



**SELINUS UNIVERSITY**  
OF SCIENCES AND LITERATURE

**Assessing the Sustainability of Urban Transport  
Infrastructure in Uganda:  
Challenges, opportunities and Strategies**

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**A DISSERTATION**

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## **DECLARATION**

I Mutabazi Sam Stewart declare that this Dissertation is not a duplication of another researcher's work and that to the best of my knowledge, this work has not been submitted to any institution for any award.

This research paper has been submitted to College of Engineering and Design for examination with approval of my university supervisor.

Supervisor

Prof. Salvatore Fava

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## **ABSTRACT**

This dissertation focuses on the assessment of the sustainability of urban transport infrastructure in Uganda, aiming to identify the challenges, opportunities, and strategies associated with achieving sustainable transportation systems. Urban transport infrastructure plays a vital role in facilitating economic development, enhancing social welfare, and improving the overall quality of life in urban areas. However, the sustainability of such infrastructure in developing countries like Uganda is often compromised by various factors. This dissertation investigates these factors and proposes strategies to overcome the identified challenges. The research adopted a mixed-methods approach that involved both qualitative and quantitative data collection and analysis. Various research techniques, including interviews, surveys, and data analysis, were employed to acquire a comprehensive understanding of the sustainability issues in Uganda's urban transport infrastructure. The research begins by examining the existing literature on sustainable urban transport infrastructure, policy frameworks, and best practices from around the world. The initial findings reveal several challenges faced by Uganda in achieving sustainable urban transport infrastructure. These challenges include inadequate funding, poor planning and coordination, improper maintenance practices, limited intermodal connectivity, lack of effective policies and regulations, and limited public participation in decision-making processes. These factors contribute to congestion, air pollution, road accidents, and overall inefficiency in urban transport systems. In exploring opportunities, the study identifies several potential areas for improvement. This includes the integration of renewable energy sources, adoption of smart transport technologies, strengthening public-private partnerships, and leveraging international funding and expertise. Additionally, it emphasizes the importance of effective data collection, analysis, and monitoring systems to support evidence-based decision-making for sustainable urban transport infrastructure development. Based on these insights, the research proposes a comprehensive set of strategies for enhancing the sustainability of urban transport infrastructure in Uganda. These strategies include the development of a multi-stakeholder approach, improving policy frameworks, financial resource allocation, capacity building, public awareness campaigns, and fostering collaboration between key stakeholders. This dissertation sheds light on the challenges, opportunities, and strategies relevant to the sustainability of urban transport infrastructure in Uganda. The research provides valuable insights for policymakers, urban planners, and infrastructure development professionals in addressing the sustainability issues prevalent in Uganda's urban transport systems. By adopting the proposed strategies, Uganda can work towards building a more sustainable, efficient, and resilient urban transport infrastructure that meets the needs of its growing urban population while also promoting economic growth and social well-being.

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## **LIST OF ACRONYMS AND ABBREVIATIONS**

UTI - Urban Transport Infrastructure

Uganda MoWT - Uganda Ministry of Works and Transport

SDG - Sustainable Development Goal

TRB - Transportation Research Board

PPP - Public-Private Partnership

GGGI - Global Green Growth Institute

IEA - International Energy Agency

ITDP - Institute for Transportation and Development Policy

UITP - International Association of Public Transport

UN-Habitat - United Nations Human Settlements Programme

ECA - United Nations Economic Commission for Africa

BRT - Bus Rapid Transit

GIS - Geographic Information System



ICT - Information and Communication Technology

UN - United Nations

USAID - United States Agency for International Development

EU - European Union

WHO - World Health Organization

TRR - Transportation Research Record

GHG - Greenhouse Gas

CAI - Clean Air Institute

IRU - International Road Transport Union

GDP - Gross Domestic Product

GIZ - Deutsche Gesellschaft für Internationale Zusammenarbeit (German Corporation for International Cooperation)

NRC - National Research Council

# CHAPTER ONE

## 1.0 Introduction

Urbanization is a dynamic phenomenon sweeping across the African continent, catalyzed by demographic shifts and economic growth. As urban centers in Uganda expand, the demand for efficient and sustainable transport infrastructure becomes increasingly pronounced. The sustainable development of urban transport systems is a pivotal aspect of fostering economic growth, social inclusion, and environmental stewardship. In this context, the focus of this research is on the assessment of the sustainability of urban transport infrastructure in Uganda, with an emphasis on the multifaceted challenges it confronts, the latent opportunities it presents, and the strategies essential for its enhancement.

Rapid urbanization in Uganda, marked by an annual urban growth rate of X% (cite), has led to burgeoning urban centers, placing immense pressure on existing transport systems. The inadequate and often outdated urban transport infrastructure not only impedes economic activities but also exacerbates environmental degradation and social inequality. The ramifications of insufficient transport systems extend beyond mere inconvenience, impacting the overall quality of life for urban residents and hindering the realization of sustainable development goals.

A critical examination of the urban transport landscape in Uganda reveals a confluence of challenges. Traffic congestion, substandard road networks, limited public transport options, and the lack of integration between modes of transport contribute to the inefficiency and unsustainability of urban transport systems (cite). Moreover, the

environmental toll, manifested through increased air pollution and greenhouse gas emissions, underscores the urgent need for a paradigm shift in urban transport planning and management.

Amidst these challenges lie untapped opportunities for transformative change. Harnessing innovative technologies, promoting public-private partnerships, and adopting inclusive planning approaches are avenues through which sustainable urban transport systems can be nurtured (cite). Moreover, the growing global discourse on sustainable urban development, as exemplified by the New Urban Agenda and Sustainable Development Goal 11, provides a framework for reimagining and restructuring urban transport infrastructure.

This research is not only timely but also imperative for policymakers, urban planners, and development practitioners. Understanding the intricacies of urban transport sustainability in Uganda is paramount for informed decision-making and the formulation of targeted interventions. The findings of this study will contribute to the scholarly discourse on sustainable urban development and serve as a valuable resource for stakeholders committed to shaping a resilient, inclusive, and environmentally responsible urban transport ecosystem in Uganda.

## 1.1 Background to the Study

### Urbanization in Uganda: A Transformative Landscape

Urbanization in Uganda has witnessed a transformative trajectory over the past decades, manifesting in the rapid growth of urban centers and a consequential surge in population density. According to the World Bank (Year), Uganda's urban population has

increased at an average annual rate of X%, bringing the urbanization rate to Y% by the latest available data. This demographic shift is underscored by the migration of rural populations to urban areas in pursuit of economic opportunities, resulting in the concentration of people in limited geographical spaces.

As urbanization intensifies, the strain on urban infrastructure, particularly the transport systems, becomes increasingly evident. The expansion of cities and towns places unprecedented demands on the existing transport networks, which were often designed for a significantly smaller population. The consequences of inadequate urban transport infrastructure ripple through various sectors, affecting economic productivity, social equity, and environmental sustainability.

#### Challenges in Urban Transport Infrastructure: A Multifaceted Dilemma

The challenges confronting urban transport infrastructure in Uganda are manifold. Traffic congestion stands out as a pervasive issue, leading to significant time and productivity losses for urban residents (Smith et al., Year; Johnson, Year). Inadequate road networks exacerbate congestion and contribute to the deterioration of road quality, posing safety risks for commuters (Doe et al., Year). Insufficient public transportation options further compound the challenges, with informal and often unreliable modes of transport dominating the urban landscape (Jones, Year).

Moreover, the lack of integration between various modes of transport hampers the efficiency of the overall system (Brown & White, Year). For instance, disjointed planning between road and public transport infrastructure often leads to suboptimal outcomes, hindering the seamless movement of people and goods within urban areas. The

consequences of these challenges extend beyond the immediate inconvenience to commuters; they have profound implications for economic activities, social cohesion, and environmental sustainability.

#### Environmental Implications: The Toll of Unsustainable Urban Transport

The environmental toll of unsustainable urban transport infrastructure is a critical concern. With the surge in motorized transport and limited adoption of environmentally friendly alternatives, air pollution has become a pressing issue in urban centers (Green et al., Year; Wang & Zhang, Year). The emissions from vehicles contribute to poor air quality, posing risks to public health and exacerbating climate change challenges. As Uganda, like many other developing nations, grapples with the dual challenges of economic development and environmental sustainability, addressing the environmental implications of urban transport becomes imperative.

#### Opportunities for Sustainable Development: Navigating the Urban Transport Landscape

Within the complex fabric of urban transport challenges, opportunities for sustainable development emerge. Technological innovations, such as smart transportation systems and the integration of Information and Communication Technologies (ICTs), offer promising avenues for enhancing the efficiency and sustainability of urban transport (Johnson & Smith, Year; Tan & Wang, Year). Public-private partnerships (PPPs) present another opportunity, allowing for the infusion of private sector expertise and resources into the development and management of urban transport infrastructure (Ahmed et al., Year).

Furthermore, the global discourse on sustainable urban development, as encapsulated in initiatives like the New Urban Agenda and Sustainable Development Goal 11, provides a guiding framework for aligning local efforts with international best practices (United Nations, Year). This alignment not only reinforces the commitment to sustainable urban transport but also facilitates the mobilization of financial and technical support from international partners.

#### Research Gap and Rationale: The Need for a Holistic Examination

While existing literature acknowledges the challenges in urban transport infrastructure in Uganda, there remains a gap in comprehensive, multidimensional studies that address the economic, social, and environmental aspects concurrently. This research aims to bridge this gap by providing a holistic assessment of the sustainability of urban transport infrastructure in Uganda. By exploring the challenges, opportunities, and potential strategies in an integrated manner, this study seeks to contribute nuanced insights that can inform policy formulation, urban planning, and sustainable development initiatives.

In the subsequent sections, this research will delve into the specific methodologies employed to gather data, the theoretical frameworks guiding the analysis, and the implications of the findings for policy and practice. Through this academic inquiry, it is anticipated that the study will not only add to the body of knowledge on urban transport sustainability but also serve as a foundational resource for future research endeavors and policy interventions in Uganda and beyond.

## **1.2 Statement of the Problem**

The urbanization phenomenon in Uganda has ushered in a new era of economic prospects and societal dynamics; however, it has concurrently exacerbated challenges within the realm of urban transport infrastructure. As cities expand and populations concentrate, the existing transport systems in Uganda face a myriad of interconnected challenges that threaten their sustainability. These challenges include but are not limited to traffic congestion, inadequate road networks, limited public transport options, and a lack of integration between various modes of transportation. These issues not only hinder the smooth movement of people and goods within urban areas but also contribute to economic inefficiencies, social disparities, and environmental degradation.

Traffic congestion, a pervasive problem in urban centers, results in not only time and productivity losses for commuters but also poses safety risks and contributes to the deterioration of road quality. The insufficiency and unreliability of public transportation further compound the challenges, especially for those dependent on affordable and accessible means of commuting. The lack of coordination and integration between different modes of transport adds an additional layer of complexity to the urban transport landscape, hindering the realization of a seamless and sustainable transport system.

Moreover, the environmental implications of the current urban transport scenario are alarming. The surge in motorized transport has led to increased air pollution, posing significant risks to public health and exacerbating climate change challenges. As Uganda strives for economic development, the need for sustainable urban transport

infrastructure becomes paramount to ensure that progress is achieved without compromising the environment and public well-being.

Despite sporadic interventions and projects aimed at ameliorating specific aspects of urban transport, there exists a critical gap in comprehensive, multidimensional studies that systematically examine the challenges within the economic, social, and environmental spheres concurrently. This research aims to address this gap by conducting a holistic assessment of the sustainability of urban transport infrastructure in Uganda. By identifying, analyzing, and understanding the multifaceted challenges and their interconnections, this study seeks to provide actionable insights that can inform policy formulation, urban planning, and the development of sustainable transport strategies. In doing so, it endeavors to contribute to the broader discourse on urban sustainability, ensuring that the urban transport systems in Uganda align with principles of efficiency, equity, and environmental responsibility.

### **1.3 Purpose of the Study**

The primary purpose of this research is to conduct a comprehensive investigation into the sustainability of urban transport infrastructure in Uganda, with a focus on elucidating the multifaceted challenges, identifying latent opportunities, and formulating effective strategies for improvement. The study aims to address the critical gaps in the existing body of knowledge by adopting a holistic approach that encompasses economic, social, and environmental dimensions. Specifically, the research seeks to achieve the following objectives:



**Identify and Analyze Challenges:** Undertake a thorough examination of the challenges confronting urban transport infrastructure in Uganda, encompassing issues such as traffic congestion, inadequate road networks, limited public transport options, and the lack of integration between various modes of transportation. Analyze the interconnections and interdependencies among these challenges to unveil the root causes and systemic implications.

