Perceived Effects of Transportation Land Use on Mobility Crisis in Selected Nigerian Cities

Ayobami Ademola Akanmu[1], Umar Obafemi Salisus[2], and **Sekinat Motunrayo Sanni[3]**
Department of Transport Planning and Management, The Oke-Ogun Polytechnic, Saki[1],
Department of Urban and Regional Planning, Olabisi Onabanjo University, Ago-Iwoye[2],
Transport and Logistics Limited, Ibadan[3]
ORCID number https://orcid.org/0000-0002-9264-5863
ORCID number https://orcid.org/0000-0003-1630-3420
ORCID number http://orcid.org/0000-0002-0713-4699

Abstract

Traffic generation is a significant function of land use; hence, this study appraised the perceived influence of transportation land use on the urban mobility crisis in Nigerian cities towards ensuring optimal transportation system performance. The objectives include identifying respondents' trip and travel characteristics, determining the nexus between transportation land use and mobility crisis, identifying challenges of transportation land use and evolving strategies for improved transportation land uses in Nigeria. A multistage sampling technique was used to administer 600 copies of a questionnaire to household representatives across the capital cities in southwestern Nigeria. Mean-weighted analysis was also used for the data analysis. Results indicated that taxis/cabs, minibuses, tricycles, ride-hailing, and private cars were the predominant means of commuting. Critical transportation land uses identified included bus stops with or without shields, motor parks, event centres, roadside automobile workshops, fuel/gas dispensing stations, mini-marts, and cafeterias. Noteworthy elements contributing to the urban mobility crisis encompassed land use development and pattern, poor parking habits, traffic delays, and traffic incidence and accidents. In contrast, consequences of transportation land use on urban mobility included increased travel time, encouragement of road encroachment, reduction of roadway capacity, heightened traffic delay and incidences, and an elevated risk of travel discomfort. In light of these findings, the study recommends the efficient coordination of transportation projects, adequate funding for transportation infrastructure, formulation and implementation of sustainable public policies, and improved coordination between transportation and land use processes to enhance transportation land use. Therefore, efficient coordination of transportation projects, adequate funding of transportation infrastructure, effective implementation of public policy, and better coordination of the transportation and land use developmental processes are recommended for improved transportation land use in Nigerian cities.

Keywords: Transportation Land Use, Transportation Infrastructure, Urban Mobility Crisis, Commuter Travel Options and Nigeria

1. Introduction

Land use constitutes a fundamental aspect of spatial development within human settlements, involving transforming land from its natural state or one form to another. Morenikeji (2011) defines land use as any temporary or permanent intervention to enhance living standards for individuals, society, and the nation. The socio-economic value of a region is closely tied to its land use properties. Human settlements, particularly in urban areas, exhibit diverse land uses that often change due to evolving demand and supply dynamics for various purposes such as residential, industrial, commercial, public, semi-public, and circulation (Ogunsesan, Akanmu & Oyejide, 2016).

Transportation land use, a significant component of urban land use, holds considerable sway over other land uses, given its role in traffic generation. It is indispensable for residents, investors, and visitors in providing access, mobility, and ancillary facilities and services. This study evaluates the perceived impact of transportation land use on the urban mobility crisis in Nigeria, aiming to optimise the transportation system's performance and overall city development. Oyesiku (2014) notes that urbanisation, industrialisation, population growth, and infrastructure demands compel land-use changes. Transportation and other land use are intricately connected, particularly in facilitating efficient circulation in urban, rural, and regional settings.

Rodrigue, Black and Comtos (2006) emphasise that various land-use activities and decisions can influence transportation land-use projects, affecting time, cost, and traveller volume on roads or transit routes. In many Nigerian cities, the rate at which cities grow and expand surpasses the available land capacity for transportation infrastructure, resulting in increased vehicle miles travelled, traffic crashes, and non-active transport users (Oyesiku, 2021). Meanwhile, cities, with their attractive attributes, continue to draw population and investments, often due to enabling infrastructure and accessible transportation options (Salisu, Akanmu, Fasina & Sanni, 2020; Olorunfemi, Akanmu & Salisu, 2022). Accordingly, Akanmu, Fasina, Salisu, Adeyemo, and Olorunfemi (2022) opined that urban residents appreciate the accessibility and mobility functions of the transportation system, which, influenced by the structure, capacity, and connectivity of transportation systems, face challenges such as changing activity patterns, demand and supply fluctuations, distribution flow, and traffic bottlenecks.

Against this backdrop, the study examines the impacts of transportation land use on the mobility crisis in Nigerian urban centres. The objectives include identifying the trip and travel characteristics of respondents, determining the nexus between transportation land use and mobility crisis, identifying challenges of transportation land use, and evolving strategies for improved transportation land uses to optimise transportation land use for enhanced accessibility and wellbeing of city residents in the Southwestern region capital cities of Nigeria.

2. Literature Review

Transportation and transportation land uses have played tremendous roles in the development and growth of human settlements and economies since time immemorial. Hence, there is an increasing research interest in transportation studies in both the global North and South. Among the scholars who have examined transportation is Wee (2002), who opines that transportation fulfils people's aspirations to engage in diverse activities such as residing, working, shopping, and recreating in various locations and also establishes that land-use patterns significantly influence transportation; hence, it is essential to assess potential plans for land use and transportation based on a comprehensive range of factors. In another study by Hrelja (2015) on integrating transport and land use planning in two Swedish municipalities, the study affirmed that integrated planning is essential for achieving aims concerning more environmentally friendly transport operations and thus established that management and working practices in local authorities, referred to as steering cultures, affect the implementation of integrated land-use and public transport planning approaches.

In the opinion of the European Road Transport Research Advisory Council (2013), the road system connects territories at all spatial scales (countries, regions, urban areas, municipalities, etc.), while on the other hand, passenger and freight travel behaviour is strongly influenced both by land use (the density and nature of activities and people, for instance) and the road transport system (availability and costs of the different transport means); hence, the road transport system is closely linked to the land-use system.

