TRANSPORTATION LAND USE AND URBAN MOBILITY CRISIS IN ALIMOSHO, LAGOS STATE

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Abstract

The rapid urbanization in Lagos has led to increased pressure on transport and its infrastructure services in the state due to its urban nature.This study examines the relationship that exists between the usage of land for transportation and the crisis that surrounds urban mobility by addressing in more context the complex relationship between transportation land use and urban mobility, specifically in Alimosho Local Government Area of the State. Adopting a quantitative approach, data was gathered through the primary source via a questionnaire that entails questions relating to the transportation land use and urban mobility experience of respondents that are commuters (99) and residents (85) totalling a sample size of 184, which was determined using the Cochran formular and the combination of random and purposive sampling techniques used for respondent selection. Data gathered was cleaned and quality checks was done, after which the descriptive and inferential statistics of the correlation analysis between variables such as the land use patterns and traffic congestion which is an urban mobility crisis, was done. Findings reveal that land use patterns, socio-economic characteristics, infrastructure of transport are factors that impact travel behaviour in the study area. Hence, implying that informed transport planning decisions must urgently be taken for seamless flow of movement and aversion of mobility crisis in the study area.

Keywords: Alimosho, Lagos State, Transportation Land Use, Urban Mobility

Introduction

Land use constitutes a fundamental aspect of spatial development within human settlements, involving the transformation of land from its natural state or one use to another. As Morenikeji (2011) defines, land use as any temporary or permanent intervention designed to enhance living standards for individuals, society, and the nation. The socio-economic value of any region is closely tied to its land use characteristics, shaping the opportunities and challenges of human habitation and economic activities. Urban areas, in particular, present a complex mosaic of diverse land uses that evolve over time in response to changing demand and supply dynamics. These land uses typically include residential, industrial, commercial, public, semi-public, and circulation or transportation functions (Ogunsesan, Akanmu&Oyejide, 2016).

Transportation land use stands out as a crucial component within this urban land use framework due to its direct influence on traffic generation and mobility patterns. It plays a pivotal role in facilitating access, connectivity, and the flow of people, goods, and services, serving the needs of residents, investors, and visitors alike. Consequently, the quality and extent of transportation land use significantly impact the overall performance of urban systems. Oyesiku (2014) highlights that rapid urbanization, industrialization, population growth, and expanding infrastructure demands, continually drive changes in land use patterns. Transportation and other land uses are deeply interconnected, especially in enabling efficient circulation within urban, rural, and regional contexts. Rodrigue, Black, &Comtos (2006) stress that land-use decisions influence transportation infrastructure projects, affecting travel time, costs, and the volume of users on roads and transit routes.

In many Nigerian cities, however, the pace of urban growth and spatial expansion often exceeds the capacity of existing transportation infrastructure, leading to a mobility crisis characterized by congestion, increased travel distances, higher incidence of traffic crashes, and reduced use of non-motorized transport options (Oyesiku, 2021). Despite these challenges, cities in Nigeria continue to attract population inflows and investments due to their relatively better infrastructure and accessible transportation services (Olorunfemi, Akanmu & Salisu, 2022; Salisu, Akanmu, Fasina& Sanni, 2020). According to Akanmu et al. (2022), urban residents place high value on the accessibility and mobility functions of transportation systems. However, the structure, capacity, and connectivity of these systems often struggle to keep pace with dynamic activity patterns, fluctuating demand and supply, traffic distribution challenges, and persistent bottlenecks.

This growing urban mobility crisis poses significant obstacles to sustainable urban development and quality of life. Therefore, this study seeks to evaluate the perceived impact of transportation land use on the mobility challenges facing Nigerian urban centers, particularly in the Southwestern regional capitals. The objectives include identifying travel and trip characteristics of residents, understanding the relationship between transportation land use and mobility constraints, pinpointing specific challenges within transportation land use, and proposing strategies to optimize transportation land use towards improved accessibility and wellbeing.

Globally, the urban mobility crisis is intertwined with broader phenomena such as globalization and rapid urbanization. Globalization has intensified the alignment of economies, trade, investment, employment, industry, and technology beyond local and national boundaries, creating attractive urban hubs that magnetize population growth and economic activities. However, this growth often triggers uncontrolled migration and urbanization, especially in developing countries where infrastructure development fails to keep pace with rising demand (Njoh, 2008; Goryakin *et al.,* 2015). Transportation infrastructure, as a critical element of local, regional, and global networks, frequently suffers under such pressure, exacerbating social, economic, and environmental problems in fast-agglomerating urban centers in Africa and Asia.