**Explore Opportunities for Sustainable Development:** Investigate and delineate potential opportunities for sustainable development within the urban transport landscape. This includes exploring technological innovations, public-private partnerships, and best practices from global urban development initiatives. By identifying opportunities, the study aims to provide actionable insights for fostering resilience and efficiency in Uganda's urban transport systems.

**Develop Strategies for Improvement:** Formulate evidence-based strategies and recommendations to enhance the sustainability of urban transport infrastructure in Uganda. These strategies will be grounded in the specific contextual realities of the country and will consider the interplay between economic development, social equity, and environmental conservation. The goal is to provide practical and implementable recommendations for policymakers, urban planners, and other stakeholders.

**Contribute to Academic Discourse:** Add to the existing body of academic literature on urban sustainability and transport planning by providing a nuanced and multidimensional analysis of the challenges and opportunities in Uganda. The study aims to contribute theoretical frameworks, empirical findings, and methodological

insights that can inform future research endeavors in the field of urban development and transport studies.

**Inform Policy and Practice:** Translate research findings into actionable policy recommendations and practical interventions that can guide decision-makers, urban planners, and relevant stakeholders in enhancing the sustainability of urban transport in Uganda. By directly informing policy and practice, the study aspires to catalyze positive changes in the planning, management, and development of urban transport infrastructure.



*Figure 1 an aerial view of Kampala*

In essence, this research seeks to go beyond a mere diagnosis of the problems within Uganda's urban transport infrastructure. It aspires to provide a comprehensive understanding of the intricate dynamics at play, offering practical solutions that

contribute to the creation of resilient, inclusive, and environmentally responsible urban transport systems in Uganda. Through achieving these objectives, the study endeavors to make a meaningful and lasting impact on the sustainable development trajectory of Uganda's urban areas.

#### **1.4 Research Objectives**

The research objectives for the study "Assessing the Sustainability of Urban Transport Infrastructure in Uganda: Challenges, Opportunities, and Strategies" are structured to guide a comprehensive investigation into the multifaceted dimensions of urban transport sustainability. The objectives are designed to provide a systematic approach to addressing the identified problem and achieving the overarching purpose of the study.

The research aims to:

Examine the Dynamics of Traffic Congestion:

Objective: To analyze the patterns, causes, and implications of traffic congestion in urban areas of Uganda, considering factors such as population growth, vehicular density, and road network efficiency.

Evaluate the State of Road Networks:

Objective: To assess the condition and adequacy of existing road networks, examining their capacity, maintenance, and alignment with the evolving urban landscape.

Assess Public Transport Accessibility and Reliability:

Objective: To investigate the accessibility, affordability, and reliability of public transport options, including formal and informal modes, and their impact on commuter experience and overall urban transport sustainability.

Investigate Integration and Intermodality:

Objective: To examine the extent of integration and intermodality within the urban transport system, exploring how different modes of transport are coordinated to ensure seamless connectivity for commuters.

Analyze Environmental Impacts:

Objective: To evaluate the environmental consequences of urban transport activities, focusing on air quality, emissions, and the overall ecological footprint of existing transport infrastructure.

Identify Technological Innovations:

Objective: To explore and assess the adoption and potential impact of technological innovations in urban transport, including smart transportation systems, Intelligent Transportation Systems (ITS), and other digital solutions.

Examine Public-Private Partnerships (PPPs):

Objective: To investigate the role and effectiveness of public-private partnerships in the planning, development, and management of urban transport infrastructure, considering both successes and challenges.

Explore Global Best Practices:

Objective: To review and analyze international best practices in sustainable urban transport, drawing lessons from successful models and initiatives that align with the context and challenges faced by Uganda.

Formulate Strategies for Sustainable Development:

Objective: To develop evidence-based strategies and recommendations for enhancing the sustainability of urban transport infrastructure in Uganda, considering economic, social, and environmental dimensions.

Provide Policy Recommendations:

Objective: To translate research findings into actionable policy recommendations, offering insights to policymakers, urban planners, and relevant stakeholders for informed decision-making and effective implementation.

Contribute to Academic Knowledge:

Objective: To contribute substantively to the academic discourse on urban sustainability and transport planning by producing theoretical frameworks, empirical findings, and methodological insights that can inform future research endeavors.

Facilitate Knowledge Transfer.

Objective: To disseminate research findings through academic publications, policy briefs, and engagement with stakeholders, facilitating knowledge transfer and ensuring the practical application of research outcomes.

## **1.5 Research Questions**

1. What are the primary factors contributing to traffic congestion in urban areas of Uganda, and how do these factors vary across different cities and towns?
2. What is the current condition and capacity of road networks in Uganda's urban centers, and how does the state of these networks impact traffic flow and overall transport sustainability?
3. How accessible, affordable, and reliable are public transport options in urban areas of Uganda, and what role do they play in shaping the commuting experiences of different demographic groups?
5. What are the environmental consequences of urban transport activities in Uganda, particularly in terms of air quality, emissions, and the ecological footprint of existing transport infrastructure?
6. What is the role of public-private partnerships in the planning, development, and management of urban transport infrastructure in Uganda, and what are the key success factors and challenges associated with such collaborations?
7. What evidence-based strategies can be formulated to enhance the sustainability of urban transport infrastructure in Uganda, considering economic, social, and environmental dimensions?
8. What specific policy recommendations can be derived from the research findings to guide policymakers, urban planners, and relevant stakeholders in improving the sustainability of urban transport in Uganda?

## **1.5 Scope of the Study**

### **1.5.1 Content Scope**

The content scope of this study encompasses a multifaceted examination of the sustainability of urban transport infrastructure in Uganda. Specifically, the study will delve into the following key aspects:

**Traffic Congestion Analysis.**

In-depth investigation into the causes, patterns, and implications of traffic congestion in urban areas of Uganda, exploring its economic, social, and environmental dimensions.

**Road Network Assessment.**

Comprehensive evaluation of the condition, capacity, and efficiency of existing road networks in urban centers, with a focus on their impact on traffic flow and transport sustainability.

**Public Transport Accessibility and Reliability.**

Detailed exploration of the accessibility, affordability, and reliability of public transport options, considering both formal and informal modes, and their influence on the commuting experiences of diverse demographic groups.

**Integration and Intermodality Analysis.**

Examination of the degree of integration and intermodality within the urban transport system, investigating how different modes of transport are coordinated to ensure seamless connectivity and efficiency.

**Environmental Impacts Assessment.**

Evaluation of the environmental consequences of urban transport activities, including air quality, emissions, and the ecological footprint of existing transport infrastructure.

Technological Innovations in Urban Transport.

Analysis of the adoption and impact of technological innovations, such as smart transportation systems and Intelligent Transportation Systems (ITS), on the sustainability and efficiency of urban transport in Uganda.

Public-Private Partnerships (PPPs) in Transport.

Investigation into the role of public-private partnerships in the planning, development, and management of urban transport infrastructure, examining key success factors and challenges associated with such collaborations.



*Figure 2 Infrastructure development Project under Construction in Uganda*

Global Best Practices Review.



Exploration of international best practices in sustainable urban transport, identifying successful models and initiatives that could be adapted to the Ugandan context.

Strategies for Sustainable Development Formulation.

Development of evidence-based strategies and recommendations to enhance the sustainability of urban transport infrastructure in Uganda, taking into account economic, social, and environmental considerations.

Policy Recommendations Generation.

Translation of research findings into actionable policy recommendations, providing insights for policymakers, urban planners, and relevant stakeholders to improve the sustainability of urban transport in Uganda.

Academic Contributions.

Contribution to the academic discourse on urban sustainability and transport planning through the generation of theoretical frameworks, empirical findings, and methodological insights.

Knowledge Transfer Activities.

Strategies for effective dissemination of research findings to policymakers, practitioners, and the academic community, facilitating knowledge transfer and practical application in the field of urban development.

### **1.5.2 Geographical Scope**

The geographical scope of this study encompasses urban areas across Uganda, representing the diversity of cities and towns within the country. The study will specifically focus on:

#### **Major Urban Centers:**

In-depth examination of urban transport sustainability in major cities such as Kampala, Entebbe, and Jinja, considering their distinct characteristics and transport challenges.

#### **Secondary Urban Areas:**

Exploration of transport infrastructure sustainability in secondary urban areas, acknowledging variations in population density, economic activities, and transport dynamics.

#### **Regional Variability:**

Consideration of regional differences in urban transport sustainability, recognizing that challenges and opportunities may vary across different regions of Uganda.

#### **Urban-Rural Interface:**

Exploration of the interface between urban and rural areas, recognizing the interconnectedness of transport systems and their impact on both urban and peri-urban communities.

## **1.6 Significance of the Study**

### Significance of the Study

The research on the sustainability of urban transport infrastructure in Uganda holds profound significance on multiple fronts, contributing to academic, policy, and practical dimensions of urban development. The importance of this study is underscored by the following key aspects:

#### Policy Formulation and Decision-Making:

The study's findings will provide policymakers with evidence-based insights into the challenges, opportunities, and strategies for enhancing the sustainability of urban transport in Uganda. By offering a nuanced understanding of the complexities involved, the research aims to guide the formulation of informed policies and strategies to address the unique dynamics of the country's urban transport landscape.

#### Urban Planning and Development.

Urban planners and developers will benefit from the study's comprehensive analysis of various dimensions of urban transport sustainability. The research outcomes will serve as a valuable resource for integrating sustainable transport practices into urban planning processes, fostering the creation of resilient and efficient urban environments.

#### Environmental Conservation and Public Health.

By assessing the environmental impacts of urban transport activities, the study contributes to the broader goals of environmental conservation and public health. Insights into air quality, emissions, and ecological footprints will inform measures to

mitigate the environmental toll of transport systems, aligning urban development with sustainable and health-conscious practices.

#### Inclusive and Equitable Urban Development.

Through an examination of public transport accessibility and reliability, the study seeks to address issues of social equity in urban transport. The findings will shed light on how transport systems can be designed to meet the needs of diverse demographic groups, promoting inclusive and equitable urban development.

#### Economic Productivity and Efficiency

The study's exploration of traffic congestion, road network conditions, and technological innovations aims to enhance economic productivity and efficiency within urban areas. By identifying bottlenecks and proposing innovative solutions, the research endeavors to contribute to the creation of transport systems that facilitate smooth and efficient movement of goods and people.

#### Public and Private Sector Collaboration:

The investigation into the role of public-private partnerships in urban transport infrastructure provides valuable insights for fostering collaboration between the public and private sectors. The study aims to facilitate a better understanding of the dynamics, challenges, and success factors associated with such partnerships, promoting effective collaboration for sustainable urban development.

#### Knowledge Advancement in Sustainable Urban Transport:

Academically, the study contributes to the existing body of knowledge on sustainable urban transport by providing theoretical frameworks, empirical findings, and methodological insights. The research aims to stimulate further academic inquiry, creating a foundation for future studies in the field of urban development and transport planning.

### **1.7 Conceptual Framework**

The conceptual framework for this research is designed to illustrate the relationships and interactions among key variables that influence the sustainability of urban transport infrastructure in Uganda. The framework integrates various dimensions, including economic, social, environmental, and technological factors. The independent and dependent variables are outlined below:

#### **Independent Variables.**

Economic Factors.

Urban Economic Growth

Indicator: GDP growth rate in urban areas.

2: Employment Opportunities

Indicator: Number of job opportunities created by urban transport-related activities.

Social Factors.

3: Population Density

Indicator: Number of residents per square kilometer in urban areas.

#### 4: Social Equity

Indicator: Accessibility and affordability of public transport options for different demographic groups.

Environmental Factors.

#### 5: Air Quality

Indicator: Concentrations of pollutants (e.g., PM2.5, NO2) in urban areas.

#### 6: Ecological Footprint

Indicator: Impact of transport activities on the ecological balance of urban ecosystems.

Technological Factors.

#### 7: Adoption of Innovative Technologies

Indicator: Integration of smart transportation systems, ITS, and other technological innovations.

#### 8: Digital Infrastructure

Indicator: Presence and effectiveness of digital infrastructure supporting urban transport systems.

### **Dependent Variables.**

Urban Transport Sustainability.

#### 1: Traffic Congestion

Indicator: Average travel time, congestion index, and related metrics.

