, but it did not take long for the machine to break down and be abandoned, never, it appears, to function ever after. Different historical sources also point out that the first automobile came to Ethiopia in 1907/08, Gregorian calendar, following which other cars with different models were imported from England and Germany. Although the Italian invasion of 1935-41 had inflicted damage on the country, it nevertheless had its own contribution to the expansion of modern transportation. It has been reported that public transportation, but especially taxi and bus services, started in Ethiopia during the Italian invasion. At the level of government offices, however, the first institution in charge of transportation was the Road Transport Administration Bureau, which was established in 1960.The 1950s and '60s constitute that period in the history of the development of our country's transportation sector in which much

was accomplished. During the Dergue period, the role of private transportation was restricted, because of which there was a high shortage of public transportation. Structural adjustment in many government institutions was first initiated in 1984. Accordingly, while in 1984 the country's road transportation service became de-centralized, the other branches of the sector have continued to-date with their previous structures intact, (Yonas Admassu , 2020)

Rapid urbanization in Addis Ababa has led to a rise in poverty and social inequality. Demand for transport has increased faster than the city can provide it and is creating health and safety risks, impeding economic development and producing more greenhouse gas emissions. The Addis Ababa 2002 - 2010 master plan highlighted increasing pressure on the city's public transport service, due to factors including an insufficient number of buses, passenger security at transport and freight terminals and a sub-standard traffic management system. People's accomplishments become more complex that is why there is the increment of people's movement from place to place. In this case, people have a habit of picking and regulating which travel mode is most proper and fair in cost for them to satisfy their needs. Therefore the obtainability of numerous modes of transport is increasing from time to time. A few decades ago, the travel modes existed only in the small shape and numbers of vehicles were built to accommodate people's movement, but now the travel modes also become parts of people's movement. Currently there are the abundances of transport modes starting from the low-priced to the most expensive one and also from the availability of the common service standard until the exclusive quality (White, P. 2009). Individuals are extremely worried about the choice of travel modes that are suitable and proper to their trip's purpose (Grava, S., 2002). From different transportation mode type's people can choose their best mode to accomplish their needs based on his or her different variables. Currently the transportation modes are becoming several features from the conventional modals and people tend to choose the mode with regard to the comfort, cost, speed, usability, frequency, protection, security, vehicle in time, trip distance, time reliability, cost of the travel mode etc. With the diverse availability of transport modes, the people have many chances to prefer the transport mode. For example, the private car is fast, comfortable, convenient and provides carrying capacity, privacy and expensive travel mode than the public bus. Thus the car is instrumental in that it increases freedom to perform activities in different places, such as work, shopping, and leisure activities (Eriksson, 2008).

The main mode of public transport in developing countries in road-based transport is the use of the conventional bus. It has extensive social, economic and environmental benefits (Schafer, et.al, 2000).Taxis are the main mode of public transport services that operate to provide short-haul services within Addis Ababa. In addition to taxis many Addis Ababa people's travels from one place to another place through buses, those buses can be Sheger, Anbesa, and Haiger minibus. The movement of people via motorized transport, whether in private or public transport, is related to climate change, dependence on fossil fuels, and traffic congestion. Reducing the share of trips made by, especially reducing the movement or traveling by using private cars might help combat oil dependence, global warming, and environmental pollution (Mulu Eshete , 2015). Walking is the main means of transportation for a number of residents especially for short distance but not for long distance. Unlike other cities in the country, bicycle use is insignificant because of topographic inconveniences (Mintesnot et.al, 2007).The choice of people has its own impact on urban mobility , for example if the people can choose taxis than buses ,it leads to traffic congestion ,accidents ,and other environmental ,economic and social problems ,but if they choose buses than taxis it somewhat reduces different environmental, economic and social problems. So this research focuses to assess the factors affecting modal choice in urban mobility, and also investigate the impacts of modal choice on urban mobility in the case of Yaka Sub city.

1.2. Statement of the Problem

Mode choice of commuters is influenced by whole activities or landscapes of social, economic, cultural, and environmental factors like travel time, travel cost, waiting time, number and ease of transfers, comfort, etc. Over the years modal choice were handling the overall range of tradeoffs individuals are willing to form among these factors (Lerman, 1975; Ben-Akiva and Lerman, 1985).Modal choice can be affected by accelerated industrialization throughout the world has led to higher growth rates, increased income, and high demand for mobility. The increasing number of vehicles in the city causes congestion and environmental problems that lead to disrupted traffic conditions like delays, accidents which cause huge economic loss every year (Ulberg C. 1989. In addition psychological factors spring an important influence on the behavior of travel mode choice, but the effects vary from different cities. The peoples are concerning the selection of travel modes consistent with their trip purpose that required being fulfilled. The availability of the travel modes is different and peoples can choose the mode with their desire to complete their trip (Ulberg C. 1989).

Currently the public transport system of the city of Addis Ababa which mainly consists of the city bus and shared taxi is facing significant tests due to the following key and general problems: The continued spatial growth of the city horizontally or urban sprawl, is becoming a major cause for the increase of travel distances, This phenomenon discourages people from resorting to non-motorized transport modes such as walking and cycling and results in an increased demand for public transport, Furthermore the demand for public transport services in Addis Ababa is growing at a rapid rate due to the continued rise in population this case was similar in Yeka sub city . Due to the existence of modal choice by the passengers in Addis Ababa different urban problems are occurred in the city like a difficulty for pedestrians, parking difficulty, traffic congestions, delays, and environmental-related problems like air pollution. For example if most of the people's choose taxies as a means of transportation than the mass type of transportation, the problem will be aggravated, but if the peoples or passengers are choose public transportation the problem will be reduced. Hence this modal choices varies from passenger to passenger depend on different factor it can be comfort ,security ,the vehicle in time ,family size ,gender ,age ,educational status ,trip distance ,time reliability ,cost of the travel mode ,and other. But are they really those are the factor for modal choice or not in the case of Yeka Sub city was answered on this research (IBIS Transport Consultants,2015).

To alleviate such deteriorating transportation conditions researchers have administered studies to know the connection between mode choice and various factors affecting it. For instance (Marie Harberinga, and Jan Schlüterb, 2020) studies the Determinants of transport mode choice in metropolitan areas the case of the metropolitan area of the Valley of México, but this research where not address all of the factors, again it does not explained its impact on urban mobility. The actual problem was due to the choice of public transportation mode. The Transportation system did not work functionally; this implies the disturbance of the environment, rises air pollution, raises traffic accidents and traffic congestions. The Marie Harberinga ,and Jan Schlüterb, were not clearly explain the consequence of modal choice on urban mobility , in addition those researches were not address many factors which affects the modal choice of passengers ,so this research was tried to investigate the factors which affect modal choice especially between buses and taxies , and also this research was explained the effect of modal choice on urban mobility. Again according to the researcher observation peoples have no detail information about the factors which affect modal choice in urban mobility, and also have no good

information about the impact of modal choice on urban mobility, so this research was tried to solve the above both research and knowledge gaps.

1.3. Objectives of the Study

This research consists both General and Specific objectives

1.3.1 General objective of the study

The general objective of the study was to analyze the factors that affect the public transport modal choice in urban mobility in Addis Ababa in the case of the Yeka Sub-city.

1.3.2 Specific objectives of the study

The study consists of the following specific objectives, those are;

- ✓ To identify the choice of motorized mode of public transportation by passengers on transportation system in Yeka Sub-city
- ✓ To evaluate the factors that affects the modal choice in Yeka sub-city.
- ✓ To investigate the impact of modal choice in urban mobility, in Yeka sub-city

1.4. Research Questions

Which types of motorized mode of public transport are selected by passengers for transportation?

What are the factors that affect the modal choice?

How the modal choice affects urban mobility?

1.5. Significance of the Study

Assessing the factors affecting the modal choice in urban mobility is very important to understand and evaluate the achievement gained in the implementation of transportation planning. Plus to that it is used as a source of information for the Minister of transport by identifying the factors of modal choice; they can reduce different transport-related problems like traffic congestion, accident, and the like.

It is hoped that the results of this study used to improve policy makers', planners', and researchers' understanding of the determinants of the modal choice of individuals in the study area and also it could serve as an important tool for any possible information towards reducing transport related problems because if the modal choice of passengers were buses, the transportation problem was reduced. Lastly, this study has important to society it might be used to create awareness and recognition about the modal choice and its impacts on urban mobility, this was enabling them to draw applicable policies that will reduce transport-related problems.

1.6. Delimitation (scope) of the Study

The scope of the study was restricted to the assessment of factors that affects modal choice in urban mobility in Addis Ababa, in the case of Yeka Sub-city. So the scope of the study where in the capital city of Addis Ababa ,especially in Yeka –sub city .Means that the scope is delineated in one sub-city from the whole 11 sub cities of Addis Ababa .

Even though the transportation system of Addis Ababa are carried out based on walking, cycling, Sheger bus, Anbesa bus, taxies , Haiger(minibus),but in this study the researcher needs to analyze the factors which affect the motorized public transportation modal choices (buses (Anbesa ,&Shger)) , and taxies(all taxies which holds 11-12 passengers) transportation system ,because according to (Mintesnot Gebeyehu and Shin-ei Takano, 2005) the major modes of public transportation in the city of Addis Ababa are buses and taxies.

The time scope of this study was from 2020_2022, means that it was done for two years, because to identify the most significant variable for modal choice, and also to express its impact on urban mobility needs time.

The methodological scope of this study was mixed _methods, which means these research efforts to association the best of in cooperation qualitative and quantitative methodologies to integrate standpoints and create an opulent picture.

1.7. Limitations of the study

The use of primary data during data collection through questionnaires and interview some respondents would not give appropriate data. Then the researcher solved this problem by asking the passengers repetitively to give their responses.

1.8. Organization of the Paper

The study accounts are complete up of five parts'.

Chapter 1 consists of the background of the study, statements of the problem, the objective of the study, the significance of the study, the scope of the study, and the limitations of the study.

Chapter 2 defines the literature review related to factors affecting the modal choice, means that it describes the previous research related to Modal choice, factors affecting modal choice, transportation mode, empirical and conceptual framework of modal choice.

Chapter 3 presenting the research methodology which is used for the research consists of the method to collect and analyze data, the sample, and the procedure.

Chapter 4 presented data analysis and interpretation which consists of descriptive analysis, inferential analysis, and logistic regression analysis as the result of the statistical analysis.

Chapter 5 presents the recommendation and conclusion based on the research results.

1.9. Definition of Terms or Concepts

Modal choice; is the choice of something or modalities or choosing one means of transport mode than another means of transport mode(White, 2009).For this study it is the choice of buses or taxies transport system , or vice versa, to travel from one area to another area.

Public transportation; public transit is a mode of public transit that enables a group of people to move together in predetermined routes. Typical examples of types of public transportation include buses, trains, and taxies. This study was covered taxies and buses type of public transportation modes (Schafer, A.,Victor, D.G.,2000).

Comfort; it is the easing or alleviation of a person's feelings of grief or distress (Kottenhoff 1999).

Safety; it is the condition or feeling of being safe, secure in certainly (Carlsson-Kanyama et al, 1999).

Attitude: it includes all important convictions related to the personal consequences of a certain behavior (e.g. travel by bus) (Davies et al 1997).

Chapter Two: Literature Review

2.1. Introduction

In any major urban making city where commerce and financial movement is thick, transportation plays an important part in moving individuals and merchandise. With an increment in industrialization and urbanization over time, the request for transportation has expanded proportionately also. Due to urbanization and therefore the populace in its urban cities, the insufficiency of transport frameworks has cleared out the individuals to make reasonable and imaginative transportation choices (Cervero, 2000).

In this chapter the empirical part, the conceptual part of the literature, the definition of transport, modes of transport, classification of modes of transportation, modal choice, factors affecting modal choice, the influence of modal choice on urban mobility are going to be explained. Modal choice in Ethiopia as direct and indirect with their detailed explanations and classification based different factor are going to be explained.

2.2 Definition of Transport

There are several definitions associated with transport, so on this paper, a number of the definitions of transport are noted like it's a system or means of carrying people or goods from one area to a different area. Again it's the simplest way of undertaking humans, animals, and goods from one place to a different place. In other words, the action of transport is defined as a specific movement of an organism or thing from appointing A (a place in space), to some extent B. This movement is practiced by differing types of modes.

Morlok (1995) defines transportation is the movement of individuals and or goods where transport activity starts from origin to destination, where the transportation activity ends. To create good movement within the city also as outside the town, different professionals prepare an idea that's associated with transport. Peoples move from one place to another to do differ works like for working purpose, for education propose for recreation purpose etc. Hence the activity system highly correlate with transportation, means that everyday activity done via transportation. Transportation planning nowadays is not any longer just a hard and fast route planning but has increasingly been characterized by the necessity for flexible and visionary policy strategies and also decision processes in an uncertain environment (Nijkamp & Blasa, 1994).

Transportation is related with the transportation facility, and their operational method during a certain area and the function of the transportation itself is that the movement of things (Morlok, 1995). Transportation is required because the source of human needs sometimes isn't provided in anywhere. Moreover, the source of main immobile must be processed into several production phases where the situation isn't within the same location with humans because the consumer.

The distance gap between the source location, production location, and consumer location describes the necessity for transportation. Therefore, there are five main components within the transportation i.e. the one that needs it, the great that's needed, the vehicle on the transporter, the road because the transportation infrastructure, and therefore the organization because the transport operator (Warpani, 1990).

2.2.1. Modes of Transportation

Transport modes also can be classified on the idea of power, i.e., man and animal, mechanical power-driven like automobiles, trains, ships, airplanes, etc., and physical power like wind or running water, facilitating the movement of products . A mode of transport may be a solution that creates use of a specific sort of vehicle, infrastructure, and operation .The transport of an individual or cargo may involve one mode or several of the modes, with the latter case being allied intermodal or multimodal transport. Each mode has its own advantage and disadvantage, and can be chosen on the idea of the value capability, and route. The form of one transport mode differs from that of another due to the technological differences between them. The foremost obvious example may be a basic difference in morphology between those modes which require endless infra-structure –roads, railways, and canals, and people which require only discontinuous infrastructure at terminals and airways (https://www.geographynotes.com/articles/modes-of-transport-and-patterns-of-movement-an-overview).

Within the modes themselves, morphology also differs with the various functions they're expected to perform in several geographical situations. Form and performance are thus closely linked in transport geography. Any form of transportation may meet the following four criteria:

(I) route, (II) vehicle, (III) locomotion, and (IV) terminal

I. Route: All modes of transport require some sort of the route, the way; course, or track on which to work, but having a distinction between land transport on the one hand and air/sea

transport on the opposite, the need of construction of a route way or track may be a necessity for land transportation, which needs large investment before journeys can take places. Both roads and railways, the essential sorts of land transport, cannot happen without the development of suitable route ways. As compared to roads, rail transport requires a more specific route within the sort of a special track also as other operational infra-structure like signalling equipment, etc.

Sea and air transportation are comparatively free from the development of route ways and should be said to work during a natural instead of a man-made environment. Except for inland water transport, the route requirement is for the development of canals or the development of the prevailing natural waterways. Air transportation is nearly as free as a bird and in theory; the route can operate anywhere and in any direction (Jean-Paul Rodrigue, etal. 2006).

Pipelines are wont to carry oil also. Their building includes heavy initial investment and mainte-nance. Land transport is one-dimensional, therefore, limited by physical influences like relief, rivers, other water bodies, waterlogging, forests, etc. In opposite side sea, and air transportation operators in several dimensions, means that they are not one dimensional. Air transportation is that the most versatile of all and operates in three-dimensional space where altitude and direction are often adjusted.

2. Vehicle: This is a prerequisite for the carriage or conveyance of people or goods through any method of transport. The history of transport shows on ever-increasing complexity within the character of the vehicle, largely as results of man's increased technological knowledge and expertise and his demand for increased speed and improved carrying capacity. There's a huge difference within the complexity of vehicles among the most modes of transport. Animal-driven vehicles are still popular in developing countries, so is that the bicycle. The auto-vehicles have now become an integral a part of our transport system. The locomotive, ships, and airplanes are the principal vehicles of recent times serving the whole world community.

The size, shape, and speed of those vehicles are changing day-by-day with the changing technological pattern. There's a huge variation within the carrying capacity of various vehicles. The railway can hold much more weight than automobiles. On the opposite hand, air transportation has limited carrying capacity and is expensive too. Water transport is particularly suited to the heavy, bulky nature of the many commodities where waterways are available.

3. Motive Power: Locomotion is important to propel or drive the vehicle. The first modes of transport relied upon the natural power of wind, gravity, animals, or maybe human muscle for the movement of individuals and goods. For inland transport man relied on horses, mules, asses, or oxen for the transport of goods; on the opposite hand, sea transport relied upon the vagaries of the prevailing winds. While almost most of the contemporary transport relies almost completely on man-made instead of natural power. For transportation, there are two major power sources: Coal, and oil. The foremost important revolutionary step affecting transport was the invention of the external-combustion engine and therefore the harnessing of steam power to the locomotive and certain other sorts of road and water transport((Jean-Paul Rodrigue, et,al. 2006).

As a result of this growth, transportation became widely available. Within the latter a part of the nineteenth century, the railway really was the king, but with the event of the interior combustion engines, using oil, this supremacy was changed. The air transportation system is exclu-sively supported oil products for his or her source of power. The utilization of electric-driven engines in railways now has enhanced the speed. In economic terms, the value of locomotion may be a deter-mining factor for the user; intrinsically air transportation is that the costliest of all sorts of transport due to the upper cost of locomotion per tonne-kilometre. For road transport, however, the load and price of fuel are both low in reference to the entire weight of the vehicle and total operating costs of vehicles among the most mode of transport (Warpani,1990)..

4. **Terminal:** The fourth essential requirement of transport is that the terminal, which initially was defined in terms of providing access to the transport route or network. The terminal is additionally some extent to which motion ends. For instance, in terms of rail transport, the terminus is that the station at the top of the line; while for the bus, the traditional stop is that the terminal. Except for cars, a parking place either at the house or a specially designed park could also be considered as a terminus, although in car transport there's nothing like terminus since the route is virtually endless. Every position in the transportation process where freight and passengers originate, terminates, or is handled. Terminals are central and intermediate locations within the movements of passengers and freight. They often require specific facilities and equipment to accommodate the traffic they handle (Jean-Paul Rodriguez, et.al.2006).

