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Building Ethiopia Since 1954

Evaluating the Efficiency of Addis Ababa's Public Bus System: User Perspectives and Infrastructure Challenges

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This Thesis is submitted to the Ethiopian institution of architecture building construction and city development EiABC and to school of graduate studies of Addis Ababa University in partial fulfillment of the requirement for a degree of masters' science in Environmental Planning and Landscape Design.

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Approval

This is to certify that the thesis prepared by Mistir Habtamu entitled: Evaluating the Efficiency of Addis Ababa's Public Bus System: User Perspectives and Infrastructure Challenges. submitted in fulfillment of the requirements for the degree of Master of Science in Environmental Planning and Landscape Design complies with the regulations of the University and meets the accepted standards concerning originality and quality.

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Declarations

I, the undersigned, declare that this thesis is my own and original work and has not been presented for a degree in any other university and that all sources of material used for the thesis have been duly acknowledged, following the scientific guidelines of the University.

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Abstract

The public transportation system in Addis Ababa, especially along the Ayat-Tor Hailoch corridor, is highly important for getting around the city, but it faces significant challenges right now that make it hard to provide good service and meet people satisfaction. This study aims to investigate the state of public bus infrastructure, assess service quality, identify key challenges affecting efficiency, and recommend actionable strategies for improvement. Utilizing a mixed-methods approach, the research employed a mixed-methods approach, conducting stakeholder interviews and surveys with passengers and operators throughout the route. Key findings reveal that an aging bus fleet, coupled with inadequate maintenance facilities, significantly contributes to operational inefficiencies. The Customer Satisfaction Index (CSI) scores for safety (0.37) and timeliness (0.46) indicate serious flaws in service quality, with approximately 65% of users reporting discomfort during commutes, particularly during peak hours. These results highlight how urgently systemic changes are required. In particular, improving management techniques and fixing infrastructure flaws are essential to regaining public trust in the bus system. Investing in contemporary buses, setting up real-time tracking systems, and enhancing maintenance procedures are examples of doable suggestions. This study concludes by emphasizing the significance of a thorough and user-centered strategy for Addis Ababa's public transportation reform. Following tactics into practice, the city can create a dependable and effective transportation system that can accommodate the expanding needs of its urban population and, in the end, improve the standard of living for its citizens.

Keywords: Customer Satisfaction Index (CSI); Mobility as a Service (MaaS); Public bus transport; Service quality; Sustainable public bus transportation; urban mobility

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- AA: Addis Ababa
- AACBSE: Addis Ababa City Bus Service Enterprise
- AACRA: Addis Ababa City Road Authority
- AALRT: Addis Ababa Light Rail Transit
- AAU: Addis Ababa University
- BRT: Bus Rapid Transit
- CSI: Calculation for Availability
- ITS: Intelligent Transport Systems
- KPIs: Key Performance Indicators
- LRT: Light Rail Transit
- MaaS: Mobility as a Service
- PPE: Personal Protective Equipment
- PSETSE: Public Service Employees Transport Service Enterprise
- SERVQUAL: "SERV" stands for "service" and "QUAL" stands for "quality."
- TOD: Transit-Oriented Development
- TRANSIP: Transport Systems Improvement Project

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study:

Transportation is essential for national development, influencing both economic growth and urban structure (Rodrigue, 2020). With Africa's urban population growing at an unprecedented rate, rapid urbanization requires well-managed transport systems to meet the mobility requirements of expanding population. Not only does effective public transport facilitate social, economic and spatial mobility; it influences the configuration of cities and counters patterns of social exclusion (Iles 2005). In developing countries, conventional buses are crucial due to their affordability and flexibility (Verma & Ramanayya, 2019).

However, cities like Addis Ababa face worsening transport challenges linked to population growth, which contributes to economic strain and social disparity (Kassahun, 2007). The public bus system is overstretched, suffering from inadequate services, terminal insecurity, and poor traffic control (Theodros, 2001). These issues result in overcrowding, limited mobility, and declining service quality. The increasing use of private vehicles worsens congestion, pollution, and noise, harming urban life (Greene & Wegener, 1997).

Promoting public transport is essential to reduce environmental impacts and traffic problems while enhancing city life (Vuchic, 2005). This study assesses the efficiency and service quality of the Ayat to Tor Hailoch corridor in Addis Ababa, using principles of transit-oriented development and sustainable mobility to recommend improvements for urban transport planning.

1.2 Statement of problem:

Addis Ababa is experiencing a great challenge in its public bus transportation system because of the rapid urbanization process. The system is beset by severe overcrowding, poor infrastructure and regular service delays. These problems annoy thousands of people who travel daily and worsen air pollution and congestion. To this end, the sustainability objectives of the city are threatened (Kassahun, 2007; Theodros, 2001).

The transportation system is still inefficient in spite of the recent investments in the transportation infrastructure, especially in the Ayat-Tor Hailoch corridor. The lacking element is a well-developed service management strategy (Abebe & Tadesse, 2023). Although the currently available studies provide valuable insights into the issues surrounding public transport systems in different parts of the world, they do not exactly capture the nature of the challenges affecting the Addis Ababa public transport system. Such a gap implies that targeted analysis is required to enhance the effectiveness of operations and user experience.

These difficulties would tend to increase unless they are addressed systematically. They also create the danger of deepening socioeconomic disparities and hinder the achievement of sustainable cities. The objectives of the papers are to evaluate the existing situation of the public bus infrastructure in Addis Ababa. It will evaluate the quality of services offered and crucial challenges, which influence efficiency of the system. At this, the study will also examine effective approaches used in other cities that have managed to enhance their mass transit systems. Specific recommendations, which can be acted upon in Addis Ababa, will be given. With the help of research, these are the critical issues that can help to make a more efficient, equitable, and sustainable public transportation system in the city.

1.3 Objective of the Study:

1.3.1 General Objective:

The general objective of this study is to optimize the efficiency of Addis Ababa's public bus transportation system by evaluating the infrastructure and service quality, identifying operational issues, and proposing effective solutions from other cities to improve urban mobility.

1.3.2 Specific Objectives:

- To assess the current state of public bus infrastructure in Addis Ababa, concentrating on the Ayat-Tor Hailoch corridor.
- To analyze the quality of services provided by the public bus system in this corridor.
- To identify key challenges affecting the efficiency of the public bus transportation system.
- To explore best practices from cities with effective public transportation systems and identify context-appropriate solutions that can enhance the efficiency and reliability of the Ayat–Tor Hailoch corridor in Addis Ababa.

1.4 Research Questions:

- What is the current state of public bus infrastructure in Addis Ababa, particularly along the Ayat-Tor Hailoch corridor?
- What factors contribute to the quality of services provided by the public bus system in this area?
- What are the key challenges affecting the efficiency of the public bus transportation system?

- What successful strategies from other cities have improved their public transportation systems, and what applicable solutions can be recommended for the Ayat-Tor Hailoch corridor in Addis Ababa?

1.5 Scope of the Study:

Spatial Focus

This study focuses on the Ayat to Tor Hailoch corridor within the broader context of Addis Ababa's public bus transportation system. This route is significant as it connects several heavily used bus lines, serving a large commuter population. The vicinity is an important node for improving the overall convenience and connectivity for public transport users with 30 bus stops located along the corridor and other nodes of transportation. This specific area was chosen due to its high traffic volume and the pressing need for improvements in service efficiency and quality.

Thematic Focus

The thematic scope encompasses the following key areas:

- **Public Infrastructure**: Assessing the condition and adequacy of bus stops, waiting areas, and overall infrastructure along the corridor.
- **Service Quality Parameters**: Analyzing factors such as punctuality, frequency, cleanliness, and user satisfaction related to the bus service.
- **Operational Challenges**: Identifying issues such as overcrowding, delays, and inefficiencies that affect the overall performance of the bus system.

Temporal Focus

To contextualize the current situation, this research examines data from the past five years (2019–2024). This period allowed for a comprehensive analysis of trends and patterns in service quality and infrastructure development. The investigation specifically excluded alternative modes of transportation, such as private vehicles or taxis, to maintain a targeted analysis of the public bus system.

1.6 Significance of the Study:

This study is significant because it has the potential to enhance the public bus transportation system in Addis Ababa, which is an essential service for thousands of commuters. The study aims to provide useful insights that could improve operational efficiency and service satisfaction while assessing the caliber of infrastructure and services. This study fills a knowledge gap about urban transportation in developing cities and gives policymakers a foundation for implementing sustainable transportation solutions. The results could also support broader efforts to promote accessible and equitable urban mobility by acting as a model for other urban areas dealing with comparable public transportation issues.

1.7 Research Limitation:

1. Reluctance to Disclose Information: Some survey participants were hesitant to share critical data, such as financial income and occupation. This reluctance may have limited the insights into user demographics and their impact on public transportation usage.

2. Lack of Up-to-Date Resources: The availability of current literature and resources related to the public transportation system in Addis Ababa was limited. This restriction may have affected the depth of the analysis and the contextual understanding of service quality and infrastructure.

3. Financial Constraints: Budget limitations restricted the scale of the study, affecting the ability to conduct a more extensive survey or collect additional data from a broader demographic.

1.8 Description of the Study Area:

An essential part of urban infrastructure, public transportation has a significant influence on environmental health, economic growth, and equitable society. Cities like Addis Ababa have historically struggled to establish efficient transit systems, which has led to an increase in traffic and made it more difficult for low-income groups to access them.

According to recent studies, inadequate public transit can exacerbate social inequality and obstruct economic development, particularly in developing countries (Smith, 2020). However, there is still a significant lack of studies that focus on the specific challenges and opportunities present in Ethiopia.

Addis Ababa has a special chance to examine the dynamics of public transportation because of its quickly growing population and urbanization. Key stakeholders, including governmental organizations, transit agencies, and neighborhood associations, are increasingly realizing the need for sustainable transportation solutions. This study aims to identify operational issues, evaluate the current state of the public bus system in the scope region, and examine the effective tactics used by other cities in order to guide future improvements.

1.9 Organization of the Document:

The six chapters that make up this study each have a specific function in analyzing Addis Ababa's public bus system. In Chapter One, the study's objectives, importance, and primary research questions are explained, as well as the research problem. It also establishes the background and context of the inquiry. Chapter Two examines the literature on public bus transportation systems, highlighting key theories, models, and prior research while highlighting any gaps that this study seeks to fill. The research topic and methodology, including sample selection, data collection and analysis strategies are described in Chapter 3. In Chapter Four, tables and narratives are used to objectively present the study's data analysis findings. Chapter Five looks at successful strategies from other cities that have improved their public transportation systems and offers pertinent Addis Ababa solutions. Chapter Six concludes by acknowledging the limitations of the study, interpreting the results in light of the research questions and literature, and offering suggestions for further research.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction:

This chapter presents a comprehensive review of literature related to public bus transportation, with special attention paid to infrastructure development, service quality, operational challenges, and established best practices. The purpose of this review is twofold: to critically evaluate the current body of knowledge and to identify specific that this investigation aims to fill.

A systematic examination of the literature is important to understand the complexities of urban public bus systems, especially in rapidly growing cities such as Addis Ababa. In addition to examining the operational and technical aspects of public transportation, this review emphasizes its wider implications for social justice, urban mobility, and environmental sustainability. The chapter offers a comprehensive view of the elements influencing the effectiveness and perception of public bus services by combining knowledge from theoretical frameworks and empirical research.

The literature review is structured into three main sections: theoretical, empirical, and contextual. The theoretical review explores important concepts related to social justice, sustainable urban mobility, and the role of public transportation within wider urban systems. The empirical section draws from international studies that investigate service quality, passenger satisfaction, and policy interventions in public transport systems. lastly, the contextual review situates these findings within the unique socioeconomic, cultural, and infrastructural landscape of Addis Ababa, ensuring that the analysis remains locally relevant and meaningful.

2.2 Key Terms and Definitions:

- Public bus transportation: Generally serving urban and suburban areas, is a system of buses run by the government or commercial organizations that offer scheduled services to the general public.
- Infrastructure: The physical structures and facilities necessary for the functioning of public transportation, including bus stops, maintenance facilities, and roadways.
- Service Quality: An evaluation of public bus services' overall performance that takes into account aspects including dependability, frequency, cleanliness, and customer service.
- User Satisfaction: the extent by which users believe the public bus transportation system meets their requirements and expectations.
- Operational Challenges: Problems including inadequate infrastructure, poor management techniques, and a lack of financing that prevent public bus systems from operating effectively.
- Social Equity: The idea that all demographic groups, especially underprivileged and marginalized ones, should have equitable and just access to public transportation services.
- Sustainability: Environmental, economic, and social aspects are frequently considered when evaluating a transportation system's capacity to satisfy present demands without endangering the capacity of future generations to satisfy their own.
- The movement of people within urban areas, including different forms of transportation and their effects on city design and development, is known as urban mobility.
- Best Practices: Techniques or approaches that have been shown to be beneficial in enhancing public transportation systems; these are frequently drawn from successful applications in other locations or situations.

- Policy Framework: A collection of rules and regulations created by governmental organizations to control how public transportation networks are developed and run.

2.3 Theoretical Review:

2.3.1 Transportation Theory:

Transportation theory encompasses various ideas and models. They explain how people and goods move within cities through interconnected networks. One of the fundamental concepts in this theory is network design, which involves configuring transit routes and nodes to maximise accessibility and efficiency (Meyer & Miller, 2001). Another essential element is mode choice, which examines the factors influencing individuals' selection of different transportation modes. An example can be buses or private vehicles or commonly called in our case (blue donkeys) (Ben-Akiva & Lerman, 1985). The concept of travel demand refers to the overall quantity of transportation services required by users, shaped by variables like socioeconomic status, land use, and population density (Ortuzar & Willumsen, 2011). When demand for travel exceeds the network's capacity, congestion results, causing delays and inefficiencies (Downs, 2004).

A mainly used analytical framework within this theory is called the Four-Step Model. It systematically evaluates travel behavior to inform transportation planning decisions. Together, these concepts provide a structured understanding of transportation dynamics, supporting planners and policymakers in designing effective and efficient public transport systems.

2.3.2 Urban Mobility Theories:

Mobility as a Service (MaaS)

Mobility as a Service (MaaS) is a transformative concept that integrates various transportation options into a single accessible platform. This approach allows users to plan, schedule, and pay for multiple forms of transportation seamlessly, thereby enhancing convenience and efficiency. According to (Hietanen 2014), MaaS emphasizes the necessity of continuous connectivity, which can significantly boost public transit usage. And it has the potential to lessen dependency on private vehicles and encourage more environmentally friendly urban mobility solutions by making it simpler to access a variety of transport options. Also, according to recent research, MaaS can boost user satisfaction and promote a move towards more environmentally friendly modes of transportation (Kamargianni et al., 2016).

New Urbanism and Its Impact on Public Transportation

The goal of the planning movement known as "New Urbanism" is to build compact, mixed-use communities that lessen reliance on private vehicles. This strategy encourages settings that support public transport use, especially bus services in this case. New Urbanism improves urban living conditions through integrating residential, commercial, and recreational areas to make transit options more accessible. In addition to advocating for sustainable development, the movement tackles urgent urban issues like traffic jams and environmental deterioration (Duany et al., 2000).

Research indicates that areas designed with New Urbanism principles tend to exhibit higher public transit ridership and lower vehicle miles traveled kin (Talen, 1999).

Transit-Oriented Development (TOD)

The important relationship between urban planning and public transportation networks is underscored by transit-oriented development, or TOD. In order to improve accessibility and promote the use of public transportation, TOD seeks to develop dense, walkable neighbourhoods around transit hubs. By integrating multiple land uses, this strategy helps locals access necessary services without having to rely as much on their cars or the lack of it. TOD makes better urban quality of life, eases traffic, and fosters sustainable urban growth by encouraging mixed-use developments near transit facilities (Cervero & Kockelman, 1997). Not only that but also by boosting foot traffic and property values close to transit stations, TOD has been demonstrated to boost local economies (Bertolini, 1999).

2.3.3 Social Equity and Accessibility

Theories of Social Justice in Transportation

The goal of social justice in transportation is to give everyone equitable access to transportation services. This is in regardless of where they live, their race, or their financial status. According to John Rawls's fundamental theory of distributive justice, the most disadvantaged members of society should be given preference when it comes to the distribution of social goods, such as transportation.

By shedding light on the necessity of providing adequate transport options in under-represented areas, this viewpoint tackles systemic injustices. (Geurs & van Eck, 2001).

