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RESIDENTS' ACCESS TO PUBLIC TRANSPORT AND TRAVEL BEHAVIOUR OF PERI-URBAN COMMUNITIES ON LAGOS-IBADAN CORRIDOR

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ABSTRACT

In the last few decades, incessant urban growth and sprawling development without corresponding improvements in transport infrastructure poses a challenge for the sustainable mobility of people in peri-urban communities of large cities in Sub-Saharan Africa. This study examined commuters' access to public transport and travel behaviour in peri-urban communities along Lagos-Ibadan corridor, southwest Nigeria with a view to understanding the mobility challenges of commuters through primary data collected on 182 residents. Findings show that the relative location of peri-urban communities to Lagos influences residents' access to public transport and travel behaviour. Majority of residents commute daily in minibuses, spend an average of ₦250 (0.7USD) per trip over 30km lasting more than one hour from the transport terminals to Lagos. Thus, the study concludes that commuters' mobility in the study area is unsustainable and recommends improved public transportation services and provision of basic services to enhance mobility in the peri-urban areas.

Keywords: Residential Location, Accessibility, Public Transport, Travel Behaviour, Peri-Urban, Sustainable Mobility, Public Transport

INTRODUCTION

The choice of individual and families' residential location is influenced by series of pull and push factors (Cummins, Curtis, Diez-Roux, & Macintrye 2007). Access to public transport services, employment locations and the fulfilment of housing aspirations are some of the pull factors, while increase in externalities like crime, increase in house rent, changes in housing affordability, housing dissatisfaction, household income, employment status are the push factors (Sanches and Dawkins, 2001; Cummins et. al. 2007).

For several decades, peri-urbanization has been on the increase. In the United States, 7.1% of the population of United States which resided in peri-urban areas in 1910 increased to over 50% in year 2000 (Hoobs and Stoops, 2002). The study of Lawanson, Yadua & Salako (2012) also corroborates this as 89.8% of residents living in peri-urban settlements along Lagos-Ibadan axis were discovered to have moved into their present place of residence in the past 10 years or less. This phenomenon could be attributed to the increasing rate of urbanization coupled with series of environmental and housing problems in most cities as it is evident in both developed and developing countries (Adell, 1999; Webster, 2002, Ransford, Acheampong & Anokye, 2013).

In Nigeria, this trend has largely been aided by motorization and characterized by sprawling development of peri-urban communities with severe implications for sustainable land development and management. For instance, the physical expansion of Lagos from 3.97km^2 in 1886 to 1,183km^2 in 2002 (Oyesiku, 2002) can be adduced to the spread of suburbanization as evident along the southwest end of Ojo-Badagry Expressway, the south east axis along the Lekki Epe corridor, the north east axis along Ikorodu corridor, and the Lagos-Ibadan axis north of Metropolitan Lagos (Lawanson et al. 2012).

This study is rooted in the Bid-Rent Theory (Alonso, 1964): a geographical economic theory that explains how distance from services in Central Business District (CBD) affects commuting time and price of properties. It established that different land uses will compete with one another for land close to the city centre based on the idea that the closer the location to the CBD, the less the commuting distance, time and cost. This study proposed that access to public transport in peri-urban communities will vary based on the distance of each community from the city and that this variation will reflect in the travel behaviour of residents with implications for sustainable development of peri-urban areas.

RESIDENTIAL LOCATIONS, PUBLIC TRANSPORT AND ACCESSIBILITY IN PERI-URBAN AREA

The current increasing rate of urbanization, spatial expansion of cities and incessant population growth have been a global trend in most countries across the globe (Un-Habitat, 2016). The resultant effect is the emergence of physical development outside the central city area which occurs rapidly in suburban areas in most megacities (Lu, 2012). This phenomenon is evident in the study of Du Plessis & Landman (2002) where they found that improvement in transport infrastructure influenced relocation of firms and individuals from the city to take advantage of availability of large and low land value in the peri-urban areas. Government policies on provision of social housing encouraged people to relocate to the urban fringe locations (Johnson, 1974). Moreover, spatial spread of retail outlet in the fringe of cities because of decentralization of consumers, central area declines and development of automobile has influenced the physical development of the peri-urban

areas (Balchin *et al.*, 2000). Additionally, Adesina (2007) argued that cheap land value has influenced physical development in the peri-urban areas.

Studies on the rural-urban linkage have established a high level of interaction between the city and the peri-urban area (Adell, 1999; Allen, 2003) in the form of work and non-work trips from peri-urban areas to urban centres (Lawanson et. al, 2012). Low and Chow, (2008) and Alade, (2010) observed that the process of moving from the peri-urban areas to the city has become increasingly difficult due to inadequate transport infrastructure and lack of access to public transport. Evidence from literature reveals that little attention has been given to suburban residents' access to public transport and travel behaviour, hence, there is the need to understand how economic and physical access to public transport affects travel behaviour of residents of the study area.