The terminals are always designed consistent with the mode of transport, their location, capacity, and importance in reference to the general transport network. The stop is that the simplest of

terminals having some shelters or sometimes is open spaces. On the opposite hand, rail terminals have several infrastructures.

Even more complex are the ocean terminals, viz., ports with their docks, wharves, warehouses, custom offices, etc. For air terminals, there are certain requirements that need to be fulfilled for the take-off and landing of aircraft. The ownership of terminals could also be private or government. However, good terminal facilities are needed for an effective network.

According to (Jean-Paul Rodriguez, et.al. 2006) the following are the most popular modes of transportation, or modal options, in urban areas:

Walking: it's the foremost important sort of urban transport. Nearly everyone walks and youngsters and ladies walk most. Car availability is additionally a robust influence on the frequency and length of walking trips, with car owners making fewer and shorter journeys. However, most trips are necessarily multimodal and walking may be a component of just about all of them, whether it's to the parked car or to and from conveyance stops and stations (Jean-Paul Rodriguez, etal. 2006).

In developing countries walking dominates urban transport for the poor, who walk most frequently and furthest. Even when buses are available they're frequently full, in order that even many of the not-so-poor cannot actually use them. But reluctant walkers are still travellers within the urban system and planning must recognize that walking is, and can remain, a wonderfully valid sort of transport for many people. It’s one that's entirely appropriate for several sorts of urban trips and it's often the foremost efficient, both for the walker and for the urban transport system as an entire (Jean-Paul Rodriguez, et.al. 2006).

Non-motorized Vehicles: In industrialized countries, the pedal cycle is that the principal vehicle within the category, but it rarely accounts for quite 10 % of the modal split. However, there has been a renaissance of cycling in recent years and lots of countries, notably Netherlands , demonstrate that the bicycle may make a really significant contribution to urban travel when appropriate amenities are provided and a recycling character is established.

However, it's in developing countries that non-motorized vehicles assume dominance as a way of mobility, though there's much variability between countries within the particular vehicle used.

Private cars: within the industrial world the car is now the leading mode for all categories of the journey. It's more popular due to its flexi-bility, personal convenience, and therefore the status that ownership confers. Car ownership has obvious transportation advantages, which are strengthened by powerful social and economic pressures that have transformed the car into a symbol of wealth, choice, and success. The disparity between developed and developing world cities is significant, and it is primarily due to income (Jean-Paul Rodriguez, et.al. 2006).

Public Transport: Bus-based System: Buses are available many shapes and sizes, including mini- and midi-buses, standard or articulated single-deckers, and variants on the double-decker, which may carry up to 150 people. Because all of them enjoy the free use of existing roads they're cheap and versatile to work as compared with rail-based conveyance (Jean-Paul Rodriguez, et.al. 2006).

Buses are less efficient users of energy than urban rail systems and emit more pollution, though their record on these criteria is far superior to other sorts of motorized road transport. The pliability and low cost of bus operation and maintenance, alongside the prior existence of the required roadways, mean that buses are likely to stay firm favourites' in cities in both industrialized and developing societies. The issues dwell clearing the road space of cars in order that the benefits of the bus are often properly exploited.

Rail-based Scheme: These schemes can route at average functioning speeds of up to 60 km per hour, loud from 15,000 to 60,000 travellers per hour, and are planned to serve high-density corridors so as to justify the high costs of construction.

Electric streetcars of 'trams' were developed, in 1880s from horse-buses, then it spread to most of the North American and European cities. They run via urban roads, trying to negotiate tight curves and rapidly accelerating from frequent stops. They're subject to car-caused congestion in order that some European cities are now upgrading them to LRTs by enclosing the tracks, granting priority at lights, and running them through pedestrian's areas and tunnels in city centres. In smaller cities, streetcars are usually the sole rail-based conveyance, but in larger ones, they complement metro systems. About 250 systems exist worldwide, including over 150 within the former communist bloc (Jean-Paul Rodriguez, et.al. 2006).

Taxis and Informal Modes: Taxis are small vehicles that sometimes carry some or a little number of passengers over short distances, often in city centres where parking shortages make the utilization of personal cars difficult. They need high unit costs, especially of labour and fuel, and thus tend to be used princi-pally by those on higher incomes and for business travel. There's also an 'informal' sector of a sort in developed countries within the sort of 'carpools and 'vanpools, whereby existing drivers share their vehicles (Jean-Paul Rodriguez, et.al. 2006).

2.2.2 .Types of Transport

Generally, there are different types of transport those are explained below:

Roads Transport: A road is a symbol of motion. Truly it's said that if the community is stagnant, roads will indicate the very fact. Roads usually play a great role in the redevelopment of a region or a nation. Outside the home, most of our activities are individual, regional, or national, greatly depends on cheap, smooth, and quick means of road transport. The vast importance of up to date road transport is extremely much a mirrored image of this unrivalled convenience to the user, especially within the conveyance of persons. No other sort of transport is in a position to supply such a comprehensive door-to-door or origin-to-destination service nor does the other mode have such an in depth route network. Apart from this, road transport also provides a feeder or reference to other modes (Jean-Paul Rodriguez, et.al. 2006).

Road transport includes all the various motor vehicles that are available for passengers, including cars, buses, and motorcycles/mopeds. Although with some differences associated with the planet regions, private cars currently remain the foremost diffused mode, because of their high flexibility and reliability, alongside their relatively low cost (Michel Noussan, et.al. 2020).

The outstanding typical of street transport is its flexibility. Motor vehicles can supply services over public highways between any two points within the country, if necessary from door-to-door on even or uneven terrain or on poor roads. Businessmen and traders enjoy the convenience to which road transportation enables them to load their goods from their site and offload them directly out of their own good towns. In the case of road transport, the vehicles go the goods, while in the case of other means of transport; goods have to be carried to the vehicle (Jean-Paul Rodriguez, et.al. 2006).

Speed, and certainty of timely delivery, which are essential within the marketing of perishable and semi-processed materials, is one among the important considerations in favour of road transport. Traffic in ‘smalls’ are often sent daily and simply by road service. The efficiency of a road is determined by its ability to maintain a smooth surface on which wheels can run without causing excessive friction. The relative cost of the road as compared with rail transport depends on a variety of circumstances (Michel Noussan, et.al. 2020).

Railways Transport: A railway is defined within the Shorter Oxford Dictionary as a way or road laid with rails (originally of wood, subse-quently of iron or steel), on which the wheels of wagons containing heavy goods are made to run simple transport; also the way composed of rails thus laid. Or it is a line of track consisting of iron or steel on which carriages or wagons conveying passengers or goods are moved by a locomotive engine. Hence there is also the whole organization necessary for the working of this and the company, or persons owning or managing it (Michel Noussan, et.al. 2020).

Due to the availability of a separate infrastructure that is not affected by road network congestions, rail transport is a significant alternative to road for land transport, though it requires careful planning and management for optimal operation. Additional advantages of rail over road transport include the upper average speed, especially in urban contexts and in high-speed rail networks, the lower fatality risk for passengers, the higher energy efficiency, and lower environmental impacts. Rail services are generally provided to the users by public or private companies, which permit passengers to travel between specific locations. Competition is feasible, but there's the necessity of a third-party management of the infrastructure to avoid potential collisions or congestions and to optimize the operation and scheduling of the trips. The flexibility of the system is less than for road transport, although in some countries well-developed rail networks ensure a redundancy that enhances the system flexibility, especially over long distances. However, rail transport is generally part of a multimodal trip that includes other modes for the first- and last-miles (Michel Noussan et.al. 2020).

In fact, the railway was, in a real sense, a product of the Industrial Revolution and afterward became a predominant mode of inland transport. Railways solved two important needs: (i) The economic carriage by land of (a) materials in bulk, (b) bulky commodities, and (ii) the relatively rapid movement of huge numbers of people as well as goods. The rails always revolve around its

fixed track. This acts as a guide for the wheels and helps for the travel of very heavy loads. Railways have the following obligations to meet:

(I) the cost of capital expenditure on tracks, (II) The cost of maintenance of tracks, (III) The cost of rolling stock, and (IV) the value of additional restrictions for the security and conve-nience of the general public

Railways are providing both long-distance as well as short-distance modes of the carrier. There are national and international railways, while some intercontinental railways also are in function.

Rail's primary function today, particularly in developed countries, is to provide inter-urban transportation. Railways are ready to achieve higher speeds and also easier access into the guts of cities. Their disadvantage lies in being tied to a hard and fast track and a printed service. New technology has also assisted railways in performing their tasks more productively. Today's trains are usually powered by either diesel or electricity. The changes to the track are much less signif-icant. In recent years, so as to realize increased speeds, endless welded track has replaced the normal rail (Michel Noussan, et.al. 2020).

Advance has also been made in improving the planning of carriage units which, alongside track changes, have promoted a far better ride for passengers. Consequently, train speeds of up to _ 200 k.p.h. are now being achieved by high-speed trains. Railways are providing goods service altogether the countries of the planet. The main advantage of rail is for the movement of heavy, bulky goods and of coal and mineral ores especially. Because of the heavy capital investment, the railway must be spent to capacity if it's to be economic**.** Capacity depends on a combination of the trainload, the average speed of the trains, and the frequency of the service. There is no need to elaborate on the importance of railways to a nation and/or a region. In fact, roads and railways are complementary to each other and together they control the entire inland movement of both goods and passengers (Michel Noussan, et.al. 2020).

Ocean Transport: The Sea offers a ready-made carriage way for ships which, unlike roadway or railway, requires no maintenance. Water surfaces are two-dimensional, and while ships frequently follow shipping lanes, they can travel in any direction, subject to a few restrictions. Because of float ability and reduced friction, ocean vessels are capable of carrying far greater

loads and much greater weights than are often handled even by the longest railway train (Michel Noussan, et.al. 2020).

Physical obstacles are less of a problem for ocean-going vessels than they are for overland transport. Terminals (i.e., ports) are necessary and control the whole ocean transportation and these normally entail heavy investment. Although the movement of ships is free and is capable of going virtually anywhere on the ocean surface, the trend to keep certain 'lanes' because of (i) physical conditions, and (ii) economic considerations(Michel Noussan, et.al. 2020)..

The construction of ship canals, primarily to shorten certain sea routes is additionally a crucial feature. The cutting of Suez and Panama Canals revolutionaries' the pattern of sea trade and after the North Atlantic route, the Red Sea-Suez-Mediterranean route became the most important in the world. Ocean shipping now has become a landmark in heavy load transportation between all parts of the planet (Michel Noussan, et.al. 2020).

Inland Waterways: Transportation through inland waterways has been a common feature not only in modern times but from ancient times as well. Natural waterways (rivers) and artificial waterways both play a role in inland water movement (canals). The depth, width, and direction of waterways, as well as physical impediments like rapids, waterfalls, flow speed, and seasonal freezing, all influence movement. In earlier times waterways were frequently used because at that time the volume of traffic was limited. But during the eighteenth century, ships began to grow in size, trade began greatly to expand and the speed of carriage came to be of greater importance and accordingly technical changes have been made (Jean-Paul Rodriguez, et.al. 2006).

The chief advantages of water transport are: (i) there is no problem of maintenance in case of natural waterways; (ii) the movement swift and rapid, thus energy is saved; and (iii) Waterways, under favourable conditions, provide cheap transport for heavy, bulky, imperishable commodities like coal, ore, timber, cement.

The principal disadvantages of inland waterways are:

(i) Rivers may involve devious journeys and should flow within the wrong direction from the purpose of view of trade; (ii), Navigable rivers could also be interrupted by rapids or waterfalls;

(iii) alteration in river levels and cold may occur in winter causing stoppages in navigation, and (iv) canal construction involves heavy capital investment as well as regular maintenance (Jean-Paul et.al ,2013).

Airways Transport: The use of aircraft and the development of air communication belong to the twentieth century. During two world wars, much of the accelerated development in the design, size, propulsion, and use of the airplane has occurred. Air transport differs from all other sorts of transport therein its three-dimensional; as a result, it's the sole one to enjoy the benefits and suffer the disadvantages of the third dimension (Jean-Paul Rodriguez, et.al. 2006).

Air routes are purely theoretical and aircraft are not tied to the surface, although, for commercial purposes, air routes are channelled along carefully prepared routes. Air transport is generally influenced by terminals as well as by weather conditions. Air transport requires terminal facilities in the shape of airports. The airports are always designed according to the landing capacity of the aircraft. An airport needs an outsized area of flat land on the suburban fringe of a city. In addition, there's a requirement for a public traffic island beyond the airport perimeter and under the approach path. With the event of hovercraft services, a replacement sort of terminal is required (Jean-Paul et.al, 2013).

In the youth of air transportation , when aircraft had a comparatively restricted range of flight thanks to their size, speed, and limited fuel-carrying capacity, air routes were so designed as to remove the extensive ocean crossings, high mountains, deserts, and vast forest areas. However, as results of the greatly improved performance of aircraft and their greater reliability, physical features in themselves now place no limit upon the selection of routes (Jean-Paul et.al ,2013)..

Air routes are now determined by (i) adequate ground facilities for operation, and (ii) availability of traffic for economic working. The cost of air transport is one of the limitations to use air transport. Air transport is best suited for the carriage of commodities that are low in bulk but high in value. Currently, air facilities are of two vital types: (i) Short-distance facilities which are functioning between important centres within a country, and (ii) Long-distance services such as transcontinental and trans-oceanic flights. The pattern of air routes within the world shows that there's a worldwide network providing excellent transport service which is speedy. Most of the

countries are having their own home as well as interna-tional air service organization, either private or owned by the government (Jean-Paul et.al ,2013).

Pipelines Transport: A pipeline may be defined as a line or conduit of pipe of variable diameter and length and traditionally used for carrying liquid or gas from a point of supply to a point of consumption. Earlier pipes were used only to provide water and its evidence is out there in ancient civilizations of China, Egypt, Mesopo-tamia, Greece, and Rome. But, the invention and use of petroleum ushered during a new era in pipeline use (Jean-Paul Rodrigue, etal. 2006).

The increasing use of pipelines in recent years represents, wrote manners, "one of the foremost notable revolutions within the history of transport". Like other sorts of transport, pipelines require mainte-nance, especially against external rusting and internal corrosion. Nowadays, pipelines are used for transporting: (i) Liquids and gases; (ii) Solids in suspension; (iii) Solids by pneumatic pressure; and (iv), materials enclosed in capsules (Jean-Paul et.al, 2013).

Generally, the above modes are categorized under land, air, and water transport systems. That means some of them are part of air (on the space), some of them are part of the land, (rail, cables, pipelines, and road), some of them are take place on water bodies.

2.2.3 Classification of Transport Modes

The mode is a means of transport that makes an objective become mobile in certain movement pathways and can operate in that way. A mode of transportation is a method of transportation that employs a specific vehicle, infrastructure, and operation.

Each mode has its own set of benefits and drawbacks, and will be selected for a trip based on cost, capability, route, and speed. Based on the traveller's number, transport mode can be divided in to the following ways:

I. Private transport

Private transport is a transportation service that is not available for use by the public. It is the private mode in which the operation can freely determine its own route, as long as it did not obey the traffic rules (Warpani, 1990) and private means of transport will still become that kind of transport until 21 century. This is because few benefit factors that private mode has such as security, comfort, privacy, flexibility, and prestige.

Security, comfort, time savings, privacy, flexibility, and prestige are all benefits of private mode. A mode of transportation is a key that utilizes a specific vehicle, infrastructure, and operation. Each mode has its own set of benefits and drawbacks, and will be selected for a trip based on cost, capability, route, and speed. We know that mode choice is important since it affects how efficiently we can travel, how much urban space is devoted to transportation functions as well as the range of alternatives available to the traveller (Mokhtarian, 2005)

Here for this study if travellers move individually they are considered as a personal traveller or, if their movement is not more than four it is like a personal traveller or it is considered as personal transport. Transport is that the movement of individuals and goods from one location to a different. Transport can also become a means to deliver from origin to destination. The mode is a means of transport that makes an objective become mobile in certain movement pathways and can operate in that way.

According to Grava (2002), there are different kinds of transportation modes: Some of the private modes of transport are listed below;

1. Bicycle; Bicycle may be a respectable contemporary sort of transportation, but its many dimensions. It is frequently hard to deal with the bike option as a simple utilitarian model and to develop from its serious service systems. Yet, the bicycle today has no known or acknowledged enemies; it is absolutely politically correct because of its non-polluting, space-saving, and resource conversing and health-enhancing characteristics. Politicians endorse it, and there are dedicated support groups that vocally promote the bicycle systems because the solution for nearly all cities' mobility problems. The advocates are mostly right, but the planet would need to be largely populated by socially responsible and physically fit persons, thinking the proper thoughts, to realize effective pure bike systems in cities (Grava, 2002).

2. Motorcycle; in the early days, a motorcycle was the first step for someone looking for low-cost motorized mobility. Motorcycles are a legitimate means of transportation, even within cities. Those who wish to face a big risk of accidents, weather as they seem and therefore the ire of automobile drivers find the fluid ability to weave forward through clogged traffic a substantial advantage and even a thrill. They usually create more problems in cities and communities that they can solve. Yet, the very fact that they are doing not always conform to general expectations

isn't a sufficient reason to think about exclusion or harsh restrictions. Motorcycles still are, and will stay for some time to be, genuine means of transport in places where a significant cohort population cannot give a car but is able to gain motorcycle (Grava, 2002).

3. Automobile/ private car; Driving a car is vital for people generally because it provides prestige and therefore the opportunity for private control and independence (Ellaway et al, 2003). Owning a car is even more important in sparsely populated areas, as it is the only way to travel long distances due to a lack of other modes of transportation. Driving is usually the only option for independent mobility for older people who have difficulty walking (to the bus stop) or cycling. According to several studies, over 90% of older drivers believe that giving up driving would limit their independence and mobility (Harrison and Ragland, 2003).