Social Capital Theory

The study of social capital looks at how social networks and relationships affect people's ability to access resources, like transportation. Strong social ties are typically associated with better access to transport services, which improves mobility generally and lessens inequality. These networks foster and facilitate information sharing all about transportation options and foster community advocacy for improved services, which is crucial and mia for marginalized groups (Putnam, 2000).

Models Explaining Accessibility for Different Demographics

Models of accessibility are essential for understanding the experiences of various demographic groups with transportation services. The gravity model quantifies accessibility based on the proximity of services and population density. And it underlines the significance of location in transportation planning (Hansen, 1959). More so spatial interaction models explore how transportation networks and distance affect the flow of people and goods. That help allowing planners to identify areas with inadequate accessibility and target improvements for disadvantaged groups (Geurs & van Eck, 2001).

Accessibility normally impacts individuals with disabilities and those with low incomes, who may face greater barriers to reliable transportation. These challenges can come in shorts when come to

access to healthcare, education, and employment opportunities, making it unquestionable to address these issues to promote social equity and enable full participation in society.

2.3.4 Sustainability in Transportation:

Theoretical frameworks for sustainable transport

The primary goal of sustainability in transportation, which is also in line with our new transformational goal, is to design systems that meet present mobility needs while guaranteeing that future generations can meet theirs. Sustainable development theory is a key theoretical framework that promotes balance between environmental protection, social justice, and economic expansion. Similar to the Brundtland Commission (1987), this concept highlights the interdependence of these areas and promotes modes of transportation that contribute to a sustainable future.

Systems theory is another significant theory that views transportation as a component of a more comprehensive, interrelated system that encompasses social dynamics, land use, and environmental concerns. According to Meadows (2008), this strategy promotes and values integrated planning and policymaking that considers the ways in which transportation interacts with other urban components.

Urban sustainability theories in Africa stress the need for context-specific approaches that take regional factors and constraints into account, even though behavioral change theories like the Theory of Planned Behavior claim that people's transportation choices can be influenced by their attitudes, social norms, and perceptions of control (Kumar & Ranjan, 2019). Sustainable practices

may become more popular as people learn more about and become more conscious of the environmental impact of different forms of transportation (Ajzen, 1991). In Ethiopia's case, initiatives to alter public attitudes toward public transit can encourage more people to take buses, which is a major sustainable option (Beyene, 2020).

The Importance of Public Bus Transportation in Promoting Environmental Sustainability:

In order to promote environmental sustainability, public bus use is essential. Buses are generally more effective at transporting large groups of people than private vehicles, which reduces greenhouse gas emissions per person (more at once). This efficiency is even more important in urban or metropolitan areas where traffic congestion can significantly increase pollution levels (UITP, 2016).

By integrating alternative energy sources like electric or hybrid buses, investments in bus infrastructure may surly help reduce reliance on fossil fuels. According to Baker et al. (2019), these advancements not only lower emissions but also encourage the development of sustainable technologies in the transportation industry. Also efficient public bus systems enhance urban mobility by allowing people to access services, employment opportunities, and educational opportunities without depending on their own vehicles. Less traffic and improved air quality are made possible by fewer cars on the road, and these two factors are essential for advancing environmental sustainability initiatives (Litman, 2017).

2.4 Empirical Review:

2.4.1 Global Perspectives on Public Bus Transportation:

Research on public transportation systems all around the world shows a variety of methods and results. In London, a well-run bus system greatly improves urban mobility and reduces traffic. The goals of this study are in line with Transport for London's (TfL) 2019 service, which carried about 6 million passengers every day and prioritized accessibility, regular service, and real-time information. scoring a great deal in transit step.

Particularly effective is Bogotá, Colombia's TransMilenio bus rapid transit (BRT) system, which has reduced pollution by roughly 32% and shortened travel times, leading to a 40% reduction in CO2 emissions (Gómez-Lobo & Contreras, 2010). Similar BRT projects have been sparked by this success in other Latin American cities.

Launched in 2015, the Addis Ababa Bus Rapid Transit (AABRT) system in Africa has shortened travel times by 30% and serves 60,000 passengers every day (Beyene, 2020). Similarly, after the installation of its BRT system in 2008, Lagos, Nigeria, saw a 50% increase in the use of public transportation and a decrease in unofficial transit options (Adelekan, 2018). However, research conducted in Los Angeles, USA, shows that public bus systems suffer in areas where cars predominate, with ridership falling as a result of insufficient infrastructure and inconsistent service (Kahn, 2018).

Lessons Learned from Successful Systems

Effective public transportation systems, like those in Bogotá and Cape Town, highlight the value of combining different forms of transportation. To improve overall mobility and promote the use of public transit, TransMilenio, for example, have connects with numerous branch routes (Pojani & Stead, 2015). A user-centric design is essential satisfying customer demands with up-to-date information, dependable timetables, and customized routes can greatly increase user satisfaction (Hensher et al., 2016). In order to lower emissions and enhance air quality, sustainability initiatives like Cape Town's adoption of electric buses are also obviously essential (Wang et al., 2020).

Effectiveness and responsiveness are increased when the community is involved in the planning and operation of bus services. Residents can voice their concerns during public consultations, which promotes a feeling of control over the transit system (Buehler & Pucher, 2011). Furthermore, investment in infrastructure is essential for improving service safety and efficiency. Adequate funding for dedicated bus lanes and also strategically chosen stops can lead to increased ridership and user satisfaction. For our example, the Nairobi BRT project anticipates increasing daily ridership from 80,000 to 200,000 due to its dedicated bus lanes (Kenya Urban Roads Authority, 2021).and it is a great with 3.900%. jump covering a lot consumers.

Table 2.1: comparison of public bus system in selected cities

City	System Type	Daily Ridership	CO2 Emission Reduction	Key Feature
London	Integrated Bus	6 million	15%	Real-time information systems

Bogotá	BRT(TransMilenio)	2.4 million	40%	Dedicated bus lanes
Addis Ababa	BRT	60,000	30%	Improved travel times
Lagos	BRT	300,000	-	Integration with informal transport
Nairobi	BRT	Projected 200,000	-	Dedicated bus lanes

(Source: UN-Habitat 2024)

2.4.2 Challenges with in Public Bus Transportation:

Many many obstacles prevent public bus transit systems from being sustainable and efficient. One of the main problems is congestion, especially in cities with constrained road space. According to research, traffic congestion causes unpredictable travel times, which delays bus services and lowers ridership (Kahn, 2018).

For public bus networks, funding is yet another major obstacle. Securing sufficient funding for operations, upkeep, and infrastructure improvements is a challenge for many cities. According to the American Public Transportation Association (APTA, 2020), a lack of funding frequently leads to service cuts and deteriorating infrastructure, which have a negative impact on customer satisfaction and dependability. Reliance on government subsidies in many developing nations can result in unpredictable and undependable funding, making bus service maintenance more difficult (Pojani & Stead, 2015).

Networks of public transportation are also greatly impacted by maintenance problems. Higher operating costs and more vehicle downtime can result from aging fleets and inadequate maintenance procedures. The public bus system in Addis Ababa has seen a 30% increase in operating costs due to poor maintenance, which has a detrimental impact on the dependability and caliber of services (Beyene, 2020).

Case Studies Related to Similar Challenges in Developing Countries

Rapid urbanization and scarce resources aid problems for public bus networks in developing countries. But these difficulties can spur creativity.

The Bus Rapid Transit (BRT) system in Lagos, Nigeria, has become more efficient. Nevertheless, during rush hour, average speeds have dropped to 10 km/h due to traffic congestion (Adelekan, 2018). This emphasizes the need for improved traffic control and additional funding for bus-only lanes.

Nairobi, Kenya, deals with competition for road space between formal and informal transport. Due to financial limitations, many buses are getting older (Kenya Urban Roads Authority, 2021). This offers a chance for public-private partnerships to update the fleet. A more unified transit system might result from the integration of informal operators with official systems.

Planning problems and budgetary limitations have delayed the deployment of BRT in Dhaka, Bangladesh. User satisfaction and operational effectiveness can be raised by securing consistent funding and involving the community in planning (Hossain et al., 2019).These case studies demonstrate that although there are difficulties, there are also important lessons to be learned for improving public bus transportation systems in developing nations.

2.4.3 User Satisfaction and Perception:

Discussion of Studies Focusing on User Satisfaction

User satisfaction is important to the effectiveness of public bus transportation systems since it directly affects ridership and overall performance. Numerous studies have examined user perspectives and found several traits that affect satisfaction or dissatisfaction. For instance, a survey in Addis Ababa found that 70% of bus riders were dissatisfied with the reliability of the service, attributing this to crowding and frequent delays (Beyene, 2020). Users rated the BRT system as mediocrely satisfied, mainly due to concerns about travel times and bus frequency, according to research done in Lagos, Nigeria (Adelekan, 2018).

A more thorough survey conducted in London found that factors like timeliness, cleanliness, and safety significantly affect user satisfaction. Improvements in these areas would encourage people to use public transport more frequently, according to nearly 80% of respondents (TfL, 2020). This emphasizes how important it is to improve service quality in order to increase ridership and enhance public opinion.

Factors Influencing User Experience:

User experience and general satisfaction with public bus transit are influenced by a number of important factors but this study will focus on the following six matters:

1. Service Reliability: User happiness depends on promptness and how they are consistency. Delays and erratic schedules can push off people from using bus services, according to research (Kumar & Ranjan, 2019). For instance, it has been noted that traffic in Los Angeles causes typical bus travel times to increase by 20%, which irritates passengers (Kahn, 2018).
2. Comfort and Cleanliness: The customer experience is greatly influanced by the caliber of the buses and bus stations. Research shows that better satisfaction levels are associated with clean, well-maintained cars and stations. Newer buses with air conditioning and comfy seats have been preferred by passengers in Nairobi, improving their entire travel experience (Kenya Urban Roads Authority, 2021).
3. Safety and Security: How satisfied users are with public transportation depends on their views of safety so it might vary. According to studies, people are more inclined to take use of bus services if they feel safe both within the buses and at bus stops. User impressions in Bogotá have improved as a result of safety measures including better illumination and surveillance (Gómez-Lobo & Contreras, 2010).
4. Accessibility: It is crucial that bus services be available to a range of demographics, including the elderly and the disabled and the young. According to research, towns that prioritize accessible features like well-designed stops and low-floor buses generally report higher

customer satisfaction. Successful efforts to promote accessibility in Cape Town have led to a rise in the number of non-traditional users using the system (Wang et al., 2020).

5. Customer service: Customer satisfaction is also influenced by the amber of interactions between passengers and bus employees. According to more studies, welcoming and accommodating personnel (like bus employees)can improve the user experience in general. Improved consumer opinion have been associated with Addis Ababa's efforts to teach conductors and drivers in customer service (Beyene, 2020).
6. Affordability of Fares: User satisfaction is greatly impacted by bus fare prices. Affordable fares have been found to boost utilization, especially among those with low incomes. Studies show that modifications to fare structures can have a major influance on riding patterns in Dhaka, Bangladesh (Hossain et al., 2019).

2.5 Contextual Review:

This part shows an overview of the public transportation landscape in Addis Ababa, highlighting the significance of the Ayat-Tor Hailoch corridor in the city's urban mobility framework. This corridor is essential as it connects various neighborhoods and facilitates access to key services, making it a vital part of the urban transport network.

2.5.1 Overview of Public Transportation in Addis Ababa

Current State of Public Transport

Public bus transportation is crucial for many residents in Addis Ababa, especially for those in lower-income brackets. The system consists of a mix of government-operated buses and privately

owned minibuses, designed to meet the growing mobility needs of the city's population (Abebe, 2020). The Ayat-Tor Hailoch corridor stands out due to its high passenger volume and the concentration of commercial activities along the route. Unfortunately, the existing infrastructure, including bus stops and road conditions, often struggles to cope with the demand. This leads to issues like overcrowding and delays, which can frustrate commuters (Desta & Alemayehu, 2019).

Historical Context

The history of public transport in Addis Ababa has been shaped by various socio-economic factors and urban development policies. Initially, the city relied heavily on informal transportation modes. However, the introduction of organized public bus services in the early 2000s marked a significant shift towards a more structured system. Recent studies have pointed out the persistent challenges faced by the public transport sector, such as inadequate infrastructure and service quality, both of which have worsened due to rapid urbanization and population growth (Gebremedhin, 2021). While there have been efforts to enhance the public transport system, considerable gaps remain, particularly regarding accessibility and efficiency (Tesfaye, 2018).

2.5.2 Infrastructure Assessment

Evaluation of Current Infrastructure

When examining the infrastructure along the Ayat-Tor Hailoch corridor, several issues stand out. Many bus stops are in disrepair; they often lack basic amenities like seating and shelter, which makes waiting uncomfortable for commuters. The state of the roads is another concern. Potholes

and uneven surfaces contribute to a bumpy journey, leading to delays and frustration among passengers (Desta & Alemayehu, 2019). Moreover, maintenance facilities are often inadequate, impacting the overall reliability of the bus services. Accessibility is a critical issue, especially for vulnerable populations and for elderly passengers or those with disabilities, navigating to and from bus stops can be quite challenging. The absence of ramps and clear signage complicates matters further, making it difficult for everyone to access public transport effectively (Desta & Alemayehu, 2019).

Impact on Efficiency

These infrastructure shortcomings have a tangible impact on how efficiently the public transport system operates. Buses frequently run late due to poor road conditions, leading to heightened frustration among passengers. Overcrowding during peak hours exacerbates the situation, forcing commuters to wait longer and compromising their safety (Gebremedhin, 2021). In essence, the state of the infrastructure undermines the efficiency of the public bus system, leaving many residents dissatisfied with their daily commutes.

2.5.3 Service Quality Analysis

Quality of Services Provided

Service quality is another vital aspect to consider. Factors like frequency, reliability, and safety greatly influence commuter perceptions of the public bus system. Unfortunately, buses often do not arrive as frequently as needed, resulting in long wait times (Gebremedhin, 2021). Safety is also a major concern, with reports of accidents and incidents on the roads. Surveys conducted among

commuters reveal a general sense of unease regarding safety, which significantly affects their willingness to rely on public transport (Gebremedhin, 2021).

Comparisons with Best Practices

Looking at successful public transportation systems in other cities can provide valuable insights. For instance, Nairobi and Kigali have implemented bus rapid transit systems that prioritize both speed and reliability (Tesfaye, 2018). These examples serve as potential models for Addis Ababa, highlighting strategies to enhance service frequency and safety measures.

2.5.4 Identification of Challenges

Key Operational Issues:

Several key operational challenges persist within the public bus system in Addis Ababa. Overcrowding is a common problem, especially during peak hours, making the experience uncomfortable for many passengers (Abebe, 2020). Additionally, delays are frequent, and the lack of real-time information about bus arrivals leaves commuters guessing. These issues stem from management inefficiencies that require urgent attention.

Safety Concerns

Safety concerns are paramount for commuters. Many face risks not only from poor road conditions but also from reckless driving and insufficient enforcement of traffic regulations (Tesfaye, 2018). These safety issues significantly impact public perception, leading many to question the reliability of the public transport system. Addressing these concerns is crucial for rebuilding trust and encouraging more people to utilize public buses.

CHAPTER THREE: RESEARCH METHODS AND MATERIALS:

3.1 Description of the Study Areas

This research examines Addis Ababa which is the capital and biggest city in Ethiopia. Because of its importance in society and economy, the need for better public transportation is increasing, especially with a population of 3.95 million (UN-Habitat, 2024). The research investigates the busy route going from Tor Hailoch to Ayat. This street is very popular with vehicles which make it appropriate for experimenting with better traffic solutions. There are both homes and offices along the corridor which attracts a lot of daily commuters.

3.1.1 Site Selection Criteria

For this study, Ayat-Tor Hailoch corridor was chosen because it plays an important role in Addis Ababa's public transportation based on several critical criteria that reflect its significance.

Traffic Volume There is a very large amount of traffic in the corridor every day, making it among the highest traffic routes in Addis Ababa. For this reason, public transportation should be measured by its effect on the community and how it is used. Studies on traffic patterns have found that this area gets very congested, mainly at the busiest times. (World Bank Group, 2021).

Population Density Because the area is densely populated, there are many people traveling to and from homes and work each day. According to demographic data from the Central Statistical Agency, the population in this corridor has been increasing steadily, making it a focal point for public transport needs (Central Statistical Agency, 2023).

Existing Public Transport Infrastructure Regular buses and a Bus Rapid Transit (BRT) system provide good coverage for the corridor. Because of this existing infrastructure, it is much easier to see what works well and which parts need attention when evaluating service. Many commuters depend on the Anbessa City Bus Service which runs via lots of routes here each day. (Gale Academic OneFile, 2024).