Dayaratne and Samarawickrama (2003) noted that sizeable proportions of urban residents relocate to the peri-urban areas in search of relatively cheap accommodation. Furthermore, the fact that peri-urban areas accommodate a multifaceted combination of the population of much socio-economic prestige implies that, location decisions there are informed by the interplay of many dynamic factors including the cultural context which is not adequately captured by the standard access-space-trade-off model. From the report of Transit Cooperative Programme (2008), it was established that there is variation in residential location in peri-urban areas which is also corroborated by the work of Ransford et. al. (2013). In Nigeria, the growing population of the Lagos Megacity coupled with factors such as relatively affordable land and rent, social engagements, cultural interactions, political affiliations, nearness to Lagos and nearness to workplaces are factors that influence residential location in the peri-urban areas of Lagos, especially Lagos-Ibadan Peri-urban settlements (Lawanson, et.al. 2012) where public transport greatly compliments personal mobility.

Public transportation is a public service needed to improve mobility and open regions with low level of transport accessibility. It provides services for commuters with very different needs, ranging from peak-period access to the central business district (CBD) to all day access to retail outlets, local shops, recreation areas, residential areas and community center to achieve social objectives. In public transportation, there are various transit mode choices ranging from cab, motorcycle, tram, bus, train and other mass transit options. However, one of the major challenges in mobility is accessibility. Bhat et al. (2002) opined that there are 5 types of accessibility measures namely: spatial separation, cumulative opportunities, gravity measures, utility measures, and time/space measures. Also, inaccessible public transport could be due to lack of service (spatial gap), high cost of transportation (economic gap), distant to public vehicle (physical gap), longer passenger waiting time (time gap), and inadequate travel information (information gap) (Daniels et al. 2011).

In many peri-urban areas, limited access to public transport services has resulted in adoption on unsustainable modes of transport and the exclusion of vulnerable groups (e.g. children and the elderly) from the satisfaction of their mobility needs, thus, the heavy reliance on the personal vehicle as a transit modal choice (Yao and Wang, 2014). Daniels et. al. (2011) observed that accessibility issue in public transport could be due to lack of service, high cost of transportation, distant to public vehicle, longer passenger waiting time, lack of travel information and cultural/attitudinal issues which are major indictors of a sustainable transport system. In the report of OECD (2015), peri-urban dwellers experienced increased cost of transportation due to lack of access to public transport, while Cox (1999) opined that developmental pattern makes

public transport inaccessible in peri-urban areas. Belwal and Belwal (2010) also noted that unavailability of public transport results in dependency on private cars and this eventually leads to increase in cost of transportation and longer travel time.

From the report of Transit Cooperative Programme (2008), it was established that there are variations in residential location in peri-urban areas with significant effects on the travel behaviour of the peri-urban dwellers. Similarly, Jalihal, Kayitha and Reddy (2005) established that access to public transport diminished as people lived farther away from the city. This corroborates the location and rent theory of Alonso (1964) which established that the farther the residential location from the city centre, the more the facilities becomes inaccessible; a condition this study argues could affect travel behaviour in the peri-urban communities.

Travel Behaviour in Peri-Urban Area

Clifton and Handy (2001) observed that the study of travel behaviour over the last half century has yielded critical insights into the choices that individual and households make about their daily travel. These insights have contributed to the development of more studies in America, Europe and Asia with increasingly sophisticated methods by researchers and transport experts to understand and predict travel behaviour (Alade, 2010). The outcomes of many studies have influenced several transport planning decisions and policy issues in many countries (Srinivasan, 2005). Several studies have established that urban form, socio-demographic and life style are the major factors that may influence travel behaviour (Curtins and Perkins, 2006).

Prior to this time, several studies have evaluated travel behaviour in relation to urban form in countries such as USA, UK, India, Northern Ireland (Boarnet and Crane, 2001; Cervero, 2002; Goudie, 2002; Pucher and Renne, 2003; Guiliano and Narayan, 2003; Naess and Jensen, 2004; Soltani and Primerano, 2005). These studies reveal that density and mixture of land use, residential location, location of place of work, level of accessibility to service, city structure are major urban form variables influencing travel behaviour.

Similarly, studies of Ogunjumo, 1986; Fadare, 1989; Dieleman et.al., 2002; Guiliano, 2003; Polk, 2004; Guiliano and Dargay, 2006; and Alade 2010; examined socio-economic attributes and travel behaviour in both developed and developing countries and identified household size, car ownership, income, age, gender to be major socio-economic attributes of household that influence travel behaviour. Furthermore, the studies of Fadare and Adeosun, 2007; Fadare and Olojede, 2009; Agunloye, 2012 and Okoye, 2014 examined the impact of mobile telephone usage on the travel behaviour and came to a consensus the use of mobile phones tend to reduce trip frequency except Fadare and Salami (2004) who noted that only business calls tend to increase the number of trips. Furthermore, Okoko and Fashakin, (2007) modeled trip generation and revealed that travel time, trip mode, number of cars per household, house rent, and trip distance are significant factors affecting trip generation. A major gap in the study of travel behaviour is the limited literature in the context of peri-urban areas.