The same drivers expressed their dissatisfaction with the poor quality of public transportation. This fear appeared to be grounded in reality, as half of those who had already given up driving thought public transportation was, at least in part, inadequate (Rabbitt et al, 1996). Automobiles are both a community's blessing and a community's curse. They have given an unprecedented level of mobility to the larger part of this society, but they also threaten to choke our centre cities, and they consume resources at a disproportionate rate (Grava, 2002)..

Evidence shows that there are a minimum of three general sorts of motorists:

A. Those who respect cars as their stronghold and an extension of their private space, if not their personality. They will never give up the automobile, short of economic or regulatory coercion, which they will fight with any possible means. They are quite willing to attend out any traffic jams. They will also lobby forcefully for the use of roads and lower expenditures for transit.

B. Those who see the car as a transportation device because the most comfortable and convenient means available at any given time, or the lesser of varied painful possibilities. They are candidates for switching to public and communal modes, but they're going to scrutinize comparative travel times, reliability of operations, need for multiple transfers and waiting, crowdedness, and private vulnerability amidst many strangers(Grava, 2002)..

C. Those that dislike driving for philosophical or practical reasons. They will use transit whenever it becomes available, and that they will advocate the expansion of public systems.

Regrettably, there are very few of them left behind a wheel because there were not too many of them begin with and some gradually conform to the dominant patterns. Convenience does tend to erode conviction (Grava, 2002).

II) Public Transport

Public transportation is a sort of public passenger transportation that operates on a set schedule, follows established routes, and charges a set fare for each trip (Schafer, &, Victor, 2000).

Public transportation in Addis is that the blue-white line "taxies" which are shared mini busses, Anbessa bus, Shger buses, and higer bus. Public transportation in Ethiopia may be a crucial part of the answer to the nation's economic, energy, and environmental challenges - helping to bring a far better quality of life. Increasing number of peoples is using public transportation and native communities are expanding transportation system services. Every segment of Ethiopian society - individuals, families, communities, and businesses - benefits from public transportation (Mulu, 2015).

Public transport is a transport that holds so many numbers of travellers, but for this study, if the travellers' number is greater than, or equal to 11 and 12 in one car it is considered as public transport. Public transport means all means of transport which are available to the public and unrelatedly of ownership. In addition to the scheduled services of the bus, coach, domestic air and rail operators, including taxis, private hire buses and coaches, and the tour/ excursion market are served by the coaching industry. Provision of school services by hired-in buses and coaches, which may in some cases be restricted to pupils of a specific school or education authority, is also included as public (White, 2009).

According to Grava (2002), most of the transportation modes can make a reasonable claim to be able to satisfy all trip purposes within the community. There are, however, modes that are best suited to specific situations with specific requirements. The options are more complicated when it comes to user groups because people have different expectations. These include everything from prioritizing comfort features to a single-minded focus on affordability.

1. Taxi; there is a widespread belief that taxis provide a high-end service to our society's wealthy. As far as it goes, this is true in the larger cities, but it isn't the entire story. For hire

services very much have to be counted among public transportation modes in any community today (Aryu utami dewi, 2010). Everybody needs a taxi occasionally for emergencies and as a backup for the personal cars and regular modes of transit, as a personalized public carrier. In smaller places with limited public services, taxi or local car services are the backup means of mobility at one time or another (Aryu utami dewi, 2010).

2. Buses; Buses without question are the workhorses of the transit world. There are many places where buses are the only mode of public transportation available; there is no a city which transit does not have a bus component. Despite the use of private cars, all indicators-passengers carried, vehicle kilometres accumulated, size of the fleet, accidents recorded, pollution caused, workers employed, or whatever else show the dominance of buses among all transportation modes in this country as well as anywhere else around the world. Bus service tends to be slow and the vehicles are frequently not particularly comfortable. They are regarded as common, both in the sense of "occurring frequently" and "lacking special status". Nevertheless, buses provide the base service in most places. They can transport substantial commuters' loads, and the service can be meaningfully advanced if good attention is paid (Aryu Utami Dewi, 2010).

3. Bus Rapid Transit; BRT is for Bus Rapid Transit. Many specific BRT actions are not capital-intensive and they do not cost large additional funds, but, because most such efforts are beyond the regular procedures, they do require the expenditure of personal and institutional energy to achieve implementation (Aryu Utami Dewi, 2010).

BRT, in its current definition, includes all programs and actions that allow urban bus service to run faster, but it also (and perhaps more importantly) includes those that provide better reliability, safety, and human amenities, such as good ventilation, comfortable seats, and secure waiting areas(Aryu utami dewi,2010).

It cannot be seen as a separate transportation mode, but rather as an advanced variant of the basic bus mode, as perhaps something that all bus operations should gradually move toward and eventually become, at least in those situations where significant volumes of passengers have to be accommodated (Aryu utami dewi, 2010).

4. Mini Bus Taxi; About 8,809 minibus taxis operate in the city of Addis Ababa, which has a seating capacity, is of 12 passengers" but 7, 494 minibus taxis properly working on the routs.

Many of these automobiles are ancient in age. These minibus taxis function on five zones and 364 routes and carry more than 1.1 million passengers per day. The minibus system provides employment opportunities to a large number of people direct and indirect. The charges are controlled by the urban administration; but, they are typically two to three times more expensive than that of city bus prices.

Addis Ababa has a large number of shared taxi services. Most of the communal taxi workers own a single automobile generally the buses are operated by signing workers, that is, drivers and their aids. On average a minibus taxi covers about 138 km per day and makes 15 trips. Most of the passengers belong to low and medium-income groups (Mulu, 2015)

Figure 2.1 Mini bus taxies

5. **Higer Mini Bus**; In the city of Addis Ababa, about 461 higer midi buses are planned, with a capacity of twenty-five passengers, and 411 higer buses are currently operating on the routes. Most of these vehicles are out of the market in a short period of time because their quality is very low. These higer midi buses operate on three zones and thirty-seven routes and carry more than 700,000 passengers per day. A large number of people are directly and indirectly employed by the higer minibus system (Mulu, 2015).

Figure 2.1 Higer bus taxies

6. Anbessa Bus; Addis Ababa is the centre of both the country of Ethiopia's and Oromia regional state , and this is one of the country's nine regional governments (UN-HABITAT,

2011); Anbessa city automobiles has been the main mode of (formal) community transport for the city and at least thirteen of the adjacent Oromia region towns for more than seven decades. It has played a significant role in integrating the culture and socio-economic life of the city and neighbouring Oromia towns through covering long distances and being relatively affordable to the lower class citizens (Mulu, 2015).

According to studies, adequate growth and transformation in modernizing the service delivery system in a way that is accessible to in-need urban dwellers has not been observed (Mintesnot Gebeyehu and Shin-ei Takano 2007).Particularly to Addis Ababa, the Federal and City government and transport regulatory bodies take the lion's share in protecting the right of users through the allocation of considerable funds to transform the sector, (UN-HABITAT, 2011).

Better availability of Anbessa buses could also be potential through the role of citizens and civil humanity groups in influencing the worker regarding the service delivery. Active participation of the community, coupled with engagement of lobby groups that intend to play a role in public transport service provision influence the accessibility of the Anbessa bus service through challenging other stakeholders on different platforms and attracting the attention of media, (UN-HABITAT,2011).

What matters in Ethiopia, however, is that the community, media, and civil society groups lack the confidence to lobby or express their views on government enterprises due to fear of negative consequences from the government that is likely to harm their immunity (Mintesnot Gebeyehu and Shin-ei Takano ,2007).

Figure 2.2 Anbesa buses

7. Sheger Express Bus ; Sheger Express bus is one of the mass transport services providers in Adds Ababa city and it starts in 2016. When the service launched at the end of May 2016, transit

users waited in long lines to take advantage of a free trial service on 10 Sheger Express buses running from Mexico Square to Shiro Meda. According to Ababa City Administration Road and Transport Bureau (2017), Addis Ababa's new Sheger Express bus system is changing the face of public transport in a city where adjacent to 60% of the residents' paces to their endpoint. With public transit demand at an all-time high, the emergence of Sheger Express buses promises to provide some relief. Features of the Sheger Express bus contain comfort of access for the elderly, physically challenged, pregnant women, and children, air conditioning, and a GPS.

Buses will arrive at limited stops every 10 minutes, allowing passengers to get to their destinations faster. Sheger, the bus operator, plans to launch two more new services in the next three years, including the city's first school bus service and a BRT system. The BRT will be a high-quality public transportation system with an aim to provide faster, more comfortable and cost-effective service through a dedicated bus lane. To ensure that the development process is inclusive and that any potential questions about the BRT's impact on Addis Ababa residents are addressed, plans are in the works to engage citizens on a wide range of issues, including future disruptions, bus logos, and station design.

Figure 2. 3 Shger buses

8. Public / Blue Bus; Transportation service for federal and Addis Ababa city civil servants was launched 199 and adding twenty buses from bishoftu automotive and locomotive industry of the planned 410 buses, which transport civil servants towards and from job, gives a paid service for the overall public during the rest of the day. Lack of transportation service has been a critical problem in Ethiopians capital city, Addis Ababa. It is very common to see people queuing up for a long time on the main roads of Addis as they try to race for time. This was particularly a source of worry for civil servants who had to report to their offices on time and provide services to clients waiting for them (Mulu, 2015).

Figure 2.4 Public buses

8) Light Railway: Light rail System is part of the modern mass transit system which has a vital role in the transformation of cities. Light rail can connect existing modes of transportation to city centres and suburbs. The Addis Ababa light rail transportation is a modern conveyance scheme designed to progress mass transportation and to decrease transportation difficulties in the city.

The opened line covers 11 miles from the industrial areas in the south of Addis Ababa to the centre of the city and the same length from east to west. The two lines have their own dedicated power grid that will be able to carry 60,000 passengers an hour when they are fully operational. The costs are 4 ETB (Ethiopian Railways Corporation, 2021). Its goals are to provide an alternative to the city's road-based public transportation system, reduce passenger journey times, and provide a more environmentally friendly mode of transportation

Figure 2.6 light trains

2.3 Definition of Modal choice

Mode choice is directly connected with the behavioural part of human nature, which means that it is related to the participation of humans especially transport users to choose by which means of transport that they travel .The selection of the mode of travel by urban population is determined by the purpose of the journey, characteristics of the trip maker, characteristics of the trip, characteristics of mode as well as many latent factors like comfort and convenience, its frequency, timing, length, characteristic participant and their economic status etc. (White, 2009).

2.3.1 Modal Choice in Ethiopia

Currently in the world, where globalization continues to grow, the founding of a well-maintained road network and infrastructure will advance the nation's competitiveness and maintain an advantage over its rivals. However, it must be regretful to acknowledge that the Ethiopia transportation sector is unsustainable especially with the rapid rise of car numbers and usage on the road.

The number of vehicles in the country has increased tremendously in the past two decades. In underdeveloped countries, economic growth and rising mobility demand are leading to an increase in passenger car ownership. This has led to congestion and consequently increases carbon emission (Mulu, 2015).

2.4 Factors Affecting Modal choice

Understanding mode choice is vital because it influences how effectively we travel, how much urban space is dedicated to transportation functions, and the range of options available to travellers (Mokhtarian , 2005).

According to the Mokhtarian , 2005 the transport mode choice has been studied both in the situation of urban mobile as well as intercity level. The home-based work trip has been the focus of urban travel mode choice modelling. Most of these modes include only motorized modes, through increasingly non-motorized modes (walk and bike) are being included. Intercity travel mode choice models are typically divided into categories such as purpose (business vs. pleasure), day of travel (weekday vs. weekend), part size (individual vs. group travel), and so on (Mokhtarian , 2005).

The transport meanness in such models typically includes the means of car, rail, air, and bus. In the large volume of literature on mode choice, scholars have identified six general groups of factors that individually or collectively influence people's mode choice. The six groups of factors are:

1. Physical environment and urban form, such as, land use and transportation planning, and infrastructure density,

2. Mode-specific or service factors, such as travel cost and transit proximity, and environmental awareness.

3. Personal attributes, such as age, gender, and income; a shared residence

4. Trip characteristics, such as time of travel; travel distance,

5. Travel demand management (TDM) measures, such as discounted bus passes;

6. Psychological factors, such as environmental awareness, attitudes of transport modes, and perceived safety (Mokhtarian , 2005).

So far, scholars find that some physical environment factors, personal attributes, and psychological factors may help explain the mode choice of the travellers. It is, however, unknown whether these factors may jointly influence the modal choice. Even though there are so many factors which affect the modal choice of the passengers, but in this research the researcher needs to investigate the most common factors of modal choice in Addis Ababa, especially in Yeka Sub –City. For the purpose of analysis those are categorised in to five categories.

1. Characteristic of the transportation facility; Vehicle in time, Comfort and convenience, Safety,

2. Personal attributes, such as age, gender, marital status, income level, family size, education status, employment status

3. Trip characteristics, such as time of travel; travel distance, trip purpose, and travel cost

4. Psychological factors, such as attitudes towards buses, attitude of people towards bus users, and lifestyle

5. Physical environment and urban form it includes availability of parks, urban land use type & design, and network of roads

2.5. The impact of Modal choice on Urban Mobility

Urban mobility has been one of the most important and challenging issues in our times. It is a catch-all term which means we are discussing the ease and speed with which people, goods, and services can move around in urban areas. The definition of urban mobility refers to all aspects of movement in urban settings. It can include modes of transport, such as walking, cycling, and public transit, as well as the spatial arrangement of these modes in a built environment. Urban mobility is a critical factor underlying global sustainability and has a significant effect on the quality of life in cities (Jean-Paul Rodrigue, 2020).

At its most basic level, urban mobility is about getting people from one place to another. However, that is not all it encompasses; it also includes how people get around within urban areas for both work and leisure activities like shopping, dining out, or visiting cultural sites. The ease with which people can go about their lives without having to use motorized vehicles is an important feature for many cities. Urban mobility influences our quality of life. The more people who can move around without cars, the better cities are for the environment, public health, and even for our mental health .The problem is that urban mobility has never been easy. We must live with congestion, long distances, and poor infrastructure (Jean-Paul Rodrigue, 2020).

Efficient transportation and mobility is and will continue to be the backbone of cities' growth and competitiveness, based on a balanced mix of public and private transportation and dependent on the characteristics of each city. There are numerous urban mobility measures that aim to balance supply and demand, and they are used all over the world.

Cities require high-quality, efficient public transportation systems that can meet the needs of businesses and citizens for increased mobility. Buses, cars, metros, tramways, and trains must all be integrated into these transportation systems. Additional provision for initial projects on integrating private and public transport should be endorsed. New concepts need to be advanced that provide flexibility, quality, efficiency, and affordability. As customer demands rise and price constraints bite harder, passenger journeys, logistics, and freight delivery are becoming

increasingly complex in the post-industrial city. These are progressively creating problems for residents as well as for local and international businesses (Clelie, 2018).

The urban mobility of now is converting more and more diverse in character. Economic prosperity and growing use of the car, two phenomena which had been associated with each other for a long time, are not necessarily linked today as they were until a decade ago. When one looks at the cumulative numbers, it is evident that in numerous cities the modal parts of public transport, cycling and walking are growing. On the one hand, these expansions have been supported by considerable interferences and policies which disturb the supply side. At the same time as road tolls and parking restrictions are challenging the attractiveness of the car, alternative modes are being improved: public transport coverage is increasing; cycling lanes and pedestrian areas are being expanded (Clelie, 2018).

New mobility options such as bicycle- and car-sharing schemes complement these changes. Their use, especially in combination, greatly benefits from information and communications technology and the digital age. On the other hand, while it is factual that an emphasis on the source side can to some extent clarify these inclinations, it does not take into account the fact that mobility and mode choices are heavily influenced by personal and social factors, habits and expectations. Moreover, the 'built environment' may also shape mobility decisions. Compact and dense cities enable people to live virtually car-free, and there is evidence that people choose their residential location because they explicitly seek the lifestyle that goes with their choice (Clelie, 2018).So the modal choice has its own impact on urban mobility, because the existence of choice of people private car and taxies than buses will the result of traffic congestion, dalliance, air pollutions, traffic accident and parking difficulties.

2.6. Empirical Review

Wilson (1967) discussed that the attempt to establish the modal split for work trips by public transport and private mode for cities in the United States of America (USA), the regression model was used to reach the mode choice in a city. The independent variables were travel time, travel cost, sex, and income level. He concludes that travel time and travel costs are significant variables but sex and income are insignificant variables. Mc Gillivray (1970) discussed that the mode choice model for Chicago using multinomial Logit model with utility variables such as cost, age, parking cost, travel time. The author concludes that age was found to be insignificant

but travel time and parking cost are significant variables. Yu (1970) discussed that the "abstract model" to establish the interaction between two similar competing public transport modes for Virginia City. The variable which was used in the study was travel time, cost, sex, income level and purpose of the trip. Time series analysis was done to calibrate the model. He concluded that the travel time and cost had a significant impact on mode choice and but sex, income level, and trip purpose were insignificant variables.

Thamizharasan and Rengaraju (1996) attempted to present the mode choice of intercity travel among public transportation systems in Tamil Nadu. Demographic characteristics and socioeconomic factors were used as variables in the model's development. A regression model was used to estimate the mode choice. He concluded that the variables of demographic characters and socio-economic characters had a significant effect.

Ponnuswamy (1992) discussed how people choose their mode of transportation for Chennai City using behavioural science techniques such as Delphi and Trade-off games. He was considered the parameters such as travel time, cost, comfort, safety, air pollution, and noise for developing the model. He concluded that the highly sensitive variables such as travel cost, travel time, and comfort had a significant impact on mode choice. But safety, air pollution, and the noise had an insignificant impact on mode choice. Thamizharasan et al. (1996) discussed that the mode choice between the public transport and private vehicles of households without vehicles in Trichy city. A binary Logit model was employed. The model mainly considers independent variables such as working members, age, sex, employment status, and distance. The author concluded that the variable distance had a significant effect on the mode choice. But other variables such as working members, age, sex, employment status had no significant effect on mode choice. Koppleman and Wen (2001) discussed the mode choice between the public transport and private transport system in Atlanta. A logit model was applied. Variables that were used in the model were travelled time and travel cost. The author concludes that both travel time and travel cost had a significant impact on mode choice. Nevertheless, the disaggregate accessibility variables are not adopted in traditional aggregated travel demand forecasting.