Moreover, one influential concept shaping transportation land use is Transit-Oriented Development (TOD), introduced in the late 1980s by Peter Calthorpe and later detailed in his 1993 publication, 'The New American Metropolis.' According to Calthorpe (1993), TOD envisions a mixed-use community that encourages individuals to reside close to transit services, reducing their reliance on personal vehicles.in other words, TOD serves as a neo-traditional guide to sustainable communities, addressing various social issues and creating vibrant, compact communities centred around transit facilities. Supporting this perspective, Carlton (2007) and Still (2002) argue that TOD addresses the ecological aspects of communities, offering a comprehensive solution for regional growth. Hence, it meets the needs of transit agencies for alternative revenue sources, potentially enhancing residents' quality of life, minimising household transportation costs, and establishing stable mixed-income neighbourhoods that reduce environmental impacts and alleviate traffic congestion. Meanwhile, TOD has emerged as a prominent urban planning model in the United States over the last decade, emphasising compact development, integrated land uses, and a pedestrian-friendly environment, all contributing to a well-balanced transportation system. Messenger and Ewing (1996) define TOD as a development activity within walking distance of transit routes, characterised by a mix of residential, retail, office, and public uses in a walkable environment. This approach makes it convenient for residents and employees to travel by

transit, bicycle, or on foot, facilitating efficient interactions with socio-economic land use activities.

Meanwhile, the majority of previous research, including studies by Akanmu, Gbadamosi and Omole (2022), Ogunsesan, Akanmu and Salisu (2022), Oyesiku (2021; 2014), Salisu, Akanmu, Fasina and Sanni (2020), Morenikeji (2011), and Still (2002), has primarily focused on various aspects such as urban transportation, traffic congestion, urbanisation, land use planning, transit-oriented development, and other urban issues. However, more empirical investigations are needed concerning transportation land use and its correlation with persistent mobility crises, particularly in third-world countries and cities. Therefore, this research aims to address and justify this gap by delving into the effects of transportation land use on mobility crises in selected Nigerian cities.

3. Materials and Methods

Southwestern Nigeria lies between latitude 6º N and 8½º N of the equator and longitude 3o E and 5o E of Greenwich Meridian Time (GMT). It comprises six (6) states, namely Lagos, Ogun, Oyo, Osun, Ondo, and Ekiti States, have a total area of 79 048 sq. kilometres. However, the study area comprises all the capital cities (Abeokuta, Ado-Ekiti, Akure, Ibadan, Ikeja, and Osogbo) of the Ogun, Ekiti, Ondo, Oyo, Lagos, and Osun States in the economically driven Southwestern geopolitical region of Nigeria. Capital cities are characterised by increasing daily mobility demand due to the apparent population advantage and socio-economic actions that propel rapidly changing land uses and complex traffic situations.

The study adopted the cross-sectional research design, which uses survey techniques that are relatively inexpensive to gather and analyse the data based on the quantitative approach. Both primary and secondary sources of data were used. Primary data detailed the use of questionnaires administered to residents (a household representative) found within three (3) kilometres of the significant transport infrastructural facilities, including roads, railways, etc., in the capital cities in southwestern Nigeria. During the literature search, the secondary data was sourced from previously published and unpublished materials like journal articles, books, and maps.

A multistage sampling technique that uses convenience, simple random and systematic sampling methods was used to administer copies of the questionnaire to respondents who are representatives of residential households within a 1km radius of major roads in the selected capital cities. In the first stage, convenience sampling was used to select 100 residential buildings within a 1km radius of major roads in the selected capital cities. In the second stage, simple random sampling was used to select the first residential building sampled along the 1km radius of the major road in the capital chosen cities. The first household was picked when the residential building was a tenement structure with more than one household. In the third and last stage, the systematic sampling technique was used to select every third residential

building after the first building had been chosen randomly. This was done until each selected city's sample size (100) proportion reached. The study engaged the use of research assistance, while representatives of households were seriously motivated to participate. In all, 600 copies of a questionnaire administered to the residents across the capital cities in Southwestern Nigeria were retrieved and used for analysis. A close-ended structured questionnaire was developed based on the research objectives. The study adopted the 4-point multiple option Likert scale for data collection and used frequency percentage distribution tables and Relative Mean Index (RMI) for data analysis. The Cronbach Alpha score reliability test was done to determine the reliability of the scales used in the questionnaire, and the results of the eight sub-scales range between 0.75 and 0.90. However, descriptive (frequency percentage tables, line graph, and Mean Index Value through the weighted index analysis) was deployed using the Statistical Package for Social Sciences IBM version 21.

4. Results and Discussion

This section presents the results of the analysed data. Subsequently, it discusses the trip and travel characteristics of respondents, the nexus between transportation land use and the prevailing mobility crisis in Nigeria's urban centres, the effect of transport land use on mobility crisis and challenges of transportation land use and strategies to optimise transportation land use in Nigeria's urban centres with a particular focus on the cities in the southwestern region of Nigeria.

4.1 Trip and Travel Characteristics of Respondents

Initially, the findings from the gathered and subsequently analysed data on the socioeconomic characteristics of residents before their trips are presented in Table 1. Regarding gender classification, it is noted that slightly over half (57.3%) of respondents are male, while the remaining 42.7% are female. This suggests that females display a relatively higher participation rate and responsiveness to the administered questionnaire than their male counterparts, challenging the common belief that women are more inclined and involved in land use than men, particularly in urban settings.

In terms of age distribution, the data analysis in Table 1 reveals that only 2.0% fall below the age of 30, with over one-tenth (11.90%) falling between the ages of 30 and 40. Additionally, over one-third (36.2% and 33.2%) fall within the age brackets of 41-50 and 51-60, respectively, while one-tenth (11.7%) are above 60 years. These results suggest that many respondents belong to the energetic working-age group. Regarding marital status, over one-tenth (16.8%) of respondents are still single and unmarried, close to two-thirds (61.3%) are married, and the remaining 21.8% are not married. Consequently, it can be inferred from the results that a substantial portion of respondents are married, indicating a potential understanding of the central focus of the study on land use and transport planning in their surrounding area.

Concerning educational attainment, the data from Table 1 indicate that only 1.2% do not have formal education, while over one-third (39.3%) have either a primary or secondary level of education. Additionally, nearly half (48.8%) have a Higher National Diploma/first-degree level of education, and one-tenth (10.7%) have a postgraduate level of education. These results suggest a high literacy level among respondents, indicating their awareness of events in their surroundings. Similarly, the data on employment status analysed in Table 1 shows that unemployed or students account for 14.3% of respondents, while close to half (46.5%) are self-employed. Additionally, slightly more than one-tenth (12.7%) of the population are civil servants working in various government organisations, and more than one-quarter (26.5%) are employed in private or corporate sectors. These results suggest that self-employed individuals and those in the private sector dominate respondents' employment status, possibly influencing land use and transport-related activities in urban areas.

