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Movement on the edge of cities: intra-urban mobility in peri-urban communities in south-west Nigeria

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Abstract. Mobility plays a crucial role in joining activity's locations to each other, enabling social contact and facilitating the movement of people and goods to and from various locations. This study investigates the mobility characteristics of peri-urban communities in selected cities of south-west Nigeria. Using a stratified sampling technique, we selected 505 respondents from the 11 peri-urban communities for the questionnaire survey. The data were summarised using frequency, mean and mode, while ANOVA and Chi-square were used to test for a significant difference in inter-community and gender variations in mobility variables. Over 80% of respondents work within the peri-urban interface, indicating increasing decentralisation of activities. Most respondents (81.4%) indicated that the roads in their communities were not paved, with adverse effects on their mobility. Transit modes were informal, with more than 33% of the respondents relying on motorcycles for their mobility needs. Mobility characteristics among peri-urban dwellers vary from one community to another and between gender. The peri-urban dwellers are mobility-starved due to failed infrastructure and informal transit services. All tiers of government should prioritise improving road infrastructures and extending public transit services that enhance sustainable mobility to city peripheries.

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Contents:

1. Introduction

Globally, peri-urbanisation occurs at the edge of cities due to a rapid increase in population and the resultant urban expansion to accommodate the city's burgeoning population. The peculiar characteristics of the peri-urban interface (PUI) in terms of its location at the rural–urban fringe, heterogeneous population and amorphous governance structure have created developmental challenges, among which mobility and accessibility to activity centres are paramount (Samuel et al., 2019). According to Lodin et al. (2019), mobility describes the extent to which people can travel within and outside their communities to access various resources and services. Characteristically, mobility is defined in terms of modes of travel, travel time and frequency of travel and is influenced by spatial configuration, household incomes and the diversification of travel needs (Gonclaves et al., 2017). With the peri-urbanisation process come many transportation challenges that include long-distance commuting, a poorly developed transport system, the absence or near-absence of public transport and traffic congestion. These challenges are, directly or indirectly, related to urban sprawl, which is characteristic of urban development in virtually all the cities of the Global South (Adu-Gyamfi, 2020).

The spatial separation of peri-urban communities from the city core, home to most urban activities, means that peri-urban dwellers must engage in obligatory and discretionary trips to the city centre to access workplaces, health services, shopping centres, and worship centres, among other things. These trips generate an enormous travel demand from the urban fringes, which is often difficult for the limited and poorly maintained transport infrastructure to cope with (Ogunsanya & Galtima, 1993; Yakubu, 2013). This mismatch between travel demand and the means of meeting this demand has resulted in the evolution of an array of unconventional modes of transport ranging from rickety, low-occupancy minibuses and taxis to motorcycles as public transport modes.

Public investments in urban and peri-urban mobility are vital ingredients of long-term sustainable growth, which can benefit the poor in the growth process (Ogun, 2010). This aligns with the Sustainable Development Goal (SDG) 11, which focuses on making "cities and human settlements inclusive, safe, resilient and sustainable". Target 2 of the goal aims at providing access to safe, affordable, accessible and sustainable transport systems for all and improving road safety, notably by expanding public transport, with particular attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons (UN-HABITAT, 2018; Samuel & Atobatele, 2019a, b). Sadly, the peri-urban communities in the cities of Africa lack sustainable means of moving people and goods. Investments in transportation infrastructure in the urban fringe can produce knock-on effects on the ease of movement of the mobility-starved peri-urban dwellers, facilitate access to jobs and social services, and consequently reduce poverty and inequality and engender community participation in the development process. Thynell (2017) established a strong link between immobility and poverty. Depending on the nature and magnitude of such investments made, unfettered movement within and across the PUIs can reduce congestion and its associated carbon emission.

In most peri-urban settings, especially in the developing world, transport infrastructure, where provided, is often inadequate, dilapidated or spasmodic in operation, resulting in poor services and a continually deteriorating environment. More often than not, the provision of such infrastructure tends to occur in a piecemeal fashion, either through the efforts of residents themselves or because of pressures from civil society on elected representatives and government officials. Without an efficient intra-city rail system, road transport remains the only means of moving people and goods within the

urban space in cities of the developing world. The quality of transportation infrastructure in terms of capacity, speed and connectivity determines the quality and advantage of one location relative to other areas, usually measured as accessibility.

In Asian cities like Tianjin (China), Rayong (Thailand) and Johor (Malaysia), governments have built mass transit rail to connect the urban core to the peripheral communities, thereby reducing the challenges of mobility and other externalities associated with uncoordinated public transport systems (Webster et al., 2014; Adu-Gyamfi, 2020). Urban transport problems in most developing countries range from inadequate and poor-quality infrastructure, a mismatch between demand and supply, unplanned growth and chaotic land-use distribution, leading to long-distance commuting, longer waiting time at bus stops and lack of, or erratic public transport services, among other problems. These are standard features of urban and peri-urban communities in Nigeria (Aderamo 2012). However, a study in Kumasi, Ghana by Acheampong and Anokye (2013) attributed prolonged commute times and higher transportation costs to an inadequately developed transport infrastructure and not the longer commute distances. The mobility challenges faced by residents of peri-urban communities are thus many and diverse, affecting the realisation of their daily activities.

Despite the centrality of an efficient transport system to the quality of life and living in the peri-urban interface, works x-raying the character and magnitude of peri-urban mobility in the context of Nigeria are few and far between. Elsewhere in the Global South, studies focusing on peri-urban transportation abound in the context of Asian cities (Thynell, 2017; Chowdhury, 2019) and other parts of Africa (Adu-Gyamfi, 2020). Except for a few studies that focused on transportation challenges in the PUI (Alade et al. 2018), the literature on urban transportation in Nigeria has primarily focused on different aspects of urban transportation like journey-to-work, trip chaining, telecommuting and transport safety (Olojede et al., 2017; Olojede & Samuel, 2018, 2019; Samuel, 2008, 2012). This study seeks to bridge this gap by: i) assessing the state of road infrastructure in the peri-urban communities; ii) analysing the variation in mobility characteristics; iii) identifying the mode choice for intra-urban journeys; and iv) the mobility challenges of peri-urban communities in selected cities of south-west Nigeria. Consequently, the study hypothesised a significant difference in the mobility characteristics of the peri-urban dwellers based on their location and gender.

2. Peri-urban mobility: a survey of extant literature

The PUIs in developing countries have evolved due to rapid motorisation (du Plessis & Landman, 2002); the provision of social housing in the urban fringe (Johnson, 1974); the dispersal of retail outlets in response to consumers' relocation (Balchin et al., 2000); the location of industries along trans-regional highways (Adu-Gyamfi, 2020); and the availability of cheap land in the urban peripheries encouraging the movement of poor urban households to the fringes (Adesina, 2007). Thus, the Peri-Urban Interface (PUI) represents a melting pot of urban development and rural land use with its characteristic admixture of urban and rural features as manifested in social, cultural, political and economic diversities and moribund institutions and governance mechanisms. Due to the mutual interdependence between the urban core and the PUIs, there tends to be a high level of interaction between these entities (Alade et al., 2018). Therefore, given the functional relationship between cities and their PUIs, the existence of efficient, cost-effective transport solutions is germane to achieving accessibility to urban-based services and activities and reducing environmental damage associated with unconventional transport solutions. Mobility (or lack thereof) occasioned by poor infrastructure, location and affordability has been known to contribute to social exclusion in the urban periphery (Chikengezha & Thebe, 2021).