In peri-urban areas, spatial gap between residential location and daily trip destinations, such as place of employment, are often greater than those observed in urban environments (du Toit et al., 2007). Consequently, this results in greater dependence on automobiles to meet daily transport needs and all life activities within these settings and in the city (Badland et.al, 2012). Du Toit et al., (2007) noted that most peri-urban residents commute to the city daily by private car to meet

the employment needs. Busa (2003) noted that most (67%) of the peri-urban dwellers of Manzini in Swaziland travelled to the city on a weekly basis to make use of available services such as health, recreation, entertainment, shopping. The study further revealed that most of the trips were made through the local bus system (daladala) which serves almost every area of the region while the in outer settlements, transport mode is complemented by motorcycles and small vehicles operated by private individuals while most of the trip last at least 30 minutes.

Similarly, Salau, et.al. (2013) found that a significant proportion of residents of peri-urban area of Ota in Ogun State, north of Lagos, commute to Lagos for work using mostly public transport system, private cars, commercial motorcycles and tricycles as modal trip and the residents claimed to spend an average of 2 – 3 hours on board daily. The study also affirmed that no fewer than 75% of the residents visit Lagos at least once a month, usually for shopping and/or social engagements. This finding is corroborated by Lawanson et.al. (2012) who observed that peri-urban settlements largely depend on Lagos megacity for survival and that 96.3% of the peri-urban residents travel to Lagos daily majorly for employment. In Northern Africa, KhaledEl-Araby (2013) noted that suburban dwellers in Cairo travel to the city to access education, health, recreation, commercial and banking facilities and most of the trips were made by public transport, private cars, and minibus as they travelled over 20 kilometres in distance. These empirical studies reveal that peri-urban residents make both work and non-work-related trip mostly in public transport to urban centres to meet their basic needs.

STUDY AREA AND METHODOLOGY

The study area is the corridor of the federal highway, popularly called 'Lagos-Ibadan expressway' a 130 km stretch of dual carriage highway linking Lagos State, the commercial and industrial capital of Nigeria to the rest of the country. This expressway is ideal for this research because it is a national transit corridor where several settlements, large industries and large religious campgrounds are located. Regional and local travels also take place within the corridor due to the nature of development along the corridor and the links with other regional roads. Settlements are situated in different locations along the transit corridor between Latitude 6^0 44' North and Longitude 3^0 25' East'' of Isheri North and Latitude 6^0 54' North and Longitude 3^0 7' East'' of the Sagamu Interchange. In aerial distance, Lagos-Ibadan Axis of the Expressway is about 32 kilometres between the Isheri North end of Lagos State and the Sagamu Interchange of the Expressway in Ogun State.

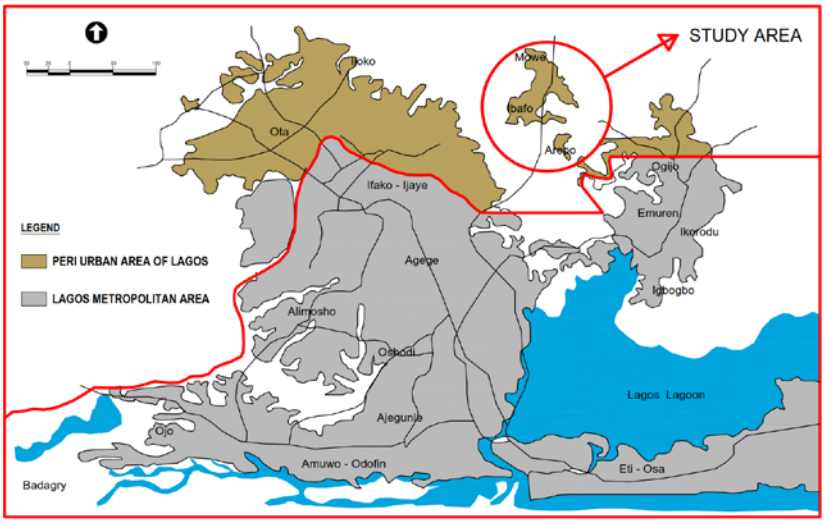

Fig 1: Showing the Study Area within the context of Lagos Megacity, Nigeria
Source: Salau et. al., (2013)

The transit corridor which lies outside the political boundary of Lagos state but largely depends on Lagos for survival is divided into three major zones namely Isheri, Ibafo and Sagamu Interchange; all located north of Lagos at 0-10km, 10-20km and beyond 20km respectively. Isheri Area constitutes a substantial portion of the first Ogun State Property and Investment Corporation (OPIC) Acquisition; occupants in the area include the cattle and ram dealers on the bank of the Ogun River, government (Sparklite Estate) and private housing estates and the Isheri community to the east of the expressway. Arepo and Warewa communities are located the northern fringe of the zone. Ibafo zone (10-20km band) is a mix of religious camp grounds (Mountain of Fire and Miracles Ministries (MFM), Deeper Life and Nasrul-Lahi-L-Fatih a.k.a NASFAT) and residential communities including Ibafo, Magboro-Sofolarin Araromi, Magboro-Akeran among others. Ibafo, the most dominant community is approximately 13.5 kilometres from State Lagos boundary, extending northwards for about 3 kilometres towards the last zone (Sagamu Interchange) within the study area.