Table 1: Socioeconomic characteristics of sampled Residents

S/no	Type	Variables	Frequency	% population
1	Gender classification	Male	256	42.7
		Female	344	57.3
		Single	101	16.8
		Married	368	61.3
		Others	131	21.8
		Below 30	12	2.0
		30-41	102	17.0
3	Age group	41-50	217	36.2
		51-60	199	33.2
		Above 60	70	11.7
		Single	101	16.8
4	Marital Status	Married	368	61.3
		Others	131	21.8
		None	7	1.2
		Pry/Second.	236	39.3
5	Level of education	HND/BSc	293	48.8
		Postgraduate	64	10.7
		Unemployed/students	89	14.3
6	Employment status	Self-employed	279	46.5
		Civil servant	76	12.7
		Corporate sector	159	26.5
		Below ₦50,000	65	10.8
7	Average Monthly Income	₦50,000-₦100,000	247	41.2
		₦100,001-₦150,000	165	27.5
		Above ₦150,000	123	20.5
		Less than 3	81	13.5
8	Household size	Between 3 and 5	325	54.2
		Between 6 and 8	152	25.3

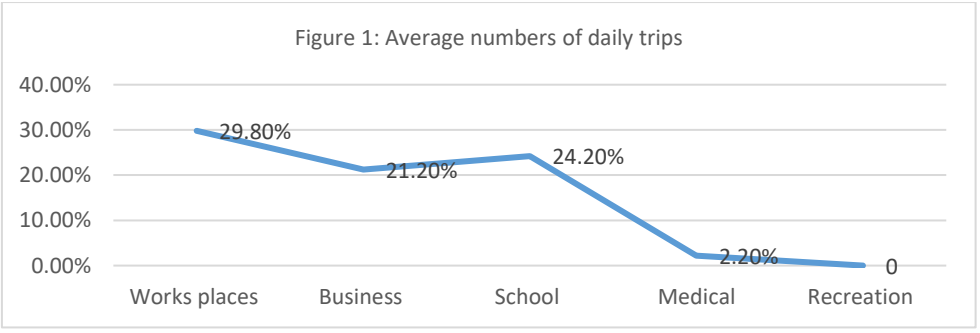
Source: Authors' Field Survey, December 2021 and January 2022

Further to the employment status is the average monthly income of respondents, in which the results of the analysed data revealed that almost one-tenth (10.8%) earn less than ₦50,000 monthly, while close to half (41.2%) earn between ₦50,000 and ₦100,000. Furthermore, more than one-quarter (27.5%) earn between ₦100,000 and ₦150,000 per month, while the remaining 20.5% earn more than ₦150,000 per month. Considering the previously discussed employment characteristics and the average monthly income, it can be inferred from these findings that the respondents are predominantly individuals who earn daily incomes, resulting in a moderately aggregated income by the end of the month. The household size of respondents varies from less than three (3) to more than eight (8) people, as evidenced by the

data analysis presented in Table 1. Specifically, more than one-tenth (13.5%) have a household size of less than three people, while slightly more than half (54.2%) have a household size ranging from 3 to 5 people. Additionally, a quarter (25.3%) have a household size of 6 to 8 people, and the remaining 7.0% have more than eight people. These results unequivocally indicate a prevalence of married respondents in the study area.

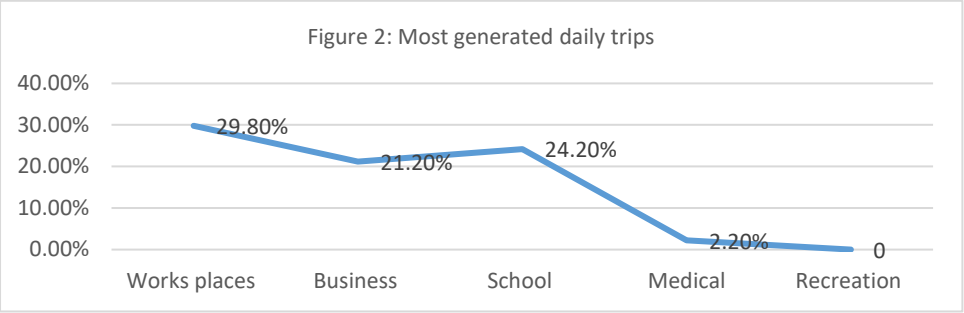
Examining the data, it is noted that the majority of respondents (60.2%) do not possess personal vehicles, while more than one-quarter (27.7%) have one personal vehicle, and 9.7% own two (2) personal cars. However, the remaining 2.5% own more than two vehicles. This outcome aligns with numerous empirical observations suggesting that vehicle ownership is generally low in many cities in developing countries, including Nigeria.

Furthermore, Figure 1 illustrates the analysis outcomes regarding the number of daily trips generated by respondents, with more than one-third (33.2%) making fewer than three (3) trips. Close to half (40.8%) make between three (3) and five (5) trips daily, and less than one-quarter (22.7%) make between six (6) and eight (8) trips daily. The remaining 3.3% of respondents make more than eight (8) daily trips. Upon careful examination, it is evident that most respondents make more than three (3) trips daily, highlighting the significance of land use and transportation activities in the study area. Hence, it can be deduced from the results in Figure 1 that the majority make more than three (3) trips daily, underscoring the integral role of land use and transportation activities in the respondents' daily lives, reflecting a dynamic urban environment.



Additionally, the results from the collected and analysed data on the most frequently generated trip purposes by respondents, as presented in Figure 2, indicate that almost one-third (29.8%) of trips are work-related, while slightly less than one-quarter (21.3%) are for business purposes. About a quarter (24.2%) of respondents make trips to school for themselves or their children, while trips to medical facilities constitute 2.2% of trips. Slightly more than one-tenth (12.5%) of trips are for recreation purposes, and trips to the shop account for the remaining 10.0% among the sampled respondents. This finding aligns with the common observation that trips related to work, shopping, school, and recreation typically dominate land use.

Therefore, based on Figure 2, it is observed that these findings corroborate the significance of crucial land uses such as workplaces, commercial establishments, and educational institutions in shaping travel patterns. Above all, the study's findings highlight the intricate interplay between socioeconomic characteristics, land use, and transportation activities in the study area. The demographic composition, employment structure, and travel patterns underscore the importance of a comprehensive approach to urban planning that considers the diverse needs and dynamics of the community.



