The United Republic of Tanzania

Ministry of Transport

Land Transport Regulatory Authority (LATRA)

Assessment of the Demand and Supply of Commuter Bus Services in Dar es Salaam and Mwanza City.

Executive Summary

The Tanzania Development Vision 2025 aims to enhance the well-being of Tanzanians across all critical aspects of life. Among the key focus areas of the vision is the development of urban commuter services. The Land Transport Regulatory Authority (LATRA) plays a vital role in ensuring that this overarching goal is achieved. To implement this effectively, LATRA is formulating various strategies aimed at improving transport market performance. However, prior to taking any action, LATRA has to ensure its regulatory decisions are based on accurate information. The absence of adequate information exposes LATRA to the risk of failure to allocate an optimal number of commuter buses in different routes. Consequently, LATRA has opted to commission a study to address this information gap. The study seeks to determine whether the provision of commuter bus services aligns with the users' demand in Mwanza and Dar-es-Salaam cities. The study is guided by several specific objectives. These are to: identify significant factors in establishing routes and the optimal number of buses; establish route-level characteristics of commuter services demand; and determine passengers' commuting decision factors. Thus, the consultants were required to review the available studies and documentations related to the objectives of assignment. The other tasks were to: establish the frequency of bus services on the selected routes and their corresponding occupancy ratios; establish the profile of travelling passengers, their travelling patterns and trip planning behaviour; assess commuter transport operations, including ownership profile and service turnover; determine the requirements of commuter passengers, including the impact of alternate means of urban transport; forecast the demand and supply of commuter buses for the next three to five years; and propose a model for assessing the required commuter buses for different routes. Finally, the consultants were required to provide recommendations for improvement of the quality and efficiency of commuter bus services in Mwanza and Dar-es-Salaam cities.

This study was carried out in cities of Dar es Salaam and Mwanza, through a comprehensive documentary review, survey and observation. Thus, the study utilized both primary secondary data.

The study focused on a selected sample of 15 routes, including 12 in Dar es Salaam and 3 in Mwanza. The selected routes in the Dar es Salaam city were: Masaki to Kariakoo, Mbagala to Gerezani, Tegeta Nyuki to Posta, Gongolamboto to Mnazi Mmoja, Kigogo Mburahati to Mnazi mmoja, Tabata Segerea to Mnazi Mmoja, Tandika to Gerezani, Makumbusho to Posta, Kigamboni to Gerezani, Kigamboni to Kongowe, Kimara to Kivukoni, and Kimara to Gerezani. On the other hand, Kisesa to Airport, Nyashishi to Nyamadoke, and Kisesa to Nyashishi routes formed part of the study in Mwanza.

Data was collected in three levels: firstly, to establish the number of trips a bus travels within a route while also capturing several passengers embarking and disembarking during pick and off pick time. Secondly, by counting commuter buses (*Daladala),* motorcycles (*Bodaboda)* and motor tricycles (*Bajaji*) after identifying the appropriate stations at each of the sampled routes. Thirdly, a semi-structured questionnaire was administered to passengers and drivers. A total of 192 and 339 questionnaires were collected from the drivers and passengers, respectively. To ensure the validity of the questions, a pre-testing of the survey instruments was done, and the necessary adjustments were made before the data collection exercise. In

addition, interviews were conducted with key informants from amongst the drivers and owners' association, conductors, LATRA, UDART and DART.

The data collected using the questionnaire was cleaned, coded and entered into STATA software. Relevant analytical frameworks were applied in order to address the specified tasks. The main findings from the study are summarized based on the tasks prescribed under the terms of reference.

The main findings of the study include the following:

Tasks#1: *Review of the relevant studies and documents*

i. Like many African cities, Dar-es-Salaam and Mwanza lack adequate mobility data, which is crucial for effective public transportation planning and regulation (Ochoa et al., 2021). The limited scope and timeframes of the available data hinders the provision of efficient urban transport services (Haas, 2022).
ii. The existing literature indicates that the unmet demand for urban public transport services in Dar-es-Salaam and Mwanza, as well as in other cities across Africa, is partly associated with the inadequate engagement with stakeholders in planning, prioritization, implementation, and operation of suitable transport systems (Shafan et al., 2024; Okyere et al., 2024; Cinderby et al., 2024).
iii. In several African countries, including Tanzania, various institutions at both the city and national levels are responsible for different functions related to the provision of urban public transport services. This institutional arrangement often leads to ineffective coordination, which affects the development of a well-functioning transport system (Welle and Kustar, 2022).
iv. The inability to meet the demand for urban public transport services in several African cities is linked to the inadequate adoption of an integrated approach to the provision of the service. For example, even though walking and cycling are predominant modes of public transport in many African cities such as Mwanza and Dar-es-Salaam, generally the focus has been on the development of transport infrastructure for motorized vehicles (Ochoa et al., 2021; Oviedo et al., 2024).
v. Over the past two decades, *Bajaji* and *Bodaboda* have become prominent in the provision of urban commuting services across Sub-Saharan African cities like Dar-es-Salaam and Mwanza (Ochoa et al., 2021; Ntramah et al., 2023). While in Tanzania, they are legally registered to provide hired transport services. *Bodaboda* and *Bajaji* contribute to several challenges such as non-compliance to regulations, congestion, road accidents, and air pollution (Ntramah et al., 2023). Unfortunately, Tanzania, like the other African nations, has yet to establish a consistent policy to address these issues (Welle and Kustar, 2022).
vi. Studies indicate that African countries including Tanzania, have been experiencing challenges in raising funds needed for construction of adequate urban transport infrastructure (Okyere et al., 2024).

Tasks#2: Analysis of commuter bus frequency, occupancy ratios and travel behaviour.

i. The study shows that commuter buses achieve an average frequency of 9 to 10 round trips per

day on most of the selected routes in Dar es Salaam and Mwanza cities. Implying that amongst other issues, passengers experience long waiting and travel times.

ii. The observed occupancy ratio in both the cities ranges between 550 and 750 passengers ferried by a bus on a typical busy day in Dar-es-Salaam. While in Mwanza it is between 390 and 455.

iii. The observed travelling patterns in both cities are characterized by many passengers during peak hours and fewer passengers during off-peak hours. On average 60% of the passengers travel during the peak hours.

iv. The findings indicate gender-based difference in the demand for commuter services in the cities. On average 56.1% of the sampled passengers were male, while 43.9% were female.

v. The study found that on average 68.25% of all the of the interviewed passengers preferred use of commuter buses. This is largely attributed to its relative affordability as compared with the available alternatives.

vi. Findings show the existence of early morning travellers, who create a positive externality for society. However, they pay the same fare as those who travel during peak hours.

vii. Nested Logit Model reveals significant factors influencing passengers' choice of travel mode in the cities, which include perceptions of safety, the extent of congestion, the presence of alternative travel options, and the specific purposes of travel. As a result, individuals may be more inclined to select public transportation over private alternatives. This highlight the importance of understanding these dynamics in transportation planning and policy.

Tasks#3: Assessment of Commuter transport operations, including ownership profile and service turnover.

i. The findings indicate that the contractual arrangements over commuter buses transport operations are not efficient. This is one of the main reasons for the operators to exit the commuter services business.

ii. The study observed that commuter buses are more regulated than the motorcycles and motor-tricycles.

iii. The study revealed that the number of licensed commuter buses is less than the required buses in all the examined routes in Mwanza and Dar-es-Salaam cities. Furthermore, many of the licensed commuter buses operates up to approximately 60 percent of the expected operational service capacity, due to wear and tear.

iv. It was established that all of the commuter buses in Mwanza and Dar-es-Salaam cities are owned by individuals rather than associations or companies.

v. The study revealed a high turnover among commuter bus owners in both cities. This imply amongst other issues, the existence of unfavourable business environment.

vi. It was also found that the growth rate in the number of licensed commuter buses has been declining in the investigated routes in Mwanza and Dar-es-Salaam. For instance, between 2022 and 2023 five out of the twelve examined routes in Dar-es-Salaam experienced a decline in the number of licensed commuter buses.

vii. Findings indicate lack of dynamic efficiency in the provision of commuter services. This is reflected by the fact that the quality of commuter bus services has not changed over the years.

Tasks#4: Assessment of user needs and requirements of commuter passengers, including the impact of alternate means of urban transport.

i. The study revealed that there is an insufficient number of buses to meet passengers' demand in the examined routes. In Mwanza, the shortfall ranges from 20 up to 72 buses, while in Dar es Salaam, it is between 42 to 185 buses per route.
ii. Most passengers are dissatisfied with each of the means of transport in the cities due to various experienced challenges.
iii. The findings show that passengers often switch between different means of transport. The switching is influenced by the availability of alternative transport options, weather conditions, and traffic congestion.

Tasks#5: Projection of demand and supply of commuter buses.

i. The study has established in the next five years, the required number of commuter buses will range between 79 to 378 buses in the selected routes in Dar-es-Salaam. In Mwanza city the demand for the commuter buses will range from 105 buses to 151 buses in the selected routes.

Tasks#6: A proposed model for assessing the required number of commuter buses for specific routes.

vii. Ideally the model for establishing the required number of buses should be determined based on the evaluation of the panel data on passengers' behaviour. Unfortunately, such data was not available. Hence the study proposes a model that uses time series data of the city's GDP and total population. The required number of buses for a specific route is then calculated by multiplying the total demand by a route factor, which is determined for each specific time period.

In light of the findings presented above, this study recommends the following:

viii. There should be a continuous mechanism to collect and archive mobility data, including panel and time series that could be used to design strategies and data-driven models for forecasting demand and supply of urban transportation services.
ix. An integrated approach should be adopted for the provision urban transport services in order to effectively address the ever-increasing demand for urban commuting services. This requires simultaneous development of different transportation alternatives.
x. There is a need for the establishment of a city-level autonomous coordinating institution to manage urban transport services. The institution shall be ultimately accountable for the provision of urban public transport services.
xi. Enhanced stakeholder engagement on all aspects of urban transport sector development, particularly in planning, prioritization, and operationalization of the transport system is needed.
xii. LATRA should promote licensing of commuter buses with a higher occupancy ratio. This will contribute in addressing the growing demand for commuter bus services.

xiii. LATRA should review the bus fares in collaboration with the stakeholders to establish reasonable fares that are affordable and which can ensure financial sustainability of the commuter bus operations. This is likely to contribute to the enhancement of the quality of commuter services.

xiv. Appropriate strategies should be implemented to develop and enhance commuter bus services and non-motorized transport (NMT), as the most preferred means of transport in the cities.

xv. LATRA has to consider extending bus routes to the interior areas, where roads are passable in order to reduce additional transport costs to the passengers.

xvi. LATRA conduct a study on the profitability and efficient operation model for the various commuter services across different means of transportation. This research is essential for ensuring sustainable provision of commuter services in the cities of Mwanza and Dar es Salaam.

xvii. LATRA has to re-evaluate and improve licensing protocols to ensure they comprehensively capture essential details regarding ownership of commuter buses.

xviii. To enhance service delivery, LATRA should evaluate and optimize supply across all routes by licensing additional commuter buses that align with the current demand levels.

xix. LATRA should enhance the management of commuter buses, through the use of a comprehensive monitoring system of the licensed buses. This initiative would facilitate efficient tracking and regulation of the urban commuter services.

xx. Although the regulation emphasizes the provision of hired transport service by motorcycles and motor tricycles, the two should be confined to the peripheries of cities.

xxi. Periodical surveys are essential for understanding the dynamics of commuter services in the two cities. These surveys will provide valuable insights that enable different authorities to formulate proactive policies aimed at enhancing the quality of public transport services.

xxii. It would be beneficial for LATRA to consider the introduction of a multi-tier system within the commuter bus services market. This approach could reduce the preference for private transport, alleviate road congestion, and enhance the overall welfare of both passengers and operators.

xxiii. LATRA may consider to commuter bus fare discrimination across different travelling times, especially peak and off-peak periods.

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Section One

1 Introduction

Tanzania's development goals are clearly defined in the National Development Vision 2025. The country is committed to providing a high standard of living for its citizens, promoting good governance based on the rule of law, and fostering a strong and competitive economy. To realize these transformative objectives, the vision document emphasizes several key areas of intervention, prioritizing the development of the transport sector. As urban areas continue to grow, enhancing urban transport systems is vital for fostering meaningful social and economic progress. Urban transport plays a pivotal role in improving access to goods, services, and opportunities, all of which are essential for driving economic advancement. Therefore, urban freight and passenger transport are crucial components of the evolving urban environment (Marquet et al., 2020). Addressing the challenge of providing efficient urban commuter services presents a significant opportunity for many developing countries, particularly in the context of rapid population growth that outpaces service development and modernization. The World Bank (2023) optimistically projects that as more people migrate to urban areas and economic opportunities expand, there will be a considerable increase in the demand for transportation-related to work, education, social services, and recreation.

The recent Population and Housing Census of 2022 definitively establishes that the Dar es Salaam Region has surpassed 5.3 million residents, asserting its position as the most populous region in Tanzania. With a noteworthy growth rate of 5%, this city is clearly outpacing the national average, validating its role as a critical urban center. The Mwanza Region follows with nearly 3.7 million residents, predominantly concentrated in its bustling urban areas. This rapid urban population increase unequivocally exerts considerable pressure on public transport infrastructures, a situation that demands immediate action. As urban living becomes increasingly prevalent, daily commutes for economic, educational, and social purposes are non-negotiable, reinforcing the urgent need for efficient urban transportation systems. The scattered settlement patterns, compounded by inadequate land use planning, pose significant challenges for delivering effective commuter services. It is essential that these issues are confronted head-on to ensure urban transportation systems can adequately meet the growing demands of passengers and freight within our cities.

In response to the numerous challenges associated with urban transport, the government of Tanzania has prioritized enhancing the development of transportation systems within cities. The Long-Term Perspective Plan, spanning from 2011/2012 to 2025/2026, delineates a comprehensive strategy to tackle the pressing issues in urban transport.

One significant measure proposed is to mitigate the rapid growth of city populations by fostering productivity and establishing economic centers in rural areas. This approach aims to alleviate the pressure on urban environments by reducing the influx of rural-urban migration. Additionally, the plan emphasizes the creation of an integrated network of urban roads and railway systems. This expansion includes the development of satellite cities that will function as extensions of existing urban centers, helping to decentralize services and create vibrant sub-cities that can accommodate residents and reduce congestion. Another critical element of the strategy is promoting public transport usage among urban dwellers. This will be achieved by enhancing the efficiency and accessibility of commuter services,

making it easier and more appealing for residents to utilize public transport options. Furthermore, it is vital to continuously monitor and assess the evolving needs of urban transport. Conducting in-depth studies to investigate the current status and challenges faced by the transport sector will be instrumental in formulating timely and effective solutions that cater to the dynamic landscape of urban mobility. Through these multifaceted efforts, the government aims to create a more sustainable and efficient urban transport system that enhances the quality of life for all citizens.

Figure 1: A newly constructed bus stand at Mwenge

1.1 Background

Tanzania's land transport sector has evolved significantly over time, marked by various phases and unique policy frameworks that have shaped its development. After independence before the Arusha Declaration, the country was pursuing a free market economy. However, it didn't take long before the Arusha Declaration was endorsed. The declaration emphasized socialism and self-reliance and cherished a collective ownership of the factors of the production. Typically, this was a state-controlled economy with the Usafiri Dar Es Salaam (UDA) established public-owned company providing commuter services in Dar es Salaam City[1]. Like in many other developing countries, transport was subsidized by the government (Behrens et al.,2016). Since the government had owned all the major means

[1] The UDA and *Kampuni ya Mabasi ya Taifa* (KAMATA) were established following the nationalization of the Dar es salaam Motor Transport Company (DMT) – a British private company that started to provide commuter services in the Dar es salaam in 1949.

of production and distribution, price was fixed by the government. Pricing of services was largely politically driven, with negative consequences on the quality of services and financial viability to the service providers (Mwandosya, 2022).

The practice of subsidizing state-owned companies couldn't be maintained because of narrowed fiscal space; hence, the policy was halted when the government embraced the Structural Adjustment Programmes (SAPs). The SAPs emphasized implementing a market-led economy, whereby the private sector is encouraged to provide various goods and services, and the government is confined to providing public services and monitoring the markets to ensure optimal outcomes. Therefore, restructuring the economy through SAPs created a much wider space for the private sector to provide commuter services in different cities. In Dar es Salaam City, the *Daladala* (private commuter buses) were introduced to provide commuting services alongside the UDA. Ever since the liberalization of the transport sector business in Tanzania, the private sector has filled the void of state companies by playing a critical role in service provision, demonstrating their invaluable contribution to the sector's growth and development despite the existing challenges[2].

In light of the dynamic nature of the transport sector in cities, new challenges are emerging and changing regularly. Thus, adaptation to such changes was necessary, and it included regular policy and institutional reforms needed for the sector's development. For example, in order to address some of the challenges, the Surface and Marine Transport Authority (SUMATRA) mandated to regulate land and marine transport was established. However, later, it was considered necessary to separate the regulation of marine and land transport sections. Thus, two separate institutions were established: the Land Transport Authority (LATRA) and the Tanzania Shipping Agency Company (TASAC). Arguably, several policy and institutional changes have happened over time, including the establishment of regulations in 2020 to enforce the LATRA Act. These regulations include the Transport Licensing (Public Service Vehicles) Regulations that regulate passenger service vehicles, including commuter vehicles and others.