Sagamu Interchange occupies the last 10km band of the study area and is similar in character to the Ibafo zone. The zone is made up of the newly planned Gateway City and other traditional communities including Mowe (most dominant settlement) which has grown to merge with Loburo and Pakuro. Other settlements include the Redemption Camp, CETEP University, Ofada, Orimerunmu, Abaren and Asese. The geographical scope of this study is limited to three purposively selected settlements: Arepo (Isheri Zone), Ibafo (Ibafo Zone) and Mowe (Sagamu Interchange Zone) based on their dominance in each zone. The relative location of theses settlement to Lagos and within the study area are presented in Figure 1 and 2 respectively.

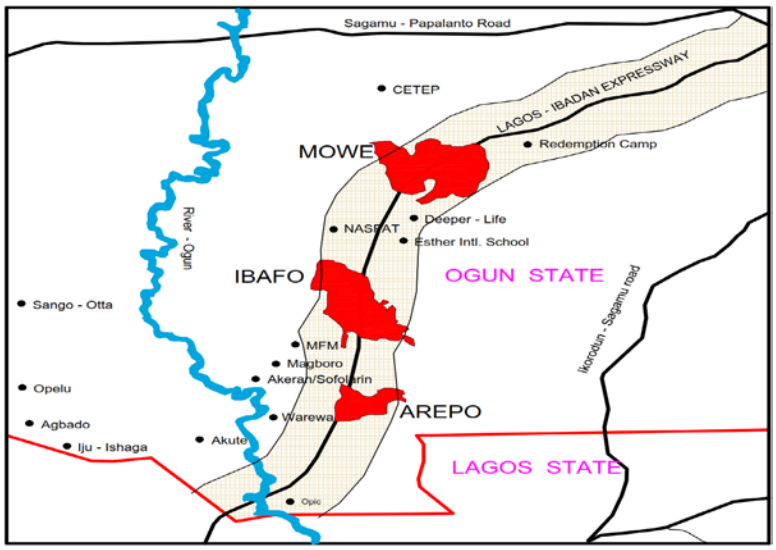

Fig. 2: Spatial location of the selected Settlements along Lagos-Ibadan Axis, Nigeria
Source: Ogun State Development Pressure Area Report (2005).

The study used both primary and secondary data to discuss the research context. The primary data (socio-economic characteristics, access to public transport and travel behaviour of respondents) were obtained from the field through questionnaire and personal interview. Population figure and the location map of the study area were obtained from Ogun State Development Pressure Area Report. Using multi-stage sampling method, the sample frame (5,126 households) of the research is the projected household population of the three selected peri-urban communities *(Arepo, Ibafo, and Mowe)* from three distance bands from Lagos as stratified in the Ogun state Development Pressure Area.

Based on calculation adopting confidence level of 93%, probable error not more than 0.07% and sample ratio of 0.65%, 182 households were selected as sample size for cross-sectional survey. Each of the three settlements was subdivided into six survey zones; followed by random selection of (50%) 3 zones in each settlement; random selection of halve of the streets in each zone; and systematic selection of every 7th building on selected street. Both descriptive and inferential statistics were used for analysis. The socio-economic, level of access to public transport services and travel characteristics of residents analysed descriptively. Access to public transport (distance, cost, modal choice, time and waiting time at terminal) and travel behaviour (travel purpose, frequency, time, cost, mode, distance, etc) are measured in relation to residents' location (distance band) from Lagos. The difference in access to public transport and travel behaviour across the three peri-urban communities was determined using Chi-square test while Pearson correlation analysis was used to determine the relationship between access to public transport and travel behaviour at 0.05 significant level.

RESULTS AND DISCUSSIONS

This section presents the results of the study starting with descriptive analysis of residents' socio-economic attributes, access to public transport and travel behaviour. Following is the test of the hypothesis on the significnce of the difference in access to public transport and travel behaviour across the three communities using distance from Lagos as the dependent variable and lastly, the bivariate analysis of the relationship between access to transport and travel travel behaviour using Pearson Correlation analysis.

Socio – Economic Characteristics of the Residents

Findings revealed that a large proportion (67%) of the respondents were males and mostly (88.7%) fall between the age of 21 and 59years indicating dominance of an active and productive group and those above 60years account for 11.5% of the study population. In education attainment, more than 90% had formal education ranging from 47.8% with tertiary education to 28.6% with secondary education. Others include 14.8% with primary education and 8.8% with no formal education. The age and educational background of the residents is indicative of active and productive members of the society whose mobility desires and aspirations should be considered through the provision of sustainable and innovative public transport options.

Further, over 75% of respondents were employed with about 50.0% in the informal sector and 25.3% in the formal sector and 10.4% were Retired. Findings on monthly income of respondents showed that majority are low income earners; 28% earned less than N25,000, 26.9% earned between N25,000 – N50,000 while 25.3% earned between N50,001 – N75,000. Others include 10.4% and 9.3% who earned between N75,001 – N100,000 and above N100,000 respectively. This might not be unconnected with the fact that majority of the residents were engaged in informal sector activities. This may be responsible for the low car ownership rate among the population as only 17.6% of respondents had a car. The foregoing findings corroborate previously documented studies which established that majority of the residents of peri-urban communities moved to such location due to the inability to compete for high land value and cost of living in the city centre. Therefore, the provision of an affordable and sustainable public transport system is germane for such communities.

