DECLARATION

I, the undersigned, certify that this thesis is my original work, that it has not been submitted for a degree at any other institution, and that all information sources cited for the thesis have been properly acknowledged, per the institute's scientific criteria.

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COLLEGE OF DEVELOPMENT STUDIES

CENTRE FOR REGIONAL AND LOCAL DEVELOPMENT STUDIES

DEPARTMENT: URBAN LAND ADMINISTRATION AND MANAGEMENT (ULAM)

Approval

This is to certify that the thesis prepared by Ruhama Lulseged entitled: **"The Influence of Street Design on Pedestrians in Selected Areas of Addis Ababa, Ethiopia**" is submitted in partial fulfillment of the requirements for the Degree of Master of Arts in Urban Land Administration and Management complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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ACRONYMS

AACRA-Addis Ababa City Road Authority

AACPPO-Addis Ababa City Plan Project Office

AAPDC-Addis Ababa Plan and Development Commission

AADT-Annual Average Daily Traffic

AANMT-Addis Ababa Non-Motorized Transport

AASHTO-American Association of State Highway and Transportation Officials

BRT-Bus Rapid Transit

ITDP-Institute for Transportation and Development Policy

IUIDSSM-Integrated Urban Infrastructure Development and Supply Strategy and Mechanism

LRT-Light Rail Transit

MUDC-Ministry of Urban Development and Construction

MUDH-Ministry of Urban Development and Housing

NACTO-National Association of City Transportation Officials

NDP-Neighborhood Development Plan

NMT-Non Motorized Transport

POD-Pedestrian Oriented Development

ROI-Return on Investment

ROW-Right of Way

TOD-Transit Oriented Development

UNEP-United Nations Environmental Programme

ABSTRACT

The design of streets is one of the most crucial aspects of urban planning. Street, land use, and transportation planning should all be done in collaboration. In many locations in Addis Ababa, pedestrian amenities are insufficient, aside from the fact that walking is the most popular mode of transit. The city of Addis Ababa has a car-oriented street design, a lack of an effective public transportation system. The city's streets are usually broad, with few pedestrian crossings, junctions, or freeway traffic devices and the bulk of crashes and accidents occur.

This study assesses the influence of street design on pedestrians, including different facilities on streets, walkways, safety, and public transport access in selected areas of Addis Ababa, Ethiopia. The descriptive survey method allows the researcher to conduct quantitative and qualitative analyses of data. For this study, the student researcher used both primary and secondary data sources; the primary data was gathered through surveys and interviews. Secondary data was obtained from an insightful audit of recorded accident data sources. The study employed a questionnaire that included 422 sample street users in Addis Ababa, in the study areas, and 30 key informants from departments dealing with urban street design and implementation. The data collected from the sample population was more quantitative, and it was done with the help of the program, SPSS, for descriptive statistics, including frequency and percentile, using tables and figures. The qualitative data is analyzed by interpreting, summarizing, and generalizing.

The result revealed the inadequacy of urban street design in the study area. 90% lack of space for parking lots and for public space, and 83.5% not using enough lanes for walkways and 71.8% public transport, 78.1% inadequate pedestrian facilities, 23.3% prioritization of the automobile transport system, 56.7% lack of participation by key stakeholders, and 73.3% inadequate resource allocation are the main challenges in urban street design implementation. Furthermore, the survey response revealed a lack of knowledge of the guidelines used for street design by street planners. Therefore, they need to invest in implementing an urban street design that supports public space, facilities, safety, and a green environment for their citizens. In addition, the city finance department needs to work on resource allocation through annual budgeting for urban street design projects. Proper street design and implementation can help lay the groundwork for a city that is more economically, socially, and environmentally friendly, as well as more productive, healthy, and appealing to pedestrians.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Urban planning is a crucial process in the improvement of the lives and activities that occur within urban centers in many countries all over the world. Good planning within urban settings leads to establishing better living conditions and creating fair, productive, appealing, and secure living conditions for present and future generations. Urban planning, therefore, plays a crucial role in creating quality environmental conditions, security, and health for the various groups of people using the streets, as well as leading to fair accommodation, efficiency, and environmental conservation. According to Levy (2016), good urban planning leads to equitable access to natural resources and the improvement of human welfare. One of the most important facets of urban planning is street design (Capolongo et al., 2018).

Policy tools and practices are used in urban street planning and land use approaches to promote physical exercise in specific spatial areas, usually a few miles away. Improved street lighting or maintenance improvements that increase the convenience and protection of street crossing, walking, bicycling, and recreational play, maintain sidewalk continuity, add or expand traffic calming such as center islands or elevated crosswalks, or improve the appearance of the street environment, such as landscaping, are examples of these policies and activities (Moudon AV, 2003).

In most urban areas, a "street" is a lane with houses on either side. It takes up a lot of space in a city and provides a crucial connection to different parts of the globe. Its imposing nature will infuse the urban atmosphere with a great deal of energy and activity. Since the beginning of time, commercial, educational, and social gatherings have been held on city streets, but many of these practices are still restricted to traffic flows on modern streets. Streets in many developed countries are designed with wide car lanes and plenty of space for cyclists (Kasraian et al., 2020). This is done with the ultimate aim of creating a street plan that maintains a sense of harmony among the many activities that occur within the streets. This is not necessarily the case of developing countries, where street projects are not always up to scratch (Abubakar & Doan, 2017).

Streets are urban spaces with urban design elements and aspects and a sense of place; movement networks serve pedestrians where they walk, talk, sit, trade, recreate, socialize, and do other activities; cyclists; mass transport and other vehicles; and as conduits for utilities. To be used as urban spaces, streets must be designed for people and have to be walkable and attractive. These streets must have enough space for people to walk comfortably and safely, as well as be mixed-use and densely developed. Creating attractive street spaces requires regulating the design of the context to have enclosure, unity, and uniformity. Streets should be safe from traffic accidents, traffic signs, and signals, and be comfortable enough to be usable. They must also have trees for shade and beauty, benches to sit on and enjoy the street life, refreshments, and good enclosure and aesthetics. They should also have provisions for people of different physical conditions and ages (Wey & Wei, 2016).

For many years in the past, transport engineers in the respective countries led street design. These street designs assist cars with moving unreservedly on the roads by expanding the paths' number and width, wiping out on-road parking spots, and diminishing the walkways' space. Henceforth, they continuously came to be viewed as the primary originators of the roads. The streets that were intended to energize the development and the fast movement of vehicles could not ensure individuals' security (de Fine, 2017). Accordingly, many street planning and design manuals were given the world over to reestablish the wellbeing of roads and empower the development of pedestrians, cyclists, and public transportation. Setting up these manuals shows the far-reaching change in perspective as far as street design is concerned.

According to MUDC (2014), when preparing an urban plan, the proportions of roads and other infrastructure, homes, green areas, and shared public spaces must be distributed according to the concept of 30:45:25 percentages. Reserving adequate right of way (ROW) for streets and increasing mobility, accessibility, and connectivity are all benefits of redefining the required percentage share and density of streets from the total areas of urban centers. Implementing a sufficient ROW allows for the safe and productive use of land by accommodating street elements, services, and transportation facilities. It is critical to maintain a sense of order in the right-of-way (ROW) of streets by defining appropriate widths at the start of the urban planning phase and maintaining them throughout implementation while keeping the middle segment free for future carriageway expansion for public transportation and medians.

Streets will serve as the foundation for urban development and utility integration. In accordance with this, Ethiopia is now trying to standardize the design of streets in urban centers by implementing the current street design standards. The Urban Development Policy, Urban Plan Preparation and Implementation Strategy, Integrated Urban Infrastructure Development and Supply Strategy and Mechanism, and the National Urban Green Infrastructure Standard are some of the examples of such efforts. As a result, the Public Right-Of-Way Management and Establishment Manual No.12/2016 emphasizes that streets are the backbone of urban development and utility integration. As per the standard, the pedestrian walk way width on each side is 5–9 meters for Principal Arterial or Boulevard Street types, including 0.6m for shop frontages, 2.8m for a clear obstructed pedestrian through zone, and 1.6m for maximum green zone including curb. The width of crossings is 5 m, and the public transport lane width is 4 m (MUDH, 2016).

In Addis Ababa, it has also been developing new and improving existing streets supported by urban plans and designs and financing schemes through the Urban Local Government Development Program in participating cities and federal, regional, and other sources. Despite the fact that these efforts resulted in some changes, they fell short of the ever-increasing problems of urban streets. Existing streets, street design elements, intersections, junctions, and utility design templates in structure, strategic, basic, strategic, sketch plans, NDP, urban, and block designs must be adjusted to their proposed ROW, layouts, and shapes. Similarly, for new streets, the templates must be applied and fitted to the proposed street shapes and layouts (MUDH, 2016).

According to UN-Habitat (2021), the "Scaling up Safe Street Designs in Ethiopia" project was launched with support from the UN Road Safety Trust Fund and in collaboration with the Institute for Transportation and Development Policy (ITDP), the Ethiopian Ministry of Transport, the Addis Ababa Transport Bureau, and local transport authorities. The goal of the project was to help the Ethiopian government design and execute policies to satisfy the requirements of pedestrians and bicycles at the local and national levels. The initiative resulted in the establishment of a non-motorized transport strategy and a five-year implementation plan for 69 cities and towns, as well as standardized street design principles, under the supervision of Ethiopia's Minister of Transport. These strategies are increasingly being used to direct investments in safer walking and cycling infrastructure.

In April 2019, Addis Ababa began a city-specific non-motorized transportation policy, assisting in the building of 2.8 kilometers of bike lanes, with another 25 kilometers under development. The Transport Sector Ten-Year Perspective Plan calls for the construction of 3,000 kilometers of non-motorized transport infrastructure across the nation, with financial allocations for the enhancement of non-motorized transport infrastructure beginning in 2022 (UN-Habitat, 2021).

Ethiopia has experienced a huge expansion in the length of expressways and private vehicle utilization (Moller & Wacker, 2017). By considering the restrictions in spending plans and execution costs, Addis Ababa City Administrators have made an extraordinary attempt to build up the transportation network with the predominance of vehicles to handle the gridlock. As indicated by the traffic records in Addis Ababa, Ethiopia's capital, the length of roadways in this city has expanded immensely within the last ten years (Terfa et al., 2020).

According to the concentration of motor vehicle movements (motorized transport) compared to non-motorized transport in Addis Ababa, not giving full attention and priority to pedestrian facilities, walkways, safety, access for public transport, and poor attention to provisions for people with disabilities, the elderly, and children in street design, it is necessary to investigate Addis Ababa's urban street design and evaluate its effectiveness with the current global approach, which seeks to prioritize pedestrian, bicycle, and public transportation movements. This study investigates the influence of street design on pedestrians in selected areas of Addis Ababa, Ethiopia. The study assesses whether street design in selected areas of Addis Ababa was done and implemented following the efficient criteria derived from national and international standards and how it affects pedestrians.

1.2 Statement of the Problem

Streets shape the form and land use of urban centers. Varied land uses, on the other hand, create different amounts of traffic, necessitating different modes of mobility as well as different types and hierarchies of roadways to accommodate them. As a result, streets, land use, and transportation are all intertwined, and their interactions and treatment have a greater impact on the growth and character of cities. Mixed-use, dense, poly-centered, and dispersed projects decrease travel and transportation requirements. These projects will become transit-oriented developments if they are supported by public transportation within walking distance (MUDC, 2015. IUIDSSM).

Poor design, inefficiency, and a lack of aesthetic characterize cities with the incorrect form and arrangement of streets. It also has a minimal impact on land use and transportation network planning and structure, as well as land-use efficiency and cost-effectiveness. Proposing an appropriate street layout and shape, on the other hand, may require the demolition of existing structures as well as natural settings, forests, and farms, both of which have an impact on urban transport (Llewelyn-Davies, 2007).

Transportation components such as lay-bys, routes, stops, stations, pedestrian walkways, and parking must all be identified and assigned to land throughout the land use design and planning phases. The main issues, however, are a lack of skills and professionals in the field of urban transportation; an absence of care paid to the connection between streets, mass transit, and land use during city planning; and the management of urban transportation concerns based on insufficient traffic data and analysis, as well as on an ongoing basis (Jones & Boujenko, 2009).

Streets must be designed primarily for pedestrians, and they must be walkable and welcoming, with enough space reserved for people to walk comfortably and safely. They must also accommodate mixed land uses. It is more reliable and environmentally conscious to use public transportation to satisfy transportation demands rather than private cars and taxis. International research shows that cities with public transportation have fewer traffic accidents and are more efficient and economically active (UN Habitat, 2014).

However, in Addis Ababa, most streets do not facilitate or respond to pedestrian movement. The majority of streets are designed or intended exclusively for automobile traffic. The main problems with public transportation include a lack of attention paid to transportation, a lack of funds, barriers to the maintenance of street rights-of-way, a lack of experienced personnel, and a lack of compliance (Fenta, 2014).

From previous research, (Ayse Ozbil or John Peponis, 2011), they attempted to identify the problem that the street network's functionality influences pedestrian allocation at sidewalk level. There was a significant variation in total traffic volumes per area due to the various land uses. Nevertheless, while related to the planning, designing, construction, and implementation stages in detail, the study fails to examine how street network functional categorization influences pedestrian walking pathways.

In a study published in 2017, Razali et al. (2017) stated the problem with the effect of walkability in determining the design of city streets in Kuala Lumpur, Malaysia. According to their results, considerations such as urban morphology, which involves the lengths of street enclosure blocks and edge environments, affect walkable streets. Whatever the studies emphasize, they are unable to recognize inadequate adherence to provisions for people with disabilities, the elderly, and youth, as well as poor enforcement, a lack of planning, and inconsistent ownership and management of pedestrian walkways.

Gumbo & Moyo (2020) conducted a study on the interoperability of public transport in urban cities in developing countries. In the study, the problem was stated and it was realized that the various modes of transport are not interconnected. There is no proper design to effectively accommodate various land users, for example, those using railways, roads, and pedestrians. However, there is a knowledge deficit in determining in what way urban road design applications influence pedestrians.

Tufa, M.A. (2019) identified an issue in Addis Ababa's shopping zones in which both road design and labeling are inadequate, leading to an absence of pedestrian flow. The research focused on the influence of street design on the orientation of pedestrians. It does not take into account the impact of roadway design on the provision of enough space and appropriate pedestrian path conditions.

(Elwelyn Davis, 2016) found a problem in which walking accounts for more than half of all trips undertaken in Ethiopian cities. The amount of ROW set aside for this method of transportation, however, is not proportionate to its volume. Only about a quarter of city streets have enough well-maintained pedestrian walkways. The study has a gap that does not address the primary issue of street design failing to account for the volume of traffic on sidewalks, in which not defining and projecting AADT does not help experts propose enough ROW for streets with inadequate ROWs.

Unnecessary journeys, congestion, costly fuel usage, pollution, and low productivity have all resulted from the lack of integration between urban land use and urban transportation. Poor transportation design and execution are also to blame. Traffic congestion has been exacerbated by road transportation infrastructure constraints, a lack of an effective public transportation system, and a rise in private automobile ownership. Furthermore, the city is plagued by traffic accidents and pollution from automobiles. Increased fuel consumption is a result of the expanding use of motorized private cars combined with rising congestion levels, making the transportation system costly and unsustainable (AACPPO, 2017). There is a gap in the study since it does not examine the influence of street planning and design on non-motorized transportation, including various amenities.

The most popular forms of travel in Addis Ababa are walking and public transit, with 31 percent taking public transportation, 54 percent walking, and 15 percent driving. Pedestrian amenities are insufficient in many locations in Addis Ababa, aside from the fact that walking is the most popular mode of transit (World Bank, 2018). The city of Addis Ababa has a car-oriented street design, with vehicular speed preceding passenger comfort. The city's streets are broad, with few pedestrian crossings, junctions, or freeway traffic devices. These issues are most prominent at junctions, where streets and users converge and the bulk of crashes and accidents occur. Speeding junctions with large turning radii and extended signal times promote speeding. Route misalignment is the source of jams and irregular traffic flow, and junction street signs and lights are inadequate. Protected junctions, mid-block crossovers, standard access features, and continuous green space are all missing from Addis Ababa's roadways (World Bank, 2018).

Bus shelter location in the streetscape is an essential component of public transit accessibility. Bus shelters would reduce the amount of open space on pathways, forcing people to use the highway, if not well designed. Furthermore, many shelters are built at a different elevation than the adjacent roadway, making them inaccessible to people with disabilities (World Bank, 2018). The problem, as mentioned in Addis Ababa's NMT plan, is effectively articulated; however, there is a gap in explaining the overall aspects influencing pedestrians when adopting street design, such as environmental, social, and economic effects.

(Wondimu, A. 2012) identified a situation in which walking the streets will continue to play an essential role and should be promoted, particularly for small distances. But Ethiopian cities' streets are unable to handle this enormous volume of foot traffic (except in the recently built streets). In Ethiopia, ignoring pedestrian activity would mean ignoring the majority of traffic volume and mobility. Due to the obvious pedestrian inconvenience, this small distance encourages people to use a cab (accidents, congestion, obstacles, lack of greenery, etc.). In this dangerous walking environment, pedestrians are at a significant risk of accidents killing them. The absence of care for pedestrians reduces the inclusivity of city streets, placing an untenable load on the crippled, elderly, and young. During peak hours, the imbalance between travel demand and accessible public transit creates significant transportation difficulties.

Gudissa, S. (2021) described a problem with pedestrian walkways and public transportation in Addis Ababa as not providing complete attention and priority, paying insufficient attention to provisions for people with special needs, the elderly, and children, poor implementation, a lack of coordination, unclear proprietorship and administration, and a financial shortfall on pedestrian walkway. Insufficient access to public transport and transportation shortages results in a waste of time and money, lowering competitiveness and overall growth.

Various studies in this area have attempted to study the problem from various perspectives, but it has not been studied from the following dimensions: identifying poor design and implementation and insufficient commitment to provisions for people with disabilities, the elderly, and youth; explaining the major factors influencing pedestrian walkways, facilities, safety, and access to public transport when adopting street design; describing what policies were used and proven to be effective; and investigating how street design influences pedestrians. So, to fill the research gap, the researcher accepts that it is essential, and so there is a need to consider this investigation. There is therefore a need to conduct a study on the influence of street design on pedestrians in selected areas of Addis Ababa.

1.3 Research Objectives

1.3.1 General Objective

The study's general objective is to assess the influence of street design on pedestrians in selected areas of Addis Ababa, Ethiopia.

1.3.2 Specific Objectives

- To assess the influence of street design on pedestrian facilities and policies in selected areas of Addis Ababa, Ethiopia.
- To assess the influence of street design on pedestrian walkways in selected areas of Addis Ababa, Ethiopia.
- To investigate the influence of street design on public transport access in selected areas of Addis Ababa, Ethiopia.
- To identify the influence of street design on the safety of pedestrians in selected areas of Addis Ababa, Ethiopia.

1.4 Research Questions

- Are there pedestrian facilities along the study route? What are the policies for the provision of pedestrian facilities? How does street design influence them?
- What are the influences of street design on pedestrian walkways in selected areas of Addis Ababa, Ethiopia? What are pedestrians' perceptions of the solution to walking problems?
- What are the influences of street design on public transport access in selected areas of Addis Ababa, Ethiopia?
- What are the influences of street design on the safety of pedestrians in selected areas of Addis Ababa, Ethiopia?
- What is the perception and contribution of stakeholders (planners, urban designers, implementers, and urban managers) on this issue? What needs to be improved concerning standards, design, and implementation?

1.5 Scope and Limitation of the Study

The study focused on street design and its influence on pedestrians in selected areas of Addis Ababa, the capital of Ethiopia. It was limited to the street designs of selected urban routes in the city and their influence on pedestrians, facilities, and walkways, including disabled people. The use of the street for both motorized and non-motorized functions is considered within both the national and global urban street design standards. The study focused on policy formulators, implementers, and the various types of road users that would give an insight into the extent and character of urban street design in the city.

1.6 Significance of the Study

The study's findings are useful to urban street designers as they provide the necessary information on how to tackle the challenges associated with street design on the selected route. It also helps identify problems linked to the environment caused by poor street design and implementation. This helps inform the decisions made by the city authorities on environmental conservation. The national government will also benefit from the study's findings by making informed decisions about urban street design and implementation. The study is also useful as a requirement for the award of a degree in urban land administration and management.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter deals with the literature review concerning the research problem. It discusses the theories that govern urban street design, analyzes previous research on the topic conducted by other scholars, and delves further into policy practices and reports on the influence of street design on pedestrians, including facilities, walkways, safety issues, and public transport access, within the study area. This will give information about the gaps between the theories and policies that inform the researcher's needs. The chapter concludes by looking at the relationship between the independent and dependent variables for the research.