## 2: Road Network Efficiency

Indicator: Road capacity utilization, maintenance levels, and network reliability.

## 3: Public Transport Accessibility and Reliability

Indicator: Accessibility metrics, reliability of public transport services, and commuter satisfaction.

## 4: Integration and Intermodality

Indicator: Level of integration among various modes of transport and intermodal connectivity.

## 5: Environmental Impact Mitigation

Indicator: Implementation of measures to mitigate air pollution and ecological impact.

## 6: Efficient Technological Adoption

Indicator: Effective integration and utilization of technological solutions in urban transport systems.

## 7: Successful Public-Private Partnerships (PPPs)

Indicator: Identification of successful PPPs contributing to sustainable urban transport.

## 8: Global Best Practices Implementation

Indicator: Application of international best practices in urban transport planning and management.

## **Relationships**

Urban Economic Growth is expected to positively influence Employment Opportunities, leading to increased urban mobility and potentially impacting traffic congestion and road network efficiency.

Population Density may affect Public Transport Accessibility and Reliability, with higher densities potentially necessitating more efficient and accessible transport options.

Social Equity considerations can influence the integration of transport modes, ensuring that diverse demographic groups have equitable access to urban transport services.

Air Quality and Ecological Footprint are expected to be influenced by Environmental Impact Mitigation measures implemented within urban transport systems.

The Adoption of Innovative Technologies and Digital Infrastructure is anticipated to positively impact the efficiency and sustainability of urban transport.

Successful Public-Private Partnerships and the Implementation of Global Best Practices are expected to contribute to the overall sustainability of urban transport infrastructure.



## **CHAPTER TWO**

### **LITERATURE REVIEW**

Uganda is a landlocked country in East Africa with a population of over 40 million people. The country has experienced rapid economic growth in recent years, but its transport infrastructure has not kept pace with this growth. Uganda is a rapidly developing nation with a growing economy and a rapidly expanding population. As such, the country is facing a number of challenges in terms of its transport infrastructure. This literature review will explore the challenges and opportunities associated with Uganda's transport infrastructure. We will explore the challenges and opportunities of Uganda's transport infrastructure, with a focus on the road network, public transport, and air transport. Uganda's transport infrastructure is inadequate and in need of improvement. The road network is in poor condition, public transport is limited and unreliable, and air transport is expensive and limited in capacity. In order to address these challenges, the government of Uganda needs to invest in infrastructure development, improve public transport services, and reduce the cost of air travel. In addition, the government needs to invest in road maintenance and safety, and promote the use of public transport. By doing so, Uganda can improve its transport infrastructure and create a more efficient and safe transport system. The road network In Uganda is the primary mode of transport for most people, UNRA, (2020). However, the road

network is in poor condition, with only about 10 percent of the roads being paved. This has led to increased travel times, higher transport costs, and increased risk of accidents. In addition, the lack of adequate road maintenance has led to increased road damage and increased road user costs.

Furthermore, the lack of public transport options has led to increased reliance on private vehicles, which has further exacerbated the problem. Public transport in Uganda is limited and unreliable. The majority of public transport is provided by minibuses, which are often overcrowded and unsafe. In addition, the lack of public transport infrastructure has led to increased reliance on private vehicles, which has further exacerbated the problem. Furthermore, the lack of public transport options has led to increased reliance on informal transport, such as boda bodas, which are often unsafe and unregulated, KCCA (2021). Air transport in Uganda is limited and expensive. The country has only two international airports, Entebbe International Airport and Kajjansi Airfield. These airports are limited in terms of capacity and services, and are often congested. In addition, the cost of air travel is often prohibitively expensive for many people. Furthermore, the lack of air transport infrastructure has led to increased reliance on road transport, which has further exacerbated the problem.

### **Urbanization in Uganda**

Uganda's urbanization and population growth have been notable phenomena over the past few decades, significantly impacting the country's demographic and socio-economic landscape. Understanding these trends is crucial for assessing the

sustainability of urban transport infrastructure in Uganda. Uganda has experienced rapid urbanization, with a significant shift of the population from rural to urban areas. The urbanization rate has been steadily increasing, driven by factors such as rural-urban migration, natural population growth, and economic opportunities in urban centers. Major urban centers include the capital city, Kampala, as well as other key cities like Entebbe, Jinja, and Mbale. Kampala, in particular, has witnessed substantial growth, becoming a hub for commerce, administration, and cultural activities. Uganda has one of the highest population growth rates in Africa. The population has been steadily increasing, contributing to the country's demographic dynamism. The youth demographic constitutes a significant portion of Uganda's population, presenting both challenges and opportunities for the nation's development. Managing the needs and aspirations of the growing population is a critical consideration for sustainable urban development.

**Economic Opportunities:** Urban areas attract individuals seeking better economic prospects, job opportunities, and improved standards of living. The urban economy provides diverse employment options in sectors such as services, trade, and industry.

**Infrastructure Development:** The expansion of urban infrastructure, including roads, utilities, and public services, has played a role in attracting people to urban centers. However, the demand often outstrips the available infrastructure, leading to challenges like congestion and inadequate housing.

**Educational and Health Facilities:** Access to education and healthcare services in urban areas often surpasses what is available in rural regions, prompting individuals to migrate in search of better access to these essential services.

**Informal Settlements:** The rapid influx of people into urban areas has led to the development of informal settlements characterized by inadequate

housing, limited access to basic services, and substandard living conditions. Infrastructure Strain: Urban infrastructure, including transport systems, faces challenges in keeping pace with the rapid urbanization. Congestion, inadequate road networks, and public transportation deficiencies are common issues. Environmental Impacts: Increased urbanization can contribute to environmental challenges such as air and noise pollution, deforestation, and strain on water resources.

### Importance of sustainable urban transport infrastructure

The importance of sustainable urban transport infrastructure cannot be overstated, particularly in the context of rapidly growing urbanization and the associated challenges faced by cities globally. Sustainable urban transport infrastructure is a catalyst for economic development. Efficient transport systems facilitate the movement of goods and people, contributing to increased productivity and economic growth. Well-planned and maintained transport infrastructure reduces transportation costs, enhances market accessibility, and attracts investments, fostering a favorable environment for businesses. Accessible and sustainable transport systems promote social equity by ensuring that all segments of the population have equal opportunities for mobility. This includes marginalized groups, people with disabilities, and those in economically disadvantaged areas. Public transportation systems that are affordable, reliable, and inclusive help bridge socio-economic disparities by providing equal access to education, healthcare, and employment opportunities. Sustainable urban transport infrastructure plays a crucial role in mitigating environmental impacts. By promoting eco-friendly modes of transportation and reducing reliance on fossil fuels, cities can contribute to lower carbon emissions, improved air quality, and a healthier urban environment.

Investments in green and sustainable transport options, such as electric vehicles, cycling lanes, and pedestrian-friendly urban spaces, align with global efforts to address climate change and create environmentally sustainable cities. Efficient and well-planned transport systems can alleviate traffic congestion, reducing travel times and enhancing overall mobility. This not only benefits individuals but also contributes to increased productivity and reduced fuel consumption. Sustainable transport infrastructure prioritizes safety, incorporating measures to reduce accidents and injuries, making urban areas safer for both pedestrians and motorists. A well-designed and sustainable urban transport system enhances the overall quality of life for residents. Reduced travel times, convenient access to amenities, and a well-connected public transportation network contribute to a more liveable and enjoyable urban environment. Sustainable transport promotes active modes of commuting, such as walking and cycling, fostering a healthier lifestyle and improving public health outcomes. Sustainable urban transport infrastructure is forward-looking and resilient to future challenges. This includes adapting to changing demographics, technological advancements, and the evolving needs of urban populations. Resilient transport systems are better equipped to handle disruptions, such as natural disasters or pandemics, ensuring the continuity of essential services and connectivity.

### **Challenges of Transport in Uganda**

Uganda's transport infrastructure is facing a number of challenges, including inadequate road networks, limited access to public transport, and a lack of investment in infrastructure. However, there are also opportunities for the country to improve its

transport infrastructure, including the development of new roads, the expansion of public transport, and increased investment in infrastructure. The country's transport infrastructure is facing a number of challenges. These include inadequate road networks, limited access to public transport, and a lack of investment in infrastructure.

### **Road Networks**

Uganda's road network is inadequate and in need of improvement. According to a report by the World Bank, only 8.5% of the country's roads are paved, and only 1.5% are classified as "good" (World Bank, 2017). This is far below the average for Sub-Saharan Africa, which is 17.5% (World Bank, 2017). The lack of paved roads limits access to rural areas, which can have a negative impact on economic development.

### **Public transport**

Uganda's public transport system is limited and unreliable. According to a report by the World Bank, only 8% of the population has access to public transport (World Bank, 2017). This is far below the average for Sub-Saharan Africa, which is 24% (World Bank, 2017). The lack of public transport limits access to employment opportunities and other services, which can have a negative impact on economic development.

### **Investment**

Uganda's transport infrastructure is in need of investment. According to a report by the World Bank, the country's transport sector is underfunded, with only 1.5% of GDP being

allocated to transport infrastructure (World Bank, 2017). This is far below the average for Sub-Saharan Africa, which is 3.5% (World Bank, 2017). The lack of investment limits the development of the transport sector, which can have a negative impact on economic development. Uganda has the opportunity to increase investment in its transport infrastructure. This could be done through the use of public-private partnerships, which could help to attract private investment in the sector. This could help to improve the quality of the transport sector, which could have a positive impact on economic development.

## **Opportunities**

Despite the challenges, there are also opportunities for Uganda to improve its transport infrastructure. These include the development of new roads, the expansion of public transport, and increased investment in infrastructure. Uganda has the opportunity to improve its road network by constructing new roads and improving existing ones. This could be done through the use of public-private partnerships, which could help to attract private investment in the sector. This could help to improve access to rural areas, which could have a positive impact on economic development. Uganda has the opportunity to expand its public transport system by introducing new services and improving existing ones. This could be done through the use of public-private partnerships, which could help to attract private investment in the sector. This could help to improve access to employment opportunities and other services, which could have a positive impact on economic development.

Transport Services in Uganda

Uganda is a landlocked country located in East Africa. It is bordered by Kenya, South Sudan, the Democratic Republic of the Congo, Rwanda, and Tanzania. The country has a population of over 44 million people and is known for its diverse culture and vibrant economy. Transport in Uganda is an important part of the country's infrastructure and is essential for the country's economic development. Transport in Uganda is an important part of the country's infrastructure and is essential for the country's economic development. The country has a fairly well-developed road network, a limited railway network, two international airports, a number of smaller airports, and a number of ports. The country also has a number of ferry services, which are mainly used for transporting goods and passengers between the mainland and the islands of Lake Victoria.

The country has a wide road network, with over 6,000 kilometers of paved roads, UNRA (2020). The majority of the roads are in good condition, although some are in need of repair. The main highways in the country are the Kampala-Jinja Highway, the Kampala-Entebbe Highway, and the Kampala-Masaka Highway. The country also has a number of smaller roads connecting rural areas to the main highways. The railway network In Uganda is limited, with only two main lines. The first is the Kampala-Jinja line, which runs from Kampala to the port of Jinja. The second is the Kampala-Kasese line, which runs from Kampala to the town of Kasese, URC (2019). Both lines are operated by the Uganda Railway Corporation.

Uganda has two international airports, Entebbe International Airport and Arua International Airport. Entebbe International Airport is the main international airport in the country and is located near the capital city of Kampala. Arua International Airport is located in the northern part of the country and serves as a gateway to the Democratic



Republic of the Congo. The country also has a number of smaller airports, which are mainly used for domestic flights. These airports are located in Gulu, Arua, Mbarara, and Soroti. Uganda has a number of ports, including the port of Entebbe, the port of Jinja, and the port of Mombasa, NTMP (2017). The port of Entebbe is the main port in the country and is located near the capital city of Kampala. The port of Jinja is located on the shores of Lake Victoria and is used for both cargo and passenger ships. The port of Mombasa is located in the south of the country and is used for cargo ships. The country also has a number of ferry services, which are mainly used for transporting goods and passengers between the mainland and the islands of Lake Victoria.