Moreover, an analysis of the nine categorised means of travel used for discretionary trips, such as excursions to recreational spots, visits to friends and family, trips to religious centres, and attendance at social functions, was conducted. The results, presented in Table 3, were based on a four-point Likert scale yielding a Total Weighted Value (TWV) of 24.5134 for the nine (9) indicators. In this context, the findings revealed that five means of travel took the lead among the nine modal options assessed by respondents. Specifically, the use of taxi/cab (3.1267), mini-bus (3.000), tricycle (3.8933), and ride-hailing (2.8800) continued to dominate the travel options. They were followed by the use of private cars (2.7917), while the use of the remaining options, including conventional bus/BRT (2.5500), ferry ride (2.3350), commercial motorcycle (2.4367), and train ride (2.3350), was less prominent.

Upon closer examination, it is noted that many cities in southwestern Nigeria, excluding Lagos, need more functional conventional public transportation and ferry services. Lagos is the sole city with dedicated Bus Rapid Transit (BRT) routes for mass commuters along specified routes. Additionally, restrictions on commercial motorcycle operations in Lagos and other cities in the region have undoubtedly decreased commuters' reliance on this mode of transportation. Lastly, intracity train services and rides are only available in some regional towns, indicating operational and geographical limitations to rail and ferry services for commuters and the broader population in the study area.

Based on the preceding, it can be deduced that a clear hierarchy emerges among the various modes assessed for such trips. Hence, taxi/cab, mini-bus, tricycle, and ride-hailing stand out as the dominant means, garnering higher preference from respondents, which indicates a shared inclination towards convenience, accessibility, and potentially cost-effectiveness,

influencing the popularity of these modes. Meanwhile, utilised private cars occupy a lower rank than shared transportation options, implying a significant reliance on communal modes of travel for discretionary activities, possibly reflecting considerations such as affordability or environmental consciousness among respondents. The lower rankings of conventional bus/BRT, ferry rides, commercial motorcycles, and train rides further indicate that these modes have less prominence or availability in the considered cities. Also, geographical landscape plays a crucial role in shaping transportation options. Unlike Lagos, the absence of functional conventional public transportation and ferry services in southwestern towns influences regional disparities. While Lagos stands out with dedicated Bus Rapid Transit (BRT) routes, showcasing a more developed infrastructure for mass commuting, limitations in intracity train services and rides in several cities highlight operational and geographical constraints, limiting the accessibility of rail and ferry services for the broader population. In addition, regulatory measures exert a notable influence on travel choices. Hence, the observed reduction in the use of commercial motorcycles in response to operational restrictions in Lagos and other cities highlights the impact of regulations on transportation preferences, as such measures not only affect the popularity of specific modes but also influence the overall dynamics of the transportation ecosystem.

Table 2: Transport Means for Discretionary Trips

Indicators	TWV	Relative Mean Index	Mean Index Value	Rank
Private cars	1675	2.7917		*5*
Commercial motorcycle	1462	2.4367		*8*
Tricycle	1736	2.8933		*3*
Taxi/cab	1876	3.1267		*1*
Minibus	1800	3.0000	24.5134/9= 2.7371	*2*
Conventional Bus/ BRT	1530	2.5500		*6*
Ferry/ Boat	1500	2.5000		*7*
Train ride	1401	2.3350		*9*
Ride-hailing	1728	2.8800		*4*

Source: Authors' Field Survey, December 2021 and January 2022

The assessment of transport modes for non-discretionary trips, encompassing commuting to work, school, shopping, and essential routine journeys, employed a four-point Likert scale. The analysis resulted in a Total Weighted Value (TWV) of 21.735 and a Mean Importance Value (MIV) of 2.4139. The detailed findings, outlined in Table 3, unveil that respondents' primary choices for non-discretionary trips, ranked in descending order, include minibus (3.1267), taxi/cab (3.0000), tricycle (2.6833), and private cars (2.5000). These preferences are closely followed by ride-hailing (2.467) and commercial motorcycles (2.3350). In contrast, respondents express a preference for ferry/boat (1.9100), conventional bus/BRT (1.8933), and train ride (1.8400) as their favoured transportation modes for non-discretionary trips. Based on the preceding, it can be deduced from the results that there is growing momentum in utilising tricycles and ride-hailing services across cities while relying on commercial motorcycles for non-discretionary trips is diminishing. Concurrently, the limited availability of conventional bus/BRT systems, especially outside Lagos, contributes to its lower patronage. This underscores the imperative for comprehensive and purposeful reforms within

the urban transportation system. These reforms should encompass enhancements in infrastructure and modal operational capacity to effectively cater to the diverse needs of residents in the southwestern region of Nigeria.

It is deduced from the findings that there is a discernible shift in the preferred transportation modes for non-discretionary trips among respondents. Thus, the increasing popularity of tricycles and ride-hailing services suggests a growing acceptance and reliance on these modes of transportation for essential and routine journeys. At the same time, the diminishing use of commercial motorcycles for non-discretionary trips indicates a decreasing preference for this mode, potentially influenced by factors such as safety concerns, regulatory restrictions, or a shift towards more convenient alternatives. Furthermore, the lower patronage of conventional bus/BRT systems, especially outside Lagos, underlines the operational and infrastructural challenges these public transportation services face. These findings affirm the position of Akanmu, Gbadamosi and Omole (2022), who advocated for significant reform in the public transportation system in the country. Hence, there is a pressing need for comprehensive reforms in the urban transportation system, emphasising infrastructure improvements and enhanced operational capacities that align with the diverse needs and ensure a more sustainable and efficient urban mobility landscape.