The studies on peri-urban mobility are as diverse and complex as the landscapes they seek to study. Many of these studies have focused on mobility patterns (Gonçalves et al., 2019), the linkage between urban form and travel characteristics, gender dimensions of peri-urban mobility (Samuel, 2008; Lodin et al., 2019), environmental and sustainability aspects, the changing nature of peri-urban mobility behaviour (Pucci, 2016; Chowdhury, 2019) and access to regulated public transport (Alade et al., 2018; Thynell, 2018).

While the rapid expansion in transport infrastructures in the cities of developed countries and emerging economies such as China and South Korea ensures the connectivity of the peri-urban areas to multimodal transport networks, thereby improving the mobility of peri-urbanites, the case is different in other cities of the developing countries. In his study of peri-urban transportation in Ghana, Adu-Gymafi (2019) noted the mobility void created by the refusal of the public transport system to convey passengers to their peri-urban destination, leaving them at the mercy of rickety

taxis that provide a link to passengers' home at an exorbitant fare and significant risk. In the context of Nigeria, Alade et al. (2018) found that the majority of passengers in the peri-urban areas of Lagos wait between 15 and 30 minutes before boarding a bus to the city centre. Most peri-urbanites travel 30 km or more to their destinations within the urban core. The study further established a significant difference in salient travel characteristics such as trip frequency, mode choice, trip distance, time and cost. They also noted that journey-to-work accounts for the most significant proportion of trips to the city centre. In contrast, minibuses account for the largest proportion of trips to the urban centre. They further highlighted the significance of commercial motorcycles (popularly known as *Okada*) in peri-urban transportation.

Owing to the peculiar characteristics of the peri-urban space, individual and household travel patterns remained dynamic in terms of mode choice, travel distance, travel time and cost. Chowdhury (2019) has attributed the change in the travel behaviour of peri-urbanites to a shift in travel mode and a shift in travel distance. He also observed a reduction in public and non-motorised transport, such as walking and biking. The increasing distance that separates the PUIs from the city centre that offers most of the goods and services that generate movements in the PUIs is partly responsible for a decline in sustainable travel modes (walking and biking). In terms of cost, Alade et al. (2018) have observed that the travel cost from the PUI to the city centre is a function of the distance that separates locations. However, the study seemed to overlook other important factors that could determine travel costs, notably the traffic situation (congestion) and road conditions, which have become recurrent features of peri-urban transportation challenges not only in Nigeria but also in many cities in Africa. In the same vein, Cervero (2013) noted a significant increase in the distance travelled and share of private vehicle owners' trips in the PUIs. This development exacerbates congestion, fuel consumption, greenhouse gas emissions and pollution (Adu-Gyamfi, 2019).

In the analysis of urban transportation, the concept of bounded rationality finds relevance: people respond to changing urban form, demographic and life-cycle stages and rising congestion by pursuing several activities along a single trip chain to achieve travel economies (Levinson & Kumar, 1995; Olojede & Samuel, 2018). In his study of peri-urban mobility in the Milan Metropolitan Area, Italy, Pucci (2017) has established a link between processes of urban sprawl belonging to different "generations" of peri-urbanism in the Milan Urban Region and the forms of mobility and lifestyles, showing other living habits and specific issues. The study focuses on user behaviours, mode choice and mobility patterns in peri-urban areas. In a previous analysis of travel behaviour, key variables that form input into the travel behaviour of individuals and households included the origin of the trip, the destination of the journey, mode of transportation, starting time, duration, end time, chosen route, and trip frequency (Samuel, 2008, 2012; Chowdhury, 2019; Olojede et al., 2019). Some studies have used a travel diary as a data collection instrument to collect trip-related data. Although this method is suitable as it captures the detailed characteristics of an individual's trip and hence the travel behaviour (Samuel, 2008, 2012), the data generated may be inaccurate, as it is often difficult for a person to accurately recollect these variables of a past trip (Chowdhury, 2019).

Given the increase in the peri-urbanisation trend across the world – a trend that is likely to continue – and the context-specific character of peri-urban mobility, the need to investigate the mobility behaviour of peri-urbanites in specific contexts together with the challenges posed by the peculiar heterogeneous nature of peri-urban interfaces in Nigeria has become urgent.

3. Research methodology

3.1. Study area

The study area comprises six cities in Nigeria – Ibadan and Saki (Oyo State), Osogbo and Ilesa (Osun State), and Akure and Ondo Town (Ondo State) in the south-west region of Nigeria (Fig. 1). Ibadan is the largest among the cities, with 3,649,023 people. At the same time, Osogbo (730,470), Akure (704,894), Ondo Town (445,442), Saki (395,000) and Ilesa (371,038) are medium-sized cities, based on the projected mid-year population for 2021 (Population Stat, 2021). South-west Nigeria is the most urbanised region in Nigeria and is home to Lagos (the only megacity in Nigeria) and many other large, medium and small urban centres. While Ibadan, with over three million inhabitants, is the largest of the studied cities, other cities with less than a million but more than a hundred thousand people are classified as medium-sized cities. While the distances between the peri-urban areas and the city centres are shorter in the smaller towns, they are much longer in the larger cities.