2.2 Theoretical Review

This part of the research presents literature about the keywords of the study. Their definition, character, role, principle, policy, implementation, interaction, and use, which include safety and health, quality, sustainability, equity, urban spaces, pathways, and transport, will be discussed. The research tried to review the literature on the role of good urban street design implementation in the proper use of urban transport, including public transport and walkability, which creates a better lifestyle for society.

2.2.1 The Role of the Street

The street is usually considered a place where people interact socially, have vitality, and a sense of community belonging (Hassen & Kaufman, 2016). For many years, some aspects that were selected, the cultural, economic, and social life patterns of people were embodied within the streets. Streets encapsulate some form of freedom, evolution, and face-to-face interaction. The advent of modernism changed the perception of streets from a place of social, cultural, and economic interaction to one of mobility from one place to another. The street life within the urban setup has lost its prominence. This perception of the street's functions led to the neglect of street life and the spending of substantial amounts of financial resources and time by governments on constructing great highways. Other aspects of street life were whisked to the periphery, and mobility became the main focus of the streets.

The modernism and isolation between various functions of a street influenced the professionals involved in designing the streets (Ntounis & Kavaratzis, 2017). Such experts, such as urban planners and designers, transport engineers, and architects, relegated the traditional roles of streets and preferred mobility functions.

2.2.2 Paradigm Shift on the use of Streets

Streets have traditionally been for efficient transportation of vehicles. Many streets are changing this to ensure that the streets are designed to balance the needs of all street users (Medina-Tapia & Robusté, 2018). This calls for changing the focus and urban design practices to develop successful streets in terms of usability. The design should be such that it provides an opportunity for all people's overall benefits to using the streets. Some of the benefits that most streets should be able to provide for their inhabitants are discussed below.

2.2.2.1 Safety and Public Health

In the modern world, street design should encourage a safe environment for all its users and provide healthy alternatives that promote good transportation (Buehler & Pucher, 2017). Important features like sidewalks, cycling lanes, and public transport should be available. Other important parameters include providing healthy foods in the streets, reducing noise pollution, and having beautiful landscapes and trees that lead to quality air and water provision. These measures prevent injuries and deaths caused by traffic offenses and chronic illnesses occasioned by poor urban planning.

2.2.2.2 Quality of Life

A well-designed city should improve the inhabitants' quality of life (Macke, Casagrande, Sarate & Silva, 2018). This can be measured in terms of its ability to attract and retain people and businesses. This is an important measure of the success of a street design. People's ability to comfortably live within an urban center or city depends on the design of the streets. When the streets are designed so that they are safe, comfortable, vibrant, and efficient, it correlates well with people's willingness to live and feel connected within the city. It, therefore, stimulates social interactions and helps in building powerful and secure societies.

2.2.2.3 Environmental Sustainability

With the emerging environmental trends and challenges, good urban street design should provide environmental sustainability and flexibility (Ambrosino, Nelson, Boero & Pettinelli, 2016). When the streets are well designed, it should reduce carbon emissions and lead to fresh air within the city. Good landscaping and trees help improve air circulation and better water management, hence promoting biodiversity.

2.2.2.4 Economic Sustainability

Well-designed streets encourage people and businesses to increase their economic worth (Litman, 2015). When the streets are designed to improve security, public health concerns, and multi-dimensional functions, the city's economic value increases. This becomes manifested through higher sales and higher values of the property. Therefore, it implies that good design and investment in streets have a good return on investment (ROI).

2.2.2.5 Social Equity

Good street design should provide safe and equitable use for all residents, regardless of their age, gender, race, economic status, religious and political affiliations (Yu, Xu, Towne, & Iman, 2018). The most vulnerable groups of people should also be catered for during the street design. For example, the disabled should be provided with suitable mobility alternatives. A well-designed city should improve access to amenities like schools, health facilities, and sanitation facilities.

2.2.2.6 Attractive and Walkable Urban Spaces

Priority ought to be given to the pedestrian movement in urban street designs in many countries. Streets are urban spaces where people walk, talk, sit, trade, recreate, socialize, and do other activities. To be used as urban spaces, streets must be designed for people and have to be walkable and attractive. These streets must have enough room for people to walk comfortably and safely, as well as mixed land use and dense development. Creating attractive street spaces requires regulating the design of the context to have enclosure, unity, and uniformity. According to Harirchian and Esmaeili (2017), in their study on new perspectives on urban street design, streets form the focal point of economic, social, and cultural life within a city. The study realized the need to give more credence to the pedestrian's role as opposed to the role of transportation in designing an urban street.

2.2.2.7 Pedestrian Walkways and Cyclists Pathways

Pedestrians and cyclists using the roads ought to be given their paths to avoid any possible collisions with vehicles using the same roads. Walking paths and bike lanes should be marked (Pucher & Buehler, 2010). There should also be guard rails or some form of fencing that gives a clear separation of the cyclists and pedestrians from the vehicles. Surface markings should be used to give a demarcation between the cycling lanes and the pedestrian walks. Entrances and exits of buildings should have more protection. There should be clear identification of road crossing points for cyclists and pedestrians. Systems like traffic lights, zebra crossings, or any other such marks should be used. The design of the urban layout can incorporate zebra crossings. In situations where the movement of vehicles is such that it does not provide adequate intervals for pedestrians and cyclists to cross the roads, traffic lights and zebra crossings may be applied. When pedestrian and cyclist crossings are being made, due consideration should be given to adequate visibility of the road users.

2.2.2.8 Public Transport

As traffic congestion keeps filling in metropolitan regions, an ever-increasing number of urban areas have understood that priority ought to be given to public vehicle modes, for example, metro trains, transport quick travel frameworks, or transport, rather than personal vehicles (O'Flaherty, 2018). In general, public transportation is more efficient than private transportation in terms of conveying and moving people. However, international experiences show that simply building more metro lines or putting more transportation out there will not be enough to get more people to use public transportation modes. There are a few non-transportation factors or metropolitan planning factors that play a basic part in travelers' choices of their best travel mode. The principal basic factors are density and the attractiveness of public transport in terms of safety and convenience.

2.2.3 Principles of Urban Street Design

According to Wey & Wei (2016), streets should be designed with five principles that are rooted in the goals, epitome, and theories of superior global street design. The dogmas describe the functionalities of streets that are paramount and should be given due consideration by urban street designers and implementers. The first principle considers streets as public spaces that play a bigger role in the public aspects of the city and the people therein.

Street design should supersede traditional functions like transportation only if emphasis is put on improving the speeds of automobiles and minimizing congestion. As much as the aspect of mobility is paramount, the streets should be designed to include public spaces that promote social interaction. The second principle emphasizes the importance of streets for economic purposes. Within the streets are great business opportunities that improve the economic status of the city and its inhabitants. When the streets are designed according to acceptable standards, they generate good incomes for the various businesses and increase property values. Streets should also be designed to improve human safety. Traffic injuries and deaths can be avoided if the streets are well designed as per acceptable standards. Transport engineers should design streets with provisions for walkways, parking lots, cycling lanes, shopping malls, working areas, and driving lanes. Users should maneuver between the various provisions without collision. The street design should give room for flexibility (Wey & Wei, 2016). The designers should be able to change the street alignment, move curbs, and vary the day lighting positions and traffic re-direction. Since many cities were designed a while ago, the functionalities may need to vary because of emerging issues of modernity. The action of street design should be immediate. Where necessary, temporary materials may be utilized to inform public decision-making on the new designs. These act as temporary measures to address an urgent need for street re-design as test measures, which are then replaced appropriately permanently.

2.2.4 Implementing a Long-Term Designed Urban Street

Greater livability may be achieved by implementing healthy urban streets. People can use various modes of transportation, such as walking, cycling, or taking public transportation, when facilities and activities are nearby, resulting in greater personal and environmental health. Due to the extremely high population density, there are fewer car miles driven and less land has to be constructed. Streets with a high volume of pedestrian and cycling traffic are healthier and foster togetherness (Bevan et al., 2007). City administrations can implement an appropriate share of streets by looking at plans that reflect the intended ROW and percentage share of streets. There is strong sustainability potential if city administrations devote funds to street ROW implementation, as well as continuing training for experts and officials in the formulation and implementation of urban plans at the local, regional, and national levels.

2.2.5 Policy on the Use of Land as well as Street Design

The cost of altering existing streetscapes is one possible impediment to street-scale urban planning and land use policy. Furthermore, street-scale urban design and land-use rules need meticulous planning and coordination among urban planners, architects, engineers, developers, and public health specialists. Community buy-in, which can take time and work to establish, is crucial to success. Inadequate resources and a lack of incentives to improve pedestrian friendliness may have an impact on how well and fully programs are implemented and assessed. According to Community Guide criteria of evidence (Heath et al., 2006), there is substantial evidence that street-side urban design and land-use strategies that encourage physical activity in limited geographic regions, often confined to a few blocks, are successful in boosting levels of physical activity. Regulations, policies, and practices that do this create safer and more attractive sites for people to visit that are nearby enough to be accessed by active transportation. Better lighting, improved aesthetics, and redesigned streets (e.g., creating or renovating playgrounds, establishing squares, traffic calming, and bicycle lanes) are particular examples of beneficial practices, as assessed by a rise in the percentage of people using active transportation or other indicators of physical activity.

2.2.6 Transportation, Land Use, and Streets

There has been recent research on the interaction between land use, streets, and transportation. Successful, competitive, and sustainable urban centers will be supported by integrated street, land use, and transportation development. Urban centers' land usage and form are shaped by streets. Varied land uses, on the other hand, create distinct amounts of traffic, resulting in varied transportation demands and, as a result, different types and hierarchies of roadways to accommodate them. As a result, streets, land use, and transportation are all intertwined, and their interactions and treatment have a greater impact on the growth and character of urban areas. Mixed-use, compact, poly-centered, and dispersed projects decrease travel and transportation requirements. If these projects are accompanied by public transportation within walking distance, they are known as Transit-Oriented Developments (TOD) (IUIDSSM, 2015). International evidence demonstrates that cities with public transportation have fewer car crashes, are more efficient, and are more economically active. According to worldwide experience, BRT has been shown to carry more people for less money than private vehicles and other forms of public transportation.

2.3 The Influence of Street Design Applicability

A lack of suitable design, poor implementation of recommended designs and management, insufficient or substandard street coverage, and density, limited and undeveloped rights of ways (ROWs), and insufficient accessibility and connection all have an impact on urban transportation, which does not create a support for people's activities and thus does not promote local economic growth. Lack of dedicated lanes, routes, and stations; narrow and poorly designed and managed pedestrian walkways; a lack of car parking and bicycle routes, as well as narrow and underdeveloped medians; difficulties in reserving enough land for medians; and a poor selection of street trees and furniture, all contribute to an uncomfortable and aesthetically deficient environment (Jones & Boujenko, 2009).

2.4 Empirical Review

Prelovskaya & Levashev (2017) investigated present-day approaches to the street space plan. In their investigation, they discovered that when measures were set up to change the organization of streets inside an urban region, the results were positive, such as improved administration for walkers, public vehicle clients, and cyclists. This suggests better quality help with an improved urban street plan rather than a non-organized one. It also resulted in a significant decrease in the amount of automobile traffic within cities and an increase in the burden of transportation for specific segments. Streets, therefore, play an important role in the movement of people and vehicles from one point to another. These arrangements should not be left to chance, but proper planning and design have an important role to play. From the study of Harirchian & Esmaeili (2017), in their investigation into new viewpoints on urban street plans, streets form a point of convergence of economic and social life within a city.

Even though a large number of advanced streets in many urban environments have been reduced to the essential elements of the development of public and private engine vehicles (Harirchian & Esmaeili, 2017), in the examination, the creators looked to build up the connection between urban street plans and transport planning.

The study understood the need to give more assurance to the function of the walker rather than the part of transportation in planning an urban street. The need should be given to passerby development in street urban plans in numerous nations. Great street plans should aim to reduce vehicle development speeds, improve the wellbeing and security of all street clients, increase their availability, and lead to the advancement of the domain of people on foot. It ought to incorporate components like parking areas, expanding side strolls into the stopping connections, and the formation of check expansions. Such aspects must be given due consideration in line with the global standards of street design and for the safety and security of the various street users. In numerous nations, urban focuses are planned in such a way as to advance the simplicity of the development of automobiles. According to Zavestoski & Agyeman (2014), this causes countless difficulties with walkability inside the streets. To improve the pedestrian experience of those on foot inside an urban place, morphological elements like the length of the walled-in area blocks and the state of the edges should be given some thought. All street users have important roles to play, and as such, their welfare is of paramount importance.

2.5 Street Coverage, Walkways and Public Transport in Addis Ababa

Ethiopia's capital, Addis Ababa, has inadequate or below-standard street coverage and congestion, tiny and underdeveloped right-of-ways (ROWs), and a lack of transportation, movement, and linkage, according to the current situation survey. They lack designated transit channels, pathways, and terminals; pedestrian walkways are restricted and poorly designed and maintained; and, even in urban centers or sites with suitable terrain, automobile parking and bicycle paths are few and far between. The Mexico route is one example in the city. They also have narrow and undeveloped medians, as well as a lack of street plants and furniture, making them uncomfortable and unappealing (Aregawi, 2018). In Ethiopia's cities, walking is the most common means of transport. It also saves money and is healthier for the environment. As a result, pedestrian-oriented developments must be used to encourage and enable this method of transportation (POD). On the other hand, as the population grows and cities grow in size, so does the demand for transportation and motorization. Using public transportation to meet transportation needs rather than personal vehicles and taxicabs is more efficient and environmentally friendly. Larger cities, such as Addis Ababa, Regiopolis, and first-class cities, also need transit-oriented developments (TOD).

2.6 Addis Ababa, Ethiopia's Pedestrian-Friendly Street Design and Transport Policies and Practices

In Ethiopia, the street design pattern is guided by the policies of the National Association of City Transportation Officials and the Global Designing Cities Initiatives. These two bodies came up with a raft of measures contained in the Global Street Design Guide. In the guide, there are tested and lifesaving designs of streets around the world that should be implemented by urban designers and planners as well as transportation officials during the planning and implementation of street designs. The guide has been endorsed by many cities around the world, including Addis Ababa in Ethiopia. The guide stresses the importance of stressing safety, transit, pedestrians, and mobility within the streets. The guide comes at a time when there are alarming statistics about the number of casualties emanating from road accidents being on the rise. 1.24 million People perish in road accidents annually, with the total number of those injured being 23–24 million (Al-Thaifani, Al-Rabeei, & Dallak, 2016).

Poor road design is one of the contributing factors to the fatalities, as it leads to over-speeding and dangerous driving. The guide, therefore, presents viable options for street types and unique street intersections that consider the safety of people as a priority, and they are flexible enough to be applied to all parts of the world. The guide gives insights into ways of making more transit lanes for people's mobility and creating room for more economic activities within the streets that are designed for implementation globally. Good road design is also the way to settle bigger issues of urban areas' economic life, comfortable living, and physical and social adaptability. The Guide comes as metropolitan populations swell around the globe and during a change in the quantity of urban communities planning, testing, and actualizing street changes. The Global Street Design Guide sets another worldwide pattern for planning urban streets (Global Designing Cities Initiative & National Association of City Transportation Officials, 2016). Perceiving that urban areas are places for individuals, the guide moves the boundaries of planning metropolitan roads from the run of the mill perspective of vehicle development and security to incorporate access, well-being, and portability for all clients, natural quality, financial advantage, improvement of the spot, general wellbeing, and, by and large, personal satisfaction. The Guide expands on NACTO's effective Urban Street Design Guide, Urban Bikeway Design Guide, and Transit Street Design Guide, growing from a North American setting to address an assortment of road typologies and plan components found the world over, Ethiopia included.

Addis Ababa is currently undergoing a massive and gigantic development spurt. Tragically, the planning and development of numerous structures and road networks are of poor quality, with little consideration being paid to issues of ecological execution and life-cycle examination. Relevant authorities are under pressure to meet rapidly growing demands for good street design plans and to raise living standards on the streets. However, the current transient spotlight on satisfying immediate needs instead of considering longer-term issues of sustainability in urban street designs is probably going to prove costly in the long run because of the significant expense and multifaceted nature of re-building and modifying the streets of Addis Ababa. As traffic congestion and air pollution grow, the Ethiopian government is encouraging walking, biking, and public transit. Ethiopia's transport ministry, in collaboration with the Institute for Transportation and Development Policy (ITDP), UNEP, and UN-Habitat, has released its NMT Strategy 2020–29, which also describes efforts to increase movement and promote inclusionary population growth for the next 10 years. The government will invest in pedestrian, bicycle, and mass transit while also controlling personal auto use. The strategy emphasizes the importance of including women, children, and people with disabilities in planning and budgeting (UN-Habitat, 2021).

Since May 2019, UN-Habitat has been assisting the Ethiopian government through the "Optimization of Safe Streets in Ethiopia" project, which aims to improve Ethiopia's ability to design and implement policies that prioritize pedestrians and the needs of cyclists and pedestrians while also allocating capital for long-term movement. The project is assisting multiple government authorities in their continuing quest to improve and implement walkways and cycling lanes by helping to align current street design standards, supporting policy-making, contributing to car-free days by organizing stakeholders and facilitating street-level activities, and providing technical evaluation support for desirability studies (UN-Habitat, 2021). Streets with the proper design and layout help with the structure and organization of land use and transportation systems. At the urban planning stage, street functional categorization will be allocated based on socioeconomic studies, expected traffic volumes, current and prospective land uses, transportation, terrain, and street location. During the planning and design phases, street length and spacing must be determined. For pedestrian walkways, public transportation, biking, and other uses, it will be defined by the type of land use.

2.7 The Overall Influencing Factors of Street Design on Pedestrians

Regarding the social impact, people can't utilize the streets for anything other than getting to work or someplace else, rather than enjoying them and interacting with others. In terms of economic impact, selling coffee or any other form of revenue is not a viable option on the streets. They're unpleasant, but they're improving. It can turn them into exhibitions. Traffic jams and automobile accidents cost the economy a considerable number of human hours. Those hours wasted result in lower productivity, higher healthcare costs, and other financial consequences. The value of lost lives and catastrophic injuries caused by traffic accidents had a major economic impact. Poorly planned streets increase emotional and physical stress, resulting in higher medical costs and a greater demand for social amenities (*Pedestrian Safety, Urban Space and Health*, 2012).

Of the environmental impacts, commute time had the most detrimental influence on people's health due to extended sitting, stress from traveling in congested areas, and a lack of time for exercise. The streets failed to prioritize pedestrians and public transportation, resulting in an increment in the number of private motor cars on the road, raising emissions and pollution. Vehicles that utilize more gasoline utilize mostly nonrenewable materials and pollute the air. It is difficult to aid in enhancing the local environment and lowering urban heat due to a lack of street trees and land fleeing, thereby increasing the requirement for high-energy climate control in cars and surrounding buildings, which increases noise pollution. In cities, there are insufficient trees and greenery to alleviate stress and violent behavior, which has been related to an uptick in criminal activity. Other issues include a lack of accessibility and serviceability for all users, a lack of aesthetics and attractiveness, and the relocation of displaced individuals (*Pedestrian Safety, Urban Space and Health*, 2012).

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2.8 Conceptual Framework of the Study

Theoretically, the literature analysis shows that in today's society, street design should provide a safe environment for all users and provide healthy options (Buehler & Pucher, 2017). Sidewalks, bike lanes, and public transportation should all be accessible. Other important characteristics include having healthy foods available on the streets, minimizing noise pollution, and having a beautiful landscape with trees that lead to clean water and air. These safeguards guard against traffic-related injuries and deaths, as well as chronic diseases brought on by inadequate urban design. When it comes to connecting the theories to the conceptual framework, streets are urban spaces with urban planning features and aspects, as well as a sense of place. They are also traffic networks that support pedestrians, cyclists, public transit, and other vehicles, as well as service conduits. Addis Ababa's population is quickly expanding, necessitating a secure, pleasant, and welcoming urban atmosphere. For far too long, transportation planning has prioritized the requirements of private automobile owners above the mass of Addis Ababa inhabitants who walk, cycle, or take public transportation. This strategy has increased traffic congestion and road safety issues, both of which harm economic development, efficiency, and population health.