According to Axhausen & Simma (2003), elder people have more choice to used public transport and young have no enough income to buy their own car. But according to Schwanen, et al (2001) Car ownership is the more significant effect on model choice, rather than the age is not much

influence factor on the selection of the mode and he also concludes that women are less likely to use the car in general than men's, in particular public transport while men are less dependent on public transport. According to Mintesnot and Takano (2007), the major mode choice of public transport is bus and taxi in the city of Addis Ababa. The Authors employed an ordered logit model to examine the citizen perception on modal choice. The variables that used in his study where fare, convenience, and frequency. The Authors conclude that all variables are a significant influence on the choice of bus transport system. According to Utami (2010), the choice of transportation mode is affected by many factors such as gender, income, education, travel time, convenience, accessibility, safety, etc. All of these factors are related to the socio-economic and service attributes. Form those incomes; education, travel time, and travel distance and safety are significant effects of mode of transport choice. But accessibility was not a significant impact on the choice of transport mode. According to De Witte, et al (2013) peoples who have high social status and have higher educated has more likely to have a high income and for this reason, they are using a private car to go to their workplace. In contrast, the people are more educated they use public transport frequently than the car (Schwanen et al., 2001).

Methodology gap: According to the review literature many researchers were assessed the factors affecting modal choice, but those researches were assessed based on inferential statics, but this research were used descriptive statics in addition to inferential statics. Plus to that this research used qualitative data's in addition to quantitative data unlike the pervious researches.

Research gaps : there is a research gap related with the influence of modal choice on urban mobility ,in addition many factors related with modal choice were not addressed ,so this research were tried to fill this research gaps .

Concluding remarks: in general on this chapter different points were explained, and give much important information for the researcher. For example this chapter gives a hint for the researcher how the problem was serious ,in addition the researcher were get in formations about how to assess the factors affecting modal choice .In addition different definitions were clarified in this chapter like the definition of transport and public transport ,modal choice and other important points were explained in this chapter . Plus the researcher were understand the research gaps by reviewing different literature, this this researcher were did to fill the reasrch gaps.

2.7. Conceptual Framework

The conceptual framework is the blueprint of the research work that guides the researcher to conceptually understand the research and outline, and operationalized the dependent and the independent variables.

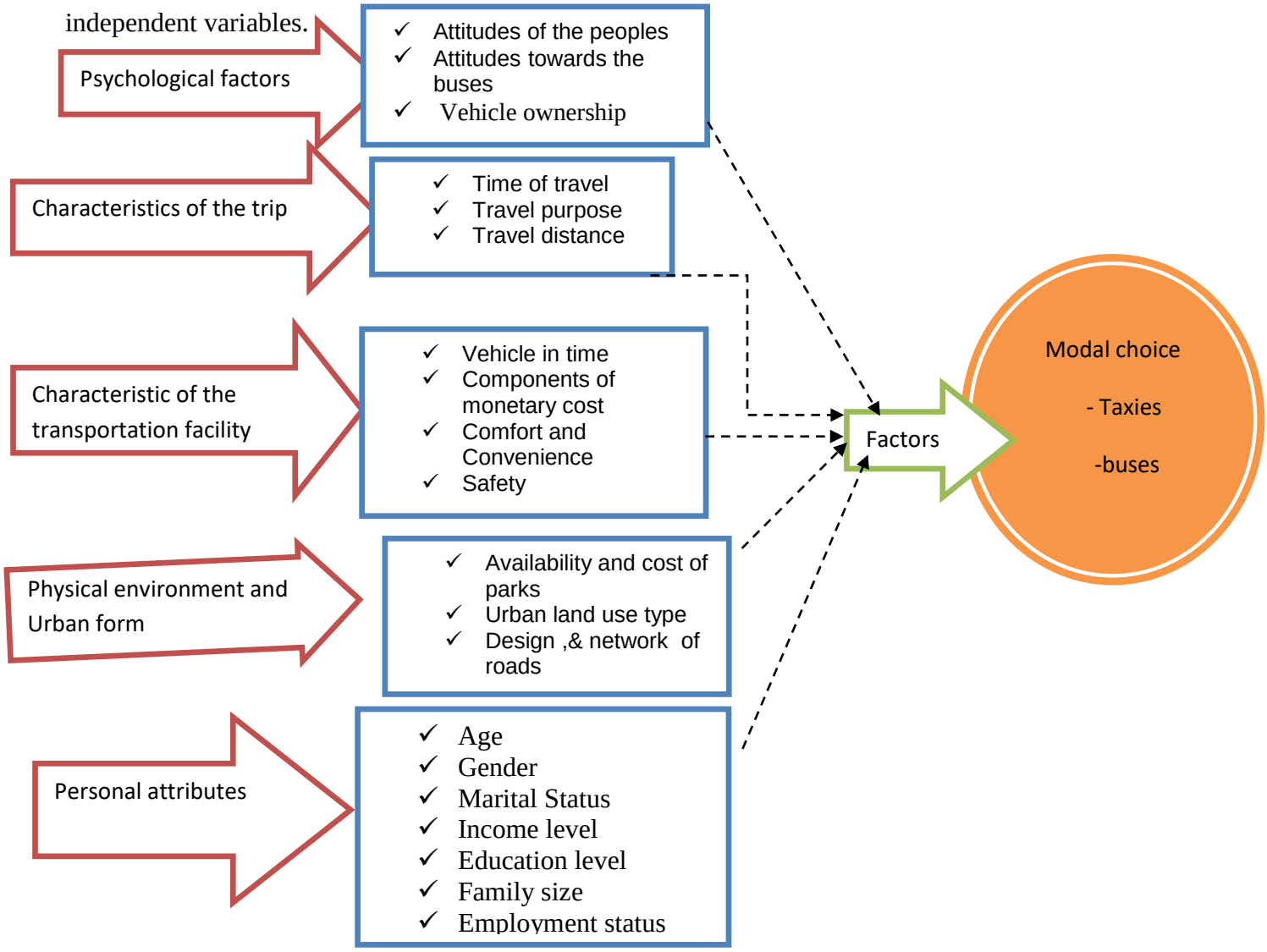

Figure 2.5 Conceptual Framework of the study

Chapter Three: Research Methodology

3.1. Descriptions of the Study Area

The study area is located in the central part of Ethiopia it is the capital city of Ethiopia which is called Addis Ababa. From Addis Ababa, the specific site of the study area is the Yeka sub-city. Yeka is one of the 11 sub-cities of Addis Ababa, the capital of Ethiopia. The absolute location of the Yeka sub-city is 9° 2 ´14.28″ N,& 38° 50´ 6″ E . According to 2007 the population census of Ethiopia Yeka sub-city contained 368,774 populations, and its area was 85.46 km square. Yeka Sub City is bordered by Gulele in North west, in west and south west it is was bordered by Arada and Kirkos respectively, again in south and North east Yeka is bordered by Bole and Lemi kura Sub city respectively .The researcher was familiar with the transportation system of Yeka sub _city that is why the researcher selected Yeka sub city for this study. Again next to Akaki Kality sub city, Yeka is the second largest sub city from Addis Ababa sub city, that way the researcher select this sub city as a study area . Selecting the next largest sub city is used to refer the transportation system the other sub cities.

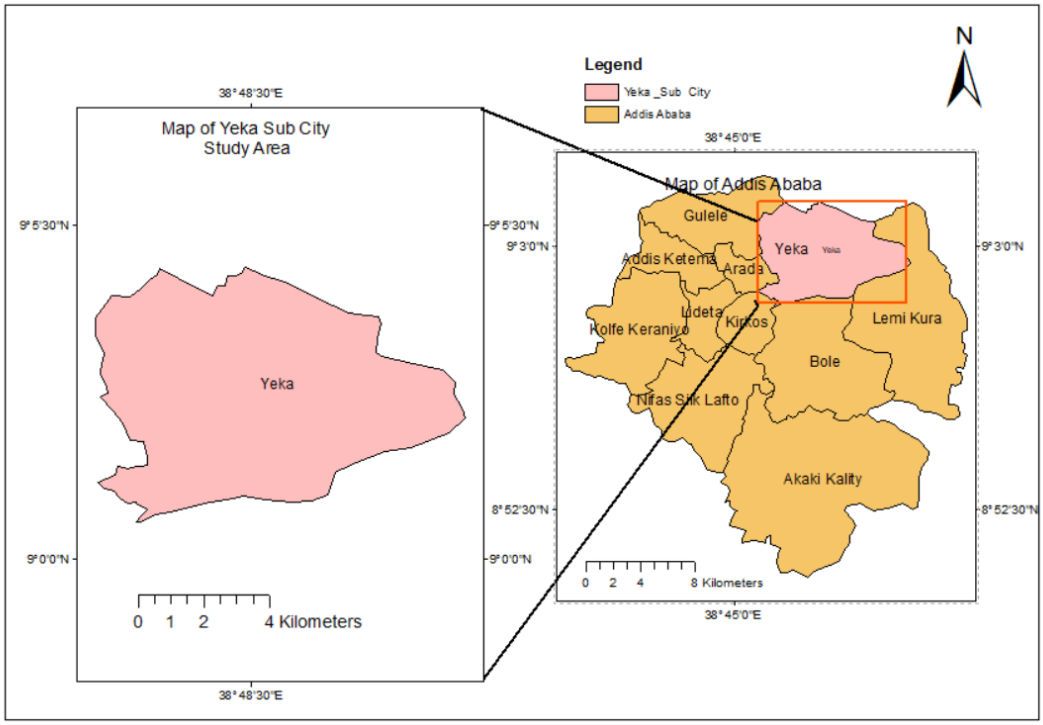

Figure 3.1 Location map of the study area (Prepared by Author,May,2022)

3.2. Research Approach and Research Design

This study was conducted in order to explore the root factors of modal choice in Addis Ababa City, in Yeka Sub-city. To be able to gather the necessary data, the study was undertaking mixed types of research. As broadly recognized, the mixed method of research is a method to an inquiry involving collecting both quantitative and qualitative data, integrating the two forms of data, and using distinct designs that may involve empirical assumptions and conceptual frameworks.

The current study used a concurrent research design means that the collection of qualitative and quantitative data simultaneously. Quantitative driven concurrent design (QUANT + quall); the core component is quantitative and the supplementary component is qualitative or primacy was given for the quantitative data as it is often important in explaining the fundamental processes of issues in a phenomenon to the possible detail.

More over the overall research design, or somewhat its structure is explained on the next page diagram.

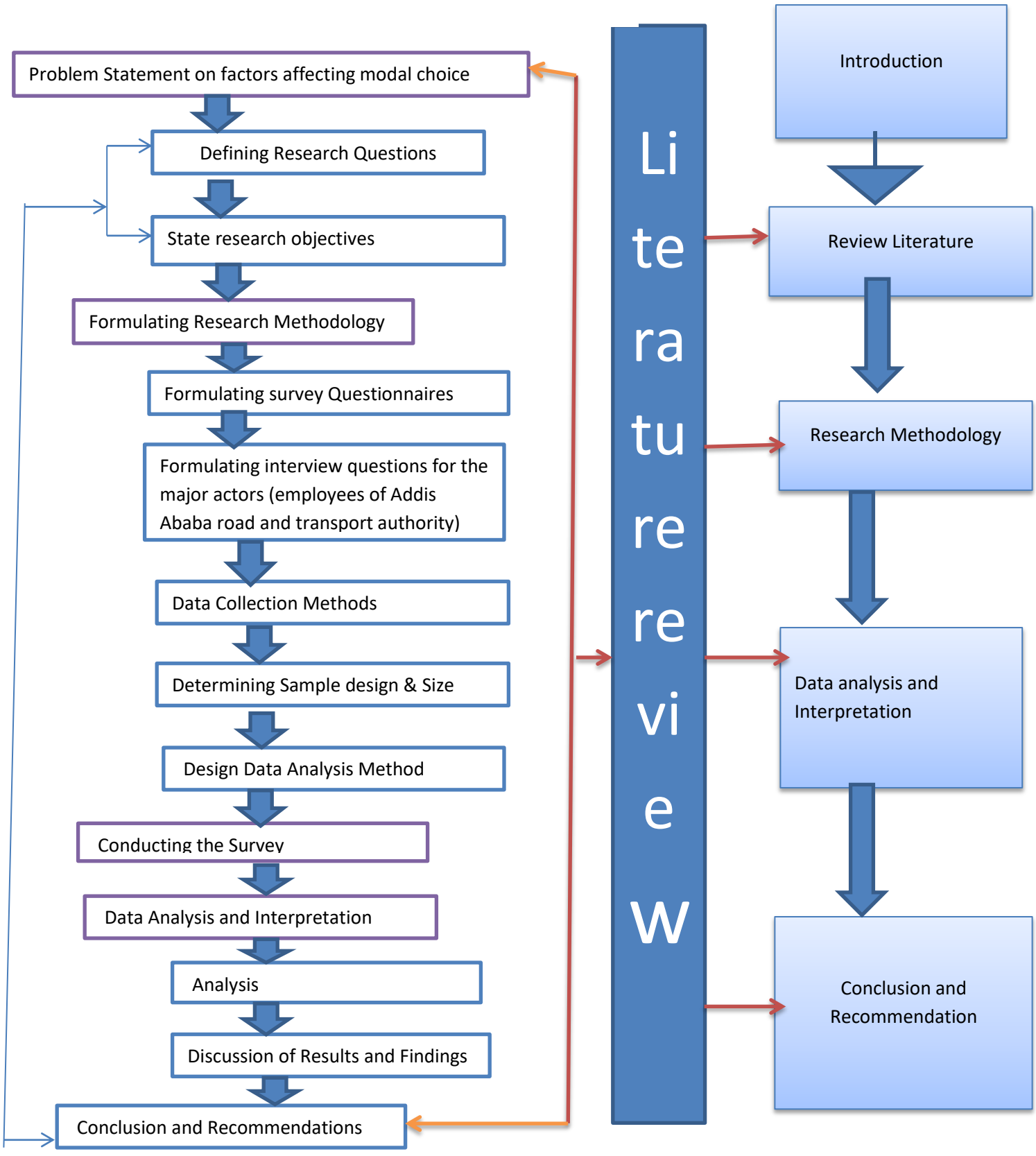

Figure 3.2 the overall research structure, or research design

3.3. Data Sources

The present study employed both primary and secondary data sources. Primary sources are the main source of information for the study, some information for the study has been collected by the researcher from selected individuals who have information advantages and offices such as, Addis Ababa road and Transport Authority, and also the passengers via interviews and questioners respectively.

Secondary data were collected from different written hard copy materials, prior studies, official documents, and related literature which are related to the factors that affect modal choice. These sources were used to help to develop a conceptual and theoretical framework for the study and to substantiate the valuable information. Moreover, the researcher had been look at archival sources from Addis Ababa road and Transport Authority. The researcher used instruments such as open and close-ended questionnaires and semi-structured interviews to collect primary data. To sum up the study was used both primary and secondary sources.

3.4. Data Collection Methods

From the quantitative method the researcher used questionnaires whereas, from the qualitative approach, the semi-structured interview was selected. The study begins with broad questionnaires in order to generalize the results and in the second phase on qualitative semi-structured interviews was used to collect detailed information from the employees of the Addis Ababa road and Transport Authority. The relevant primary data was collected from passengers those who use the road routes which are found in Yeka sub-city by distributing questionnaires to be filled by the passengers. The primary data collection tools consisted of the following

Interviews; Interview was conducted with key informants from Addis Ababa Road and transport authority employers. The interviewer inspires members to freely deliberate their spirits and opinions, and investigations on questions to gain insight and depth to responses. This study has been used semi-structured interview to be flexibility in obtained information from investigators.

Questionnaire; the questionnaires were used as tool of data collection. It was provided to for all selected samples of passenger's. The questioner it has been open and close ended questioners

Observation; Observation is a focused, systematic and selective way of viewing and listening to a collaboration or occurrence as it takes place. There are many situations in which observation is the most appropriate method of data collection. The road design as well as the availability of parks existed in Yeka sub-city was observed the researcher.

As the researcher explained on the above, secondary data was collected from different written hard copies documents' that are related to factors that affect model choice in urban mobility in Addis Ababa, in the case of Yeka Sub-city from reports and documents. Secondary data's where used to organize both the empirical and conceptual frame work. A mixed-method is useful to capture the best of both qualitative and quantitative approaches. In this situation, the advantages of collecting close-ended quantitative data and open-ended qualitative data provide the advantages to gather sufficient information.

3.5. Sampling Design

3.5.1 Sample population

The target population of the study was the communities who lives in Yeka sub-city where the target population. In addition to the communities who live in Yeka Sub City, the community who uses the roads that are found in the Yeka sub-city was the part of the sample, but most of the selected road users where live in Yeka sub city. So the sample was taken from the Yeka sub-city that was used to study the factors that affect modal choice in urban mobility in Addis Ababa, in the case of the Yeka Sub-city.

3.5.2 Sample size determination

In accompanying a research study, it is basically impossible, time-consuming and too costly to test every individual in the entire population. Therefore smaller portions of a unit sample are chosen to signify the relevant characteristics of the whole of the units. The researcher was used rationale of the total population to determine the sample size formula ;- (Yemane, 1996)

$n= N /1+N (e^2)$

Where n= total sample size

e=error (0.05)

N=total population

*According to CSA 2007, the total population of Yeka Sub-City is 368, 774. So

n= 368,774/1+368,774(0.05²)

n=368,774/921.9375 =399.99 =400 so the sample size of this research was planned 400. Here from the total sample, the researcher was used 360 samples for the questioner; the remaining 40 samples used for a semi-structured interview. But only 338 samples where answered the questions in a complete way so the researcher used in this study 338 sample for questioners ,and 40 samples for semi structured interviews ,totally 378 samples gives complete information. From 40 employees 14 where females, but the remaining 26 of respondents where males, again the employees distribution where 11 of them from integrated transport information system study office, 8 of them where from transport infrastructure system office, 9 of the respondents were from integrated peoples and goods transport organization and transit payment office, 7 of them where from communication office, and the remaining 5 of them where from human resource administration office.