Table 3. Transport mode for non-discretionary trips

Indicators	TWV	Relative Mean Index	Mean Index Value	Rank
Private cars	1500	2.5000		4
Commercial motorcycle	1401	2.3350		6
Tricycle	1610	2.6833		3
Taxi/cab	1800	3.0000	21.725/9=2.4139	2
Minibus	1876	3.1267		1
Conventional Bus/ BRT	1136	1.8933		8
Ferry/ Boat	1146	1.9100		7
Train ride	1104	1.8400		9
Ride-hailing	1462	2.4367		5

Source: Authors' Field Survey, December 2021 and January 2022

The evaluation of factors influencing the travel modal choices of respondents involved assessing nine criteria on a four-point Likert scale. The analysis presented in Table 4 yielded a Summated Weighted Value (SWV) of 27.16 and a Mean Importance Value (MIV) of 3.0177, indicating a vital consideration for the identified and assessed factors. Specifically, the findings, as outlined in Table 4, underscore that respondents place significant importance on the availability of travel modes (3.3983), accessibility of travel modes (3.3333), affordability (3.0783), and ease of navigation (3.0717). These factors emerged as respondents' most crucial and influential considerations when making travel mode choices. Additionally, safety (2.9100), comfortability (2.8917), reliability (2.8500), response functionality (2.8083), and speed (2.7767) also played a role in the decision-making process, although their values fall below the Mean Importance Value. Therefore, the results indicate that the most available, accessible, and affordable travel modes take precedence and remain the leading considerations for urban commuters when choosing their mode of transportation.

Table 4: Factors influencing travel modal choice

Indicators	TWV	Relative Mean Index	Mean Index Value	Rank
Availability	2039	3.3983		*1*
Reliability	1710	2.8500		*7*
Affordability	1847	3.0783		*3*
Safety	1746	2.9100	27.16/9= 3.0177	*5*
Speed	1666	2.7767		*9*
Comfortability	1735	2.8917		*6*
Response functional	1685	2.8083		*8*
Accessibility	2000	3.3333		*2*
Maneuverability/ ease of navigation	1843	3.0717		*4*

Source: Authors' Field Survey, December 2021 and January 2022

4.3 Nexus between Transportation Land Use and the Urban Mobility Crisis

In delving into the connection between transportation land use and the urban mobility crisis, the study scrutinised fourteen prevalent types of transportation land uses within the study area, employing a 4-point Likert scale. The outcomes of this evaluation, presented in Table 5, yielded a cumulative weighted value of 42.5715 for the fourteen indicators assessed, resulting in a 3.2251 Relative Index Value. Upon comparison of these results, nine indicators emerged as particularly noteworthy, signifying the prominence of certain transportation land uses in the cities. These indicators include bus stops with or without shields (3.4433), motor parks (3.4417), event centres (3.4083), roadside automobile workshops (3.3883), auto display marts (3.3883), fuel/gas dispensing stations (3.3733), mini marts and cafeterias (3.3133), and car cleaning facilities (3.0200). As anticipated, these land uses consistently generate and attract daily city traffic, serving as essential hubs for residents to fulfil their daily tasks and obligations. In contrast, the remaining transportation land uses, such as cycling paths (2.8417), pedestrian walkways (2.8083), traffic information and signal posts (2.5433), and pedestrian bridges (2.3417), are less conspicuous within the urban landscape. These findings shed light on the differential impact and prevalence of various transportation land uses in the study area, offering valuable insights into urban mobility dynamics.

The inference drawn from the assessment of transportation land use and its correlation with the urban mobility crisis in the study area is that specific types of land use significantly influence and contribute to the challenges faced in urban mobility. The examination of fourteen distinct transportation land uses revealed that certain facilities and infrastructure, such as bus stops, motor parks, event centres, and others, play a prominent role in generating daily traffic. These transportation hubs, characterised by their high relative importance values, attract substantial, essential and non-essential commuter activity, contributing to the urban mobility crisis. However, other transportation land uses like cycling paths, pedestrian walkways, traffic information and signal posts, and pedestrian bridges exhibit lower prominence, indicating a relatively reduced impact on urban mobility dynamics. This affirms the findings of Akanmu, Gbadamosi and Omole (2021), who articulated provisions of active transportation infrastructure as strategies for enhancing city livability.

Table 5: Nature of Transportation Land Use

Indicators	TWV	Relative Mean Index	Mean Index Value	Rank
Event centre	2045	3.4083	42.5715/14=3.2251	*3*
Fuel/gas dispensing station	2024	3.3733		*6*
Mini marts and cafeteria	1998	3.3133		*7*
Cycling path	1705	2.8417		*9*
Motor parks	2065	3.4417		*2*
Auto display mart	2033	3.3883		*4*
Traffic safety and monitoring post	1526	2.5433		*13*
Traffic information and signal post	1577	2.6283		*12*
Parking facility	1579	2.6317		*11*
Pedestrian walkway	1685	2.8083		*10*
Car cleaning facility	1812	3.0200		*8*
Roadside automobile workshop	2033	3.3883		*4*
Pedestrian bridge	1405	2.3417		*14*
Bus stops with or without shields	2066	3.4433		*1*

Source: Authors' Field Survey, December 2021 and January 2022

Moreover, the nature of the mobility crisis identified in the selected cities was assessed using a four-point Likert scale with varying gradations, resulting in a SWV (Severity Weighted Value) of 68.67565 and an RIM (Relative Importance Measure) of 2.7503. This serves as a baseline for comparing the perceived severity of the mobility crisis among commuters in the study area. The detailed outcomes of the analysis, as presented in Table 6, indicate that seventeen (17) indicators exhibit a high level of mobility crisis in Nigerian cities. Taking into account the above, factors such as land use development and pattern (3.4433), road encroachment (3.4417), poor parking habits (3.4083), traffic delay and congestion (3.3883), inadequate travel and traffic information (3.3733), deficient traffic flow and coordination (3.3133), subpar urban connectivity and navigation (3.0783), insufficient transport infrastructure maintenance (3.0767), a high rate of traffic accidents or crashes (3.0450), weak multimodal integration (3.0417), and inadequate design or absence of active transportation facilities (3.0200) reflect the substantial extent of the mobility crisis experienced by respondents across various surveyed cities.

Furthermore, additional urban mobility crises that hold prominence include complicated and unregulated travel mode operations (2.9100), violence and traffic insecurity (2.8600), insufficient parking facility supply and management (2.8567), unpredictable and extended travel time (2.8417), elevated travel risk and discomfort (2.8083), and the proliferation of informal travel modes (2.7767). These findings underscore the imperative for comprehensively reviewing Nigerian cities' transportation land use and urban activities. This aligns with the conclusions drawn by Akanmu, Gbadamosi and Omole (2021) and Fasina, Akanmu and Salisu (2020).