The NMT Strategy in Addis Ababa defined a comprehensive set of actions to increase the usage of non-motorized modes and public transportation access. AA city transport strategies and policies are based on designing and planning cities for the movement of people rather than private cars and investing in more sustainable modes so that people walk, cycle, and take public transport of choice rather than necessity.

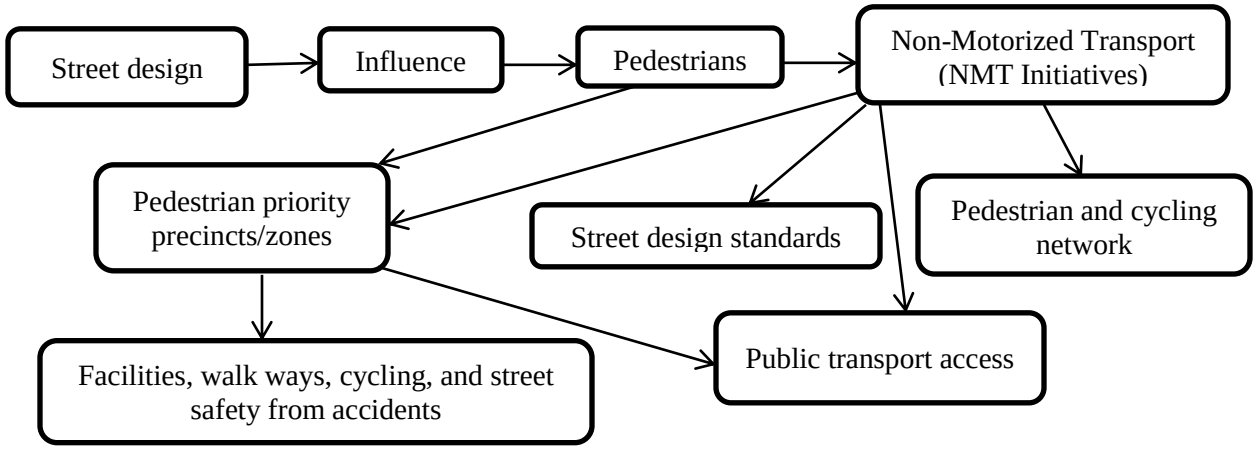

Figure 1: Conceptual Frame Work of the Study

Source: By a researcher

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Background of the Study Area

The research was carried out in Addis Ababa, Ethiopia. Addis Ababa, Ethiopia's capital and largest city, has seen strong annual growth in recent years, with population counts approaching 4 million as of 2017. Ethiopia's capital city covers an area of 527 square kilometers (Belete & Yilma, 2020). As an established city, Addis Ababa additionally fills in as the capital city of the Oromia Region. It is the place where the African Union is settled and where its archetype, the African Union Organization (AUO), is based. It also serves as the headquarters of the United Nations Economic Commission for Africa (ECA), as well as several other domestic and international organizations. Addis Ababa is frequently referred to as Africa's diplomatic capital for its record, discretionary, and political criticality to the mainland. Between the Nubian Plate and the Somali Plate, the city is located a few miles west of the East African Rift, which divides Ethiopia into two sections. The region is surrounded by the unique area of Oromia and is inhabited by people from all over Ethiopia. Addis Ababa University is located there.

The development of the Addis Ababa ring road was started in 1998 to execute the city's groundbreaking strategy and upgrade fringe improvements. The ring road was separated into three significant stages that interfaced all the five primary doors through Addis Ababa with any remaining areas. The Ring Road has extraordinarily served to decongest and mitigate city traffic. The fast development of Addis Ababa is not being overseen effectively by proper city planning authorities. As a result, city development and street design activities are not managed holistically. For instance, enormous multi-story structures are developed with no parking bays on significant streets where parking is also restricted. Moreover, there is an absence of thought given to the impacts of metropolitan improvement on the current character of areas and the rise (and decimation) of regions. There is also an absence of any consideration for pedestrians in urban street design and construction management (Belete & Yilma, 2020).

The city of Addis Ababa has prioritized space and taken a car-centric approach to street design. Pedestrian safety takes a back seat to traffic throughput. The city's streets are usually wide and without curbs. Traffic calming components include things like walkways, crossovers, and traffic decreasing measures. These are significant problems. Public transportation and walking are the most popular modes of transportation in Addis Ababa, accounting for over 85% of all journeys. The percentage of passengers carried on foot varies greatly from one neighborhood to the next. Walking accounted for 78 percent of journeys in the Addis Ketema sub-city, whereas just 40 percent of excursions are made on foot in the Bole sub-city. Walking tours are about 1.5 kilometers long. Addis Ababa's roadway design prioritizes automobile speed over pedestrian comfort. The city's roadways are generally broad, with fewer pedestrian crossings, junctions, or congestion-reducing elements (World Bank, 2018). In Ethiopia's metropolitan areas, walking accounts for more than half of all journeys. The amount of ROW set aside for this form of transportation, however, is not proportionate to the volume. In urban areas, only approximately a fourth of the roadways have adequate and well-maintained pedestrian crosswalks.

Urban centers require a suitable number and breadth of public transportation or transit lanes as the population and geographic extent of urban regions grow. At the start of their growth, transportation routes in small cities might have been shared with other vehicles. However, as the volume of traffic grows urban transportation networks should be designed with distinct, exclusive, or dedicated lanes for urban transportation to provide quicker and more reliable public transportation routes. This strategy might begin with just bus lanes, progressing to Bus Rapid Transit (BRT) and Transit-Oriented Development (TOD) as time goes on. For Addis Ababa's LRT and BRT systems to function correctly, people require secure station access. At-grade crossovers are the best way to get into a fast-moving transportation hub. Thanks to well-designed crossings, pedestrians may cross crowded roads safely and conveniently. By adopting transportation master plans and big road projects, Addis Ababa is attempting to address urgent transportation difficulties and growing urban concerns (Hordofa et al., 2018).

The study area includes central areas that are integrated or connected by routes such as Bole Road (Meskel Square to Bole International Airport), Mexico, and Urael, which are located on the East-West LRT line road corridor. The areas were chosen for their high pedestrian volumes (number of pedestrians moving), transportation facilities, such as public transportation, major passenger boarding points along the LRT road at Urael Church and the Mexico Corridor, and the Bole Road, which is the country's main entrance and a very important street, has wide streets and longer pedestrian crossings, and Meskel Square, a public space for various activities.

Figure 2: The Study Routes Depicted on the Map.

Source: By a researcher from Google earth and AutoCAD

Bole Road is the main road from the airport to Meskel Square. All visitors, including dignitaries coming to the African Union summits, will first travel on Bole Road to enter the city, making this route one of the most important streets in Africa. The Bole Road links the Addis Ababa areas and is the quickest path to the central city. It connects the international airport to Meskel Square (the city's main public area), the stadium, and the bus station at Leghare's. Bole Road is very level except for a small length when it crosses a river right before reaching the intersection at Wollo Sefer. Addis Ababa is a city in which individuals from all socioeconomic backgrounds coexist.

Moreover, except for a few in-fills near the Bole Airport, most of the in-fills on this route (Flamingo, Olympia, Wollo Sefer) are primarily low-to-moderate economic classes. In January 2012, the Addis Ababa City Roads Authority (AACRA) began construction of the 40-meter-wide, 5-kilometer-long Bole route as part of a city-wide road network upgrade. The Bole Road, which runs from Meskel Square to Bole International Airport, is the city's main international gateway and one of the city's most crowded arterial roads. Due to the recent upgrade of Bole Road, a drastic improvement has been made to allow for better movement of vehicular traffic. This is a prominent road that should be recognized on the international stage, representing not just Addis Ababa or even Ethiopia, but the union of Africa as a whole. This opens the door to the second phase of upgrading that is more ambitious and befitting of its prestigious obligation (AACRA, 2014).

The new design of Meskel Square features a new colorful stage for concerts, public events, and, of course, the State of the Union Address. A canopy-covered pathway with trees serves to screen off the bustling traffic while providing walkers with unrestricted access to the square. The ground is decorated with radial patterns of colored asphalt in the colors of the Ethiopian flag. Water fountains are hidden behind concealed holes in one section of the plaza, which may be turned on to offer a quick play area for youngsters. It uplifts the soul and, in the summer, cools the space. The grassy rows of the tiered seats blend nicely with the new plants and towering trees. It softens the plaza with vegetation and completes the design, which depicts Ethiopia and Africa as having a bright and sustainable future (AACRA, 2014).

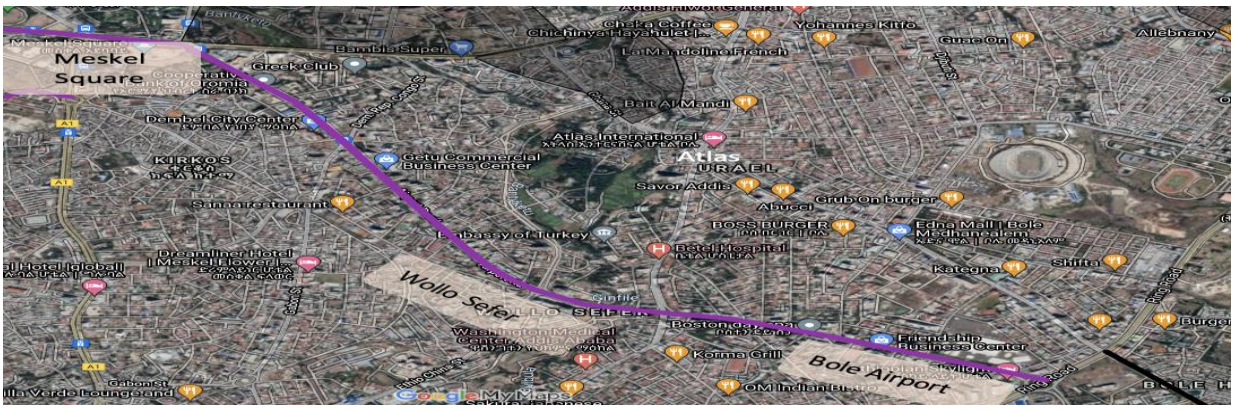

Figure 3: Route from Meskel Square to Bole

Source: By researcher from Google earth

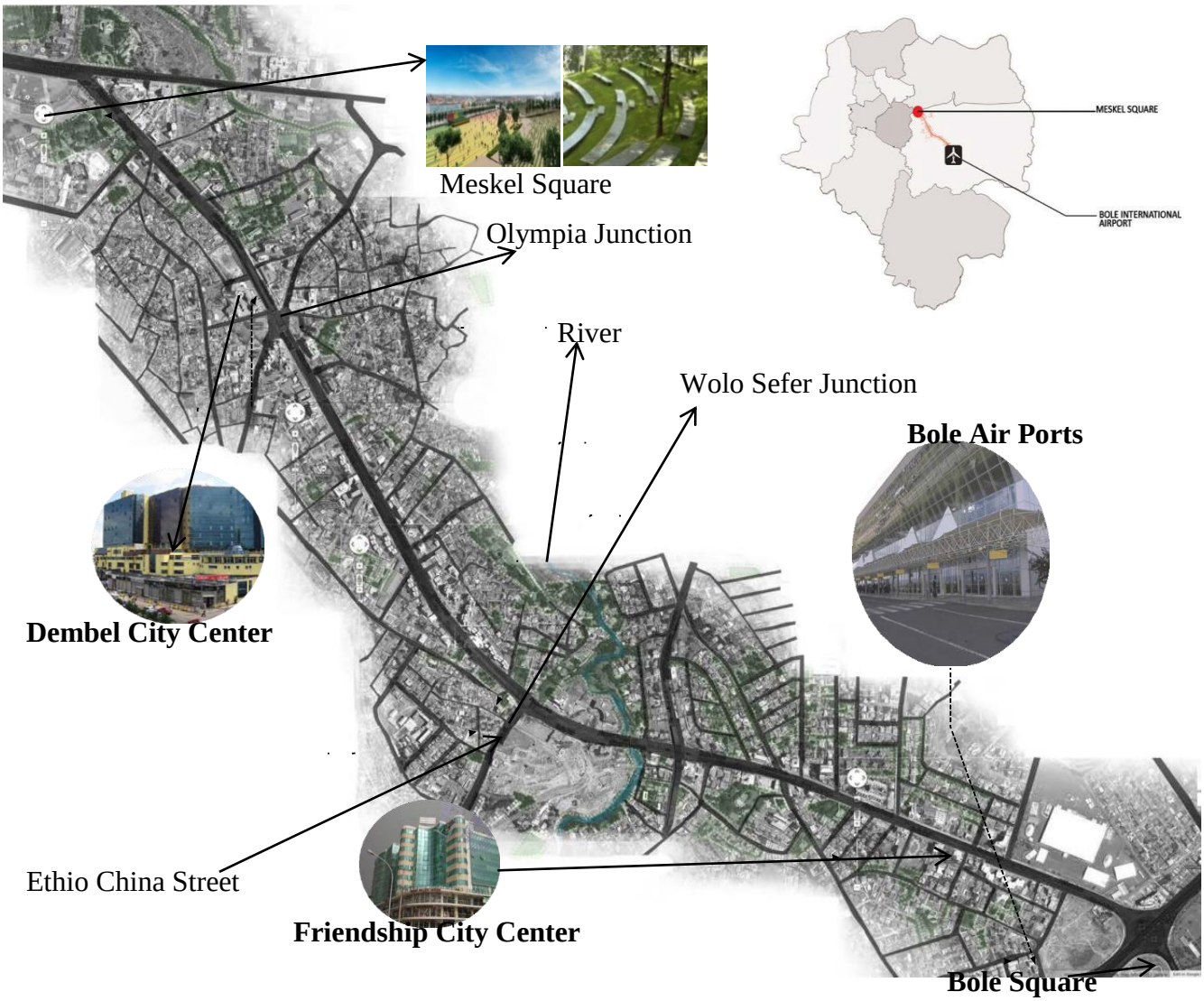

Figure 4: Main and Access Streets of Bole Road

Source: Bole Road Design Intervention, Addis Ababa City Road Authority (AACRA), 2014

On the East-West LRT line, Mexico and Urael are important landing sites. The LRT line at both junctions is underground, and there are pedestrian and vehicle crossings at each intersection. A foot crossing is necessary. The nearest LRT station (Urael), which is located at the entrance to Bambi's Supermarket, is 350 meters away. From Mexico Junction to Estifanos Church, it is a fully elevated section whereby a pedestrian crossing with a zebra sign is provided on to the road as per the standard. Three stations exist, from Estifanos to Urael Church (AAPDC, 2017).

One of the busy roundabouts in the city of Addis is located in Mexico. Because of the street vending and public transportation terminals, the area is flooded with large numbers of pedestrians. Mexico's speed zoning is highly focused on Mexico's roundabouts. The sidewalks in the Buna Shay (Leghar) and Debrewerk corridors are usually invaded by street vending activities; there is a higher volume of pedestrians across the corridor, and pedestrians walking on the roadbeds are common, even though the sidewalks are in fair condition.

Figure 5: Route from Mexico to Urael on a Map

Source: By a researcher from Google earth

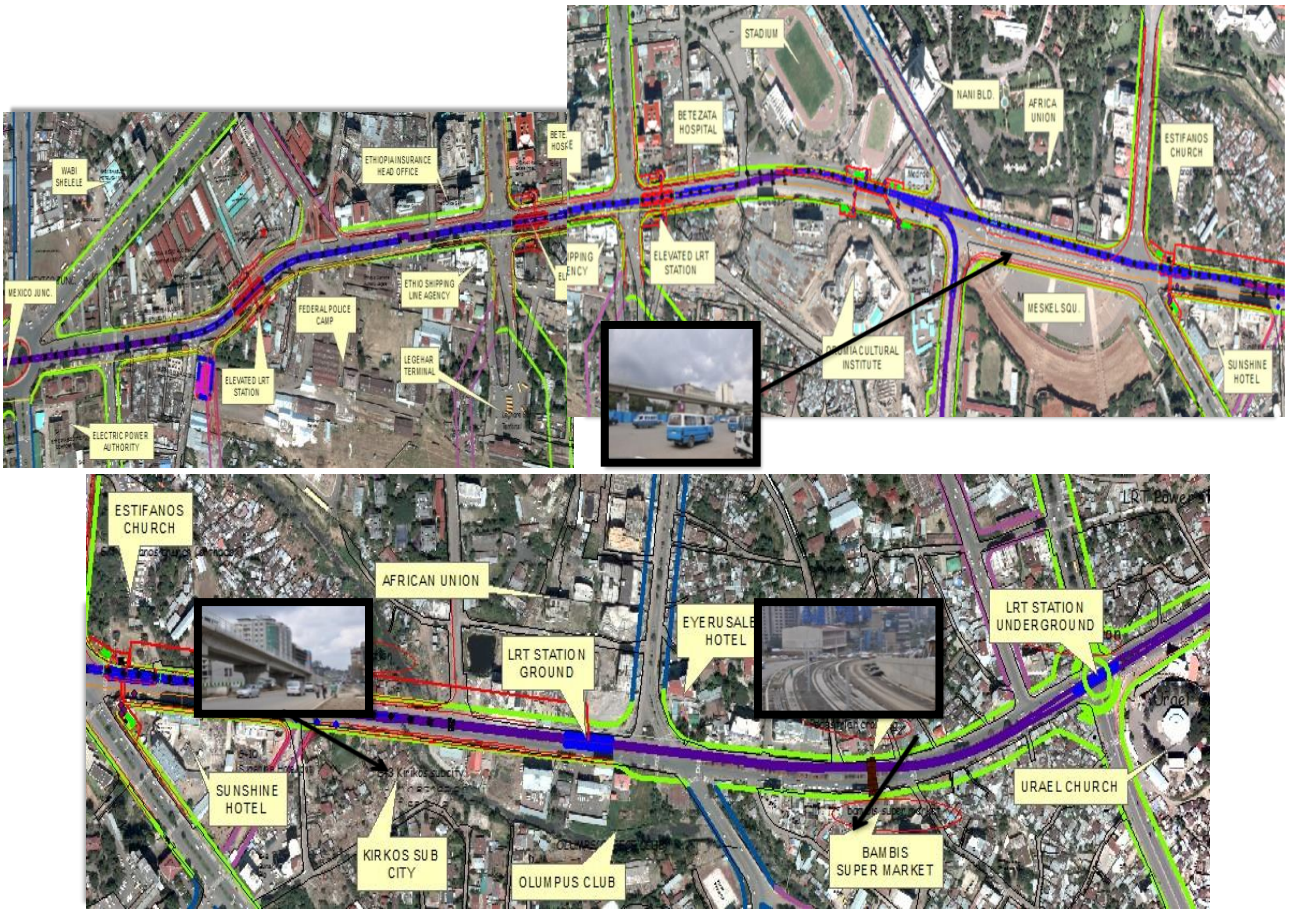

Figure 6: LRT and Pedestrian Crossings from Mexico to Urael

Source: Addis Ababa Plan and Development Commission (AAPDC), 2017

3.2 Research Design

3.2.1 Research Type

The research utilizes a descriptive research design, which, as indicated by Rahi (2017), is organized to look at various sensible sub-units or units of investigation inside associations. Rahi (2017) recognizes the significance of the descriptive plan, particularly when the goal is to gain a more comprehensive understanding of the study's setting and the cycles being established.

Additionally, Rahi contends that the plan has an impressive capacity to produce answers to the research questions. The descriptive survey method allows the researcher to conduct quantitative and qualitative analyses of data on current street design implementation and its influence on urban transportation. Furthermore, it aids the researcher in identifying and describing viable solutions as well as making appropriate recommendations.

3.2.2 Study Variables

The study was conducted to gain an insight into street design influences on pedestrians, including facilities, walkways, safety and public transport access in selected areas of Addis Ababa, Ethiopia. Street design influence was the independent variable, while pedestrian facilities, walkways, safety, and public transport access were the dependent variables for this study. The study considered the successful street design and implementation for pedestrians in the city.

3.2.3 Data Sources

The study collected data from inhabitants of Addis Ababa, Ethiopia on the routes of Mexico, Urael, and Bole Road (Meskel Square to Bole). For this study, the student researcher used both primary and secondary data sources; the primary data was gathered through a survey and an interview. In the research areas, the survey was completed by both key informants and street users. The researcher interviewed key informants who were entrusted with the design and implementation of the city's street designs: urban planners and designers on the guidelines that they apply to the city's urban street design; traffic, road, and transport; architectural and civil engineers; and others from concerned offices. Secondary data was collected by examining relevant documents from concerned bodies, such as the Addis Ababa Transport offices and the Addis Ababa Traffic Management Agency's accident history data report of traffic police.