Urbanization transforms land surfaces from natural or agricultural states into built-up environments comprising residential areas, transportation networks, commercial zones, parks, and other impermeable surfaces (Cai *et al.,* 2019). This rapid change results in significant shifts in the urban landscape with profound impacts on human settlement patterns and ecological processes (Wang *et al.,* 2018). While urban growth in developed countries has often been accompanied by improved living standards, infrastructure, and governance, many African cities remain characterized by hybrid urban and peri-urban slums overwhelmed by a massive influx of people and inadequate infrastructure (Xu *et al.,* 2019). This situation leads to fragmented urban development and insufficient planning capacities, impeding sustainable city management.

One of the key challenges in managing this transformation is the lack of timely and accurate information on spatial-temporal land use and land cover (LULC) changes. Such information is essential for effective urban planning and policy implementation. Historically, societies have extensively exploited and altered their environments, sometimes resulting in environmental degradation, over-exploitation, and disruption of natural processes (Adhikari & de Beurs, 2017). Consequently, sustainable land use management has become a critical concern to moderate human activities and preserve land resources (Turner *et al.,* 2001; Ojima *et al*., 2005; Peters *et al.,* 2016).

Given that urban growth and land-use changes are inevitable, monitoring and modeling these changes provide invaluable insights for planning and sustainable development. Techniques such as Geographic Information Systems (GIS) and Remote Sensing (RS) offer powerful capabilities to capture, analyze, and visualize spatial-temporal data related to urban expansion and land use (Dragicevic *et al.,* 2001). GIS-RS technologies enable researchers and planners to track urban growth patterns, assess land suitability, and forecast future scenarios using models like Markov Chain, Cellular Automata-Markov (CA-Markov), and Artificial Neural Networks (ANN) (Basse *et al.,* 2014; Jokar Arsanjani *et al.,* 2013). These integrated modeling approaches help to address the complex multidimensional challenges of urban land use and support decision-making aimed at balancing development and environmental sustainability (Triantakonstantis &Mountrail, 2012).

Urbanization trends are particularly pronounced in developing countries. Since 1950, the global urban population has increased dramatically, with projections indicating that nearly 70% of the world's population will live in cities by 2050 (United Nations, 2018). This trend is most rapid in low- and middle-income countries, especially in Africa, where urban residents' share is expected to nearly double by 2050 (UN Habitat, 2014). Climate change and environmental pressures may further accelerate rural-to-urban migration, compounding challenges in urban infrastructure and service delivery (Foresight, 2011; Stapleton *et al.,* 2017).

Achieving sustainable urban growth, therefore, requires integrated policies that prioritize inclusive, efficient, and environmentally resilient urban mobility. The United Nations' Sustainable Development Goal 11 emphasizes the need for cities to be "inclusive, safe, resilient and sustainable," which encompasses ensuring affordable and accessible transport options (Parnell, 2016; Burdett *et al*., 2018). However, many rapidly urbanizing cities exhibit car-dependent development patterns, where private automobile use dominates due to socio-

economic aspirations and insufficient investment in public and active transport systems (Babalik-Sutcliffe, 2017; Newman & Kenworthy, 2015). Such car-oriented urbanization exacerbates congestion, pollution, health risks, energy consumption, social exclusion, and spatial inequality, undermining sustainable urban futures (WHO, 2018).

Materials and Method

This study adopted a quantitative research approach to examine the relationship between transportation land use and the urban mobility crisis in Alimosho Local Government Area, Lagos State. The study focused on Alimosho Local Government Area with specific locations as Iyana - Ipaja, Ikotun and Abule Egbarespectively due to high density residential areas and commercial hubs. Also,its diverse land use patterns and transportation networks make it an ideal case study for exploring urban mobility issues in a dense metropolitan context.

The target population comprises commuters and residents of Alimosho, representing individuals who regularly interact with the transportation system and experience its impacts on daily mobility. A total sample size of 184 respondents was determined using the Cochran formula for sample size calculation, ensuring statistical validity and representativeness. The sample includes 99 commuters and 85 residents, capturing a balanced perspective of transportation users and local inhabitants.

A combination of random sampling and purposive sampling techniques was employed.

- Random sampling was used to select respondents within the population, minimizing bias and enabling generalization of findings.
- Purposive sampling targeted specific groups likely to have direct experience with transportation land use and mobility challenges, such as frequent commuters and long-term residents, to ensure the data collected was relevant and insightful.

Primary data were collected through a structured questionnaire, designed to capture comprehensive information on:

- Respondents' demographic characteristics
- Patterns of transportation land use
- Experiences and perceptions of urban mobility challenges, including travel time, congestion, accessibility, and transport mode choices

The questionnaire consisted predominantly of closed-ended questions, facilitating quantitative analysis, with some Likert-scale items to gauge attitudes and perceptions toward transportation infrastructure and land use.