3.5.3. Sampling and Sampling Technique

Before the researcher takes the sample from the population who uses transport routes as well terminals, the researcher were did survey, or the researcher observes the area, during that time the researcher gets information about the areas transportation system .Based on that the researcher where selected the three transport routes those are from Megenange to Hayat , from Megenanga to Wosen ,and from Six killo to Megenanga mostly facilitated by Megnenage and Lamberet terminal which are the main terminals of Yeka Sub City. So to collect the information about those transport routes, the researcher where selected the two terminals because on those terminals the researcher can get enough samples that represent the whole population.

After that the researcher had used simple random sampling to select the passengers. Random sampling from a finite population refers to that technique of sample selection which gives each possible sample amalgamation an equal likelihood of being selected and each element in the whole population to have an equal chance of being encompassed in the sample. In brief, the inferences of random sampling (or simple random sampling) are: (a) It offers each element in the population an equal likelihood of attainment into the sample; and all choices are independent of

one another. (b) It gives each possible sample combination an equal probability of being chosen (Kothari, 1990).

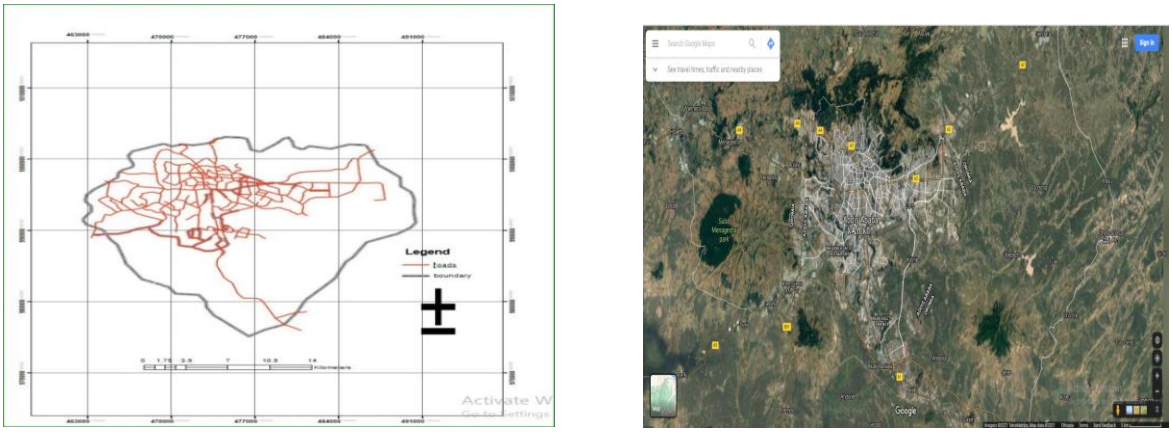

Figure 3.3 Road network of Addis Ababa

The above figure shows the road network of the city is vary from Sub city to Sub city or from center to outside part. For instance in Yeka sub city they are three main transport routes those are Six kilo to Megenange , Megenanga to Hayat ,and Megenanga to Wosen roads those roads are given many service to travelers on that sub city as well as to another sub city . So the above terminals where selected based on purposive sampling, but to select the respondents or passengers, the researcher where used simple random sampling method.

Here are the following steps to explain more;

Stage 1: Determining the place where the study should be carried out in the Yeka sub-city, it is selected randomly from the whole sub –city of Addis Ababa based the familiarity of the researcher.(The researcher where selected the two terminals based on survey information via purposive sampling technique) .**Stage 2**; Select respondents, or sample from the study population, or from the whole population who lives in the Yeka sub-city and uses the transport modalities: here the researcher was selected communities who are the users of selected road routes by using simple random sampling techniques. After selecting 360 samples via simple random sampling on those terminals the researcher tried to distribute the questioners, but on the questioners there is one note that is if they are not live in Yeka sub city they could not full fill the questioners, rather they skipped to another person who lives in Yeka sub city because the

research study area is Yeka sub city. On the distributed questioners 338 questioners where fulfilled in a complete ways, so the researcher where used 338 samples for questioners.

In Addition, the researcher had selected 40 employees who were worked at the Addis Ababa Road and Transport Authority for a semi-structured interview via purposive sampling. The best sampling method for this research was purposive sampling method. Purposive sampling occurs when items for the sample are selected deliberately by the researcher. Based on this the researcher had been used totally 378 samples, 338 for quantitative purpose, the remaining 40 respondents were used for qualitative purpose.

3.6 Method of Data Analysis

For quantitative data, the study was used both descriptive and inferential data analysis techniques with the help of statistical Software like SPSS 25 version. According to Walpole and Myers (1993), statistical methods are grouped into two parts namely descriptive statistics and inferential statistics. A descriptive statistic is related to the collection and presentation of cluster data that provide useful information. The physical background (demographic characteristic) of the respondents and the influence of modal choice on urban mobility where analyzed by descriptive statistics, whereas the factors which affect the modal choice were analyzed by inferential statistics. The inferential statistic includes all methods associated with partial data analysis until the forecast or inferences about the overall data.

In descriptive statistics, pie charts, frequencies, percentages, tables, and graphs has been deployed. In inferential analysis this research had been conducted by using binary logistic regression as discussed below. The rationale for using logistic regression is that it has an advantage over the linear probability model (Gujarati, 2007) and the use of its binary type is because the dependent variable (Modal choice) has only two outcomes i.e. either it choose taxies transport mode or bus transport mode. This can be indicated in the next way;

$$Y = \begin{cases} 1 & if\ the\ passanger\ uses\ \ Buses \\ 0 & if\ the\ passenger\ uses\ \ taxies \end{cases}$$

P(y=1) = p

(1-P)=p(y=0) =p, Where, Y is modal choice is assuming the value 1 for Buses and 0 for Taxies.

The data gathered through different methods was interpreted and analyzed by using qualitative and quantitative analysis. To support the empirical findings, first-hand information was analyzed by using descriptive methods. The data collected through the aforementioned research tools could be organized in a way suitable for analysis using computer software. Descriptive and inferential data analysis methods were employed using Statistical Package for Social Scientists (SPSS) Version 25 for Windows Software. Again to show the influence of spatial data like land use type and network of roads on modal choice ArcGIS10.8, Google earth pro, and Erdas imagion.14 software's where used by the researcher. When qualitative data analysis is considered the semi-structured interview methods .The semi structured data was analyzed through framework analysis by coding texts and word by word (verbatim) form of a transcription of the collection, data and summarize the words.

3.7. Model Specification

Logistic regression is useful when the researcher where tried to model a categorical dependent variable (DV) as a function of one or more independent variables. For this research the researcher was used binary logistic regression; because the dependent variable is categorical those are taxies and bus transport ,So for this analysis the researcher had been used binary logistic regression method .The formula are expressed below ;

$$ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_{5x_5} + \cdots \beta_p x_p$$

P= probability of using buses, $\frac{p}{1-p}$=odd ratio

If probabilities of the use of taxies happening by the passengers needed, the logistic regression equation can be writer as: $p = \frac{exp(\beta_0+\beta_1 x_1+\beta_2 x_{2+\beta_3} x_3+\beta_4 x_4+\beta_5 x_5 \cdots+\beta_p x_p)}{1+exp(\beta_0+\beta_1+\beta_2+\beta_3+\beta_4+\beta_5)}$

$$Y = \begin{cases} 1 \ \ if\ the\ passanger\ uses\ \ buses \\ 0 \ \ if\ the\ passenger\ uses\ \ taxies \end{cases}$$

P(y=1) = P

P (y=0) = (1-p): Whereby modal choice is assuming the value 1 for buses and 0 for taxies where us, x is independent variables.

3.8. The Study Variables

Dependent Variable: The response variable for this study is the factors of modal choice in urban mobility in Addis Ababa in Yeka sub city. Modal choice is related as: buses, and taxies. The response variable is binary logistic category and our interest of the study is buses. Thus, the dependent variable is coded as: 0 for taxies, and 1 for Buses.

Independent Variables: The independent variables in this study are classified as five categories, but totally around 21 independent variables where selected, those are related with factors of modal choice for this study. 1. Characteristic of the transportation facility; Vehicle in time, Comfort and convenience, Safety, 2. Personal attributes, such as age, gender, marital status, income level, family size, education status, employment status,3.Trip characteristics, such as time of travel; travel distance, trip purpose, and travel cost**,** 4.Psychological factors, such as attitudes towards buses, attitude of people towards bus users, and lifestyle **,**5. Physical environment and urban form includes availability of parks, urban land use type & design, and network of roads.

The next table summarizes the independent variables and dependent variables with their measurement scale.

Table 3. 1 Types of Variables and Measuring technique

Variables	Types of Variable	Measurement scale & description	Measuring the influence of the variables
Characteristic of the transportation facility; includes Vehicle in time ,Comfort ,&Safety	Independent	Inferential statistics	Binary logistic regression to assess their influence
Personal attributes, such as age, gender, marital status, income level, family size, education status, employment status	Independent	Inferential statistics	Binary logistic regression to assess their influence
Psychological factors, such as attitudes towards buses, attitude of people bus users, and lifestyle	Independent	Inferential statistics	Binary logistic regression to assess their influence
Trip characteristics, such as time of travel; travel distance, trip purpose, and travel cost	Independent	Inferential statistics	Binary logistic regression to assess their influence
Physical environment and urban form includes availability of parks, urban land use type , and design & network of roads	Independent	GIS and Erdas imagion based analysis	Er das imagine analysis of urban land use type ,& GIS based analysis of the network of roads
Modal Choice ✓ Choosing of Buses ✓ Choosing of taxies	Dependent	By using the GIS based and inferential statistics	Using the above all measuring types.

(Source: Organized by the author, April, 2022)

3.9. Ethical considerations

In this research ethical issues was considered by different techniques first data collectors was inform the participants of the study about the aim of the study and participating in this study is only based on their willingness even after starting interview or filling the questionnaire participant could be told it's their right to escape questions they don't what to answer or quit participation. Confidentiality was assured by using pseudo names or by coding the questionnaires.

Table3. 2 Summary of research methodology

Research questions	Data and variables needed to be answered in the research question	Methods of analysis used to answer the question	Purpose of findings
Which types of modalities are selected by passengers for transportation (buses, or taxises)?	Survey on the passengers to identify their choice; either from Buses, or taxies.	Descriptive analysis and Pie chart based presentation of their choice.	To identify the choice of modalities by passengers on transportation system in Yeka Sub-city
What are the factors that affect the modal choice?	Survey on the passengers to evaluate the factors on modal choice.	Inferential statistics based on binary logistic regression	To evaluate the factors that affects the modal choice in the in Yeka sub-city.
How the modal choice affects urban mobility?	Survey on the passengers to assess the influence of modal choice on urban mobility. And interviewing the employees to investigate the influence of modal choice on urban mobility	Descriptive statistics :table based analysis Qualitative based analysis are employed	To investigate the impact of modal choice in urban mobility, in Yeka sub-city

(Source: Organized by the author, April, 2022)

Chapter Four: Results and Discussion

4.1. Introduction

The chapter has four sections. The first section presents and discusses the demographic characteristics of respondent's while the second section presents the choice of transport modes by passengers in Yeka sub city. The third section is related with the evaluation of the major factors which affect the modal choice and the last section investigating the impact of modal choice on urban mobility in the study area. Generally; this chapter, it can be said, is the main part of this study. It basically reveals the finding of the research along with discussion which is implanted in every piece of its section.

4.2. Demographic Characteristics of the Respondents

This section attempts to show the overall demographic characteristics of respondents for this research. The researcher used 378 samples, from those samples 40 of them were interviewed, the remaining 338 respondents where filling the questioners. Based on the questioner here in this part the researcher analyzes the gender, age, educational qualification, marital status, family size, monthly income, and employment status of the respondents.

4.2.1 Gender of the respondents

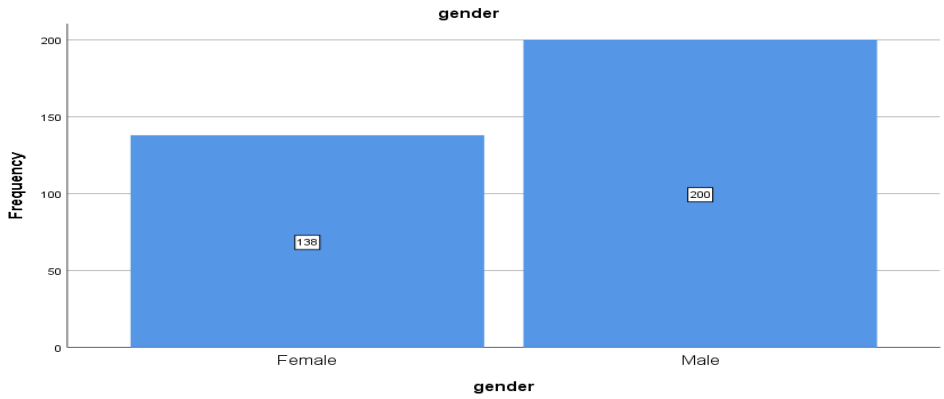

Figure 4.1 Gender of the respondents (Source; Computed from field survey April, 2022.)

As the above graph shows that from the total number of respondents 138 (40.83%) were female respondents, while the remaining 200 (59.17%) were males of respondents. Hence in the selected transport routes seem to there is no fair gender composition of respondents.

4.2. 2.Age of the respondents

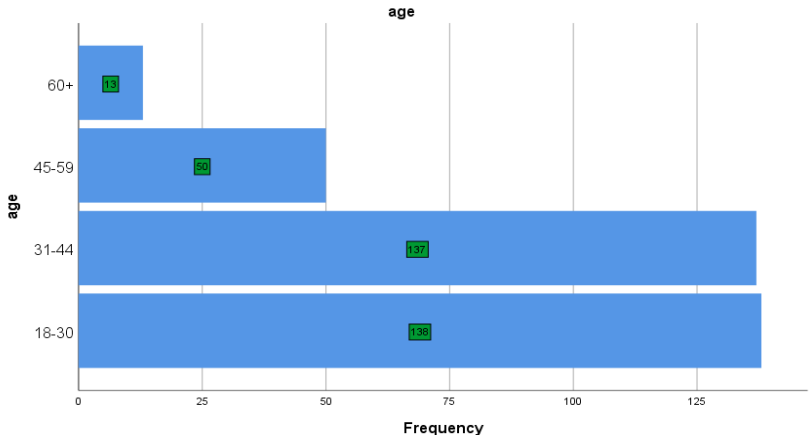

Figure 6 Age of the respondents (Source; Computed from field survey April, 2022.)

As the above graph indicates most of the respondents were under the category of 18-30 years and 31-44 years. 138 (40.8%) and 137 (40.5%) of the respondents were found on the age of 18-30 years and 31-44 years respectively. 50(14.8%) and 13 (3.9%) of the respondents where under the part of 45-59 and 60 and above years respectively. This implies most of the respondents for this research where found under the age of 18_30 years and 31-44 years

4.2.3. Educational qualification of the respondents

Educational qualifications are the degrees, diplomas, certificates, professional titles and so forth that an individual has acquired whether by full-time study, part-time study or private study, whether conferred in the home country or abroad and whether conferred by educational authorities, special examining bodies or professional bodies. The acquisition of an educational qualification therefore implies the successful completion of a course of study or training program. More over the next graph shows the educational qualification level of the respondents

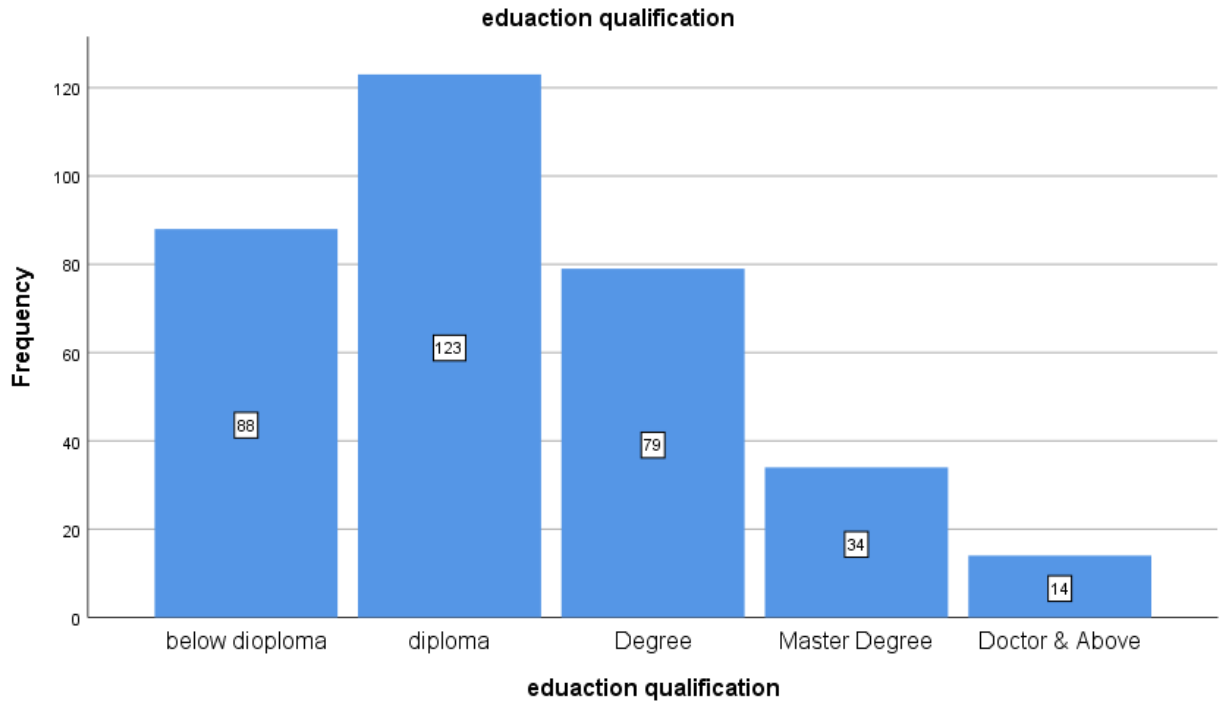

Figure 7 Educational Qualification of respondents (Source; Computed from field survey April, 2022.)