3.2.4 Data Collection Instruments

The data for the investigation was gathered from both primary and secondary sources. The secondary data frames the reason for the linkage with discoveries and provides a framework for the research questions. The data was obtained from an insightful audit of recorded sources. The primary data was gathered through open-ended and close-ended questionnaires, which helped to get more detailed qualitative and quantitative data on related issues and semi-structured interviews. The purpose of using questionnaires is to make every respondent react to a similar arrangement of inquiries and give a productive method of gathering reactions from a large population sample, which will lead to quantitative analysis (Dillman, 2000). Interviews aid an investigation in gathering valid and reliable information relevant to answering research questions and hypotheses.

3.2.5 Sample and Sampling Techniques

Several sample procedures were chosen for the research study's convenience, each having its own explanation. In qualitative studies, participants are selected purposefully; as a result, key informants tasked with the design and implementation of the city's street designs were taken accordingly. The reason behind this is that all selected participants were organized with the responsibility for the implementation of street design based on standards and guidelines to address urban transport issues. They feel it gives the greatest knowledge to address the problem under inquiry for the research.

The survey was conducted on key informants' days of work and all of the days with pedestrians during peak hours from May 25 to the last week of June 2021. Using a purposive sampling method, the questionnaires were given to 30 people from departments involved in urban street design and implementation (Key Informants): 5 from the Addis Ababa City Planning and Development Office, 5 from MUDC, 5 from AACRA, 5 from the AA Transport Authority, 5 from the Ethiopian Urban Planners and Architects Association, and 5 from the Traffic Management Agency. Concerned bodies were chosen based on their role, experience, study knowledge and understanding, status, supportiveness, and other factors. The researcher found them personally by visiting their workplace and communicating with them via phone calls and email.

Table 1: The number of key informants surveyed and their office

Number of key informants from various departments	Office of key informants
1. Five key informants	Addis Ababa City Road Authority (AACRA)
2. Five key informants	Addis Ababa City Transport Authority
3. Five key informants	Addis Ababa Traffic Management Agency
4. Five key informants	AA Ministry of Urban Development and Construction
5. Five key informants	AA City Administration Plan and Development Commission
6. Five key informants	Ethiopian Urban planners and Architects Association

Source: By a researcher

Mexico, Urael, Meskel Square, and Bole routes were selected for study, and 422 people were sampled among the street users. Thus, the study was conducted with 452 participants. Convenience sampling was used to obtain 422 respondents from the street users. The method is an affordable way to gather data, making it useful as an intervention to correct dissatisfaction and the like. Street users were chosen because they had a better understanding of the problem of pedestrian pathways than the others. According to the survey, street users were selected based on whether they were friendly and had enough street awareness, as well as whether they routinely walked and accessed public transportation in the study areas. The researcher discovered people on the sidewalks as they walked, traveled, used routes to arrive at a certain area, engaged in various businesses (street vending), used cafeterias mostly around pedestrian rights-of-way, polished their shoes on the walkways of the streets, and awaited public transportation on the stations, such as the LRT and Sheger Bus. The pictures below show that when street users conducted a survey.

Figure 7: A Survey Carried Out in the Selected Study Areas of Addis Ababa, Ethiopia

Source: By a researcher

The pedestrian count at peak hour is taken from the Consultancy Service for traffic studies, design, and construction supervision of comprehensive corridor improvements, and design and construction supervision of citywide Intelligent Transportation Systems (ITS), including preparing an ITS master plan for Addis Ababa City. The data is used to estimate the population size of Mexico, Urael, and Bole routes. The researcher counts pedestrians manually in Meskel Square on three randomly selected weekdays during a peak hour on Wednesday, Saturday, and Sunday in the morning and afternoon, from both the right and left sides of the path, and then averages the results. Yamane (1967) recommends a sample size of n = 1 + N at a 95 percent confidence level and p = 0.5, where N is the population size and e is the degree of accuracy. With a significant number of respondents in the survey, the researcher feels that high sample size is necessary for a thorough evaluation of walkers' walks and crossing details. As a consequence, for each route, a sample size of 5% level of significance is determined, and a total of 422 pedestrians will be surveyed for the questionnaire.

Table 2: Showing pedestrian count and sample size calculation

Streets (Routes)	Sample pedestrian count (Pedestrians are counted on three randomly selected days in a week, with peak hours on each street and an average value taken).	Sample size, n for 95% confidence level:		
		±5%	±7%	±10%
1.Mexico	219	142	106	69
2.Urael	176	122	90	64
3.Meskel Square	103	82	68	51
4.Bole	94	76	64	48
Total	592	422	328	232

Source of pedestrian count: (The Mexico, Urael, and Bole routes' pedestrian counts are taken from the consultancy service for traffic, pedestrian walking, and crossing studies, the main intelligent transportation system study report, 2020). The researcher did the Meskel Square route pedestrian count.

3.2.6 Data Analysis

The data collected from the sample population was more quantitative, and it was done with the help of the program, Statistical Package for Social Sciences (IBM SPSS Version 26), of descriptive statistics, including frequency and percentile, using tables and figures. The qualitative data is analyzed by interpreting, summarizing, and generalizing.

3.3 Presentation of Data

The data obtained from the study are presented using various ways of presenting statistical data. These include the use of tables, bar graphs, line graphs, and pie charts. These methods have some advantages since they provide a visual account of the data collected, which makes it easy to understand and utilize.

3.4 Ethical Considerations

The respondents of the study were assured of confidentiality and privacy of any information they gave in the questionnaires. To give an assurance on this, they were requested not to indicate their identity while answering the questions. In addition, the respondents were informed that the research is for academic purposes only and the benefits emanating from the study will outweigh any imagined risks.

CHAPTER FOUR: RESULTS

This section of the research paper presents the findings of the study. The collected data is analyzed and interpreted into meaningful information from which a conclusion is drawn. The primary data collected for this study was mainly in text and was subject to content analysis through the IBM Statistical Package for Social Science version 26. The results are presented in tables, pie charts, and bar graphs.

4.1 Street Users

4.1.1 Response Rate

The response rate determines the success of the project and the overall representation of the population in terms of sample size. The response rate was determined as the total survey response divided by the sample size expressed as a percentage.

4.1.2 General Information

Gender

Table 3 below gives a summary of the information on the gender of the participants**.**

Table 3: Gender information of the participants

Gender	Frequency	Percent (%)
Female	204	48.34
Male	197	46.7
No response	21	5
Total	422	100.0

Source: Own survey (2021)

From the results, at least 5% of the participants did not declare their gender details. However, the overall percentage of both genders shows a minimum variation. This result indicates that the data collected was a representation of all genders within the study area. The study result does not show gender biases, which can therefore be concluded to be an opinion of the population within the study area.

Analysis by Age

The study included participants between the ages of 15 and 70 years old, divided into five age brackets. The majority of participants were between the ages of 24 and 30 and between the ages of 31 and 40, accounting for 32.7% and 30.5%, respectively. The elderly, age bracket of 66–70, were the least responsive to the survey, accounting for 2.5%. The summary results are presented in figure 8 below. The age question was not answered by 9.5% of those polled.

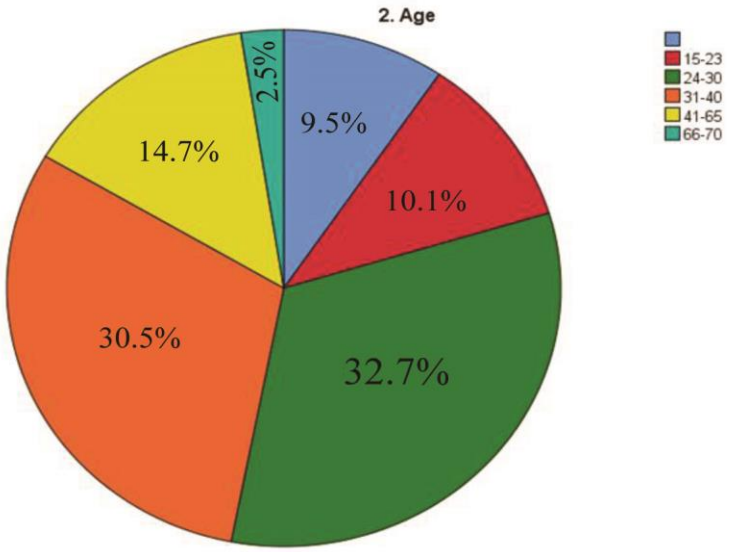

Figure 8: Showing age of the survey participants

Source: Own field survey (2021)

In other results, 87.1 percent of the participants were familiar with the area of study (Mexico, Urael, Meskel Square, and Bole). These observations guaranteed the study's validity. 59.8% of the participants made a daily (or frequent) visit to the study area. This indicates that a good number of at least 60% will give an opinion of daily encounters accessing the study area as far as roads are concerned. 18.7% of the participants and 10.4% of the participants were weekly and monthly users of the roads in the area, respectively (Figure 9). Annual visitors were only 1.6%, and 9.5% did not respond.

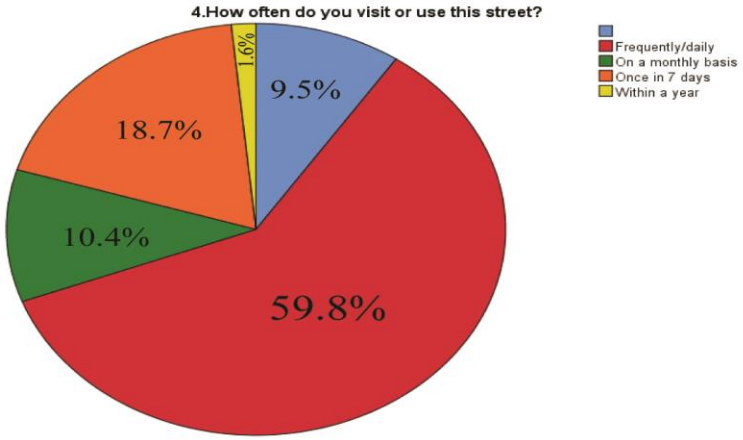

Figure 9: Pie chart showing the frequency of users and visitors to the area of study

Source: Own field survey (2021)

4.1.3 Using the Streets Mexico, Urael, Meskel square, and Bole

When asked for the reason for using the streets, 44.5 % of the respondents indicated they use the streets to arrive at a certain location, 42 % for a walk, 1.8 % for biking, and 0.9 % for parking, while 0.5 % gets to work and 0.2% indicated others. 10.2% did not respond to this question. Figure 10 below presents the time preference by respondents for utilizing the roads within the study area. From the study results, most of the users preferred using the road late in the afternoon at 4 pm and in the morning hours at 8am, accounting for 31.6% and 24.2%, respectively.

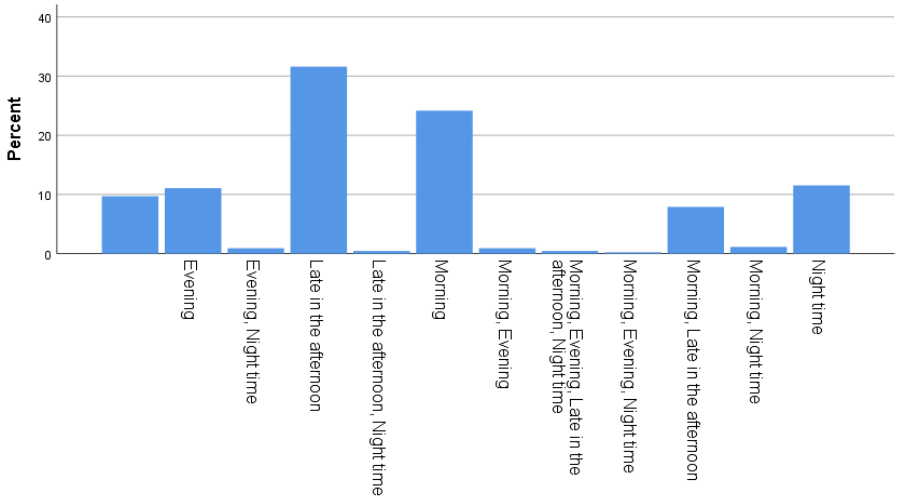

Figure 10: Time preference for using the roads within the study area.

Source: Own field survey (2021)

At least 76.7% of the survey respondents have never been involved in a vehicle-pedestrian collision on the streets within the study area. This is in contrast to the 13.5% of respondents who have been involved in collisions with vehicles on the road. From traffic police data, the total serious and fatal accidents of crossing pedestrians in the three years (2015, 2016 & 2020) were 21 on Meskel Square, 6 on Mexico, 5 on Urael, and 2 on Bole were the victims. At the same time, when accessing the streets, 34.12% walk while 24.4% utilize minibuses as their means of transport. The overall results regarding the mean of transport utilized by the respondents in accessing the roads are provided in table 4 below. Surprisingly, 77.7% of the respondents said the public transport lanes were not fitted with signs, signals, marks, and sound alerts. Similarly, 83.5 percent agreed that street widths were not adequate for easing movement within the study area. Moreover, 71.8% of the survey participants showed that public transport lanes did not have wider carriageways than other motor lanes.

Table 4: Means of Transport in accessing the streets

Means of Transport	Frequency	Percent
Bicycle	11	2.60
Bus (Sheger, Ambesa, Higer…)	43	10.2
Foot	144	34.12
LRT	34	8.1
Minibuses	103	24.4
Motor	2	.5
Others (Specify)	2	.5
Private vehicle	37	8.8
Public service	34	8.1
Taxi	4	.95
No response	8	1.9

Source: Own survey (2021)

The survey results also revealed that all facilities on the sidewalks and streets were inadequate. This was supported by 78.1% of the survey respondents, while 13.5% acknowledged adequacy, with 2.3% being satisfied with the facilities and 6.1% failing to respond to the question. Concerning safety, 88.0% of the respondents regarded the streets as unsafe for use because of congestion, narrow pedestrian lanes, theft, and sometimes accidents, while 5.6% noted the streets were safe, and 6.3% failed to respond.

At least 26.2 percent said it was easy to cross the roads, but the majority (67.5%) said it was difficult. Similarly, 91.9% of participants about parking lots acknowledged the inadequacy of parking space, while 2.5% noted the space to be enough, and 5.6% failed to respond to this question. A similar observation was made on the adequacy of sidewalks and cycling lanes, with 93.5% stating the inadequacy, 1.1% acknowledging the adequacy, and 5.4% failing to respond. From the survey, essential services like eateries within the streets in the study area were only in some places (18.5%). 6.3% acknowledged the presence of these facilities, for a total of 24.8% (Figure 11).

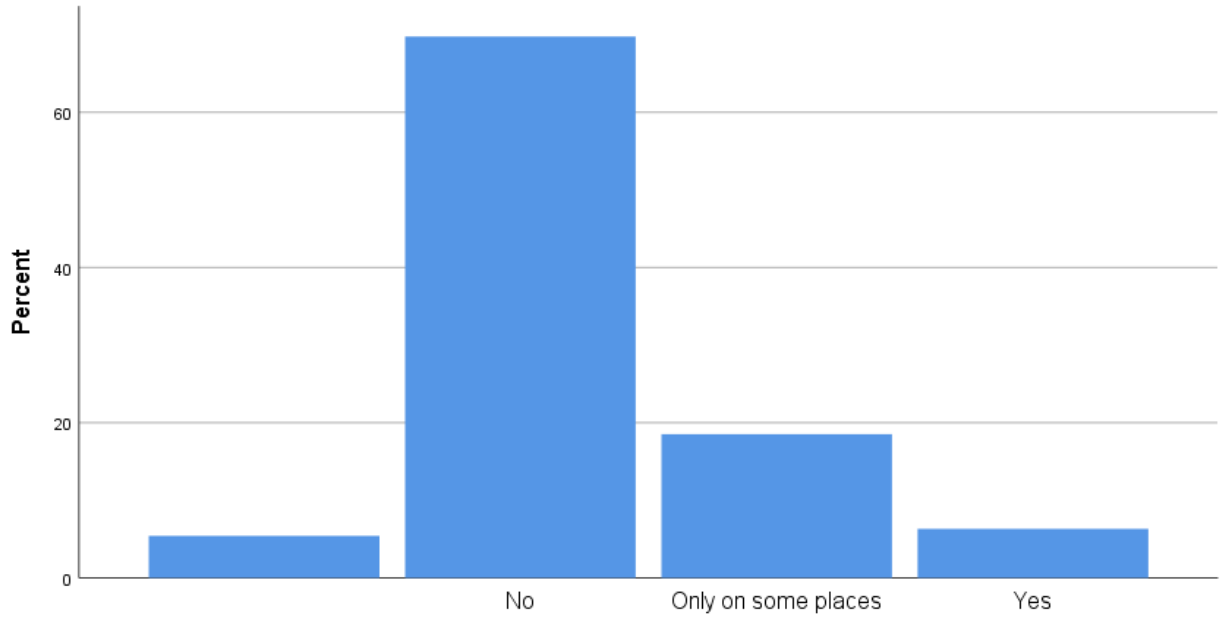

Figure 11: Presence of essential facilities within the streets.

Source: Own field survey (2021)

The study revealed that 75.6% have a negative perception of the landscaping and environmental design on health and safety outcomes in the city, while 19.0% showed a positive perception. For example, buffer spaces that do not separate motor vehicle traffic from pedestrians, such as on-street parking, a line of trees, or a roadside swale barrier, do not improve walkers' feelings of safety and protection. Buffer zones in the landscape can help pedestrians feel more secure. Various functions of motor vehicles contribute to a pedestrian's sense of insecurity. The speed of motor vehicle traffic, for example, has been demonstrated to be a significant factor affecting walkers' sense of safety; as speed increases, so does pedestrian discomfort.

At least 49.9% of respondents representing the entire population were positive about their ability to stay within Addis Ababa's city limits, while 44.9% were not (figure 12).

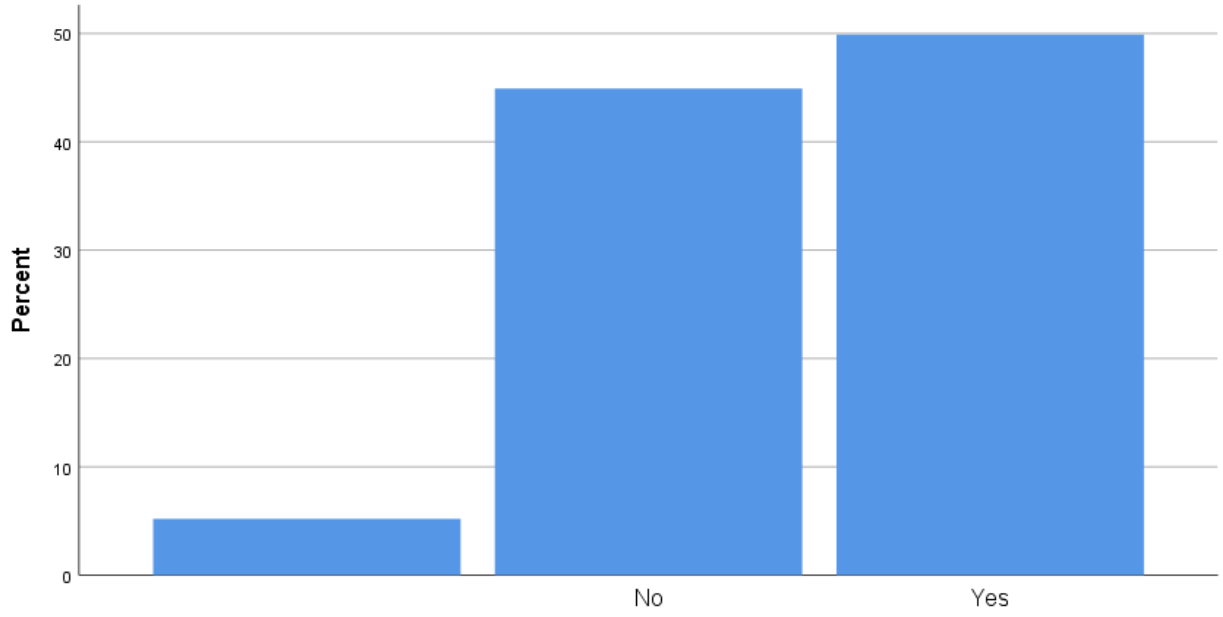

Figure 12: Respondent perception in staying within the urban center

Source: Own field survey (2021)

4.1.4 An Overview of the Street Design Influences on pedestrians in the Study Areas

4.1.4.1 Pedestrian Facilities, Walkways, and Safety Concerns

In the study areas of Bole Road (Meskel Square to Bole), Mexico, and Urael, the majority of respondents stated that they walk on streets and use walking as a mode of transportation. However, all of the amenities, including parking spaces on the sidewalks and streets, were insufficient. Uneasy road crossings due to the city's train railroad, unsuitable bridges, long distances to cross the road, no services or access like eateries, uncomfortable and unsafe to walk on because of improper use of sidewalks for parking, theft and robbery, narrow street width and congestion. Pedestrian lanes are used for other business purposes (street vending), forcing users to use the vehicle lanes, and conflicts between pedestrians and vehicles happen. Sand is put on sidewalks by construction companies and private builders. There are no designated lanes and parking lots for wheelchairs, inadequate curb cuts and ramps, inaccessible pedestrian signals at intersections, and inappropriate sidewalk obstacles for people with disabilities. Experts in the sector verified the impacts on the users at the time of conversation.