The Land Transport Regulatory Authority (LATRA) is a multi-sectoral regulatory authority established (under section 4(1) of the Land Transport Regulatory Authority Act, 2019 (Cap. 413) to regulate the land transport sector in mainland Tanzania. Section 5 (1) of the Act provides functions of the Authority that include enforcing standards for terms and conditions of supply of regulated goods and services. Furthermore, Section 6 (e) of the Act provides duties of the Authority, including promoting the availability of regulated services to all consumers. Under Para, the LATRA seeks to collect relevant information on, among others, the route of operation, number of buses, required bus carrying capacity, and passenger density. Regulating commuter services involves balancing the issued transport licenses with actual demand. On the other hand, the structure, trends and behaviour of commuter transport services are informed by the dynamics of urban dwellers' economic and social activities. As socioeconomic activities change, certain parameters in urban transport planning also change. Hence, the LATRA needs useful information to adjust routes and operators' licensing to meet expected demand in terms of standards, quality, and efficiency

[2] Although, SAPs is applauded for allowing the private sector to provide commuter services, there are sentiments that SAPs were the main reasons for the collapse of the previously existed nationalized companies in many African cities after the removal of the subsidy during the time when public transport was not profitable (Behrens et al., 2016).

of services. Section 5(1), subsection (g) calls for the LATRA to monitor the performance of regulated sectors in terms of standards, investments, costs and efficiency of services. In addition, studies of demand and supply of services enables the LATRA to obtain and monitor key factors for determining economic fares that protect efficient suppliers and affordability of consumers as a duty under Section 6. To achieve this, the LATRA regularly interacts with a cross-section of consumers to determine their needs and expectations. The LATRA and stakeholders interact through consultations and studies.

1.2 Rationale of the Study

The provision of efficient commuter services is not just important; it is essential for driving economic transformation and bringing about substantial social change. Thoughtful and comprehensive planning is imperative to guarantee that urban commuter services function effectively and seamlessly. This planning process must actively involve all key stakeholders in the urban transportation landscape, including government agencies, transport providers, and community representatives. By fostering collaboration among these parties, we can create a tailored and optimal supply of services that aptly satisfies the diverse needs of both passenger and freight transport, ultimately contributing to a more connected and thriving urban environment.

The Land Transport Regulatory Authority (LATRA) plays a vital role in regulating and overseeing urban transport systems, serving as a key guide for various stakeholders involved in this sector. By utilizing a range of regulatory frameworks and policy instruments, LATRA aims to create a well-structured and efficient transport environment. To achieve this goal, it is essential to gather and analyze timely and precise information that captures the dynamic nature of change within the transport landscape and its far-reaching implications. With this comprehensive understanding, LATRA is empowered to develop robust, evidence-based policies that not only enhance their regulatory effectiveness but also enable other stakeholders to provide commuter services that are more efficient and responsive to the needs of the public.

In light of the significant population growth in urban areas and various ongoing changes, it is imperative to acquire detailed information about the demand for commuter services. This information is essential for aligning supply with demand and ensuring the efficient delivery of services. Regular market surveys must be conducted to account for and reflect these necessary policy changes. Currently, there is a lack of updated information on the demand and supply of commuter services in Dar es Salaam and Mwanza—cities that are experiencing substantial population growth. The existing data is limited and outdated, relying on a study carried out by SUMATRA in 2017. Since then, numerous policy and institutional changes have taken place, notably the establishment of LATRA and the implementation of regulations in 2020 to enforce the LATRA Act. These regulations, which include the Transport Licensing (Public Service Vehicles), are crucial for governing passenger service vehicles, including commuter vehicles, and must be adhered to for effective service management.

Furthermore, the LATRA regulation requires that information regarding tariff determination be sourced from stakeholders. As such, the study on demand and supply seeks to position the LATRA to make informed regulatory decisions regarding efficiency in the allocation of

routes and vehicles and the setting of economic fares per the needs and expectations of consumers. However, limited information precludes the LATRA to fulfil its role adequately. The non-availability of such information exposes the LATRA to the risk of initiating inefficient routes and failure to allocate an optimal number of vehicles, which in turn may result in inefficiencies in service provision and compromised quality of services.

In light of this context, LATRA was tasked with conducting a study to gather current information that would aid in the efficient establishment of commuter routes, the allocation of commuter vehicles, and the determination of economic fares tailored to passenger demand in major cities, all in accordance with the new regulatory framework. Conversely, the lack of such information puts LATRA at risk of initiating inefficient routes and licensing an excessive or inadequate number of vehicles, which may lead to service inefficiencies and a decline in service quality. Consequently, the study explored the process of route establishment, determined the optimal number of buses needed, identified specific characteristics of commuter demand at the route level, and examined household behaviors related to commuting decisions. The findings from this study are anticipated to offer valuable insights that will support the optimal allocation of commuter routes and buses, thereby balancing the demand and supply for commuter service vehicles.

1.3 Objectives of the Study

The main objective of the assignment is to conduct a study on commuter bus operations in Mwanza and Dar-es-Salaam cities to obtain information that will eventually help to improve efficiency in the allocation of buses according to the demand on different routes.

Specific Objectives

The specific objectives of the study are as follows:

i. To identify significant factors in establishing routes and determining the optimal number of buses;

ii. To establish route-level characteristics of commuter services demand; and

iii. To obtain household transport demand behaviours and commuting decision factors

1.4 Scope of the Study

i. Review available studies and documentation with a view of establishing the necessary data required for the assignment to achieve its objective;

ii. Carry out analysis of collected data to establish, among others, the frequency of bus services on the selected routes and their corresponding occupancy ratios, profile of travelling passengers, their travelling patterns and trip planning behaviour;

iii. Critically assess Commuter transport operations, including ownership profile and service turnover;

iv. Critically assess user needs and requirements of commuter passengers, including the impact of alternate means of urban transport;

v. Project demand and supply of commuter buses for the next three to five years;

vi. Propose a working system/model of assessing the required number of commuter buses for identified routes according to demand considering the seasonality factor;

vii. Recommend appropriate actions to be taken to improve the quality and efficiency of commuter passenger bus operations; and

viii. Make a presentation of the findings and recommendations to Management, Stakeholders and the Board.

Section Two

2 Approach and Methodology

2.1 Study Area

This research was carried out in the Dar es Salaam and Mwanza cities, both of which are grappling with significant commuting challenges due to their rapidly expanding populations. Tackling these issues is essential for fostering social and economic development within these cities. To thoroughly investigate these challenges, the study utilized a mixed-methods approach that included an extensive review of existing documentation, as well as conducting surveys and observational studies to gather a rich blend of primary and secondary data. This methodology was specifically designed to effectively address the tasks outlined in the Terms of Reference (ToRs), and ensuring a comprehensive understanding of the commuting dynamics in these two key cities.

2.2 Primary data

The primary data collection process involved utilizing a survey that employed a semi-structured questionnaire and an interview guide as tools for gathering information. Two distinct types of questionnaires were developed for the study. The first type of questionnaires focused on collecting information from passengers, while the second was designed to gather data from the service providers, specifically those operating commuter bus services. Key informant interviews were conducted using a structured interview guide, engaging individuals from the key stakeholders such as LATRA, DART, UDART, commuter bus owners, as well as drivers' and bus conductors' associations.

To ensure the validity of the survey questions, a pre-testing phase was conducted, followed by adjustments in alignment with the ToRs. This undertaking included a robust monitoring framework with designated supervisors for each route and a feedback mechanism that continuously informed the team of emerging issues during the data collection process. This approach enabled the consultants to ensure the relevance and quality of the collected data.

The specific tasks outlined in the ToRs guided the nature of the primary data needed to address the study's objectives. Data collected from the passengers included information on various means of transport chosen at different times, travel patterns and trip planning behaviors, seasonal variations, frequency of travel, and waiting times. Additionally, the study sought to gather socioeconomic and demographic information related to the passengers, such as gender, age, education level, personal income, marital status, household size, and ownership of any mode of transport.

The questionnaires and the key informant interviews were used to collect data from the service providers. The information sought from the service providers included the frequency or number of trips a bus covers within a specific period, occupancy ratios and turn-around times. Such data was gathered through questionnaires subjected to the drivers and then validated by data collectors who travelled with the commuter buses on each of the selected routes. This exercise was conducted during weekdays and repeated on weekends in order

to understand the dynamics of demand and supply of transport. Additional information on the number of commuter buses and their frequencies was also collected.

2.3 Sampling Technique and Sample Size

The commuter bus routes were identified prior to the commencement of the survey. Data were gathered from both passengers and operators of the commuter bus services on these routes. In this context, each specific route was treated as a stratum for selecting respondents for the questionnaires. A stratified random sampling technique is particularly effective for data collection in heterogeneous populations (Ajay and Micah, 2014). The necessity to sample various routes, followed by the selection of passengers from the respective buses, makes this method specifically suitable. Additionally, the use of stratified sampling is advantageous given the numerous commuter routes present in both cities. Specifically, each route was regarded as a stratum, from which respondents were randomly chosen. A sample size of 5% of the total routes in each of the cities was utilized. This sample size was adequate given the resources provided for the study. Based on the sampling protocol, 15 routes were selected as a sample size including 12 routes in Dar es Salaam and 3 routes in Mwanza. The routes that were selected in the Dar es Salaam city were: Masaki to Kariakoo, Mbagala to Gerezani, Tegeta Nyuki to Posta, Gongolamboto to Mnazi mmoja, Kigogo mburahati to Mnazi mmoja, Tabata segerea to Mnazi mmoja, Tandika to Gerezani, Makumbusho to Posta, Kigamboni to Gerezani, Kigamboni to Kongowe, Kimara to Kivukoni, and Kimara to Gerezani. In Mwanza, the selected routes were Kisesa to Airport, Nyashishi to Nyamadoke, and Kisesa to Nyashishi.

A sample size of the passengers and drivers for the study was derived using the formula according to Miaoulis and Michener (1976)

$$N = \frac{(Z)(Z)}{(e)(e)}(p)(q)$$

Whereby P = 0.5; q = 0.5; e = 0.08 (acceptable error)

Confidence interval (C.I.) =95% and α = 0.05; n is the sample size required for the study, e is sampling error, 2 Z =1.96 is the coefficient constant-coefficient obtained from the table with areas under a standard normal curve (Z =standard variate at a given confidence interval). Therefore, N = 150------(2) Based on the above formula, the sample size of this study was supposed to be 150 respondents. However, a decision was made to scale up the sample size to 378. This is because a large sample size has the advantage of a relatively high degree of freedom. Table 1 provides a snapshot of the routes that were finally selected and the number of passengers who were interviewed on each specific route.

Table 1: Routes Selected and Number of Passengers Interviewed

S/No	District _Route selected	Number of Passengers Interviewed
1	Kisesa - Airport	25
2	Kisesa - Nyashashi	30
3	Nyashishi-Nyamadoke	29
4	Gongo la Mboto -Mnazi	26

S/No	District _Route selected	Number of Passengers Interviewed
5	Segerea-Mnazi	21
6	Ubungo -Gerezani	29
7	Mbagala- Gerezani	25
8	Tandika -Gerezani	21
9	Machinga- Kigamboni	25
10	Kigamboni -Kongowe	31
11	Tegeta -Posta	22
12	Makumbusho-Posta	29
13	Tabata- Mnazi	14
14	Kigogo- Mnazi	26
15	Kimara -Gerezani	34
	Total	378

Source: Survey data 2024.

Questionnaires were also administered to a total of 192 commuter bus operators from Dar-es-Salaam and Mwanza, respectively. Furthermore, key informant interviews were conducted with a total of 28 individuals, 21 of whom from Dar-es-Salaam and 7 from Mwanza.

Secondary Data

Secondary data was gathered from various institutions including the Ministry of Transport, LATRA, Planning Commission, and DART. Secondary data collection involved collection and review of various Acts, Regulations, policy documents and reports. The reviewed documents included the National Development Vision (2025), the current Ruling Party Election Manifesto, Five-Year National Development Plan, Long-term Perspective Plan (2011/12-2025/26), National Road Safety Policy (2009), National Transport Policy (2003), LATRA's Strategic Plan for 2021/2022-2025/2026, LATRA Act No.3 of 2019 and other relevant Acts and Regulations. Additionally, LATRA provided secondary data on all the established routes in the cities, detailing the licensed commuter buses for each route, ownership structures, registration years, and bus seating capacities. The data covers a period of three years from 2021.

2.4 Data Management and Analysis

Data collected using Open Data Kit software was entered into the STATA Version 14 for analyses. Data analysis was proceeded by data cleaning to examine inconsistencies and make the necessary adjustments. Data analysis was done taking into consideration the specific tasks as prescribed by the ToRs. In this respect, data analysis started with the computation of simple statistics- means, percentage, frequency, totals, etc.

In analyzing behavior of a passenger in choosing different types of means of transport to commute with, it was assumed that the choice of the mode is a matter of probability that ranges from 0 to 1. In such case, an alternative framework has to be used to put some structure on the different probabilities. Thus, a common starting point was a random utility framework in which the utility of each alternative is a linear function of the observed characteristics plus an additive error term. A random utility function is as described below,

where a passenger is assumed to maximize utility over the choice of different transport means.

$$P\{Y_i = 1\} = \max\{U_i, \ldots\ldots\ldots\ldots\ldots, U_i\}$$
$$= P\{\mu_{ij} + \varepsilon_{ij} > Max'_{k=1\ldots M, k\neq j}(\mu_{ik} + \varepsilon_{ik})$$

In this respect, a multinomial logit regression model may be applied. A multinomial logistic regression is applied when the predicted outcome variable is nominal and has more than two categories that do not have a given rank or order. This model is used with any number of categorical or continuous independent variables.

The formula below describes the structure of the equations. Two model equations are presented to depict the structure of the equation (y1 up to Yj). However, the two equations show only up to when Y=2.

$$\text{logit(y=1)} = \log\left(\frac{p(y=1)}{1-(p=1)}\right) = \beta_0 + \beta_1 \cdot x_{i2} + \beta_2 \cdot x_{i2} + \ldots + \beta_p \cdot x_{in} \text{ for } i = 1\ldots n.$$

$$\text{logit(y=2)} = \log\left(\frac{p(y=2)}{1-(p=2)}\right) = \beta_0 + \beta_1 \cdot x_{i2} + \beta_2 \cdot x_{i2} + \ldots + \beta_p \cdot x_{in} \text{ for } i = 1\ldots n.$$

Coefficient Bi of the independent variable and Xi are independent variables. A multinomial logistic regression model is estimated using the Maximum Likelihood Estimation method. A likelihood ratio is computed to reflect whether the model as a whole fit significantly better than a model without a predictor.

To do this, there is a set of socioeconomic and demographic variables like age, gender, income, education level, employment status and the number of children that correlate with travel behaviour, which were included in many previous studies. The results of Lleras *et al*. (2002), Giuliano and Dargay (2006), Timmermans et al. (2003) and Buehler (2011) indicate that the very young, the elderly, and women make fewer and shorter trips compared to middle-aged employed males. Guerra et al. (2018) show that men are more likely to commute by car or walk/bike than to use public transport. Guerra *et al.* (2018) indicate that those with a higher education or an often-associated higher income drive more, and households with children are associated with more car use. Income has been considered the primary determinant of transport mode choices (Dargay and Gately, 1999; Ingram and Liu, 1999; Schafer and Victor, 2000). A higher income increases the opportunity costs of travel time, making faster modes of transport, such as the private car, more attractive. Klöckner and Friedrichsmeier (2011), using data on mode choice preferences of German students for different purposes, indicate that both trips to work and leisure activity are important determinants of the type of transport chosen.
The multinomial logit model has been used almost exclusively to model both urban and intercity mode choice until recently on account of mathematical simplicity and ease of estimate and interpretation. However, the multinomial logit model restricts the relative probability of choosing between any pair of unchanged modes due to changes in other modes of travel. This restriction implies that introducing or improving any new mode will affect all other modes proportionally. This property of equal proportional change or equal cross-elasticity of

unchanged modes is unlikely to represent actual choice behaviour in various situations. Differences in the impact of introducing new services on existing modes can be addressed by adopting the multinomial probit model, which is rarely used in applications due to problems of complexity, estimation, and interpretation, or the nested logit model. The nested logit model has been used to estimate mode-choice models for urban mode-choice and for multimodal and multidimensional choices. In this work, together with the multinomial model, we estimate a two-stage multinomial nested logit (NL) model with four alternatives: private car/uber, *Daladala*, BRT and *Bajaji/Bodaboda*. In the first stage, the alternatives are private and public transport modes. In the second one, if public transport was chosen initially, a subsequent choice would be made between *Daladala* and BRT. If private transport mode is selected, a subsequent choice is a private car or *Bajaji/Bodaboda*. The *Daladala* and BRT probabilities may be written as the product of the probability of choosing between them conditional on having previously chosen public transport times the marginal probability of using public transport. The same is true for *Bajaji/Bodaboda* and private cars.

$P(J) = P(j|i) * P(I)$, where j refers to the alternatives available at the second stage and the i to private transport and public transport. At each stage, choice probabilities take the form of logit models.

The systematic component of utility derived from the choice of each alternative is decomposed in two parts: the one due to variables that differ between *Daladala* and BRT or between *Bajaji/Bodaboda* and private car, and therefore determine the choice between them (V_j), and the one due to variables that differ between private and public transport (V_i). The former only appears in the expression of the second-stage choice. However, the first-stage choice may be influenced by factors beyond the ones in which private and public transport differ. The role of the characteristics of *Daladala* and BRT or between *Bajaji/Bodaboda* and private car in that choice is captured by the term I_i, or 'inclusive value'. This term is a measure of the utility additional to (V_i) that the commuter may expect to obtain if he/she chooses public or private transport at the initial stage, and is defined as:

$$I_i = ln \sum_j \exp(V_j)$$

If the estimated coefficient lies between 0 and 1, the choice process will be consistent with the random utility maximisation hypothesis (McFadden, 1981). When the estimated coefficient is equal to unity, the Nested Logit (NL) model collapses to the multinomial logit (MNL) specifications.