Based on the preceding, the detailed analysis breakdown highlights seventeen key indicators contributing to the observed high level of the mobility crisis. The factors include land use development and pattern, road encroachment, poor parking habits, traffic delay and congestion, inadequate travel and traffic information, and deficient traffic flow and coordination, which are among the primary contributors to the perceived severity of the

mobility crisis. These elements collectively emphasise the challenges in urban planning, infrastructure, and coordination that impact the efficiency of transportation systems in the surveyed cities. Therefore, the analysis identifies other salient urban mobility crises, including complicated and unregulated travel mode operations, violence and traffic insecurity, insufficient parking facility supply and management, unpredictable and extended travel time, elevated travel risk and discomfort, and the proliferation of informal travel modes. These issues further compound the challenges commuters face in the studied urban centres.

Table 6: Nature of Mobility Crisis in Selected Nigeria Cities

Nature of the problems	TWV	Relative Mean Index	Mean Index Value	Rank
Poor road-rail capacity and network maintenance	1063	1.7717	68.2249/25= 2.7290	22
Poor land use development and pattern	2066	3.4433		1
Poor traffic flow and coordination	1998	3.3133		6
Poor parking habits	2045	3.4083		3
Road encroachment	2065	3.4417		2
Traffic delay and congestion	2033	3.3883		4
Poor parking facilities supply and management	1714	2.8567		14
Unaffordable parking pricing	887	1.4783		24
Unaffordable road pricing and tolling	882	1.3700		25
Poor design or absence of active transportation facilities	1812	3.0200		11
Violence and traffic insecurity	1716	2.8600		13
Poor modal choice accessibility	1526	2.5433		19
High vehicle operating and maintenance costs	1405	2.3417		20
Unpredictable and longer travel time	1705	2.8417		15
Poor travel and traffic information (as	2024	3.3733		5
High travel risk and discomfort	1685	2.8083		16
Expensive transportation fares	956	1.5933		23
Proliferation of informal travel mode	1666	2.7767		17
Poor urban connectivity and navigation	1847	3.0783		7
High rate of traffic accidents or crashes	1827	3.0450		9
Poor transport infrastructure maintenance	1846	3.0767		8
Inadequate transport infrastructural facilities	1136	1.8933		21
Complicated and unregulated travel mode operations	1746	2.9100		12
Weak multimodal integration	1825	3.0417		10
Poor implementation of transport policies and regulations	1530	2.5500		18

Source: Authors' Field Survey, December 2021 and January 2022

Meanwhile, an examination was conducted on the influence of transportation land use on the mobility crisis, and the collected data in this regard were analysed using a four-point Likert scale. The analysis of twenty (20) indicators, as presented in Table 7, yielded a weighted sum of 54.5499 and a relative mean index value of 2.7275. Given these outcomes, it is evident that certain factors, including increased travel time (3.4433), encouragement of road encroachment (3.4417), reduction of roadway capacity (3.4083), increased traffic delay and congestion (3.3883), and heightened travel risk and discomfort (3.3733), stand out as the primary adverse influences of transportation land use on urban mobility. This observation is based on the fact that the relative index value for each indicator significantly surpasses the entire analysis's relative index value. Following closely in terms of adverse effects on the mobility crisis are increased transportation infrastructure damage (3.0767), heightened urban stress (3.0450), the complication of city livability (3.0417), and increased difficulty for pedestrians and cyclists (3.0200). Respondents identified increased parking difficulties (2.8417) and greater use of informal travel modes (2.7767), contributing to the perceived negative impact of land

transportation use on urban mobility. However, other indicators, such as the reduction in parking supply, increased vehicle operating costs, decreased city functionality, heightened transportation costs, reduced urban connectivity, increased parking pricing and management, and the encouragement of road pricing and tolling, are deemed less impactful by the respondents in terms of their influence on the urban mobility crisis.

The inference drawn from these findings suggests that certain aspects of transportation land use have a pronounced and detrimental effect on urban mobility. The identified challenges, ranging from increased travel time to road encroachment and traffic congestion, signal the need for comprehensive urban planning and transportation infrastructure interventions. In other words, the analysis results emphasise the importance of understanding the nuanced dynamics between transportation land use and urban mobility to provide a foundation for targeted interventions and policy considerations.

Table 7: Effect of transport land use on mobility crisis

Indicators	TWV	Relative Mean Index	Mean Index Value	Rank
Reduce roadway capacity	2045	3.4083		3
Reduce traffic flow and speed	1998	3.3133		6
Increase parking difficulties	1705	2.8417		11
Encourage road encroachment	2065	3.4417		2
Increase traffic delay and congestion	2033	3.3883		4
Reduce parking supply	1526	2.5433		13
Increase parking pricing and management	887	1.4783		18
Encourage road pricing and tolling	882	1.3700	54.5499/20= 2.7275	19
Increase pedestrian and cycling difficulties	1812	3.0200		10
Increase access difficulty	2033	3.3883		4
Increase vehicle operating costs	1405	2.3417		14
Increase travel time	2066	3.4433		1
Increased travel risk and discomfort	2024	3.3733		5
Increase transportation cost	1063	1.7717		16
Increase the use of informal travel mode	1666	2.7767		12
Reduce urban connectivity	956	1.5933		17
Increase urban stress	1827	3.0450		8
Increase transport infrastructure damage	1846	3.0767		7
Reduce city functionality	1136	1.8933		15
Complicate city livability	1825	3.0417		9

Source: Authors' Field Survey, December 2021 and January 2022

4.4 Challenges of Transportation Land Use in Nigerian Urban Centres

Residents in the selected Nigerian cities assessed the seventeen (17) challenges associated with transportation land use by utilising a four-point Likert scale. The outcomes of this evaluation, as detailed in Table 8, yielded a weighted sum of 44.7500 and a relative mean index value of 2.6234, identifying nine (9) predominant constraints. Specifically, the challenges perceived as most critical include the attitude of members of the public (3.4417), corruption and mismanagement of funds (3.2233), encroachment (3.200), activities and excesses of miscreants (3.15967), poor transport-land use planning (3.1317), unprecedented population growth (3.1200), and the abandonment of professionals in land use transportation plan implementation and facilities instalment (3.0550). According to the residents ' assessments, these challenges collectively represent the most pressing issues. Additionally,

factors such as lack of transport policy (2.9683), poor synergy between ministries of transportation, works, and physical planning (2.8983), and inadequate funding (2.7550) are considered pertinent constraints but are ranked in the second category.