Accessibility Access to the corridor is convenient for commuters. Checking how users feel about each stop and the general accessibility of the route is necessary to identify what problems the public transportation system is experiencing. (Kassahun, 2007).

Economic Activity Many people go through the Ayat-Tor Hailoch corridor daily due to the commercial activities and high traffic along it. Looking public transport in such an economically active area can show us the relationship between transportation and local businesses. (WFG, 2021).

Alignment with Urban Development Plans The Addis Ababa City Development Plan focuses on improving public transportation and the corridor does the same. Because of this, it is important to study public transport and see how it can meet future demands (Addis Ababa City Administration 2019)**.**

Historical Context Previous studies have identified the Ayat-Tor Hailoch corridor as a critical area for public transport analysis, highlighting ongoing challenges and opportunities for improvement (Abebe & Tadesse, 2023).

3.1.2 Location

Study Area Map

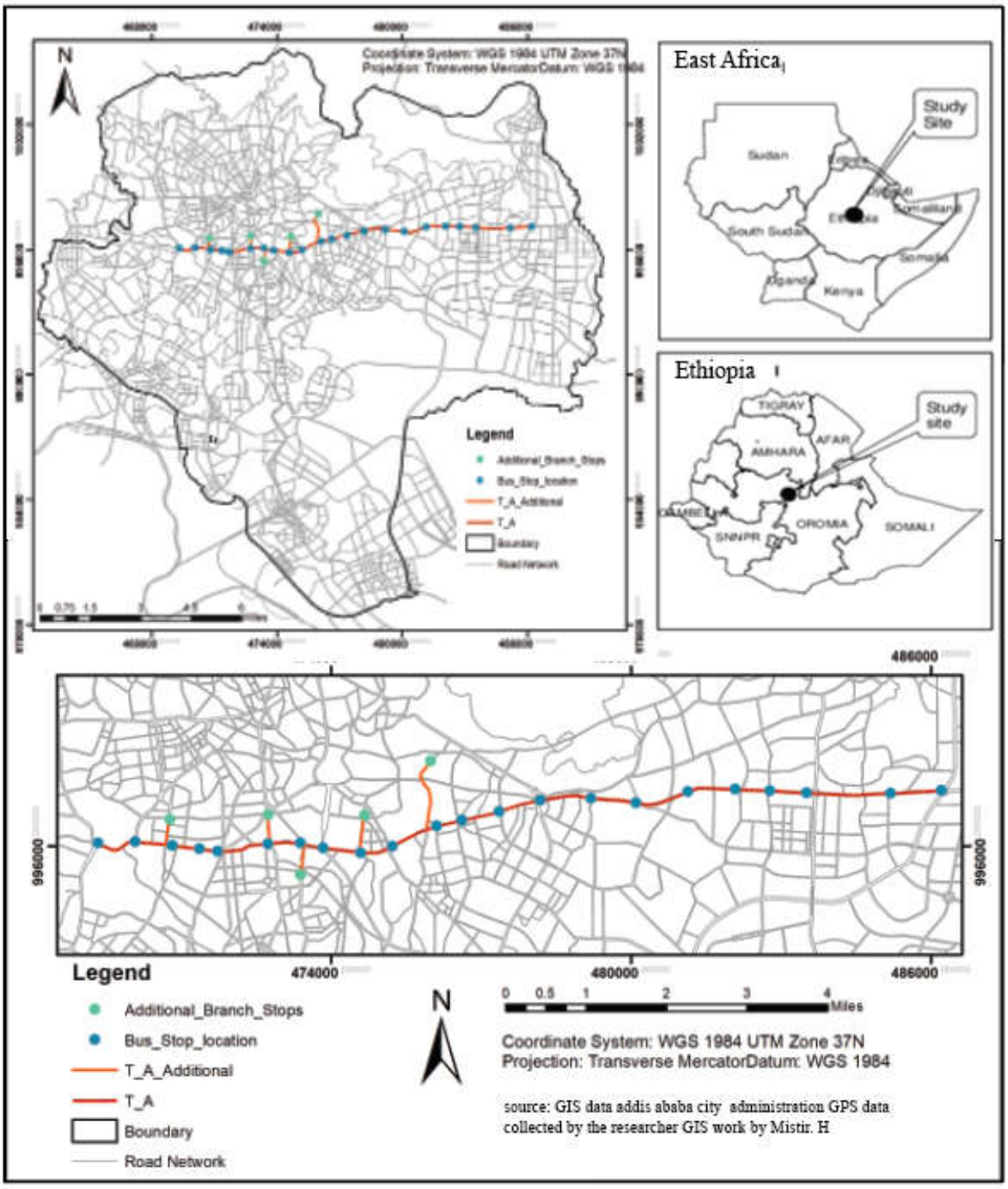


Figure 3.1 study area map

3.1.3 General Overview of the Addis Ababa Bus System

The public transportation system in Addis Ababa is very important for getting around the city. The service is mainly led by the Anbessa City Bus Service Enterprise (ACBSE) which runs about 1,000 buses every day, covering 93 routes and serving more than one and a half million people. This includes both regular buses and Bus Rapid Transit (BRT) services, making this a big part of everyday life for many residents (Gale Academic OneFile, 2024). And also According to reports, 40% of the trains are currently without service because of technical reasons, making waits longer and causing crowded conditions, especially when traffic is high (Gale Academic OneFile, 2024).

Land Use and Bus Route Integration

The routes of the buses are set up to link busy areas where people live with commercial spots and major places like schools and hospitals. This arrangement helps ensure that the system answers to the needs of people who commute (World Bank, 2020). To improve bus service, special lanes for buses have been set up along major roads, but unfortunately they often deal with traffic mixed with other vehicles and heavy crowds (Tesfaye, 2019).

When houses, shops and offices are near bus stops, more people are likely to use the bus service. The connection between public transport and city planning greatly improves opportunities for mobility among residents (Alemayehu & Zewdie, 2021).

Transportation Infrastructure

The bus service is closely related to how well Addis Ababa's roadways are maintained which are made up of over 136,000 kilometers of different types of roads. But poor roads and far more

vehicles approaching 1.4 million means public transport is often less reliable for commuters (WFG, 2021).

City Development Plans and Urban Transportation in Addis Ababa

The Addis Ababa City Development Plan contains two major master plans that highly influence the city's growth and development, particularly in the context of urban transportation.

First Master Plan (1984)

The First Master Plan which was set in 1984, provided the basic structure for how Addis Ababa would be developed. It tried to solve the problems of fast-growing cities by improving infrastructure and service delivery. Some important elements were: The plan’s zoning requirements set apart different zones for homes, businesses and industry to encourage well-organized cities that are easier to keep transport routes organized (Meyer & Miller, 2001).

The importance given to water supply and sanitation in cities helped sustain the urban population and indirectly influenced transportation (Beyene, 2020).

Land use planning was necessary to provide more housing and facilities and lay the foundation for future transit zones (Putnam, 2000).

Plan released in 1994

In 1994, the Second Master Plan was aimed at prioritizing transportation because of how vital it is to city movement. The main aim of this plan was to supply a cost-effective way for everyone to travel as the population grew. Some key approaches were:

Providing a transportation system in which it is accessible and low-cost was a key goal. The purpose of this strategy was to make it possible for all to use dependable public transit by combining different modes of public transport (WFG, 2021).

Access should be easier in the city, so the plan includes designing a full network of well-planned roads. To make it easier for people to move around, the plan set out to connect important residential spots with business areas and utilities (Adelekan, 2018).

Several steps to boost traffic movement and reducing congestion were put forward to help the flow of motorists: Improving Roads like Adding to and upgrading road systems to handle the extra strain on transportation (Geurs & van Eck, 2001). Optimal traffic management is necessary to make public buses work efficiently by handling bus traffic more efficiently and cutting down on traffic delays (Kahn, 2018).

3.1.4 Mapping Land-Use Context and Service Nodes

Because of these master plans, the city has been guided in building its public transportation networks. Promoting access to affordable transit supports the wish to enhance how cities are moved and to address existing transport problems. With the city expanding, having good public transport is becoming much more important.

An illustration of bus routes and highlighting major land use areas would show better how buses are connected to the entire city. This way of displaying things allows us to see: Showing the key bus routes to make it easier for people to get around.

Land Use Zones Shows how the buses are used for travel to neighborhoods, shops and essential places in the city. Checking for places where passengers can move from buses to taxis, trains or other types of transport.

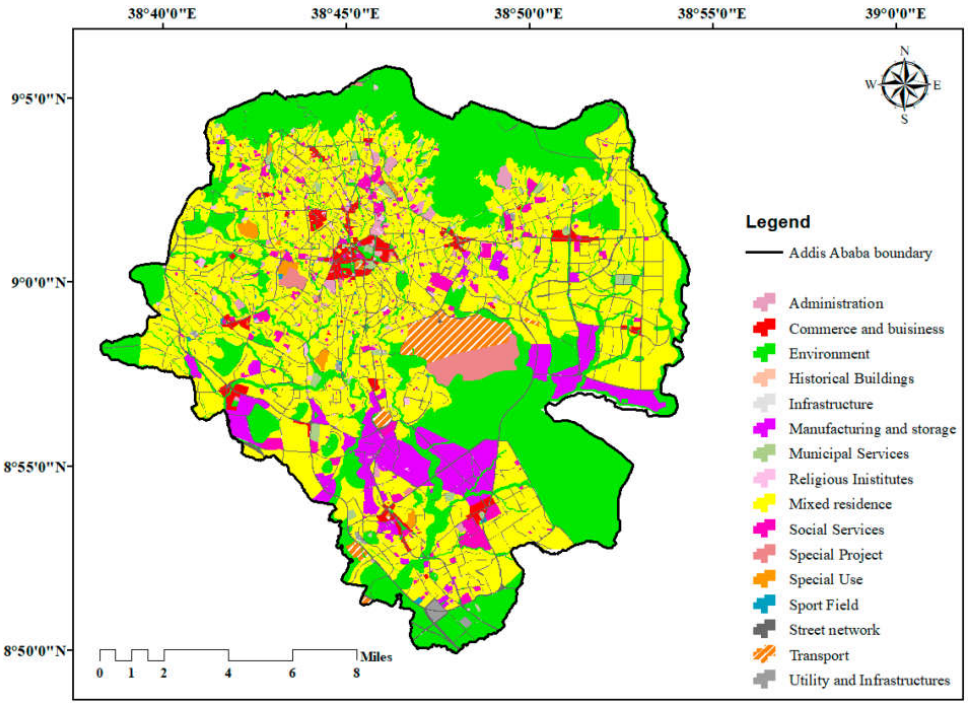
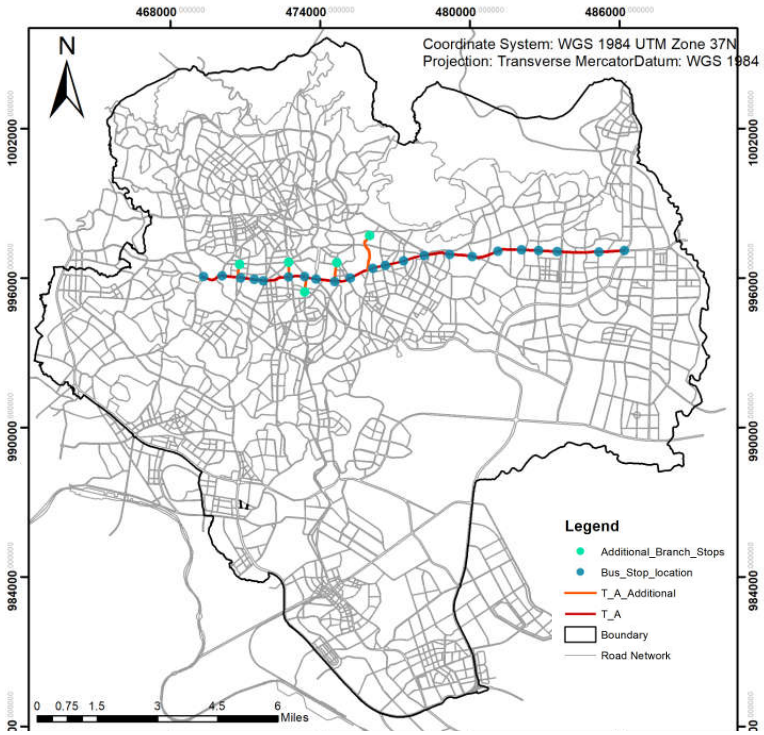


Figure 3.2 Addis Ababa land use map



- Ayat 1
- Ayat 2
- Bambis
- Haya Hulet 1
- Haya Hulet 2
- Gurd Shola 1
- Gurd Shola 2
- Megenagna
- Leghar
- Lem Hotel
- Meri
- Meshualekia
- Civil Service University
- CMC
- Coca Cola
- Darmar
- Mexico
- Stadium
- St Estifanos
- St Urael
- St Michael
- St Lideta
- Tegbared
- Tor Hailochz

Figure 3.3 east-to-west ordering of those locations along the Ayat → Tor Hailoch corridor

When viewed together, the land-use map and bus-stop locations reveal how urban functions and public transport access interweave across the Ayat–Tor Hailoch corridor: the above figures can be explained as follow:

Eastern Periphery (Ayat 1 & Ayat 2 to Bambis)

At the eastern edge, around Ayat 1 and Ayat 2, the map shows predominantly low-density residential parcels transitioning into peri-urban agricultural plots. Bambis marks the start of a gradual increase in density: homes become more closely spaced and a few small commercial clusters shops and cafés appear along the main road. Bus stops here serve local residents and the growing commuter inflow from outlying areas.

Mid-Eastern Residential Belt (Haya Hulet through Gurd Shola)

Moving westward into Haya Hulet 1 & 2 and both Gurd Shola stops, the land use shifts to high-density residential, with blocks of multi-story apartment buildings. Green pockets (small parks or school grounds) are interspersed. Notice how bus stops at Gurd Shola often sit adjacent to these communal spaces indicating their role as neighborhood nodes. This section has relatively short walking distances between stops, reflecting the compact street grid and dense population.

Commercial and Institutional Core (Megenagna to Coca Cola)

Around Megenagna, Leghar, and Lem Hotel, the map's commercial zoning (retail, offices, hotels) intensifies. The Civil Service University and the CMC/Coca-Cola complex stand out as large institutional and light-industrial blocks respectively. These land uses generate high passenger

volumes at those stops, especially during term-time and shift changes. The bus routes here thread between mixed-use developments, serving both students and workers.

Recreational and Event District (Darmar through Stadium)

Approaching Mexico and the Stadium stop, the map highlights recreational land use: sports grounds, open-air venues, and some commercial support services (restaurants, kiosks). Bus stops here are spaced a little farther apart, matching the larger plot sizes, and cater to episodic peaks of ridership during events.

Western Institutional and Historic Zone (St Estifanos to St Urael)

Between Stadium and the churches at St Estifanos, St Urael, and St Michael, the land-use pattern is a mix of religious/institutional and dense urban fabric narrow streets lined with small shops and residences. These stops not only serve daily commuters but also pilgrims and visitors to these historic sites.

Transport Hub and Western Terminus (St Lideta, Tegbared, Tor Hailoch)

Finally, the western end around St Lideta and Tegbared shows a transport intermodal zone: wider roads, bus depots, and taxi stands highlighted as special transit-oriented land use. Tor Hailoch, the terminus, reverts to a mainly residential and some light-commercial mix, marking the turnaround point for buses and the boundary between urban and peri-urban land uses.

Key Insights from the Overlay

Density vs. Stop Spacing: High density residential areas have closely spaced stops, while large institutional or recreational parcels have fewer, more widely spaced stops.

Land-Use Demand Alignment: Commercial and institutional zones (Megenagna, CMC, Stadium) coincide with clusters of bus stops and likely show the highest ridership peaks.

Transit-Oriented Development Gaps: Some dense residential blocks (e.g., Haya Hulet) lack adequate shelter or seating at stops, as seen by small gap symbols on the map highlighting areas for infrastructure upgrades.

3.1.5 Organizational Structure of Anbessa City Bus Service Enterprise

The structure of the Anbessa City Bus Service Enterprise (ACBSE) is set up to help the company manage its work and offer quality service within Addis Ababa. It is very important for handling the large number of vehicles and the many routes found in the city.

Organizational Structure

ACBSE is structured in a way that has several important parts.

1. The top of the hierarchy has a General Manager, who looks after all operations and assignments. It is very important that the manager guides the organization towards its goals.

2. Apart from the top executive positions, ACBSE operates with a number of departments each tasked with different functions:

Operations Department looks after daily operations, from planning routes to setting up schedules.