In estimating current demand, an assumption was made that there is a fixed number of people who need to commute within a day from one point to another for various reasons. Assuming that the occupancy ratio of the bus is fixed, the population was distributed across a fixed number of buses operating daily from early morning to late evening or night. The

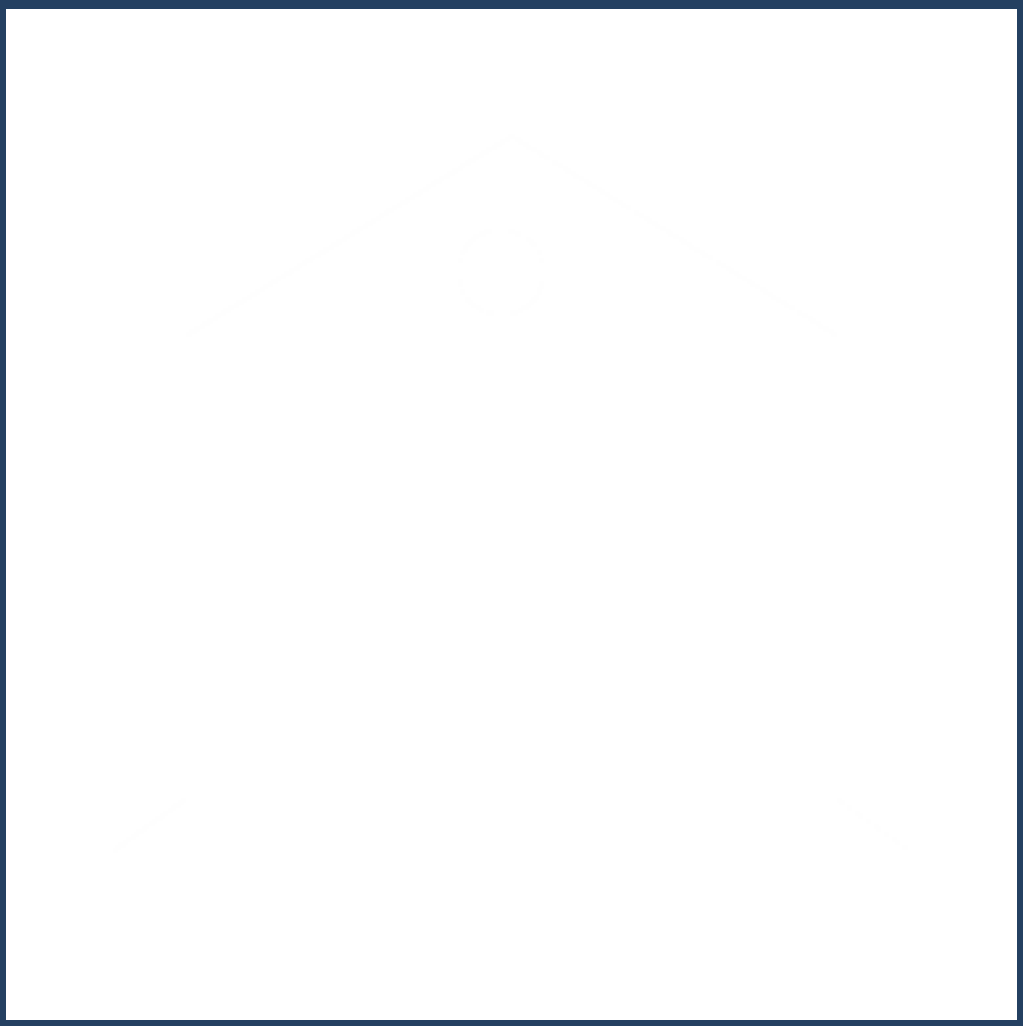
amount of revenue generated per trip may affect the frequency of commuting on one particular route. Increasing the number of buses without considering the number of passengers, distance, road conditions, and other factors may influence the profit margin. It may misguide the optimization of the number of commuter buses licensed in a route. This information helped to establish a profitable amount of revenue and therefore, the optimal number of trips required to operate a bus. It is on the basis of this information that optimal number of buses required to be allocated in a specific route was determined.

Ideally, a certain amount of revenue must be generated daily to entice one to enter and continue offering the services. Otherwise, one may not agree to continue offering the services. Thus, this was estimated using an arithmetic equation to establish the optimal number of commuter buses.

No of passengers carried by a single bus (PCSB)= occupancy ratio (OR) x required number of trips to break even per day (Trp)

Optimal number of buses (ONB)= Effective number of passengers (NP)/ no passengers carried by a single bus daily (NPSB).

Using the above formula, it was possible to estimate the optimal number of buses per route. This information was then used to forecast the required number of buses within the next 3 and 5 years.



Section Three

3 Prior Studies and Policy Review

3.1 Introduction

Countries in the developing world, including Tanzania, continue to experience pressure on urban transport systems due to increased motorization, urbanization and growing population (Armstrong-Wright, 1986; Thondoo et al., 2020; Ochoa et al., 2021). Furthermore, studies indicate that commuter buses are the major means of urban transport in most developing countries, as they are relatively affordable, particularly to the poor (AlSuleiman et al., 2023). Yet despite their vital role, commuter bus services in many cities in developing countries do not meet the demand for the services (Ochoa et al., 2021). For developing countries to meet the increasing demand for urban public transport, there is generally a need to adopt appropriate policies and strategies for providing such services and ensuring they are effectively implemented (Gijre and Gupta, 2020; Oviedo et al., 2024). Thus, it is crucial to explore the urban transport policy measures and strategies to establish whether Tanzania is moving in the right direction in addressing the demand for public transport in cities. Hence, there is a need for prior studies and policy review, and its implications for the promotion of the supply of urban public transport services in Mwanza and Dar-es-Salaam cities.

3.2 The National Transport Policy and Tanzania Development Vision 2025

The Tanzania Development Vision 2025 outlines a constructive path toward becoming a middle-income country by 2025. This vision aims to transition our economy from a low-productivity agricultural base to a well-rounded semi-industrialized framework. By fostering modernized agricultural practices that work in harmony with other vital sectors, a set is created for sustainable growth. The transport sector is instrumental in this transformation, providing essential support to the development of various elements of our economy. Our comprehensive roadmap is built on three consecutive five-year development plans, with the final plan covering the period from 2021/22 to 2025/26. By prioritizing the construction and enhancement of urban transport infrastructure and facilities, we are creating a solid foundation for our future growth and success.

On the other hand, the National Transport Policy (NTP) of 2003 explains how the transport sector will be developed in order to enhance its contribution to the growth of the national economy. The vision of the policy is “to have efficient and cost-effective domestic and international transport services to all segments of the population and sectors of the national economy, with maximum safety and minimum environmental degradations”. From this perspective, the government envisions developing a modern, efficient and integrated transport system capable of facilitating a vibrant economy.

In the case of urban transport, the NTP provides policy directives that emphasize on the following issues:

i. The existence of comprehensive and effective institutional set up for urban transport management;
ii. Improvement of the capacity and quality of urban road infrastructure to accommodate the ever-growing road traffic;

iii. Development of complementary transport infrastructure to road in order to ensure smooth traffic flow;
iv. Need for ensuring provision of adequate and reliable supply of urban transport services;
v. Ensuring effective and efficient traffic flow and management;
vi. Land use planning that addresses urban transport problems;
vii. Ensuring availability of adequate financing for the development of urban transport infrastructure;
viii. Existence of an efficient and effective transport system that can conveniently facilitate movement of the disadvantaged population;
ix. Existence of appropriate and acceptable vehicle design, standards and specifications to cater for the needs of various groups; and
x. Ensuring that urban road transport is environmentally friendly and sustainable.

As demonstrated through the policy directives, the NTP is comprehensive and has considered all the important aspects related to developing the country's urban transport sector. Such policy directives are being implemented by the various institutions that play different roles in developing and providing urban public transport services. However, the main challenge with respect to the NTP in meeting the demand for urban public transport services is the lack of effective implementation of important policy issues and appropriate strategies, as detailed in section 3.3.1.

3.3 Status of Urban Public Transport in DSM and Mwanza Cities

Public transport in Dar es Salaam is predominantly road-based, largely provided by commuter buses commonly known as *Daladala* (Appelhans and Magina, 2021; Ochoa et al., 2021). Tengecha and Mwendopole (2021) indicate that about 62% of individuals use commuter buses to move to and from the city. Walking is the second most common form of transport in Dar-es-Salaam (Appelhans and Magina, 2021). On the other hand, Ochoa et al. (2021) found that in Mwanza and other cities in Tanzania, walking and cycling are the dominant form of transport, accounting for between 50% and 70% of the surveyed trips in the cities, while commuter buses represented the second most-used transport means. Studies on the demand and supply of urban transport services in other cities in African countries have also identified walking as the dominant means of transport, followed by public transport through commuter buses (UN-Habitat, 2022; Oviedo et al., 2024). For instance, it is estimated that the proportion of people walking daily is more than 70% of the urban population in most African cities (UN-Habitat, 2022).

The commuter bus services in Dar-es-Salaam and Mwanza cities face several challenges, including inadequate safety of passengers, lack of reliability of services, long travel times, overloading of passengers, poor condition of the buses, use of low occupancy buses and congestion (SUMATRA, 2017; Mchome and Nzoya, 2023; Shafan et al., 2024). There is also a tendency of the commuter buses in the cities to concentrate to provide services to routes with high demand while the other routes are underserved and to cut specified trips short (Ochoa et al., 2021). *Bajaji* and *Bodaboda* have recently gained importance in the provision of ‘public commuting services’ in Tanzanian cities, despite the fact that they legally licenced by LATRA to provide hired transport services (Ochoa et al., 2021; Appelhans and Magina, 2021). These means of transport have been contributing to meeting the unmet demand for commuting services by commuter buses in many African cities (Ntramah et al., 2023). However, *Bajaji* and *Bodaboda* are generally characterized by several challenges, including

unregulated high fares, accidents, motorcycle driver theft, careless driving, inadequate passenger safety gear, and non-compliance with traffic rules and regulations (Essau and Ngonzi, 2022).

The Bus Rapid Transit (BRT) system, which is currently being implemented to replace the previously operating *Daladala* on the major routes/corridors from the city centre in Dar es Salaam, is considered as a way of addressing public transport problems (Matata et al., 2017; Chengula & Kombe, 2017; Appelhans and Magina, 2021). The BRT system has contributed to the reduction of traffic congestion and commuting times and improved safety of passengers as well as the enhancement of accessibility by the potential users (Tengecha and Mwendopole, 2021; Kruger et al., 2021; Andrew et al., 2022; Mchome and Nzoya, 2023). However, prior studies have also demonstrated the prominent challenges facing the BRT system in Dar es Salaam, which include incompletion of the remaining five main routes, lack of sufficient buses, passenger overcrowding during peak hours, long waiting times in the bus stations, relatively high fares, disruption of commuting services during flooding, and passenger safety issues (Joseph et al., 2021; Mchome and Nzoya, 2023; Bouraima et al., 2024).

Commuter rail services have also been provided in Dar-es-Salaam since 2012. Such commuter services are offered during the morning and evening rush hours from the city centre to the outskirts of the city (Ubungo and Pugu) on the existing tracks of the Tanzania Railway Limited and Tanzania and Zambia Railway Authority (Appelhans and Magina, 2021). However, such rail commuter services are not supported by appropriate infrastructure and automobiles, but more important, they are financially unsustainable and provide very limited commuting services in Dar-es-Salaam (LATRA, 2017; Appelhans and Magina, 2021). Studies in some African cities indicate the potential contribution of urban commuter rail services to address the growing demand for urban mobility while enhancing protection of the environment (Lawrence et al., 2023). However, only a few African cities in South Africa and North African countries have significant urban commuter rail services. This is due to the challenges associated with the development urban rail commuter services, which include building of new urban rail lines that require huge capital investment, land acquisition, and the need to reposition the existing infrastructure and utilities (Lawrence et al., 2023).

Generally, both the cities are unable to meet the ever-increasing demand for commuter bus services due to several factors, as detailed in section 3.3.1.

3.3.1 Challenges in coping with the increasing demand for urban public transport in the cities

Prior studies on urban public transport indicate that Dar-es-Salaam and Mwanza cities have been experiencing several challenges in addressing the problem of increasing demand for urban public transport services. The key policy related and strategic challenges are summarized below, together with the related experience and finally lessons from the other African cities, as presented under section 3.3.2.

Inadequate road infrastructure and other facilities

Prior studies indicate that Mwanza and Dar-es-Salaam like other cities in the country experience shortage of appropriate road networks as well as underdeveloped transportation infrastructure (Kiunsi, 2013; Todd et al., 2019; Ochoa et al., 2021; Shafan et al., 2024). This is also one of the major challenges facing many African cities in meeting the growing demand for urban public transport services (Okyere et al., 2024; Cinderby et al., 2024).

Insufficient financing for the urban transport *infrastructure development*

It has been difficult for the government to obtain sufficient funds for the construction of urban transport infrastructure in order to meet the increased demand for such transport services. The development of public transport infrastructure is largely dependent on funds from international development partners and finance institutions, while other funds are raised through fuel levies collected by the Roads Fund Board (Warrall et al., 2017). For example, the Dar-es-Salaam BRT system is financed through loans from the international finance institutions. Cities in other African countries have also been experiencing challenges in raising funds needed for the construction of adequate urban transport infrastructure to meet the demand for public transport services (Wood, 2022; Okyere et al., 2024).

Lack of urban transport authority

Urban transport in Tanzania is handled by multiple ministries, departments, and agencies at the national, regional, and local levels. These multiple institutions are generally exposed to conflicting interests and functional overlaps in the provision of urban transport services. Furthermore, such multiple entities are characterized by a lack of effective coordination and integrated approach to transport systems development, as well as the absence of an entity with overall accountability for the delivery of urban transport services (Kabange et al., 2014; Msigwa 2015; Kanyama, 2016; Appelhans and Magina, 2021). For instance, Appelhans and Magina (2021) and Ochia et al. (2021) observed that despite the existence of multiple institutions with varied specified roles related to urban transport, there was no institution responsible for the coordination of development of the transport sector in Dar-es-Salaam and Mwanza cities. In the case of Dar-es-Salaam, the Dar Rapid Transit Agency (DART) is responsible for developing and managing the BRT system. Recognizing the challenges associated with the lack of a coordinating institution, cities in other African countries, such as Maputo, Lagos, and Nairobi, have well-established independent authorities ultimately accountable for providing urban public transport services (Lawrence et al., 2023).

Limited linkage between transport planning and urban development plans

Establishing a sustainable urban transport system requires, amongst other issues, an integrated approach to land use and transport planning (Gijre and Gupta, 2020). There are different authorities in Tanzania which are involved in the governance of urban public transport such as the Ministry of Transport, President's Office-Regional Administration and Local Government, Tanzania National Roads Agency (TANROADS), Tanzania Rural and Urban Roads Agency (TARURA) and Local Government Authorities (LGAs). However, none of these institutions is explicitly responsible for land-use planning for transport planning and transportation issues (Appelhans and Magina, 2021; Shafan et al., 2024). Furthermore, there are few cities in the country where land use is linked with transport requirements (Ochoa et al., 2021; AfDB, 2013).

Poor urban planning

The problem of poor implementation of master plans in the cities coupled with laxity in enforcing and coordinating the relevant legislations have contributed to the concentration of business activities and social amenities in Central Business Districts (CBDs) and growth of unplanned settlements. The unplanned settlements have been growing rapidly compared to the planned areas, hence leading to spatial growth of the cities and complication in the

establishment of the required transport systems in the country (Peter and Young, 2019). These resulted in the need for people to commute to CBDs, and hence accentuating the demand for urban public transport (Msigwa, 2013; Kasala, 2015; Todd et al., 2019). For instance, (Todd et al., 2019) observed that Dar-es-Salaam city suffered from inappropriate coordination between planning authorities, lack of involvement of LGAs in planning and land use, and poor implementation of the master plans.

Commuter bus fares in the cities

It is argued that the prescribed low bus fares adversely affect the supply of adequate and appropriate commuter buses in the cities. These fares do not support the financial sustainability of the business and are also perceived as too high for most potential users to afford (Ochoa et al., 2021; Shafan et al., 2024).

Very limited investment in non-motorized transport

The focus in the development of urban road infrastructure in Tanzanian cities has been on enhancing motorized transport rather than the non-motorized transport (NMT) facilities that are used by a significant portion of the population (Ochoa et al., 2021; Appelhans and Magina, 2021). This reinforces motorization trends, reducing the potential contribution of NMT in addressing the increased demand for commuter bus services in cities (Cinderby et al., 2024). However, low-income commuters largely depend on walking and cycling, yet 95% of road infrastructure is allocated to cars and trucks (Ochoa et al., 2021). Studies in cities in other African countries such as Maputo, Freetown and Nairobi have also observed the importance of NMT and hence called for additional transport infrastructural investments that support walking and cycling (Domeneghini et al., 2022; Benton et al., 2023; Wood, 2022; Okyere et al., 2024; Oviedo et al., 2024).

Ineffective urban transport management and lack of sufficient mobility data

Ineffective and inefficient urban transport management and control of operations contribute to the imbalance between demand and supply for urban public transport services in Tanzania. Master plans for various cities such as the one for Mwanza are not comprehensive as they focus on motorized infrastructure and traffic, while covering only some general issues regarding the other public transport means including NMT (Ochoa et al., 2021). Also, the plans focus more on long-term transport infrastructure development projects that are not being supported by adequate mobility data and realistic financing options. Emphasizing on nature of the challenge, Ochoa et al. (2021) observed that decision-makers and those responsible for transport management in Tanzanian cities, are not guided by the necessary and adequate data regarding the demand and supply as well as the performance of urban public transport services. As a result, there are parts of the cities or routes which are served by excessive number of commuter buses while those with lower demand or inadequate road infrastructure remain underserved. The effect of the insufficient mobility data on the effectiveness and efficiency in the management of the existing urban road infrastructure is also reported in studies conducted in other African countries (Benton et al., 2023; Shafan et al., 2024; Oviedo et al., 2024). For instance, Oviedo et al. (2024) noted that lack of adequate transport and land-use data needed to guide policymakers and planners contribute to urban transport challenges faced by residents in Maputo and Freetown cities. Benton et al. (2023) observed that the focus on transport data collection in many of the African cities is on motorized rather than NMT and hence the emphasis on development of infrastructure for motorized transport.