Meanwhile, the remaining seven (7) challenges, including weak political will (2.2783), inadequate advocacy and public enlightenment on encroachment (2.1417), inadequate transport planning institute (2.0567), poor institutional framework (1.8200), weak policy implementation (1.6867), and political instability (1.6683), are perceived as less critical by the residents. In other words, the assessment provides valuable insights into the perceived challenges associated with transportation land use. From this evaluation, nine (9) challenges emerge as the most predominant and critical factors influencing transportation land use in these urban centres. Accordingly, the most pressing challenges, according to resident assessments, include the attitude of members of the public, corruption and mismanagement of funds, encroachment, activities and excesses of miscreants, poor transport-land use planning, unprecedented population growth, and the abandonment of professionals in land use transportation plan implementation and facilities instalment. These challenges collectively point to a complex interplay of societal, administrative, and planning issues that significantly impact the effectiveness of transportation land use in Nigerian cities.

Also, the secondary category of challenges, including the need for more transport policy, poor synergy between ministries of transportation, works, and physical planning, and inadequate funding, underscores additional constraints that contribute to the overall complexity of the transportation landscape. While not deemed as critical as the primary challenges, these challenges still require attention and intervention to ensure a holistic and sustainable approach to transportation planning and implementation.

Table 8: Challenges of transportation land use

Nature of challenges	TWV	Relative Mean Index	Mean Index Value	Rank
Weak policy implementation	1012	1.6867	44.75/17=2.6234	16
Poor institutional framework	1092	1.8200		15
Poor funding	1653	2.7550		10
Corruption and mismanagement of funds	1934	3.2233		2
Unprecedented population growth	1872	3.1200		6
Political instability	1001	1.6683		17
Weak political will	1367	2.2783		11
The poor synergy between ministries of transportation works and physical planning	1739	2.8983		9
The dearth of workforce and qualified personnel	1265	2.1083		13
Inadequate transport training institute	1234	2.0567		14
Poor planning	1879	3.1317		5
Lack of transport policy	1781	2.9683		8
Inadequate advocacy and public enlightenment on encroachment	1285	2.1417		12
Activities and excesses of miscreant	1918	3.1967		4
Abandonment of professionals in plan implementation and facilities installation	1833	3.0550		7
Encroachment	2064	3.200		3
The attitude of the public	1974	3.4417		1

Source: Authors' Field Survey, December 2021 and January 2022

4.5 Strategies for Improved Transportation Land Uses and Urban Mobility

Residents were requested to evaluate and propose strategies to enhance transportation land use planning and urban mobility. Their assessments were conducted using a four-point Likert scale. The outcomes of this analysis, as presented in Table 9, revealed a weighted sum of 25.7451 and a relative mean index value of 3.2181. From the results outlined in Table 9, it is evident that respondents exhibited favourable inclinations towards four (4) out of the eight (8) identified and evaluated strategies for improving transportation land use in the country. Specifically, respondents advocated for the establishment of a road transport administration (3.3667), the development and deployment of a commercial travel demand model (3.3600), adequate funding (3.2533), and better coordination of the transportation and land use process (3.3217) as the most prominent strategies. The respondents deemed these strategies essential to enhancing land transportation use in the country.

Additionally, residents identified strengthening transport education at the tertiary level (3.1317), improving the technical capacities of transport planners (3.1967), and enhancing travel demand model plans (3.1767) as viable additional strategies. It is worth noting that while improved technical capacities of transportation planners are considered, the respondents should emphasise them more. These findings align with the research conducted by Salisu, Akanmu, and Fasina (2020) and Fasina, Akanmu, Salisu, and Okunubi (2020), reinforcing the importance and viability of the identified strategies in the context of transportation land use planning and urban mobility improvement.

Table 9: Strategies to improve transportation land use planning in Nigeria

Nature of strategies	TWV	MIV	RIV	Rx
Adequate funding	1952	3.2533	25.7451/8= 3.2181	3
Integration of land use forecasting models with travel demand models	1973	2.9883		8
Development and deployment of commercial travel demand model	2016	3.3600		2
Better coordination of transportation land use process	1993	3.3217		4
Improved technical capacities of transportation planners	1918	3.1967		6
Strengthening transport education at the tertiary institution level	1879	3.1317		5
Improved travel demand model in the plan	1876	3.1267		7
Establishment of road transport administration	2020	3.3667		1

Source: Authors' Field Survey, December 2021 and January 2022

4. Conclusion and Recommendations

Arguably, transportation land use is a significant component of urban land use, significantly affecting and influencing other land uses. With traffic generation as a function of land use, transportation land use becomes indispensable to all the residents, investors, and visitors in the cities, providing access and mobility as well as other ancillary facilities and services to ensure seamless overcoming of the friction of distance for various purposes. Based on the preceding, this study investigated the perceived effects of transportation land use on the mobility crisis in six Nigerian cities in the southwestern region: Ikeja, Ibadan, Abeokuta, Osogbo, Ekiti, and Akure. The study, therefore, appraised the socio-economic attributes of the residents, trip characteristics including forms of transportation for daily commuting, travel modal options for both discretionary and nob-discretionary trips, factors influencing travel

modal choice, and the nature of transportation land use and mobility crisis in Nigerian cities, as well as the effects of transportation land use on urban mobility crisis, challenges of transportation land use, and strategies for improving transportation land use and mobility crisis.

Consequently, the study established the significance of transportation land use to the efficient functioning of cities and the socio-economic and environmental development of people and societies. As such, it concluded that inappropriate transportation land use does influence the urban mobility crisis. The availability of transportation land use influences the development of various business investments, improving trade and commerce and the value of the properties adjoining the transportation land use. Unfortunately, the attitude of the public, corruption and mismanagement of funds, and the unguided development of road encroachment are among the most pronounced challenges affecting transportation land use in Nigerian cities. In the quest to ameliorate the attributed issues and challenges and improve the transportation land use in Nigerian cities, it is recommended, among others, that:

a. Efficient coordination of transportation projects and programmes is needed for efficient spatial development. In this regard, better coordination of the transportation ministry and other land-use-related ministries, including the Ministry of Physical Planning, the Ministry of Works, and the Ministry of Environment, is required to resolve various dimensions of the mobility crisis in the cities.
b. Adequate funding of transportation infrastructure to cater for both discretionary and non-discretionary trips of all transportation system users. This includes the development of active transportation infrastructure that prioritises pedestrians, cyclists, and other vulnerable users of the transportation system.
c. formulation and implementation of sustainable public policy for conventional transportation systems. In this regard, the cities and residents require implementing and maintaining various transportation reforms, including provisions for Bus Rapid Transit and other conventional transit schemes.
d. Better coordination of the transportation and land use processes is needed to eliminate friction, encroachment, and displacement of transportation land use in the cities and other land urban centres.
e. expansion of public enlightenment to strengthening transportation education and advocacy in society, especially at the tertiary education level.
f. Enforcement of traffic rules and regulations governing banning unlawful encroachment and displacement of transportation land uses, including street trading, hawking, and begging.