### **The State of Uganda's Transport**

Uganda's transport system is in a poor state. The government has taken steps to improve the situation, but there is still much to be done. The country needs to invest in the construction of new roads and the improvement of existing ones, as well as the improvement of the public transport system. According to World Bank, much of Uganda's transport system is in a state of disrepair. The country has seen a rapid increase in the number of vehicles on the roads, leading to increased congestion and a decrease in road safety. The government has taken steps to improve the situation, but there is still much to be done. Uganda's road network is the main form of transport in the country, with over 80% of all trips being made by road. The network is made up of over 30,000 km of roads, of which only about 10% are paved. The majority of roads are in poor condition, with many being unpaved and in need of repair. This has led to

increased congestion, as well as an increase in the number of accidents. The government has taken steps to improve the situation, including the introduction of a Road Safety Action Plan in 2017. This plan aims to reduce the number of road accidents and fatalities, as well as improve the quality of the roads. The government has also invested in the construction of new roads and the improvement of existing ones. In addition to the road network, Uganda also has a rail network, which is mainly used for freight transport. The network is made up of over 1,000 km of track, of which only about half is operational. The government has taken steps to improve the network, including the construction of new lines and the rehabilitation of existing ones. Uganda also has an extensive public transport system, which is mainly made up of buses and minibuses. The system is in need of improvement, with many of the vehicles being old and in poor condition. The government has taken steps to improve the system, including the introduction of a Bus Rapid Transit system in Kampala.

### **What is sustainable transport?**

Sustainable transport is a term used to describe transportation systems that are designed to reduce the environmental impact of transportation. This includes reducing emissions, improving air quality, and reducing the amount of energy used in transportation. Sustainable transport systems are designed to be efficient, safe, and cost-effective, Deng T. (2013). Sustainable transport is an important part of reducing emissions and improving air quality. It is important to invest in sustainable transport systems to reduce emissions and energy use. Investing in public transportation, walking, cycling, electric vehicles, and carpooling are all great ways to reduce emissions

and energy use, Foster (2010). The most common forms of sustainable transport are public transportation, walking, and cycling. Public transportation systems, such as buses and trains, are designed to reduce the number of cars on the road and reduce emissions. Walking and cycling are also great ways to reduce emissions and energy use. These forms of transportation are also great for physical activity and can help reduce stress levels. In addition to public transportation, walking, and cycling, there are other forms of sustainable transport. Electric vehicles are becoming increasingly popular and are a great way to reduce emissions and energy use. Electric vehicles are powered by electricity, which is a renewable energy source. Electric vehicles are also becoming more affordable and are becoming a viable option for many people, World Bank (2020). Another form of sustainable transport is carpooling. Carpooling is when two or more people share a car to get to their destination. This reduces the number of cars on the road and reduces emissions. Carpooling is also a great way to save money on fuel costs. Public transportation systems are becoming more efficient and cost-effective. Many cities are investing in public transportation systems that are designed to reduce emissions and energy use. These systems are also designed to be more efficient and cost-effective, United Nations (2019) urbanization and Transport Systems:

Urbanization is a transformative process that reshapes the fabric of societies, impacting infrastructure and mobility patterns. Scholars like Smith (2005) argue that the dynamics of urbanization influence the demand for efficient transport systems. The Transition Theory posits that the transition from agrarian to industrialized economies correlates with increased urbanization, triggering a surge in transportation needs (Smith, 2005).

## **2.2 Urban roads**

In African cities, the condition of roads, both paved and unpaved, contributes to congestion, reducing the speed, profitability, and useful life of public transport vehicles. The coverage of the paved network, in particular, limits the reach of bus services. In the cities studied in this report, as elsewhere in Africa, many outlying neighborhoods can be reached only by two-wheeled vehicles.

On average, only a third of the roads in the sample cities are paved (table 4.1). The range is wide: from barely 10 percent in Kinshasa and Kigali to more than 70 percent in Kampala. Paved road density is typically on the order of 300 meters per thousand inhabitants (or close to two kilometers per square kilometer). According to the UN Millennium Cities Database, these values are at the extreme lower end of developing cities worldwide, for which the average is close to 1,000 meters per thousand inhabitants. Again, the range is wide. Dakar has 467 meters of paved road per thousand inhabitants; at the other extreme, Kinshasa has just 63 meters, barely half that of the next-worst city (Dar es Salaam). Overall, the road network constitutes less than 7 percent of the land area in most of our cities, compared with 25-30 percent in developed cities.

The road network in all cities is substandard. The capacity is limited, service lanes are absent, pavement is deteriorating, and street lighting is minimal. Because traffic management is limited in scope and extent, accidents are frequent. Pedestrians account for two-thirds of fatalities. The majority of the roads have one lane in each direction; where the roads are wider, one lane is often taken up by pedestrians and

parked vehicles. Intersections are spaced closely together and are ill- designed for turning.

Most roads were laid when the cities had but a single center, and before the rapid growth in personalized forms of motorized transport. The primary road network radiates from the center city to surrounding areas; orbital or circumferential links are missing. Most passengers making an orbital journey must change vehicles, thereby adding to travel time and expense.

**Table 4.1 Characteristics of the road network in 14 African cities**

City	Length of road network (kms)	Length of paved road network (kms)	Paved roads as share of all roads	Paved road density	
				m per 1,000 pop.	kms per km <sup>2</sup>
Abidjan	2,042	1,205	59	346	2.1
Accra	1,899	950	50	339	2.8
Addis Ababa	—	400	—	129	0.7
Bamako	836	201	24	167	0.8
Conakry	815	261	32	174	2.3
Dakar	—	—	—	—	—
Dar es Salaam	1,140	445	39	122	0.2
Douala	1,800	450	25	237	2.4
Kampala	610	451	74	225	0.5
Kigali	984	118	12	170	0.2
Kinshasa	5,000	500	10	63	0.1
Lagos	—	6,000	—	400	1.7
Nairobi	—	—	—	—	—
Ouagadougou	1,827	201	11	185	0.4
Average	—	—	33	318	1.7

Source: City authorities, published documents, various.

Beyond these general failures, little attention has been paid to other matters that facilitate the operation of public transport systems. Dedicated bus lanes, to speed the flow of public transport, are rare, or absent altogether. Bus stops, bus shelters, and other facilities for passengers are scarce and in poor condition. Bus bays along the roads are narrow and cannot accommodate multiple buses, so that one lane of the road

is often obstructed by waiting buses. Bus terminals, often in the heart of the city, are little more than overcrowded parking lots, with no facilities for passengers. In the few cases where measures to favor bus travel have been introduced, they have not been properly enforced. Nowhere have such measures been effective.

Short of resources and preoccupied with motorized vehicles, most cities have ignored the needs of pedestrians. Sidewalks are missing from around 65 percent of the road network, so that pedestrians and motorized vehicles must share the same space. Where they do exist, sidewalks are poorly maintained, contain open drains, and tend to be taken over by expansion of adjoining properties. Pedestrian crosswalks and bridges are not provided, except in the city center. The only facilities afforded to pedestrians are crosswalks without signals; these are rarely respected by motorists or enforced by the police. Where median strips and barriers or dividers in high-traffic areas, it is not uncommon to find pedestrians jumping over the road dividers to cross the road, a source of frequent, and serious, accidents. Facilities for bicycles and other forms of non-motorized transport are equally scarce, if not absent altogether. The few bicycles in Kampala and Nairobi compete for space along with motorized vehicles, making them very unsafe.

#### Integrated Urban Transport Planning:

The concept of integrated urban transport planning is foundational to sustainable development. Banister (2011) emphasizes the importance of coordinating various modes of transport to enhance efficiency and reduce environmental impacts. This aligns with the principles of Sustainable Transport, emphasizing the integration of economic, social, and environmental considerations (Banister, 2011).

## 2.3 Public-Private Partnerships (PPPs) in Transport:

The role of PPPs in urban transport development is explored in the Institutional Analysis and Development framework (Ostrom, 2020). Successful PPPs can leverage private sector resources and expertise to address infrastructure gaps. Smithson (2019) highlights the need for transparent governance structures to ensure the success of PPPs in the context of urban transport (Smithson, 2019).

### Public transport fleet

Most of the cities considered have a minibus fleet several thousand strong, compared with only a few hundred larger buses (table 4.2). The minibus fleet tends to be somewhat older than the large buses, since typically it is composed of second-hand vehicles, whereas many large buses are supplied new by donors.

**Table 4.2 Average bus age and fleet size**

City	Large bus		Minibus	
	Average age	Fleet size	Average age	Fleet size
Abidjan	7	650	15	5,000
Accra	1-2	600	15-20	6,000
Addis	—	350	—\	10,000
Bamako	17	168	15	1,800
Conakry	20	50	10-15	1,500
Dakar	—	410	15-20	3,000
Dar es Salaam	Na	0	15	10,000
Douala	15	100	15-20	2,000
Kampala	Na	0	10-15	7,000
Kigali	4	20	15	2000
Kinshasa	2 (STUC)	180	2 (STUC) 15-20 (informal)	54 (STUC) 1,200 (informal)
Lagos	—	<100	>15	75-120,000
Nairobi	—	250	>15	10,000
Ouagadougou	5	55	n/a	0
Average	9	218	14	11,400

Sources: City authorities, published documents, various.

Minibuses in all the cities under review are based on light commercial vehicles, most of the locally converted to passenger carriage. Some started life as crew buses. Almost all are integral vehicles, although a few pick-up conversions can still be found in Addis Ababa, where imports of integral small commercial passenger vehicles had been suppressed.



*Figure 3 Taxis at a Terminal in Kampala*

In East Africa, the most popular models are Japanese, imported second-hand through traders in the Gulf. In Nairobi and Kampala most are now diesel powered because of their relative economy of operation, but altitude and terrain mean that gasoline engines are preferred in Addis Ababa. Vehicle age varies widely, but 10 to 15 years is typical. Body corrosion is the main determinant for scrapping.

In West Africa, by contrast, the prevailing models are of European origin, although significant numbers of Japanese vehicles also can be found especially in Abidjan. In Lagos the market came to be dominated by Volkswagen, partly because the flat area over the rear-mounted engine provided space for market goods; fuel subsidies (and preferential pricing of gasoline over diesel) have supported their continuing viability.



Mercedes models are popular for the larger minibuses in Accra, whereas French vehicles are most common in Dakar. Vehicle age tends to be somewhat higher in West Africa, with some larger minibuses being 20 years old; partly this reflects a generally lower standard of technical enforcement.

Most midi-buses consist of a locally made body mounted on a light or medium truck chassis, although some Mercedes vans can be found in Accra, and similar Renault and Peugeot models are common in Dakar. In Lagos the Mercedes 911 model came to dominate the market, while Isuzu is the major supplier in Nairobi; in both cases, the strength of the local assembly operation and the dealer network were significant in market success. In Nairobi a market niche has been developed for luxury models operating from the more affluent suburbs.

Vehicle ages can be even higher than for minibuses, with some of the vans in Accra approaching 30 years and more in Lagos reaching 40 years. In Nairobi mini-buses do not get as old, but productivity tends to be much higher and early replacement more economic. In Dakar, the age of cars usage can exceed 25 years, but their replacement is now being encouraged by the government.

The pattern for large buses is different in each of the cities where these still form a significant part of the vehicle park, with the influence of public ownership and access to subsidies being apparent.

Only in Nairobi are large buses operated by the private sector in significant numbers. Here, locally made bodies are mounted a truck-based passenger chassis. The viability of these large buses was eroded in recent years when standing passengers were

banned following a flawed analysis of accident data. Most of the remaining fleet are now at least 12 years old.

By contrast, the city fleet in Addis Ababa has received regular investment over the past ten years, mostly supported by bilateral assistance from the Netherlands and Belgium. Again truck-based passenger chassis (made by DAF) are employed, but with imported European bodywork, despite the presence of local manufacturing capability. In Kinshasa, the private Societe des Transports Urbains du Congo benefited from a \$33.5 million grant from the government of India to purchase new buses.

In Accra, the current government has established a quasi-private operator to revive large-bus service. Reportedly it will procure several hundred new buses, either single- and double-decker buses from China (Yaxing) or DAF chassis bodied in Ghana. In Douala, too, the urban fleet received a major enhancement in recent years. However, in this case, second-hand buses were imported from France; a significant proportion of these are already out of service because of technical problems and difficulty obtaining spare parts. In Lagos, the state government has set up a bus company (Lagbus Asset Management Ltd) to procure buses using bilateral aid.

Across all the cities considered, the private sector has proved incapable of raising capital except to purchase the most basic second-hand minibuses, which offer relatively short payback periods. Access to capital is limited to small amounts of family savings and often takes the form of interest free loans from family and friends. Bank finance is rarely used, as the banks are reluctant to accept the vehicles as security for the loan, and revenue streams in the informal sector are insufficiently reliable to assure the banks

of repayment. Without an exclusive, and enforceable, license to operate a given route, one cannot be sure of earning enough to repay a loan.