Residents' Access to Public Transport

Access to public transport in this study was measured by the distance from home to terminals, time, cost, travel mode and the waiting time at the public transport terminals.

Distance from Home to Public Transport Terminal

Results presented in Table 1 revealed that 80.0% of respondents travelled more than one kilometre to the nearest public transport terminal, 14.8% and 4.4% travelled between 0.5-1km and less than 0.5km respectively to the nearest terminal. Besides, the results revealed that the further away commuters live from Lagos, the longer the distance travelled to the nearest terminal suggesting that access to public transport becomes poorer with distance from Lagos. For instance, the proportion (68.1%) of respondents who travelled more than 1km to the nearest public transport terminal in Arepo, the closest community to Lagos was much lower than what obtained at Ibafo (83.3%) and Mowe (81.8%). Considering the distance travelled to the terminals, it is obvious that commuters in peri-urban communities of Lagos have difficulties accessing public transport. The foregoing indicates that the available public transport system probably results in unsustainable mobility and social exclusion of the vulnerable group of the communities who are hindered in the satisfaction of their daily trip requirements due poor public transport access standards.

Table 1: Distance from Home to Public Transport Terminal

Distance to Public Transport Terminal	Selected Settlement			Total
	Arepo	Ibafo	Mowe	
Less than 0.5km	1 (4.5%)	4 (5.1%)	3 (3.7%)	8 (4.4%)
0.5 – 1km	6 (27.3%)	9 (11.5%)	12 (14.6%)	27 (14.8%)
More than 1km	15 (68.1%)	65 (83.3%)	67(81.8%)	147 (80.8%)
Total	22 (100%)	78 (100%)	82 (100 %)	182 (100%)

Source: Field Survey, 2015

Travel Time to Public Transport Terminal

Analysis of travel time to the nearest terminal as presented in Table 2 shows that 62.6% travelled between 15 and 30 minutes from their homes to the nearest terminals. A lower proportion (30.2%) travelled less than 15 minutes and a much lower proportion (7.1%) travelled for more than 30 minutes. Although, the proportion (40.9%) of commuters within the 15-30minutes time band in Arepo is much lower than what obtains in Ibafo (65.4%) and Mowe (65.9%), this is expected considering that Arepo is closer to Lagos than the two other communities. The distance decay effect of residents' location from Lagos is more pronounced among commuters who travelled less than 15 minutes to the terminals. The highest proportion (59.1%) of commuters in this group is found in Arepo, 28.2% and 24.4% are in Ibafo and Mowe respectively. However, the fact that majority of commuters travelled between 15 and 30 minutes over a distance above 1km as shown in Table 1 reflects a relatively low travel speed and calls for concern as this further suggests poor access to public transport in communities located further away from Lagos.

Table 2: Time Spent to Public Transport Terminal

Time Spent to Public Transport Terminal	Selected Settlement			Total
	Arepo	Ibafo	Mowe	
Less than 15mins	13 (59.1%)	22 (28.2%)	20 (24.4%)	55 (30.2%)
15 – 30mins	9 (40.9%)	51 (65.4%)	54 (65.9%)	114 (62.6%)
More than 30mins	-	5 (6.4%)	8 (9.8%)	13 (7.1%)
Total	22 (100%)	78 (100%)	82 (100 %)	182 (100%)

Source: Field survey, 2015

Travel Cost to Public Transport Terminal

Table 3 revealed that 64.3% of respondents spent between ₦100–200 to the nearest public transport terminal and the rest spent less than ₦100. On the average, respondents spent about ₦200 on transport from home to the terminals and ₦400 (above 1UDS) per day on return trip from terminals back home. Also, the results showed that commuters (68.2%) who spent less than ₦100 at Arepo were more than those living at Ibafo (30.8%) and Mowe (31.7%). On the contrary, those who spent between ₦100–200 were more at Ibafo (69.2%) and Mowe (68.3%) than those (31.8%) at Arepo. This clearly indicates that the cost of transport to public transport terminals in peri-urban areas of Lagos is influenced by their proximity to the city. This is expected; however, the difference is not very significant beyond Arepo, the closest community to Lagos.

Table 3: Travel Cost to Public Transport Terminal

Travel cost to Public Transport Terminal	Selected Settlement			Total
	Arepo	Ibafo	Mowe	
Less than ₦100	15 (68.2%)	24 (30.8%)	26 (31.7%)	65 (35.7%)
₦100 – 200	7 (31.8%)	54 (69.2%)	56 (68.3%)	117 (64.3%)
Above ₦200	-	-	-	-
Total	22 (100%)	78 (100%)	82 (100 %)	182 (100%)