Maintenance Department: Looks after the company's buses, keeps them in good condition and maintains their safety.

Finance Department: Responsible for budgeting, financial reporting and allocating resources.

Human Resources Department: Concentrates on managing employee matters such as hiring, training and relationships between staff.

3. Helpful services such as customer support and public relations are important for keeping in touch with commuters and managing their problems.

Workforce

There are many different roles in ACBSE's workforce which helps the buses function properly. The following are main features of the workforce: The backbone of the company, bus drivers are responsible for safely delivering passengers along the fixed routes.

Technicians and mechanics that maintain the scheduling of services and maintain buses are called maintenance staff. Administrative Staff are in charge of the company's operations, finances and employees. Customer Service Representative are Someone passengers turn to for answers to their queries and to learn route and schedule details.

The workforce is supported by ongoing training programs aimed at enhancing skills and improving service quality. This focus on professional development is essential for maintaining high standards of safety and customer satisfaction.

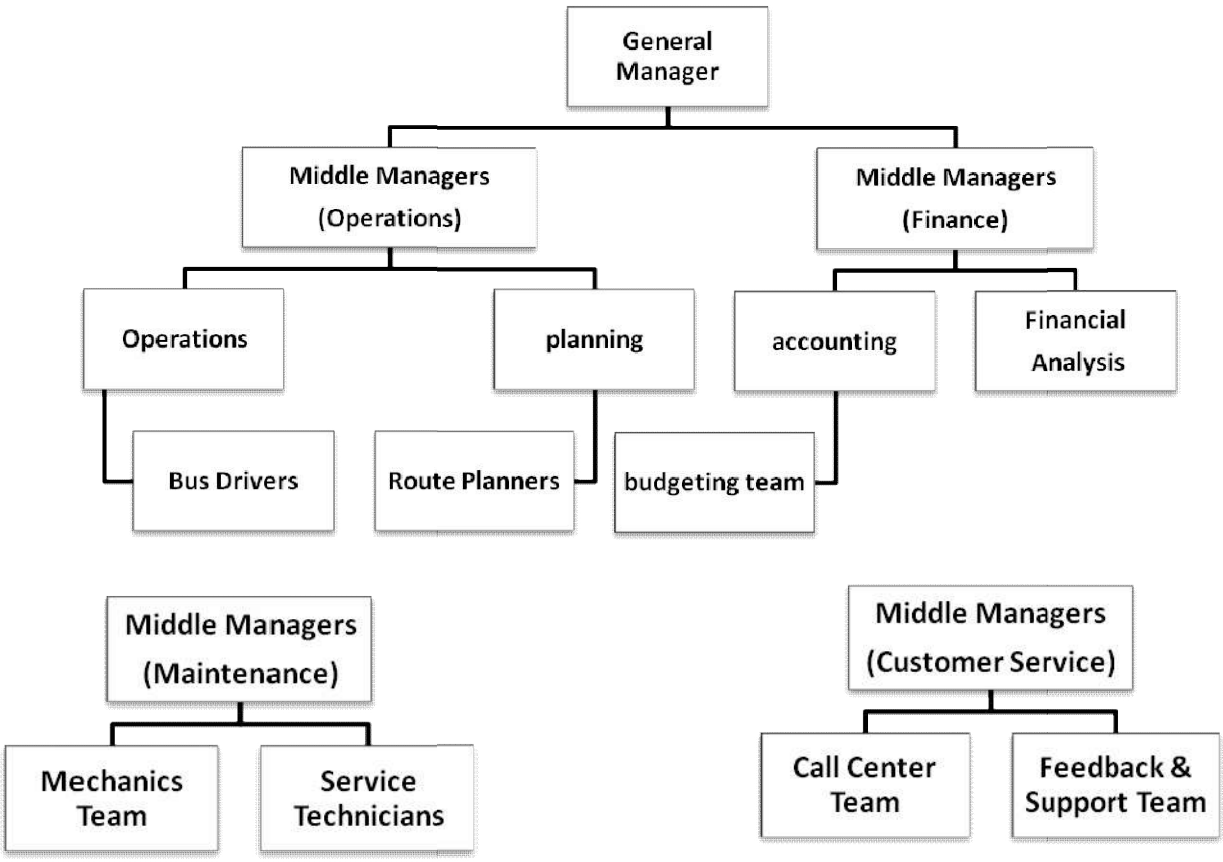


Figure 3.4 Organizational Structure of Anbessa City Bus Service Enterprise

3.2 Research Design

This paper uses a descriptive and cross-sectional research design to evaluate and examine the public transportation system in the Ayat-Tor Hailoch corridor of Addis Ababa. The descriptive aspect provides a detailed look out of the current state of the public bus system, examining factors like service quality, infrastructure, and overall user satisfaction. For the reson of documenting these elements helps pinpoint strengths and weaknesses within the transportation network.

The cross-sectional approach involves collecting data at a single point in time. This method offers a view of how the public transportation system works or functions, assessing traffic patterns and

commuter experiences along the corridor without needing to track changes over time. This clarity allows for a concise understanding of the current situation.

Moreover, while the study is primarily descriptive and cross-sectional, it incorporates some explanatory elements as well. This includes exploring how various factors, such as traffic volume and population density, relate to public transport efficiency. Getting a knowhow of these relationships uncovers the reasons behind observed patterns, guiding potential improvements.

3.3 Data Type and Their Sources

This study utilizes both primary and secondary data to offer a comprehensive analysis of the public transportation system in the Ayat-Tor Hailoch corridor.

Primary Data

Getting the primary data from the right people helps learn about the problems and strengths in the transit system. It also consists of conducting surveys, observing and talking to people.

Questionnaires are handed out to passengers to determine their satisfaction with the bus service, how easy the system is to use and the problems they meet with it. Hearing how users feel gives an important insights into their opinions and desires.

Physical evaluations of bus stops, traffic at various times and how commuters act are included in observations. It allows decision makers to see what is going on at any given moment along the corridor such as ongoing maintenance needs.

Speaking to bus drivers, administrators and executives involved in public transportation uncovers more information about their decision-making and everyday issues. Engaging in such discussions gives a chance to learn what people working in the public transport sector believe.

Secondary Data

Existing information such as reports or articles, collected from several sources is considered secondary data. The official documents used are from both the Addis Ababa City Administration and the Anbessa City Bus Service Enterprise. They show what transport networks exist now and what rules guide these services.

Information from the Central Statistical Agency supports understanding why demand for public transportation is high in the corridor. Work published in academic journals shares useful information and analyses about the problems and prospects of public transport in Addis Ababa.

Combining this two, primary and secondary data, this creates a well-rounded over view and understanding of the public transportation system in the Ayat-Tor Hailoch corridor, considering what travelers go through now and insights from the past.

3.4 Sample Size Determination

Figuring out the exact number of passengers on public buses traveling every day between Ayat and Torhailoch in Addis Ababa is not easy due to the lack of route-specific information. But we are still able to give an estimated forecast using secondary resources from relevant organizations..

Public Bus Ridership Overview

There are many ways to travel on the east-west Ayat–Torhailoch corridor in Addis Ababa, using public transport.

- Anbessa City Buses: Anbessa has more than 125 routes, and it transports about 1.2 million people in the city every day.
- Anbessa's services are complemented by those of Sheger and Alliance Buses, as Sheger has 470,000 passengers per day and Alliance has 25,000.

Because official information about the route is missing, we can guess its length. Since Ayat–Torhailoch has a high ridership on a daily basis, it stands to reason that the route accommodates tens of thousands of travelers daily. To find the ideal number of people to survey, we can use the sample size formula developed for a limited population. Given that the route makes up 2% to 3% of the whole bus system that the population served is about 42,500.

Sampling Design

To ensure a representative sample of commuters on the Ayat Torhailoch route, a combination of **stratified sampling** and **purposive sampling** is employed.

1. **Stratified Sampling**:
    - The population is divided into strata based on demographic factors such as age and occupation, ensuring diverse representation of different commuter segments.
2. **Purposive Sampling**:
    - This technique targets specific groups of commuters who frequently use this route, enhancing the relevance of the data collected.

Sample Size Calculation

Using the formula for sample size determination: $N = \frac{N * Z^2 * P * (1-p)}{E^2 * (N-1) + Z^2 * p * (1-p)}$ where as :

N = 42,500N (total daily passengers) P = 0.5 (maximum variability)

Z = 1.645 (for a 90% confidence level) E=0.06 (margin of error)

Calculating the sample size: $n = \frac{42,500 * (1.645)^2 * 0.5 * (1-0.5)}{(0.05)^2 * (42,500-1) + (1.96)^2 * 0.5 * (1 - 0.5)}$

$n \approx \frac{42,500 * 3.8416 * 0.25}{(0.0025) * (42,499) + (2.706) * 0.25}$

n = 266

The required sample size for the study is approximately **266 commuters**.

Demographic Breakdown

To provide clarity, demographic variables are separated into two distinct tables: one for age and another for occupation, based on the total sample size of **266**.

Table 3.1: Age Distribution of Sample Population

Age Group (Years)	Estimated Proportion (%)	Calculated Sample Size
18-24	25%	69
25-34	40%	103
35-44	15%	43
45 and above	20%	51
Total	**100%**	**266**

Author's survey data (2023–2024)

Table 3.2: Occupation Distribution of Sample Population

Occupation	Estimated Proportion (%)	Calculated Sample Size
Student	25%	67
Employed (Public/Private)	50%	124
Self-Employed	15%	42
Retired/Unemployed	10%	31
Total	**100%**	**266**

Author's survey data (2023–2024)

Explanation of Sampling Design

- **Total Sample Size**: The total sample size of **266** represents the number of commuters surveyed in the study.
- **Stratification**: The sample is divided into different age groups and occupations based on calculated proportions to ensure a representative view of the commuting population.
- **Sampling Techniques**: The combination of stratified and purposive sampling allows for targeted data collection, making the findings more relevant to the study focus.

3.5 Method of data collection

3.5.1 Location of Data Collection

Data collection was made at 30 strategically chosen bus stops along the Ayat Torhailoch route. These stops were chosen based on high commuter traffic, diverse demographics, and proximity to key locations such as educational institutions and commercial centers.

(see Figure 3.3 east-to-west ordering of those locations along the Ayat → Tor Hailoch corridor) and 3.1.4 for farther explanation.

3.5.2 Site Observation

Site observation involves visiting the chosen bus stops along the Ayat Torhailoch route to gather information about commuter behaviors and bus operations. We prepare an observation checklist **(see Annex 1)** to help guide these visits. This includes noting the layout of bus stops, how often buses arrive, and how many passengers get on and off at different times of day. We collect data over a month, covering both weekdays and weekends, at various times (morning, midday, and evening). During each observation, we keep track of passenger numbers and patterns at each stop.

3.5.3 Document Review

For the document review, the study looks at relevant policy documents, transportation plans, and reports from the Anbessa City Bus Service. This helps us understand the historical context and the rules that govern public transportation in Addis Ababa. We also review any available statistics on ridership trends and service frequency.

3.5.4 Key Informant Interviews

Then it is conduct face-to-face interviews with key informants selected through purposive sampling. These informants include officials from the Addis Ababa City Government, transportation planners, and bus operators. Their insights are valuable for identifying challenges and potential strategies to improve bus services along the route. The interviews feature semi-structured questions, allowing us to explore additional topics that may come up during the discussions (see Annex 2).

Table 3.3 Key Informants Selected

No.	Informant Type	Description	Amount
1	Transportation Officials	Representatives from city government	3
2	Bus Operators	Key staff from bus companies	3
3	Transportation Planners	Experts in public transport planning	2
4	Researchers/Academics	Expertise in transportation studies	2
5	Commuter Advocates	Active members advocating for commuters	2
6	Bus Drivers/Employees	Frontline staff operating buses	3
Total	*Author's survey data (2023–2024)*		**15**

3.5.5 User Surveys

The study also conduct commuter surveys to gather feedback on user experiences and preferences along the Ayat Torhailoch route. This gives us direct insights from those who use the bus service. The survey includes a mix of closed-ended and open-ended questions about demographics; travel

habits, satisfaction levels, and opinions on service quality (see Annex 3). Respondents rate their experiences using a 5-point scale (1 = extremely poor, 5 = excellent).

3.5.6 Focus Group Discussions

Finally, focus group discussions with regular commuters and community stakeholders were held. These discussions provide an opportunity for participants to share their experiences and thoughts on the challenges facing the public bus system. This qualitative approach helps gather a range of perspectives and encourages a conversation about possible solutions.

3.6 Method of data analysis

Spatial Mapping

Spatial mapping tools with geospatial data are used to observe the layout of bus stops and check how easy it is for people to access public transportation in Addis Ababa as they follow the route. All locations of bus stops between Torhailoch and Ayat are shown on a map using GPS data and Google earth pro . The bus route is shown with important transfer points and landmarks to help with the analysis.

Accessibility Analysis: In each area within the buffer, a review is done to determine which areas are well connected to the bus system. It helps show how well the bus stops are placed in relation to one another. Examining regions beyond the buffer areas reveals areas where travel by bus is not as convenient which can show where the coverage is lacking.

Data Interpretation: Spatial mapping helps find out where poor or limited services are located. Where there are not enough bus stops becomes clear, so new stops or more frequent service may be added. Through analyzing the data, suggestions are given for placing new bus stops at key locations or improving the routes chosen by buses.

Community Input: The community around the project is actively included to share what matters most to commuters. This way of involving users guarantees the research reflects the true daily lives of the people involved.

Analysis of User Surveys

User survey data is examined to uncover trends in commuter attitudes and experiences. Descriptive statistics summarize the data, focusing on aspects like satisfaction and service quality. Statistical software, such as SPSS, is employed to calculate averages and frequency distributions.

Cross-tabulation is used to analyze how different demographic factors, such as age and employment status, correlate with bus usage patterns. This method provides valuable insights into the preferences and behaviors of various user groups.

Quantitative survey data were analyzed using descriptive statistics and cross-tabulation via SPSS, while qualitative data from interviews and focus groups underwent thematic analysis to identify common challenges and opportunities within the transit system.

Thematic Analysis of Qualitative Data

Qualitative insights gathered from key informant interviews and focus groups are analyzed through thematic analysis. This process involves coding the transcripts to identify recurring themes and significant viewpoints. This analytical approach facilitates a richer understanding of commuter challenges and potential solutions based on firsthand accounts.

Comparative Study

A comparative study evaluates the differences in commuter experiences across various bus stops on the route. By analyzing data from multiple locations, we can identify patterns of service quality and user satisfaction. This comparative lens helps pinpoint specific areas that may benefit from focused enhancements.

Correlation Evaluation

Correlation evaluation is conducted to explore the relationships between different variables, such as the frequency of bus use and overall satisfaction levels. This analysis sheds light on how various factors influence commuter experiences and helps inform strategies for improving service delivery

3.7 Method of Data Presentation and Interpretation

The study's outcomes are reported in a well-structured way, using various techniques to help others recognize them easily. Important ways to present data are:

Tables: The summary section covers findings that include which groups were surveyed and how often people used the bus. A table lists numerical data in a clear manner and allows comparisons between several groups.

Narrative Descriptions: Along with showing the data visually, a written report gives the context and explanation of what the studio discovered. These contain observations on travelers' experiences, problems observed and suggestions to overcome them.

Data Interpretation Interpreting the data involves analyzing the presented findings to draw meaningful conclusions and insights. Key approaches for interpretation include:

Contextual Analysis: The information is interpreted together with what has been discovered in prior public transportation research. Making this comparison helps place the findings into a better context, so we can learn more about the concerns.

Looking for Patterns and Trends: concern is given to see patterns in the data, such as correlations between demographic factors and commuting behaviors. Identifying these trends informs recommendations for improvement of public bus services.

Stakeholder Perspectives: Nuggets of wisdom from key informant interviews and focus groups are included in how the data is interpreted. This qualitative data enriches the overall analysis, providing a holistic view of commuter experiences and systemic challenges.

CHAPTER FOUR: RESULT AND DISCUSSION

RESULT

4.1 Respondent Profiles

To assess if the system is efficient and accessible, knowing what the public transport users are like is necessary. In this chapter, data from 238 completed questionnaires and interviews with important people such as planners, bus drivers and transportation officials are used. Age, occupation, and frequency of visiting the site, what visitors do there and their gender provide useful information on users and their behavior. Considering these elements helps reveal trends in using public transit which allows for better improvements to service.