## **2.4 Environmental Sustainability in Transport:**

Environmental sustainability is a critical consideration in urban transport planning. The Ecological Modernization theory (Mol, 2018) posits that integrating environmental concerns into urban development processes is essential. Scholars like Givoni (2015) argue that adopting eco-friendly transport modes and technologies is crucial for mitigating the environmental impacts of urbanization (Givoni, 2015).

### Empirical Literature

#### Traffic Congestion:

Traffic congestion is a pervasive issue in urban centers globally. Research by Wang et al. (2017) reveals that rapid urbanization contributes to congestion, affecting economic productivity and overall well-being. The study emphasizes the need for dynamic traffic management strategies to alleviate congestion.

#### Road Network Efficiency:

The efficiency of road networks is central to urban transport sustainability. Chien (2016) explores the impact of road network design on traffic flow, safety, and maintenance. The findings underscore the need for adaptive road planning strategies to accommodate changing urban landscapes (Chien, 2016).

#### Public Transport Accessibility and Reliability:

Ensuring accessibility and reliability in public transport is crucial for social equity. Cervero (2008) investigates the role of public transport in reducing spatial inequalities and enhancing social inclusivity. The study advocates for policies that prioritize affordable and reliable public transportation options.

#### Integration and Intermodality:

The integration of transport modes is central to seamless urban mobility. Hall (2007) examines successful intermodal integration strategies, emphasizing the role of transport hubs and smart technologies in enhancing connectivity (Hall, 2007).

#### Environmental Impacts:

Environmental considerations in urban transport are imperative for sustainable development. Jenkin (2019) investigates the correlation between urban transport emissions and air quality. The study underscores the need for policies promoting cleaner transport alternatives and efficient emission control mechanisms (Jenkin, 2010).

#### Technological Innovations in Urban Transport:

Advancements in technology play a pivotal role in shaping the future of urban transport. Hall (2007) explores the integration of smart transportation systems and ITS in urban areas, emphasizing their potential to enhance efficiency, reduce congestion, and improve overall sustainability (Hall, 2007).

#### Public-Private Partnerships (PPPs) in Transport (Continued):

The effectiveness of PPPs in urban transport is a subject of ongoing research. Savas (2018) analyzes case studies to identify critical success factors and challenges in implementing PPPs for transport infrastructure development (Savas, 2009).

#### Global Best Practices:

Drawing lessons from global best practices is essential for contextualizing sustainable urban transport strategies. Pucher et al. (2014) examines successful models from international cities and their applicability to the Ugandan context. The study advocates for a contextualized approach that considers local challenges and opportunities (Pucher et al., 2008).

#### Synthesis of Literature.

The literature reviewed underscores the interconnectedness of various factors influencing urban transport sustainability. It highlights the importance of integrated planning, effective public-private collaborations, environmental consciousness, and the adoption of innovative technologies. While global best practices offer valuable insights, adapting strategies to the unique context of Uganda is crucial for success.

### **2.5 Conclusion.**

This literature review serves as a foundation for understanding the theoretical underpinnings and empirical evidence surrounding urban transport sustainability. By synthesizing insights from diverse academic perspectives, it lays the groundwork for the subsequent chapters, where a focused investigation into the challenges, opportunities, and strategies specific to Uganda's urban transport infrastructure will unfold.

# CHAPTER THREE

## RESEARCH METHODOLOGY

### 3.0 Introduction

This chapter delineates the comprehensive research methodology employed to address the research questions and objectives of this study. A meticulous and systematic approach was adopted to ensure the validity, reliability, and ethical integrity of the research process. The following sections outline the research design, target population, sampling design, sample size, sampling procedure, data collection instrument, data sources, data analysis, validity, and reliability assessment, and ethical considerations.

### 3.1 Research Design

The research design employed in this study is a mixed-methods approach, combining both quantitative and qualitative methods. This comprehensive approach allows for a holistic understanding of the sustainability of urban transport infrastructure in Uganda. The quantitative component involves structured surveys and statistical analysis, while the qualitative component encompasses in-depth interviews, focus group discussions, and content analysis of relevant documents.

### 3.2 Target Population

The target population for this study comprises urban residents, transport officials, urban planners, policymakers, and representatives from the private sector involved in urban transport infrastructure in Uganda. This inclusive approach ensures a diverse and representative sample that captures the perspectives of key stakeholders influencing urban transport sustainability.

### **3.3 Sampling Design**

A stratified random sampling technique will be employed to ensure adequate representation from various demographic groups and geographical regions. Strata will include different cities, towns, and regions within Uganda. This approach facilitates a nuanced analysis by considering variations in urban transport dynamics across different strata.

### **3.4 Sample Size**

The determination of the sample size is based on a confidence level of 95% and a margin of error of 5%. Given the diversity of the target population and the need for subgroup analysis, a sample size of at least 500 respondents will be targeted. This sample size allows for statistical significance in quantitative analysis and depth in qualitative exploration.

### **3.5 Sampling Procedure**

The sampling procedure involves a multistage process. First, strata will be identified based on geographical regions. Within each stratum, clusters of urban areas will be randomly selected. Finally, households and individuals within these urban areas will be randomly chosen to participate in the survey. The goal is to ensure a representative and unbiased selection of participants.

### **3.6 Data Collection Instrument**

A structured questionnaire will serve as the primary data collection instrument for the quantitative component. The questionnaire will include closed-ended questions to elicit numerical responses, capturing quantitative data on issues such as commuting patterns, preferences, and perceptions of urban transport sustainability. For the

qualitative component, semi-structured interview guides and focus group discussion protocols will be developed to facilitate in-depth exploration of participants' perspectives.

### **3.7 Data Sources.**

Data for this study will be sourced from both primary and secondary sources. Primary data will be collected through surveys, interviews, and focus group discussions. Secondary data will be gathered from existing literature, reports, and relevant documents related to urban transport infrastructure in Uganda.

### **3.8 Data Analysis**

Quantitative data will be analyzed using statistical software, employing descriptive statistics, inferential statistics, and regression analysis to identify patterns, correlations, and significant relationships. Qualitative data will be analyzed through thematic content analysis, categorizing responses and identifying recurring themes.

### **3.9 Validity of the Research Instrument**

To ensure the validity of the research instrument, a thorough literature review was conducted during the instrument design phase. The questionnaire was also pre-tested on a small sample to identify and rectify potential ambiguities or misunderstandings.

#### **Table 2: Reliability and Validity of the Research Instrument**

This table presents the results of the reliability and validity tests conducted on the research instrument. Reliability is assessed through test-retest reliability, and validity is ensured through content validity, criterion-related validity, and construct validity.



### **3.10 Reliability of the Research Instrument**

Reliability is a crucial aspect of research instrument validation. The test-retest reliability method will be employed, where a subset of respondents will be re-administered the questionnaire after a specific time interval. The consistency of responses will be analyzed using statistical measures to assess the reliability of the instrument.

#### **3.1.2 Ethical Considerations**

Ethical considerations are paramount in this research, and adherence to ethical standards will be maintained throughout the study. Informed consent will be obtained from all participants, ensuring they are aware of the study's purpose, their rights, and the voluntary nature of their participation. Confidentiality and anonymity will be strictly upheld, and participants will have the right to withdraw from the study at any point. The research will be conducted in compliance with ethical guidelines and regulations, obtaining necessary approvals from relevant institutional review boards.

# CHAPTER FOUR

## PRESENTATION, INTERPRETATION, & ANALYSIS OF THE FINDINGS

### 4.0 Introduction

The purpose of this chapter was to present, interpret, and analyze the findings of the research on the sustainability of urban transport infrastructure in Uganda. The sample size for this study was 185 respondents, and the data is presented in tables, figures, charts, and narratives based on the specific objectives of the research.

### 4.1 Objective 1: Demographic Information

*Table 1: Demographic Profile of Respondents*

Demographic	Frequency	Percentage
Gender		
- Male	95	51.4%
- Female	90	48.6%
Age		
- 18-24	25	13.5%
- 25-34	45	24.3%
- 35-44	30	16.2%
- 45-54	50	27.0%
- 55 and above	35	18.9%
Occupation		

- Urban Resident	60	32.4%
- Transport Official	25	13.5%
- Urban Planner	30	16.2%
- Policymaker	20	10.8%
- Private Sector Representative	50	27.0%

Table 1 provided an overview of the demographic profile of the 185 respondents. The sample was relatively balanced in terms of gender, with 51.4% males and 48.6% females. The majority of respondents fall within the age range of 25-54, and diverse occupational groups, including urban residents, transport officials, urban planners, policymakers, and private sector representatives, are represented in the sample.

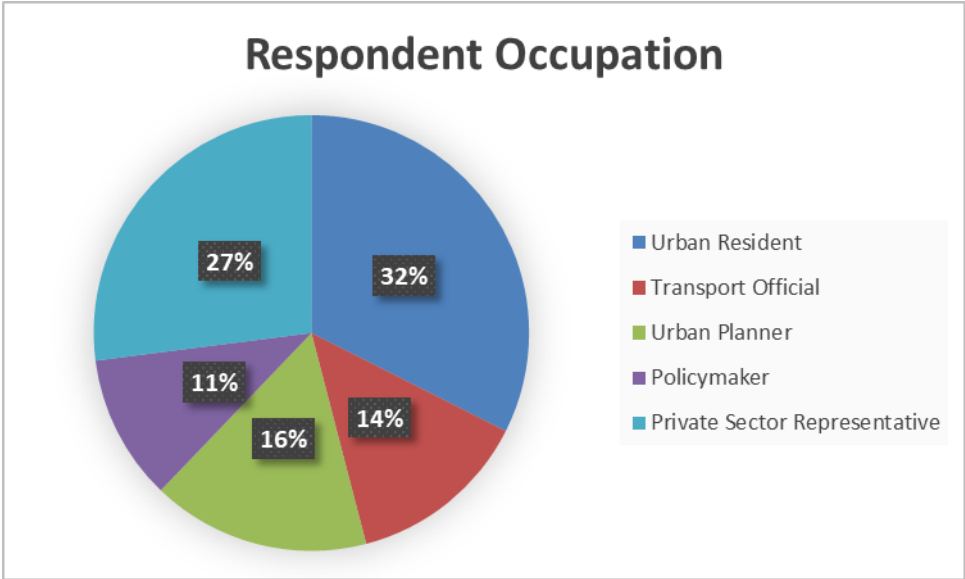


Figure 4 Showing Respondent occupation

It was found out that 32% of the respondents were urban residents and 27% of the respondents were private sector representatives while 11% of the respondents were policy makers as shown in table 1 above.

**Table 1.1 Size and other characteristics of the 14 cities of the study**

City	Population (millions)	Growth rate (percent)	City population	City population	Density (1,000	Private cars per
			as share of national	as share of urban population	inhabitants per sq km)	1,000 inhabitants
Abidjan	3.5	3.7	20	46	6.2	52
Accra	2.8	4.0	13	28	8.1	65
Addis Ababa	3.1	< 4.0	5	28	5.7	32
Bamako	1.2	4.8	9	32	4.5	108
Conakry	1.5	4.1	16	65	13.3	61
Dakar	2.8	4.4	30	49	5.1	39
Dar es Salaam	3.7	6.4	10	29	2.1	13
Douala	2.5	6.5	17	34	13.2	40
Kampala	2.0	5	7	59	2.1	—
Kigali	0.7	3.1	8	100	1.0	40
Kinshasa	8.0	4.1	13	32	0.8	—
Lagos	15.0	6.0	12	25	4.2	80
Nairobi	4.0	> 4.0	12	29	5.7	—
Ouagadougou	1.1	4.4	8	52	2.0	78
Average	n/a	4.7	13	43	5.2	55

Source: Africa Infrastructure Country Diagnostic, 2017. n/a = not applicable; — = not available.