3.3.2 Implications of the review of the prior studies and policy measures

Our findings from the review of prior studies and policy measures point to several implications for addressing the excessive demand for commuter bus services in Mwanza and Dar-es-Salaam cities. First, as the supply of commuter bus services is constrained by inadequate and inappropriate roads in the cities, there is a need to construct additional road infrastructure and facilities as well as improvement of the existing ones. This is particularly important in the context of the predicted ever-growing demand for urban transport, which is associated with the economic and social development in the country (Ochoa et al., 2021).

Secondly, there is a need to construct and enhance infrastructure facilities that promote the use of the other transport means in the cities, such as city rail and waterways commuter services, as both the cities have water bodies, namely Lake Victoria and the Indian Ocean (SUMATRA, 2017; Todd et al., 2019; Ochoa et al., 2021). Furthermore, the road infrastructure facilities should be enhanced to promote the usage of non-motorized transport modes, that is, walking and cycling (Appelhans and Magina, 2021; Olorunfemi and Adeniran, 2024). Non-motorized modes contribute to reducing the demand for commuter bus services and are currently one of the dominant forms of travel in most African cities (Okyere et al., 2024). Studies indicate that walking and cycling in other cities in the world have, to some extent, reduced the pressure associated with the demand for commuter bus services (Okyere et al., 2023; Oviedo et al., 2021; Wood, 2022; Olorunfemi and Adeniran, 2024). Furthermore, a study by Lawrence et al (2023) conducted in Maputo, Lagos and Nairobi cities demonstrates the potential of urban rail commuter service in addressing the demand for urban public transport through use of the existing railway lines.

Thirdly, all the concerned institutions should ensure comprehensive data is continuously gathered and analysed to obtain relevant knowledge on urban mobility patterns and needs, facilitating proactive responses to the demand and efficient management of public transport services in the cities.

Fourthly, the two main sources of funding for transport sector development in the country include grants and loans from development partners and fuel levies, which are not sufficient to meet the increased demand for urban public transport services. Thus, the stakeholders need to consider other new fees related to the transport sector that should be ring-fenced to strengthen the financing of urban transport development (Ochoa et al., 2021).

Fifthly, it seems the prescribed fares that the commuter buses are required to charge the passengers cannot ensure the financial sustainability of their operations. This contributes to jeopardizing the quality and efficiency in the provision of commuter bus services in the cities. On the other hand, the fares are also considered high relative to the income levels of many potential passengers, who, as a result, choose to walk (Ochoa et al., 2021). This suggests the need for a study on the financial sustainability of commuter bus operations to establish sustainable fares while looking for appropriate alternative ways to ensure the inclusivity of relatively low-income users (Shafan et al., 2024).

Sixth, there is a significant opportunity to reduce the imbalance between the supply and demand of urban public transport services in the cities through more efficient use of the

existing transport infrastructure by improving transport management and operations (Ochoa et al., 2021). For example, this can be achieved by reallocating the existing commuter buses based on mobility patterns during the day or across different routes within a city (Appelhans and Magina, 2021).

Seventh, the major deficiency in managing and governing urban public transport must be addressed by establishing an independent coordinating authority with proper powers and capacities in each city. Experience in other cities in African countries demonstrated that the establishment of independent authorities for coordinating the development and management of urban public transport services contributed to improvement in the provision of such services (Gijre and Gupta, 2020; Welle and Kustar, 2022; Lawrence et al., 2023).

Eight, the *Bajaji* and *Bodaboda* are currently being informally allowed to fill the gap in the provision of urban public commuting services in Tanzania (Appelhans and Magina, 2021; Ochoa et al., 2021). However, they are legally registered in the country to provide hired transport services. They can be allowed to operate as feeders from the low density or remote areas that lack commuter bus services; but to fully exploit their potential, they need to be adequately regulated and integrated within the urban transport sector strategy (Kumar, 2011).

Lastly, prior studies in developing countries suggest the need for urban transport planning to be properly linked with integrated urban development through the participation of all the key stakeholders (Welle and Kustar, 2022; Shafan et al., 2024; Okyere et al., 2024).

SECTION FOUR

4 Commuter Bus Services Operations

4.1 Commuter Transport Operations

4.1.1 Ownership Profile and Service Turnover

Key informant interviews were conducted with 21 respondents from Dar es Salaam and 7 respondents from Mwanza to gain insights into various aspects of commuter bus operations. These aspects included ownership structure, service turnover, route determination, and bus frequency on specific routes. This qualitative data was supplemented by an analysis of three years of secondary data on commuter bus licensing provided by LATRA. The analysis revealed that all commuter buses were individually owned. According to regulations, a bus is granted a license to operate commuter services on a specific route for one year. Once the license expires, the owner must apply for a new license. This allows for a clear connection between each bus owner, their operational capacity, and the date the license was issued.

Findings from interviews with key informants, including bus owners and owners' associations in both cities, revealed a high turnover rate among commuter bus owners. The informants identified several factors contributing to this issue, particularly related to the operational management of the buses. Currently, bus owners delegate the management of operations to the bus drivers and conductors. In most instances, this arrangement is based on a verbal agreement that requires drivers and/or conductors to remit a specified amount of revenue to the owner on a daily or weekly basis. The survey found that breaches of contract are a significant factor driving the high turnover of commuter bus owners. As a result, some owners are compelled to sell their buses and exit the business. Conversely, many operators, including bus drivers and conductors, expressed dissatisfaction with the perception that commuter bus service is lucrative. They attributed this to poor road conditions, inadequately regulated *Bajaji* and *Bodaboda* services, numerous fees and taxes imposed by various government agencies, and intense competition within the industry.

Further analysis of the secondary data provided by LATRA, when compared with findings from primary sources, revealed some contrasting observations. The data secondary indicates that only a few owners have changed their ownership, suggesting a low turnover rate. This finding contradicts the accounts given by key informants or primary data. However, the contradiction may be attributed to the procedures for relicensing of commuter buses, which allow transfer of ownership and thereafter relicensing without altering of the ownership details.

4.1.2 Routes Characteristics

4.1.2.1 Creation of Routes

The provision of commuter services begins with creating a route, where the buses are licensed to provide the services. Creating a route is a supply response to the existing demand for commuter service. Scattered settlements are accentuating the demand to commute for different purposes. In ideal situation, the Local Government Authorities, are responsible for planning settlements and ensuring the availability of infrastructure for all services, including the commuter service. This means a planned route may be developed

and may be shared and become visible to the key stakeholders who will eventually plan to provide the service. In the absence of this key urban panning deliverable, route planning and creation is based on the subjective opinions rather than the relevant data. For example, Ward councilors may influence the creation of a route after receiving complaints from the people within their constituencies.

During the key informant interviews, the LATRA revealed that route creation in both cities is a collaborative process involving multiple stakeholders. The stakeholders include the Tanzania Roads Agency (TanRoads), Tanzania Rural & Urban Roads Authority (TARURA), the Police Force, local government, Bus owners' associations and *Daladala* drivers' associations. LATRA leads and coordinates the process for planning and creating the route for the commuter buses. However, the bus owners' and *Daladala* drivers' associations from both cities, revealed that their engagement during commuter bus route planning and creation was very limited. They claimed that commuter bus routes planning is handled almost entirely by LATRA. In practice, LATRA announces the establishment of a new route, marked by the invitation issued to the service providers to seek for licenses to operate within the proposed routes. Furthermore, they indicated that the approach is associated with several operational challenges such as a lack of passable roads and insufficient parking spaces. As a result, some bus operators have been switching from their designated routes or cutting short the routes in both cities.

4.1.2.2 Fleet Size Determination

Optimal fleet size is critical to ensure operators generate a sustainable income and passengers enjoy good services. Thus, determining optimal fleet size is an essential exercise for LATRA. Ideally, the optimal number of buses is determined after having worked out the exact number of passengers demanding to commute using a bus. This is after considering the commuting behaviour of the people in terms of their selection of different modes of transport. According to LATRA, there is no optimal or standard waiting time; however, it considers 10 minutes as reasonable waiting time. Presently, there is no specific formula to determine actual number of buses required. The survey revealed that the determination of the actual number of buses to license in a route is done through consideration of the waiting time, the number of passengers, and the effective number of commuter buses in operation.

Thus, fleet size is determined by gradually increasing the number of buses while monitoring the outcome. When a particular route is assumed to have reached an optimal number of buses it is closed and there will be no further authorization or licensing of commuter buses in that route. For instance, in Dar es Salaam, the route from Machinga to Kigamboni is assumed to have reached an optimal number of buses. In accordance with LATRA officials, further authorization of the buses on this route means that operators will not be able to break even and hence may exit the business.

In Mwanza, most of the commuter buses operating on the Airport to Kisesa route are Hiace type with 15 seat capacity. Since LATRA has decided to licence buses with a relatively large seat capacity, there are few buses plying on this route and the other closed routes, and hence the gap in the provision of commuter services. The supply gap has attracted the operation of *Bajaji*, which provide commuter services illegally, thus competing with the commuter buses. This has become a significant source of conflict between the commuter bus and *Bajaji*

operators. The commuter bus operators are complaining, and some have decided to dispose of their buses and ventured into offering commuter services using *Bajaji*. If this problem is not addressed, it may end up affecting the provision of commuter bus services. The aftermath of this will be increased commuting costs, which will bear consequences on the cost of living.

There seems to be a lack of consensus between commuter bus operators and LATRA regarding the processes for determining the optimal fleet sizes in Dar-es-Salaam and Mwanza. Finding common ground on this issue could lead to improved efficiency and service quality for commuters in both cities.

4.1.2.3 Characteristics of Selected Routes

As elaborated in the methodology section, 15 routes were selected to represent all other routes in Dar es Salaam and Mwanza cities. The selected routes have different characteristics in terms of distance, demographic characteristics, fleet sizes, frequency of buses, and other relevant factors. Table 2 provides information regarding the routes and distance in Kilometres. According to the table, the Makumbusho - Posta, Masaki – Gerezani, Gerezani - Kigamboni and Kigogo Mburahati – Mnazi Mmoja routes are relatively shorter than all the selected routes in Dar es Salaam city. The findings show that bus operators and owners prefer relatively shorter distance routes with good road conditions and many passengers. The routes with those features are guaranteed to generate relatively good revenue. The amount of revenue and general operating costs are some of the criteria used when selecting a route during licensing. Usually, the commuter bus is given a license of one year, and during that time, there is an allowance for changing the route if requested.

Table 2: Routes and Distance.

S/No	Route Name	Covered Distance (One Way)
1	Kigamboni - Gerezani	15.9 KM
2	Masaki - Gerezani	12.5 KM
3	Kigogo mburahati - Mnazi Mmoja	9 KM
4	Kigamboni - Kongowe	25.2 KM
5	Tandika - Gerezani	8.4 KM
6	Tegeta Nyuki - Posta	22.8 KM
7	Kivukoni - Kimara	16.2 KM
8	Kimara - Gerezani	14.3 KM
9	Gerezani - Mbagala	12.5 KM
10	Makumbusho - Posta	8 KM
11	G/Mboto - Mnazi Mmoja	17 KM

12	Tabata Segerea - Mnazi Mmoja	12.4 KM

Source: Survey data (2024)

In Mwanza city, the selected routes are Nyashishi - Nyamadoke, Nyashishi - Kisesa, and Kisesa - Airport. Figure 2 depicts the relative distances for each specific route. The route from Aiport to Kisesa is the shortest, while the route from Nyamadoke to Nyashishi is the farthest.

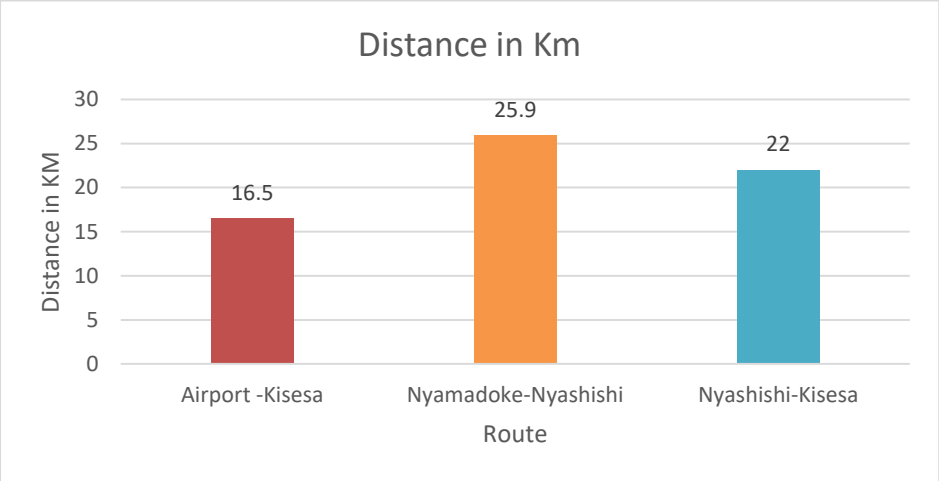


Figure 2: Route Distance

Source: Survey Data (2024).

Further analysis was done on the selected routes using secondary data provided by the LATRA. This data enabled the establishment of the actual fleet size for each specific route. Table 3 presents fleet sizes for each particular route in the two cities. For Dar-es-Salaam city, all the selected routes connect to at least one of the two Central Business Districts (CBD): Posta and Kariakoo. The bus stands at Mnazi Mmoja and Gerezani are within the central business area of Kariakoo and Posta. For Mwanza city, all the three selected routes pass through the city's central business areas, including Makoroboi, Nata, and Rock City Mall. The data analysis shows that the route from Kigamboni to Gerezani has the highest number of licensed commuter buses (82). Meanwhile, the route from Mbagala to Gerezani appears to have the lowest number of buses (11).

Table 3: Selected Routes in the Two Cities

S/N	Selected Routes Dar Routes ->1 to 12 Mwanza Routes-> 13 to 15.	Licensed buses as per LATRA
1	Gongolamboto - Mnazi Mmoja	26
2	Mbagala – Gerezani (Via Kilungule-Temeke-Road-Usalama-Road Via Kilwa Road	11
3	Tabata Segerea - Mnazi Mmoja	47
4	Posta – Makumbusho via Ali Hassan Mwinyi Road	45
5	Tegeta Nyuki – Posta (Kivukoni) Via Ali Hassani Mwinyi	46
6	Tandika – Gerezani (Buza -Gerezani -32) Via Usalama-Sudani-Majaribio	32
7	Kigogo Mburahati - Mnazi mmoja Via Kawawa Via uhuru	63
8	Kigamboni – Gerezani Via Mji-Mwema-Road-Chekechea-Road-Mbagala-Kuu-Road-Kilwa-Road	82

	Kigamboni – Machinga Complex Via Daraja-Jipya-Road	
9	Kigamboni - Kongowe	82
10	Masaki – Kariakoo Via Muhimbili-Hospital-Road Masaki to Gerezani Via Namanga-Road-St-Peters-Road (7)	51
11	Kimara to Kivukoni,	No data
12	Kimara to Gerezani	No data
13	Kisesa – Airport Via Nyerere-Road-Buzuruga-Road (16) Via Nyasaka-Center-Road (2)	16
14	Nyamadoke - Nyashishi	88
15	Kisesa – Nyashishi Via Kenyatta-Road	68

Source: LATRA Data (2024).

4.1.2.4 Frequency of Bus Services and Occupancy Ratios

As observed in many of the selected routes in Dar es Salaam and Mwanza, there are differences in the time the commuter services begin to operate in a day. In the Dar es Salaam City, most operators start operation at 6.00 am. In Mwanza, most of the commuter buses begin operation at 6.30 am. In most cases, the time to start or stop operation is influenced by income maximization objective of the operators. Therefore, operators wish to minimize costs through reduced travel distance, increased number of passengers, reduced fuel price, reduced parking fees, minimization of fines due to road traffic violations, and any other payment. According to the analytical results, operators in both the Mwanza and Dar es salaam city have a frequency of between 9 and 10 (inbound and outbound trips).

The primary form of competition between bus operators is expressed through the number of passengers that board a bus and the number of inbound and outbound trips (frequencies). The number of passengers carried by the bus within a day determines the amount of revenue generated. During the off-peak time, the number of passengers demanding transport declines. Thus, operators mitigate the situation by queueing for passengers arriving at the bus terminal at different time intervals. Using this approach, the operator manages to regulate or manipulate the commuting behaviour of the people through pooling of the passengers, leading to increased waiting time so that the bus becomes full before starting the trip (form a cartel). When the waiting time increases, the passengers have the alternative of boarding a motor tricycle or motorcycle. Therefore, competition between the commuter bus and motor tricycles increases during this time.

During peak times, commuter buses efficiently manage to load and offload passengers in just a few minutes—typically no more than 10—before embarking on their next trip. Operators strategically capitalize on the high demand during these periods to maximize passenger capacity. The substantial influx of passengers at the bus terminal leads to minimal wait times. On average, both inbound and outbound trips take approximately 40 minutes, with survey data showing that the quickest commuting time from Kigogo-Mburahati to Mnazi Mmoja is just 34 minutes. In contrast, longer trips can extend to 1 hour and 15 minutes, primarily due to road congestion during evening peak hours. Additionally, the survey demonstrated that the occupancy ratio of commuter buses varies during the peak and off-peak periods as well as due to the specific route characteristics. The occupancy ratio of commuter buses in Dar-es-Salaam ranges between 550 to 850 passengers per day, and in Mwanza it is from 390 to 455.

Table 4: Outbound and Inbound –Kigogo to Mnazi Mmoja.