Pictures showing obstructions on sidewalks that do not take into account the needs of children and the disabled along the street and one picture showing a nice example along Bole Road.

Figure 13: Walkways along Bole Street

Source: By a researcher

4.1.4.2 Public Transport

Except in a few areas, such as LRT stations, public transportation lanes on the research routes were not equipped with signs, signals, markings, or sound alarms. Because there were so many private automobiles on the road instead of public transit, public transportation lanes did not have as broad a roadway or as many lanes as other motor lanes, causing traffic congestion. Except for LRT on the study routes, there are inadequate stations and parking for public transportation. From the interview with key informants, the issue of public transportation was not addressed at the time of street planning, but BRT and LRT are currently in operation. The city has recently begun work on constructing BRT lines and creating dedicated bus lanes. Due to a shortage of public transportation, there are long queues for public transportation, traffic jams, and people squandering time and resources on the street. The streets are not designed with disabled people in mind, or they are not implemented or constructed in a way that is pleasant for them.

Figure 14: Public Transport Stations and Pedestrian Crossings on the Mexico and Urael Routes

Source: By a researcher

4.1.5 Suggestions to improve street design and planning

Street users suggested building bridges, increasing public transport access, extending bike lanes, and making more room for outdoor dining spaces, of course with consideration given to car accidents and car-free pedestrian streets. They suggested that the pedestrian streets should be built properly with aesthetics (more traditional) and avoid dug streets as soon as possible. Create awareness in order to change drivers' attitudes toward manners, prepare separate roads for public transportation with strict rules, and implement strict rules requiring new buildings to have adequate parking spaces. For already existing buildings, prepare parking areas in critical places and provide adequate facilities for disabled people. It would be nice if it fit the people's movements around the area. It would be suitable and comfortable for most people.

A suitable bridge for pedestrians only to cross the road is a good design for the designers to use when designing a human-centered design. Ban construction companies and private builders from putting sand and other materials on pedestrian sidewalks, thereby widening the lanes and improving the infrastructure. The walkways should be wide, as should the car lanes. The plan and design of the street should be long-term planned. Highway and ring road construction will be a good solution to decrease high traffic volumes and give more attention to walking routes and public transportation. To balance the traffic and walk ways, making walk ways roads of terazo tiles will decrease congestion. Create wide, comfortable pedestrian and cycling lanes, as well as public transportation lanes with signs, signals, and markings.

Proper design must improve our traditional traffic management system. All the roads and streets should be planned. Make sure the pedestrian lanes are only used for pedestrians and not for other business purposes, forcing the walking pedestrians to use the vehicle lanes. Awareness creation and fair punishment for unlawful pedestrians are good planning in designing roads. In terms of recommendations, the public parks should improve the fence and address security concerns for the community. Adequate street width, making streets safe and comfortable, providing adequate sidewalks and cycling areas are all things to learn and emulate from other countries that are making significant improvements in pedestrian and public transportation. To compromise the needs of both pedestrians and public transportation while designing or, in other words, by connecting transportation and land use planning. It is better to allocate sufficient space for both uses and to give employees adequate rod management.

4.2 Urban Street Design Professionals (Key informants)

The section presents the results of an analysis of data collected from urban street design professionals and support departments. The questionnaire targeted 30 respondents. The survey in this category recorded a 100% response rate. All of these responses were selected by key informants and summarized into categories by a researcher.

4.2.1 General Information

The survey, conducted among urban design professionals, included mainly men, accounting for 83.3% of the sampled population. Only 13.3% of the respondents were females, with 3.3% (1 person) failing to mention gender. The majority of the respondents were urban planners/s/designers (40%), five architectural engineers (16.7%), six civil engineers (20%), five transport or road authority/sector staff (16.7%), and two from other fields (figure 15).

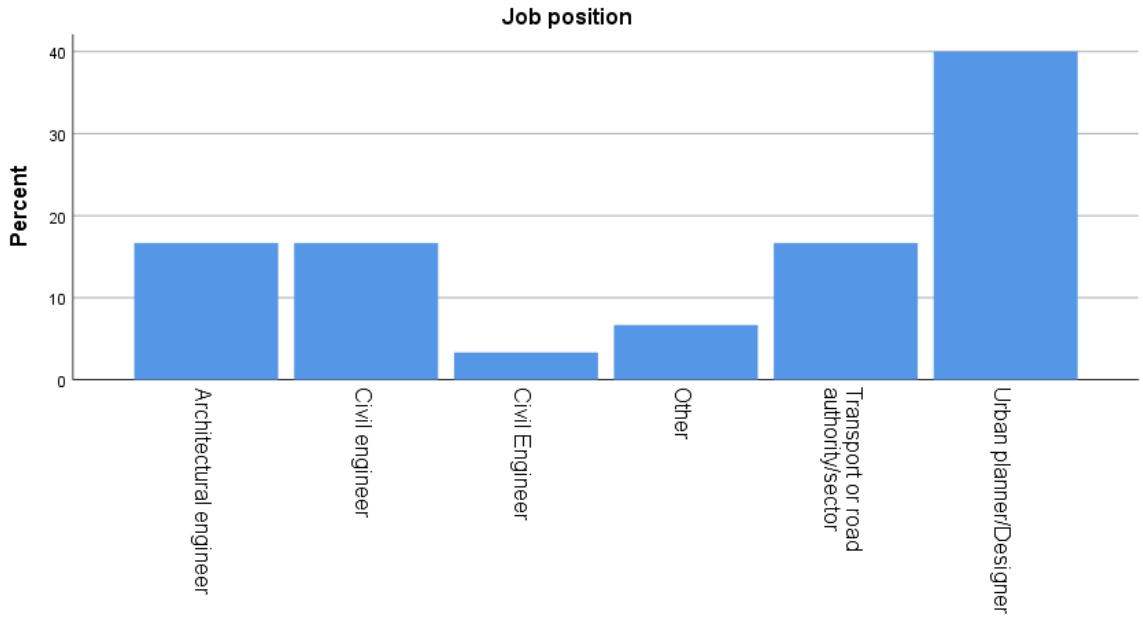

Figure 15: Job position of the respondent from the urban design sector.

Source: Own field survey (2021)

From the output, the majority of the respondents had work experience of 0–five years (43.3%) or 5–10 years (43.3%), as indicated in figure 16 below.

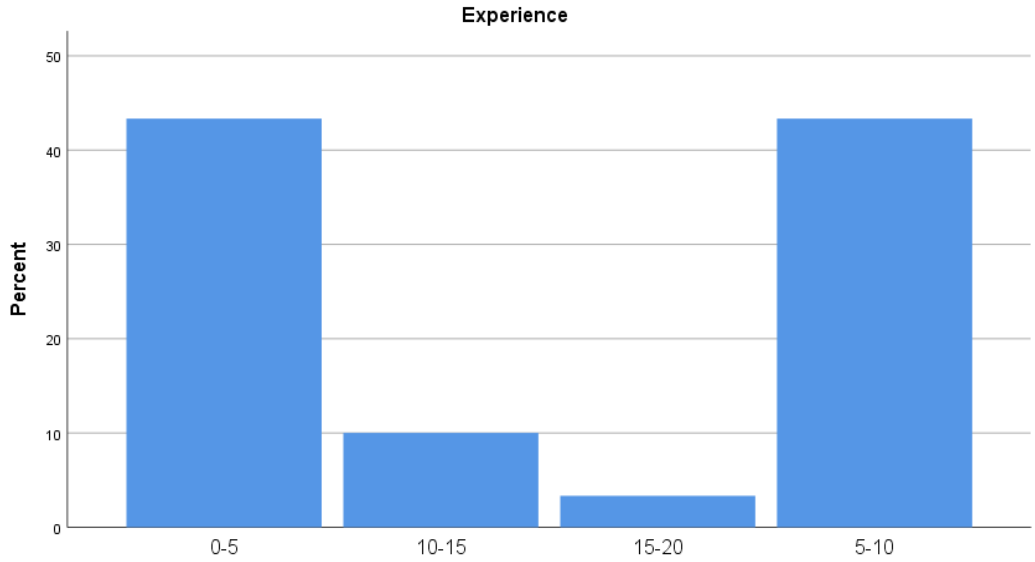

Figure 16: Work experience of the respondents

Source: Own field survey (2021)

4.2.2 Urban Street Lanes Design

This variable was evaluated to gauge the key consideration of urban planners in designing and constructing roads within a city or town. The survey included thirty respondents; building setbacks, pedestrians and cyclists, public transport, and street row (Table 5) were the main factors considered in street design. Not all the factors together were considered to be contributing to the design of urban roads (6.6%).

Some of them said they took into account vehicle size, turning radius, utility lines, and building frontages as a group. According to AACRA experts, traffic count was the major consideration and standard for constructing street lanes and breadth. 3.3% of them stated that the road hierarchy, Principal Arterial Streets, Sub Arterial Avenue (street), and Collector Street are functional street classes that establish an ordered street network, balance street ROW, and allow certain streets to service their capacity or others to be utilized. As a result, it is critical to organize urban roadway networks according to their function in designing street designs.

Table 5: Factors considered in designing of urban streets

Factor	Frequency	Percent
Addis Ababa City Master Plan	1	3.3
Building setbacks	4	13.3
Building setbacks, Pedestrians and cyclists, Public transport	2	6.7
Building setbacks, Pedestrians and cyclists, Public transport, Street ROW	5	16.7
Building setbacks, Pedestrians and cyclists, Public transport, Street ROW, Utility lines, and Building frontages.	1	3.3
Pedestrians and cyclist	3	10.0
Pedestrians and cyclists, Public transport	1	3.3
Pedestrians and cyclists, Public transport, Street ROW	1	3.3
Public transport	2	6.7
Road hierarchy PAS, SAS, and CS	1	3.3
Street ROW	4	13.3
The team considers the vehicle size, turning radius	1	3.3
Traffic count is the main consideration and standard of AACRA	1	3.3
We do not have new roads to design in our agency; we only improve safety and safe flow.	1	3.3
All the above	2	6.6

Source: Own survey (2021)

On asking if there are designated points for crossing the roads, 76.4% of the respondents acknowledge their existence, while 16.7% give a contrary opinion. Those who responded "yes" cited location and accessibility, pedestrian density, adjacent land use, convenience and standards, and pedestrian traffic flow as factors in designing the pedestrian crossing point.

Other respondents mentioned nearby services, junction connections, spending limits, lanes, safety, visual access to the pedestrian crossing, two traffic lanes in each direction, no installation of pedestrian crossings, mid-block crossings in big blocks, and gates of traffic-generating social services.

4.2.3 Public space

Just like in the response obtained in a survey conducted amongst road users, 90% of the respondents in this category acknowledged the inadequacy of parking lots within the city, with 6.7% saying yes, and one person not sure. Vegetation as part of the pedestrian walkways (36.7%) was the major consideration for landscaping and the environment during the urban street design in Addis Ababa. However, 23.3% of the participants noted that landscaping is not practical in the city (table 6 and figure 17).

Table 6: Landscape and environmental factors to consider when designing a street

Landscaping factors	Frequency	Percent
It is not yet practical in the city	7	23.3
Medians	2	6.7
Medians and Vegetation as part of the pedestrian walkways	1	3.3
Medians, Vegetation as part of the pedestrian walkways	5	16.7
Medians, Vegetation as part of the pedestrian walkways, Aesthetic/inviting/, Comfort, topography, Climate (Temperature, Wind, Rainfall),	1	3.3
Medians, Vegetation as part of the pedestrian walkways, It is not yet practical in the city	1	3.3
The Vegetation on the median and along the walkway is the major elements.	1	3.3
Vegetation as part of the pedestrian walkways	11	36.7
Very generic question, climate, the type of street, type of existing shading all play a part. So no direct answer	1	3.3
Total	30	100.0

Source: Own survey (2021)

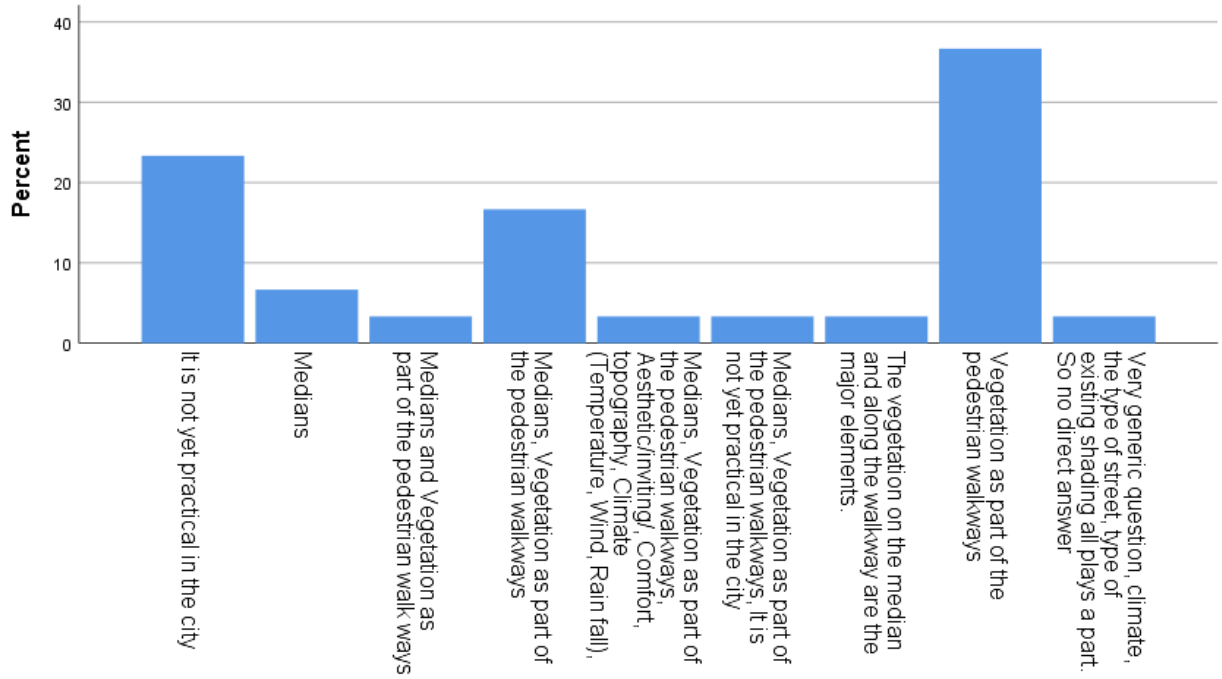

Figure 17: Graphical presentation of landscaping factors.

Source: Own field survey, 2021

Similarly, most of the participants (86.7%) stated a lack of social amenities within the city. Participants stated yes, describing the public setting, trash cans, and other facilities (figure 18). According to the participants, there were few recreational amenities, such as athletic fields, exercise courts, children's playgrounds, recreational spaces, or pedestrian walkways, that might be shared and used to help establish a more cohesive, calm, developed, active, and creative society. A park, public restrooms, a bus station, the main sewer, drains, a marketplace area, and a food hall were all lacking in infrastructure.

All the respondents noted that people with disabilities were not comfortable in the streets in the study area. The reason that they described was that the streets don't consider it while designing the streets, or they won't properly implement it or construct it in a way that makes it comfortable for disabled people, and because they are not comfortable spaces for disabled people, they miss proper materials, design elements, and other related materials that would suit them.

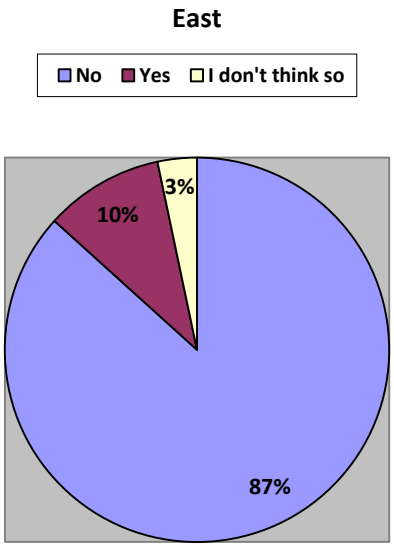

Figure 18: Availability of social amenities

Source: Own field survey (2021)

The proper design includes ramps and tiles for disabled people, as well as other related facilities such as sound-based road crossings, leveled, undamaged, or linked substrates, appropriate curbside cuts and ramps, forethought of standing water from surface runoff, and stream flow creeks near crossings, enough escalators, elevators, or ramps to resolve stages, available bus stops, open spaces with landmarks, paths going wherever, and an attempt to avoid improper pedestrian walkway barriers were among the considerations conducted in the survey.

Figure 19 below presents outcomes on the ways urban designers may improve the comfort of street users with disabilities. From the observations, transitions in pedestrian walkways, proper ramps at an appropriate place, and proper marks (26.7%) were considered the best ways to improve the comfort of the disabled on the streets.

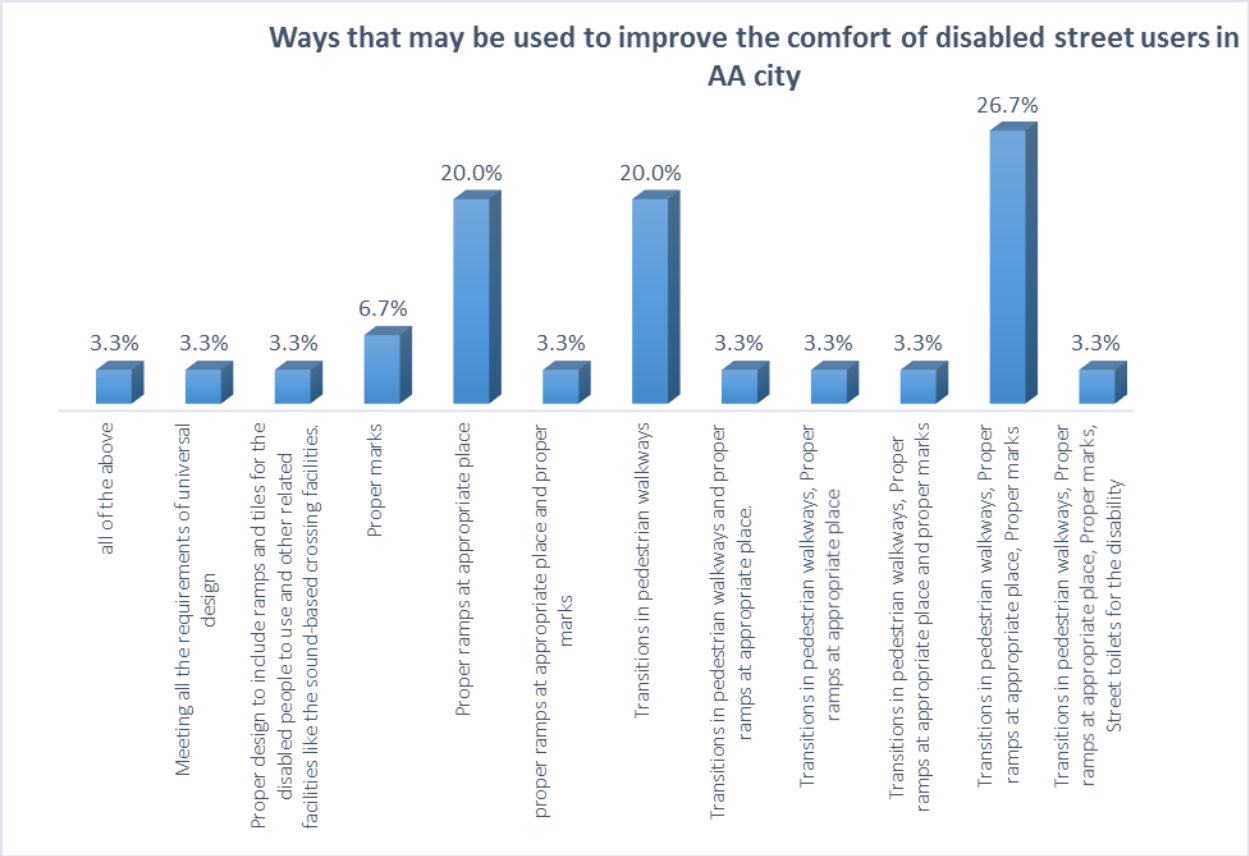

Figure 19: Ways that may be used to improve the comfort of disabled street users in AA city

Source: Own field survey (2021)

Traffic soothing strategies to minimize the speed of vehicles or enable safe and secure crossings were seen as a principle for the particular needs of Addis Ababa and included proven measures such as speed limits, systems, curbs, safe refuge islands, intersections, streets that are shared, and also other street designs that can strengthen safety.