Source: Field survey, 2015

Waiting Time at Terminals

Findings as shown in Table 4 revealed that 45.5% of the respondents usually waited for 15 – 30minutes at the terminals, while 42.9% waited for less than 15 minutes. Others include 11.5% of the respondents who waited at the terminals for more than 15 minutes. Further analysis of those who waited at terminals for less than 15 minutes across the three communities revealed that Arepo had the highest proportion with 72.7% while Ibafo and Mowe had 11.5% and 64.6% respectively. This suggests that Mowe, the farthest community performed better than Ibafo. Table 4 further revealed that 26.9% of commuters in Ibafo waited for more than 30 minutes at the terminals whereas no commuter was found to wait at terminals for more than 30 minutes in Arepo and Mowe. This might not be unconnected with the midway location of Ibafo as public transport service providers have the option of returning to Lagos from Arepo or going as far as Mowe before returning to Lagos, hence, commuters at Mowe experience much less waiting time at terminals than those living at Ibafo. Overall, the waiting time observed in the three communities exceeds the maximum passenger waiting time of 5 – 10

minutes advocated by the World Bank. The high demand for public transport during the morning peak period and poor service provided by operators may be responsible for the long waiting time experienced at terminals.

Table 4: Waiting Time at Terminals

Waiting time at the terminal	Selected Settlement			Total
	Arepo	Ibafo	Mowe	
Less than 15mins	16 (72.7%)	9 (11.5%)	53 (64.6%)	78(42.9%)
15 – 30mins	6 (27.3%)	48 (61.5%)	29 (35.4%)	83 (45.6%)
More than 30mins	-	21 (26.9%)		21 (11.5%)
Total	22 (100%)	78 (100%)	82 (100 %)	182 (100%)

Source: Field survey, 2015

It can be inferred from these analyses that residents of peri-urban communities have access to public transport at varying degrees in terms of cost, time spent, and mode of transport based on the distance of each community from Lagos which aligns with the study of Sanches & Dawkins (2001) and the distance decay in access to service by Alonso (1964). These outcomes are expected to reflect in the commuters' travel behaviour across the three peri-urban communities.

Residents' Travel Behaviour

This section presents the findings on residents' travel behaviour through analysis of daily trip characteristics from public transport terminals to commuters' destination in Lagos and these include trip frequency, trip purpose, trip departure time, trip mode, trip distance, trip time and trip cost. The findings show some similarities and differences in commuters' travel behaviour across the three communities.

Trip Frequency

Trip frequency measures the intensity of residents' interaction with Lagos and other locations. Findings on trip frequency in Table 5 indicates that 62.6% of commuters in the three communities undertake a trip every day, followed by 18.1% who travel twice a week and another 16.5% who travel once a week. The proportion of those who travel daily in Mowe (65.9%) is higher than what obtains in Arepo (59.1%) and Ibafo (60.3%). This may be an indication of the level of deprivation the community being the farthest from Lagos.

Table 5: Residents Travel Frequency

Travel Frequency	Selected Settlement			Total
	Arepo	Ibafo	Mowe	
Daily	13 (59.1%)	47 (60.3%)	54 (65.9%)	114 (62.6%)
Twice a week	4 (18.2%)	15 (19.2%)	14 (17.1%)	33 (18.1%)
Weekly	5 (22.7%)	11 (14.1%)	14 (17.1%)	30(16.5%)
Monthly	-	5 (6.4%)		5 (2.7%)
	22 (100%)	78 (100%)	82 (100 %)	182 (100%)

Source: Field Survey, 2015

Trip Purpose

Findings presented in Table 6, shows that 60.5% of commuters undertake work and school trips daily. Those who undertake work trips accounted for 45.1% of the interviewed population, however, this rises to 50% at Arepo and down to 41% at Ibafo. Similarly, those who undertake trips for basic services account for 21.4% of all commuters; the proportion observed in Arepo (13.6%) is the lowest and that of Mowe (25.6%) is the highest. This difference may be related to the location of each community from Lagos and commuters' access to public transport.

Table 6: Residents Trip Purpose

Trip Purpose	Selected Settlement			Total
	Arepo	Ibafo	Mowe	
Work	11 (50%)	32 (41%)	39 (47.6%)	82 (45.1%)
School	2 (9.1%)	15 (19.2%)	11 (13.4%)	28 (15.4%)
Shopping	3 (13.6%)	11 (14.1%)	5 (6.1%)	19 (10.4%)
Social	3 (13.6%)	5 (6.4%)	6 (7.3%)	14 (7.7%)
Basic Service	3 (13.6%)	15 (19.2%)	21 (25.6%)	39 (21.4%)
Total	22 (100%)	78 (100%)	82 (100 %)	182 (100%)

Source: Field survey, 2015

Trip Mode

The modal choice of commuters as presented in Table 7 revealed that 73.1% of the residents relied on the minibus as transit modal choice for daily commuting. The percentage (45.5%) of minibus users is the least in Arepo and highest (78%) in Mowe. Users of BRT account for 9.9% of the sampled population, however, the proportion observed across the three communities differs. Findings reveal that sustainable BRT service is limited to both Arepo (40.9%) and Ibafo (11.5%). The absence of BRT service at Mowe might not be unconnected with the fact that it is the farthest of the three communities from Lagos. Another major finding is the non-availability of commercial motorcycle services at Arepo, the closest community to Lagos; whereas, 22% and 14.1% of commuters use this mode in Ibafo and Mowe respectively. The ban on commercial motorcycle in Lagos and poor access to public transport in Ibafo and Mowe may not be unconnected with this pattern.