Kigogo- Mburahati		Mnazi Mmoja		Inbound and Outbound Times		
Departure Time	Arrival Time	Departure Time	Arrival Time	Trip Time Inbound	Trip time Outbound	Trip Time
06:00			06:40	00:40		00:40
	07:20	06:40			00:40	00:40
07:20			08:20	01:00		01:00
	08:53	08:12			00:41	00:41
08:56			09:30	00:34		00:34
	10:20	09:30			00:50	00:50
10:20			11:06	00:46		00:46
	12:00	11:06			00:54	00:54
12:01			12:53	00:52		00:52
	13:56	12:56			01:00	01:00
13:56			15:00	01:04		01:04
	15:56	15:00			00:56	00:56
16:00			16:50	00:50		00:50
	18:05	16:50			01:15	01:15
18:05			18:55	00:50		00:50
	19:55	18:55			01:00	01:00
20:00			20:40	00:40		00:40
	21:30	20:40			00:50	00:50

Source: Survey Data (2024).

Table 5 provides a snapshot of the route from Tabata-Segerea to Mnazi-Mmoja. There is a minor variation concerning the bus operation's starting and ending times.

Table 5: Tabata Segerea to Mnazi Mmoja

	Tabata Segerea		Mnazi Mmoja		Inbound and Outbound Times		
Trip No	Departure Time	Arrival Time	Departure Time	Arrival Time	Trip Time Inbound	Trip time Outbound	Trip Time
1	05:10			05:50	00:40		00:40
2		06:30	05:55			00:35	00:35
3	06:35			07:15	00:40		00:40
4		07:45	07:16			00:29	00:29
5	07:48			08:50	01:02		01:02
6		09:30	08:56			00:34	00:34
7	09:37			10:40	01:03		01:03
8		12:03	10:47			01:16	01:16
9	12:05			13:23	01:18		01:18
10		14:27	13:24			01:03	01:03
11	14:30			15:35	01:05		01:05
12		16:40	15:36			01:04	01:04
13	16:42			17:20	00:38		00:38
14		18:37	17:25			01:12	01:12
15	18:40			19:25	00:45		00:45
16		20:35	19:30			01:05	01:05
17	20:40			21:30	00:50		00:50

Source: Survey Data (2024).

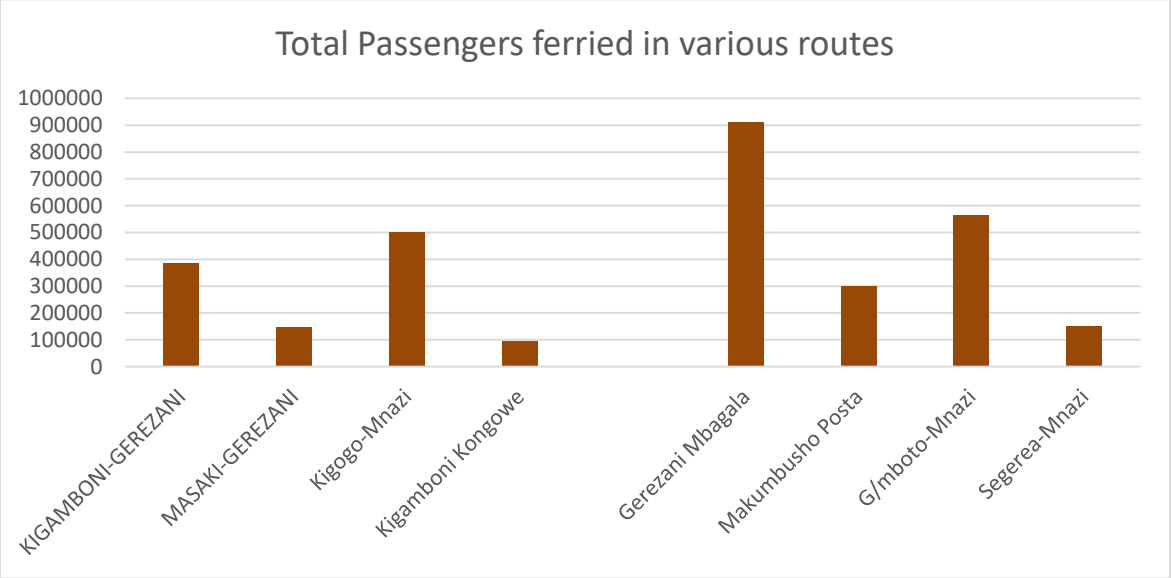
The behaviour of the data is similar to what was observed in Table 4 for Kigogo Mburati to Mnazi mmoja. If this data is plotted, it will depict a hyperbola shape. Suggesting that actual commuting time is shortest early in the morning; however, it gradually increases with traffic building up. Then it reaches a maximum point and begins falling to its initial level. Then it picks up again due to evening traffic congestion (but from the opposite direction). This pattern indicates the possibility of influencing passengers' behaviour and hence improve the quality commuter service without necessarily increasing the number of buses within a route.

4.1.2.5 Total Number of Passengers Ferried in Various Routes

Further route analysis is provided by considering the number of people ferried within each route. This information sheds light on the level of demand for the commuting bus service and other modes of transport. Figure 3 provides an entire picture of the demand for public transport in each specific route within Dar es Salaam City. Ideally, people who commute using motorcycles and motor tricycles are passengers who would have commuted using the bus. The assumption is that these people may be interchangeably commuting using the three transport modes. Based on this definition, counting was done for all the passengers who used buses, motorcycles, and motor tricycles. They were then aggregated to get the number of passengers who would have commuted using the buses. According to the regulations, motorcycles and motor tricycles are not licensed to provide commuter services. Although they are only authorized to provide hired services like the conventional taxis, they don't comply with the law.

In terms of demand, Figure 3 reflects a wide variation in the number of people who want to commute using different modes of transport. More often, people are commuting from their

areas of domicile to the Central Business Districts (CBD), which are Posta and or Kariakoo/Mnazi Mmoja. Analytical information from the selected routes shows that the route from Kigamboni to Kongowe has the lowest number of passengers among all the designated routes. Less than 100,000 people are demanding to commute on this particular route. Meanwhile, Gerezani to Mbagala has the lowest number of passengers counted in one direction (Inbound or Outbound only). Almost 900,000 people demand to commute using commuter buses on this particular route.



Source: Survey Data (2024).

Figure 3: Total Passengers ferried in various routes

Figure 3 presents details on the number of passengers travelling on the selected routes using different modes of transport. The passengers who travelled using private transport were omitted. Table 6 depicts the disaggregated number of passengers recorded in percentage who commuted using buses, motor tricycles and motorcycles. Overall, the highest percentage of passengers commuted using buses, while the lowest number of people commute using motorcycles[3]. The Gongolamboto to Mnazi Mmoja route appears to have the highest number of passengers commuting using the commuter buses (98%), only 2% are commuting using motor tricycle, and no motorcycle offers commuter services between the two destinations. The presence of a commuter train operating from the Kariakoo and the TAZARA area may be one of the attributing factors. On the route from Kigamboni to Kongowe, no motor tricycle provides commuter services like in other routes. Most motor tricycles operate between the Kigamboni and the Kibada areas. Segerea to Mnazi mmoja route has a high percentage of motorcycles on all the routes. However, this doesn't mean the route has the highest number of motorcycles. The route from Kigamboni to Gerezani appears to have the highest number of motor tricycles (21%), and only 77% of the passengers' commute using commuter buses. This is the lowest share of the commuter buses in all the selected routes.

[3] In this respect, substitutability between different modes of transport was considered, such that passengers have option of selecting one mode to commute. This is unlike the case where there is a complementarity between different modes of transport.

Motorcycles and tricycles are filling the existing gap in commuter buses. Therefore, any effort to increase the number of commuter buses may displace motorcycles and motor tricycles, especially on distant routes when the commuting costs of the two modes of transport are significantly higher than the bus fare. This is to say that motorcycles and tricycles are only competitive on relatively shorter routes and when there is traffic congestion. Using the two modes of transport to provide commuting services creates major havoc within the cities. It won't be easy to develop an efficient transport system within the cities in the future if the current practice continues. The commuter buses may likely be displaced on some routes, and the risk of accidents will increase. The aftermath of all these effects will be increased commuting costs, impacting the overall cost of living.

Table 6: Passengers Carried by Different Transport Modes in Percentage – Dar es Salaam City

S/No	Route	Bus	Motor tricycle	Motorcycle	Total
1	Kigamboni-Gerezani	77%	21%	3%	100%
2	Masaki-Gerezani	95%	1%	4%	100%
3	Kigogo-Mnazi	95%	1%	4%	100%
4	Kigamboni Kongowe	96%	0%	4%	100%
5	Gerezani Mbagala	91%	2%	7%	100%
6	Makumbusho Posta	94%	1%	5%	100%
7	G/mboto-Mnazi	98%	2%	0%	100%
8	Segerea-Mnazi	88%	5%	8%	100%
9	Tegeta-Posta	97%	2%	1%	100%

Source: Survey data (2024)

Table 7 shows the total number of passengers who travelled using different modes of transport in Mwanza. The situation in Mwanza resembles that of Dar es Salaam city, where the passengers commute using different modes of transport. The main push factors for using alternative modes of transport are road congestion and long waiting times before bus boarding.

Table 7: Passengers Commuted with Different Modes in Percentage in Mwanza

S/No	Route	Bus	Motortricycle	Motorcycle	Total

1		Nyashishi-Nyamadoke	90.2%	5.8%	4.0%	100%
2		Kisesa - Airport	95.4%	3.3%	1.3%	100%
3		Nyashishi- Kisesa	94.2%	2.6%	3.2%	100%

Source: Survey Data (2024)

Table 8 presents the number of passengers travelling with different modes of transport. The carrying capacity of buses was established by counting the number of passengers a specific commuter bus may have during a busy weekday. Usually, the carrying capacity reflects the actual number of passengers a bus may ferry to break even[4] within a day.

Table 8: Number of Passengers Travelled with Different Modes of Transport

S/No	Route	Dala dala	Motortricycle	Boda Boda	Total Passengers	Carrying capacity	No. of Buses Required
1	Kigamboni-Gerezani	62500	16720	2123	81343	750	108
2	Masaki-Gerezani	33950	455	1250	35655	550	65
3	Kigogo-Mnazi	97387	1050	3825	102262	750	136
4	Kigamboni Kongowe-Kigamboni	43379	158	1728	45264	600	75
5	Gerezani to Mbagala	240621	4556	19503	264680	850	311
6	Makumbusho Posta	114660	1020	6110	121790	750	162
7	G/mboto-Mnazi	166915	4082		170998	850	201
8	Segerea-Mnazi	80860	4374	6945	92179	850	108
9	Tegeta-Posta	108563	1916	1485	111964	850	132

[4] Break-even is attained when the bus operators (driver and bus conductor) have remitted the agreed amount of money to the bus owner, have paid for fuel and left with a modest amount of money that they will share amongst in day.

Source: Survey Data (2024).

As depicted in Table 8, the Masaki to Gerezani route requires the smallest optimal number of buses. Meanwhile, the Mbagala to Gerezani route requires the highest number of buses to optimize the services. On each route, a specific type of bus with a certain capacity which is operating. Thus, in estimating the number of buses, the type or capacity of the bus is a common type of bus on a particular route. For instance, on the Makumbusho - Posta route, a common type of bus licensed is a Coaster with almost similar carrying capacity.

4.1.3 Other Modes of Transport

The survey has found that in addition to the buses that offer the commuter service, other modes of transport operate in all the selected routes. The parallel market comprises motorcycles and motor tricycles, which offer commuting services on almost all routes. The two modes of transport (Motorcycle and motor tricycle) are ideally licensed to provide a hired service. The Local Government Authorities designate parking areas to facilitate service provision in this context. However, there is a difference between the policy statement and the actual practice on the ground. The fact is, in many parts, the two modes provide both commuter and hired services. This practice has become a source of conflict between them and commuter bus (daladala) operators on the pretext that they are violating the regulations by offering commuter services like buses.

There are also complaints of unfair competition posed by motorcycles and motor tricycles in different forms. Firstly, the commuter bus pays a much higher license fee than the motorcycle and motor-tricycle. Secondly, they are subjected to different penalties in case of any violations of traffic regulations. Thirdly, while commuter buses are heavily regulated, the market largely determines the motorcycle and motor tricycle service fees. Fourthly, despite a massive difference in investment and operational costs, the two have no significant difference in profit.

Table 9: Frequency of motorcycles and motor-tricycles on different routes in Dar es Salaam city.

Route	Point of Counting	Bus	Motorcycle	Motor-tricycle
Tandika-Gerezani	Serengeti Breweries	1,325	406	3,180
Tegeta Nyuki-Posta	Mwenge	1,930	630	1,485
Kivukoni-Kimara	Fire	710	958	10,250
Kimara-Gerezani	Ubungo Plaza	6	2,325	2,940

Source: Survey Data (2024)

Table 9 provides a snapshot of the situation on different routes in Dar Es Salaam and Mwanza. The data shows the number of buses, motorcycles, and motor tricycles, which were established by counting at various observation points. The counting was done throughout the day in one direction of the route; therefore, the number of trips presents the frequency of different modes of transport in the selected route. The route from Kimara – to Kivukoni has the least frequency of buses (only 6). Conversely, the route from Tegeta – to Posta – appears with a higher frequency of buses than any of the four routes. The route from Kimara to Kivukoni

seems to have the highest number of motorcycles. Meanwhile, the route from Kimara to Kivukoni has the highest number of motor tricycles.

Table 10: Different Modes of Transport in Various Routes in the Dar es Salaam City.

Route	Point of Counting	Bus	Taxi	Motor Tricycle	Motor-Cycles
Kigamboni-Gerezani	Daraja La Nyerere	500		760	2830
Masaki-Gerezani	Tambaza Shule	485	225	650	1250
Kigogo Mnazi Mmoja	Ilala Boma	1081	240	700	2550
Kigamboni-Kongowe	Kibada Shule	**239**	18	**105**	**540**

Source: Survey data (2024)

Table 10 shows the situation, which is more or less similar to what was presented in the preceding Table 9. All the routes are currently characterized by commuter buses, motorcycles and motor tricycles.

Table 11: Frequency of Commuter Buses in Mwanza

Route	Point of Counting	Commuter Bus	Taxi	Uber	Motor-tricycle c	Motorcycle
Nyashishi - Nyamadoke	Kiseke Near By Ifm Site	194.0	N/A	N/A	856.0	1,177.0
Kisesa - Airport	Madini	412.0	N/A	74.0	38.0	418.0

Source: Survey Data (2024).

Refering to Table 11, the route from Nyashishi to Kiseke has the lowest number of buses (194); meanwhile, Kisesa to Madini appears to have a higher number of buses – 412, compared to the route from Nyashishi to Kisesa, which has 412 commuter buses. Unfortunately, the route with the lowest number of commuter buses also leads to the highest frequency of motor tricycles (865) and motorcycles (1,177).

4.2 Passenger Preferences

4.2.1 Passenger Profiles and Patterns

According to the analytical results, 56.1% of the passengers were male in a randomly collected sample, and the remaining 43.9% were female passengers. A higher proportion of males points out that women's labour participation rate is relatively lower than men's (Household Budget Survey, 2020). The assertion is attested by the fact that the majority of the people commute daily for work rather than for other reasons. The women who mostly attend the household chores may also commute for various other reasons, but their frequency is relatively low compared to their counterparts. The Descriptive statistics further point out that

about 88% of the respondents were either married, cohabiting, widows or divorced. Within the sample of the married respondents' 66 per cent were males, and of single respondents' 47 per cent were male. These proportions have an implication on the differential demand for commuter services according to gender. Table 12 provides a snapshot of the choice of transport mix by gender in the two cities.

Table 12: Choice of Transport mix to work by gender (Dar es Salaam and Mwanza)

Type of Transport/Gender	Female	Male	Total
Motor-tricycle	4.8	4.3	4.5
Motor-cycle	2.4	1.9	2.1
Bus	21.7	29.7	26.2
BRT	10.8	8.0	9.3
Private	4.8	3.8	4.2
Tax/Uber	0.6	0.0	0.3
Motor-tricycle-Motorcycle	3.0	2.4	2.7
Motor-tricycle-Bus	15.7	13.7	14.6
-Motor-tricycle	B	us	16.4
BRT-Motorcycle	2.4	0.5	1.3
BRT-Motor-tricycle	3.0	7.1	5.3
Bus-Tax-Uber	1.2	0.0	0.5
Bus-Private	1.2	2.8	2.1
All	10.2	10.9	10.6
	100.0	100.0	100.0

In this context, respondents were asked about the transport mix they use to work. Table 12 shows that the commuter bus is a dominant mode of transport for males and females, followed by a mix of buses and motorcycles or motor tricycles. This is understandable, given that most buses offer the service at a much lower price compared to other modes of transport, with the exception of only a few cases.

Still, most people use their first motor-tricycle or motorcycle to reach the bus stations. More than half of the respondents (both male and female) use more than one transport mode to the office. LATRA may need to explore further whether there is a need to enhance the length of the routes to extend to more interior areas to relieve people from additional transport costs. Otherwise, the presence of motorcycles and buses may displace or reduce the share of buses.

Further analysis was done to test whether there was any statistical difference between males and females regarding the choice of the mode mix, and the results in Table 13 indicate no statistical difference between males and females in Dar es Salaam and Mwanza City.