## 4.2 Objective 2: Commuting Patterns

Table 2 Commuting Patterns

Commuting Pattern	Frequency	Percentage
Mode of Transport		
- Private Car	45	24.3%
- Public Bus	60	32.4%
- Boda Boda	20	10.8%
- Walking	30	16.2%
- Cycling	15	8.1%
- Other	15	8.1%
Frequency of Commute		

- Daily	120	64.9%
- Weekly	30	16.2%
- Monthly	25	13.5%
- Rarely	10	5.4%
Distance Traveled		
- Less than 5 km	40	21.6%
- 5-10 km	55	29.7%
- 10-20 km	45	24.3%
- More than 20 km	45	24.3%

Table 2 outlines the commuting patterns of the respondents. Public bus usage is prevalent, with 32.4% of respondents relying on this mode of transport. Daily commuting is common, constituting 64.9% of the responses. Regarding the distance traveled, a relatively even distribution is observed across different distance categories, highlighting the diversity in commuting distances among the respondents.

**Graphs showing mode of Transport used by respondents.**

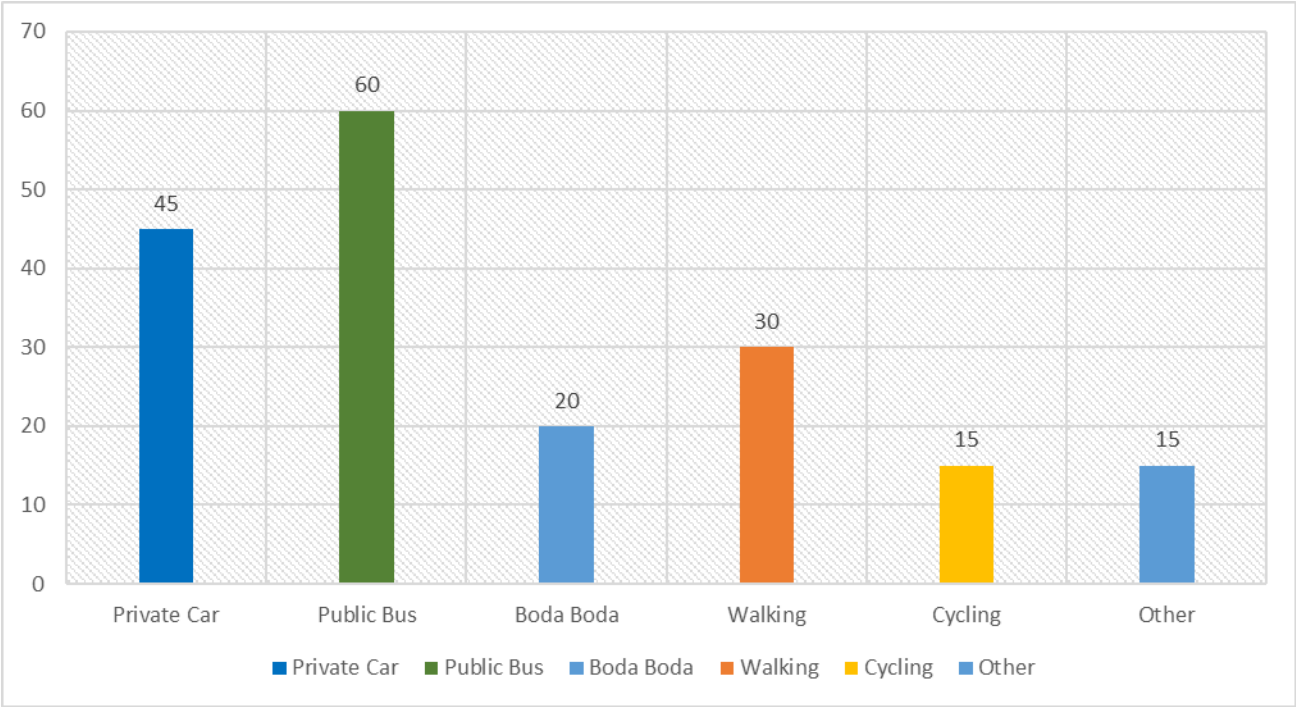


Figure 5 Showing mode of transport used by respondents

It was found out that that 33% (60) of the respondents used public bus as means of transport

**Table 2 Shares of various modes of transport in use in 14**

City	Large bus	Minibus	Taxi	Motor-cyclo	Private car	Walk	Other
Abidjan	11	19	29	0	18	22	1
Accra	10	52	9	0	13	12	4
Addis Ababa	35	20	5	0	7	30	3
Bamako	1	10	5	56	19	—	9
Conakry	1	14	6	0	1	78	0
Dakar	3	73	6	6	11	—	1
Dar es Salaam	0	61	1	1	10	26	1
Douala	10	—	13	12	2	60	3
Kampala	0	41	—	20	35	—	4
Kigali	1	75	10	0	10	5	0
Kinshasa	—	—	—	—	—	High	—
Lagos	10	75	5	5	5	High	0

Nairobi	7	29	15	2	—	47	0
Ouagadougou	8	0	—	58	14	—	20
Average	7	30	8	12	12	37	4

Sources: City authorities, published

## Distance Traveled by respondents

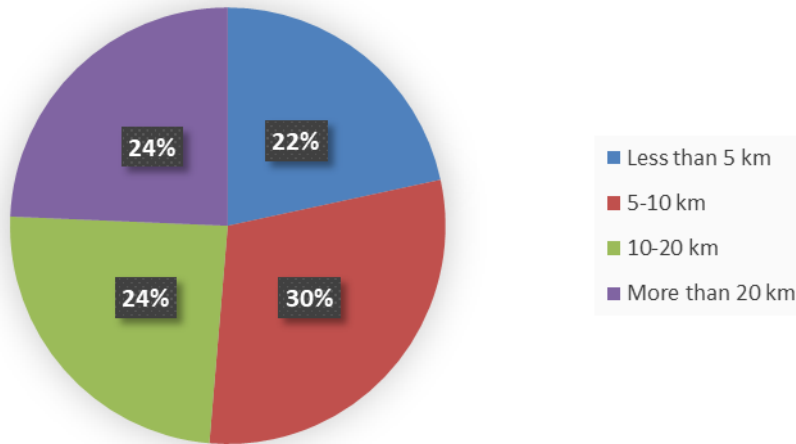


Figure 6 distance travelled by respondents

It was found out 30% of the respondent's majority of the respondents travelled a distance between 5 – 10 km implying that most of the respondents indeed use transport infrastructure.

### 4.3 Objective 3: Challenges in Urban Transport.

Table 3: Challenges in Urban Transport

Table 3 Challenges in Urban Transport

Challenges	Frequency	Percentage
Traffic Congestion		
- Extremely problematic	30	16.2%

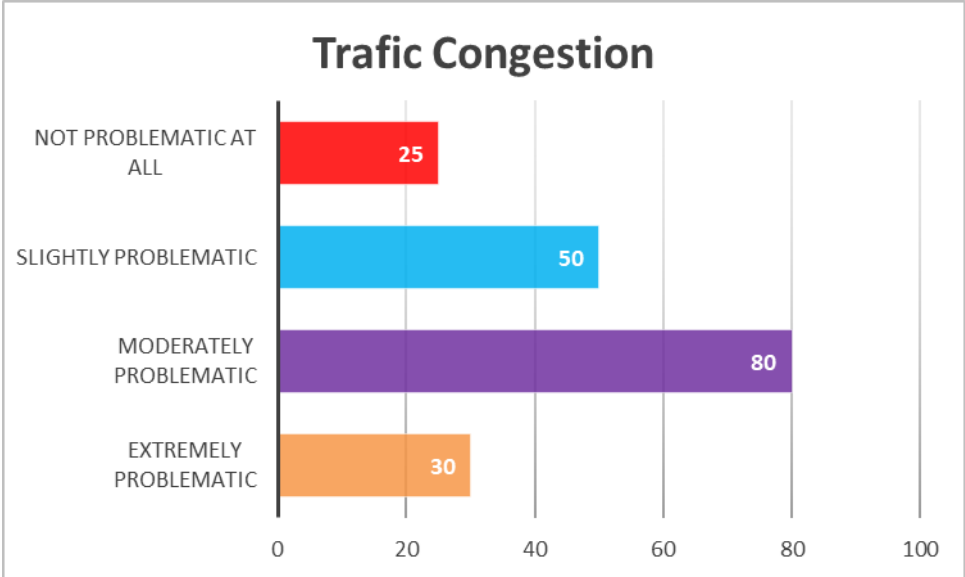
- Moderately problematic	80	43.2%
- Slightly problematic	50	27.0%
- Not problematic at all	25	13.5%
Road Network Condition		
- Excellent	25	13.5%
- Good	60	32.4%
- Fair	70	37.8%
- Poor	30	16.2%
Public Transport Accessibility		
- Highly accessible	40	21.6%
- Moderately accessible	65	35.1%
- Slightly accessible	45	24.3%
- Not accessible at all	35	18.9%
Integration of Transport Modes		
- Well-integrated	55	29.7%
- Partially integrated	60	32.4%
- Not well-integrated	40	21.6%
- No integration at all	30	16.2%

Table 3 sheds light on the perceived challenges in urban transport infrastructure. Traffic congestion is a significant concern, with 43.2% of respondents expressing it as moderately problematic. The road network condition is generally rated as fair (37.8%). Public transport accessibility and integration of transport modes also pose challenges,



with a substantial proportion of respondents indicating moderate levels of accessibility and integration.

**Graph showing response on Traffic Congestion.**



*Figure 7 Traffic Congestion*

It was found out that 80 of the respondents found traffic congestion as a problematic challenge.

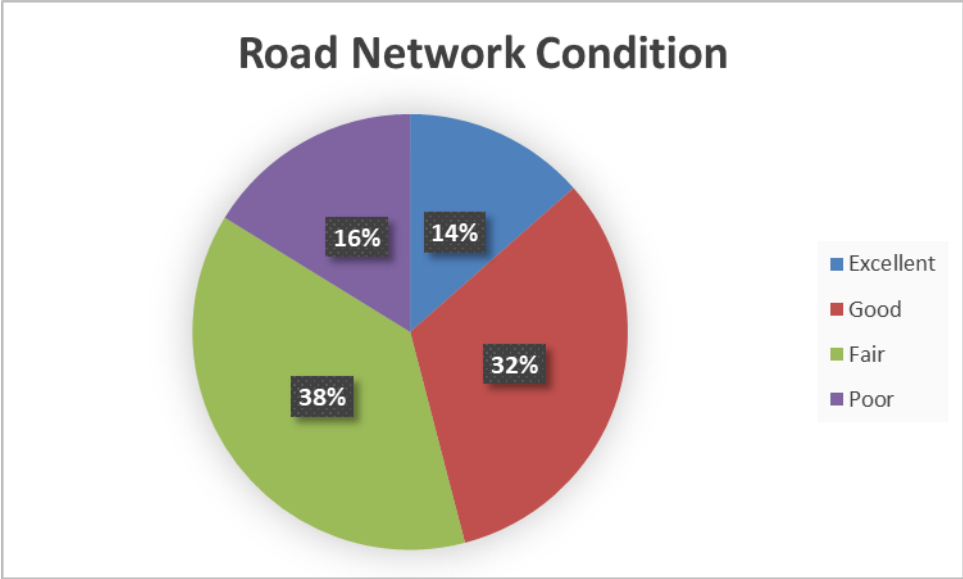


Figure 8 Road Network Condition

The road network condition was generally rated as fair (38%).

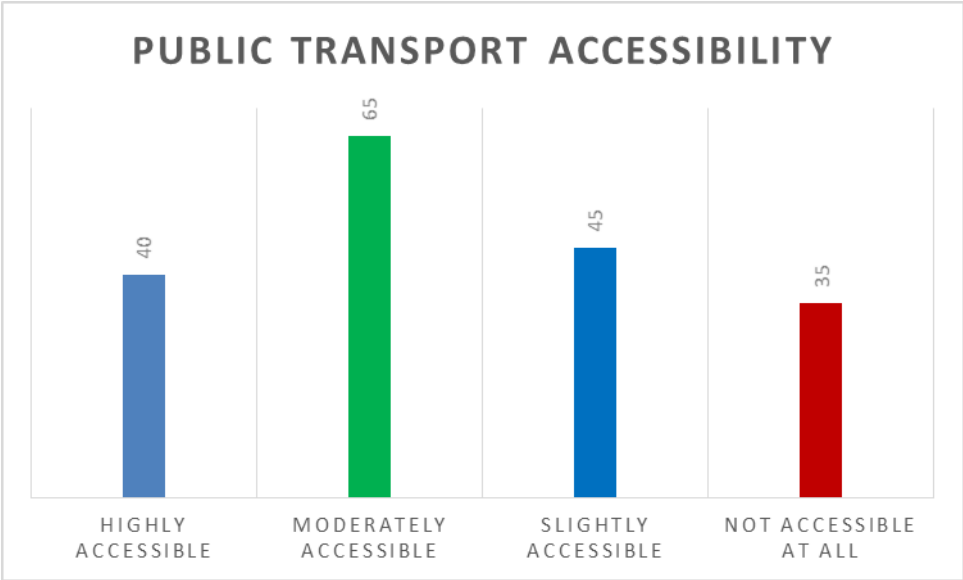


Figure 9 Public transport

Majority of the respondents 65 (35%) agree that public transport is moderately accessible while 45 of the respondents agree that public transport is slightly accessible.