Table 7: Trip Mode

Travel mode	Selected Settlement			Total
	Arepo	Ibafo	Mowe	
Minibus	10 (45.5%)	58 (74.4%)	64 (78%)	133 (73.1%)
BRT	9 (40.9%)	9 (11.5%)		18 (9.9%)
Taxi	3 (13.6%)	-		3 (1.6%)
Motorcycle	-	11 (14.1%)	18 (22%)	29 (15.9%)
Total	22 (100%)	78 (100%)	82 (100 %)	182 (100%)

Source: Field survey, 2015

Trip Distance

Analysis of residents' trip distance as presented in Table 8 indicated that over 90% of residents in the three communities travelled for more than 10km daily. All the commuters interviewed at Mowe travelled beyond 10km and those in Arepo and Ibafo account for 77.3% and 83.3% respectively. This is expected for Mowe being the farthest community, however, it suggests that employment and basic services are not readily available there, hence the need for residents to look in the direction Lagos to meet their daily needs.

Table 8: Residents' Travel Distance

Travel Distance	Selected Settlement			Total
	Arepo	Ibafo	Mowe	
1- 10km	5(22.7%)	13 (16.7%)	-	18 (9.9%)
11 – 20km	7 (31.8%)	10 (12.8%)	9 (11%)	26 (14.3%)
21 – 30km	10 (45.5 %)	36 (46.2%)	8 (9.8%)	54 (29.7%)
More than 30km	-	19(24.4%)	65 (79.3%)	84 (46.2%)
Total	22 (100%)	78 (100%)	82 (100 %)	182 (100%)

Source: Field survey, 2015

Travel Time

A cursory look at Table 9 and shows that majority of the residents (55%) undertook daily trips lasting more than one hour, 40.7% spent between 30 minutes and one hour per trip and only 4.3% undertook daily trips that are less than 30minutes. Again, there were differences in the trip time across the communities. Mowe, being the farthest had no commuter whose trip time was less than 30 minutes but had the highest percentage (76.8%) of commuters whose daily trip time was more than one hour.

Table 9: Travel Time

Travel time	Selected Settlement			Total
	Arepo	Ibafo	Mowe	
Less than 30mins	2 (9.0%)	6 (7.7%)	-	8 (4.3%)
30mins – 1hr	11 (50.0%)	44 (56.4%)	19 (23.2%)	74 (40.7%)
More than 1hr	9 (41.0%)	28 (35.9%)	63 (76.8%)	100 (55.0%)
Total	22 (100%)	78 (100%)	82 (100 %)	182 (100%)

Source: Field Survey, 2015

Trip Cost

The trip cost of residents presented in Table 10 shows that 27.5% of residents spent less than ₦200 from the terminals to their destinations, 41.7% spent between ₦200-400 and 30.8% spent above ₦400 per trip. Across the three communities, 68.3% of commuters in Mowe spent above ₦400 per trip to their destinations, whereas, no commuter in this category was found in both Arepo and Ibafo. Arepo had the highest percentage (54.6%) of those who spent less than ₦200 per trip to their destination, followed by Ibafo (30.8%) and Mowe (17%). This further confirms the assertion that the location of

commuters in peri-urban area affects travel behaviour. This is so because access to public transport is more challenging with corresponding higher trip distances and trip times for peri-urban communities located farther away from the city.

Table 10: Travel Cost

Travel Cost	Selected Settlement			Total
	Arepo	Ibafo	Mowe	
Less than ₦200	12 (54.6%)	24 (30.8%)	14 (17.0%)	50 (27.5%)
₦200 – 400	10 (45.4%)	54 (69.2%)	12 (14.7%)	76 (41.7%)
More than ₦400	-	-	56 (68.3%)	56 (30.8%)
Total	22 (100%)	78 (100%)	82 (100 %)	182 (100%)

Source: Field Survey, 2015

Findings in this study have shown that residential location affects access to public transport and travel behaviour of residents in peri-urban communities of Lagos and this aligns with the study of du Toit et. al. (2007). The significance of the difference in access to public transport and travel behaviour across the three communities is presented in the following test of hypothesis.

Test of Hypothesis

Using the Chi-square test, the significance of the difference in access to public transport was tested using four variables and six variables for the difference in travel behaviour. As presented in Table 11, findings revealed that significant differences exist in access to public transport in peri-urban settlements along Lagos-Ibadan axis as measured by distance to public transport (χ^2 = 88.923); Time spent to public transport terminal (χ^2= 84.868); Transport cost to the terminals (χ^2 = 14.857) and Average waiting time at the terminal (χ^2= 39.110). The alternative hypothesis is hence accepted at $p \leq 0.05$. Similarly, the results indicated the existence of significant difference in residents' travel characteristics in the study area as measured by trip frequency (χ^2 = 220.692), trip mode (χ^2 = 226.747); trip distance (χ^2 = 59.110); trip time (χ^2= 172.835); trip cost (χ^2 = 65.405); and departure time (χ^2 = 99.231). The alternative hypothesis is hence accepted $p \leq 0.05$.