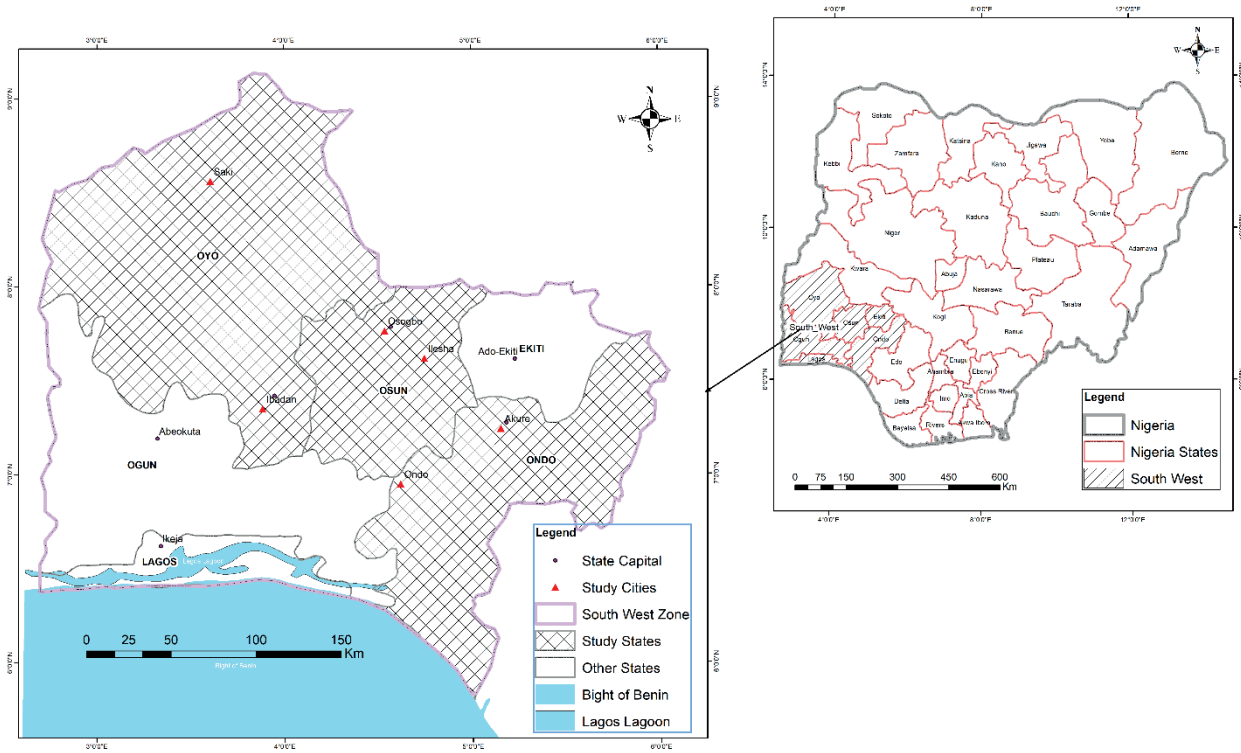


Fig. 1. Map of south-west Nigeria showing the study cities

Due to rapid population growth of more than 2% *per annum*, the modest industrialisation rate, and the rise of cities with administrative functions, cities in the south-west regions have grown in complexity, land-use mix, demography and areal extent, engendering peri-urbanisation. Common to these settlements is the nature of the peri-urban areas, which are mostly unplanned. Where there is a plan, as in the case of Ibala in Ilesa, Egbeda in Ibadan and Valentino in Ondo, the planning codes were not enforced, leading to haphazard and sprawling developments. Furthermore, the peri-urban areas in these cities lack basic infrastructures such as paved roads, functional drainage systems, waste disposal facilities, and piped water. It is important to note that Orita-Obele in Akure stands out as a well-planned, well-serviced sub-urban housing estate. However, years of infrastructure neglect have deteriorated the public infrastructure.

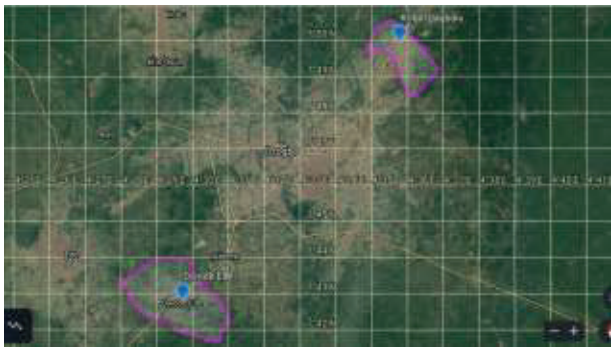
The gap created by the shortage of public transport in these areas is filled by informal private actors who operate rickety buses, taxis, tricycles, and motorcycles whose service provision is not only sporadic and exorbitant but also have raised safety concerns. However, it is essential to note that these peri-urban areas, though similar in certain respects, exhibit some differences in their morphologies, heterogeneity, and spatial organisations. Although several studies have focused on the mobility characteristics of peri-urban dwellers, few (if any) have attempted a cross-location comparison of these attributes. Moreover, gender differences in mobility behaviours have not been systematically studied in the peri-urban context in Nigerian cities with peculiar planning and governance contexts. Lodin et al. (2019) noted that gender norms, practices and relations often create different opportunities and constraints for women and their access to goods, services and innovation.

3.2. Data collection and analysis

Data for this research were collected from both primary and secondary sources. The primary sources of data collection were household questionnaire surveys that involved household heads of the selected peri-urban communities. The study area was divided into communities for data collection. Only communities that met the criteria of a peri-urban community were selected. The sample size taken in each community was proportional to the household population of each community. The three south-west states selected for field survey

(a) Orita Obele and Ugele in Akure

(b) Valentino and Ita-nla in Ondo Town



(c) Kobo-Dagbolu and Owode in Osogbo

(d) Ibala and Sabo-Muslim in Ilesa

(c) Idi-Omo and Egbeda in Ibadan

(e) Saki West in Saki

Fig. 2. Location of peri-urban communities

for the study were Ondo, Osun and Oyo States. Eleven peri-urban communities were chosen from the three selected states, which include: Itanla, Valentino, Orita-Obele, Garage Area (Ondo State); Kobo, Owode-Ede, Ibala, and Sabo (Osun State); Egbada, Idi-Omo and Saki (Oyo State). The survey was carried out between 2017 and 2018. Only one peri-urban community was selected in Saki because no other community met the selection criteria set for the peri-urban community. In all, a total of 505 sets of questionnaires were administered, while only 472 were successfully retrieved and used for the analysis, thereby yielding a return rate of 93.5%. The distribution of the sample sizes is indicated in Table 1.

The questionnaire elicited information on household characteristics (age, gender, employment status, personal income, household composition, and vehicle ownership), road and drainage characteristics, travel behaviour (trip purpose, length, frequencies, mode choice, trip cost) and measures that can improve mobility in the peri-urban communities. The retrospective (stylised) questionnaire approach was employed for the household questionnaire survey, whereby respondents were asked questions about their activity/travel patterns for the

Table 1. Sample size of selected peri-urban communities

S/n	State	Peri-urban community	Sample size
1	Ondo	Ita-nla	20
		Valentino	20
		Ugele	35
		Orita Obele	82
2	Osun	Kobo	100
		Owode-Ede	40
		Sabo	48
		Ibala	20
3	Oyo	Egbeda	47
		Idi-Omo	48
		Saki West	45
Total			**505**

Source: field survey

previous period (Olojede and Samuel, 2018). The questionnaire was administered using a face-to-face administration method. This technique provokes a higher response rate than the online survey, telephone interview and "pick and drop" mode (Manoj & Verma, 2015; Chowdhury, 2019). In administering the questionnaire, certain streets were inaccessible due to entry restrictions, while some prospective respondents did not participate in the survey. Despite these setbacks, the required number of questionnaires was administered while the required spread across the peri-urban communities was achieved.

In line with the objectives of this study, quantitative data collected through questionnaire administration were summarised using frequencies and percentages, cross-tabulations and measures of central tendencies (mean, mode and median). One-way ANOVA was employed to analyse the possible significant difference in mobility characteristics among the selected peri-urban communities. This is important as the peri-urban communities vary in size, just like the cities in which they are located. This analysis is expected to reveal the possible effect of size, location and other characteristics on the mobility characteristics of peri-urban dwellers. Chi-square was computed to infer the differences in mobility characteristics (trip length, frequency and cost) based on gender, location and other socio-economic profiles of the respondents.