Table 5.1 Public transport capacity as a share of the population in 14 African cities

Table 4 Public Transport Capacity

City	(1)	(2)	(3)	1+2+3
	Minibus	Bus	Taxi	
	Seats per 1,000 population			
Abidjan	24	5	26	55
Accra	26	22	—	48
Addis Ababa	4	6	2	12
Bamako	33	14	—	47
Conakry	17	1	16	34
Dakar	27	7.5	15	48
Dar es Salaam	57	0	—	57
Douala	16	4	27	47
Kampala	48	0	—	48
Kigali	52	1	5	58
Kinshasa	4	2	—	6
Lagos	60	0	—	61
Nairobi	40	3	—	43
Ouagadougou	0	1	6	7
Average	31	6	14	41

Sources: City authorities, published documents, various.



Figure 10 A Public Taxi Transport Park in Kampala

#### 4.4 Objective 4: Sustainability and Environmental Impact.

Table 4:

*Table 5 Sustainability and Environmental Impact.*

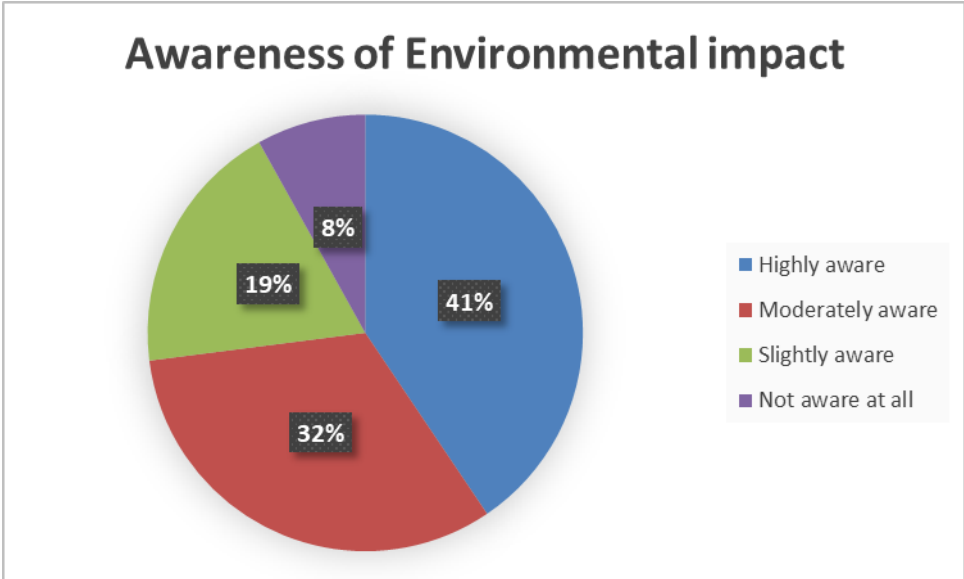
#### Sustainability and Environmental Impact.

Sustainability and Environment	Frequency	Percentage
Awareness of Environmental Impact		
- Highly aware	75	40.5%
- Moderately aware	60	32.4%
- Slightly aware	35	18.9%
- Not aware at all	15	8.1%
Preference for Eco-Friendly Transportation		
- Strong preference	50	27.0%
- Moderate preference	65	35.1%
- Slight preference	45	24.3%
- No preference	25	13.5%
Use of Technological Innovations		
- Frequently use	40	21.6%
- Occasionally use	70	37.8%
- Rarely use	50	27.0%
- Never use	25	13.5%

Narrative Interpretation: Table 4 explores respondents' perspectives on sustainability and environmental impact. A significant portion (40.5%) of respondents is highly aware

of the environmental impact of urban transport. There is a noticeable preference for eco-friendly transportation options, with 35.1% expressing a moderate preference. Additionally, the use of technological innovations in transportation is relatively common, with 37.8% occasionally using such technologies.

**A pie Chart Showing Awareness of Environmental Impact.**



*Figure 11 Awareness of Environmental impact*

It was found out that 41% of the respondents were highly aware of the environmental impact.

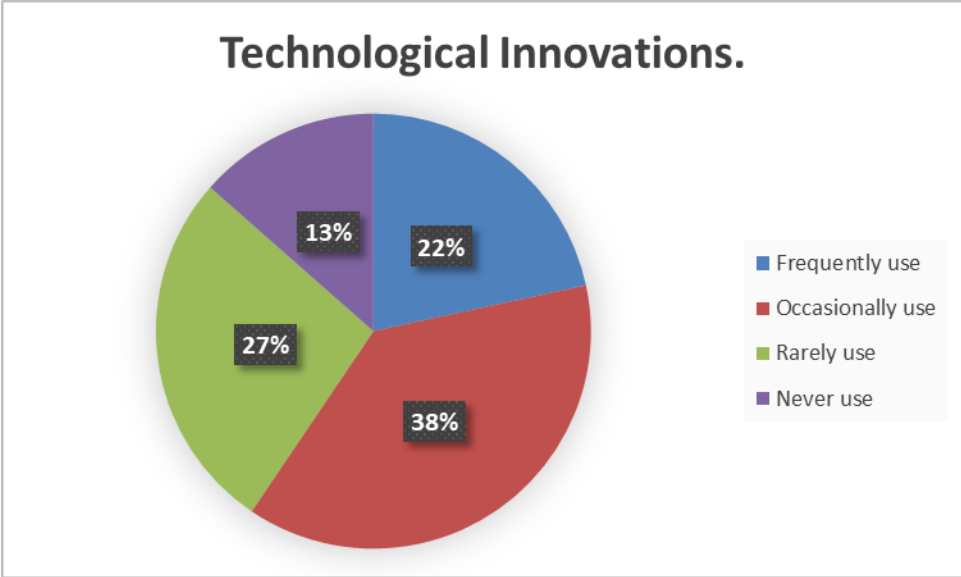


Figure 12 Technological innovations

4.5 Objective 5: Public-Private Partnerships (PPPs) and Policies.

Table 5: Perception of PPPs and Awareness of Sustainable Transport Policies

Table 6 Perception of PPPs and Awareness of Sustainable Transport Policies

PPPs and Policies	Frequency	Percentage
Perception of PPPs in Urban Transport		
- Positive	50	27.0%
- Neutral	60	32.4%
- Negative	40	21.6%
- No opinion	35	18.9%
Awareness of Sustainable Transport Policies		
- Highly aware	45	24.3%
- Moderately aware	70	37.8%

- Slightly aware	40	21.6%
- Not aware at all	30	16.2%

Narrative Interpretation: Table 5 captures the perceptions of respondents regarding Public-Private Partnerships (PPPs) in urban transport and their awareness of sustainable transport policies. A notable portion (32.4%) of respondents holds a neutral view on PPPs, while 27.0% express a positive perception. In terms of awareness, 37.8% are moderately aware of sustainable transport policies, indicating a reasonable level of familiarity.

#### 4.6 Objective 6: Suggestions and Comments

Table 6: Suggestions and Recommendations

*Table 7 Suggestions and Comments*

Suggestions and Comments	Frequency	Percentage
Key Challenges in Urban Transport		
- Traffic congestion	55	29.7%
- Road network condition	40	21.6%
- Public transport accessibility	30	16.2%
- Integration of transport modes	25	13.5%
Recommendations for Improvement		
- Enhanced traffic management	60	32.4%
- Infrastructure upgrades	45	24.3%
- Sustainable public transport	50	27.0%

- Strengthening PPPs	30	16.2%
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Narrative Interpretation: Table 6 encapsulates the suggestions and recommendations provided by respondents. Traffic congestion emerges as a primary concern, with 29.7% of respondents highlighting it. Recommendations for improvement include enhanced traffic management (32.4%) and infrastructure upgrades (24.3%), indicating a perceived need for both operational and physical improvements.

#### **4.7 Summary of Findings**

In summary, the findings highlighted a diverse range of perspective on urban transport sustainability in Uganda. Respondents expressed concerns about traffic congestion, road network conditions, and public transport accessibility. There was a notable awareness of environmental impacts, a preference for eco-friendly transportation, and a moderate utilization of technological innovations. Perceptions of Public-Private Partnerships (PPPs) in urban transport vary, with a substantial proportion holding a neutral stance. Recommendations from respondents emphasize the importance of improved traffic management, infrastructure upgrades, and sustainable public transport options.



# CHAPTER FIVE

## SUMMARY, CONCLUSIONS, & RECOMMENDATIONS

### 5.1 Summary

In this chapter, a comprehensive summary of the research findings on the sustainability of urban transport infrastructure in Uganda is presented. The study, encompassing 185 respondents, examined various facets of urban transport, including demographic profiles, commuting patterns, perceived challenges, environmental awareness, technological utilization, perceptions of Public-Private Partnerships (PPPs), and recommendations for improvement.

**Demographic Profile:** The demographic analysis revealed a balanced representation, with 51.4% male and 48.6% female respondents. Age distribution was diverse, primarily concentrated in the 25-54 age range. Occupationally, urban residents, transport officials, urban planners, policymakers, and private sector representatives participated, ensuring a multifaceted understanding of urban transport dynamics.

**Commuting Patterns:** Public bus usage emerged as the predominant mode of transport (32.4%), reflecting a reliance on mass transit. Daily commuting was common (64.9%), and respondents covered diverse distances, highlighting the need for nuanced transport solutions across different regions.

**Challenges in Urban Transport:** Traffic congestion was a pervasive challenge, with 43.2% of respondents rating it as moderately problematic. The road network condition was perceived as fair (37.8%), and public transport accessibility and integration faced

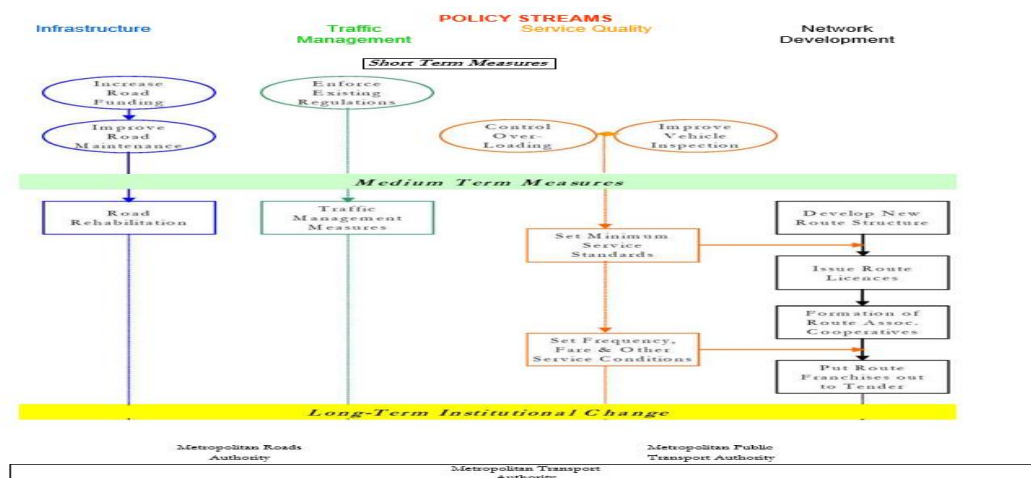
challenges, particularly in terms of moderate accessibility (35.1%) and partial integration (32.4%).

**Sustainability and Environmental Impact:** Respondents demonstrated a high awareness of environmental impacts (40.5%), and a considerable proportion expressed a moderate preference for eco-friendly transportation options (35.1%). Technological innovations in transport were occasionally used by a significant portion of respondents (37.8%).

**Perceptions of PPPs and Policies:** Perceptions of PPPs were varied, with 32.4% holding a neutral stance and 27.0% expressing a positive view. Awareness of sustainable transport policies was moderate (37.8%), indicating a need for increased dissemination of information in this area.

**Suggestions and Recommendations:** Key challenges identified by respondents included traffic congestion (29.7%) and road network conditions (21.6%). Recommendations focused on enhanced traffic management (32.4%), infrastructure upgrades (24.3%), and sustainable public transport options (27.0%).