The below results (figure 20) demonstrate that bumpers were seen as the main measure for reducing traffic in the streets of Addis Ababa. This was closely followed by a combination of speed regulation and bumpers (20%), and speed regulation came in third place as a measure for reducing traffic within the city streets (16.7%). The traffic speed regulations use speed breakers and signs to show the maximum speed regulations.

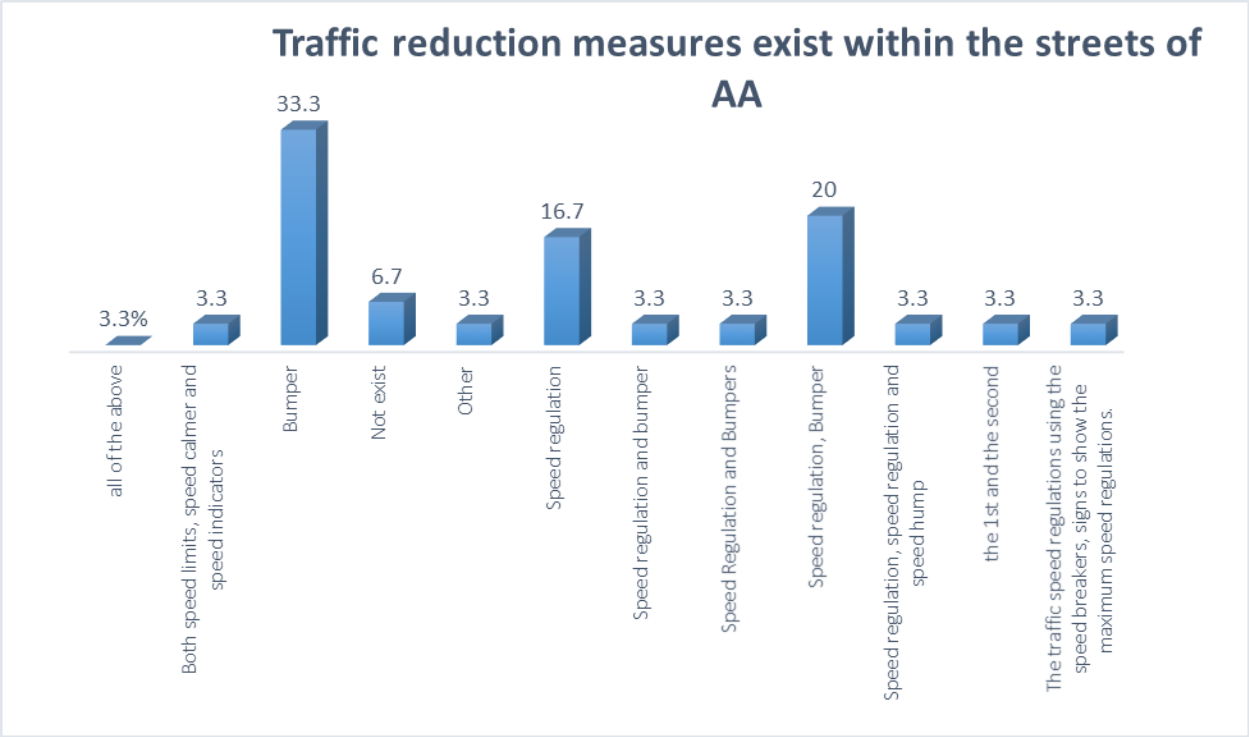

Figure 20: Traffic reduction measures exist within the streets of AA

Source: Own field survey (2021)

4.2.4 Urban Street Design

Street design standards, according to the respondents, were defined as the technical specs, requirements, parameters, design guidelines, and the level of quantity and quality of streets stipulated for each design and planning component of streets in the street design standards document that shall be implemented in the time to prepare the Framework, Strategic, Basic, and Sketch Plans, Neighborhood Development Plans (NDP), Urban Designs, Block Designs, and Street Designs.

Regarding the guidelines used for implementing an urban street design in Addis Ababa, 10 out of 30 respondents had no idea of the guidelines used. However, 13.3% (4 out of 30) mentioned AASHTO, and one of them identified that the guidelines that the city is using are old guidelines called the AASHTO Street Design Guidelines, and 20% (6 out of 30) mentioned the NACTO and Global Cities Design Initiatives guidelines. The data is summarized in figure 21 below.

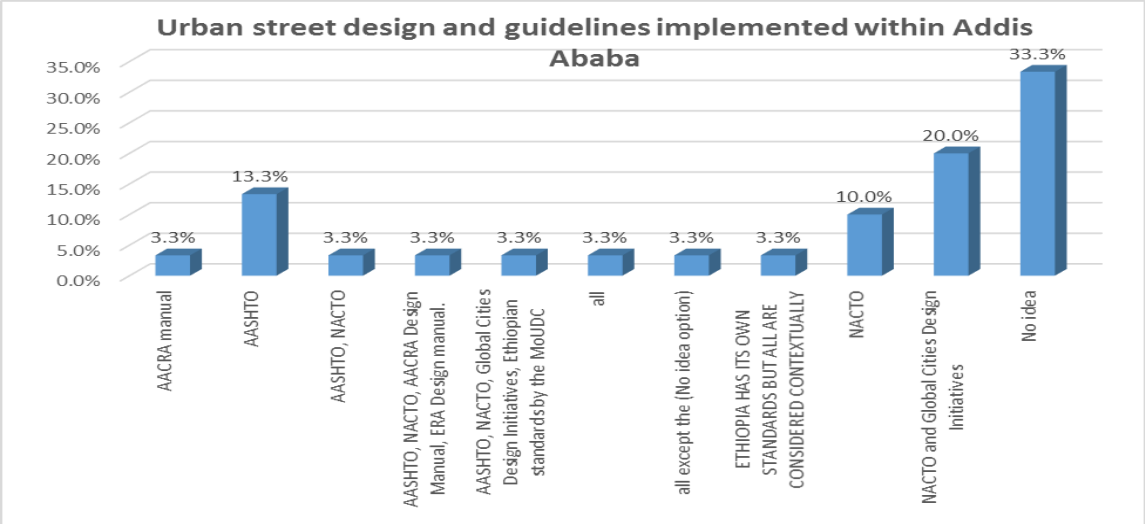

Figure 21: Urban street design and guidelines implemented within Addis Ababa

Source: Own field survey (2021)

At least 46.7% (14 out of 30) of the participants mentioned that urban planners, civil engineers, traffic engineers, surveyors, and transport engineers are involved in designing and constructing urban streets (Table 7).

Table 7: Opinion on expert involved in urban street design and constructions

Experts	Frequency	Percent
All but mainly civil and traffic engineers	1	3.3
Civil and traffic engineers	9	30.0
Civil and traffic engineers and urban planners are involved	1	3.3
Mostly the civil engineers and other traffic engineering staff and a few urban planners.	1	3.3
Surveyors	1	3.3
Transport engineers	1	3.3
Unrelated professionals to the field	1	3.3
Urban planners	1	3.3
All are involved	14	46.7

Source: own survey (2021)

Tables 8 and 9 summarize the challenges faced with the design used and during the design implementation. From the observations, the main challenges of the design used were the lack of designated space for public space (23.3%) and car-oriented (20%). Both the lack of designated public space and the lack of consideration for pedestrian and car-oriented designs accounted for 23.3%. Similarly, having more space for automobiles than humans was observed as the major challenge when implementing the design.

Table 8: Challenges faced with the design used

Challenges faced with the design used.	**Frequency**	**Percent**
Car oriented	6	20.0
Lack of consideration for pedestrian	2	6.7
Lack of consideration for pedestrian and car-oriented	1	3.3
Lack of designated space for public space	7	23.3
Lack of designated space for public space and car-oriented	1	3.3
Lack of designated space for public space, lack of consideration for pedestrian	1	3.3
Lack of designated space for public space, lack of consideration for pedestrians, car-oriented	7	23.3
Lack of designated space for public space, Lack of consideration for pedestrian, car-oriented, Lack of consistent design philosophy and plan	1	3.3
Nowadays, there is a shift from car-oriented to pedestrian and non-motorized oriented design, which shows we are heading on the right track	1	3.3
All	1	3.3
No response	2	6.7
Source: Own survey (2021)		

Table 9: Challenges faced during design implementation

Challenges faced during design implementation	Frequency	Percent
Corruption	1	3.3
Lack of coordination	5	16.7
Lack of coordination, Corruption	3	10.0
More space for automobiles than for humans	12	40.0
More space for automobiles than for humans and lack of coordination.	1	3.3
More space for automobiles than for humans, lack of coordination	3	10.0
More space for automobiles than for humans, Lack of coordination, Corruption	3	10.0
More space for automobiles than for humans, Lack of coordination, Corruption, Lack of actual and existing Studies before implementation	1	3.3
This is research in of its self, no answer	1	3.3

Source: Own survey (2021)

Respondents to insufficient resource allocation suggested that pre-planning and allocating resources to certain activities should be done as much as possible. It's critical to properly schedule available resources to ensure that the implementation of street design runs smoothly and on time and budget. When resources are scarce, disputes can arise, which can be resolved by utilizing resource allocation techniques. Allocation guarantees that necessary resources do not exceed available resources, but only if any associated delays are kept to a minimum.

According to the graph below (fig 22), 73.3 percent of respondents believe that the resources allocated to urban street design and implementation are insufficient. This is contrary to the 23.3% and the remaining percentage not knowing if they are adequate or not. Some participants stated the city budget is enough to describe that the budget allocation is thereby the city administration, under the Addis Ababa City Road Authority.

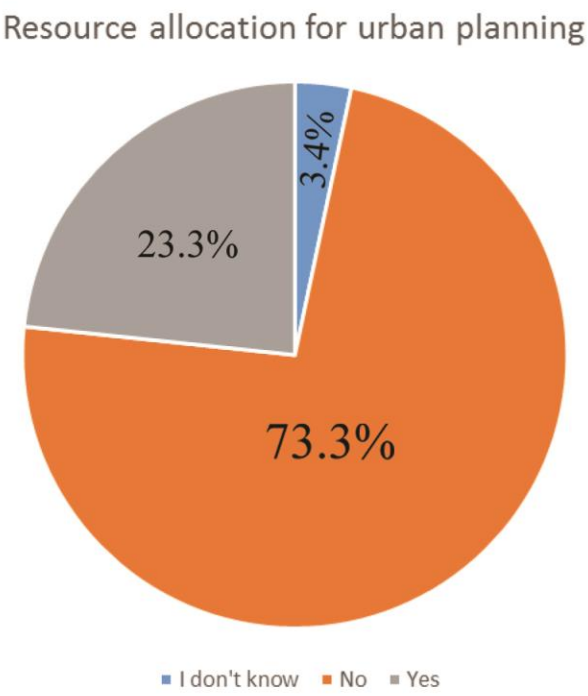

Figure 22: Resource allocation for urban planning

Source: Own field survey (2021)

On the extent of the stakeholder involvement in the process of urban street design planning and implementation, 17 out of 30 (56.7%) respondents noted a low participation rate from both the government and citizen sides. 13.3% stated high stakeholder participation from both the government and citizen side, but not enough on both sides (Table 10).

Table 10: Stakeholder participation in the process of Urban street design

Stakeholder		Frequency	Percent
	High but, the scale of participation is not enough on both side	4	13.3
	High from the government and citizen side	4	13.3
	High only from the government side	2	6.7
	Low from both sides	17	56.7
	Unknown	3	10.0

Source: Own field survey (2021)

The urban planning professional considers the existing street network and ROW availability (43.3%) as the primary sources of the street design plans used in Addis Ababa (figure 23).

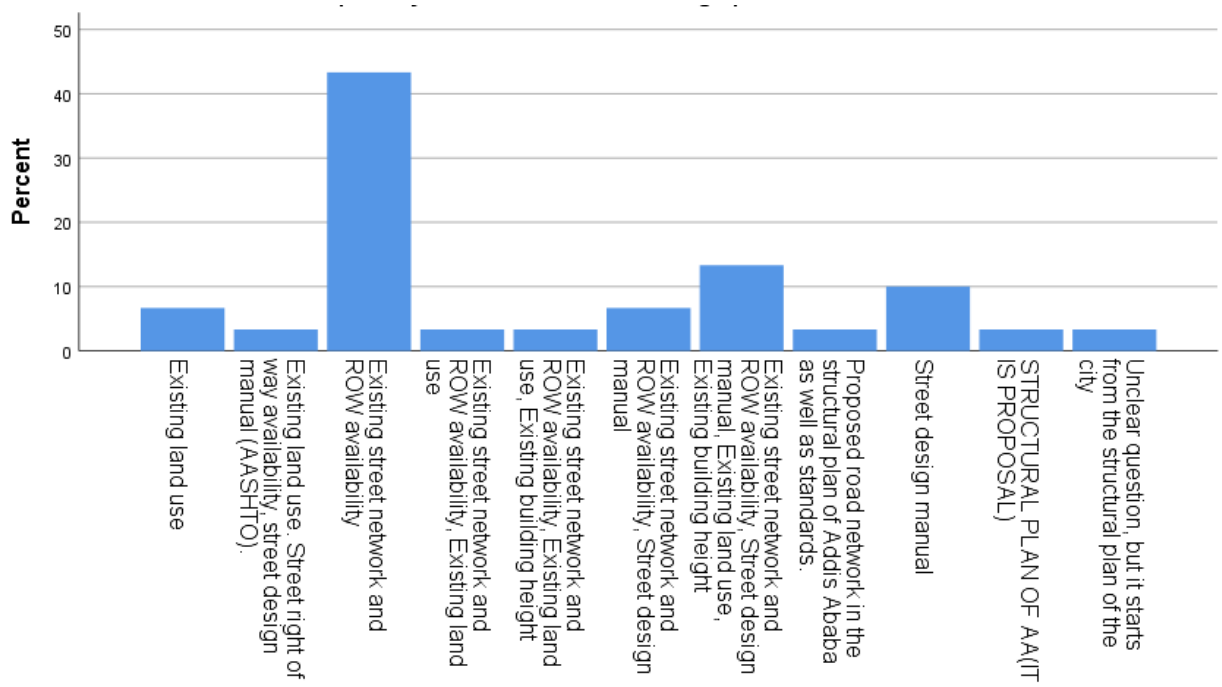

Figure 23: Primary source of the street design plans used in Addis Ababa

Source: Own field survey (2021)

Regarding the fee charged for street users, at least 70% stated that there is no fee charged; however, respondents mentioned the fee charged for street parking and private owners with less than six people inside. Four respondents said the fee was charged to street users, and one mentioned road funds as the fee charged.

Figure 24 below presents analysis results on the success of the current street design used in the city. Considering pedestrians and bike lanes together, 33.3% considered the main success factor observed from the results. Wider walkways and the many road construction projects planned and prepared an urban street design manual, changing the existing manual. Using the guidelines to implement street projects, proper street hierarchy, avoiding street parking, integration of transport and land use, and coordination between different transport offices were also pointed out.

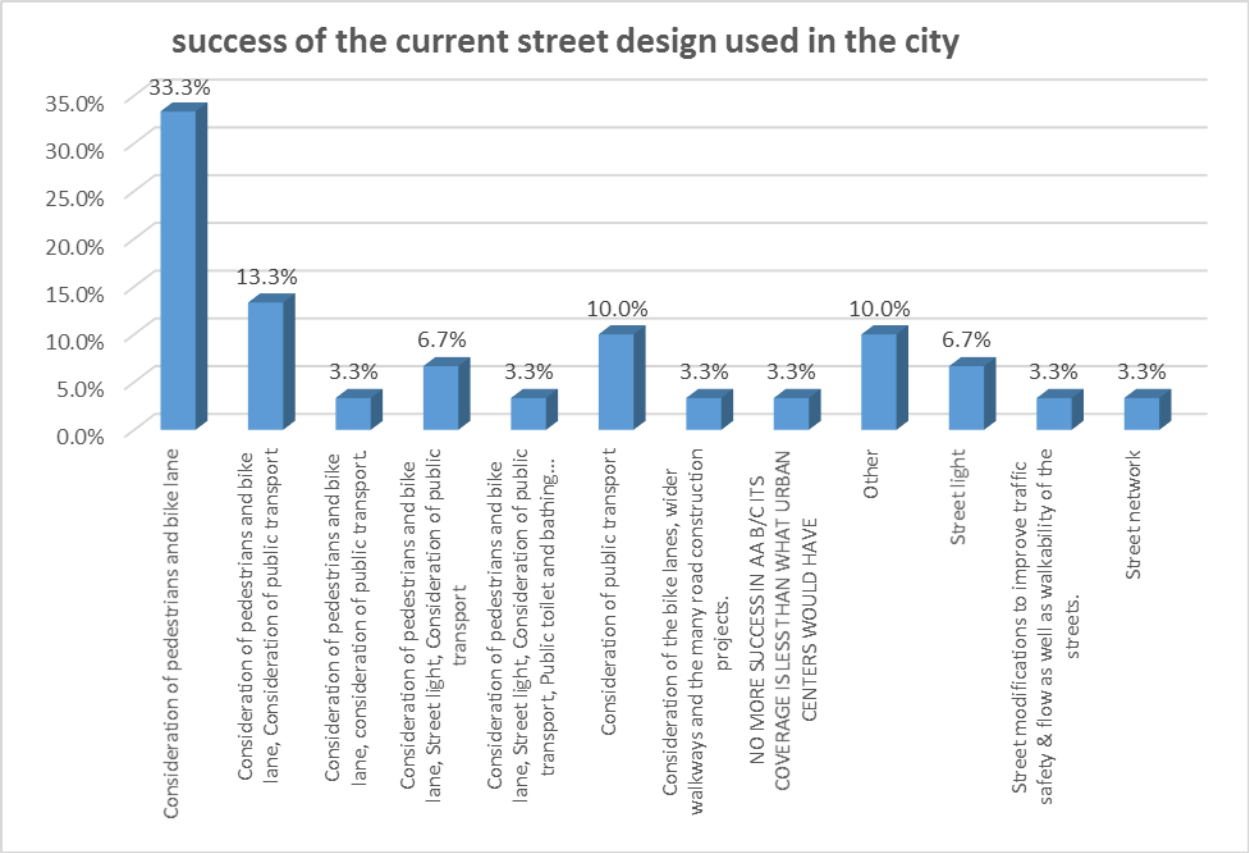

Figure 24: Success of the current street design in Addis Ababa

Source: Own field survey (2021)

From the interview, the qualitative data was taken from key informants, including urban planners, traffic managers, transport, and civil engineers. In many master plans, there is inadequate consideration of NMT (non-motorized transport), both in the cross-sections and in the proposed street networks. The road network plan study, except for the 10th Addis Ababa city master plan, which was launched in 2017, had provided more space for walkways, particularly in the city center streets. Cycle lanes were also included as part of the street NMT zone. Street design in Ethiopia started more than 20 years ago. It's been a while. Firstly, for all streets, there has to be a design with detailed geometric designs, and usually, they put them on tender for the private consultants to work on them. Priorities for the design were already set by the city master plan, and ITDP was also supporting them, but now it is reviewing them for better implementation. They used different standards from their manuals, and their designs also differed depending on the topology, right of way (ROW), locations, and their components.