4. Results and discussion

This section discusses the questionnaire results administered to respondents in the selected peri-urban areas of south-west Nigeria on peri-urban and transport services.

4.1. Socio-economic and demographic characteristics of respondents

This section presents the analysis of the socio-economic characteristics of the peri-urban respondents to have background information about the respondents. Table 2 shows that respondents of the young age of 31–40 years dominated the age group with 33.3% and were closely followed by the following age groups: 21–30 years (29.9%), 41–50 years (16.9%), 50 years and above (12.6%) and less than 21 years (7.4%). Youthful populations

Table 2. Socio-economic characteristics of respondents

Item	Variable	Frequency	%
Age	<21	34	17.4
	21 - 30	138	29.9
	31 - 40	154	33.3
	41 - 50	78	16.9
	>50	58	12.6
	Total	**462**	**100.0**
Gender	Male	216	45.8
	Female	256	54.2
	Total	**217**	**100.0**
Educational level	No Formal Primary	12	2.6
	Primary	48	10.3
	Secondary	202	43.3
	Tertiary	196	42.1
	Others	8	1.7
	Total	**466**	**100.0**
Marital status	Married	236	70.0
	Single	128	27.7
	Separated	2	0.4
	Widow/Widower	10	2.1
	Total	**466**	**100.0**
Main Occupation	Civil Servant	62	13.6
	Trading	204	44.7
	Farming	18	3.9
	Artisan	98	21.5
	Others	74	16.2
	Total	**456**	**100.0**
Monthly Income (₦)	< 16,000	226	54.1
	16,000–30,000	120	28.7
	31,000–45,000	34	8.1
	46,000–60,000	16	3.8
	> 61,000	22	5.3
	Total	**418**	**100.0**

Source: Authors' field survey
NGN1 = USD0.0056 at the time of the study

are characteristically more mobile; hence, their demand for mobility means and infrastructure is likely higher than the aged populations. The gender status revealed that female folks are preponderant, with 256 (54.2%), against males, with 216 (45.8%). The extant literature has highlighted differences in mobility requirements and mobility constraints between men and women due to certain gender norms, roles and relations (Lodin et al., 2019). With the exception of 2.6%, all respondents had some formal education, with 43.2% (secondary), 42.1% (tertiary), 10.3% (primary) and 1.7% (others). Respondents with high levels of education are likely to earn more, own mobility means, participate in more activities, and engage in more travelling than those with lower education. On the marital status of the respondents, a dominant proportion (70.0%) are married, and 27.5% are single. In comparison, 2.1% and 0.4% are widows/widowers and separated, respectively. Marital status determines the household size and socio-economic roles individuals perform and, by extension, the aggregate demand for mobility. The majority of the respondents (72.8%) are Christian, while a considerable proportion (26.3%) are Muslim. Only a small portion (0.9%) are traditionalists who do not practise either of the two major religions in Nigeria. Occupational structure ranged from 44.7% (trading) to 21.5% (artisan), 13.6% (civil servant), 16.2% (others) and 3.9% (farming), respectively. Work-related travel constitutes the most critical intra-urban obligatory movement (Samuel, 2008, 2012; Olojede, 2019). While respondents that engage in paid government jobs or organised private sectors might engage in obligatory work travel to the city centre where their jobs are located, those engaged in farming and artisanal activities are likely to travel less to the city centre. Since this group constitutes a small fraction of the sample, the movement frequency to the city centre is expected to be comparatively low. The respondents' monthly income distribution showed that over 72% of the respondents earned N30,000 (approximately USD 80.00) (the minimum wage in Nigeria), while the remaining 27% earned a higher income. These relatively low-income profiles of the respondents are likely to reduce their capacity to meet their mobility needs.

4.2. Spatial attributes of the sampled communities

The size of cities, the distance of the peri-urban regions from the city centres and their internal morphologies affect intra-urban travel and mode choice for that purpose. Table 3 shows the selected peri-urban areas and their spatial characteristics of the sampled cities and peri-urban communities. The built-up areas of the study cities vary markedly from 68.6 km^2 in Saki to 586.3 km^2 in Ibadan, the biggest of the study cities. It is essential to point out that Ibadan is a primate city in the south-west region of Nigeria and, hence, the extensive area coverage, half the study cities' total area coverage. Only Ibadan and Akure have areas larger than the mean for the study cities. The table shows that the distances of the peri-urban communities from the centres of the cities are directly proportional to the size of each of the urban centres. The distance of the peri-urban communities from the city centre is crucial as it determines to a large extent the commuting distance and, by extension, the cost of transportation and the associated emission from transport modes. As revealed in the table, the spread of the peri-urban communities from their respective city centres ranges from 4.3 km in Ilesa to 20.1 km

Table 3. Some spatial characteristics of peri-urban communities

State	Town	Community	Area (km^2)	Distance of peri-urban communities from city centre (km)
Ondo	Ondo	Ita-nla Valentino	76.9	6.8 5.4 ($\bar{x}$ = 6.1)
	Akure	Orita Obele Ugele	211.3	8.2 7.8 ($\bar{x}$ = 8.0)
Osun	Osogbo	Kobo Owode Ede	198.4	8.2 10.5 ($\bar{x}$ =9.35)
	Ilesa	Sabo Ibala	86.7	4.4 4.3 ($\bar{x}$ = 4.35)
Oyo	Ibadan	Egbeda Idi-Omo	586.3	19 .2 20.1 ($\bar{x}$ = 19.7)
	Saki	Saki West	68.6	4.7
Total			**1228 ($\bar{x}$ = 204.7)**	**94.9($\bar{x}$ = 8.6)**

Source: Authors' field survey

Table 4. Difference in distance of peri-urban communities from city centre

Parameters	Value	df	Asymptotic significance (2-sided)
Pearson chi-square	2360.000	50	0.000
Likelihood ratio	1663.821	50	0.000

Source: Authors' analysis

in Ibadan. Apart from areal size, the compact nature of Ilesa accounts for the short distance between the peri-urban community and the city centre. The Chi-square analysis in Table 4 further reinforced the variations of the city's peri-urban communities. The result (X^2=2360.0, p-value=0.000) indicated that the variations in the distance of the peri-urban communities from the city centres could not have come about by chance.

4.3. Perceived road conditions in the peri-urban communities

Accessibility is the ease of overcoming the frictions of physical distance, time, and monetary and inconvenience costs. Road conditions are critical determinants of accessibility, affecting travel time, transport fare and travellers' psychological well-being (Chikengezha & Thebe, 2021). Table 5 indicated that most of the roads (81.4%) in the peri-urban communities were not paved, suggesting that movement might not be as fast, easy and cost-efficient as it ought to be. Further, the roads in most peri-urban areas lack drainage facilities except for some major highways that pass through the region with good drainage systems. Most peri-urban dwellers (78%) noted the absence of a drainage facility, whereas 22% claimed that roads in their communities had drainage channels. Among the roads with drainage, those with open drainage facilities constitute 50.7%, followed by open drainage (41.0%) and underground drainage (8.4%). Most of the available drainage facilities were adjudged inefficient (48.6%), while 34.3% and 17.1% were partially efficient and efficient, respectively.