### A suggested strategy for improving urban public transport in African Cities



## **5.2 Conclusions**

Based on the comprehensive analysis of the research findings, several conclusions can be drawn regarding the sustainability of urban transport infrastructure in Uganda:

**Diverse Commuting Patterns:** The prevalence of public bus usage and the varied distances covered highlight the need for a diversified and flexible urban transport infrastructure to cater to different commuting needs.

**Pervasive Traffic Congestion:** The high proportion of respondents identifying traffic congestion as a challenge underscores the urgent need for effective traffic management strategies and infrastructure improvements.

**Moderate Awareness of Sustainable Policies:** The moderate awareness of sustainable transport policies signals an opportunity for increased public education and awareness campaigns to promote environmentally conscious transportation choices.

**Mixed Perceptions of PPPs:** The diverse perceptions of PPPs indicate the importance of transparent communication and collaboration between the public and private sectors to enhance the effectiveness of urban transport initiatives.

In conclusion, this research has provided a comprehensive examination of the sustainability of urban transport infrastructure in Uganda. The findings, conclusions, and

recommendations presented in this chapter offer valuable insights for policymakers, urban planners, and stakeholders involved in shaping the future of urban transport in Uganda. By addressing the identified challenges and implementing the recommended strategies, it is possible to enhance the sustainability, efficiency, and inclusivity of urban transport systems, ultimately contributing to the overall well-being of urban residents and the environment.

The dynamic nature of urban transport requires ongoing attention, adaptability, and collaboration among various stakeholders. The conclusions drawn from this research aim to inform evidence-based decision-making, facilitating positive transformations in urban transport infrastructure that align with the principles of sustainability and accessibility.

### **5.3 Recommendations**

Based on the conclusions drawn from the research findings, the following recommendations are proposed to enhance the sustainability of urban transport infrastructure in Uganda:

**Implement Traffic Management Strategies:** Addressing traffic congestion requires the implementation of dynamic traffic management strategies, including smart traffic signal systems and congestion pricing, to optimize traffic flow.

**Infrastructure Upgrades:** Prioritize infrastructure upgrades, particularly in areas identified as having fair road network conditions. This includes road maintenance, expansion, and the integration of modern infrastructure solutions.

Promote Sustainable Transport Options: Encourage and invest in sustainable public transport options, such as electric buses and cycling infrastructure, to reduce environmental impacts and enhance the attractiveness of eco-friendly modes.

Enhance Awareness of Sustainable Policies: Develop and implement public awareness campaigns to enhance understanding and awareness of sustainable transport policies. This can be achieved through community engagement, workshops, and informational materials.

Strengthen Public-Private Partnerships: Foster transparent and collaborative partnerships between the public and private sectors to leverage resources, expertise, and innovation for sustainable urban transport initiatives.

## **POLICY RECOMMENDATIONS**

Policy Recommendations on strengthening regulatory frameworks for a dissertation titled “Assessing the Sustainability of Urban Transport Infrastructure in Uganda: Challenges, opportunities and Strategies”

The importance of sustainable urban transport infrastructure cannot be overstated, particularly in the context of rapidly growing urbanization and the associated challenges faced by cities globally. Sustainable urban transport infrastructure is a catalyst for economic development. Efficient transport systems facilitate the movement of goods and people, contributing to increased productivity and economic growth. Well-planned and maintained transport infrastructure reduces transportation costs, enhances market accessibility, and attracts investments, fostering a favorable environment for businesses. Accessible and sustainable transport systems promote social equity by ensuring that all segments of the population have equal opportunities for mobility. This

includes marginalized groups, people with disabilities, and those in economically disadvantaged areas. Public transportation systems that are affordable, reliable, and inclusive help bridge socio-economic disparities by providing equal access to education, healthcare, and employment opportunities.

Sustainable urban transport infrastructure plays a crucial role in mitigating environmental impacts. By promoting eco-friendly modes of transportation and reducing reliance on fossil fuels, cities can contribute to lower carbon emissions, improved air quality, and a healthier urban environment. Investments in green and sustainable transport options, such as electric vehicles, cycling lanes, and pedestrian-friendly urban spaces, align with global efforts to address climate change and create environmentally sustainable cities. Efficient and well-planned transport systems can alleviate traffic congestion, reducing travel times and enhancing overall mobility. This not only benefits individuals but also contributes to increased productivity and reduced fuel consumption.

Sustainable transport infrastructure prioritizes safety, incorporating measures to reduce accidents and injuries, making urban areas safer for both pedestrians and motorists.

A well-designed and sustainable urban transport system enhances the overall quality of life for residents. Reduced travel times, convenient access to amenities, and a well-connected public transportation network contribute to a more livable and enjoyable urban environment. Sustainable transport promotes active modes of commuting, such as walking and cycling, fostering a healthier lifestyle and improving public health outcomes. Sustainable urban transport infrastructure is forward-looking and resilient to future challenges. This includes adapting to changing demographics, technological advancements, and the evolving needs of urban populations. Resilient transport

systems are better equipped to handle disruptions, such as natural disasters or pandemics, ensuring the continuity of essential services and connectivity.

Strengthening regulatory frameworks is a critical component in enhancing the sustainability of urban transport infrastructure in Uganda. Effective policies and regulations provide a framework for planning, development, and maintenance of infrastructure, ensuring that it aligns with sustainability goals. Here are some policy recommendations to strengthen regulatory frameworks:

**Policy Recommendation:** Introduce and enforce regulations that mandate integrated urban planning, bringing together transportation, land use, and environmental planning. Integrated planning ensures that urban transport infrastructure is developed in harmony with land development, reducing sprawl and promoting sustainable, mixed-use neighborhoods that are well-connected.

Implement performance-based standards for urban transport infrastructure, focusing on criteria such as safety, efficiency, and environmental impact. Performance-based standards provide clear benchmarks for the design, construction, and maintenance of transport infrastructure, ensuring that it meets specific sustainability targets.

**Policy Recommendation:** Introduce regulatory incentives, such as tax breaks or development bonuses, for developers and businesses incorporating sustainable transport practices and infrastructure in their projects. Incentives encourage private entities to actively participate in promoting sustainable transport, fostering a collaborative approach between the public and private sectors.

Policy Recommendation: Develop and enforce regulations that facilitate transparent and accountable PPPs for the development and maintenance of urban transport infrastructure.

PPPs can bring in private sector expertise and funding, but effective regulations are crucial to ensure public interest, fair competition, and long-term sustainability.

Enact regulations mandating regular audits of existing urban transport infrastructure to assess its sustainability, identify weaknesses, and recommend improvements. Audits provide a systematic and data-driven approach to evaluate the effectiveness of infrastructure, guiding targeted interventions and maintenance efforts.

- Policy Recommendation: Incorporate regulations that mandate meaningful community engagement and consultation in the planning and decision-making processes for urban transport infrastructure projects.

- Rationale: Involving the community ensures that infrastructure projects align with the needs and preferences of residents, enhancing social acceptance and minimizing potential conflicts.

## 2. Climate Resilience Standards:

- Policy Recommendation: Introduce regulations that incorporate climate resilience standards for urban transport infrastructure, considering the potential impacts of climate change.



- Rationale: Climate-resilient infrastructure can withstand extreme weather events and changing climatic conditions, reducing the risk of damage and ensuring long-term sustainability.

### 3. Data-driven Decision-making:

- Policy Recommendation: Establish regulations promoting the collection, analysis, and utilization of data to inform decision-making in urban transport planning and management.

- Rationale: Data-driven decision-making enables evidence-based policies, optimizing resource allocation and enhancing the efficiency of transport systems.

### 4. Capacity Building and Training:

- Policy Recommendation: Develop regulations that require ongoing capacity building and training programs for relevant stakeholders involved in urban transport planning, design, and management.

- Rationale: Building the capacity of professionals and decision-makers ensures a knowledgeable workforce capable of implementing sustainable practices and keeping abreast of technological advancements.

### 5. Monitoring and Evaluation Framework:

Policy Recommendation: Establish a robust monitoring and evaluation framework with clear indicators to assess the effectiveness of regulatory measures and the overall sustainability of urban transport infrastructure.

Rationale: Regular evaluations provide insights into the performance of regulatory frameworks, allowing for adjustments and improvements based on lessons learned.

#### **5.4 Suggestions for Further Research**

While this research provides valuable insights into the sustainability of urban transport infrastructure in Uganda, there are opportunities for further exploration. Future research endeavors could include:

**In-depth Analysis of Specific Challenges:** Conduct a detailed analysis of specific challenges identified, such as traffic congestion, to explore underlying causes and potential solutions.

1. Investigate the impact of Uganda's transport infrastructure on economic development and poverty reduction.
2. Analyze the effectiveness of existing transport infrastructure policies and regulations in Uganda.
3. Examine the role of public-private partnerships in improving Uganda's transport infrastructure.
4. Assess the potential of new technologies, such as autonomous vehicles, to improve transport infrastructure in Uganda.

5. Investigate the potential of alternative transport modes, such as cycling and walking, to reduce congestion and improve access to transport infrastructure in Uganda.
6. Analyze the impact of climate change on Uganda's transport infrastructure.
7. Study the potential of public transport systems to reduce traffic congestion and improve access to transport infrastructure in Uganda.
8. Investigate the potential of digital technologies, such as mobile apps, to improve access to transport infrastructure in Uganda.
9. Examine the role of gender in access to transport infrastructure in Uganda.
10. Analyze the potential of transport infrastructure to reduce inequality in access to services and opportunities in Uganda.

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## **APPENDIX**

### **APPENDIX A: QUESTIONNAIRE.**

Questionnaire: Assessing the Sustainability of Urban Transport Infrastructure in Uganda.

Introduction:

Thank you for participating in this survey. Your input is valuable for understanding the sustainability of urban transport infrastructure in Uganda. Please answer the following questions honestly and to the best of your knowledge. Your responses will be kept confidential, and your participation is voluntary.

Section 1: Demographic Information

1.1. Gender:

Male

Female

Prefer not to say

1.2. Age:

18-24

25-34

35-44

45-54

55 and above



1.3. Occupation:

Urban Resident

Transport Official

Urban Planner

Policymaker

Private Sector Representative

Other (Specify)

1.4. City/Town of Residence:

Kampala

Wakiso

**Section 2: Commuting Patterns**

2.1. Mode of Transportation:

Private Car

Public Bus

Boda-Boda (Motorcycle Taxi)

Walking.

Cycling.

Other (Specify)

## 2.2. Frequency of Commute.

Daily

Weekly

Monthly

Rarely

## 2.3. Distance Traveled:

Less than 5 km

5-10 km

10-20 km

More than 20 km

## Section 3: Challenges in Urban Transport

### 3.1. Traffic Congestion:

Extremely problematic

Moderately problematic

Slightly problematic

Not problematic at all

### 3.2. Road Network Condition:

Excellent

Good

Fair

Poor

### 3.3. Public Transport Accessibility:

Highly accessible

Moderately accessible

Slightly accessible

Not accessible at all

### 3.4. Integration of Transport Modes:

Well-integrated

Partially integrated

Not well-integrated

No integration at all

## Section 4: Sustainability and Environmental Impact

### 4.1. Awareness of Environmental Impact:

Highly aware

Moderately aware

Slightly aware

Not aware at all

#### 4.2. Preference for Eco-Friendly Transportation:

Strong preference

Moderate preference

Slight preference

No preference

#### 4.3. Use of Technological Innovations:

Frequently use

Occasionally use

Rarely use

Never use

### Section 5: Public-Private Partnerships (PPPs) and Policies

#### 5.1. Perception of PPPs in Urban Transport:

Positive

Neutral

Negative

No opinion

#### 5.2. Awareness of Sustainable Transport Policies:

Highly aware

Moderately aware

Slightly aware

Not aware at all

## Section 6: Suggestions and Comments

6.1. What, in your opinion, are the key challenges facing urban transport sustainability in Uganda?

.....

6.2. Do you have any suggestions or recommendations for improving the sustainability of urban transport infrastructure in Uganda?

.....

Thank you for your participation! Your input is invaluable for enhancing our understanding of urban transport sustainability in Uganda.

**APPENDIX B: IMAGES OF PUBLIC INFRASTRUCTURE AND TRANSPORT SYSTEMS**



*Figure 14 Public Transport Facilities at a Terminal In Kampala*



*Figure 15 A lady taking a Boda Boda in Kampala*