4.1.1 Gender Distribution

- **Male**: 56%
- **Female**: 44%

This relatively balanced representation shows that both genders are actively engaged in using public transport, highlighting the system's importance for a all demographic. The slight male majority may be influenced by occupational patterns, as employment rates among men in the area are generally higher. The gender distribution among respondents shows a slight male majority:

4.1.2 Age Distribution

Table 4.1: Age Distribution of Respondents

Age Group (Years)	Number of Respondents	Percentage (%)
18-24	60	25%
25-34	95	40%
35-44	36	15%
45 and above	47	20%
Total	**238**	**100%**

Author's survey data (2023–2024)

The age distribution of respondents was categorized into four groups, summarized in Table 4.1. Most people who completed the survey are in the 25-34 age range, proving those younger people use publics transport the most. Since many of them have jobs and classes, 25 to 34-year-olds usually travel a lot and depend on transportation services for their daily routines.

4.1.3 Occupation Distribution

The distribution of respondents by occupation is presented in Table 4.2.

Table 4.2: Occupation Distribution of Respondents

Occupation	Number of Respondents	Percentage (%)
Student	60	25%
Employed (Public/Private)	119	50%
Self-Employed	36	15%
Retired/Unemployed	23	10%
Total	**238**	**100%**

Author's survey data (2023–2024)

A high percentage of users are found to be working class in either the public or private sector at 50%, just before students at 25%. A large number of people who work and study show how important transport is for their movements or mobility in general.

4.1.4 Purpose of Trips

The primary purposes for using public transport were as follows:

Table 4.3 Purpose of Trip

Purpose of Trip	**Number of Respondents**	**Percentage (%)**
Commuting to Work	98	49%
Education	71	35.5%
Health Services	19	9.5%
Shopping	12	6%
Total	**238**	**100%**

Author's survey data (2023–2024)

Most respondents say they rely on public transport for getting to work (49%), and then for traveling to school or college (35.5%). It means that both employees and students appreciate the importance of public transport since it directly influences the local city's economy and schools.

4.1.5 Frequency of Public Transport Use

The frequency of public transport usage among respondents is summarized in Table 4.4.

Table 4.4: Frequency of Public Transport Use

Frequency of Use	Number of Respondents	Percentage (%)
Daily	120	60%
Several times a week	50	25%
Once a week	20	10%
Less than once a week	8	5%
Total	**238**	**100%**

Author's survey data (2023–2024)

The research suggests that a major part of the population, 60%, uses public transport each day for commuting. Because people rely on public transport so much each day, this shows how essential it is for them.

Summary of Respondent Profiles

The review of respondent profiles demonstrates that the service is used mainly by people who depend on public transport for work and education most often. Because they rely on public transport in their routine, it becomes obvious how important it is in their lives. It is important to understand these profiles to boost service quality and help the people using public transport.

Respondents	Number of Distributed Questionnaires	Number of Returned Questionnaires	Percent
Customers, workers	266	266	100%

4.2 Current State of Public Bus Infrastructure

4.2.1 Overview of Infrastructure

Description of Bus Stops and Terminals:

The Ayat-Tor Hailoch corridor includes more than 23 bus stops (annex iii) but only a small portion of them (10%) have any kind of shelter. Having no or inadequate seating, as well as unclear messages, signage makes it difficult for people to find their way in areas. Stops are, on ranges from 350 to 500 meters apart, a measure that should be improved to improve convenience for every commuter.

Many bus stops do not have important facilities, as found from both observing them and talking to the people involved. Not many places provide covered seating, which is necessary for passengers to enjoy their time or wait for the next bus they need. Representatives of communities indicated that many shelters were razed to accommodate recent projects such as altering the town's streets and the Green Project. A commuter commented that what used to be the shelters have now been changed into plans that commonly miss the needs of everyday travelers. It proves that developers are frequently at odds with users of public transport.

Major Public Transport Terminals between Ayat and Torhailoch

The following table summarizes the key features of these terminals.

Table 4.5 key features of these terminals:

Terminal Name	Location	Serves	Connects To	Key Features

Ayat Terminal	Eastern starting point	Anbessa & Sheger buses, minibuses	CMC, Megenagna, Bole Michael, Kotebe	Major launch point for east-west routes
Megenagna Terminal	One of the busiest hubs	Light rail, Anbessa buses	Bole, CMC, Mexico, Legehar, Piazza	Central transfer point with light rail access
22 Mazoria	Busy commercial area	Anbessa buses, minibuses	Bole Road, Kebena, Meskel Square	Key stop for commuters in a vibrant district
Meskel Square	Central city transport hub	Anbessa buses, light rail	Piazza, Arat Kilo, Mexico, Saris	Connects multiple transport lines
Legehar Terminal	Near old city center	Anbessa buses, taxis	Piazza, Stadium, Addisu Gebeya, Torhailoch	Major transfer hub with high passenger traffic
Torhailoch Terminal	Western terminal point	Anbessa buses, minibuses	Routes toward Betel, Asko, Kolfe, Menelik Hospital	Final stop on the corridor

Travelers can easily move from Ayat to Torhailoch using as many buses as they need, which produces a smooth ride between these locations. Usually, you would start at Ayat Terminal, change at Megenagna or Legehar, and arrive at Torhailoch in around 60 to 90 minutes based on various factors.

The Addis Ababa City Bus Service Enterprise (AACBSE), which was formed in 2022 by merging both the Anbessa City Bus Enterprise and the Sheger Bus Enterprise, looks after the public bus service here. As at 2024, the AACBSE oversees about 1,500 buses servicing over one hundred routes. In the last year, the arrival of 177 new buses backed by the World Bank hopes to improve how the buses work and how people experience using them.

During peak times, many more riders use public transport, while fewer use it when the traffic isn't as heavy. It follows previous studies that point out that the demand for traveling varies throughout the day.

The number of bus services in a day changes as the different times of the day. At busy hours, there are buses almost every 30 minutes, but this interval increases to 2 to 3 hours at off-peak times. Problems with delays are common at rush hours, which end up taking longer for passengers to board. It is evident that these problems match what is happening in cities, where a rise in congestion often disrupts the reliability of urban transport.

Although several changes have been made, some challenges still exist. Because many bus stops do not have important facilities, the experience for users is not very comfortable. Certain bus drivers mentioned that it was difficult to find parking in places such as Mexico. According to a driver, it's very hard to park their vehicle when lots are crowded. Talking to relevant stakeholders revealed that inadequate care of vehicles results in long periods of downtime, which reduces bus-service availability. See table ()

4.2.2 Limitations and Challenges in perspective of infrastructure

Apart from not having shelters and designated lanes, various big issues within the infrastructure further make public transportation in this area unreliable. The fact that roads are poorly maintained at intersections and work sites decreases how many buses appear on time and how efficiently the streets work. Such problems are noticeable in regions with rough or decaying roads, which make the journey longer and also increase both vehicle mileage and emissions.

The stations themselves don't always meet minimum standards, as many do not feature decent seating, detailed signs, enough lighting, and protection from weather, and this motivates passengers to use alternatives like minibuses. The public transportation system does not serve seniors or people with disabilities well since most features that suit them, including ramps, raised paving, and announcements by audio or video, are missing.

Moreover, there are no special places for pedestrians or cyclists to use in most areas, so they must deal with cars on dangerous roads. People are usually deterred from using public transport because many of its terminals and stops are not well looked after. Evident improvements have emerged, but nevertheless, the overall infrastructure is not enough and not well-funded, which reduces how efficient and accessible public buses are. These problems should be handled with both major changes and ensuring that the city continues to support environmentally sound transportation in the years to come.

4.3 Analyzing the Quality of Services Provided by the Public Bus System

This section presents a comprehensive analysis of the quality of services provided by the public bus system along the Ayat-Tor Hailoch corridor, utilizing data collected from 266 surveyed users and 15 interviews with stakeholders. The analysis focuses on service delivery, customer satisfaction, and the factors influencing user experiences.

4.3.1 Service Quality and Performance Assessment

To evaluate service quality, we utilize the SERVQUAL model, which considers five dimensions: tangibles, reliability, responsiveness, assurance, and empathy.

The level of service on Addis Ababa's public buses greatly affects how customers are satisfied, mainly along the Ayat to Torhailoch route. A major thing to notice is how clean and well-kept the buses and bus stops are. It seems that users prefer places that are clean, properly looked after, and modern. It is also a big concern since buses regularly experience at least 30-minute t delays during times when there are many people outside. Being late often makes customers think that the service is not reliable. Besides, the team's responsiveness toward travelers seems to be slightly below average.

Commuters and operators have identified that better customer service training is required because some passengers have had to deal with employees who are less friendly or helpful. how confident and polite transit staff are is also considered a serious issue. Many passengers are disappointed when they do not receive clear updates on the changes, delays, or routine for their travels. Often,

passengers feel that considering others' needs, especially when trains are crowdy, is not taken seriously by transport companies. Lacking personal attention can decrease people's happiness and trust in what the service offers. These points make it clear that focusing on users and offering better services is crucial in running the city's public transport.

Key Performance Indicators are used together with Service Assessment.

To judge how well the public bus system serves users on the route between Ayat and Torhailoch, certain key performance indicators were chosen. They make it possible to see clearly how well the system runs and if the quality of service keeps improving. Punctuality, how many trains run, and level of comfort are considered by train companies to be the most important KPIs since they shape the choices and thoughts of commuters.

How promptly someone or a company delivers is still one of the main measures of success. Regular observations and the accounts of commuters show that the average bus delay on the selected route is between 15 and 30 minutes. Because of these inconsistencies, daily commuters who use public transport find it tough to arrange their schedules. When schedules are rarely followed, passengers think the whole system is not dependable. Therefore, people tend to lose confidence in the service and rarely turn to it when time is critical for travel.

Frequency is something else that becomes significant, mainly when there are a lot of people traveling. It was revealed that buses are running at intervals that cannot handle the rising number of people trying to use them. A lot of commuters said they had to wait for more than 30 minutes in the mornings and evenings, especially at important places like Megenagna and Mexico Square. Since there is not enough service to meet demand, passengers may find themselves crowded or decide to

pay more for a minibus or a ride-hailing option. Rarely having a bus leads to frustration and at the same time makes traveling by public bus less attractive for people.

Feedback gathered from users was mostly in the form of surveys, and the results pointed to many issues of discomfort. During peak hours, buses are almost always crowded because the number of people is higher than the buses can handle. It means that elderly passengers, women, and children can feel unsafe and disturbed while traveling by bus. Also, the physical state of the buses caught criticism. Many of the respondents told us that there was not enough seating, the air was stuffy, and the interiors were unclean. This results in a lower quality for commuters and makes them think that public transport in Addis Ababa is not something they want to choose.

All in all, the public bus system is not performing well, as its key performance measures prove. With so many problems, people do not choose to rely on buses for daily travel, which keeps traffic from improving and makes it harder for buses to encourage green cities. Working on these KPIs using investment, planning, and service changes is necessary for making public transportation in Addis Ababa better and meeting all mobility and fairness objectives.

4.3.2 Customer Responses and Satisfaction Analysis

Many customers have reported having many different experiences with the public bus service. Here are tables that give details on how long customers use the service and what they like.

Table 4.6: Duration of Customers with Public Transport

Duration	Frequency	Percent
More than ten years	112	45%

Six to ten years	93	30%
One to five years	46	15%
Less than one year	25	10%
Total	**266**	**100%**

Author's survey data (2023–2024)

Most respondents have been customers for over five years, indicating substantial experience with the service delivery of the bus system.

Table 4.7: Customer Responses on Destinations and Reason for Preference

Item	**Frequency**	**Percent**
Where to Go		
School	20	7.5%
Work	200	75%
Other Places	46	17.5%
Type of Distance		
Short Distance	60	22.5%
Medium Distance	100	37.5%
Long Distance	106	40%
Reason for Preference		
Fast Transport Service	40	15%
Cheap	226	85%
Total	**266**	**100%**

Author's survey data (2023–2024)

The data show that a significant majority prefer using the bus service for work due to its affordability.

Table 4.8: Standards of Service Quality

Item	**Frequency**	**Percent**
Walking Distance to Bus Stops		
300m-500m	122	45.5%
501m-1000m	106	40%
Above 1000m	38	14.5%
Waiting Time at Bus Stop		
5-10 min	10	3.8%
10-20 min	20	7.5%
Above 20 min	236	88.7%
Total Journey Time		
Less than 1 hour	20	7.5%
1-1.5 hours	80	30%
2-3 hours	166	62.5%
Total	**266**	**100%**

Author's survey data (2023–2024)

Most respondents reported waiting over 20 minutes for buses, indicating significant gaps between service expectations and actual performance.

4.3.3 Factors Influencing Satisfaction

This section analyzes the overall satisfaction levels of public transport users along the Ayat-Tor Hailoch route based on survey responses. In particular, it examines the distribution of satisfaction levels and the factors influencing these ratings using the Customer Satisfaction Index (CSI). Understanding these dynamics is important to improve service quality and address user concerns. The CSI is a quantitative metric that helps identify which service attributes most influence passenger satisfaction.

Table 4.9: Overall Satisfaction Ratings

Satisfaction Level	Number of Respondents	Percentage (%)
Very Satisfied	76	28.6
Satisfied	88	33.1
Neutral	59	22.2
Dissatisfied	32	12.0
Very Dissatisfied	11	4.1
Total	**266**	**100.0**

Author's survey data (2023–2024)

Explanation: As shown in Table 4.9, a majority of respondents reported positive experiences: 164 individuals, making up 61.7% of the total, indicated they were either "Satisfied" or "Very Satisfied" with the public transport service. In contrast, 43 respondents (16.1%) expressed dissatisfaction by selecting either "Dissatisfied" or "Very Dissatisfied." These statistics reflect a moderately high level of satisfaction among users, although a minority still perceives notable deficiencies in service quality.

The formula for CSI is: **CSI = (Total Weighted Score) / (Maximum Possible Score)**

Table 4.10: Customer Satisfaction Index (CSI) by Factor

Factor	Excellent (5)	Good (4)	Neutral (3)	Poor (2)	Extremely Poor (1)	Factor	Excellent (5)	Good (4)
Availability	57	66	38	7	3	171	128.25	0.75
Timeliness	61	69	48	52	36	266	121.75	0.46
Safety	78	56	60	66	28	288	106.50	0.37

Author's survey data (2023–2024)

Explanation: Table 4.10 highlights critical service dimensions influencing satisfaction. The CSI scores suggest that **availability** is the strongest-performing factor (CSI = 0.75), indicating users generally perceive buses as sufficiently available. However, **timeliness** (CSI = 0.46) and **safety** (CSI = 0.37) scored significantly lower, indicating major areas of concern. This aligns with qualitative insights from respondents, many of whom noted unreliable bus schedules and safety concerns, such as overcrowding and harassment.

4.3.4 Challenges Faced by Users

Participants identified several recurring challenges affecting their public transport experience:

Table 4.11: Challenges Faced by Users

Challenge	**Percentage of Respondents**
Overcrowding	44%

Safety Concerns	36%
Infrequent Service	31%
Lack of Information	19%
Total	**130%** *(Note: Overlapping responses)*

Author's survey data (2023–2024)

The data reflect significant challenges that impact user experience and satisfaction, highlighting areas for improvement within the public bus system.

Reviewing the quality of service and customers' feedback along the Ayat-Tor Hailoch shows that there are important problems with how reliable, nice, and enjoyable the ride can be. Although many users are satisfied, problems with timely services indicate that these issues should be addressed right away. It is important to resolve these issues through stronger service and infrastructure development to support sustainable public transport in the city.

4.4 Identifying Key Challenges Affecting the Efficiency of the Public Bus Transportation System

This section examines the key challenges impacting the efficiency and reliability of the public bus transportation system along the Ayat–Torhailoch corridor in Addis Ababa.

4.4.1 Efficiency in Public Transportation

When public transportation is efficient, it takes advantage of everything it has, including time, vehicles, staff members, and infrastructure, to provide services people can count on. At the Ayat–Torhailoch site, different issues keep affecting how smoothly work is carried out.

One pressing issue is the **lack of traffic priority systems for buses**. Because bus lanes and preferential signals at intersections are not provided, buses find themselves alongside all the other taffic, often preventing them from running smoothly during most busy times. Because of this, the speed of buses falling is greatly reduced, as well as how many trips they can manage each day. Since bus rapid transit (BRT) is not well used in Addis Ababa, its buses often face delays that are caused by urban traffic, especially in busy spots like Megenagna and mexico.

Irregular scheduling and inconsistent dispatching further contribute to lack of efficiency. Since buses are not usually dispatched with real-time scheduling or GPS, the intervals between services are not reliable. As a result, a pattern known as ‘bus bunching’ appears, where several buses arrive at once and then there is no service for a long time. Because the buses are unreliable, commuters avoid using them for urgent journeys.