Table 5. Perceived road characteristics and peri-urban mobility

Variables	Respondents	Frequency	%
Road paved	Yes	86	18.6
	No	376	81.4
	Total	**462**	**100.0**
Availability of drainage	Yes	96	22.0
	No	340	78.0
	Total	**436**	**100.0**
Drainage type	Open drainage	186	41.0
	Underground	38	8.4
	None	230	50.7
	Total	**454**	**100.0**
Efficiency of drainage	Efficient	62	17.1
	Partially efficient	124	34.3
	Inefficient	176	48.6
	Total	**362**	**100.0**

Source: Authors' field survey

4.4. Trip characteristics of peri-urban households

The distribution of peri-urban households by their trip characteristics provides a good understanding of the relationship between their socio-economic and journey attributes, such as the frequency of trips to different activity centres. From the information presented in Table 6, the weekly trips of peri-urbanites are dominated by work and school trips with mean frequencies of 5.6 and 4.2 visits per week, respectively, as over 60% of these trips were undertaken five times or more per week. Conversely, trips for social and shopping activities with mean trip frequencies of 1.9 and 2.5, respectively, have lower frequencies, as more than 70% of the respondents made three or fewer trips per week. The implication is that the respondents' journeys to work and schools represent more than than any other trip purpose. This is understandable as these are obligatory trips, as opposed to discretionary trips like social activities and shopping. It is also important to note that shopping trips are included in obligatory trips, which notably also include trips to work; shopping trips and trips to work are thus not usually distinguished from one another (Olojede & Samuel, 2018).

4.5. Mobility attributes of peri-urban dwellers

The mobility attributes of individuals and households often depend on socio-demographic attributes, location relative to the city centre and ownership of mobility means. Some of these characteristics are discussed in this section. The distance from the city centre to the peri-urban area is indicated in Table 7, where 57.6% of respondents live between 1 and

Table 6. Weekly trip frequencies

Trip	No. of Trips	Work Freq. (%)	School Freq. (%)	Market/ Shopping Freq. (%)	Social Freq. (%)	Religious Freq. (%)	Recreation Freq. (%)
Trip Frequency per week	0–1	14 (3.8%)	4 (4.7%)	114 (34.7%)	94 (62.7%)	113 (28.3%)	28 (43.7%)
	2–3	36 (9.8%)	8 (21.0%)	144 (44.2%)	68 (38.7%)	170(42.9%)	30 (48.9)
	4–5	96 (26.2)	64 (74.4%)	34 (10.4%)	12 (6.8%)	52 (13.2)	6 (9.4%)
	>5	220 (60.1%)	0	34 (10.4%)	4 (2.2%)	62 (15.6%)	0
	Total	366 (100%)	86 (100%)	326 (100%)	178 (100%)	396 (100%)	64 (100%)
	Mean	5.55	4.23	2.52	1.88	3.13	1.88
	Mode	6	5	1	1	3	1

Source: Authors' field survey

3 km from the main urban area, followed by 27.8% that live within 10 km or more, while others fall in between. Most peri-urbanites reside within 1–3 km of the main urban or city boundary, which is the entry point for most immigrants from the city, while the middle point and the periphery of the peri-urban communities are mostly for migrants from the rural areas that need a large area for peri-urban agriculture (Yakubu & Oduniyi, 2009). This finding agrees with Oladotun (2005) and Ekanade et al. (2019). However, as revealed in Table 6, most respondents (83.3%) have their work locations within the peri-urban space, suggesting increasing decentralisation. As an obligatory trip, journey-to-work is among the least flexible intra-urban movements in terms of timing. Hence, it contributes to traffic peaking and its associated economic and environmental costs on intra-urban road networks (Samuel, 2008; 2012).

Transportation costs from peri-urban to the main urban area in ascending order vary from NGN 100 (USD 0.38) (41.6%) to NGN 200 (USD 0.53) (31.6%), NGN 300 (USD 0.53) (9.1%), NGN 400 (USD 0.94) and above (17.7%), respectively. Though the amount the respondents spent on transportation daily seemed small, the transportation costs are high compared to their average monthly income. More than 83% of the respondents work in the peri-urban space, as against the 16.7% who worked in the urban centres. Perhaps due to the occupational characteristics of the peri-urban dwellers, most of them work within the peri-urban interface, an indication of increasing decentralisation of jobs. The decision of most residents to work within their communities might indicate the severity of the mobility challenges in these communities, though this invariably reduces the frequency of travel to the city centres for work and the associated externalities. Most respondents (70.6%) do not own vehicles. In comparison, 29.4% are vehicle owners, indicating that most peri-urban dwellers depend on the public transport system, which is unreliable and dominated by motorcycles. As a low-occupancy mode, the preponderant use of motorcycles in the cities' periphery raises safety and environmental sustainability issues. The time of day or day of the week determines the ease of movement. During the working days of the week, movements in the morning and closing hours are usually very tedious and chaotic due to the narrowness of the feeder roads to contain a large volume of inflow from the access roads as poor road condition (45.5%), and traffic congestion (42.3%) are the major causes of delay.

4.6. Mode choice in peri-urban mobility

Peri-urban dwellers usually face a restricted choice regarding the mode of transportation available for intra-urban movement. As shown in Fig. 3, more than one third of the respondents used motorcycles as their mode of travel. At the same time, 23% took taxis, and another 11% relied on commercial minibuses to meet their mobility needs. Other identified transport modes included private cars (13%), tricycles (8%), walking (7%) and bicycles (2%). This finding exhibits a slight deviation from the findings of Chowdhury (2019), who found an increase in the use of non-motorised modes such as biking and walking. Unsurprisingly, motorcycles account for the largest share of transport modes for peri-urban movements. This mode is readily available and flexible and offers door-to-door services in challenging terrains where roads barely exist or are in dilapidated states (Yakubu, 2013). More than

Table 7. Perceived mobility attributes of peri-urban dwellers

Item	Variable	Frequency	%	
Distance to the city centre (km)	1–3	242	57.6	Mean=7.1 Mode=2.0
	4–6	54	13.0	
	7–9	8	1.9	
	10 and above	116	27.8	
	Total	420	100.0	
Average Daily Cost of transport to the city centre (₦)*	100 ($0.27)	174	41.6	Mean=231.6 ($0.62) Mode=100 ($0.38)
	200 ($0.53)	132	31.6	
	300 ($0.79)	83	9.1	
	400 and above	74	17.7	
	Total ($1.06)	418	100.0	
Location of workplace	Peri-urban	378	83.3	
	Outside peri-urban	76	16.7	
	Total	454	100.0	
Vehicle Ownership	Yes	134	29.4	
	No	322	70.6	
	Total	456	100.0	
Ease of movement	Very easy	168	35.9	
	Easy	146	31.2	
	Not that easy	118	25.2	
	Not easy at all	36	7.7	
	Total	468	100.0	
Major cause of delay	Poor road condition	112	45.5	
	Traffic congestion	104	42.3	
	Broken down vehicle	20	8.1	
	Accidents	4	1.6	
	On-going construction	4	1.6	
	Others	2	0.8	
	Total	0	0	
		246	100.0	