References

Akanmu, A. A., Gbadamosi, K. T. & Omole, F. K. (2022). The Nexus Between City Livability And Transportation in Lagos Metropolis, Nigeria. *Logistics, Supply Chain,*

Sustainability and Global Challenges, 13(1), 1-18. https://doi.org/10.2478/jlst-2023-0001.

Akanmu, A. A., Fasina, S. O., Salisu, U. O., Adeyemo, L., & Olorunfemi, S. O. (2022). Socio-Economic and environmental implications of roadside automobile workshops in Ota City. *Nigeria. Journal of Social Science, 5*(3), 48-70.

Akanmu, A. A., Salisu U. O., Fasina S. O., Adeyemi A. A. & Sanni, S. M. (2022). Transportation land use planning in Nigerian cities: issues, challenges and prospects. In K. Lawal, B. Ogunsesan, J. Adejare & D. Olagunju (Eds). *Nigeria's cities, regions and transportation systems, a festschrift in honour of Tpl. Owolabi Dadepo Agboola. Centre for Innovative Design and Development Research (CIDDR)*, Ibadan. Pp. 260-271.

Akanmu, A. A., Salisu, U. O., Fasina, S. O., Sanni, S. M., Olatunji, O. M., & Faleti, C. A. (2020). State of urban transport in a traditional Nigerian city. *Transport and Communications, VIII*(II),1-12. DOI: 10.26552/tac.c.2020.2.1

Calthoper, P. (1993). *The new American Metropolis: ecology, community and the American Dream.* California: Princeton Architectural Press.

Carlton, I. (2007). *Histories of transit-oriented development: perspectives on the development of TOD concept for real estate and transit, urban and social movement.* California: University of California

European Road Transport Research Advisory Council (2013). Land use and transport interactions, *Integrated Research Initiative*, June 2013

Fasina, S.O., Salisu, U.O., Odufuwa, B.O., & Akanmu, A.A. (2020). Travel behaviour and mobility challenges of disabled elderly in selected Ogun State, Nigeria cities. *LOGI Scientific Journal on Transport and Logistics, 11*(1), 25-36.

Fasina, S. O., Salisu, U. O., & Akanmu, A. A. (2020). Curtailing the disaster of moving Monsters in Lagos, Nigeria. *Journal of Academic Research in Economics, 12*(1), 151-173.

Fasina, S. O., Akanmu, A. A., Salisu, U. O., & Okunubi, S. A. (2020). Intra-city mobility and The characterisation in the fast-growing city of Lagos, Nigeria. *Logistics & Sustainable Transport*. 11(1), 33-50.doi: 10.2478/jlst-2020-0003.

Giuliano, G. (1995). Land Use Impacts of Transportation Investments: Highway and Transit", In T. Litman (2012). *Evaluating Transportation Land Use Impacts.* Victoria: Victoria Transport Policies Institute VTPI.

Hrelja, R. (2015). Integrating transport and land-use planning: How steering cultures in local Authorities affect the implementation of integrated public transport and land-use planning.

Transportation Research Part A: Policy and Practice, 74: 1-13 http://dx.doi.org/10.1016/j.tra.2015.01.003

Messenger, T. & Ewing, R. (1996). Transit-oriented development in the Sun Belt. *Transportation Research Record, 1552,* 145-153.

Morenikeji, W. (2011). Land use planning and transport system in cities *(Lecture paper presented at 2-Day Mandatory Continued Professional Development Programme),* Town Planner Registration Council of Nigeria and Nigeria Institute of Town Planners, Nigeria.

Obateru, I. O. (2003). *Yoruba has been a city in history from the 11th century to the present.* Ibadan: Penthouse Publications.

Ogunsesan, A. S., Akanmu, A. A. & Salisu, U, O. (2022, November). Urbanisation and regional security breaches in Nigerian southwestern communities: the residents' Experiences. *Paper presented at the 53rd National Conference of the Nigerian Institute Of Town Planners*, held at International Conference Centre, Abuja.

Ogunsesan, A. S., Akanmu, A. A. & Oyejide, I. O. (2016). World Bank Contributions to Physical Planning and Disaster Management in Oyo State. In K. Lawal and L. Agboola, (Eds.), *Physical Planning in Nigeria: The Oyo State Experience* (pp. 256-266). Penthouse Publications.

Olorunfemi, S. O., Akanmu, A. A., Salisu, U. O. (2022). Government investment in road Infrastructure in Kogi State, Nigeria: the impact on urban mobility. *Journal of Social Sciences, 5* (3), 88-104. https://doi.org/10.52326/jss.utm.2022.5(3).07.

Oyesiku, K.O. (2014). Managing fast-growing cities in developing countries: The role of urban and regional planners. *(Paper presented at the 27th TOPREC Induction Ceremony),* Town Planning Registration Council of Nigeria, Nigeria.

Oyesiku, K.O. (2021). *Transport and Logistics in Nigeria.* HEBN Publishers Plc, Ibadan.

Rodrigue, J. P., Comtois, C. & Slack, B. (2006). *The geography of transport systems.* New York: The Guilford Press.

Salisu, U. O., Akanmu, A. A., & Fasina, S. O. (2020). Information and communication Technology for improved intra-city traffic flow in Ibadan city, Nigeria. *Journal of Academic Research in Economics,* 12(2), 388-407.

Salisu, U, O., Akanmu, A. A., Fasina, S. O., & Sanni, S. M. (2020). Traffic congestion and Intelligent transport system in a fast-growing Nigerian city. *Transport and Communications*, VIII(I), 36-49. DOI: 10.26552/tac.C.2020.1.6.

Still, T. (2002). *Transit-oriented development: reshaping America's Metropolitan Landscape On common ground.* Washington D.C: Winter.

Wee, B. V. (2002). Land use and transport: research and policy challenges, *Journal of Transport Geography, 10(4)*, 259-271.