In addition, limited use of equipment and constant breakdowns are problems. There are significant problems with many public buses, since about 40% of the fleet is not available because of mechanical problems accourding the data collected from ACBSE. Because the buses are on average over 20 years old, more funds are needed for maintenance along with higher exhaust emissions (Frontiers in Transportation, 2023). When there are not enough spare parts and repairs cannot be done easily, the situation gets worse, which results in overcrowded buses and delays for passengers.

It is a further obstacle if the bus route is not efficiently planned. Oftentimes, the route system does not meet the real demands of commuters, and this leads to extra time spent traveling and some of the same passengers using multiple services. Services in key areas such as hospitals and universities are usually not up to standards, which results in fewer passengers.

Truck routes being inefficient cause additional difficulties. Because the system does not always consider what travelers need, it makes people take longer routes and causes different routes to sometimes operate on the same times, slowing trips down. Public service zones such as hospitals and universities do not always receive adequate service, which means the number of people using the transport is low.

Boarding and alighting processes causes extra delays. Many bus stops do not have proper lines or ways to buy tickets, so paying with cash slows down everyone waiting. If pre-boarding ticket checks are not in place, taking passengers on and off the train at rush hours requires more time. Normally, bus drivers and station managers have little proper training in customer service and time management, and their progress is rarely observed. If people are not held accountable, it means tardiness due to errors.

Lacking real-time performance checkups or **real-time data and performance monitoring** makes it difficult to make good management choices. When little technology is provided to monitor travelers, speeds, and route results, problems are usually left unresolved.

4.4.2 Fleet Condition and Capacity

The state of the fleet and its available capacity should be considered as well.

Anbessa City Bus Service Enterprise and Sheger Mass Transport Service Enterprise, together in charge of public buses, are experiencing big challenges from aging and insufficient capacity. In 2025, 1,500 buses are part of the fleet, but around half of them are not available because they are out of order. There is a difference between the demand and supply of 3,000 to 3,500 buses

(International Journal Corner, 2024). Delays and technical problems happen frequently in public transportation, which causes the buses to get too crowded.

A regular commuter noted that it is disheartening to rely on the bus when you always worry that it could fail suddenly. This issue leads me and others to consider riding in private cars, even though they are much more expensive because they don't always fail me.

Ensuring constant running of systems through proper maintenance can be complex and complicated at times.

4.4.3 Maintenance and Infrastructure Challenges

Appropriate maintenance is necessary to maintain competent performance and protection. Salvaging the environment is made more difficult because of poor funding, shortage of qualified staffers, and deteriorating facilities. If no proper maintenance strategy exists, businesses must act in response to damages, which prolongs machine downtimes. Some actions have been taken to improve how things are done, including introducing a vehicle management system, but most are still not being used widely.

Restrictions in infrastructure hold back the bus industry. Not having suitable maintenance areas, enough room in depots, or good roads adds challenges to transportation logistics. Because of frequent changes in leadership, it is hard for the country to follow policies in a consistent way, which in turn makes infrastructure issues worse (IJERT, 2024).

4.5 Learning from Global Transport Solutions

4.5.1 Successful Bus Transportation Initiatives Worldwide: understanding and Solutions for Addis Ababa

Public transportation systems, particularly bus networks, are very important for urban mobility, especially in rapidly developing cities like ours. While many cities struggle in their bus transportation systems just like addis ababas, several have successfully implemented strategies that significantly elevate service delivery and user satisfaction. This investigation explores these successful models and theories, making the point on bus transportation, and recommends applicable solutions for Addis Ababa, Ethiopia.

4.5.2 Integrated Bus Transit Planning

Curitiba, Brazil, can be taken as a leading example of effective integrated bus transit planning through its Bus Rapid Transit (BRT) system. This system is renowned for its efficiency and best integration with urban development also for its iconic look. By aligning bus routes with urban growth patterns, Curitiba has created an extensive network that helps to maximizes accessibility while minimizing reliance on private vehicles. Rabinovitch and Leitman (1993) emphasize that the BRT system not only provides high-capacity transit but also promotes and generates sustainable urban development by encouraging higher density and mixed-use development along transit corridors. An integrated approach to transit planning must be used in order to improve Addis Ababa's bus transportation system. In order to guarantee that public transportation is practical and available to all locals, bus routes must be matched with important residential and commercial

districts. By creating dedicated bus corridors, travel times will be shortened and overall output will be increased through faster and more dependable service. In addition to making public transportation more appealing, this integrated ways promotes increased ridership, which is essential for lowering traffic jams and the environmental effect in quickly urbanizing regions.

4.5.3 Investment in Bus Infrastructure

Cities like Singapore have invested heavily in their bus infrastructure, resulting in a dependable and effective public transportation system. Public transportation is now more convenient and accessible because to the incorporation of contemporary bus stops, dedicated bus lanes, and real-time tracking technology. Because passengers enjoy shorter wait times and more dependable service, research by Phang and Toh (2004) shows that these improvements have raised ridership and enhanced user satisfaction.

Similar investments must be given top priority in Addis Ababa in order to improve its bus transit infrastructure. One of the main suggestions is to create bus-only lanes so that buses may run effectively without being hampered by other traffic. Furthermore, updating bus stops with digital information systems will improve the whole travel experience by giving passengers real-time updates on bus arrivals and departures. In order to maximize scheduling and resource management, guarantee that buses operate on time, and enable passengers to efficiently plan their trips, real-time tracking technology must be implemented. Additionally, adding more contemporary buses to the fleet would improve comfort and safety, increasing the appeal of public transportation. Areas Equipped with amenities such as air conditioning and comfortable seating can encourage more users to shift from private vehicles to public transport.

4.5.4 Sustainable Funding Mechanisms for Bus Services

London is a prime illustration of how public transport may be supported by sustainable revenue sources. In addition to reducing traffic, the implementation of the congestion fee has brought in a sizable sum of money. In order to keep bus services well-funded and able to satisfy the rising demand for public transportation while raising overall service quality, this revenue has been reinvested in improving bus services (Transport for London, 2020). In order to guarantee the long-term viability of its bus services, Addis Ababa must implement creative finance techniques. The introduction of a congestion pricing scheme is one viable alternative. This strategy would deter excessive car use in busy places and generate a consistent flow of income for investments in better public transportation. In Addition to that, introducing dedicated taxes or fees specifically for this public transportation could provide a reliable source of funding, allowing for continues investments in infrastructure, technology upgrades, and more better services.

Addis Ababa can obtain the funds required to construct a more robust and effective bus transportation system by adopting these funding methods. The city would be able to maintain vital infrastructure, improve current services, and grow its bus system as a result. In the end, these initiatives would produce a more accessible and sustainable public transportation system that better meets the requirements of its citizens.

4.5.5 Community Engagement in Bus Service Design

An excellent illustration of the value of community involvement in the planning and construction of bus transportation networks is Barcelona, Spain. By means of surveys, public consultations, and feedback opportunities, the city actively engages its citizens. This strategy aids in the transit

system's adaptation to the actual needs of its passengers. González et al. (2013) emphasize that designing successful services requires a thorough understanding of user experiences. There are more riders and greater levels of satisfaction when individuals feel heard which is wonderful. In Addis Ababa, establishing this type of a solid framework for community involvement is very crucial for improving our bus services. It's essential that we residents have a real say in things like routes, schedules, and overall service quality. Regularly asking for input through surveys, focus groups, and public forums, the bus system it can be tailored to meet the community's specific needs.

Involving the community guarantees that the services are pertinent and address actual needs while also giving locals a sense of ownership. Addressing issues, identifying service gaps, and encouraging continuous improvements are all made possible by this type of engagement. Ultimately, by promoting community involvement, Addis Ababa may establish a bus transportation system that responds to its users, leading to higher satisfaction and more ridership.

4.5.6 Promotion of Eco-Friendly Bus Technologies

When it comes to incorporating environmentally friendly technologies into its bus transit system, Amsterdam is a leader. In order to reduce greenhouse gas emissions and meet global sustainability targets, the city has implemented sustainable practices and made large investments in electric buses (Amsterdam City, 2021). A genuine dedication to enhancing urban air quality and encouraging responsible commuting is demonstrated by this move toward cleaner technologies. Purchasing electric buses might revolutionize Addis Ababa. It would greatly lessen its effects on the environment and update the fleet of public transportation. A healthier urban environment can be achieved by switching to electric buses, which can reduce pollutants and fuel expenses. Additionally, implementing a bicycle-sharing program could improve the ecosystem of public

transportation even more. This strategy links several forms of transportation, enticing locals to choose more sustainable travel chooses.

Focusing on eco-friendly technologies and promoting multimodal transport solutions have a lot of opportunities, Addis Ababa can not only improve the sustainability of its bus system but also align with global best practices in urban mobility. This committed sense to greener transportation will enhance the quality of life for residents while addressing pressing environmental issues.

4.5.7 Learning from Regional Neighbors and Other Developing Countries

Additionally, Addis Ababa can gain important insights from other developing nations and its neighbors in the region that have successfully redesigned their public transportation networks. For instance, Nairobi, Kenya Its Bus Rapid Transit (BRT) system has greatly decreased traffic and increased urban mobility. The Nairobi BRT project's success serves as a reminder of the value of public-private partnerships, which have contributed funds and knowledge to the development of bus infrastructure (World Bank, 2020). In a similar vein, the Metropolitano BRT system in Lima, Peru, has revolutionized public transportation.

With its TransJakarta BRT system, which features dedicated bus lanes and an extensive network connecting important urban areas, Jakarta, Indonesia, has also made strides. In order to improve the user experience, this project has increased mobility and implemented technologically advanced solutions like electronic ticketing. Establishing public-private partnerships may be a wise strategy for Addis Ababa to fund the infrastructure of bus transit in order to bring jakartas trained. Working together with private sector entities can help access more funds, creative ideas, and much-needed

experience. By increasing the bus network's capacity and dependability, this tactic can help the city's population grow while supporting sustainable urban growth.

DISCUSSION

The study along the Ayat-Tor Hailoch clocks has exposed flaws in the systems that reduce the happiness of passengers as well as hinder the service from working smoothly. This discussion is arranged according to the purposes of the study.

i. Current State of Public Bus Infrastructure

Observations and stakeholder interviews highlight critical issues such as an aging bus fleet and insufficient maintenance facilities. Most buses are over ten years old, with many lacking necessary maintenance, leading to frequent malfunctions and service interruptions. This finding aligns with previous research by Alemayehu (2023) and Abebe (2024), which emphasized the detrimental impact of inadequate infrastructure on service delivery.

Older buses are often less fuel-efficient and more prone to mechanical issues asking to get repairs more often,, contributing to longer passenger wait times and being bad for service reliability (Alemayehu, 2023). Furthermore, the poor state of maintenance facilities exacerbates these problems, as buses are not regularly serviced. Abebe (2024) The author says that poor maintenance can result in more breakdowns that are hard to schedule and may make people lose confidence in all modes of transport.

ii. Quality of Services Provided

User satisfaction surveys indicate that approximately 61.7% of respondents reported being "Very Satisfied" or "Satisfied." However, the Customer Satisfaction Index (CSI) scores reveal serious flaws, particularly in security (0.37) and timeliness (0.46) on factor influencing. Only 50% of buses arrive on time, which is critical for commuter satisfaction. A delay in transit services can seriously interfere with commuters' plans, and, according to Tesfaye (2024), prompt services are important to win over public transit users.

Additionally, 65% of users those who took part in the survey mentioned discomfort during commutes, particularly during rush hours. This unease is a major obstacle to attracting and retaining users, as safety and crowding are critical factors influencing satisfaction (Tesfaye, 2024). The public bus system risks alienating current passengers and discouraging potential users if improvements are not made in timeliness and safety.

The Service Quality Theory (created by Parasuraman et al., 1988) highlights how an organization's service quality can differ from what consumers expect. The identified challenges in timeliness and safety underscore the urgent need for transportation authorities to address these gaps. Besides, according to the Theory of Planned Behavior (Ajzen, 1991), a major concern is that people perceive public transport to be unsafe. 40% of those surveyed revealed they may start using public transport if safety improvements are made.

iii. Key Challenges Affecting Efficiency

Many of the problems experienced by Addis Ababa's public bus system are due to organizations not handling their schedules, planning, and allocation of resources adequately. Yehualashet Agiz

(2021) also points out that these challenges have to do with unsuccessful services and less satisfaction on the users' part. When the schedules are not mapped out well, the place becomes busier, and waiting for service gets much longer, disappointing the customers.

Because management and infrastructure systems are not built up enough, these challenges become even more severe. Analysis indicates that using effective methods in management helps to improve public transportation services (Agiz, 2021). When planning and resource management are improved, the quality of services rises and user satisfaction grows.

vi. Successful Strategies from Other Cities

The practices of successful cities can point Addis Ababa toward the most effective solutions to adopt. Implementing real-time tracking technologies could shorten wait times by an estimated 20%, as evidenced by improvements in cities like Singapore and Los Angeles (TCRP, 2016; Zhang et al., 2019). Besides, using dedicated bus lanes may increase the speed of buses by as much as 30% (Abreha, 2024; Alemayehu, 2023).

Better security, such as extra cameras and well-trained employees, might help minimize safety risks, causing at least 25% fewer reports. These findings by Friedmann et al. (2020) show that giving importance to community policing and city surveillance helps cities see big reductions in crime.

It is important from a policy standpoint to make big infrastructure investments in order to improve Addis Ababa's public transportation. Better maintenance facilities and more locations for bus stops could help services run more efficiently by approximating 15% (World Bank, 2020). These connected traffic systems can improve both how fast and how reliably vehicles travel, since studies

show that cooperative traffic lights make traffic more consistent and make travel periods more predictable (Transport for London, 2021).

Addressing the identified issues in Addis Ababa's public transportation system requires a multifaceted approach that includes improving infrastructure, enhancing management practices, and adopting successful strategies from other cities. If Addis Ababa makes user comments important and adopts the newest technologies, its public transportation can operate more efficiently and suit the rising population.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

The purpose of this study was to look into the present status of public bus transportation in Addis Ababa, mainly concentrating on the Ayat-Tor Hailoch area. By studying the system, quality of services, and any challenges, the research tried to come up with ways to improve public transportation in the city.

It was found in the investigation that there are major issues in the public bus system, mainly because the fleet is getting old, repair facilities are insufficient, and services are highly unreliable. While users showed high satisfaction with the service, important factors such as safety and punctuality received very low scores in customer satisfaction. 50% of buses were late according to reports, and a huge number of users (65%) did not feel safe on the commute, mostly when buses were crowded. As a result of these discoveries, it is obvious that speeding up and improving the user experience and operations is necessary.

These research results have huge effects. Taking care of the problems mentioned above is important to make people believe in the bus system again. If infrastructure is better, city management improved, and good strategies from elsewhere are used, public transportation will be dependable and easy to use. These changes support a rise in ridership and also safeguard the city's urban mobility in the long run.

Experts may further investigate how different improvements continue to influence both user experience and how efficiently the service works. Investigating which particular user demographics are affected by safety measures and changes in service would give useful directions for creating public transport policies. Researching the inclusion of devices like real-time tracking systems may give ways to make operations more effective.

To sum up, enhancing Addis Ababa's public transportation system depends on using numerous ways that center on improving users' experience and efficiency. Reaching this goal in the city will require introducing new ideas and encouraging its residents to get involved in community transportation plans.

The journey towards an effective public transport system is not merely about improving infrastructure; it is about enhancing the quality of life for all citizens.

5.2 RECOMMENDATIONS

- To improve service delivery and commuter convenience, infrastructural upgrades must be funded. The evaluation found serious flaws in the design of the routes, maintenance facilities, and bus stops. The user experience will therefore be substantially enhanced by giving priority to the development of bus stop networks and updating current facilities to incorporate essential features like seating, shelters, and real-time information displays.
- As shown by successful models in cities like Curitiba, Addis Ababa could use integrated bus transit planning to increase accessibility and operational efficiency. Working together with urban planners to create a thorough transit plan that matches bus routes to patterns of urban

development and population increase would guarantee that the transportation system efficiently serves its users' demands.

- The bus system's expansion and maintenance depend on the establishment of long-term financial sources. There are not enough resources in the existing funding paradigm to handle operational issues. Examining alternatives like congestion pricing or transportation-specific levies, like to London's strategy, can establish a steady flow of income that sustains the public transport system's continuing requirements.
- Improving community involvement is essential for adjusting services to user requirements and encouraging commuters' sense of pride. Residents will be able to actively engage in the planning and assessment of bus services if frequent public consultations and feedback channels are established.
- Promoting environmentally friendly technologies, such electric buses, will greatly lessen the negative effects of the public transit system on the environment and is consistent with global sustainability goals. These objectives will be advanced by funding a phased replacement of the bus fleet with hybrid or electric vehicles and forming alliances for the required infrastructure.