Table 13: t-test of mode mix by gender

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf. interval]	
Female	166	6.855422	.2943133	3.791961	6.274316	7.436527
Male	212	6.811321	.2740062	3.989591	6.27118	7.351461
Combined	378	6.830688	.2005418	3.898978	6.436367	7.225008
diff		.0441009	.4046174		-.7514955	.8396974

diff = mean (Female) - mean (Male)

t = 0.1090 H0: diff = 0 Degrees of freedom = 376

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0 Pr(T < t) = 0.5434 Pr(|T| > |t|) = 0.9133 Pr(T > t) = 0.4566

Table 14: Reason for use within type of mode (%)

Mode used	Accessibility	Convenience	Income	No other options	Total
Motor tricycle	13.3	53.3	33.3	0.0	100.0
Motorcycle	18.2	51.5	24.2	6.1	100.0
Bus	21.1	17.6	57.9	3.5	100.0
BRT	22.2	36.5	39.7	1.6	100.0
Private	40.0	50.0	10.0	0.0	100.0
Tax/Uber	0.0	100.0	0.0	0.0	100.0
Total	21.2	26.1	49.6	3.1	100.0

Source: Survey data (2024)

Looking at transport mode, respondents indicated the main reason for choosing Motor tricycle, private cars, tax, and Motorcycle was convenience, while the main reason for choosing bus and BRT was income (because their income is low) and accessibility. Further analysis was done to explore the same across the transport modes (Table 15) to find that bus and BRT lead in all options and the reason for the choice.

Table 15: Reason for use across type of mode (%)

Mode used	Accessibility	Convenience	Income	No other option	Total
Motor-tricycle	2.5	8.0	2.6	0.0	3.9

Motorcycle	7.4	17.0	4.2	16.7	8.6
Bus	67.9	46.0	79.5	75.0	68.2
BRT	17.3	23.0	13.2	8.3	16.5
Private	4.9	5.0	0.5	0.0	2.6
Tax/Uber	0.0	1.0	0.0	0.0	0.3
Total	100.0	100.0	100.0	100.0	100.0

Source: Survey data (2024)

The analysis also considers the purpose of travel when examining trip behaviour. In Table 16 we found that 33 per cent of those travelling for work purposes use a mix of buses and other modes, and about 25.5 use buses only, making the bus the most dominant mode of transport for work travel. A mix of motorcycles and other transport modes is attractive for social activities. From these findings, a significant number of people tend to mix transport services regardless of the travel purpose.

Table 16:Purpose of travel per type of mode

Mode used	Work	School/College	Social	Total
Motor tricycle	4.6	4.2	0.0	4.5
Motorcycle	2.3	0.0	0.0	2.1
Bus	25.5	37.5	28.6	26.3
BRT	9.9	0.0	14.3	9.3
Private	4.4	4.2	0.0	4.3
Tax/Uber	0.3	0.0	0.0	0.3
Motor tricycle - Motorcycle	2.0	4.2	28.6	2.7
Motor tricycle -Bus	15.1	12.5	0.0	14.6
Bus-Motorcycle	15.1	25.0	28.6	16.0
BRT-Motorcycle	1.5	0.0	0.0	1.3
BRT-Motor tricycle	5.8	0.0	0.0	5.3
Bus-Tax-Uber	0.6	0.0	0.0	0.5
Bus-Private	2.3	0.0	0.0	2.1
All	10.7	12.5	0.0	10.6
	100.0	100.0	100.0	100.0

Source: Survey data (2024)

4.2.2 Passenger Choices and Trip Planning Behaviour

Estimation of demand for transport involves identification of the key determinants of demand based on the passengers' behavior. According to literature, in most cases, studies estimate elasticities of demand for each specific attribute. For instance, estimation income elasticity of demand which will then depict the overall picture of how the variation in income may affects demand for transport. This section uses data collected from Dar es Salaam and Mwanza passengers sampled from selected routes during the survey. The passengers were asked several questions that form the variables of this work. In this respect, a due focus is on several correlates, including gender, household size, number of times primary mode is used in standard days, income per month, whether congestion and availability of substitutes are the reason for the use of the primary means of transport, marital status, travel frequency, education, cost of travel, the safety of the means and transport expenditure per week.

In modeling passengers' choices and trip planning behavior, it is important to point out that, passengers in the two areas have a wide range of transport means to choose to travel to any specific area. In this perspective, a passenger is considered to be rational and thus, seeks to maximize utility however subject to income. Such a scenario affects the modelling approach of this study and that logit is the desirable model to use given that, there is a certain level of probability for the passengers to selecting a specific means of transport. However, given that there are more than 2 means of transport, then the Nested Logit model is the most appropriate model to apply. The Nested logit models relax the independence assumption and allow us to group alternatives for which unobserved shocks may have concomitant effects. The Nested logit has been empirically applied in assessment of demand for transport. Few among the works done in this regard, include Lyman et al., (2019) who applied the model when assessing the effect of new commuter bus service on demand and impact on greenhouse gas emissions in Boston. The study uses a nested multinomial logit model for mode choice in a region where means include driving alone, carpooling, walking, cycling, and using four possible transit means (ferry, commuter rail, rapid transit, and bus) by walk-access or drive-access. In the present study, passengers are facing similar kind of conditions in which they have to make choices over the different means of transport at their disposal. Thus, the means of travel should be grouped by type (public and private). The tree structure of an individual's decision about what transport mode to use looks like this:

type	N	mode trans	N	k
private	770	Motor tricycle /Boda~a	385	47
		Tax/Privat~r	385	15
public	770	Bus	385	258
BRT		385	63	
		Total	1540	383

k = number of times alternative is chosen N = number of observations at each level

Table 17 provides the nested multinomial model of the transport mode chosen.

Table 17: Nested multinomial model

Dependent: Mode of transport chosen	Coefficient	Standard Error
alternative-specific variables		
cost (1= Costier)	1.0848	0.2439*
safety (1= Safer)	0.3169	0.1337*
Public Transport (Private Transport is the base category)		
gender: sex of the respondent (1=male)	0.2974	0.3308
hsize=Household size (Number)	-0.0669	0.0787
ntimesmainmodenormal (Number of times transport mode is used as main mode during normal hours)	0.0657*	0.0326
incpm (Income per month)	-8.08E-08	1.45E-07
congestion (whether reason for the use of mode is congestion, 1=Yes)	0.763**	0.3976
substitute (whether presence of the substitute makes it to the mode itself, 1=Yes)	0.9701*	0.4002
marital (Marital Status, 1 Married)	-0.2411	0.3841
travelfreq (Frequency of Travel)	0.4587	0.3709
educ (1=secondary and above)	-0.4325	0.3287
purpose (1=Purpose of travel is work)	1.3059*	0.4399
tranexpnrmwk (transport expenditure per week)	-0.00003	8.00E-06
dissimilarity parameters		
private_tau	1.0551	0.4053
public_tau	0.6721	0.172
LR test for IIA (tau=1): Prob > chi2 = 0.1003	chi2(2) = 4.60	Prob > chi2 = 0.1003
no. of observations=1,496	no. of cases=374	

Note: * p<0.01, ** p<0.05, *** p<0.1

Source: Survey data and authors computations (2024).

To interpret this, the first equation that regresses the mode chosen to cost and safety provides for alternative specific variables cost and safety that vary among the bottom-level alternatives, and these vary for every transport mode. The dependent variable is the mode of transport chosen by individuals. The coefficients represent the influence of various factors on the likelihood of choosing a particular mode of transport compared to the base category (private transport). The cost has a positive coefficient that indicates that as the cost increases, the likelihood of choosing a particular mode (likely public transport) statistically significantly increases compared to private transport. Safety is also statistically significant and positively affects the likelihood of choosing the mode of transport.

Regarding the choices between the public or private transport modes, we used private transport modes as the base category. Gender, household size, income per month, marital status, travel frequency, education level and travel expenditure per week were not statistically

significant in explaining the choice of public transport over private transport. As the number of times using a particular mode type during normal hours increases, the likelihood of choosing public transport over private transport increases. The coefficient is significant, indicating a reliable predictor. This implies that, on normal days, people prefer public transport to private modes of transportation. Congestion and availability of substitutes (e.g., an alternative public transport option) significantly increase the likelihood of choosing public transport over private. The results are surprising since one would have expected people to opt for private mode during the congestion period to ease reaching home. Since the variables such as income, education and travel frequency, the variables that have been associated with negative influence towards using public transport mode (see Dargay and Gately, 1999; Ingram and Liu, 1999; Schafer and Victor, 2000) turn out statistically insignificant, this partially explain the results.

In assessing the overall model, the LR Test for IIA (tau=1) that checks the validity of the assumption of Independence of Irrelevant Alternatives (IIA) in the nested logit model shows a p-value of 0.1003 (slightly above 0.05), suggesting that there is not enough evidence to reject the null hypothesis that the IIA holds, indicating that the nested structure is appropriate. We further assess independence of irrelevant alternatives (IIA) using the dissimilarity parameters (Private_tau and Public_tau). The private transport dissimilarity parameter is not significant. It is close to 1, suggesting that the utility differences between alternatives in this nest (private transport) are small but insignificant. On the other hand, the public transport dissimilarity parameter (public_tau = 0.6721; $p < 0.05$) is less than 1, indicating that the alternatives in the public transport nest are closer substitutes than those in the private transport nest.

To summarise, the model suggests that factors like safety, congestion, the presence of substitutes, and the purpose of travel significantly influence the likelihood of choosing public transport over private transport. However, other factors such as gender, household size, and education level do not show significant effects. The dissimilarity parameters indicate that the alternatives within the public transport category are more similar to each other than those in the private transport category. A shift towards public transport implies that to obtain the optimal number; there must be enough public transport services to cope with use increases from modal shift (i.e. the total passenger-km for each mode must not exceed what is possible based on the number of services available).

4.2.3 Mode of Transport and Level of Satisfaction

The data analysis shows that most respondents aren't satisfied with commuter buses (daladala), motor-tricycle I, BRT and private vehicles. Different reasons may be attributed to the dissatisfaction of each mode. For instance, relatively long waiting times, especially during pick time, struggle when boarding, overcrowding inside the bus, and a high probability of being robbed are some factors that reduce the passengers' satisfaction level with using the commuter bus. Motor- tricycles are generally considered unsafe due to reckless driving and overcrowding of passengers. The level of satisfaction with using private vehicles may be attributed to high operating costs due to fuel prices and other general maintenance costs.

Table 18: Factors that Make People Change Mode of Transport

S/No	Factors which Make Change Mode of Transport	%
1	Availability of Substitute	39.53
2	Change of weather	20.16
3	Congestion	30.37
4	Nature of the road	6.02
5	Safety	3.93
	Total	**100**

Source: Survey (2024)

4.2.4 Change in the Mode of Transport

The data analysis shows that passengers are intermittently changing between different modes of transport. The analytical table above provides a summary of the respondents from the passengers. As reflected in Table 18, there are various reasons why people shift their mode of transport from time to time. The majority cited the presence of an alternative mode of transport as one of the reasons why they managed to shift from using the commuter bus to boarding motor- tricycles. 20 per cent of the respondents cited a change in weather as yet another reason for switching from using the bus to using motorcycles or motor- tricycles. Usually, when it rains, especially in Dar es Salaam, roads are not easily passable; therefore, travel time is prolonged. 30.37% of the passengers cited congestion as a reason they shifted from their preferred mode of transport. It is easy to commute using a motorcycle or motor tricycle when there is congestion owing to the ability to circumvent the traffic jam.

4.3 Efficiency Analysis of Commuter Services

This sub-section combines the analysis of commuter service provision and passenger demand to gauge the efficiency of commuter services in the two cities (Dar es Salaam and Mwanza). It presents more crystalized facts about how commuter services operate in the two cities and creates a foundation for specific policy resolutions.

4.3.1 Comparison between Fleet size and demand for Commuter Buses

The optimal fleet size of the commuter buses that balance with the existing demand is important to bringing the commuter service market to equilibrium. To this end, a licensing system is a very important tool that should facilitate establishing the required number of commuter buses. The findings of the study point out several main challenges facing the licensing system used by the LATRA. These include lack of information on the number of

people who demand to commute using a bus and any other modes of transport, inability to establish the actual number of buses in operation within a given route and assigning different names for the same route.

In light of the mentioned challenges, the study sought to examine the adequacy of commuter buses licenced on the selected routes in Dar-es-Salaam and Mwanza cities. Table 19 compares the number of buses licensed with those required to provide the services optimally. The Gongo la Mboto –Mnazi Mmoja route appears to have the highest gap in the number of buses (185 buses). Masaki to Gerezani is the route with the lowest gap in the number of buses.

Table 19: Commuter Buses Required for the Selected Routes

S/No	Route	To	No of Buses Registered	Number of Buses Required	A gap in the Number of Buses
1	Mbagala	Gerezani		311	
2	Posta Mpya	Makumbusho	40	162	122
3	Tegeta Nyuki	Posta	53	132	79
4	Gongo la Mboto	Mnazi Mmoja	16	201	185
5	Kigamboni	Machinga comp	66	108	42
6	Masaki	Gerezani	48	65	17
7	Tabata segerea	Mnazi Mmoja	38	108	70
8	Kigogo Mburahati	Mnazi Mmoja	40	136	96

Source: Survey data and LATRA (2024).

In Mwanza city, the Nyashishi to Kisesa and Nyashishi to Nyamadoke routes appear to have the highest number of licensed buses. However, there is still a gap in the number of buses required to optimize the services. As shown in Table 20, the route from Nyashishi to Kisesa needs 124 buses to optimise the services, while the Kisesa to Airport route requires 99 buses.

Table 20: Number of Buses Required in Mwanza City for Selected Routes

S/No	Route	To	No Buses Registered	Number of Buses Required	Gap in Number of Buses

1	Nyashishi	Nyamadoke	66	86	20
2	Kisesa	Airport	27	99	72
3	Nyashishi	Kisesa	66	124	58

Source: Survey Data (2024).

4.3.2 Growth Rate in Number of Commuter Buses

Ideally, the number of commuter buses licensed is supposed to increase over time (years) commensurate with the growth in demand. The growth rate in the number of licensed commuter buses would indicate that the LATRA is trying to match the supply and demand of the commuter service through licensing. In this section, the study examines whether the growth in the number of buses licensed on the selected routes match the demand or not. The analysis is done using data provided by the LATRA that spans over three years. The analytical results are summarized in Table 21. The findings revealed a worrying decline in the number of licensed buses over the analyzed period. In year 2021, the Makumbusho–Gerezani route had a total of 188 licensed buses. However, this figure declined to 167 buses in the subsequent year. By establishing year 2021 as benchmark it was possible to calculate growth rates for the subsequent years. This analysis highlighted remarkable spike in 2022, where the growth rate reached an astonishing 231% for Kigogo to Kivukoni route. This is followed by a 29% growth rate experienced on the Masaki to Gerezani route. Some routes reported a negative growth rate; for instance, -32% is observed in the Kigamboni to Machinga Complex route.

Table 21: Growth Rate in Number of Buses

Route	2021	2022	2023
Kigamboni -Machinga Complex	68	81	55
Posta -Makumbusho	49	43	41
Tabata-Mnazi Mmoja	48	34	37
Makumbusho- Gerezani	188	167	122
Tegeta- Kivukoni	37	38	48
Kigogo- Kivukoni	16	53	42
Masaki - Gerezani	31	40	48

Source: LATRA data (2024).

As it has been revealed in Table 22, the number of buses has generally been inadequate as the growth rate of the licensed buses does not match with the growth in demand.

Table 22: Growth Rate on Number of Buses in Few Selected Routes

Route	2022	2023
Kigamboni -Machinga Complex	19%	-32%
Posta -Makumbusho	-12%	-5%
Tabata-Mnazi Mmoja	-29%	9%
Makumbusho- Gerezani	-11%	-27%
Tegeta- Kivukoni	3%	26%
Kigogo- Kivukoni	231%	-21%
Masaki - Gerezani	29%	20%

Source: LATRA data (2024)

4.3.3 Dynamic Inefficiency of the Commuter Services

One key characteristic of a competitive market is its ability to efficiently compensate service providers while ensuring that users receive services in a cost-effective manner. For a market to be truly competitive, it must foster innovation and embrace new technologies that can sustainably enhance services. Therefore, the market's dynamic efficiency is a crucial factor to consider when evaluating its competitiveness. Evidence from recent surveys indicates that the provision of commuter services has evolved over the years. This is reflected in the increasing number of buses, the creation of numerous routes, the registration of commuter buses, and the development of mechanisms for determining new prices or bus fares. Many of these changes have been supported by favorable policy frameworks.

However, the quality of commuter bus services has remained unchanged over the years. Congestion at bus terminals and overcrowding within the buses continue to be common issues. As a result, it is clear that there is a lack of dynamic efficiency in this market. Several factors contribute to this problem. One major drawback is the insufficient incentives for private commuter bus owners to invest in improving service delivery. Additionally, the pricing policy that sets a ceiling price may also be a critical area of concern. Probably there is an over-regulation of the commuter bus services market in the two cities.

4.3.4 Emergence of Other Modes of Transport

Due to the inefficient commuter bus services in Dar es Salaam and Mwanza City, alternative modes of transport have taken the course. The poor performance of commuter bus services has accentuated a growing preference for private transport. Thus, city residents commute using private transport, motorcycles, and motor tricycles. Due to the persistent nature of the

problem, the number of motor tricycles and motorcycles has been increasing in various routes over the years.

Motorcycles and tricycles operate almost everywhere in Dar es Salaam and Mwanza City. Initially, they were just confined to the outskirts of Dar es Salaam city. Because there were just a few, preventing them from entering the city centre was easy. The Municipal Councils had appointed private agents to ensure compliance with the law. The private agents would catch unscrupulous motorcycle riders who were breaking the law, and they would fine them. However, this policy wasn't maintained, and somehow, it opened a pathway for motorcycles and motor tricycles to spread almost everywhere in the two cities. The use of motorcycles to provide transport services has two sides. The positive side is the availability of transport in areas where the commuter buses may not reach for various reasons. Secondly, is the availability of quick means of transport wherever there is a demand. Thirdly, it is the source of employment, especially for the youth. Fourthly, there is the complementarity between the commuter buses and the motorcycles and motor tricycles. On the negative side is the competition between the commuter buses and motorcycles/motor tricycles, increased pollution due to the number of motorcycles and motor tricycles and high risks of accidents given their numbers and riding style.