Besides the Chi-square test, Pearson correlation analysis was also done to test the significance of the relationship between access to public transport and residents' travel behaviour with a view to further highlight the mobility challenges in the study area. The outcomes of this test are presented in Table 11.

Table 11: Chi-Square test on the difference in Access to Public Transport and Travel Behaviour of the Residents

Variable	Value	df	Asmp Sig. (2 – Sided)	Table value	Decision
Distance to Public Transport Terminal	88.923	5	0.000	11.05	Accept H1
Accessibility cost to Public Transport Terminal	14.857	1	0.000	3.84	Accept H1
Trip Gap to Public Transport Terminal	84.868	2	0.000	5.99	Accept H1
Average waiting Time	39.110	2	0.000	5.99	Accept H1
Travel Mode	226.747	3	0.000	7.82	Accept H1
Travel Time	172.835	4	0.000	9.49	Accept H1
Travel Cost	65.405	5	0.000	11.07	Accept H1
Travel Distance	59.110	3	0.000	7.82	Accept H1
Travel Frequency	220.692	4	0.000	9.49	Accept H1

Relationship between Residential Location, Access to Public Transport Terminal and Travel Behaviour

The results of the Pearson correlation analysis between access to public transport and the travel behaviour variables are presented in Table 12. Findings show that the correlation coefficient (0.158* $P < 0.05$) between distance to the terminal and trip distance to destination in Lagos is weak, positive and statistically significant, thus, suggesting that commuters living far away from the public transport terminals also travel longer distance from the terminals. Similarly, trip cost to public transport terminal and trip distance have weak, positive and statistically significant correlation coefficient (0.161* $P < 0.05$). Again, this indicates a mobility challenge for the commuters as daily travel costs are likely to be higher as they live far away from Lagos; unfortunately, majority of them are low income earners.

Furthermore, time spent from home to the terminals had statistically significant correlation coefficients with travel time (0.358* $P < 0.05$) and travel distance (0.432** $P < 0.01$) respectively, suggesting that commuters' longer travel distances result into longer travel time and this may affect productivity and well-being. Again, these are indicative of poor transport system and mobility challenges in the study area. These patterns are not surprising though, going by the outcome of the descriptive analysis of the access and travel behaviour variables.

Finally, the waiting time at the terminal and trip cost to destination have weak, negative and statistically significant correlation coefficient (-0.147* $P < 0.05$), showing that those who experience short waiting time at the terminals spent more to get to their destinations and vice versa. The short waiting time at the terminal may be a positive mobility attribute, but the higher trip cost associated with it calls for concern.

Table 12: Correlations between Access to Public Transport and Travel Behaviour of Residents

		Residents Travel mode	Residents Travel purpose	Residents Travel time	Residents Travel Cost	Residents Travel Distance	Residents Travel Frequency
Distance to Public Transport (terminal)	Pearson Correlation	-.109	.096	.122	-.141	.158(*)	.138
	Sig. (2-tailed)	.143	.197	.100	.057	.034	.063
	N	182	182	182	182	181	182
Accessibility cost to Public Transport Terminal	Pearson Correlation	.017	-.270(**)	.130	.137	.161(*)	.005
	Sig. (2-tailed)	.820	.000	.080	.065	.031	.943
	N	182	182	182	182	181	182
Time Gap to Public Transport Terminal	Pearson Correlation	.076	-.014	.358(**)	.247(**)	.432(**)	-.069
	Sig. (2-tailed)	.311	.846	.000	.001	.000	.358
	N	182	182	182	182	181	182
Average waiting time at the terminal	Pearson Correlation	-.173(*)	-.008	-.091	-.147(*)	-.059	.071
	Sig. (2-tailed)	.020	.919	.220	.048	.433	.338
	N	182	182	182	182	181	182

*Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

CONCLUSION AND RECOMMENDATION

The study has assessed residents' access to public transport and travel behaviour in peri-urban communities on Lagos-Ibadan corridor, southwest Nigeria and reveals significant difference across the communities based on their relative location from Lagos, thus validating the Bid Rent theory of Alonso (1964). Further, the results showed that access to public transport and travel behaviour are interrelated and reveal various dimension of mobility challenge with many implications for sustainable public transport planning and travel demand management in the study area. This study concludes that residents in the peri-urban communities of Lagos are generally low-income earners who commute frequently to Lagos for livelihood and other services and are confronted with several mobility challenges which affect their travel behaviour due to unsustainable transport systems.

Similar studies particularly in European and American cities have concluded that limited access to public transport affect travel behaviour (Yao and Wang, 2014). In many cases, conclusions were used to influence transport policy that promotes sustainable mobility. The study posits that access to public transport could be improved in the study area by extending the BRT service to communities that interact more with Lagos, though they are located outside the political jurisdiction of Lagos. This will minimize the dominance of unsustainable transport modes such as minibuses and other para-transit modes that pose safety risks on highways and pollutes the environments. In addition, innovative and smart transit options such as

e-hailing services and carpooling as currently practiced in Lagos city will also provide viable transit options for residents of these peri-urban communities. Provision of basic needs and access to them in the study area may reduce reliance on motorised transport and engender sustainable development.

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