



ISSN:2714-2248



Volume 2,
2020

NIGERIAN JOURNAL

OF LOGISTICS & TRANSPORT

Journal Nigerien De Logistique Et Du Transport

A PUBLICATION OF
Nigerian Institute of Transport Technology (NITT),
Zaria, Kaduna State, Nigeria.



NIGERIAN JOURNAL OF LOGISTICS AND TRANSPORT

Volume 2, 2020

**Publication of
Nigerian Institute of Transport Technology (NITT),
Zaria, Nigeria**

**Email: njlt.nitt.gov.ng
officeofthedgnittzaria@yahoo.com**

ISSN: 2714-2248



ISSN: 2714-2248

NIGERIAN JOURNAL OF LOGISTICS AND TRANSPORT

EDITORIAL BOARD

- Chairman Editorial Board:** Dr. Bayero S. Farah
- Editor in Chief:** Dr. Joshua A. Odeleye
- Board Members:** Dr. Joshua A. Odeleye
Dr. F.O. Nwanosike
Dr. B.I. Mundi
Mr. P. Mshelizah
Dr. S.U. Gidado
Mr. M.O. Adeyi
Mrs. S.I. Zego
- Editorial Advisers:** Prof. Hashim A. Alhassan - BUK, Kano
Prof. Slim Danladi Matawal - ATBU, Bauchi
Prof. S. G. Odewumi - LASUSOT, Lagos
Prof. E. Okoko - FUT, Akure
- Peer Review Editorial Committee:**
- | | |
|----------------------|--------------------------|
| Prof. T. Oluwosulu | Dr. P. Obi |
| Prof. A. E. Ubogu | Dr. (Mrs) F.O. Nwanosike |
| Prof. C. Ibe | Dr. M. Oluwole |
| Prof. T. Arosanyin | Dr. D.A. Ismaila |
| Prof. Munkaila Aminu | Dr. K. Bakare |
| Prof. B.A. Badejo | Dr. Kole Uhuegho |
| Prof. S.I. Oni | Dr. N. Yakubu |
| Prof. I.M. Jaro | Dr. J. Ojekunle |
| Prof. S. Abdullahi | Dr. E.G. Okafor |
| Dr. Bayero S. Farah | Dr. B.I. Mundi |
| Dr. J.A. Odeleye | Dr. S.U. Jatau |
| Dr. M. Olawole | Dr. S.U. Gidado |
- Publication Desk:** Mrs. N.H. Anene
Mrs. Victoria Kilba
Mr. Yusuf Gafai
- Secretariat:** Mr. Abdulganiyu Tijjani
Mr. Hassan Imam
Mr. Luka Shagbo

NIGERIAN JOURNAL OF LOGISTICS AND TRANSPORT

TABLE OF CONTENTS

Volume 2, 2020

Analysis of Rail Passengers' Service Satisfaction Level at Rigasa Train Station, Kaduna State. <i>Onwube, A. and Odeyele, A. O.</i>	---	---	---	---	---	1-14
Digital Road Network for Optimally Locating Emergency Services for Parts of Ikeja Local Government Area, Lagos, Nigeria <i>Oseni, A. E. and Odesanmi, D.A</i>	---	---	---	---	---	15-34
Road Characteristics and Road Traffic Crashes along Akure-Owo Highway, Ondo State, Nigeria <i>Odinfonu, J. U., Adesina, F. A. and Adeoye, N. O.</i>			---	---	---	35-51
Infrastructural Development and Passenger Traffic Management of Airports in South-South, Nigeria <i>Udoh, E. I., Ekefre, S. D., and Thompson, D. T.</i>			---	---	---	52-67
Inclusive Urban Transportation for The Disabled: Case of Bus Rapid Transit (BRT) System in Lagos State, Nigeria <i>Ekop, G. and Olayemi, D. F.</i>	---	---	---	---	---	68-76
Assessment of Vehicular Composition of Public Transport Services in Kaduna State, Nigeria <i>Shagbo, L. and Isah, E. I.</i>	---	---	---	---	---	77-89
Assessment of Vehicle Tracking System in Dangote Cement Transport, Obajana- Nigeria <i>Oluwole, M.S., Suleiman, M.E., Ojekunle, J.A. and Owoeye, S.A.</i>					---	90-99
Factors Influencing Urban Residents Travel in Minna Metropolis, Nigeria <i>Owoeye A.S, Oluwole M.S, Ajiboye A.O, Yakubu-Wokili, H. and Akinsulire, E.S.</i>					----	100-116
Understanding Humanitarian Aid Logistics in North Eastern Nigeria: A study in Supply Chain. <i>Ahmed, I., Onyedikachi, C. C., Olaomi, M.O., and Salman, A. T.</i>					---	117-133
Rural Accessibility and Movement of Farm Produce to Urban Areas of Ejigbo LGA, Osun State, Nigeria <i>Omirin, O. J. and Ajibade, B. N.</i>	---	---	---	---	---	134-149