Adopting a face-to-face administration of questionnaires to respondents at selected locations within Alimosho, such as transport hubs, residential areas, and commercial centers. This method ensured high response rates and the ability to clarify any ambiguities in the questions, thereby improving data reliability.

Collected data were coded and entered into statistical software (SPSS) for analysis. Descriptive statistics (frequencies, percentages, means) were used to summarize respondents' demographic profiles and mobility experiences. Inferential statistics, including correlation analysis and regression modelling, were conducted to assess the strength and nature of the relationship between transportation land use variables and indicators of urban mobility crisis such as congestion, travel time, and mode choice.

Results

Analysis of relationship between land use patterns (LUP) and traffic congestion (TC).

Table 1: Relationship between land use patterns (LUP) and traffic congestion (TC)

Variable	Coefficient (β)	Std. Error	t-value	p-value
Intercept	4.20	0.45	9.33	0.000
Land Use Patterns (LUP)	-0.55	0.10	-5.50	0.000

Source: Author's Construct, 2024

The regression analysis conducted to examine the relationship between land use patterns and traffic congestion in Alimosho Local Government Area reveals a significant and meaningful connection between the two variables. The results indicate that land use patterns have a statistically significant negative effect on traffic congestion, with a coefficient of -0.55 and a p-value of 0.000. This means that improvements in how land is used for transportation and related purposes are associated with a reduction in traffic congestion. Specifically, for every one-unit improvement in the land use pattern score, traffic congestion decreases by 0.55 units.

The intercept value of 4.20, which is also statistically significant, represents the baseline level of traffic congestion when land use patterns are at zero. The model explains about 29% of the variation in traffic congestion ($R^2 = 0.29$), suggesting that while land use patterns are an important factor, other variables not included in this model also influence congestion levels.

These findings highlight the critical role that effective land use planning plays in managing urban mobility challenges. By optimizing land use patterns, such as through strategic zoning, mixed-use developments, and integrating transportation planning with land management, policymakers and urban planners can significantly reduce traffic congestion. However, the moderate R-squared value also indicates the complexity of traffic congestion, implying that a multifaceted approach addressing other contributing factors alongside land use improvements is necessary for sustainable solutions to the urban mobility crisis in Alimosho.

Evaluating LUP, SEC, and TIQ impact on Urban Mobility Efficiency (UME).

Table 2: LUP, SEC, and TIQ impact Urban Mobility Efficiency (UME)

Variable	Coefficient (β)	Std. Error	t-value	p-value

Intercept	2.30	0.50	4.60	0.000
Land Use Patterns (LUP)	0.40	0.12	3.33	0.001
Socio-Economic Characteristics (SEC)	0.28	0.09	3.11	0.002
Transport Infrastructure Quality (TIQ)	0.55	0.13	4.23	0.000

Source: Author's Construct, 2024

The multiple regression analysis assessing the impact of land use patterns (LUP), socio-economic characteristics (SEC), and transport infrastructure quality (TIQ) on urban mobility efficiency (UME) demonstrates that all three variables have statistically significant positive effects on mobility efficiency in Alimosho Local Government Area.

The model shows an intercept of 2.30, which is significant ($p = 0.000$), representing the baseline level of urban mobility efficiency when all predictors are zero. Each of the independent variables contributes positively to mobility efficiency, with transport infrastructure quality having the strongest impact ($\beta = 0.55$, $p = 0.000$), followed by land use patterns ($\beta = 0.40$, $p = 0.001$) and socio-economic characteristics ($\beta = 0.28$, $p = 0.002$).

This implies that improvements in land use patterns, such as better zoning and integration with transport services, significantly enhance urban mobility efficiency. Similarly, higher socio-economic status among residents positively influences travel behavior and mobility, possibly due to better access to transport options and resources. Most notably, the quality of transport infrastructuresuch as road conditions, availability of transit services, and supportive facilitieshas the greatest positive effect on mobility efficiency, underscoring its critical role in facilitating seamless urban movement.

The model explains 57% of the variance in urban mobility efficiency ($R^2 = 0.57$), indicating a strong overall fit and highlighting that these three factors collectively account for a substantial portion of what drives mobility efficiency in the study area.

These findings suggest that integrated efforts to improve land use planning, address socio-economic disparities, and upgrade transport infrastructure are essential strategies for enhancing urban mobility and mitigating the challenges posed by rapid urbanization in Alimosho.

Discussion of Findings

The study's findings underscore the pivotal role that land use patterns play in shaping urban mobility and traffic congestion, aligning closely with established scholarly discourse on the spatial dynamics of urban development and transportation.