4.3.5 Expenditure on Transport

The analysis shows that, on average, households are spending a sum of Tsh. 457,284.31 for transport education, housing, food, cooking energy and health-seeking as detailed in Table 23. On average, they spend a total of Tsh. 62516.0751 on transport. This is equivalent to 14% of the total expenditure of the listed items. This means that transport costs come second, just like the cost of housing and cooking energy. Further analysis shows that on average, households in Dar es Salaam are spending 17% of their total expenditure on transport. This is unlike in Mwanza, where they spend 16% on transport. Thus, the amount of household spending on transport in the cities is generally high.

Table 23: Expenditure Pattern

S/No	Item	Average Expenditure in Tsh	Average expenditure in %
1	Transport	62516.0751	14
2	Education	47827.43	10
3	Housing	65256.13	14
4	Food	198721.0526	43
5	cooking	63160.31	14
6	Health	19803.31	4
	Total	457,284.31	

Source: Survey Data (2024)

The kernel density of the monthly expenditure on transport is left-skewed (Figure), suggesting that the mean spending on transport is less than the median. This is evident because most of the respondents use public transport with similar spending levels. Most passengers commute using *Daladala* and pay almost the same amount for the transport.

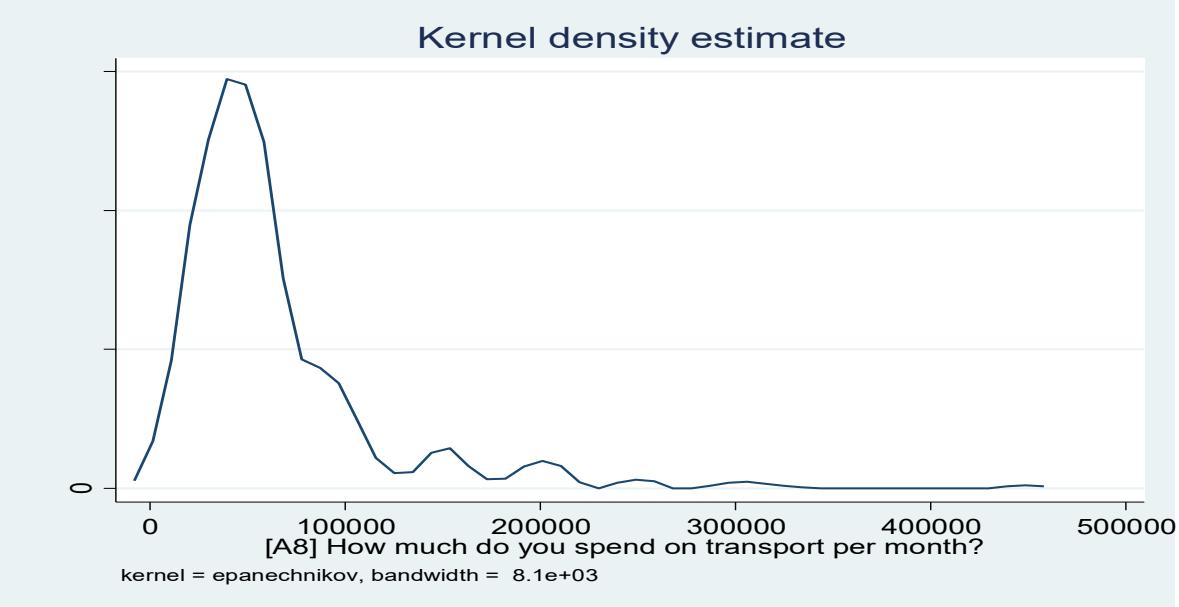


Figure 4: kernel density

Source: Survey data (2024)

4.3.6 Pricing and Externality

Analysis of the demand for transport was done using data collected from the passengers. Based on the analytical results, some of the passengers commute early on many routes (starting at 5.30 am). Usually, some buses operate overnight on a few routes with high population densities. However, these are exceptional and were not considered in this assignment. During the survey, it was evident that a passenger who decides to commute during this time can get a bus without scrambling, and generally, there is no congestion on the road. The buses are not heavily loaded and would arrive at the final destination quickly. Apparently, at any time, the passenger's objective is to travel comfortably, use the shortest time possible and minimise the cost of travel subject to his income.

Therefore, a passenger who leaves early in the morning enjoys comfortable travel in the shortest time but pays the same fare as someone who wakes up late (during the peak time) and has the disadvantage of waking up early in the morning. From an economic point of view, a passenger who leaves early in the morning inflicts a positive externality on society. However, the externality is not internalised because the passenger pays the exact bus fare as someone else who decides to wake up late and arrive at the peak hour. Therefore, the passenger has no incentive to continue with his or her good behaviour. No compensation is given to monetized benefits such as a reduced bus fare.

Conversely, a passenger who decides to travel during peak times is penalized because of reduced comfort. Such a person must scramble to board a heavily loaded bus or come late

during off-peak hours. Road congestion is common during peak hours; therefore, a late passenger will use a relatively longer time to travel. Besides that, a late passenger accentuates a social cost or negative externality to society within a given route. Unfortunately, this passenger pays the same amount as a bus fare even though his decision to wake up late inflicts congestion and, therefore, a pain for society. However, he or she is penalised for longer travel time and an uncomfortable environment inside the bus.

The pattern is repeated during the evening time when the majority of the people are going back to their homestead. This means the market is clearing but with externalities, such that the marginal costs and benefits are not entirely reflected in the market price. If the market failures are dealt with, late passengers could pay a much higher fare in return for comfortable transport. Thus, both passengers (early wake and late comer) would enjoy good transport but pay differently due to their different behaviour.

Regulatory intervention is necessary to address the market failure and increase society's welfare. Operationalising this requires differentiated bus fares in accordance with road situations (peak and off-peak time). However, this may not be easy, particularly when the pricing setting mechanism is regulated. The critical challenge of such a policy is the administrative mechanism of monitoring a differentiated bus fare over time and according to road conditions and the number of passengers.

Nevertheless, even if the policy is adopted, the administrative mechanism for monitoring it may appear to be complicated for LATRA. However, with the use of digital technology, monitoring may be possible. Initiatives to introduce electronic tickets may facilitate central monitoring. Such an intervention may allow the authorities to monitor ticketing as it is done by upcountry buses. In this respect, the authority may have different policy options. Firstly, one may leave the market freely to determine the price. Secondly, if the price is set to a level that would generate a producer surplus, then the operators themselves could differentiate the market price according to time. A producer surplus will incentivise the service providers to innovate and improve commuter services. There is also an opportunity for the authority to start a multiple tier licensing policy. This will help differentiate commuter services within the cities, benefiting the service providers and passengers. Lack of incentives has compromised the quality of commuter services in Dar es Salaam and Mwanza City. Generally, regulatory intervention is urgently needed to correct the market failure.

4.4 Forecasted Demand and Supply of Commuter Buses Services

In the previous section, optimal demand for the selected routes was estimated using data collected by counting the passengers who commuted using buses, motorcycles, and motor tricycles on a typically busy weekday. This information was then used to estimate the required number of commuter buses for each particular route. Thus, finally, the optimal number of buses was established for the selected routes. In this section, forecasting of demand and supply of commuter buses is done to avert a practice of ad hoc planning in determining the number of buses that will be required in the future. Thus, forecasting is done based on the optimal number of buses established for each of the selected route.

An assumption is made that the current demand will increase yearly at a constant rate. The rate is established from the average growth rate of the population and the economy. Therefore,

the number of people will increase due to the birth rate and rural-urban migration. Economic growth and social transformations are likely to affect commuting behaviour and the ability to pay for different modes of transport. A consideration is made that a certain proportion of the people will graduate and begin to commute using private transport (own or hired vehicle). In this light, it was assumed that the required number of commuter buses will grow at an average of 4% annually. On the basis of that the number of buses for the selected routes was estimated for the next five years.

Number of Buses in the Next Five Years

Table 24 presents the forecasted number of buses required in the selected route for Dar es Salaam city. Routes from Mbagala to Gerezani require the highest number of commuter buses. Meanwhile, the route from Masaki to Gerezani shows the smallest number of buses.

Table 24: Forecasted number of Commuter Buses in the Dar City

S/No	Route	Year (2025-2029) Number of Buses Required				
		2025	**2026**	**2027**	**2028**	**2029**
1	Kigamboni-Gerezani	112	117	121	126	131
2	Masaki-Gerezani	68	70	73	76	79
3	Kigogo-Mnazi	141	147	153	159	165
4	Kigamboni -Kongowe	78	81	84	88	91
5	Gerezani to Mbagala- Gerezani	323	336	350	364	378
6	Makumbusho Posta	168	175	182	190	197
7	G/mboto-Mnazi	209	217	226	235	245
8	Segerea-Mnazi	112	117	121	126	131
9	Tegeta-Posta	137	143	148	154	161

Source: Survey data (2024)

Table 25 shows number of buses required to provide commuter services in Mwanza city from the year 2025 to 2029. The Nyashishi –Kisesa route will demand the highest number of buses, meanwhile, Nyashishi to Nyamadoke will demand the least number of buses.

Table 25: Forecasted number of Commuter Buses in the Mwanza City

S/No	Route	2025	2026	2027	2028	2029
1	**Nyashishi-Nyamadoke**	89	93	97	101	105
2	**Kisesa- Airport**	102	107	111	115	120
3	**Nyashishi-Kisesa**	129	134	139	145	151

Source: Survey Data (2024).

4.5 A Model for Assessing Required Number of Commuter Buses

Developing a working model for assessing the required commuter buses for identified routes according to demand and seasonality is not just a step but a significant leap towards addressing the transport needs of the two cities. In the previous section, the study established the factors explaining the passengers' behaviour in selecting an appropriate commuting mode.

However, those factors may not be adequate to estimate the demand for transport services. Ideally, the demand for transport should have been established after evaluating the panel data. Unfortunately, such data is not available. To circumvent this hurdle, the study estimates the market demand using two crucial variables, namely, a specific city's gross domestic Product (GDP) and the urban population. The two are the most essential variables changing and obliging people to commute for various reasons. There are several examples to demonstrate the application of such a model. Nkiriki et al., (2022) provide historical and projected road transport demand from 2010 to 2025. In this context, the projected GDP and urban populations were applied to project road transport.

Thus, the determinants of the number of people who demand transport are done at two levels. Firstly, its determination is at the macro level, which considers the overall city population and economic activities, and secondly, at the micro level, which considers specific route demands and individual commuter needs.

$$TD = \delta_i GDP + \delta_2 urban_{Pop} + \mu_i$$

Where TD = Total demand for transport within the entire city: Urbanpop = Urban population, U error term. The error term U accounts for any unexplained variability in the model's predictions, ensuring a more accurate estimation of total transport demand.

Established elasticities will be used to estimate the demand for transport at any particular period. Since it considers the population growth within the city and the level of economic activity, the model can be a good predictor of the demand for transport in the town. However, the figure that will be generated will only help to establish the total number of buses required to provide commuter services on all the routes. From there, it should be possible to establish the total number of buses needed for each route. This will be established after using the proportion of buses in a route out from the entire fleet of all the buses within the city. The proportion of buses in a route here referred to as the Route factor (Rf), is a derived factor computed from data observed from each examined route. The computed Route factor is a route-level characteristic in the overall estimation model. Thus, the model for determining required commuter buses will be given by:

$$NoCB = TD*Rf;$$

where NoCB denotes the number of commuter buses, TD is the total demand for transport within the entire city, and Fr is a route factor that stands for a route-level characteristic.

The proposed model operates under the following assumptions:

i. The movement of passengers within a city is not confined to a specific locality. For example, Mbagala residents could be working or seeking services at Masaki,

and Nyashishi residents could be working or accessing services in Kisesa and vice versa.

ii. The Route Factor (Rf) assumes various route characteristics, such as distance and nature of the road. The Rf is a dynamic value that needs to be derived within a specific span of time.

5 Conclusion and Recommendation

5.1 Conclusion

The study aimed at examining whether the provision of commuter bus services in Mwanza and Dar-es-Salaam cities aligns with the users' demand. The study was required to undertake several tasks in order to meet its main objectives. These tasks included review of the available prior studies and documentations, and investigation of the frequency of commuter bus services as well as their occupancy ratios on the selected routes. The other tasks undertaken were examination of the profile of passengers, travelling patterns, trip planning behaviour, commuter buses operations, requirements of the commuting passengers and the impact of the alternate means of transport. The study proposes a model for assessing the required number of commuter buses for different routes. It also, provides forecasts of the demand for commuter buses in the examined routes for the next three to five years. More important, the study provides recommendations for improvement of the quality and efficiency of commuter bus services in Mwanza and Dar-es-Salaam cities.

The data for the study was gathered through a comprehensive documentary review, survey and observation. The study undertook a review of prior studies together with policies and regulatory frameworks and benchmarked the findings against those from other African countries. Secondary data provided by LATRA was triangulated with primary data collected through key informant interviews, semi-structured questionnaires and observation. A total of 192 and 339 questionnaires were administered to the drivers and passengers, respectively. Interviews were conducted with a total of 28 key informants from amongst the drivers and owners' associations, conductors, LATRA, UDART and DART. The study also involved counting of commuter buses, motorcycles and motor tricycles after identifying the appropriate stations at each of the sampled routes. The primary data was collected from the selected sample of 15 routes, including 12 in Dar es Salaam and 3 in Mwanza. Quantitative and qualitative analytical frameworks were applied to ensure robust insights from the data. Notably, we utilized a nested logit model to analyse passengers' travel behavior in the context of multiple modes of transportation, with descriptive statistics calculated beforehand to strengthen our analysis.

The main findings from the study are summarized below based on the tasks as prescribed under the terms of reference. Firstly, in case of the review of prior studies and documentations, the study shows that Dar-es-Salaam and Mwanza, like other African cities experience lack of mobility data crucial for effective public transportation planning and regulation (Ochoa et al., 2021; Haas, 2022). The previous studies in several African cities including Dar-es-Salaam and Mwanza observed that the unmet the demand for urban public transport services is partly linked to the inadequate adoption of an integrated approach to planning and service provision, lack of a coordinating institution, inadequate financing and insufficient engagement with stakeholders in the planning and prioritization of suitable transport systems (Shafan et al., 2024; Cinderby et al., 2024; Okyere et al., 2024). For example, despite the fact that walking and cycling are predominant modes of public transport in many African cities including Mwanza and Dar-es-Salaam, the focus is generally on the development of transport infrastructure for motorized vehicles (Ochoa et al., 2021; Oviedo et al., 2024). More important, the review revealed that over the past two decades, *Bajaji* and *Bodaboda* have become prominent in the provision of urban commuting services across Sub-Saharan African cities like Dar-es-Salaam and Mwanza (Ochoa et al., 2021; Ntramah et al., 2023). In Tanzania, *Bajaji* and *Bodaboda* are legally registered to provide hired transport services, however, they were also involved in the provision of commuting services in the cities. The Bajaji and *Bodaboda* contribute to several challenges such as non-

compliance to regulations, traffic congestion, road accidents, and air pollution (Ntramah et al., 2023). Unfortunately, Tanzania, like other African countries, has yet to establish a consistent policy to address these challenges (Welle and Kustar, 2022).

Secondly, the study indicates that commuter buses in Dar es Salaam and Mwanza operate an average of 9 to 10 round trips daily, with an occupancy ratio of 550 to 750 passengers on busy days in the former, and 390 to 455 in Mwanza. Most passengers travel during peak hours, accounting for 60% of the total trips. The passenger profile shows 56.1% male and 43.9% female, with women commuting less frequently than men, revealing gender-based differences in demand for urban commuting services. The observed strong preference for commuter buses (68.25%) stems from their affordability. Passengers typically arrive at bus terminals by 5:30 AM, providing societal benefits that go unrecognized, as they pay the same fare as those travelling in peak hours. Factors like safety, congestion, alternative options, and travel purposes significantly influence passengers' choices, highlighting the need for a comprehensive understanding of these dynamics in transportation planning.

Thirdly, the findings reveal that contractual arrangements for commuter bus operations are inefficient, contributing to operators exiting the business. Commuter buses are more regulated than motorcycles and motor tricycles. Many of the commuter buses operate at only 60% of their expected capacity due to wear and tear. Additionally, there is a high turnover among commuter bus owners due to an unfavourable business environment. The growth rate of the licensed commuter buses has declined, with five out of twelve routes in Dar-es-Salaam seeing reductions between 2022 and 2023. Overall, the quality of commuter bus services has not improved over the years, indicating a lack of dynamic efficiency.

Fourthly, the study has highlighted a significant shortage of commuter buses on all of the examined routes within the cities. In Mwanza, the shortage ranges from 20 to 72 buses, while Dar es Salaam requires between 42 and 185 more buses to adequately meet the demand. Passengers in the two cities express dissatisfaction with the current transport options available to them. As a result, they often find themselves switching between different modes of transportation, influenced by factors such as the availability of alternatives, weather conditions, and traffic congestion.

Fifthly, the study projected that over the next five years, the demand for commuter buses in the selected routes of Dar-es-Salaam will range between 79 and 378 buses. This range reflects the varying needs of the population and the growth of public transport usage in the city. Meanwhile, in Mwanza city, the anticipated need for commuter buses is expected to be between 105 and 151 buses on the designated routes. This data underscores the importance of planning for adequate public transport to meet the commuting needs of residents in these urban areas.

Finally, the findings indicate that in order to accurately establish the optimal number of buses needed, the model would be ideal based on an analysis of panel data reflecting passengers' travel behavior. However, due to the unavailability of such critical data, the study introduces an alternative approach. This approach leverages time series data, specifically focusing on the city’s Gross Domestic Product (GDP) and total population figures. In this model, the required number of buses for a particular route is calculated by first determining the total transportation demand. This demand is then adjusted by a route factor, which is uniquely defined for each specific time period, thereby ensuring that the bus allocation aligns with fluctuating transportation needs throughout the year. This method aims to provide a more systematic framework for optimizing bus services despite the limitations of data access.