Source: Authors' field survey
*NGN 1 = USD 0.0056 at the time of the study

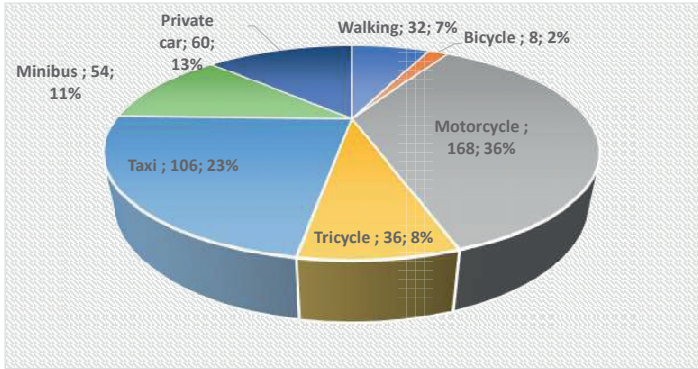


Fig. 3. Transportation mode choice in peri-urban movements

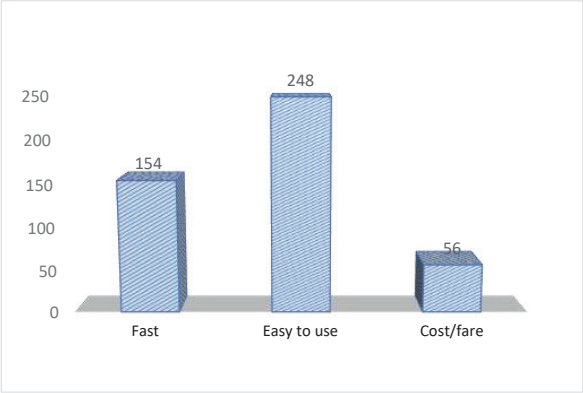


Fig. 4. Reasons for choice of trip mode

half of the respondents identified ready availability as the reason for their mode choice, in contrast to more than a third who chose their mode because it was fast (Fig. 3). The popularity of motorcycles as the preferred mode of mobility might also be due to the unwillingness of the other informal public transit (taxi and minibus) drivers to extend services to these areas due to the poor state of roads and low passenger threshold (Adu-Gyamfi, 2020). Most studies on peri-urban mobility in Nigeria have found motorcycles to be the dominant transport mode (Yakubu, 2013; Alade et al., 2018). The choice of taxis and commercial minibuses is borne out of the safety consideration and relatively cheaper trip costs. However, these modes are not always available in all peri-urban communities, mainly due to threshold issues and the poor condition of road infrastructure in many of these communities. The use of private cars is limited by the peri-urban dwellers' economic realities, most of whom are low-income earners (over 70% earn below NGN 30,000 or USD 80 a month) who cannot afford a car and the associated maintenance costs.

4.7. Spatial variations in mobility characteristics of peri-urban residents

The primary objective of this study was to analyse the spatial variation in the mobility attributes of peri-urban dwellers. An inter-city comparison of the critical mobility attributes, such as mode of transportation, ease of movement, average cost of transportation, and frequencies of obligatory trips, such as work and school trips, are presented in Table 8. For obligatory trips, the larger cities (notably Ibadan and Osogbo) have the highest frequencies, with 38% and 28% of respondents making 5–6 work trips, respectively. In contrast, the school trip recorded fewer respondents within the same band. The mode choice for intra-city travel also varies among the respondents and across the cities. While the motorcycle is most prevalent in Ilesa and Ibadan, with 48 and 20, respondents mostly prefer taxis in Akure (40) and Ondo (34). Osogbo (40) and Ilesa (20) account for most of the respondents that preferred the minibus. The disparity in mode choice among respondents is related to the availability of the mode, itself a function of each city's peculiarity in terms of transport organisation. Similar disparities were also observed in the ease of movement. While most respondents in Ibadan (90%), Ilesa (77%) and Akure (64%) described their intra-city movement as easy, only 44% in Ondo and about 50% in Shaki expressed the same opinion.

The result of the Chi-square that was conducted to test the hypothesis that "there is a significant variation in mobility characteristics among the peri-urban dwellers" is presented in Table 9. The results showed that frequencies of work trips (X^2=117.2, p-value=0.000; N=472), school trips (X^2=264.0, p-value=0.000; N=464), mode choice (X^2=264.0, p-value=0.000; N=464), travel cost (X^2=71.85, p-value=0.000; N=418) and ease of movement (X^2=20.07, p-value=0.001; N=454). This implies that peri-urban dwellers' mobility experience varies from city to city. This variation might be linked to the size, shape, internal structure and mode availability. The extant literature has established a link between urban form and intra-urban travels (Samuel, 2008; 2012).

4.8. Gender aspect of peri-urban mobility

The importance of gender and gender roles cannot be overlooked in the analysis of the intra-urban movement. For instance, gender plays an essential role in determining the trip characteristics of urban dwellers in terms of trip type, length, timing and costs. As shown in Table 10, the mean trip frequencies for obligatory trips such as work trips (5.79), school trips (4.73), and discretionary trips like shopping trips (2.71) were higher for women than for their male counterparts. This finding is premised on the fact that women engage more in obligatory trips, particularly school trips, locally described as "school runs". This might explain why the women's mean trip frequency for work trips was also higher than that of men.

Conversely, men had higher trip frequencies for most of the discretionary trips, particularly trips for social (1.5), religious (3.1), and recreational (1.6) activities. Regarding trip costs, women had lower

Table 8. Perceived mobility attributes of peri-urban dwellers

Variables	City	Frequency of trip to work				Total
		0–2	3–4	5–6	7–8	
Town * trip to work	Akure	6	12	34	2	54
	Osogbo	6	25	40	0	71
	Ilesa	4	26	32	0	62
	Ibadan	0	15	59	0	74
	Saki	0	24	12	0	36
	Ondo	4	25	32	8	69
	Total	20	127	209	10	366
		Frequency of trip to school				Total
		0–2	3–4	5–6	7–8	
Town * trip to school	Akure	6	19	18	0	43
	Osogbo	3	28	21	0	52
	Ilesa	7	6	20	0	33
	Ibadan	0	16	40	0	56
	Saki	0	12	0	0	12
	Ondo	4	24	6	2	36
	Total	20	105	105	2	232

		Preferable mode of transportation							Total
		Trekking	Bicycle	Motorcycle	Tricycle	Taxi	Minibus	Private car	
City * Preferable transport mode	Akure	4	0	24	0	40	0	10	78
	Osogbo	8	4	28	8	6	34	1	89
	Ilesa	4	4	48	10	6	12	10	94
	Ibadan	6	0	20	18	20	0	10	74
	Saki	0	0	24	0	0	0	18	42
	Ondo	10	0	24	0	34	8	11	87
	Total	32	8	168	36	106	54	60	464