Land Use Pattern and Traffic Congestion

The strong negative correlation between land use patterns and traffic congestion observed in this study confirms that better-planned and optimized land use significantly alleviates traffic congestion. This supports Morenikeji's (2011) conceptualization of land use as a transformative intervention aimed at improving living standards, where a strategic allocation

of land for residential, commercial, industrial, and transportation purposes reduces the stress on road networks. Urban areas in Nigeria often suffer from haphazard land use changes driven by rapid urbanization and population growth (Oyesiku, 2014; Ogunsesan, Akanmu&Oyejide, 2016), leading to inadequate spatial allocation for transportation infrastructure. The mismatch between urban expansion and transportation land capacity results in increased vehicle miles traveled and congestion, as highlighted by Oyesiku (2021).

This finding resonates with the broader theory that efficient spatial distribution and integration of transportation land use reduce traffic bottlenecks (Rodrigue *et al.,* 2006). By ensuring that land use planning is coordinated with transport infrastructure development, cities can better manage trip generation and reduce excessive travel times, thus mitigating congestion. In many Nigerian cities, the lack of cohesive land use-transport integration has led to fragmented urban growth, aggravating congestion challenges.

Mobility Efficiency and Influencing Factors

The finding that mobility efficiency improves with better land use, higher socio-economic status, and enhanced transport infrastructure quality, with infrastructure quality playing the most critical role, aligns well with prior research. Transportation land use serves as a fundamental determinant of accessibility and connectivity, impacting how efficiently people and goods move (Akanmu *et al.,* 2022). This is consistent with Njoh (2008) & Goryakin *et al.* (2015), who emphasize that poor infrastructure in developing cities exacerbates mobility problems and constrains socio-economic development.

The socio-economic status factor reflects how individuals with higher incomes or resources can better leverage transport options, contributing to overall mobility efficiency. However, the infrastructural dimension remains the cornerstone because well-designed roads, public transit systems, and multimodal networks are indispensable for reducing travel times and improving user experience (Salisu *et al.,* 2020). This finding also corroborates the global recognition that sustainable urban mobility integrating land use and transport infrastructure is crucial for meeting international development targets such as the UN Sustainable Development Goals (Burdett *et al.,* 2018; Parnell, 2016).

Mobility Challenges Due to Inadequate Public Transport and Infrastructure

The widespread mobility challenges identified, mainly due to insufficient public transport and poor infrastructure, are a significant barrier to effective urban mobility. This reflects the realities in many African cities characterized by fragmented, inadequate, and often dysfunctional transport systems unable to cope with rapid urbanization (Xu *et al.,* 2019; Njoh, 2008). The inadequacy of public transport options forces increased reliance on private vehicles, contributing to congestion, environmental degradation, and social inequities (Cervero, 2013; Banister, 2008).

These challenges highlight a vicious cycle common in developing contexts where rapid population influx outpaces the capacity of transport infrastructure and urban planning, leading to environmental and health externalities such as pollution and road accidents (Hickman & Banister, 2013; WHO, 2018). Additionally, the absence of integrated transport policies and

land use planning aggravates car-dependence and limits the adoption of sustainable mobility solutions (Stanilov, 2007).

Conclusion

This study established a strong and significant relationship between land use patterns and traffic congestion in Nigerian urban centres, particularly in the Southwestern region. The findings affirm that better and well-planned land use significantly reduces traffic congestion by optimizing the spatial distribution of activities and improving accessibility. Moreover, the analysis highlights that mobility efficiency is highly influenced by multiple factors, including land use, socio-economic status, and, most critically, the quality of transport infrastructure. Despite these interrelationships, mobility challenges remain pervasive, largely driven by inadequate public transport systems and underdeveloped infrastructure.These findings underscore the complex dynamics of urbanization, rapid land-use changes, and transportation demands in developing cities, where infrastructure growth has not kept pace with urban expansion. Consequently, inefficient land use and poor transport infrastructure exacerbate congestion, limit mobility, and reduce overall urban livability. Addressing these intertwined challenges is essential for fostering sustainable urban development, enhancing socio-economic wellbeing, and achieving the broader goals of inclusive and resilient cities.

Recommendations

Urban planners and policymakers should adopt integrated approaches that align land use with transportation infrastructure development. This includes prioritizing mixed-use developments, encouraging compact urban forms, and strategically locating residential, commercial, and industrial zones to minimize travel distances and reduce congestion.There is also, a critical need for substantial investment in upgrading and expanding transport infrastructure, especially public transit systems. Authorities should implement policies that promote sustainable and active transportation modes, such as walking, cycling, and mass transit.Urban mobility policies must be inclusive, addressing socio-economic barriers that limit access to efficient transport. Finally, there is need to establish continuous monitoring mechanisms to assess the effectiveness of land use and transport policies.

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