As the above graph depicts most of the respondents from the passengers, 88 (26.0 %) and 123 (36.4 %) of the respondents have below diploma, and diploma respectively .79 (23.4 %) and 34 (10.1 %) have first degree, and second degree respectively. There remaining 14 (4.1%) of respondents have doctorate degree education qualification .Therefore this indicates that the majority of passengers were not well educated .Consequently, they may have no knowledge about how the modal choice is affected the urban mobility and the factors of modal choice in urban mobility.

4.2.4 Martial status of the respondents

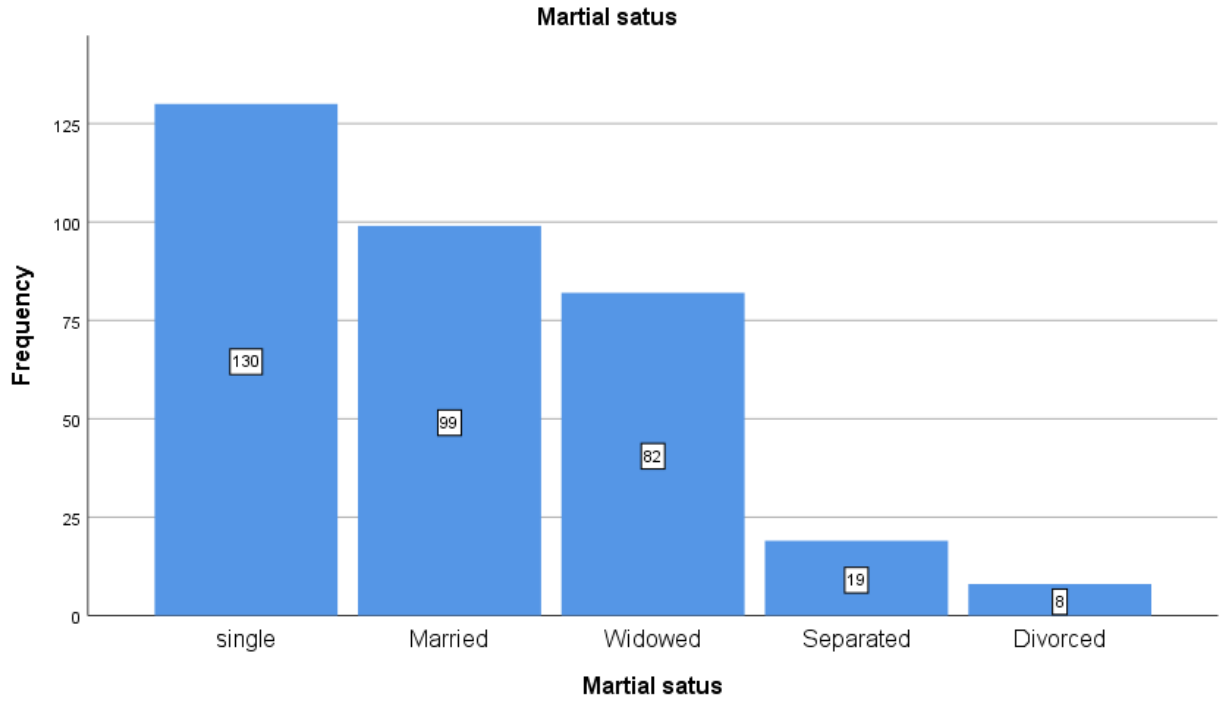

Figure 8.Marital status of the respondents (Source; Computed from field survey April, 2022.)

As we can observe from the above graph 4.4 130 (38.5%) and 99 (27.2%) of the sampled respondents from the passengers in respectively were single and married, however the 82 (24.3%), and 19 (5.6%) of the respondents in respectively were widowed and separated .8 (2.4%) of respondents were divorced. This implies most of the passengers were single, if they are single, according to the respondent's information they are exposing to choice taxies than buses, means that they are not need to travel via buses due to their attitudes towards bus users and buses.

4.2.5 Family size of the respondents

The family size of the respondents is vary from passengers to passengers .From the respondents most of the respondents have no more family size, means that they were single; due to this their family member was only one. But some of them have also 4-6 and 6+ family sizes. Again 86 respondents have 2-3 family size. More over the next table describes the family size of the respondents.

Table 4.1 Family size of the respondents

family size					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	140	25.4 %	41.4%	66.9%
	2-3	86	41.4%	25.4%	25.4%
	4-6	57	16.9%	16.9%	83.7%
	6+	55	16.3%	16.3%	100.0%
	Total	338	100.0%	100.0%	

Source computed from field Survey; January; 2022

According to the above table many respondents 140 (41.4%) have no family size, and also 86 (25.4%) of respondents had 2-3 family size, means that their family size were more than one. Again 57 (16.9%), and 55(16.3%) of the respondents where have 4-6, and above 6 family size respectively. So many respondents had no large family size in Yeka sub city.

4.2.6 .Monthly income level of the respondents

Table 3 .2 Monthly income level of the respondents

income status					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1500-3000bir	80	23.7%	23.7%	23.7%
	3001-6000bir	81	24.0%	24.0%	47.6%
	6001-9000bir	119	35.2%	35.2%	82.8%
	9001_15000 birr	49	14.5%	14.5%	97.3%
	15000+ birr	9	2.7%	2.7%	100.0%
	Total	338	100.0%	100.0%	

Source; Computed from field survey, April, 2022

According to the table 4.2.119 (35.1%) and 81(24.0%) respondents have 6001-9000 and 3001-6000 monthly income respectively . 80(23.7%) and 49(14.5%) respondents monthly income is

1500-3000 and 9000-15000 birr respectively ,but little number of respondents about 9 (2.7%) of respondents have more than 15000 birr monthly income .income level has its own impact on modal choice ,most of higher income group were choose taxies than buses.

4.2.7 Employment status of the respondents

Table 4.3 Employment status of the respondents

employment status					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Unemployed	161	47.6%	47.6%	47.6%
	employed	177	52.4%	52.4%	100.0%
	Total	338	100.0%	100.0%	

Source; Computed from field survey, April, 2022

As the above table 4.3 indicates 177 (52.4%) respondents are employed ,where us 161(47.6%) respondents are not employed ,which means the majority of respondents for this research where employed persons . this may have a chance for the various of choose transportation modes .Here unemployed means the peoples who were not work on the government organization ,but they may work with their private organization ,or work on their own business.

4.3. The Modal Choice of the Passengers

Modal choice is the choice of transport modes by passengers, or travelers to travel from starting point, or origin area to ending point or destination areas. Due to different reasons passengers choose one type of transport modes than another types transport modes. The passengers have many choices related with transport modes, but on this research the researchers tries to identify their choices from two options from Buses and Taxies. Many respondents where choose taxies transport mode than buses transport mode due to different collective and individual reasons.

The next graph shows the transport mode choice of the respondents

What is your choice of transport mode?

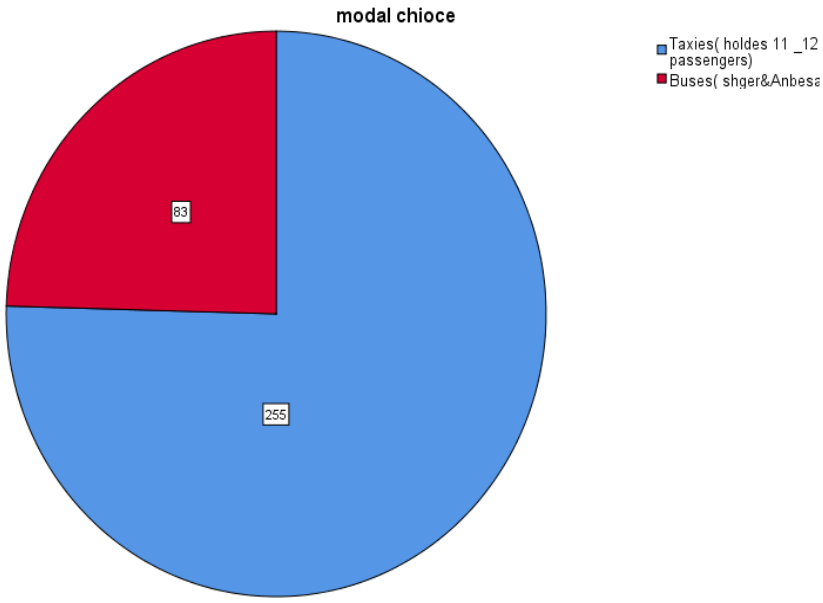

Figure 4.5 the modal choice of the respondents (Source; Computed from field survey April, 2022.)

According to the graph 4.5, majority of the respondents prefer taxies than buses to travel from one place to another place. About 255 (75.4%) of respondents choose taxies to travel from origin to destination, but the remaining 83 (24.6%) of respondents choose buses rather than taxies. Choosing taxies than buses may aggravate different urban transportation related problems like accidents, congestion, pollutions and etc. According to their interview response most of the passengers prefers taxies transport mode because of its flexibility ,speed ,comfort and other factors ,this is not appropriate because it creates more urban related transport problems like affecting the environments ,parking capacities ,travel time than buses transport modes . Again taxies has larger impact on daily or annual passenger-km by means of PT, Length of paved roads, modal balances (Modal split), Road network density, and on Road network length than buses transport mode, because taxies reduce the yearly number of travelers by bus ,covers along roads which means they affect the roads .

4.4. Factors affecting Modal choice in Urban Mobility; Econometric Model

In any statistical model, if the nature of the variable is categorical or non-numeric with having more than one level, then dummy variable approach should be used. Therefore for this study, the dependent variable was transport modal choice which has two levels. In fact, there is no scientific logic for setting reference group, but it may be better if it has the common sense of

understanding. Hence in this study taxies can be considered as a reference by assuming the above logic. Finally, Maximum likelihood estimation technique was used to estimate the coefficients and their probability value and odds ratio is reported.

4.4.1 Model selection criteria

The model fitting information reflects that intercept-only model have 261.897.Akaki information criteria, 342.181 of Bayesian information Criterion, and the final fitted model have AIC of 264.821. As we know the minimum is the better, so that the AIC will be the most economical model and everything was made on this model.

Table 4.4 Model selection criteria

Goodness of Fit[a]			
	Value	Df	Value/df
Deviance	210.168	243	.865
Scaled Deviance	210.168	243	
Pearson Chi-Square	327.727	243	1.349
Scaled Pearson Chi-Square	327.727	243	
Log Likelihood[b]	-109.949		
Akaike's Information Criterion AIC)	261.897		
Finite Sample Corrected AIC AICC)	264.821		
Bayesian Information Criterion BIC)	342.181		
Consistent AIC (CAIC)	363.181		

Dependent Variable: modal choice

Model: (Intercept), age, gender, education qualification, Marital status, family size, income status, employment status…….

a. Information criteria are in smaller-is-better form.

b. The full log likelihood function is displayed and used in computing information criteria.

Source: Computed from field survey, April, 2022

4.4.2. Model adequacy checking

The model goodness of fit of the data was checked by both omnibus test of modal coefficient and hosmer and lemeshow tests. If the modal is significant omnibus test of modal coefficient shows that there is a significant improvement in fit as compare to the null model, hence the modal shows a good fit. Hosmer and lemeshow test is also a test of modal fit .It indicates the poor fit if significance value is less than 0.05. Here on this research the model adequately fits the data .Hence there is no observed and predicted value.

Table 4.5 the modal adequacy checking

Omnibus Tests of Model Coefficients				
		Chi-square	Df	Sig.
Step 1	Step	118.408	6	.000
	Block	118.408	6	.000
	Model	118.408	6	.000

Step	Chi-square	Df	Sig.
1	8.918	7	.259

Source: Computed from field survey, April, 2022

Based on the above the researcher were did, or cheeked the accuracy of models, because checking the accuracy of the model is very important to assess the factors affecting modal choice based on proper model. In addition model adequacy checking very necessary to explained, or cheek the selected variable whether appropriate or not for this study. So table 4.5 shows the model was accurate, because omnibus test is significant.

4.4.3 Econometric results of personal information

Table 4.6 Econometric results of parameters estimates of personal information

Parameter Estimates										
Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test			Exp(B)	95% Wald Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	Df	Sig.		Lower	Upper
(Intercept)	2.194	1.4673	-.682	5.070	2.236	1	.135	8.972	.506	159.166
[gender=0]	-1.652	.3553	-2.349	-.956	21.626	1	.000	.192	.095	.384
[gender=1]	0[a]	.	.	.	.	.	.	1	.	.
Age	-.249	.2120	-.664	.167	1.377	1	.241	.780	.515	1.181
[education Qualification=0]	-1.182	1.1905	-3.516	1.151	.986	1	.321	.307	.030	3.161
[education qualification=1]	-1.417	1.1625	-3.695	.862	1.485	1	.223	.243	.025	2.368
[education qualification=2]	-1.615	1.1601	-3.888	.659	1.937	1	.164	.199	.020	1.933
[education qualification=3]	-1.424	1.2112	-3.798	.949	1.383	1	.240	.241	.022	2.584
[education qualification=4]	0[a]	.	.	.	.	.	.	1	.	.
[Marital status=0]	.297	.9452	-1.555	2.150	.099	1	.753	1.346	.211	8.583
[marital status=1]	.841	.9421	-1.005	2.688	.797	1	.372	2.319	.366	14.699
[marital status=2]	-.258	.9412	-2.103	1.587	.075	1	.784	.773	.122	4.889
[marital status=3]	.031	1.0639	-2.054	2.116	.001	1	.977	1.031	.128	8.298
[marital status=4]	0[a]	.	.	.	.	.	.	1	.	.
[employment status=0]	2.344	.3944	1.571	3.117	35.328	1	.000	10.427	4.813	22.590
[employment status=1]	0[a]	.	.	.	.	.	.	1	.	.
family size	.871	.1829	.513	1.230	22.689	1	.000	2.390	1.670	3.420
income status	-.390	.1666	-.717	-.064	5.487	1	.019	.677	.488	.938
(Scale)	1[b]									

Dependent Variable: modal choice

Model: (Intercept), gender, age, education qualification, Marital status, employment status, family size, income status

a. Set to zero because this parameter is redundant.

b. Fixed at the displayed value.

Source: Computed from Filed Survey, February, 2022

Gender; The odds of the females respondents those of who uses/choose buses have .192 times lower than those of who uses/choose buses of males .In other words, as compared to taxi users in the log scale the rate of change of choosing bus is .000, Or in another way the ODDS of choose of transport modes changes when gender changes. The odds of choosing transport mode (bus category) are. 192 times lower for female's s as opposed to males.

Several studies show that women and men make different travel mode choices and have different travelling patterns (Carlsson-Kanyama et al, 1999). Men travel longer distances regardless of the weekend day (Carlsson-Kanyama et al, 1999). Another difference is that men spend their leisure time outside the home more often than women (Carlsson-Kanyama et al, 1999).According to Ortúzar, J. (2000), the difference between women and men depends on how work at home is divided among the household. Females still receipts larger accountability for children and the home.

Family Size: The odds of use/choice of buses for respondents having two and more family size is 2.390times greater than those who have less than 2 family size there are likely choose buses . Similarly as compared to taxi users the mode of transportation when the family has one more family size, in the log scale the rate of change of preferring buses was increased by 0.000 keeping the effect of other determinants holding constant. Hence when the family size increases, passengers are choose of buses than taxies; this is more related with the economic issues. This finding is similar with Thamizharasan et al. (1996) attempted to present the mode choice of intercity travel among public transportation systems in Tamil Nadu. He concluded that the variables of demographic characters and socio-economic characters had a significant effect.

Employment status; the odds of respondents who had no jobs were choosing buses is 4.813 times more than those of who had jobs than taxies. Members use/choice taxies those had good jobs because if participants had good job those of them had provided more income. So the relationship between buses user and employment status is negative, means that the passengers have good job they choose taxies than buses and vice versa. This finding is contradicts the Thamizharasan et al. (1996) finding, this scholar explained that employment status had no significant effect on mode choice.

Income Status: The odds of the respondents those who have higher income are less likely choose bus at .677 times of the respondents of less income groups who choose buses. This indicates that the people who had higher income are choosing taxies than buses. Like employment status it is the significant factor for modal choice at the significant levels of .019 this finding where similar with another scholar: the scholar indicates that house hold income, or when normalized to family sized household income per person, has a strong impact on the mode choice. When the poor uses the communal transportations, access to it is another major issue, as because, up to now in many places the feeder facilities are not that strong and sophisticated also if linked to what a normal poor person can have enough money for travel (forward, 1998).

4.4.4. Econometric result of characteristics of trip

Table 4.7 econometric results estimates of trip characteristics

Parameter Estimates										
Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test			Exp(B)	95% Wald Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	1.470	.6900	.118	2.823	4.541	1	.033	4.351	1.125	16.826
[travel purpose,0]	-2.547	.6179	-3.758	-1.336	16.994	1	.000	.078	.023	.263
[travel purpose,1]	-1.803	.6038	-2.986	-.619	8.912	1	.003	.165	.050	.538
[travel purpose 2]	-1.381	.6069	-2.571	-.192	5.180	1	.023	.251	.076	.825
[travel purpose,3]	0[a]	.	.	.	.	.	.	1	.	.
travel distance	.529	.1203	.293	.764	19.319	1	.000	1.697	1.340	2.148
transport cost	-.515	.1565	-.822	-.208	10.823	1	.001	.598	.440	.812
[travel time=0]	1.200	.5959	.032	2.368	4.053	1	.044	3.319	1.032	10.672
[travel time=1]	1.083	.5351	.034	2.131	4.093	1	.043	2.952	1.034	8.427
[travel time=2]	1.268	.5068	.274	2.261	6.257	1	.012	3.553	1.316	9.594
[travel time=3]	1.145	.5147	.136	2.154	4.950	1	.026	3.143	1.146	8.618
[travel time=4]	0[a]	.	.	.	.	.	.	1	.	.
(Scale)	1[b]									

Dependent Variable: modal choice

Model: (Intercept), travel purpose , travel distance , transport cost, travel time

a. Set to zero because this parameter is redundant.

b. Fixed at the displayed value.