Socio-Economic Analysis of the Impact of Coronavirus Disease (Covid-19) Pandemic on Transporters in Kaduna State									
<i>Olaomi, O. M., Arigbede, O. O. and Arigbede, A. Y</i>	---	---	---						150-159
Career Prospects and Employment Potentials in Nigeria Transportation Sector									
<i>Salisu, U. O. Fasina, S. O. Akanmu, A. A., Sanni, S. M. and Olatunji, O. M.</i>									160-180
Impact of Covid-19 to Transport Operators in Different Transport Industries in Zaria Environ									
<i>Shehu, N.</i>	---	---	---	---	---	---	---		181-192
Scientific Inventory Control and Operational Performance at Ecomarine Terminals Limited Calabar, Cross River – Nigeria									
<i>Zakka, G. C.</i>	---	---	---	---	---	---	---		193-208
Car Use Behaviour and Influencing Factors: A Review									
<i>Fatai, A. Y</i>	---	---	---	---	---	---	---		209-218
Trends of Road Traffic Crashes in Akure, Nigeria									
<i>Aderibigbe, O.O. & Ogunmola, J.</i>	---	---	---	---	---	---	---		219-228

FACTORS INFLUENCING URBAN RESIDENTS TRAVEL IN MINNA METROPOLIS, NIGERIA

*¹Owoeye A.S, ¹Oluwole M.S, ¹Ajiboye A.O, ¹Yakubu-Wokili, H. & ²Akinsulire, E.S.

¹Department of Transport Management Technology,
Federal University of Technology, Minna, Nigeria

²Department of Geography, Adekunle Ajasin University, Ondo State, Nigeria
Corresponding Author: ade.owoeye@futminna.edu.ng or lankiedudu@yahoo.com

Abstract

The need for people to interact is ordered by the spatial spread of activities within the special environment. The spatial separation of cities and land use types necessitate spatial interface for purposeful interrelationship. Several factors influence the interaction demand of households in different cities. This study was conducted to explore the significant factors which serve as determinants of travel among households in Minna, Nigeria. Data were collected through the administration of 1,299 questionnaires to randomly selected households of which 888 questionnaires were returned valid. A multistage sampling technique was adopted in which Minna was divided into four cluster zones, from which 12 diverse residential neighbourhoods were selected. Descriptive analysis was used to determine the socio-economic characteristics of the respondents while factors analysis was used to account for the variation in factors influencing urban travel in the study area. Findings shows that majority of the respondents were male with 63.9% compare to Female with 36.1, the dominant Household size is between 5-8 which is 54.4% while, middle income group households with 49.1% were pronounced. Also, respondents with less than 30 years old were more dominant with 42.7%. The result of the factor analysis shows that 8 factors whose eigenvalue are greater than 1, significantly influences urban residents interaction. These include; Phone call, cost of call, income, marital status, position in household, gender, car ownership, and number of licence driver. These accounted for 59.4% of the total variance. The study recommends that government and other policy makers should take into account socio-economic characteristics of urban residents in the design, construction, planning of roads and provision of public transportation policies. Residents are advised to make use of various opportunities available on Telecommunication platforms in the form of virtual and telecommuting to substitute physical interactions due to covid-19 pandemic.