		Ease of movement				Total
		Very easy	Easy	Not that easy	Not easy at all	
City * Ease of movement	Akure	22	28	22	4	78
	Osogbo	13	39	28	9	89
	Ilesa	42	34	12	10	98
	Ibadan	42	28	4	0	74
	Saki	18	0	18	6	42
	Ondo	31	17	34	5	87
	Total	168	146	118	34	468

		Average daily cost of transportation					
		≤300	301–600	601–900	901–1200	>1200	Total
City * Average daily cost of transportation	Akure	36	22	8	2	6	74
	Osogbo	28	45	4	0	8	85
	Ilesa	34	26	12	0	14	86
	Ibadan	26	18	0	4	6	54
	Saki	12	6	6	0	12	36
	Ondo	38	15	8	0	22	83
	Total	174	132	38	6	68	418

Source: Authors' field survey

Table 9. Spatial variations in the mobility characteristics of peri-urban dwellers

Variables	Statistics	Value	df	P-value
Town * Trip to work	Pearson chi-square	117.209	20	0.000
	Likelihood ratio	127.077	20	0.000
	N of valid cases	472		
City * Trip to school	Pearson chi-square	38.042	10	0.000
	Likelihood ratio	55.494	10	0.000
	N of valid cases	472		
Town * Preferred transport mode	Pearson chi-square	264.062	30	0.000
	Likelihood ratio	281.159	30	0.000
	N of valid cases	464		
Town * Average daily cost of transportation	Pearson chi-square	71.846	20	0.000
	Likelihood ratio	71.882	20	0.000
	N of valid cases	418		
Town * Ease of movement	Pearson chi-square	20.074	5	0.001
	Likelihood ratio	30.957	5	0.000
	N of valid Cases	454		

Source: Authors' field survey
NGN 1 = USD 0.0056 at the time of the study

Table 10. Gender aspects of peri-urban mobility

Gender		Frequency of trips to different activity centres							Travel cost to different activity centre (NGN*) (USD)			
	Statistics	Social	Work	School	Religion	Market or shopping	Recreation centre	Others	Healthcare centre	Retail centre	School	Motor park
Male	Mean	2.3	5.28	3.7	3.1	2.1	1.9	2.8	112.1 ($0.30)	100.8 ($0.28)	118.2 ($0.31)	86.0 ($0.23)
	Median	2	5	4	2	2	2	2.5	90 ($0.24)	80 ($0.21)	100 ($0.27)	75 ($0.2)
	Minimum	0	1	1	1	0	0	1	30 ($0.08)	40 ($0.11)	30 ($0.08)	40 ($0.11)
	Maximum	10	10	5	8	7	5	5	300 ($0.80)	200 ($0.53)	300 ($0.80)	300 ($0.80)
Female	Mean	1.51	5.79	4.73	3.12	2.71	1.6	2.57	95.89 ($0.26)	97.68 ($0.26)	109.29 ($0.29)	79.64 ($0.21)
	Median	1	6	5	3	2	2	3	70 ($0.19)	80 ($0.21)	80 ($0.21)	70 ($0.19)
	Minimum	1	1	3	1	1	1	1	30 ($0.08)	30 ($0.08)	30 ($0.08)	30 ($0.08)
	Maximum	4	7	5	7	7	2	3	300 ($0.80)	250 ($0.66	300 ($0.80)	300 ($0.80)

Source: Authors' field survey

Table 11. Analysis of variance of mobility attributes with gender as a factor

Variables		Sum of squares	df	Mean square	F	Sig.
Average daily cost of transportation	Between groups	765880.79	1	765880.79	15.91	0.000
	Within groups	20023295.29	416	48132.92		
	Total	20789176.08	417			
No. of trips to work	Between groups	24.29	1	24.29	9.19	0.003
	Within groups	962.43	364	2.64		
	Total	986.71	365			
No. of trips to school	Between groups	22.05	1	22.05	18.29	0.000
	Within groups	101.30	84	1.21		
	Total	123.35	85			
No. of trips to the market or shopping centre	Between groups	23.68	1	23.67	7.84	0.005
	Within groups	977.75	324	3.02		
	Total	1001.42	325			

trip costs for trips than men. A probable reason might be that men engage more in long-distance trips than women. The result of ANOVA indicates significant differences in the average daily cost of transportation (F=15.91, p-value=0.000, N=417), frequencies of work trips (F=9.19, p-value=0.003, N=365), school trips (F=18.29, p-value = 0.000, N=85), and shopping trips (F=7.84, p=value 0.005, 325). These results highlight the gender disparities in mobility outcomes in peri-urban communities.

5. Conclusion

This study analysed the mobility characteristics of peri-urban dwellers in the cities of south-west Nigeria. We found that the basic road infrastructures required for effective peri-urban movement were either lacking or existed in dilapidated states in each region's communities. In the absence of formal transit services in the urban centres, the peri-urban dwellers have resorted to motorcycles as a popular mode of intra-urban travel despite the safety and environmental concerns. The study also revealed substantial disparities in mobility outcomes based on communities and gender, reinforcing the study hypotheses that postulate a significant difference in mobility characteristics based on location and gender. The dearth and poor conditions of road infrastructures in the PUIs could be attributed to the nature of the ownership of the roads, mainly vested in the third tier of government (local government), most of which are financially handicapped to provide and maintain road infrastructures. This has hampered the extension of transit services to the teeming population of urban residents living at the fringe of these cities. As the peri-urban communities differ in their spatial characteristics, which in turn affect the mobility of the residents, efforts at solving the mobility challenges of this segment of the urban population should be contextualised. The peri-urban areas of south-west Nigeria have snowballed over the years, resulting in a change of land use without a concomitant improvement in the road transport infrastructure, causing mobility problems to urban dwellers. The government at all levels (Federal, State and Local) should prioritise road construction and rehabilitation in the urban periphery. This would aid the extension of public transport services to these communities, thus improving the mobility of the peri-urban dwellers.

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References

Acheampong, R.A. & Anokye, P.A. (2013). Understanding households' residential location choice in Kumasi's peri-urban settlements and the implications for sustainable urban growth. *Research on Humanities and Social Sciences*, 3(9): 60-70.

Adedotun, S.B. (2015). A Study of Urban Transportation System in Osogbo, Osun State, Nigeria. *European*

Journal of Sustainable Development, 4(3): 93-101. DOI: https://doi.org/10.14207/ejsd.2015.v4n3p93.

Aderamo, A.J. (2002). Transport and the Nigerian Urban Environment. *Paper delivered at 45th Annual Conference of the Nigerian Geographical Association held at the University of Ilorin, 30 June–3 July 2002.*

Aderamo, A.J. (2012). Urban transportation problems and challenges in Nigeria: A planner's view. Available at: www.primejournals.org/pre. Accessed: 21 September 2019.

Adesina, A. (2007). Socio-Spatial Transformations and the Urban Fringe Landscape in Developing Countries, Nigeria, Ibadan University Press.

Adu-Gyamfi, A. (2020). Planning for peri urbanism: Navigating the complex terrain of transport services. *Land Use Policy,* 92: 104440. DOI: https://doi.org/10.1016/j.landusepol.2019.104440.