Source: Computed from Filed Survey, February, 2022

Transport cost; the odds of those of the participants, who funded high cost, choose/uses buses were .598 times less than the participant's funded high costs that choose/use taxies. This means the peoples who travel by taxies expensed more transport costs than the travels of buses. Travel cost had a significant impact on mode of transport choice at 1 % (0.01) level of significance. Because people have chosen low or fair cost accordingly their income and time. This finding is matched with the finding of Wilson (1967) that was transport cost is a significant variable for modal choice.

Transport distance; the odds of choose buses, by respondents had traveled a long distance was 1.697 times greater than those of use/choose taxies. Travel distance similar to travel cost, it had a significant influence on the mode of transport choice at 0.000 significant levels. Here every one unite increase of travel distance, choosing of buses are increased. This outcome is reliable with the discovery of Thamizharasan et al, (1996).

Travel propose ; Due to their purpose of travel ,passengers can prefer one transport mode than the another .For example according to the above table the odd ratio of choosing bus for leisure propose .251times lower than the other purpose to travel for taxies. This finding is not similar with the findings of Yu (1970) discussed travel purpose were insignificant variables. But the travel of passengers for education purposes, for work purpose and leisure propose and for other purpose has its own impact on the modal choice.

Travel time ; the odd ratio of choosing buses to travel from one place to another place during peak hours that means 1-3 hr. in the morning 3.319 times greater than traveling from one place to another place in the time of 1-4 hr. night. Again the odd ratio of choosing buses when traveling from the place of origin to destination during the time of 9-1 hr.in late afternoon and night time 3.143 times greater than 1 -4 hr. nigh time. So during the peak hours or periods choose of buses by the peoples where higher than choosing of taxies the other time. This finding is supported the Wilson (1967) finding that indicates travel time is a significant variables for modal choice.

4.4.5. Econometric result of psychological factors

Table 4.8 Econometric results of parametric estimates of psychological factors

Parameter Estimates										
Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test			Exp(B)	95% Wald Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	4.203	.6999	2.831	5.575	36.056	1	.000	66.872	16.962	263.643
[attitudes of people towards bus users=0]	-1.544	.6488	-2.816	-.272	5.663	1	.017	.214	.060	.762
[attitudes of people towards bus users=1]	-3.937	.6840	-5.277	-2.596	33.125	1	.000	.020	.005	.075
[attitudes of people towards bus users=2]	-1.898	.5394	-2.955	-.840	12.376	1	.000	.150	.052	.432
[attitudes of people towards bus users=3]	-1.774	.4086	-2.575	-.973	18.844	1	.000	.170	.076	.378
[attitudes of people towards bus users=4]	0[a]	.	.	.	.	.	.	1	.	.
[attitudes towards buses= 0]	-1.580	.5733	-2.703	-.456	7.592	1	.006	.206	.067	.634
[attitudes towards buses=1]	-1.144	.5775	-2.276	-.012	3.922	1	.048	.319	.103	.988
[attitudes towards buses=2]	-2.254	.8118	-3.845	-.663	7.709	1	.005	.105	.021	.515
[attitudes towards buses=3]	-1.366	.5426	-2.429	-.302	6.334	1	.012	.255	.088	.739
[attitudes towards buses=4]	0[a]	.	.	.	.	.	.	1	.	.
[Life Style of people=0]	-.904	.5797	-2.040	.232	2.431	1	.119	.405	.130	1.262
[Life Style of people= 1]	-.964	.5069	-1.957	.030	3.614	1	.057	.382	.141	1.030
[Life Style of people=2]	.670	.6154	-.536	1.876	1.185	1	.276	1.954	.585	6.529
[Life Style of people=3]	-.277	.5080	-1.273	.719	.298	1	.585	.758	.280	2.051
[Life Style of people=4]	0[a]	.	.	.	.	.	.	1	.	.
(Scale)	1[b]									

Dependent Variable: modal choice

Model: (Intercept), attitudes of people towards bus users, attitudes towards buses, Life Style of people

a. Set to zero because this parameter is redundant.

b. Fixed at the displayed value.

Source; computed from field survey; April; 2022

Attitudes towards bus; The odds of those of the participants who had low attitudes towards buses are.206 times lower to choose buses than taxies as compared to the odds of participants who have good attitudes towards bus. To make clear those who had low attitudes towards buses are .206 times lower to prefer buses than taxies as compared to the odds of participants who had good attitudes towards buses. The respondents have good attitudes for taxies than buses they related with the speed. Attitudes between peoples are different who travel by buses and people who never travel by buses (Davies et al 1997).

Attitudes towards bus users ; the odd ratio of choosing buses by the respondents who had bad attitudes towards the bus users are .214 times lower to choose buses than choosing the taxies as compared to the odds of participants who have good attitudes towards buses users .The respondents believe that the peoples who travel by bus are the poorest and serves for the less economical people than the taxies users , because of this attitudes towards the bus users is the significant factor for modal choice ,with the significance level of .017. Attitude is important when choosing a mode of travel. People's attitude to buses depends on their lifestyle, their personal circumstances, whether they have access to a car, and the social norm (Forward 1998).

4.4.6. Econometric characteristics of the transport facility

Table 4.9 Econometric results parametric estimates of transport facility

Parameter Estimates										
Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test			Exp(B)	95% Wald Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	Df	Sig.		Lower	Upper
(Intercept)	-1.377	.3972	-2.156	-.598	12.017	1	.001	.252	.116	.550
[comfort =0]	1.588	.7076	.201	2.975	5.038	1	.025	4.895	1.223	19.588
[comfort=1]	1.331	.5199	.312	2.350	6.552	1	.010	3.784	1.366	10.484
[comfort =2]	2.260	1.1537	-.001	4.522	3.839	1	.050	9.587	.999	91.986
[comfort =3]	.679	.3400	.012	1.345	3.983	1	.046	1.971	1.012	3.838
[comfort =4]	0[a]	.	.	.	.	.	.	1	.	.
[safety = 0]	1.717	.6591	.426	3.009	6.789	1	.009	5.570	1.530	20.271
[safety =1]	1.294	.6514	.017	2.570	3.944	1	.047	3.646	1.017	13.071
[safety =2]	-.800	1.1959	-3.144	1.543	.448	1	.503	.449	.043	4.681
[safety = 3]	1.395	.3395	.730	2.061	16.887	1	.000	4.036	2.075	7.852
[safety =4]	0[a]	.	.	.	.	.	.	1	.	.
[Vehicle in time=0]	2.924	.6434	1.663	4.185	20.650	1	.000	18.616	5.274	65.703
[Vehicle in time=1]	2.908	1.0800	.791	5.025	7.250	1	.007	18.319	2.206	152.111
[Vehicle in time=2]	1.877	.5263	.846	2.909	12.722	1	.000	6.536	2.330	18.336
[Vehicle in time=3]	.882	.3773	.142	1.621	5.462	1	.019	2.415	1.153	5.061
[Vehicle in time=4]	0[a]	.	.	.	.	.	.	1	.	.
(Scale)	1[b]									

Dependent Variable: modal choice

Model: (Intercept), comfort of transport, safety of transport, Vehicle in Time

a. Set to zero because this parameter is redundant.

b. Fixed at the displayed value.

Source computed from filed Survey: January, 2022

Vehicles in time ; the availability of transport mode is different ,some of transport modes are existed in anytime ,where us others are existed in rare manner ,this has its own influence on the transport mode choice ,as the above table indicates the odd of the participates who have less importance on the availability of vehicle in time where 18.616 times choose buses more than taxies. This indicates that the availability of taxies is better than buses, so they choose taxies than buses. So vehicle in time is the significant factor for modal choice, because its p value is .000. So the finding of this research indicates that availability is the significant factor to choose transport mode in contrast of Utami (2010), availability was not a significant impact on the choice of transport mode.

Comfort; As compared to those of who offered main concern to comfort , participants who offered less importance to comfort have 4.895 times greater to choose buses than taxies . To sum up those of who needs comfort prefers taxies than buses. Comfort is the important factor for the mode of transportation since the probability value of p= .025. Kottenhoff (1999) also explained that the level of comfort and service were also very important to choose transport mode when someone travels from origin to destination.

Safety: The participants who offering less importance to safety where 5.570 times greater to choose than taxies. This means those of who needs greater safety prefers taxies than buses. Safety is the important determinate for the mode of transportation since it's a probability value of .009 significance level.

4.4.7 The influence of physical and environmental factors for modal choice

This part examines how various land use, road networks, and availability of parks affects the modal choice. All of the above are spatial related data's so here based on GIS software and Erdas imagine 14 software the influence of road design ,road network urban land use type, and availability of parks on modal choice where analyzed. So the influence of road network, road design, availability of parks and urban land use where explained in the following ways.

4.4.7.1 The influence of road network on modal choice.

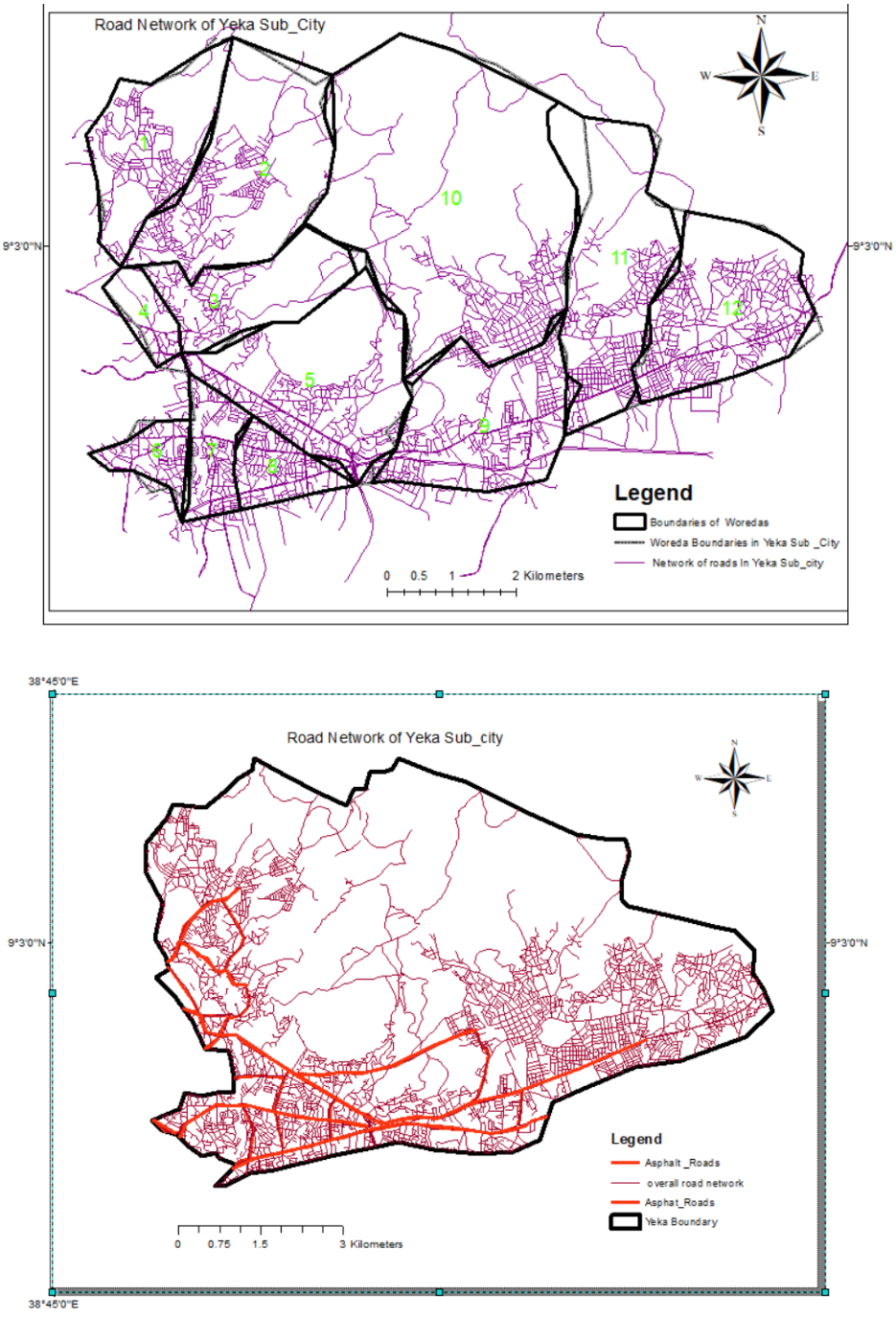

Figure 4.6 road network of the study area (Source; Computed from field survey April, 2022.)

Road Network; Connectivity refers to the grade that a road or route system is connected, and therefore the straightforwardness of travel between destinations. A poorly connected road network, with many dead-end streets that connect to a few major arterials, provides less accessibility than a well-connected network, as illustrated in Figure 4.6a shows most of the

woredas are poorly connected so the buses were not give service on all woredas because they were inaccessible. Analysis by Kottenhoff, 1999, indicates that increasing connectivity in suburban multifamily developments can significantly increase use of alternative modes. In Ethiopia the availability of roads are still at infant stage ,especially the supply of roads are almost it is very poor ,it is specified in certain areas this indicates that service is restricted in certain area , especially the buses give service only in asphalt roads only than taxies ,so to get door to door services peoples are choice taxies than buses . Figure 4.6b shows that the asphalt roads which are used by buses were concentrated in a certain area, so the buses were not give on the whole area of the sub city, due to that the people had no option instead of using taxies.

4.4.7.2 The influence of road design on modal choice

Road design; Multi-modal streets increase use of alternative modes. In the study areas the roads that are exist in Yeka sub city are design for one mode of transport, mostly for motorized. All of motorized transport modes and non – motorized transport modes are travel with the same line. This has its own impact on the bus transport modes, means that it reduces their speed and accessibility that is why the passengers choose taxies than buses. Roadway design refers to factors such as broad cross-section (lane widths and management, on-street parking, and sidewalks), design speeds and speed control, and sidewalk condition and the number and size of driveways etc. To drive buses it needs further as wider roads, so thinking about design roads are more complex than thinking about the design of roads for taxies

Figure 9 the road design type of Yeka sub city (Source; Computed from field survey April, 2022.)

The figure 4.7 depicted that there is no division of roads for buses , cycles ,taxies and other modes , means that all of transport mode uses the same roads this affects the bus transportation system it reduces their speed ,it exposes to use more oils ,and it affects the movement of buses ,so to get better service the passengers where choose taxies than buses . Again the existing roads in the study area are more focus on motorized transport systems, it was designed for one mode of

transport, this has its own impact on modal choice, and it narrows their choices. There is no buses lane only streets on the study area, rather they are used with other modes this reduces the speed of the buses.

4.4.7.3. The influence of availability of parks on modal choice

Availability of Parks; the buses could not get more parks than taxies, because taxies were parked at every corner of the streets than buses. Mainly buses were parked with their specific parking areas, for example in Yeka sub city buses were parked at Megenanga terminal, but taxies are parking on every border of the street, this parking difference has its own impact on modal choice ,it is related with accessibility ,that is why passengers choose taxies than buses .

Figure 10 Parking system of Yeka Sub city (Source; Computed from field survey April, 2022.)

4.4.7.4. The influence of urban land use type on modal choice

Urban land use type; the existence of various land use type has its own impact on the choice of transport modes. Land use arrangement can play a very significant role in determining the travel plans of the travelers and the form of the city regulates its journey length, mode use, and hence the congestion degrees. Land uses such as where and how a residential area, commercial areas, social infrastructure such as schools, hospitals etc. affect the choices of the people greatly. The existence densely built up area in one area has various choices than sparsely built up area.

In order to analyze the impacts of urban land use type on modal choice ; the researcher where did classifying the urban land use type of Yeka sub city based on Supervised classification . The classification where based on Anderson definitions of land use /land cover, Anderson classifies the urban land use type in to 3 (three) groups those are Vegetation area, Bare land, and Built up areas. To check the accuracy of the classification the researcher where did taking ground control points, or training samples from Google earth map of 2022, the overall accuracy of the

assessment where 85.55% then based on this accuracy, finally the classified images are like the following.

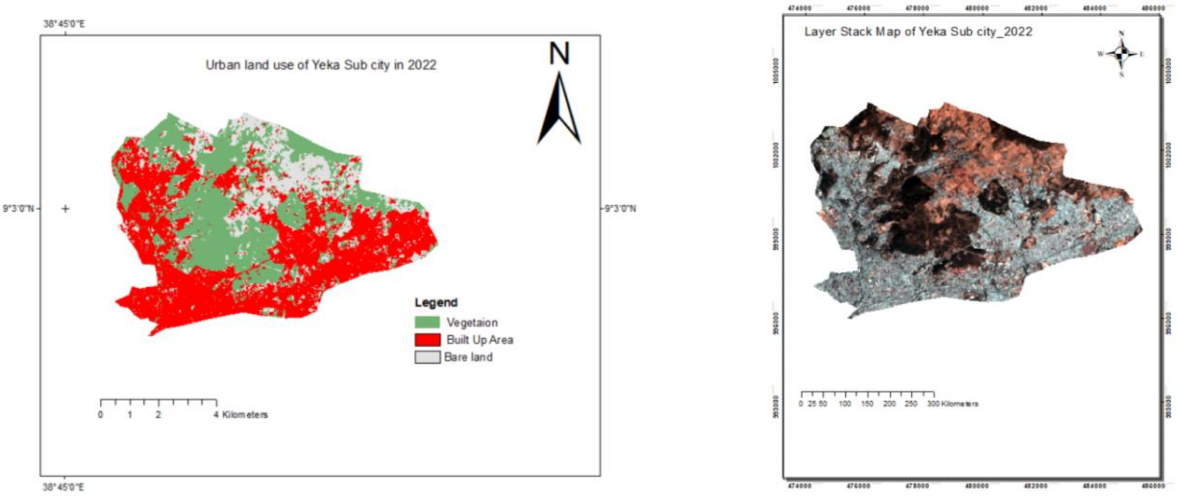

Figure 11 the urban land use type of Yeka Sub city (Source; Computed from field survey April, 2022.)