For now, urban street design is being done by the responsible body, AACRA, which is designing and constructing streets. The expertise is composed of most civil engineers, planners, and landscape architects.

4.2.5 Challenges with the Design and Implementation of the Urban Street

According to key informants, the main issues were integration and coordination issues with various governmental institutions and other stakeholder organizations. The lack of an integrated design/build approach and ROW issues arising from government compensation was very low because the government had landed on hand and people were unwilling to be displaced. Sustainability issues, inconsistencies in design philosophy, a lack of a long-term plan to be implemented by the city municipality, a lack of proper knowledge or skilled professionals (in terms of plantations and utility installations), a disregard for enforcing building setback regulations (despite the approach being cast-oriented), and a lack of adequate parking within buildings were all issues that needed to be addressed. Another issue was budget politics in terms of financial decision-making in terms of furnishing and social with the public not requesting, creating awareness, design and construction quality, corruption, in which high government intervention primarily benefits wealthy stakeholders and political interference, rigidity, lack of designated space for public space, and giving more attention to vehicles. In other words, pedestrians will find the roadways unsuitable for travel.

4.2.6 What policies and strategies have been implemented and proven to be effective?

The Addis Ababa NMT Strategy was created with technical assistance from the Institute for Transportation and Development Policy with support from the United Nations Human Settlements Programme and the United Nations Environment Programme. The Addis Ababa transport policy, road safety plan, A.A. master plan, and climate-resilient green economy strategy were all taken into consideration when developing the strategy. The Addis Ababa City Transport Strategy aims to develop a long-term transport network by transferring an investment from motorized to non-motorized forms of transportation. The strategy's purpose was to expand integrated, safe, efficient, and cost-effective sustainable means of transportation.

An interview with key informants reveals that NMT's ten-year targets were determined according to pedestrian prioritized districts' implementation activities like pedestrian areas, public spaces, and detailed street adjustments implemented in some areas of the AA city, including Piazza, Megenagna, Merkato, and Churchill South. In terms of pedestrian paths, 600 kilometers of new and existing streets feature high-quality walkways, safe at-grade crossings, and enough street lighting, and all schools have secured pedestrian access.

When it comes to public transport access, BRT and LRT stations include safe, at-grade pedestrian crossings with traffic calming or signalization. Bus stops have high-quality bus shelters that blend nicely with the design of the sidewalks and cycling tracks. At BRT and LRT stations, bike parking was available.

Integrating safe crossings into the designs for the BRT, enhancing 36 station approaches at LRT stations, and defining standards for bus shelter placement are all part of the public transportation access implementation plan for 2019–2022. The priority implementation plan includes creating a network of high-quality public spaces, formalizing and extending pedestrian spaces, and redesigning with upgraded NMT facilities.

A transportation policy served as a basic guideline, but in a rapidly increasing city with exceedingly complicated land-use and transportation difficulties, a plan that tackles the city's upcoming challenges are critical. The proposed five strategic directions based on transportation policy matters include Integrated Land Use and Transportation Development and Planning; Road Infrastructure Development; Traffic Control and Pedestrian Safety; Public Transport Improvement; and Institutional Building Capacity. There were "suggested measures" for each strategic direction, which were then converted into specific duties. Finally, the suggested measures' social, economic, and environmental implications were discussed, as well as their connection with the Sustainable Development Goals (SDGs) and prospective implementation agencies.

4.2.7 The way to improve the urban street design and implementation in Addis Ababa.

Key informants suggested not compromising on a design for every user, a user-centric design approach, a holistic vision for the city, and strategies for achieving such a vision across all aspects of the city, including road and street design. Integration, resolving ROW issues, and the design process should be more coordinated. When designing eco-friendly streets as well as public gathering streets that could also be used for other occasions, it would be better to think about including wider pedestrian zones. This will require the implementation of a consistent and well-planned transport infrastructure development program, upgrading the design principles from outdated ones to up-to-date ones and increasing public awareness of how to use the transport infrastructure. First of all, before anything is done, the community should participate, at least by listening to what they have to say.

They believe enforcing building setbacks and building parking areas would greatly minimize the perceived issues. Additionally, proper on-street utility (street lights, traffic lights, etc.) installations, appropriate street plant plantations, and street furniture allocations would enhance the experience more. In the implementation, it is critical to engage the major stakeholders starting from the design planning stage and discuss and find ways for the parties to work in perfect coordination. To mitigate the ROW challenge, the government should pay landholders in accordance with current market conditions.

Creating a mechanism for contextual socio-economic, environmental, and formulated manuals, standards, rules, and regulations on street design awareness among stakeholders, etc. Facilitate parking areas by changing the design philosophy to more pedestrian-oriented ideas. They were on their way to implementing a non-motorized transport system in the city as the Addis Ababa Roads Authority. All the ongoing design projects are forced to consider a pedestrian-oriented design approach. High participation of various stakeholders, a shift towards pedestrian and non-motorized transport designs, and an increase in public transport accommodation were also suggested.

Plans have to be planned by urban planners, economists, environmentalists (geographers), sociologists, and designers. Coordination from different governmental institutions and transparency are key. The government should consider low-income stakeholders. Political interference needs to have a limit.

The professional mix of the urban street design group must be improved (must incorporate urban designers, not only civil and highway engineers); more emphasis should be given to the majority of road users, who are pedestrians. They should also consider people with different disabilities and sustainable, environmentally friendly, and healthy transport systems, e.g., walking, cycling, and mass transit. Provision of more BRT corridors in the city, biking facilities, and other NMT considerations will result in higher operational costs for Para transit vehicular users. Prepare a state-of-the-art master plan with a vision to create a sustainable city and lead all the development accordingly.

Consideration of pedestrians and cyclists in designing streets; giving priority to public transport; considering the environment, especially the vegetation types based on the street types; proper street hierarchy; avoiding street parking; integration of transport and land use; coordination between different transport offices.

Plan and prepare an urban street design manual, change the existing manual, and use the guidelines to implement street projects. Allow all streets to be functional and active as they should be, and leave the design to specific professional designers and other stakeholders. Design and implement streets for humans rather than cars, making them inclusive for all street users, including enough public spaces and social amenities, while making them environmentally viable by using urban street guidelines and capacity building.

4.3 Pedestrian Accident History in Addis Ababa, Ethiopia

The extraordinarily high rate of pedestrian fatalities is the most serious safety concern in Addis Ababa. This is because of the high number of pedestrian fatalities. This is due to a high degree of pedestrian activity combined with a poor level of pedestrian safety protection. When considering that walking is necessary at the beginning and conclusion of any transportation trip, one can see how important walking is in the transportation mix. According to the Addis Ababa traffic management agency's eight-year accident history, which spans the years 2011–2018, it showed that even if the number of traffic accidents was increasing, the growth rate of increased accidents indicated a reduction. As per the survey conducted, pedestrian collisions were on the rise with the increase of urban car ownership and the construction of urban road amenities, and the issue of pedestrian safety had become increasingly severe. Pedestrians were the most vulnerable members of the traffic community.

Table 11: Addis Ababa Accident History, 2011- 2018

Year	2011	2012	2013	2014	2015	2016	2017	2018
Total accidents in Addis Ababa	9134	11529	15815	17904	20432	22939	26942	28361
Growth from previous year		26%	37%	13%	14%	12%	17%	5%

Source: Addis Ababa Traffic Management Agency's Data (2021)

According to the 8-year accident data studied, accidents occurred most frequently in the marketplace, working places, residential and leisure locations, religious sites, schools, and others, in descending order. Pedestrian accidents accounted for 11.56 percent of all accidents. Furthermore, the most common pedestrian accident occurred when a pedestrian crossed in a crosswalk position, accounting for 25.1% of all pedestrian accidents, followed by crossings outside of crosswalk locations, accounting for another 22.8% of all pedestrian accidents. As a result, more focus should be placed on preventing pedestrian accidents at crossings to combat pedestrian accidents.

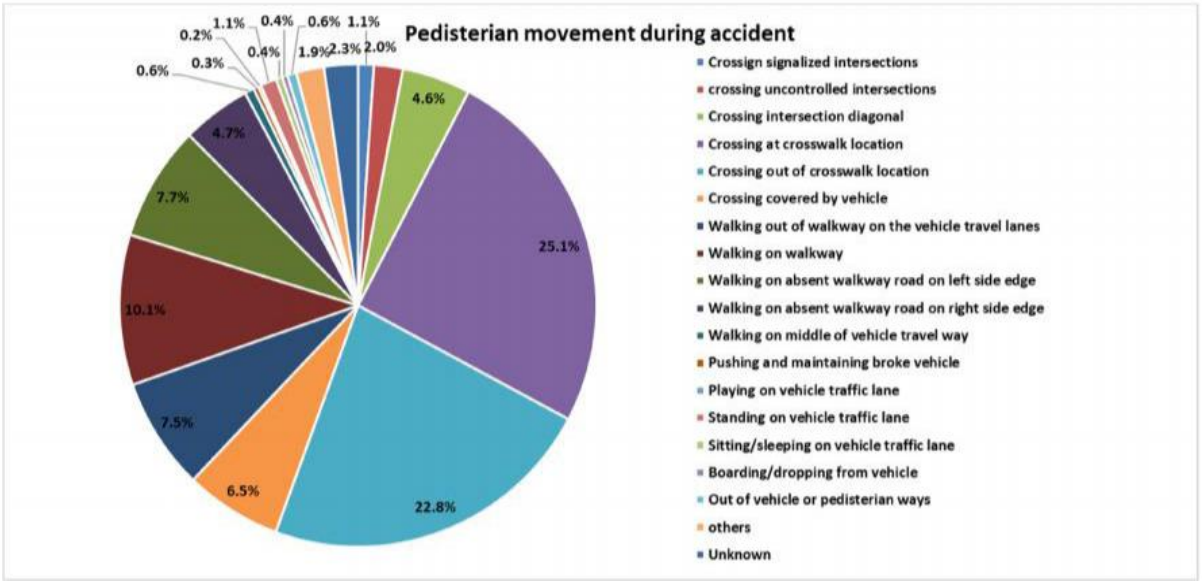

Figure 25: Pedestrian Accident Patterns during Accident

Source: Addis Ababa Traffic Management Agency's Data (May 24, 2021)

According to a conducted survey, pedestrians cross the road an average of two to three times on every walking trip. Their perceptions of the walking experience were largely focused on the difficulties of crossing roads, and any problems with this could cause delays and create a sense of insecurity. Therefore, correctly designing, building, and signing appropriate crossing facilities should be a major consideration when developing pedestrian crossings. Where possible, crossings should be located on the pedestrian desire line. Where this is not possible or unsafe, use environmental and/or physical signals to guide pedestrians to the crossing point. Other road users should be able to predict the routes of pedestrians who are about to leave the curbs.

From the interview results, problems with street design implementation, such as a lack of sidewalks for pedestrians, accessible crosswalks, safeguards (wide multi-lane streets without spaces), consistency (when signals and counting down clocks are not provided), cycle amenities, poor roundabout design, unsecure boarding areas, and surface risks, were found to be common causes of traffic deaths.

The accident history of the street was investigated as a result of the interview with the transportation authorities, to increase safety on the corridor while crossing. The Addis Ababa Transport Bureau collected and analyzed traffic police accident history data reports to determine the project's road corridor's accident history. Traffic accident data was gathered for three years: 2015, 2016, and 2020. While the accident data for the 2016 and 2015 fiscal years covered all sorts of accidents, the data for the 2020 fiscal year only included fatal incidents. Accident reports from 2015, 2016, and 2020 were used for in-depth study. The accident data was evaluated to identify high-accident-frequency pedestrian crossing points on the road corridor. Crossing pedestrians were the most impacted road users, mostly because they assisted in identifying pedestrian areas that needed improvement or new facilities.

As shown below, the green LRT road corridors are used to show the line from east to west on the LRT line. The East-West LRT line starts at Ayat and ends at Torhailoch, passing through major land mark areas and stations at Lideta, Mexico, Leghare, Stadium, Meskel Square intersection, Estifanos, Urael, and ends at Ayat. The Green Line Pedestrian Crossing code is indicated by GL-EPC 1, 2, 3,… Fatal accident numbers of pedestrians on E-W LRT road corridors, according to Ethiopian calendar 2007, 2008, and 2012 data shown below.

On the Green Line and LRT Road Corridor, accident occurrences at each location with a high frequency of traffic accidents were identified using descriptions of locations given by collected accident history data. It was found that most accidents happen at major intersections. The traffic operational performance throughout the corridor was very poor, with a very poor level of service during peak times and a good level of service during off-peak times mostly. The connection of incompatible road hierarchies and land use inconsideration created pressurized routes. Such as, the housing units built on the outskirts of the city were not planned for mixed-use purposes, resulting in high-generated traffic at the exit of the city and the entry of the city center. During peak hour time, frequent and highly congested sections were observed, and most of them were intersections and midblock crossings. Most of the junctions lacked more usable space for pedestrians at the corner and had safety issues because of gentle corner radii that resulted in vehicle speeds affecting pedestrian crossings, especially those that were located at the junction.

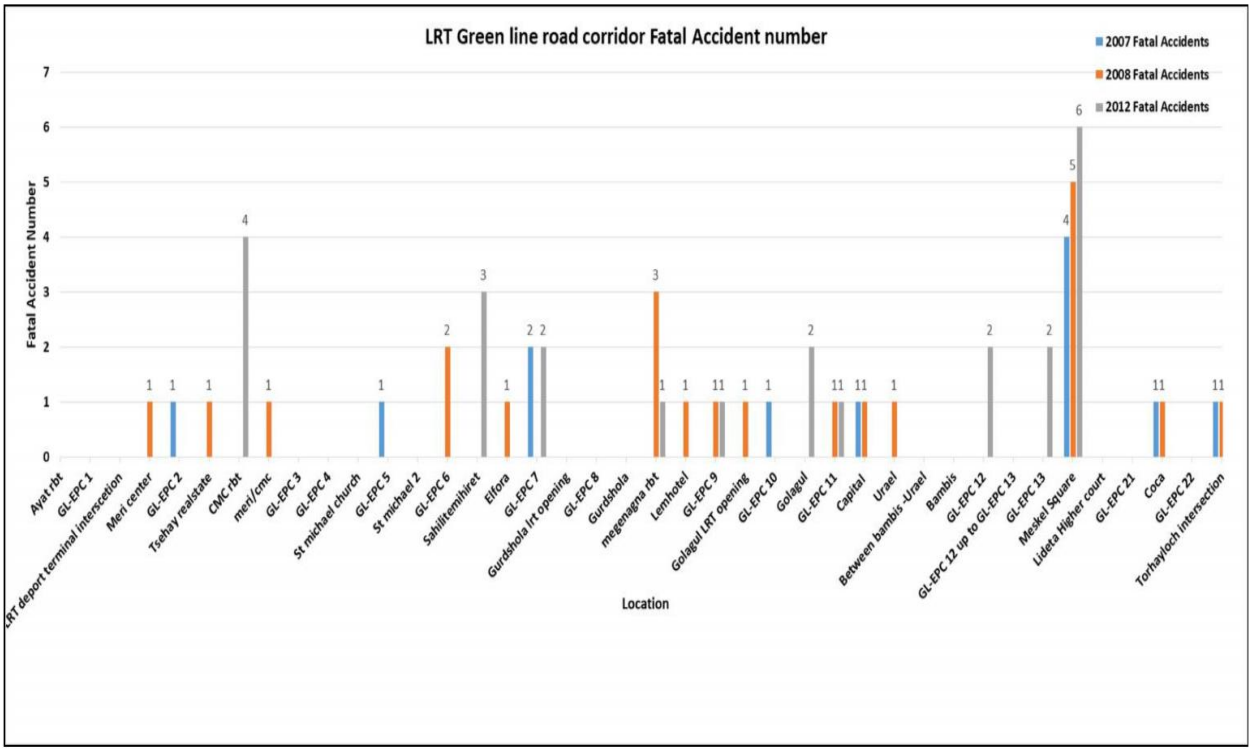

Figure 26: Locations of Green Line LRT Road Corridors with Fatal Accident Frequency in 2015, 2016, and 2020.

Source: Addis Ababa Transport Bureau, Project Implementation Unit, Technical Team (2021)

Pedestrians crossed the road more than 2 lanes plus LRT transit, and it was worse when they were uncontrolled. The combination of the high speed of a vehicle, especially during off-peak hours, and the deceleration gap of a vehicle, the effect on crash risk came mainly via the relationship between speed and stopping distance. The location of the pedestrian crossing and its surroundings were high-risk because of their absence, poor quality, and visibility of road markings. Pedestrians who wish to cross the road will be obscured by improperly positioned trees, poles, advertising boards, and vertical signs because vehicles were parked too close to the pedestrian crossings. This significantly increases the risk because drivers and pedestrians cannot see each other. In the Ring Road Corridor accident occurrence, it was found that most of the accidents happened at the major intersections. The Bole roundabout is one of them, on which the accident and fatality numbers for pedestrians in 2020 show 61 and 2 respectively.

The absence or inability to modify information, warnings, and mandatory signs at crossing locations resulted in the driver and pedestrian not being conscious and safe. The absence of Krebs (or other physical separators) at the border between pedestrian and vehicular roadways resulted in pedestrians walking along the travel lane and the walkway right of way not being protected from vehicular traffic to travel or park. This outcome was not safe from accidents, particularly for the vulnerable pedestrian.

CHAPTER FIVE
DISCUSSION, CONCLUSION, AND RECOMMENDATION

5.1 Summary and Conclusion

The study findings following analysis gave a useful insight into the overall issues facing urban street design on the study route in Addis Ababa. Research objectives and questions were formulated regarding the problem presumed to be encountered by citizens of Addis Ababa and the documented evidence in the literature review. The study that utilized a mixed study approach mainly focused on Mexico, Urael, Meskel Square, and Bole routes in Addis Ababa. The study findings provide clear evidence and a response to the study questions, indicating the existence of pedestrian challenges while using the streets within the study area of Addis Ababa. Several cities worldwide are prioritizing public transport and the exercise of effective policy systems such as comprehensive street design and place-making, enabling their citizens to create vibrant, livable, and green urban atmospheres. These cities' urban planners and designers, with the support of the government, are tasked with the mandate of creating a plan to resolve problems surrounding public transport to address the issues of environmental pollution, high-energy consumption, congestion, and urban sprawl.

The creation of public places along the streets provides room to achieve this goal. For Mexico, Urael, Meskel Square, and Bole routes in Addis Ababa, the study reported the inadequacy of essential pedestrian facilities, including the parking lot and other social amenities. This is despite most participants showing an interest in utilizing walking and cycling as their means of transport. The study reports various challenges in street design in the area of study. Pedestrians face difficulties when using pedestrian lanes due to narrow street width, traffic congestion, conflict with vehicles, theft, robbery, violence, pickpocketing, traffic accidents, a long distance to cross the street from the LRT station, and a lack of accessibility for the disabled. The streets have also been considered unsafe for pedestrians, indicating theft, mugging, accidents, and assaults as the main challenges. Prioritization of space for automobiles in the study area is the limiting factor in allocating more space for pedestrian street designs. Street design and implementation of pedestrian walkways in the study area of Addis Ababa is termed a game-changer in ensuring the comfort and ability of the citizens residing within the city. The current status of the street, more so in the study area, poses a challenge to the street's utilization by disabled road users.

Cities that adopt green city technology prioritize citizens' comfort within the urban area by providing definite public space. In this study, pedestrians feel that urban street design has to reconsider the design of the street by allocating more space for walkways and cycling areas. There is also a need for increasing essential facilities available for the public on the streets within the study area. The said approach does not just make the lives of citizens easier, but also offers the benefit of reducing traffic and congestion in the public transport sector. Inadequate resource allocation to the urban street design department in Addis Ababa is considered the main factor affecting the implementation of street design in the study area. Allocation of enough resources can lead to a good city with enhanced public space, including parks, playing fields, open spaces, pocket spaces, small incidental green spaces, and tree-lined streets with waterways. Resource limitation denies the public an opportunity to witness enhanced and well-organized urban streets (United Nations, 2014). In addition, stakeholders' participation in urban design is also seen as a factor hindering urban street design in the study. Low government and public sector participation in the design and implementation of urban street designs within the study area is seen as a challenge to the planners in coming up with policies and the best approach to implementing various designs.