Alade, W., Adeniji, O. & Adeleke. E. (2018). Residents' Access to Public Transport and Travel Behaviour of Peri-Urban Communities on Lagos-Ibadan Corridor. *Journal of Sustainable Development in Africa*, 20(2): 67-86.

Balchin, P., Isaac, D. & Chen, J.J. (2000). Urban Economics, A Global Perspective, United States: Palgrave Macmillan.

Cervero, R. (2013). Linking urban transport and land use in developing countries. *Journal of Transport and Land Use (JTLU)*, 6(1): 7–24. DOI: https://doi.org/10.5198/jtlu.v1.425.

Chikengezha, T. & Thebe, V. (2021). Living on the Periphery and Challenges of Mobility: a Tale of Transport Induced Social Exclusion in Southlea Park, Harare, Zimbabwe. Urban Forum, (Online Only). DOI: https://doi.org/10.1007/s12132-021-09437-5.

Chowdhury, T.R. (2019). Change in Travel Behaviour in a Dynamic Peri-Urban Area: A case study of Hyderabad, India. M.Sc Thesis, University of Twente Enschede, The Netherlands, March, 2019.

du Plessis, C. & Landman K. (2002). Sustainability Analysis of Human Settlements in South Africa, A report prepared by CSIR Building and Construction Technology Programme for Sustainable Human Settlement, Pretoria.

Gonçalves, J., Gomesa, M. & Ezequiel, S. (2017). Defining mobility patterns in peri-urban areas: a contribution for spatial and transport planning policy. *Case Studies on Transport Policy*, 5(4): 643-655. DOI: http://dx.doi.org/10.1016/j.cstp.2017.07.009.

Idczak, P. & Mrozik, K. (2018). Peri-urbanisation – evidence from Polish metropolitan areas. *Economic and Environmental Studies*, 18(1): 173-192. DOI: https://doi.org/10.25167/ees.2018.45.11.

Johnson, J.H. (1974). Suburban Growth, Geographical Process at the Edge of the Western City, Aberdeen: Aberdeen University Press.

Levinson, D. & Kumar, A. (1995). Activity, Travel, and the Allocation of Time. *Journal of the American Planning Association*, 61(4): 458-470. DOI: https://doi.org//10.1080/01944369508975657.

Lodin, J.B., Tegbaru, A, Bullock, R., Degrande, A, Nkengla, L.W. & Gaya, H.I. (2019). Gendered mobilities and immobilities: Women's and men's capacities for agricultural innovation in Kenya and Nigeria. *Gender, Place & Culture*, 26(12): 1759-1783. DOI: https://doi.org/10.1080/0966369X.2019.1618794.

Manoj, M. & Verma, A. (2015). Design and administration of activity-travel diaries: A case study from Bengaluru city in India. *Current Science*, 109(7): 1264–1272. DOI: https://doi.org/10.18520/v109/i7/1264-1272.

Margaux Sanchez, M., Ambros, A., Salmon, M., Bhogadi, S., Wilson, R.T., Kinra, S., Marshall, J.D. & Tonne, C. (2017). Predictors of Daily Mobility of Adults in Peri-Urban South India. *International Journal of Environmental Research and Public Health*, 14: 783. DOI: https://doi.org/10.3390/ijerph14070783.

Ogun, T.P. (2010). Infrastructure and Poverty Reduction: Implications for Urban Development in Nigeria. *Urban Forum* 21: 249–266. DOI: https://doi.org/10.1007/s12132-010-9091-8.

Ogunsanya, A.A. & Galtima, M. (1993). Motorcycles in public passengers' transport service in Nigeria: Case Study of Yola Town. In: Ikya, S.G. (ed). Urban Passengers Transport in Nigeria, 190-207.

Oladotun, O.O. (2005). A study of strategic Urban Planning in Ojoo and Sasa, Ibadan, South-western Nigeria. Unpublished M.Sc Thesis, Institute of Ecology and Environmental Studies, Obafemi Awolowo University, (OAU) Ile-Ife.

Olojede O.A. & Samuel K.J. (2019): Residents' assessment of local government road infrastructure delivery in Ile-Ife, Nigeria. *Local Economy,* 34(4): 346-363. DOI: https://doi.org//10.1177/0269094219857044.

Olojede, O.A. & Samuel, K.J. (2018). Households' Trip-Chaining Behaviour: Evening Intervening Stops across Residential Areas in Ibadan, Nigeria. *Annals of the University of Oradea, Geography Series,* 28(2): 185-196.

Olojede, O., Daramola, O. & Olufemi, B. (2017). Metropolitan transport safety and security: An African experience. *Journal of Transportation Safety & Security*, 9(4): 383-402. DOI: https://doi.org/10.1080/19439962.2016.1230164.

Pucci, P. (2016). Mobility behaviours in peri-urban areas. The Milan Urban Region case study. *Transportation Research Procedia*, 25: 4233–4248 DOI: https://doi.org//10.1016/j.trpro.2017.05.227.

Samuel K.J., Agbola S.B. & Olojede O.A. (2021). Local governance and the crisis of water and sanitation provision in medium-sized urban centres: Evidence from three cities in Nigeria. *Local Economy*, 36(2): 164–177. DOI: https://doi.org/10.1177/02690942211035359.

Samuel, K.J. (2008). Can mobile telecommunication reduce intra-city work travel? Empirical evidence from a third-world city. *Ibadan Journal of the Social Sciences*, 6(1): 45-54.

Samuel, K.J. (2012) A Spatio-temporal Analysis of Within-work Travels in Ikeja Business District Area of Nigeria. *Geo-Studies Forum*, 5(1): 113-123.

Samuel, K.J. & Atobatele. R.E. (2019a). Land use/cover Change and Urban Sustainability in a Medium size City. *International Journal of Sustainable Society,* 11(1): 13-28. DOI: https://doi.org//10.1504/IJSSOC.2019.101961.

Samuel, K.J. & Atobatele, R.E. (2019b). Change in Administrative Status, Urban Growth and Land Use/Cover Change in an African Medium-size City. *Human Geographies,* 13(1): 13-28. DOI: https://doi.org//10.5719/hgeo.201 9.131.1.

Thynell, M. (2017). Roads to Equal Access: The Role of Transport in Transforming Mobility. *Transport and Communications Bulletin for Asia and the Pacific*, 87: 1-12.

UN-HABITAT (2018). Tracking Progress Towards Inclusive, Safe, Resilient and Sustainable Cities and Human Settlements. SDG 11 Synthesis Report High-Level Political Forum 2018. Available at: http://uis.unesco.org/sites/default/files/documents/sdg11-synthesis-report-2018-en.pdf.

Webster, D. (2002). On the edge: Shaping the future of peri-urban East Asia. Stanford, California: Asia/Pacific Research Center, Stanford University.

Yakubu, S. (2013). The Role of Commercial Motorcycles in Intra-Urban Transport Mode in Okene. *African Journal of Social Sciences*, 4(3): 59-70.

Yakubu, S. & Oduniyi, D.A. (2009). Integrating urban agriculture into planning for sustainable urban development in Zaria. *The Abuja Journal of Geography and Development*, 3(1): 57-67.