As the above graph indicates most of the land use of Yeka sub city is used for built up area. 56.75 % and 25.06 % of the sub city where covered by built up and vegetation land uses respectively, the remains 18.82 % where bare lands of the sub city. Again the above figure shows that most of the built up areas are found near to roads, means that main activists are done near to the roads. The built up areas are used for either residual, commercial and mix purpose. On those built up areas the speed of buses are limited that is way the peoples are choose taxies transport modes than buses. Again buses cannot give door to door service, because there is no infrastructure for buses around the residential areas, so the peoples have no option instead of using taxies. Due to the above reasons urban land use has its own impact on modal choices. Here there is the mix of land use in the study area. Land use combination refers to finding diverse kinds of land uses (residential, commercial, institutional, recreational, etc.) close together. This can happen at numerous scales, including mixing within buildings (such as ground-floor retail, with offices and residential above), along roads, and within districts. It can also include mixing housing kinds and value ranges that accommodate diverse demographic and income groups. In the study area in those mixed urban land use most of passengers where choice taxies than buses. This finding is similar with increased mixture can reduce travel distances, particularly if affordable housing is situated near to work area, and mixed-use area residents are

more likely to travel by another modes Ewing, R.,& Cervero, R., 2010.So choosing buses in those areas becomes very low due to the availability of alternative modes.

To strength the quantitative data, the researcher were interviewed fourteen (40) employees of Addis Ababa road and transport Authority for semi structured interview, those employees are explained what was existed in their office and in transport areas.

❖ Based on that the major factors which affect the modal choice are the followings;

✓ Lack of accessible & enough mass transportation modes

✓ Poor connectivity between buses and taxies nodes

✓ Poor attitude of the peoples for buses and buses users,

✓Poor regulation of the buses system ; it is related with the absence of good management on the buses system ,the tricksters and bus drivers have not work properly with the adjusted routes

✓ Taxies are arrive in time than buses because of this the people are choose taxies than buses

- ✓ Inadequate mass transport service supply and restricted attention to key roads only.
- ✓ Absence of stakeholder coordination in the transport sector
- ✓ Deficiencies of road network with reverence to the size of the city.
- ✓ Lack of sufficient access roads.
- ✓ Absence of off street parking services and over application of road space by parked vehicles.
- ✓ Poorly designed road junctions.
- ✓ Lack of pedestrian walkways/facilities and miss-use of the existing facilities ,and sub-standard terminals for passenger and freight transport and inconvenient bus and taxi bays

4.5. The Influence of Modal Choice on Urban Mobility

4.5.1 The influence of modal choice on urban mobility related with air pollution

Table 4.10 the influence of modal choice on urban mobility related with air pollution

Do you believe choosing Buses creates more air pollution than Taxies					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	112	33.1%	33.1%	33.1%
	Disagree	173	51.2%	51.2%	84.3%
	Neutral	13	3.8%	3.8%	88.2%
	Agree	19	5.6%	5.6%	93.8%
	strongly agree	21	6.2%	6.2%	100.0%
	Total	338	100.0%	100.0	

Source; Computed from Field Survey; April, 2022

Table 4.10 illustrates that 173 (51.2%) and 112 (33.1%) of respondents raised their ideas regarding the chance of buses to create air pollution than taxies they were disagree and strongly disagree respectively. But 21(6.2%) ,and 19(5.6%) of the respondents were strongly agree and agree on the chance of buses to create air pollution .So that many of respondents are believe that buses were not a source of air pollutions than taxis ,but the reverse is true ,means that taxies are where a source of air pollution than buses .Towns and cities worldwide are afflicted by polluted air. Speedy population's progress and growing traffic are producing the concentration of contamination to rise in many places. The influences of emissions such as particulate matter, nitrogen oxides and CO2 on people, the environment and climate are subjects of hot discussion. Principally affected are the many populations of densely-populated urban cores and also often those who live further away but who travel by car to polluted areas. It explains the negative environmental influences of the rapid urbanization and the advance of motorization appreciated in recent years in some developing countries. Modal choice has its own impact on urban mobility for example; the more use of taxies and the high urban density in large cities; have led to the more pollution problem. Air pollution has become an increasing problem in megacities and great urban areas throughout the world, and transportation is known as the major source of air pollution in many cities, especially in developing countries. Urban mobility measures consists different indicators, but here the researcher were assess based the main indicators only.

4.5.2 The influence of modal choice on urban mobility related with traffic accidents

Table 4.11 the influence of modal choice on urban mobility related with traffic accidents

Do you believe choosing buses creates more traffic accidents than Taxies					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	119	35.2%	35.2%	35.2%
	Disagree	112	33.1%	33.1%	68.3%
	Neutral	24	7.1%	7.1%	75.4%
	Agree	39	11.5%	11.5%	87.0%
	Strongly agree	44	13.0%	13.0%	100.0%
	Total	338	100.0%	100.0%	

Source computed from field survey, April, 2022

Table 4.11 indicates that 119 (35.2%) and 112(33.1%) of the respondents from passengers said that buses were not create traffic accidents than taxies , but 44(28.7%) and 39 (11.2%) of the respondents from the passengers were explained that the buses were create traffic accidents than taxies .The remaining 24 (7.1%) of respondents were not explain their ideas ,they were neutral. The above ideas were also assured by Mattson, Caroline (2006) the involvement of taxies for traffic accidents is large than that of other vehicles including buses. Because they drive aggressively, violating traffic laws like speeding, or running a red light and others.

4.5.3 The influence of modal choice on urban mobility related with dalliance

Table 4.12 the influence of modal choice on urban mobility related with delays

Do you believe choosing Buses creates more dalliance than Taxies					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	70	20.7%	20.7%	20.7%
	Disagree	65	19.2%	19.2%	39.9%
	Neutral	21	6.2%	6.2%	46.2%
	Agree	57	16.9%	16.9%	63.0%
	strongly agree	125	37.0%	37.0%	100.0%
	Total	338	100.0%	100.0%	

Source computed from field survey; April, 2022

According to table 4.12 most of respondents 125 (37.0%) and 57 (16.9%) were justify the bus have a chance to create delays than taxies .70 (20.7 %) and 65(19.2%) of respondents were explained that delays is not the major problem for buses than taxies. This finding was similar with most of the reasons that leads the buses to delay are related with lack of bus-only lane ,buses speed are lower , buses are use longest route ,there existence of many bus stations and etc. To assure this finding the researcher where checked via observations, during the researcher observations especially during peak hours (1_3 morning & 11_1 Night time) to get buses it needs on average 20_25 minutes, but relativity taxies where available. Again buses carry so many passengers then to manage those passengers it needs more time, because of this dalliances is existed on buses than taxies, this affects the urban mobility.

4.5.4 The influence of modal choice on urban mobility related with traffic congestion

Table 4.13 the influence of modal choice on urban mobility related with traffic congestion

Do you believe choosing buses creates more traffic congestion than taxies					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	72	21.3%	21.3%	21.3%
	Disagree	115	34.0%	34.0%	55.3%
	Neutral	56	16.6%	16.6%	71.9%
	Agree	25	7.4%	7.4%	79.3%
	Strongly agree	70	20.7%	20.7%	100.0%
	Total	338	100.0%	100.0%	

Source computed from field survey; April, 2022

As table 4.13 shows that, the majority of the respondents, 115 (34 %) and 72 (21.3%) of the passengers explained that choosing buss were not the reason to create traffic congestion than taxies , but the remaining 70 (20.7%) and 25(7.4%) of respondents were strongly agree and agree on the creation of traffic congestion by buses than taxies respectively . The increments of traffic congestion have become a major problem in many of the developing metropolitan areas across the globe. With the increase in the number of vehicle with every passing day, this calls for an increase in the size of roads to accommodate the extra vehicles entering the roads. The uses of

taxies creates more traffic congestion than uses of buses ,because uses of buses are used to reduce the number of vehicles ,with small number of buses ,many peoples can travel at the same time Gössling, S., & Schroder, M.(2016).

- ❖ According to the information that is given by the interviewees the influence of modal choice on urban mobility is;
  - ✓ Due to modal choice, especially due to the choice of taxies than buses traffic congestion is existed in a high manner especially at peak hour this means modal choice affects the traffic flow.
  - ✓ Again modal choice has it has its own impact on parking system it affects the parking space, that means it creates problem of parking service provisions.
  - ✓ Excessive use of taxies than buses creates more air pollution, and it is source of the disturbance of the environment, this is the opposite of sustainable urban mobility.
  - ✓ Modal choice is also again it is source of dalliances; this dalliance affects the urban mobility either in a direct or in direct ways , and also the rate of accident is very high on taxies than buses ,so choosing taxies is not recommended ,but most of the people is traveling by taxies by ignoring those impact ,this choice affects the urban mobility ,because accidents disturbs the movement of transport modes .
- ❖ To minimize the problems that where existed on the modal choice : The transport authority shall take the following measurements those are;

✓ Prepare clear policies and strategies regarding about buses,

✓ Strong stand of the government over development of bus lines and bus stations,

✓ Connect the bus station with taxies station system,

✓ Increase the awareness of peoples by giving further information about the importance of buses than taxies, and give quality training for employees who are working the transport related works as well as if it is possible for drivers to work properly.

Chapter Five: Conclusion and Recommendation

5.1 Conclusion

The central objective of this study was to analyze the factors that affect the modal choice in urban mobility in Addis Ababa in the case of the Yeka Sub-city. In ordered to test the hypothesis, binary logistic regression was identified and useful with the mode of transport choice as a meaning of series of characteristics. The dependent variable was the preference of transport mode ,or modal choice it can be buses, or taxies, where us the independent variables are the personal attributes or demographic factors; characteristic of the transportation facility: trip characteristics: psychological factors: and physical environment and urban form. Around 21 independent variables were specified from these sequences of characteristics and used in the econometric model.

In the analysis part the significant relationship between the independent and dependent variable were established, which confirmed that the mode of transportation choice relates to one or more of the variables stated as a purpose the characteristics or attributes of variables. Based on the finding of the study the researchers emanates to the following conclusions. Transportation service is sensitive to the characteristics and performance of each mode of transportations. The following variables like gender, employment status, family size ,income status, travel purpose ,travel time, transport cost ,travel distance , attitudes towards buses , attitudes towards buses users ,comfort of transport ,safety of transport , availability of transport modes ,or vehicle in time are the most significant factors for modes choice.

In addition the spatial related data's like availability of street parks at everywhere for taxies, the road design, the road network and urban land use type affect the modal choice. Due to the above significant variables the choice of people related to transport mode is vary to travel from one area to another area, this variation has its own impact on urban mobility. Modal choice affects the urban mobility because it affects the traffic flow; again it is the means of traffic accidents, congestion, air pollution and dalliance.

Urban mobility is not sustainable due to the existence of modal choice particularly due to the existence of choosing taxies than buses in Yeka Sub city. There are different forms of

transportation modes which gives service for the passengers in Yeka Sub city ,but this research compares' the choice of passengers to travel from one area to another from the specification of buses (both Anbesa and Shger Buses) ,and taxies (all taxies which carries 11_12 passengers) .Taxies were the most preferable transport mode in Yeka sub cities than buses. Choosing taxies creates more urban transportation problem than buses, means that choosing taxies where the source of air pollution, parking difficulties, traffic congestion and accidents than buses. This finding indicates that modal choice affects the urban mobility; it affects the overall traffic flow.

5.2 Recommendation

There is lack of study in relation to the factors which affects modal choice and the impacts of modal choice on urban mobility. The main objectives of the study were to analyze the factors that affect the modal choice in urban mobility in Addis Ababa in the case of the Yeka Sub-city.

Based on the findings of the study, to reduce the problems related with the factors of modal choice as well as related with urban mobility, the researcher recommends the following points;

- ✓ Emerging public transport systems that are safe, clean, convenient, accessible, efficient and affordable.
- ✓ Government shall be inspiring private sectors to take part in mass transportation services to increase accessibility in all transport modes.
- ✓ The stakeholders shall be create awareness on the passengers to uses buses than taxies transport mode
- ✓ Managing the transport mode in a better and standard way is very necessary
- ✓ Expanding the infrastructure especially for buses transport mode
- ✓ The city administers shall be integrates the urban land use types with the transport plan
- ✓ The Federal Government as well as the city administration shall be investing a huge amount of money for the development of road infrastructure and transport service provisions. Moreover, for the public transportation transport service provision that has serious financial restraints have made the Anbessa City Bus Service and Sheger bus Enterprise unable to replace the old buses with new ones which in turn, has controlled its service worth and handling.

❖ To enhance the urban mobility again the researcher's recommends the following points:

- ✓ Supply adequate transportation modes especially supply buses which can enhance the

transport service.

- ✓ Create the appropriate design and management of the transport facilities and therefore the services they supply will rise.
- ✓ Increasing the parking systems that are used for buses in terms of number and quality.
- ✓ The city administers shall improve travel option, means that in addition to buses, preparing roads for cycling, walking and for other non-motorized transport modes.
- ✓ Making buses more attractive by enhancing its availability and reliability
- ✓ Construction of road infrastructures which is safety ,comfortable for buses drivers
- ✓ The governments shall be considered the mass transport system for the mobility needs of the urban inhabitants.
- ✓ Inspire traffic safety research to minimize accident

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Department of Regional and Urban Planning

Appendix

Dear Respondents

Dear respondent :I am Fentahun Abebe , from MSC graduating class student from **Ethiopian Institute of Architecture ,Building Construction and City Development campus ,Addis Ababa University** to conducting research study on " *Factors Affecting Modal choice in Urban Mobility* " for the purpose of partial fulfilment of Master degree (MSC) in Urban planning . So, you are kindly requested to give accurate and relevant information which is the most valuable input for the success of my study. Please be aware that there is no any political, economic, social or psychological harm on you due to responding these questions, therefore the researcher hopes that you will be answer all questions confidently and frankly.

Thank you in advance

Read each statement carefully and respond by giving the answer that most accurately you are feeling. If you have questions, do not hesitate to call …. 0931434337

B.N:- Don't write your name

Part I Part one demographic characteristic of respondents

1 .Personal information

A. Age; ---------

B. Gender; Male ☐ Female ☐

C. Educational Qualification

Below diploma ☐ Diploma ☐

BA/BSC Degree. ☐ Master Degree. ☐ Doctor and Above ☐

D. Marital Status?

Single ☐ Married ☐ Divorced ☐ Widowed ☐ Separated ☐

E. how many family size do you have (Family size) _____

F. how much monthly income you will get on average _____

G. employment status; employed ☐ unemployed ☐

Part two questioners related with the choice of transport modes by passengers

2.1. Passengers choose one type of transport mode than another due to different reasons , therefore, from the following choice the researcher will identify which type of mode is chosen by the passengers , So write down the √ sign on your choice of transport mode to travel from one place to another .

Transport modes	Your choice of transport mode
Buses; which includes all Anbesa & Shger buses.	
Taxies ; which includes all taxies which holds 11 _12 passengers	

Part 3: questions related with evaluating the major factors which affect the modal choice

3.1 Mostly the factors of the modal choice are related with the following points, therefore the researcher was tried to assess the contribution of those factors on the modal choice, so according to your personal consideration, please kindly answer the following questions by putting the tick mark (√) and by filling the blank space below the options of the questions for question 3.1 &3.2 and 3.3, and 3.4 respectively .

3.1. At what travel time modal choice variation is high (Characteristics of the trip)?

A. 1-3 hr. morning B 3_6 hr late morning C. 6 _ 9 hr afternoon D. 9-12 hr in late after non E 1 -4 hr in late night .

3.2 For what purpose do you travel from one place to another (Characteristics of the trip)?

A. Work B. education C. leisure D. others

3.3 On Average how much transport cost you pay from the place of origin up to destination in one travel (Characteristic of the transportation facility)? _____

3.4 On Average how many kilo meters do you travel from the place of origin up to destination in one travel (Characteristics of the trip)? _____

3.2 In addition to the above the following questioners are used to analyze the factors of modal choice, so according to your personal consideration, please kindly rate the following points by putting the tick mark (√) below the options of numbers 1, 2, 3, 4, &5

1= Very unimportant 2, Unimportant 3, Neutral 4 Important 5, Very unimportant

Number	Factors of modal choice	1	2	3	4	5
1.Psychological factors	Attitudes of the peoples					
	Attitudes towards the buses					
	Life style of people					
3.Characteristic of the transportation facility	Vehicle in time					
	Comfort of transport mode					
	Safety of transport mode					

Part 4: questions related with investigating the impact of modal choice on urban mobility

3.1. Mostly the modal choice has its own impact on urban mobility, so according to your personal consideration, please kindly rate the following points by putting the tick mark (√) below the options of numbers of 1, 2, 3, 4, & 5

1= strongly disagree, 2 = disagree, 3= neutral, 4= agree, and 5= strongly agree.

Choosing buses (like Anbesa ,& Shger bus)	1	2	3	4	5

have more impacts than taxies on the following points					
Parking problem					
traffic congestion,					
dalliance,					
traffic accident					
air pollution					

In addition to the above questions; the following yes & no questions are used to investigate the impacts of modal choice on urban mobility, so try to answer the questions by circling on the choice.

3.2 Do you believe that choosing bus is more appropriate than taxies to travel form one area to another?

A. Yes B .No

Justify your Answer

……

……..

3.3. Do you believe choosing bus is advantages for urban mobility by creating minimal environmental impacts than taxies?

A. Yes B. No

4. Do you think average passenger travel time, capacity of park and ride facilities, and condition of transport networks are affecting by modal choice?

A. Yes B. No

Justify your answer if your answer is yes

……

……..

5 Do you believe choosing taxies than buses transport mode has its own impact on daily or annual passenger-km by means of PT, Length of paved roads, passenger transport trends by mode (Modal split), road network density, and on road network length?

A, Yes B, No

If your answer is yes, please justify your answer……
…….

Interview research questions

1. Which types of transport mode are selected by passengers?
2. Why passengers choose one type of transport mode than another type transport mode?
3. What are the factors that affect modal choice in urban Mobility?
4. How the modal choice affects the urban mobility?
5. What solutions do you suggest to enhance Urban Mobility?