The study findings in the study areas of Bole Road (Meskel Square to Bole), Mexico, and Urael show that while the majority of users walk as a mode of transportation, mostly using streets to walk and also to arrive at a specific location, most are familiar with the area of study and frequently visit the Mexico, Bole Road, and Urael routes, all of the facilities, including parking spaces on the sidewalks, amenities, crossings, and spaces, are insufficient for the users. People with impairments do not feel safe in the streets and at research sites. Signs, signals, markings, and sound alarms are not installed in public transportation lanes. The carriageways of public transportation lanes are not as broad as those of other automobile lanes. Walking has been employed as a mode of transportation by some street users who have been involved in crashes with automobiles on the road while attempting to enter the roadway. Social, economic, and environmental issues all have an influence on urban transportation when a street design is implemented. According to NMT initiatives and transportation policies, higher investment in non-motorized transportation will provide a lot of benefits, particularly for low-income individuals.

The study is aimed at assessing street design and its influence on pedestrians in the study areas of Addis Ababa, the capital city of Ethiopia. Urban planners are faced with various challenges that need to be addressed by the entire stakeholder group to make the city conducive for staying within. Proper street designs provide an environment that allows easy movement within urban centers, reducing traffic and accidents, providing accessibility to various areas, and reducing time and resource wastage. The users of the streets in the study demonstrate discomfort and dissatisfaction with the available essential facilities and public space along the streets in the study areas of Addis Ababa. The study identifies financial constraints, insufficient knowledge by urban professionals on the guidelines, lack of stakeholders' participation, and inadequate space as the major challenges for urban street design implementation and recommends addressing these problems to appreciate urban street development.

Based on NMT strategies and transportation policies' plans and implementation activities, streets should be free of traffic accidents and comfortable enough to be used. Each user should have their place and facilities, as well as traffic signs and signals. Trees for shade and beauty, seats to relax on and enjoy the street activity, refreshments, and adequate enclosure and aesthetics are also required. They must also cater to people of various physical abilities and ages. Streets must be planned for people and be pedestrian-friendly to be used as urban places. People must be able to stroll comfortably and safely on these streets.

Prioritizing walkers, bicycles, and public transportation reduces the number of private motor cars on the road, which lowers pollutants and emissions. Streets should also be designed to improve human safety. Traffic injuries and deaths can be avoided if the streets are well designed as per acceptable standards. Transport engineers should design streets with provisions for walkways, parking lots, cycling lanes, shopping malls, working areas, and driving lanes. Users should maneuver between the various provisions without collision.

The study findings add new information to the street design literature to comprehend the main principles of urban street design, the challenges in the design and also in implementing it, and its influence on the users of the study area. The findings also inform the stakeholders of what needs to be done to achieve the objectives of urban street modernization. Finally, future research work should focus on developing tools that will aid in decision-making, green infrastructure adaptation, and technical approaches for adopting and utilizing several urban design protocols and guidelines in implementing successful street design.

5.2 Study Implication

The urban street design in Addis Ababa is faced with various challenges during the design and implementation of various selected designs. Among the problems faced during the design implementation are:

- This causes consternation among city administration officials and road consultants about which manual to prioritize.
- In urban centers, the creation of different street types with the same width causes a conflict in traffic management.
- Challenges to municipal governments in managing the street design and construction process.
- The guidelines are usually rigid, and they limit the room to be flexible with new ideas for improving streets.
- Creating variable street features in the urban area, like split overs, leads to a disconnection between neighborhoods.
- The total sum of this effect results in transportation problems like congestion and traffic accidents, which lead to economic and social chaos in the cities.
- Challenges to the placement of the infrastructure and utilities in the city (drainage, electricity, water supply, and so on).
- In many street design plans, provision for non-motorized transport (NMT) is not catered for, leading to difficulties for pedestrian movements.

5.3 Practical Implication and Recommendation

Based on insights gained from literature, the outcome of the survey conducted among street users and key informants, and field observation, it can be concluded that the streets in Mexico, Urael, Meskel Square, and Bole routes in Addis Ababa do not offer a suitable atmosphere for street users. The observation is true regarding the inadequacy of parking spaces, essential social amenities and facilities, safety, traffic congestion, public space, and the lack of comfort ability for disabled street users. Furthermore, urban planners have reported various limitations in implementing modern urban street designs, including low resource allocation, lack of stakeholders' participation, limited public space, and existing infrastructure. Time spent commuting negatively influences their health from prolonged sitting, stress from driving in heavy traffic, and less time for exercise.

More fuel used by vehicles consumes mainly non-renewable resources and increases air pollution. Implementing sustainable urban streets can create more livable communities. With amenities and attractions closely located, individuals are more likely to utilize alternative mode choices such as walking, biking, or transit, which leads to improved health of individuals and the environment. Total vehicle miles traveled are reduced, and less land needs to be developed because of a greater population density. Streets busy with pedestrian and bicycle traffic are safer and strengthen a sense of community.

A proper understanding of the citizens' needs, consideration of public space, resource allocation, and the space factor determine the suitability of the urban street design. The study highlights the deficiencies in the status of the street designs in the study area of the city of Addis Ababa. The deficiencies mentioned serve as a recipe for urban designers to develop and implement a proper design that addresses the stated problems within the study.

The following recommendations can be adopted to transform the current practice of implementing urban street designs in Mexico, Urael, Meskel Square, and Bole routes in Addis Ababa. Firstly, overcoming the limitations of finances and other resources can be addressed by allocating a sufficient annual budget by the city administration. Moreover, the urban planning department should be given the mandate and authority to generate income from various activities such as licensing, sponsorship, entry, and other service fees.

Secondly, the government should emphasize adopting green infrastructure, which will stimulate urban street design by providing infrastructure for adopting green technology rather than concentrating mainly on automobiles. Crossings should be designed to best accommodate the type of pathway use expected. Pedestrian source generators and destinations must be considered. Sources and destinations include train stations, bus stops, schools, retail/commercial centers, and residential communities. Pedestrian crossings are illegal and outside of dedicated crossing locations. These crossings cause life-threatening injuries to pedestrians. To reduce pedestrian injuries and fatalities, understanding pedestrian road crossing behavior is important.

Thirdly, the creation of awareness among the communities living in these urban areas is required. This awareness should focus on emphasizing the importance of public space and place-making in urban street design. The urban planners' sensitization is to be the concept and creative thinking in implementing the urban street designs. Lastly, the principles of social inclusiveness demand the involvement of all stakeholders' interests and participation in urban street design. Therefore, a planning process that is more open to the community and that is likely to guarantee significant community inputs that can affect the urban street plans should be adopted.

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APPENDICES

APPENDIX A

Addis Ababa University, College of Development Studies,

Centre for Regional and Local Development Studies

Department: Urban Land Administration and Management (ULAM)

QUESTIONNAIRE FOR PEDESTRIANS (STREET-USERS)

ATTESTATION: My name is Ruhama Leulseged. I am currently pursuing a master's program in Urban Land Administration and Management at Addis Ababa University (AAU). As part of the curriculum, I am surveying for research purposes, and this questionnaire is prepared to collect relevant data for the study that is planned to assess the influence of street design on pedestrians in selected areas of Addis Ababa, Ethiopia. Any information provided towards this research will be treated with the utmost confidentiality and exclusively be used for academic purposes.

Thank you in advance for your kind cooperation.
Towards a bright future!

Questionnaire No…… Time of Interview ……Date of interview…….....

Name (optional) ……

Kindly fill in the following questions

Section A: Background Information of Respondents

1. Gender
   (a) Male (b) Female
2. Age
   (a) 15-23 (b) 24-30 (c) 31-40
   (d) 41-65 (e) 66-70 (f) 71 and above
3. Are you friendly with this place and/or street?
   (a) Yes (b) No
4. When do you visit this place or use this street?
   (a) Frequently/daily (b) Once in 7 days (c) monthly (d) Within a year

5. What is your reason for using the street?

   (a) To walk (b) To bike (c) To arrive at a certain location

   (d) For parking (e) Other_____

6. When is the good time for you to walk through this street?

   (a) Morning (b) Evening (c) Nighttime (d) late in the afternoon

7. Have you been involved in a vehicle-pedestrian collision? Have you been struck by a car on this street before?

   (a) Yes (b) No

8. Which mode of transport do you use most frequently? **(use a tick mark √)**

Private vehicle		Bicycle	
Foot		Mini-Buses	
Bus (Sheger, Ambesa, Higer…)		Motor	
Public service		Others (Specify)	

9. Are the public transport lanes signalized fitted with signs, signals, marks, and sound alerts?

   (a) Yes (b) No

Section B: Street Design and Pedestrians

Street Width

10. Are the street widths adequate for ease of movement? **(use a tick mark √)**

Yes	
No	

11. When compared to other motor lanes, do public transport lanes have wider carriage or lane widths?

    (a) Yes (b) No

12. Are all of the facilities (crossings, parking, toilets, recreation places, eateries, and sitting places) on the sidewalks and streets adequate?

    (a) Yes (b) No

13. Are the streets safe from accidents and comfortable to walk in?

(a) Yes (b) No

14. Is it possible to cross the roads?

(a) Yes (b) No

15. Are there enough parking lots?

(a) Yes (b) No

16. Are there adequate sidewalks and cycling lanes? **(use a tick mark √)**

Yes	
No	

17. Is there availability of essential services like eateries within the streets?

(a) Yes (b) No

18. What is your perception of the landscaping and environmental design in the city? **(use a tick mark √)**

Adequate	
Inadequate	

19. Are you comfortable staying within the urban center?

(a) Yes (b) No

20. What challenges do pedestrians faces while using pedestrian lanes? **(use a tick mark √)**

1	Street congestion	
2	Conflicts between the pedestrian and vehicles	
3	Accidents caused by vehicles	
4	Narrow street widths	
5	Theft, robbery with violence, Pick-pocketing	

21. What recommendations would you make to improve pedestrian street design and planning?

_____

For Disabled Users

22. Are there designated lanes and parking lots for wheelchairs?

(a) Yes (b) No

23. Are there adequate curb cuts and ramps?

(a) Yes (b) No

24. Are there adequate, accessible pedestrian signals at intersections?

(a) Yes (b) No

25. Is there a presence of inappropriate sidewalk obstacles?

(a) Yes (b) No

26. Are there tactile walking indicators?

(a) Yes (b) No

27. Are there push buttons accessible to wheelchair users?

(a) Yes (b) No

APPENDIX B

(Amharic Form)

ለእግረኞች የሚሆን ጥያቄ

የጥያቄ ቁጥር…… ቃለ ምልልስ የሚደረግበት ጊዜ……

ቃለ መጠይቅ የሚደረግበት ቀን……

ስም (በአማራጭ)……

እባካቹ ለሚከተሉት ጥያቄዎች መልስ ስጡ::

ክፍል ሀ፡ የመላሾች ማንነት መረጃ

1. ጾታ

(ሀ) ወንድ (ለ) ሴት

2. ዕድሜ

(ሀ) 15-23 (ሐ) 31-40 (ሰ) 66-70

(ለ) 24-30 (መ) 41-65 (ሸ) 71 እና ከዛ በላይ

3. ይህንን ቦታ ወይም መንገድ ብዙ ጊዜ ትጠቀማለህ (ታዘወትራለህ)?

(ሀ) አዎ (ለ) አይ

4. ይህን ፡ ቦታ ፡ ወይም : መንገድ ምን ያህል ታዘወትራለህ?

(ሀ) በየቀኑ (ለ) በሳምንት አንድ ጊዜ (ሐ) በየወሩ (መ) በአንድ ዓመት ውስጥ

5. ይህን መንገድ የምትጠቀምበት ምክንያት ምንድነው?

(ሀ) ለመራመድ (ሐ) ለብስክሌት

(ለ) የተወሰነ ቦታ ለመድረስ (መ) ለመኪና ማቆሚያ

(ሰ) ሌላ _

6. በዚህ መንገድ ላይ ለመንዝዘ አመቺ የሆነው ጊዜ መቼ ነው?

(ሀ) ጠዋት (ሐ) ለሊት

(ለ) ምሽት (መ) አመሻሽ ላይ

7. ከዚህ በፊት በዚህ መንገድ ላይ የመኪና አደጋ ደርሶብሀል?

(ሀ) አዎ

(ለ) አልደረሰብኝም

8. አብዛኛውን ጊዜ የሚጠቀሙት የትኛውን የትራንስፖርት ዓይነት ነው?

(ሀ) የግል መኪና	(ሰ) አውቶቡስ (ሸገር፣አምበሳ፣ ሀይገር...)
(ለ) ብስክሌት	(ሸ) ሞተር
(ሐ) እግር	(ቀ) የህዝብ አገልግሎት
(መ) ሚኒ ባስ	(በ) ሌሎች (ግለፅ)

9. የህዝብ ማመለሻ አውራ ጎዳናዎች ተገቢ የሆኑ የመረጃ ምልክቶች: የድምፅ ማንቂያዎች አሉአቸዉ?

(ሀ) አዎ

(ለ) የላቸውም

ክፍል ለ: የጎዳና ንድፍ እና እግረኛን በተመለከተ

የመንገድ ስፋትን በሚመለከት

10. የጎዳና ወርድ ለእንቅስቃሴ ምቹ ነው?

(ሀ) አዎ (ለ) አይደለም

11. የሕዝብ ማመላለሻ አውቶቡሶች ከሌሎች የመኪና መንገዶች ጋር ሲወዳደሩ ሰፋ ያለ ወርድ አላቸው? (ሀ) አዎ (ለ) የላቸውም

12. በእግረኛ መተላለፊያዎችና ጎዳናዎች ላይ ያሉት ሁሉም ቦታዎች በቂ ናቸው?

(ሀ) አዎ (ለ) አይደሉም

13. መንገዱ አስተማማኝና ምቹ ነው?

(ሀ) አዎ (ለ) አይደለም

14. መንገዶቹን ማቋረጥ ይቻላል?

(ሀ) አዎ (ለ) አይቻልም

15. በቂ የመኪና ማቆሚያዎች አሉ?

(ሀ) አዎ (ለ) የሉም

16. በቂ የእግረኛና የብስክሌት መንገዶች አሉ?

(ሀ) አዎ (ለ) የሉም

17. በጎዳናዎች ላይ እንደ ምግብ ያሉ አስፈላጊ አገልግሎቶች ሊገኙ ይችላሉ?

(ሀ) አዎ (ለ) አይችሉም

18. በከተማዋ ውስጥ ስለሚከናወነው መልክዓ ምድራዊ አቀማመጥና አካባቢያዊ ገጽታ ያለህ ግንዛቤ ምን ያህል ነው?

(ሀ) በቂ ነው (ለ) በቂ አይደለም

19. በከተማው መሃል ለመቆየት ምቹ ነዉ?

(ሀ) አዎ (ለ) አይደለም

20. እግረኞች የእግረኛን መንገድ ሲጠቀሙ ምን ፈታኝ ሁኔታዎች ያጋጥሟቸዋል?

(ሀ) የመንገድ መጨናነቅ

(ለ) በእግረኛውና በተሽከርካሪ መካከል የተከሰቱ ግጭቶች

(ሐ) ተሽከርካሪዎች የሚያስከትሉት አደጋ

(መ) ቀጭን የመንገድ ስፋት

(ሰ) ሌብነት ፣ ዝርፊያና ዓመፅ መቀስቀስ

21. የእግረኛን መንገድ ንድፍና እቅድ ለማሻሻል ምን የድጋፍ ሐሳብ ታቀርባለህ?

_____

_____

ለአካለ ስንኩላን

22. ለዊልቸር ተብለው የተሰየሙ መንገዶችና የመኪና ማቆሚያዎች አሉ?

(ሀ) አዎ (ለ) የሉም

23. ለአካለ ስንኩላን አመቺ መንገዶች አሉ?

(ሀ) አዎ (ለ) የሉም

24. በመስቀለኛ መንገዶች ላይ ለእግረኞች በቂና ተደራሽ የሆኑ ምልክቶች አሉ?

(ሀ) አዎ (ለ) የሉም

25. ተገቢ ያልሆኑ የእግረኛ መንገድ እንቅፋቶች አሉ?

(ሀ) አዎ (ለ) የሉም

26. በዳሰሳ እንቅስቃሴን ለማድረግ ጠቋሚዎች (አመላካቾች) አሉ?

(ሀ) አዎ (ለ) የሉም

27. ለዊልቸር (ተሽከርካሪ ወንበር) ተጠቃሚዎች የሚሆኑ የግፊት መጫኛ ምልክቶች አሉ?

(ሀ) አዎ (ለ) የሉም

APPENDIX C

KEY INFORMANT QUESTIONNAIRE

CONFIDENTIAL PHRASE: My name is Ruhama Lulseged, and I'm a master's student in AAU in the field of urban land administration and management. I'm conducting research and this interview guide is used as a tool in the study that assesses street design and its influence on pedestrians in selected study areas of Addis Ababa, Ethiopia. Any information provided towards this research will be treated with the utmost confidentiality and used for academic purposes exclusively.

Instruction: Kindly give your honest opinion on the question

1. Gender

   (b) Male (b) Female

2. Background/job position

   (a) Architectural engineer (b) Urban planner/Designer

   (c) Transport or road authority/sector (d) Other_____

3. Experience

   (a) 0-5 (b) 5-10 (c) 10-15

   (d) 15-20 (e) 20-25 (f) Over 25

4. What is the extent of the stakeholder involvement in the urban street design planning and implementation?

   _____

5. What is the primary source of the street design plans used in Addis Ababa?

   _____

6. Do you charge the street users for the services offered? Explain.

   _____

7. What would you consider to be the success of the current street design used in the city?

   _____

8. What are some of the challenges with the design and implementation of the urban street design in the city of AA?

   _____

9. What factors do you consider when designing the street lanes and widths?

   _____

10. Are there designated points for crossing the roads? What factors do you consider while designing these crossing points?

    _____

11. Are there enough parking lots within the city?

    _____

12. What are the landscape and environment considerations during the urban street design in the city? Give practical examples.

    _____

13. Are there adequate social amenities within the streets and included in the design?

    _____

14. Do you believe that disabled street users are comfortable on the streets? Explain

    _____

15. What are some of the ways that may be used in the design to improve the comfort of disabled street users?

    _____

16. Which traffic reduction measures exist within the streets?

    _____

17. Which urban street design and guidelines are implemented within Addis Ababa?

    _____

18. Which experts are involved in the design and implementation?

    _____

19. What are some of the challenges of the design used?

    _____

20. What challenges exist during the implementation of the design?

    _____

21. What are the influences of urban street design on pedestrian walkways, safety, facilities, and public transport access in Addis Ababa?

    _____

    _____

22. Is the resource allocation for the urban street design and implementation adequate? Why?

    _____

23. Suggest the ways that can be used to improve the urban street design and implementation in Addis Ababa.

    _____

    _____

Respondent's Name: ----------

Date ----------

Signature ----------

THANK YOU FOR YOUR TIME!

APPENDIX D

(Semi-Structured Interview Questions for Key Informants)

This questionnaire's main goal is to collect data for the assessment of street design and its influence on pedestrians in the selected study areas of Addis Ababa, Ethiopia. As a result, I respectfully request your detailed and honest response. The data would be kept private and used solely for research. Your participation contributes to the study's objectives. Please accept my sincere gratitude in advance for your help.

The information would be kept private and solely utilized for the research. Your accurate information aids in achieving the study's objectives. Please accept my sincere gratitude in advance for your help.

Part 1: Personal information

Participants	
	1.1 Office of employment:
	1.2 Service year:
	1.3 Sex: A. Male B. Female
	1.4 Positions:
	1.5 Work experience:

Part 2: Interview questions based on street design implementation and urban transport

2.1 What is your line of work (Profession)?

2.2 Do you have an academic certificate or enough knowledge or experiences in street design please explain?

2.3 What is your role in street design and implementation?

2.4 What do you think are the biggest challenges with the design and implementation of urban streets?

2.5 Are you considering NMT (Non-Motorized Transport) in master plans? In both the cross-sections and the proposed street networks?

2.6 Do you believe that pedestrian walkways and public transportation should be considered during street planning and design?

A. Yes B. No

2.7 What are the policies and strategies for transport that have been implemented and proven to be effective?

2.8 What do you think are the main causes of pedestrian accidents caused by street design and implementation?

2.9 What suggestions do you have for improving the design and implementation of roadways to prevent pedestrian-related accidents and fatalities?