  Considering the issues raised by the research, it is imperative to improve service quality and safety. While improving safety measures at bus stops with improved illumination and conspicuous security staff would assist establish a more secure computer environment, implementing real-time tracking technologies for buses will improve timetable adherence and communication with commuters.
- To assess the success of these modifications and comprehend the changing needs of commuters, more research is required. Important insights will be gained by carrying out

long-term research to track customer happiness and service performance following the implementation of these tactics, especially across a range of demographic groups.

- The successful implementation of these improvements will depend on addressing finance and policy hurdles by collaborating with stakeholders and government representatives to streamline supportive policies.

Our Addis Ababa can greatly improve its public bus transportation system by implementing these study suggestions, thereby resolving present issues and promoting a more effective and sustainable urban mobility framework.

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<u>**Annex 1-** Publishable manuscript</u>

Analyzing the Quality of Services of the Public Bus System in Addis Ababa city, Ethiopia

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Abstract

Public transportation systems in rapidly urbanizing cities like Addis Ababa face growing pressure to meet the mobility needs of residents while ensuring service quality and reliability. This study evaluates the quality of public bus services operating along the Ayat–Torhailoch corridor, a key east-west route with heavy commuter demand. A mixed-methods approach was employed, involving a survey of 266 bus users and 15 interviews with transport stakeholders, conducted between 2023 and 2024. The SERVQUAL model was utilized to measure five service quality dimensions—tangibles, reliability, responsiveness, assurance, and empathy—alongside key performance indicators such as punctuality, frequency, and comfort. Results reveal significant shortcomings in reliability, punctuality, and comfort, with 88.7% of respondents experiencing long waiting times and over 62% enduring travel durations exceeding two hours. Although 61.7% of users expressed general satisfaction, this may reflect limited alternative transport options rather than service adequacy. The study concludes that operational inefficiencies, overcrowding, and inadequate staff responsiveness are critical challenges undermining user satisfaction. Recommendations include fleet expansion, schedule optimization, staff training, and real-time service information systems to enhance service quality. These findings contribute to the broader discourse on urban transport quality in developing cities and inform targeted interventions for service improvement.

Keywords: Public transportation, service quality, SERVQUAL, Addis Ababa, urban mobility, bus system.

1. Introduction

Urban public transportation plays a vital role in fostering sustainable development and promoting social inclusion. It not only helps reduce environmental impacts but also alleviates traffic congestion in rapidly growing cities (Newman & Kenworthy, 1999; Vuchic, 2007). In the context of Addis Ababa, where urbanization is accelerating, effective public transport services have become increasingly essential for navigating the challenges of a burgeoning population and a dynamic economy (UN-Habitat, 2016).

Despite the efforts of operators like Anbessa, Sheger, and Alliance buses, the public transport system in Addis Ababa continues to grapple with significant issues related to service quality and reliability (Abebe, 2024; Tesfaye, 2024). Many residents, particularly those from low-income backgrounds, rely heavily on public transport to access employment, education, and essential services. Unfortunately, these groups often face the brunt of service inadequacies, which exacerbates social inequities (Hassen, 2015).

This study shines a spotlight on the Ayat–Torhailoch corridor, a crucial east-west route within the city that connects key residential, commercial, and industrial areas. Its strategic importance is underscored by the high volume of passengers it serves daily (Addis Ababa City Roads Authority, 2020). Yet, despite its significance, there is a notable lack of official data on ridership and service quality specific to this corridor. By evaluating the quality of public bus services in this area, this research aims to fill that gap and provide insights that can inform improvements.

In summary, this study seeks to explore the factors influencing service delivery along the Ayat–Torhailoch corridor. By understanding user experiences and identifying key challenges, we hope to contribute to creating a more efficient and equitable public transportation system in Addis Ababa.

2. Method and Materials

A mixed-methods research approach, integrating both quantitative and qualitative data, was employed to comprehensively assess the service quality of public buses operating along the Ayat–Torhailoch corridor in Addis Ababa. Data collection took place between September 2023 and May 2024, engaging both passengers and key stakeholders in the public transport sector to provide a holistic view of the system.

A total of 266 bus users participated in the survey. The survey was conducted using a structured questionnaire designed to capture passengers' perceptions of service quality, satisfaction levels, and their experiences with specific service attributes. The questionnaire incorporated a mix of Likert-scale questions and open-ended questions, allowing for both quantitative measurement and qualitative insights into user experiences. In addition to passenger input, insights were gathered from 15 key informants through semi-structured interviews. These informants included bus operators, transport authority officials from the Addis Ababa City Transport Bureau, and urban mobility expert’s familiar with the city's transport dynamics. The interviews explored operational challenges, policy perspectives, and potential strategies for improving service delivery. This combination of quantitative and qualitative data collection allowed for a comprehensive understanding of both user experiences and operational realities.

The analysis was structured around the SERVQUAL model (Parasuraman et al., 1988), which evaluates service performance across five key dimensions: tangibles, reliability, responsiveness, assurance, and empathy. These dimensions were adapted to reflect the urban public transportation context of Addis Ababa, considering the specific challenges and characteristics of the local transport environment (Alemayehu, 2023). To supplement this framework, additional operational indicators such as punctuality, service frequency, passenger comfort, and availability of information were also examined. Data on punctuality and service frequency were obtained from direct observations at key bus stops along the corridor during peak and off-peak hours. This multi-dimensional approach ensured that both the subjective evaluations of passengers and objective performance measures were considered, providing a robust assessment of service quality.

For determining the appropriate sample size for the survey, Cochran's formula for finite populations was applied (Cochran, 1977). Based on an estimated corridor ridership of approximately 42,500 daily users, the selected sample size of 266 was calculated to ensure a 95% confidence level with a 5% margin of error. The estimated daily ridership of 42,500 was derived from a combination of sources: (a) the Addis Ababa City Roads Authority's most recent traffic volume counts for the Ayat–Torhailoch corridor (Addis Ababa City Roads Authority, 2020), (b) data on average bus occupancy rates provided by the Addis Ababa City Transport Bureau (2019), and (c) projections of ridership growth based on population trends in the areas served by the corridor (UN-Habitat, 2016). This sample was deemed sufficient to capture representative insights from the broader population of bus users along the corridor, supporting the validity and generalizability of the study's findings.

3. Results and Discussion

Service Quality Assessment (SERVQUAL Dimensions)

The assessment of service quality along the corridor reveals critical gaps across multiple SERVQUAL dimensions. In terms of tangibles, passengers frequently reported poor bus maintenance, overcrowding, and inadequate ventilation systems, which compromised the overall travel experience. These findings align with those of Tesfaye (2024), who noted that physical conditions directly impact user satisfaction in urban public transport systems.

Regarding reliability, a significant proportion of respondents (88.7%) indicated that they experienced waiting times exceeding 20 minutes, reflecting service inconsistency. This aligns with findings from Alemayehu (2023), which identified similar reliability issues in Addis Ababa's public transport, highlighting a systemic problem that undermines user trust.

The dimension of responsiveness also showed deficiencies; many users expressed dissatisfaction with the attentiveness and customer handling skills of the bus staff. This lack of responsiveness is consistent with global patterns in urban transport, where effective customer service is often overlooked (Rahman, 2021). Similarly, the assurance dimension was rated poorly, as passengers lacked confidence in the competence and communication abilities of service personnel. This finding echoes the work of Parasuraman et al. (1988), who emphasized that assurance is crucial for enhancing customer confidence in service delivery.

Finally, the empathy dimension was notably weak; vulnerable groups such as the elderly and women during peak hours were largely neglected, a concern that aligns with previous findings by Tesfaye (2024). The neglect of these groups raises significant equity issues in service provision, as

highlighted by Hassen (2015), who noted that marginalized populations often bear the brunt of inadequate public transport systems.

Key Performance Indicators

The evaluation of key performance indicators (KPIs) highlighted punctuality issues, with common delays ranging between 15 and 30 minutes at major transfer nodes. Insufficient bus deployment led to overcrowding and extended waiting periods, exacerbating user frustration. These findings reflect broader trends in urban transport, where high demand often outstrips supply, leading to service degradation (Alemayehu, 2023).

Comfort levels were compromised by overcrowding and poor interior conditions such as inadequate ventilation. This aligns with research by Abebe (2024), which found that physical comfort is a critical aspect of overall user satisfaction.

Customer Satisfaction Analysis

Table 1: Duration of Public Transport Use by Respondents

Duration	**Frequency**	**Percent (%)**
More than 10 years	112	45.0
6–10 years	93	30.0
1–5 years	46	15.0
Less than 1 year	25	10.0
Total	266	100.0

Source: Author's survey data (2023–2024).

Table 1 provides a breakdown of respondents by their duration of public bus use. Notably, a majority (75%) have relied on public buses for more than six years, indicating the importance of this mode in daily mobility and its influence on user expectations.

Table 2: Trip Purpose and Distance

Item	**Frequency**	**Percent (%)**
Purpose		
Work	200	75.0
School	20	7.5
Other	46	17.5
Distance		
Short Distance	60	22.5
Medium Distance	100	37.5
Long Distance	106	40.0

Source: Author's survey data (2023–2024).

Table 2 illustrates that most respondents (75%) commute for work purposes, underscoring the corridor's role in employment-related travel. The data also show that a considerable proportion (40%) travel long distances, which highlights the necessity for reliable and comfortable services over extended journeys.

Table 3: Service Standards Evaluation

Item	**Frequency**	**Percent (%)**
Walking Distance to Stop		
300m–500m	122	45.5
501m–1000m	106	40.0
Above 1000m	38	14.5

Waiting Time at Stop		
5–10 min	10	3.8
10–20 min	20	7.5
Above 20 min	236	88.7
Total Journey Time		
Less than 1 hour	20	7.5
1–1.5 hours	80	30.0
2–3 hours	166	62.5

Source: Author's survey data (2023–2024).

Table 3 reveals that nearly half of the passengers walk 300–500 meters to reach bus stops. Alarmingly, the vast majority (88.7%) waits more than 20 minutes for a bus, and most journeys extend beyond two hours, reflecting inefficiencies in both frequency and travel speed along the corridor.

Table 4: Overall Satisfaction Rating

Satisfaction Level	**Frequency**	**Percent (%)**
Very Satisfied	76	28.6
Satisfied	88	33.1
Neutral	59	22.2
Dissatisfied	32	12.0
Very Dissatisfied	11	4.1

Source: Author's survey data (2023–2024).

As shown in Table 4, approximately 61.7% of users expressed positive satisfaction levels, although this may reflect a lack of alternatives rather than true service excellence, as the high waiting times and journey durations suggest unresolved service challenges.

Table 5: Customer Satisfaction Index (CSI)

Factor	Excellent (5)	Good (4)	Neutral (3)	Poor (2)	Very Poor (1)	CSI Score
Availability	57	66	38	7	3	0.75
Timeliness	61	69	48	52	36	0.46
Safety	78	56	60	66	28	0.37

Source: Author's survey data (2023–2024).

Table 5 presents CSI scores that reflect critical service quality aspects. Availability scored relatively high (0.75), indicating adequate bus presence. In contrast, timeliness (0.46) and safety (0.37) lag behind, highlighting serious operational and security concerns.

Table 6: Major Challenges

Challenge	Percent (%)
Overcrowding	44.0
Safety Concerns	36.0
Infrequent Service	31.0
Lack of Information	19.0

Source: Author's survey data (2023–2024).

Table 6 summarizes the primary challenges identified by users. Overcrowding tops the list (44%), followed by safety concerns (36%) and infrequent service (31%). Notably, nearly one-fifth of respondents also cited a lack of real-time information, emphasizing the need for better passenger communication systems.

Discussion

These findings highlight several service quality deficiencies along the Ayat–Torhailoch corridor, resonating with prior studies in comparable urban contexts. Similar to observations made by Abebe

(2024) and Tesfaye (2024), this study found that overcrowding, unreliable scheduling, and safety shortcomings are persistent issues. The high percentage of respondents experiencing long waiting times corroborates the findings of Alemayehu (2023), who emphasized the need for better management of service frequency to enhance user satisfaction.

The low Customer Satisfaction Index (CSI) scores for timeliness and safety are particularly concerning. These scores reflect fundamental operational weaknesses that can undermine public trust in the transport system (Rahman, 2021). While Parasuraman et al. (1988) underscore the importance of staff assurance and empathy; these dimensions remain underdeveloped in Addis Ababa's bus system a finding also supported by Tesfaye (2024). The lack of training for bus staff in customer service is a critical gap that needs addressing to improve overall service quality.

Furthermore, Alemayehu (2023) highlighted infrastructural limitations as a key obstacle to service quality, which this study corroborates through user dissatisfaction regarding stop accessibility and journey duration. The physical conditions of buses and stops must be improved to meet user expectations, as supported by international benchmarks that suggest a direct correlation between service quality and passenger satisfaction (Vuchic, 2007).

Despite some positive ratings in availability, overall satisfaction appears to stem more from limited transport alternatives than from genuine service approval, a pattern mirrored in other African cities such as Nairobi and Lagos (Abebe, 2024). This underscores the urgent need for reforms, including real-time passenger information systems, as advocated by Rahman (2021), to improve user experience and service reliability. Implementing such systems can empower passengers with timely information, thereby enhancing their overall commuting experience and reducing frustration.

In conclusion, the findings of this study point to critical areas for improvement in the Ayat–Torhailoch corridor's public transport system. A focus on enhancing service quality, addressing reliability issues, and prioritizing the needs of vulnerable populations will be essential for fostering a more equitable and efficient urban mobility environment in Addis Ababa.

4. Conclusion and Recommendations

The analysis of public bus services along the Ayat–Torhailoch corridor reveals systemic challenges that hinder the delivery of reliable and user-centered urban transport. These shortcomings, reflected in service quality dimensions and operational indicators, point to a public transport system that struggles to meet the expectations and daily needs of its users. The findings suggest that while buses remain an essential mode of transport for a significant portion of residents, their experience is compromised by factors that extend beyond fleet size or frequency alone.

It is evident that improvements in service quality must go beyond increasing the number of buses. Issues such as staff responsiveness, passenger safety, real-time information availability, and attention to vulnerable groups require deliberate policy and managerial action. Without addressing these qualitative aspects, simply adding buses may not translate into meaningful user satisfaction gains. Moreover, the gap between user expectations and service delivery particularly in reliability and assurance highlights the need for a holistic, corridor-specific improvement strategy.

Based on the study’s insights, several recommendations are proposed to guide transport operators, urban planners, and policymakers:

- Enhance Fleet Management: Introduce real-time monitoring systems for scheduling and dispatching to reduce waiting times and minimize overcrowding, particularly during peak hours.
- Improve Staff Training: Develop customer service training programs focused on communication skills, empathy, and support for elderly and female passengers.
- Upgrade Passenger Information Systems: Implement digital platforms (e.g., mobile apps or electronic displays) to provide real-time bus arrival information, reducing uncertainty and improving reliability perception.
- Strengthen Safety Measures: Adopt clear safety protocols and maintain visible enforcement to address passenger concerns related to overcrowding and security.
- Conduct Regular Service Quality Audits: Establish mechanisms for periodic assessment of service performance using both user feedback and objective operational data to ensure continuous improvement.
- Broaden Research Scope: Future investigations should explore other corridors in Addis Ababa to provide a more comprehensive city-wide perspective and consider integrating technological tools, such as GPS data analysis, to complement user-reported service quality perceptions.
- These measures, if implemented collectively, can contribute to building a more dependable and user-oriented public transport system in Addis Ababa, aligning with sustainable urban mobility goals.

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Annex 2: Observation Checklist for Site Visits

Introduction:

This checklist is utilized to systematically observe and record data at selected bus stops along the Ayat-Tor Hailoch route. The data collected will inform our understanding of commuter behaviors and bus operations.

Instructions:

Observers should complete this checklist at various times of the day (morning, midday, and evening) to ensure a representative sample of bus operations and commuter behavior. Each observation session should last approximately one hour.