5.2 Recommendations

In light of the above summarized findings, this study provides the following recommendations:

i. It is essential to establish a robust and ongoing system for gathering and preserving mobility data. This system should encompass a variety of data types, including both panel and time series data. The goal is to utilize this comprehensive collection of information to inform the development of strategies and to create data-driven models that can effectively forecast the demand and supply of urban transportation services. By continuously archiving this data, we can ensure the ability to analyze trends and patterns over time, ultimately leading to more informed decision-making in urban mobility planning.

ii. To effectively meet the growing demand for urban commuting services, it is essential to adopt an integrated approach to urban transport service provision. This strategy should involve the concurrent development of a variety of transportation alternatives, ensuring that all facets of urban mobility are addressed comprehensively. By doing so, cities can enhance their public transport networks, reduce congestion, and provide residents with diverse, convenient options for travel within urban areas. This holistic approach not only aims to improve efficiency but also seeks to promote sustainability and accessibility in urban transport systems.

iii. To effectively manage urban transport services, it is essential to establish a dedicated autonomous coordinating institution at the city level. This institution will take on the critical role of overseeing and ensuring the seamless provision of urban public transport services. By centralizing responsibility within this organization, it will be held accountable for the overall performance and efficiency of transport services within the city.

iv. Enhanced engagement with stakeholders is crucial for the comprehensive development of the urban transport sector. This involves actively involving all relevant parties in aspects such as the planning phase, where strategies are formulated, prioritization of projects that align with community needs and goals, and the effective operationalization of the transport system to ensure it functions smoothly and efficiently. By fostering this collaborative atmosphere, cities can better address the diverse interests and concerns of the community, leading to a more sustainable and effective urban transport system.

v. LATRA should continue take proactive measures to promote the operation of commuter buses with a higher occupancy ratio. By prioritizing these buses, LATRA can effectively address the increasing demand for commuter bus services, ensuring that more passengers can travel together efficiently. This initiative could lead to reduced congestion, lower emissions, and a more sustainable public transport system, ultimately enhancing the overall commuting experience for residents.

vi. The LATRA should engage in a comprehensive review of bus fares, working closely with various stakeholders involved in the transportation sector. This collaboration aims to establish fare structures that are not only reasonable and affordable for commuters but also ensure the long-term financial viability of bus operations. By doing so, LATRA could significantly enhance the overall quality of commuter services, making them more accessible and reliable for the community.

vii. To improve urban public transportation, it is essential to implement effective strategies aimed at developing and enhancing non-motorized transport (NMT) facilities. The improvement of NMT infrastructure is likely to contribute in addressing the demand within the two cities.

viii. LATRA should explore the possibility of expanding bus routes into the interior regions, particularly to areas with accessible roads. This initiative aims to alleviate the extra transportation expenses that passengers currently face, making travel more convenient and affordable for those living in these less-served locations.

ix. The LATRA should undertake a comprehensive study aimed at assessing the profitability and operational efficiency of various commuter services across multiple modes of transportation. This research is crucial for fostering a sustainable framework for commuter services, particularly in the bustling urban environments of Mwanza and Dar es Salaam. By analysing different transport methods, the study will provide valuable insights that can enhance service delivery and ensure that these cities are equipped with effective and reliable transportation options for their residents.

x. LATRA should prioritize a thorough reassessment and enhancement of its licensing protocols to ensure they effectively encompass all critical information related to commuter bus ownership.

xi. To improve the quality of service provided to commuters, LATRA should conduct a thorough assessment of current supply across all the routes in the cities. This evaluation will help identify any gaps or imbalances in service availability. Based on the findings, LATRA should consider licensing additional commuter buses that are tailored to meet the existing demand levels, ensuring that the public transportation system is both efficient and responsive to the needs of the community.

xii. LATRA should enhance the management of commuter buses, through the use of a comprehensive monitoring system of the licensed buses. This initiative would facilitate efficient and effective tracking and regulation of the urban commuter bus services.

xiii. While the regulation highlights the importance of providing hired transport services through motorcycles and motor tricycles, it is advisable to limit their operation to the outskirts of cities for optimal public transport management and safety.

xiv. Periodical surveys are essential for understanding the dynamics of commuter services in the two cities. These surveys will provide valuable insights that enable different authorities to formulate proactive policies aimed at enhancing the quality of public transport services.

xv. It would be beneficial for LATRA to consider the introduction of a multi-tier system within the commuter bus services market. This approach could reduce the preference for private transport, alleviate road congestion, and enhance the overall welfare of both passengers and operators.

xvi. LATRA should actively pursue the introduction of a differentiated commuter bus fares based on varying travel times, specifically targeting peak and off-peak periods. This strategy is essential for effectively reducing the externalities associated with public transport.

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Appendix 1: Drivers questionnaire

DRIVERS QUESTIONAIRE

Introduction and Consent

First, I would like to thank you for agreeing to speak with us. We have randomly selected you as driver driving the BRT/ Daladala/ Bajaji/ Boda boda and any other type of transport to commute……. [INSERT DISTRICTS and route] to CBD. The main objective of this discussion is to learn about your views on how you operate your daily routine, when you are serving passengers that are in need of commuting to the time when you are closing your operations. The information collected from you, will be used by the planners and other government bodies for efficient planning.

During this discussion, I am going to ask you to share your opinions on the trip covered and the quality of services rendered.

xvii.

Participant's Consent:

Before we proceed, we would like to ask you whether you are still willing to continue with this discussion or not. By saying "Yes" it does not necessarily stop you from terminating the interview at any point, simply let us know that you want to terminate your participation and we will arrange for you to continue with your trip.

[Interviewer; Only if the respondent says Yes then you can continue with the discussion].

SOCIO-DEMOGRAPHIC CHARACTERISTICS		
CODE	QUESTION	SELECT OPTION/ DATA TYPE
SD1	What is the gender of the driver (respondent)?	[1] Female [2] Male
SD2	How old are you?	[1] <20 [2] 20-29 [3] 30-39

		[4] 40-49 [5] >50
SD3	What is the highest level of schooling you completed?	[1] No formal education [2] Primary [3] Secondary [4] University [5] Other (specify in English)
SD4	In which part of Dar es Salaam or Mwanza do you reside?	Mention Ward/Street Name ……
SD5	What is the type of Bus/Daladala you are driving?	[1] BRT Small route [2] BRT long Route [3] Toyota Coaster <30 passengers [4] Eicher < 50 passengers [5] Marcopolo< 60 passengers [6] Other (please specify) ……..
SD6	Is this BUS/DALADALA belongs to you?	[1] YES [2] NO
SERVICE PROVISIONS		
TRIP OPERATIONS		
CODE	**QUESTIONS**	**SELECTION/OPTION TYPE**
TP1	In a normal working day, at what time do you start your trip?	[1] 3 am- 4 am [2] 4 am- 6.am [3] 6 am- 7 am
TP2	During weekend, at what time do you start your trip?	[1] 3 am- 4 am [2] 4 am- 6.am [3] 6 am- 7 am
TP3	In a normal working day, how many trips per days per do you drive?	[1] less than 5 [2] 5-15 days per day [3] 15-30 days per day [4] 30-45 per day
TP4	During weekend, how many trips per days per do you drive?	[1] less than 5 [2] 5-15 days per day [3] 15-30 days per day [4] 30-45 per day
TP5	In a normal working day, what is travel time to cover single trip?	[1] within 15 minutes [2 within 30 minutes [3] within 45 minutes [4] within 60 minutes [5] beyond 60 minutes

TP6	During weekend, what is travel time to cover single trip?	[1] within 15 minutes [2] within 30 minutes [3] within 45 minutes [4] within 60 minutes [5] beyond 60 minutes
TP7	In a normal working day, what is waiting time for passengers at CBD/destination?	[1] within 15 minutes [2 within 30 minutes [3] within 45 minutes [4] within 60 minutes [5] beyond 60 minutes
TP8	During weekend, what is waiting time for passengers at CBD/destination?	[1] within 15 minutes [2 within 30 minutes [3] within 45 minutes [4] within 60 minutes [5] beyond 60 minutes
TP9	In a normal working day, what is waiting time for passengers at the origin/outskirts?	[1] within 15 minutes [2 within 30 minutes [3] within 45 minutes [4] within 60 minutes [5] beyond 60 minutes
TP10	During weekend, what is waiting time for passengers at CBD/destination?	[1] within 15 minutes [2 within 30 minutes [3] within 45 minutes [4] within 60 minutes [5] beyond 60 minutes
TP11	In a normal working day, at what time do you close your trip/operations?	[1] 8 pm- 9 pm [2] 9 pm- 10pm [3] 10 pm- 11 pm [4] 11 pm- 12 pm
PICK HOURS OPERATIONS		
PH1	In normal working days, how many trips you drive during pick hours?	[1] 1-5 trips [2] 5-10 trips [3] 10-20 trips
PH2	what is the travel time during pick hours?	[1] within 15 minutes [2 within 30 minutes [3] within 45 minutes [4] within 60 minutes [5] beyond 60 minutes
PH3	what is waiting time at CBD/destination during pick hours?	[1] within 15 minutes [2 within 30 minutes [3] within 45 minutes [4] within 60 minutes [5] beyond 60 minutes

PH4	what is waiting time at CBD/destination during off-pick hours?	[1] within 15 minutes [2 within 30 minutes [3] within 45 minutes [4] within 60 minutes [5] beyond 60 minutes
PH5	In a normal working day, what is the occupancy ratio during pick hours	[1] 1-30 passengers [2 30-60 passengers [3] 60-90 passengers [4] 90-120 passengers
PH 6	Are you satisfied with the trip operation during pick hours?	[1] Unsatisfied [2] Moderately Unsatisfied [3] Neutral [4] Moderately satisfied [5] Satisfied
OFF-PICK HOURS OPERATIONS		
OP1	In normal working days, how many trips you drive during off-pick hours?	[1] 1-5 trips [2] 5-10 trips [3] 10-20 trips
OP2	what is the travel time during off-pick hours?	1] within 15 minutes [2 within 30 minutes [3] within 45 minutes [4] within 60 minutes [5] beyond 60 minutes
OP3	what is waiting time at CBD during off-pick hours?	1] within 15 minutes [2 within 30 minutes [3] within 45 minutes [4] within 60 minutes [5] beyond 60 minutes
OP4	In a normal working day, what is the occupancy ratio during off-pick hours	[1] 1-30 passengers [2 30-60 passengers [3] 60-90 passengers [4] 90-120 passengers
OP5	Are you satisfied with the trip operation during off-pick hours?	[1] Unsatisfied [2] Moderately Unsatisfied [3] Neutral [4] Moderately satisfied [5] Satisfied
VEHICLE MAINTANANCE AND PROFIT		
VH1	Do you do service of the vehicle/Bus?	[1] YES [2] NO
VH2	IF YES From Above, how many times in a month?	[1] 1-2 [2] 2-3 [3] 3-4 [4]4-5

VH3	What are the components of the bus service above?	[1] …… [2]…….. [3] …… [4] …… [5] ……..
VH4	What is your operating cost per day?	…….
VH5	Please mention the components of the operating cost above	[1] …… [2]…….. [3] …… [4] …….. [5] ……..
VH6	What is your total income including the operating cost	……
VH7	What is your total income excluding the operating cost	……
VH8	What amount of money do you send to the owner?	…….
VH9	Are you satisfied with amount of money you get per day?	[1] Unsatisfied [2] Moderately Unsatisfied [3] Neutral [4] Moderately satisfied [5] Satisfied
VH9	Dou you have any comments?	……..
C. END		
	Question	**Select Option / Data type**
C1	End time	
C2	Please thank participant for their time	
C4	Comments (in English/Swahili)	

Determining the Optimal Number of Commuter Buses

SURVEY to Determine Optimal Number of Commuter Buses

DATE	STATION CODE	Sheet Number				
SURVEYOR	DIRECTION/ Route					
SUPERVISOR	ROAD NAME					

BUS TYPE	NO OF TRIPS/ DAY	NO OF TRIP/OFF PICK	NO OF TRIP/PICK HOURS	TRIP TIME/ OFFPICK	TRIP TIME/ PICK HOURS	OCCUPANCY RATIO/OFFPICK	OCCUPANCY RATIO/PICKHOUR	WAITING TIME OFFPICK	WAITING TIME PICKHOURS

Notes:										
Prepared by: *Checked by:*										

Appendix 2: Passengers Questionnaire

A Survey of Choice of Model of Transport

CF: Start			
	Question	Select Option / Data type	Skip Logic & Hint
CF1	Fieldworker name		Please select your name from the list below
CF2	Date		
CF3	Time		
CF4	ID		
CF5	GPS Coordinates		For internal use only. Wait until accuracy==xx m to take coordinates
CF6	Corridor or Route Name/Number		
CF7	Data Collection/Observation Point Number/ Terminal Number		

Introduction and Consent

First, I would like to thank you for agreeing to speak with us. We have randomly selected you as representatives of passengers using the BRT/ Daladala/ Bajaji/ Boda boda and any other type of transport to commute [INSERT DISTRICTS and route]. The main objective of this discussion is to learn about your views on how you choose a specific model when in need of commuting. As you may know, information regarding the choice of model of transport is important for efficient planning.

During this discussion, I am going to ask you to share your opinions on the quality of services rendered.

xviii.

Participant's Consent:
Before we proceed, we would like to ask you whether you are still willing to continue with this discussion or not. By saying "Yes" it does not necessarily stop you from terminating the interview at any point, simply let us know that you want to terminate your participation and we will arrange for you to continue with your trip. [Interviewer; Only if the respondent says Yes then you can continue with the discussion].

A. EDUCATION and SOCIO-DEMOGRAPHIC CHARACTERISTICS			
CODE	Question	Select Option / Data type	Skip Logic & *Hint*
A1	What is the gender of the passenger (respondent)?	[1] Female [2] Male	
A2	How old are you?	[1] <20 [2] 20-29 [3] 30-39 [4] 40-49 [5] >50	
A3	What is the highest level of schooling you completed?	[1] No formal education [2] Primary [3] Secondary [4] University [5] Other (specify in English)	
A4	In which part of Dar es Salaam or Mwanza do you reside?	Mention Ward/Street Name	
B. SERVICE QUALITY DIMENSIONS			
	Question	**Select Option / Data type**	**Skip Logic & *Hint***
B1	In general (most of the time), what type of transport do you use most of the time?	[1] BRT [2] Daladala [3] Bajaji [4] Bodaboda [5] Personal drive [6] Other (please specify in English)	Select all that apply
B2	In a typical week, how many days per week do you use the BRT Transport?	[1] Every day [2] 4-6 days per week [3] 1-3 days per week	
	In a typical week, how many days per week do you use the Daladala Transport?	[1] Every day [2] 4-6 days per week [3] 1-3 days per week	
B3	During **the three recent months**, how often/frequent have you been travelling?	[1] Daily [2] Weekly [3] Occasionally	
B4	In general (most of the time) what is the purpose of your travel?	[1] Work [2] School/College [3] Social	
B5	Which factors make you change the mode of transport?	[1] Change of weather. Eg Rain [2] Congestion [3] Availabilty of substitute(Eg bajaj, motorcycle, etc [4] Nature of the road. [5] Traffic Jams.	
B6	Are you satisfied with the transport services during the three recent months?	[1] Unsatisfied [2] Moderately Unsatisfied [3] Neutral [4] Moderately satisfied [5] Satisfied	

B7	Are you satisfied with the availability of transport services along the BRT corridor during the three recent months?	[1] Unsatisfied [2] Moderately Unsatisfied [3] Neutral [4] Moderately satisfied [5] Satisfied	
B8	Are you satisfied with the reliability of transport services along the BRT corridor during the three recent months?	[1] Unsatisfied [2] Moderately Unsatisfied [3] Neutral [4] Moderately satisfied [5] Satisfied	
B9	Are you satisfied with the ticketing system of transport services along the BRT corridor during the three recent months?	[1] Unsatisfied [2] Moderately Unsatisfied [3] Neutral [4] Moderately satisfied [5] Satisfied	
B10	During travelling, between BRT and daladala where do you find comfortable?	[1] BRT [2] Daladala [3] None	
B11	During travelling, where do you find it safe?	[1] BRT [2] Daladala [3] bajaji [4] Bodaboda [5] Personal drive	
B12	Rank the different models of transport concerning waiting time	[1] BRT [2] Daladala [3] Bajaji [4] Bodaboda [5] Personal drive [6] Other (please specify in English)	
B13	Rank the different models of transport concerning waiting time	[1] BRT [2] Daladala [3] Bajaji [4] Bodaboda [5] Personal drive [6] Other (please specify in English	
B14	Rank the different models of transport concerning safety	[1] BRT [2] Daladala [3] Bajaji [4] Bodaboda [5] Personal drive [6] Other (please specify in English	
B15	Rank the different models of transport concerning cost	[1] BRT [2] Daladala [3] Bajaji [4] Bodaboda [5] Personal drive [6] Other (please specify in English	
B16	Rank the different models of transport concerning cleanliness	[1] BRT [2] Daladala [3] Bajaji [4] Bodaboda	

		[5] Personal drive [6] Other (please specify in English	
B15	What is your Travel time?	[1] within 15 minutes [2 within 30 minutes [3] within 45 minutes [4] within 60 minutes [5] beyond 60 minutes	
C. END			
	Question	**Select Option / Data type**	**Skip Logic & *Hint***
C1	End time		
C2	Please thank participant for their time		
C3	Any comments you want to record?	[1] Yes [2] No	
C4	Comments (in English/swahili)		IF J3==1

The cost of commuting with different models of transport should be asked for each particular route.

LATRA