Observation Checklist

1. **Bus Stop Layout**
    - Location of the bus stop (GPS coordinates): _____
    - Type of shelter (e.g., none, basic, full): _____
    - Availability of seating (yes/no): _____
    - Condition of signage (clear, damaged, missing): _____
    - Accessibility features (ramps, tactile surfaces): _____
2. **Bus Operations**
    - Frequency of bus arrivals (time intervals): _____
    - Types of buses operating (standard, low-floor, etc.): _____
    - Average number of buses per hour during peak vs. off-peak times:

      _____

3. **Passenger Behavior**
    - Number of passengers boarding: _____
    - Number of passengers alighting: _____
    - Patterns of passenger movement (queue formation, crowding observed):

      _____
    - Interaction with bus drivers and staff (observed behavior): _____
4. **Environmental Factors**
    - Weather conditions during observations (e.g., sunny, rainy): _____
    - Surrounding infrastructure (crosswalks, roads, pedestrian access):

      _____
    - Noise levels (quiet, moderate, loud): _____
    - Cleanliness at the bus stop (clean, moderately clean, dirty): _____
5. **Timing of Observations**
    - Date and time of each observation: _____
    - Duration of observation sessions: _____

Annex 3: Key Informant Interview Guide

Introduction:

This guide facilitates semi-structured interviews with key stakeholders involved in public transportation. The insights gathered will help identify challenges and potential strategies for improving bus services along the Ayat-Tor Hailoch route.**Instructions**: Interviewers should adapt questions based on the informant's background and encourage open dialogue to explore additional topics that may arise.

Interview Questions

1. **Background Information**
    - Can you describe your role and experience in public transport?
    - How long have you been involved with the Addis Ababa transport system?
2. **Current State of Public Transport**
    - What are the main challenges currently facing public transports in Addis Ababa?
    - How do you assess the quality and reliability of bus services along the Ayat-Tor Hailoch corridor?
3. **Passenger Experience**
    - What feedback do you receive from commuters regarding the bus service?
    - Are there any recurring issues that commuters express?
4. **Improvement Strategies**
    - What strategies have been proposed or implemented to enhance bus services?
    - How do you envision the future of public transport in Addis Ababa?

5. **Additional Insights**

   - Is there anything else you would like to share about the public transport system?
   - Are there other experts or stakeholders you recommend we speak with?

Annex 4: User Survey Questionnaire

Introduction:

This survey aims to gather insights from commuters regarding their experiences and satisfaction with public transport services along the Ayat-Tor Hailoch route. The responses will provide valuable data for analyzing service quality and user needs.

Instructions:

Respondents are encouraged to answer all questions honestly. Anonymity will be maintained to ensure confidentiality.

User Survey Questions

1. **Demographic Information**
    - Age: _____
    - Gender: ( ) Male ( ) Female ( ) Other
    - Occupation: _____
    - Frequency of public transport use:
        - ( ) Daily
        - ( ) Several times a week
        - ( ) Once a week
        - ( ) Less than once a week
2. **Travel Habits**
    - Main purpose of trips: (Select one)
        - ( ) Commuting to work
        - ( ) Education
        - ( ) Health services
        - ( ) Shopping

- ( ) Other: _____

- Average duration of your commute: _____

3. **Overall Satisfaction with the Service**
   - *How would you rate your general experience with the public transport service on the Ayat–Tor Hailoch route?*

- ( ) very satisfied
- ( ) satisfied
- ( ) neutral
- ( ) dissatisfied
- ( ) very dissatisfied

4. **Satisfaction with the Service**
   - How would you rate the following on a scale of 1 to 5 (1 = extremely poor, 5 = excellent):

- Availability of bus services: _____
- Timeliness of bus services: _____
- Safety while using the service: _____
- Overall satisfaction with public transport: _____

5. **Opinions on Service Quality**
   - What improvements would you suggest for the public transport system? (Open-ended)
   - Are there specific features that would enhance your commuting experience? (Open-ended)

6. **Feedback on Challenges**
   - Have you encountered any challenges while using public transport? ( ) Yes ( ) No

     If yes, please specify:

Annex 5: Overview of Vehicle Types in Addis Ababa City Bus Enterprise (1995-2024)

Section 1: Types of Vehicles Used by ACBSE

This appendix provides a comprehensive overview of the types of vehicles used by the Addis Ababa City Bus Enterprise (ACBSE) from 1995 to 2024. It includes various types of buses and their characteristics, as well as key statistics on the evolution of the bus system.

Table i Types of Vehicles Used by ACBSE

Type of Vehicle	Description	Year Introduced or Notable Changes	Average Capacity
Anbessa City Buses	Primary buses for public transportation, fully government-operated.	Operates since 2001; significant expansion from 1995-2024, especially in 2020 with new routes.	60-80 passengers
Midi Buses (Higer Buses)	Mid-size buses used for inner-city routes; more comfortable and newer than Anbessa buses.	Gained popularity post-2008; new acquisitions reported in 2020.	25-30 passengers
Sheger Buses	Modern buses focusing on comfort and accessibility for vulnerable populations.	Introduced in 2020; targets densely populated routes with air-conditioning.	40 passengers
Minibus Taxis	Privately owned vehicles providing semi-public transport services.	Fleet peaked around 2015 with 11,576 vehicles; now around 8,911 due to regulation.	12-15 passengers
Light Rail	Fixed-rail transit option for	Launched in 2015; ongoing	Approximately 250

Transit (LRT)	urban mobility.	expansion with additional routes planned.	passengers per train
Digital Van Services	Emerging service aiming to reduce reliance on private cars; operates on-demand.	Introduced around 2022 as part of a strategy to diversify urban mobility.	10-20 passengers

Source : Addis Ababa City Administration Transport Bureau. (2024). Public transport fleet overview and development strategy. Unpublished official data.

Key Trends and Observations

- **Growing Fleet Size**: The number of registered buses grew from approximately 600 in the mid-1990s to about 1,000 operational vehicles today, reflecting significant investment in public transport infrastructure.
- **Modal Shift**: There is a decreasing trend in private car usage due to rising operational costs and increased availability of public transport services, particularly under new digital and BRT initiatives.
- **Service Reliability & Demand**: Substantial efforts have been made to improve service scheduling in high-demand areas, addressing previously long wait times.
- **Future Developments**: The Addis Ababa Administration is actively enhancing transport diversity and investing in BRT solutions alongside digital service models to accommodate urban growth while promoting sustainability.

Section 2: Types of Vehicles of Addis Ababa City Bus Enterprise (1995 - 2023)

Table ii : Types of Vehicles of Addis Ababa City Bus Enterprise (1995 - 2023)

Year of Purchase (EC)	Fiat	Mercedes	Volvo	DAF	Total
1995	1	150			151
2000		50			50
2005		100			100
2010	150	100			250
2015	100	100			200
2018	75				75
2020	75		200		275
2023	100		115		215
Total	**2**	**800**	**300**	**315**	**1,417**

Source>: Addis Ababa City Administration Transport Bureau. (2024). Fleet procurement data report (1995–2023). Unpublished official document.

Notes: This table summarizes the procurement history of different public bus types in Addis Ababa, categorized by manufacturer and Ethiopian calendar (EC) year of purchase. The data reflects the city's efforts to modernize and diversify its bus fleet to meet growing transportation demands. The dominant suppliers include Mercedes, which accounts for the largest share with 800 units, followed by Volvo (300 units) and DAF (315 units). The Fiat brand appears only in the earliest procurement record of 1995. Notable fleet expansions occurred in 2010 and 2020, indicating periods of significant investment in public transport infrastructure. The total number of buses acquired over this period amounts to 1,417 units.

Annex 6: Overview of the City Bus Enterprise (2024)

Bus Network Overview

- **Network Expansion**: The bus network continues to maintain extensive coverage, consisting of various routes that connect essential locations, such as residential neighborhoods, commercial areas, and educational institutions.
- **Bus Rapid Transit (BRT)**: The BRT system has thrived, further improving transit speed and reliability on major corridors.
- **Infrastructure Developments**: The public transportation infrastructure has experienced substantial growth, including the establishment of additional bus depots to enhance service coverage and efficiency.

Key Notes

- **Total Operational Buses**: Approximately **1,241** new buses are currently in operation.
- **Historical Context**: About **100** buses were operational before 1995 EC, with around **10** buses remaining out of service due to various issues, including accidents and wear.

Operational Breakdown:

- **800** buses provide full-time service.
- **60** buses operate during peak hours only.
- **50** buses are designated for governmental offices and other organizations.
- The remaining buses serve as backups or are reserved for maintenance and repairs.

Overview of Bus Depots in Addis Ababa (2024)

As of 2024, the City Bus Enterprise operates **26** bus depots across Addis Ababa, effectively managing routes, providing maintenance, and ensuring reliable service throughout various districts.

General Information about the Bus Depots:

- **Functionality**: Each depot is responsible for a specific section of the city, ensuring that buses are maintained, refueled, and ready for operations.
- **Facilities**: Depots typically include workshops, fueling stations, washing bays, spare parts storage, and administrative offices.
- **Fleet Management**: Each depot oversees a specific number of buses, varying based on local commuter demand.

Examples of Major Depots:

1. **Yeka Depot (Head Office)**
    - **Location**: Yeka, Addis Ababa
    - **Area**: Over **70,000** square meters
    - **Facilities**: Comprehensive workshops equipped with advanced machinery and specialized tools for bus maintenance and repairs.
    - **Fleet Strength**: Approximately **221** buses currently in operation.
2. **Shegole Depot**

- **Location**: Northwestern Addis Ababa
- **Area**: **53,996** square meters
- **Facilities**: Includes a satellite spare parts store, a fueling station, a greasing and washing bay, and light machinery for bus upkeep.
- **Fleet Strength**: Approximately **171** operational buses.

3. **Mekanissa Depot**
    - **Location**: Southern Addis Ababa
    - **Area**: **72,861** square meters
    - **Facilities**: Basic maintenance facilities to support bus operational needs.
    - **Fleet Strength**: About **73** buses serving the local area.

In 2024, the City Bus Enterprise remains crucial for public transportation in Addis Ababa, operating from three strategically positioned depots. The Yeka Depot serves as the central hub with the largest fleet, while the Shegole and Mekanissa depots enhance transportation efficiency and coverage throughout the city. Continued investment in facilities and fleet maintenance underscores the enterprise's commitment to providing reliable public transport services for residents.

Scheduled Operations

- Buses run from early morning until late evening, with peak service frequencies ranging from every **5** to **15** minutes, depending on the route and time.

- Ongoing efforts are aimed at enhancing schedule adherence, despite challenges presented by traffic congestion.

Quality Control

- The City Bus Enterprise has implemented a rigorous maintenance program to ensure bus reliability and safety, including regular inspections and maintenance schedules.
- Passengers are encouraged to provide feedback on services, and the enterprise is committed to addressing any concerns raised.

Organizational Structure

The City Bus Enterprise is organized into several departments, including:

- Operations and Planning
- Customer Service
- Maintenance
- Financial Management

A general manager oversees operations, supported by various middle managers across departments to ensure smooth functioning.

Workforce

As of 2024, the City Bus Enterprise employs approximately **3,500** individuals, including bus drivers, maintenance personnel, administrative staff, and customer service representatives. This dedicated workforce is essential for the continued success and reliability of the city's public transport system.

Annex 7 Anbesa city bus, Sheger bus and minibus location and rout directly or indirectly related to the research

Table iii Anbesa city bus, Sheger bus and minibus location and rout related to the research

No.	**Location**	**Anbessa City Bus**	**Sheger Bus**	**Minibus Taxi**
1	Abnet	B19	SH10 SH40	
2	Abo Junction	AB110 B19	SH16, SH28	
3	Adey Abeba	AB29, AB110 B19	SH16, SH28	
4	Alem Bank	A9	SH10	
5	Alem Bekagn	AB76, AB110		TX5
6	Akaki-Cabana	AB76, AB110		TX5
7	Akaki Stadium	AB110		
8	Atikilt Tera	AB15, AB41	B37	TX1
9	Autobus Tera	AB15, AB18, AB28, AB41, AB47, B19, B22, B35, B37	SH40	TX1
10	Ayat 1	AB49, AB61, AB83, AB97, AB101	D23, D46	
11	Ayat 2	AB97, AB101	D23	
12	Ayer Tena Square	AB87, A9	B40	SH40
13	Bambis			A24
14	Betel Hospital		SH10	
15	Civil Service University	AB49, AB61, AB83, AB97, AB101, AB106	D23, D25, D46	
16	CMC	AB49, AB61, AB83, AB97, AB101, AB106	D23, D25, D46	
17	Coca Cola	A9	SH10	SH40
18	Darmar	B19	SH10	SH40
19	Furi		A18	
20	Gojam Berenda	AB15, AB41	B37	TX1

21	Gurd Shola 1	AB49, AB61, AB83, AB97, AB101, AB106	D23, D25, D46	TX65
22	Gurd Shola 2	AB49, AB61, AB83, AB97, AB101, AB106	D23, D25, D46	TX65
23	Haya Hulet 1	A24		
24	Haya Hulet 2	A24		
25	Kality	AB110 B40		
26	Keranyo		SH10	
27	Kidane Mihret	A9	SH10	
28	Lansha	AB29, AB110	SH16, SH28	
29	Lege Tafo		AB97	
30	Leghar	AB29, AB32, AB61, A1, A24		
31	Lem Hotel	A24		
32	Megenagna	AB1, AB10, AB32, AB49, AB61, AB76, AB83, AB97, AB101, AB106	C17, C51, D23, D25, D26, D46, D52, SH4,	TX65
33	Management Institute	AB49, AB61, AB83, AB97, AB101, AB106	D23, D25, D46	
34	Menelik II Square		B37	
35	Meri	AB49, AB61, AB83, AB97, AB101, AB106	D23, D25, D46	
36	Meshualekia	AB29, AB110	SH16, SH28	
37	Mexico	A1 A24		
38	Nifas Silk 1	AB29, AB110	B19, SH16, SH28	
39	Nifas Silk 2	AB29, AB110	B19, SH16, SH28	
40	Repi - Kara Kore		SH40	
41	Riche	AB29, AB110	SH16, SH28	
42	Saris	AB110	B19, SH16, SH28	
43	Sebetegna	B19	SH10 SH40	
44	Shiro Meda	AB110, A1	B37, SH27, SH28	

45	Sidist Kilo	AB41, AB83, AB110	A1, B37, SH27, SH28	
46	Stadium	AB29, A1	A24	
47	St Estifanos	AB110, A1	A24, SH15, SH27, SH28, TX5	
48	St Gabriel	AB76, AB110		TX5
49	St Lideta	A9, B19		
50	St Michael	AB49, AB61, AB83, AB97, AB101, AB106	D23, D25, D46	
51	St Urael	A24		
52	Tegbared	A9, B19		
53	Temenja Yazh	AB29, AB110	SH16, SH28	
54	Tirunesh Dibaba Hospital	AB110		
55	Tor Hailoch	AB18, AB87, A9, SH10, SH40		
56	UNISA - Tulu Dimtu	AB110		

Adapted from Anbessa City Bus Service Enterprise, Sheger Bus Service Enterprise, and Addis Ababa Minibus Taxi Associations official websites (2024).

This table presents the distribution of public transport services—Anbessa City Bus, Sheger Bus, and Minibus Taxi—available at major locations along the Ayat–Torhailoch corridor in Addis Ababa. Each row indicates a specific stop or node, with corresponding bus lines or taxi routes that operate at that location. The table highlights service overlap, where multiple operators serve the same node, as well as gaps where service options are limited to only one or two modes.

For example, key transport hubs such as Autobus Tera, Megenagna, and Leghar exhibit high service diversity, with multiple Anbessa, Sheger, and minibus routes available, reflecting their importance as transfer points within the city's public transport network. In contrast, locations like

Betel Hospital, Furi, and Keranyo are served by fewer routes, indicating potential service accessibility limitations in these areas.

This distribution also illustrates the coverage strength of the Anbessa City Bus fleet across the corridor, while Sheger Bus routes and Minibus Taxis tend to complement or fill service gaps in select locations. Such spatial service patterns are crucial for understanding connectivity, route redundancy, and potential bottlenecks or underserved zones that may affect commuter satisfaction and operational efficiency along the corridor.

Table IV. Observational results

Station	Morning (Buses/hr	Boarding	Alighting)	Midday (Buses/hr	Boarding	Alighting)	Evening >(Buses/hr	Boarding	Alighting)
Ayat	6	60	55	3	25	20	5	55	50
Megenagna	5	50	48	2	20	18	4	48	45
Mexico	4	40	38	3	30	25	5	50	48
Stadium	3	30	28	2	22	20	4	42	40
Lideta	4	35	33	3	28	26	5	45	43
Tor Hailoch	5	45	42	2	18	15	4	40	38

Notes: “Buses/hr” is the total number of buses observed in one hour at each station.

This table is a consolidated table of the observation results for the six stations along the Ayat–Tor Hailoch corridor, showing buses per hour and passenger boarding/alighting counts for morning, midday, and evening sessions.