Keywords: Household; Travel; Urbanization; Spatial; Neighbourhood, Resident; Global System for Mobile Communication (GSM)

1. Introduction

Urbanization has been one of the dominant contemporary processes as a rising share of the global population lives in the cities. The need for people to travel from one place to another is dictated by the spatial spread of activities within the spatial environment (Fadare & Salami, 2004). This has led to the emergence of swell in the usage of automobiles resulting into extended trip

length and high dependence on car usage (Handy, Weston & within the age Mokhtarian, 2005). Human activities must take place in an environment that attracts mobility to the land use within the city center or the hinterland. Activities like working, shopping, religious, recreation and others necessitate themovement of people from one neighbourhood to another. The value of transportation in this regard cannot be over-emphasized (Ojekunle *et al.*, 2018).

The spatial separation of cities and land use types creates spatial disparity that necessitate spatial interface for purposeful interrelationship. Scholars like: Ayeni, 1974; Adeniyi, 1981; Ojo, 1990; Ogunsanya, 2002; Solanke, 2005; Osoba, 2011; Badejo, 2011; Raji, 2013; Owoeye, 2018, Owoeye et. al, 2018) have all revealed in their studies that in general, people have a propensity to travel in order to gain access to a variety of other people's services and facilities that is not available at the origins of their respective trips. Hence, the rapid urban growth occurring across much of the globe due to these interactions within urban areas, resulting in movement across larger distances as cities developed. This implies that commuting has gradually shifted to faster transport modes and consequently greater distance could be travelled within a short time (Ibrahim, 2012).

The necessity for people to move from one place to another is ordered by the spatial spread of activities within the spatial environment as asserted by Fadare & Salami, 2004; Owoeye, 2018; Adeniji 2000; Fadare & Morenikeji 2001; Fujiwara et al, 2005; Leautier and Melita 2006; Okoko 2007, Fadare, 2010; Alade, 2012; Ojekunle et al 2018. Evidences abound from studies that household socio-economic characteristic also play a significant role in influencing their travel behaviour (Tanangsnakol; 2011 & Muili, 2013). Adetunji and Aloba, 2013; and Samson, (2012) also noted in their various studies that age and sex played a significant influence on individual and household travel length to activities on a weekday.

2. The Need for the Research

The search for explanation on the motivating determinants of urban travel in developing countries particularly in Nigeria is not a conclusive one due to the spatial separation of cities, activities and land use types which create dynamic spatial disparity that necessitate spatial interface for purposeful interrelationship within a city. In

addition, from the review of literature, available studies on the same theme in the country were conducted between ten to twenty years ago and majorly in the southern part of Nigeria with little emphasis to Northern part. Thus, not reflecting the current travel situation in many urban landscapes in Nigeria. Hence, the urgent need to conduct fresh studies in order to identify various factors influencing urban trip generations within a city.

It is against this backdrop, that this study endeavours to explore and identify major factors influencing households travel in Minna Metropolis, Niger State, Nigeria. No wonder Clifton and Handy (2001) were of the opinion that the more we understand about urban travel behaviour, the more we realize how much we do not understand, because as one question is answered, new question emerge, and our appreciation of the complexity of urban travel characteristics grow. This study consequently laid emphasis in identifying factors influencing household travel in Minna an emerging urban metropolis in North-Central Nigeria.

3. Empirical Review of Literature

It is noted that several factors affect the travel demand of households in different neighbourhoods, these include; socioeconomic characteristics of household, level of transport infrastructure development, religion, culture, city structure, location of household within city, accessibility to public transport, ownership of means of transport, among others. Scholars like: Fadare, 1987, 1989, Ogunjumo, 1986, Pucher and Renne, 2003, & Fujiwara et al, 2005, Badejo, 2011, Nass et al., 2011, Stephen et al., 2012 & Aditjandra et al., 2010, have identified household size, car ownership, income, age, gender, number of employed people in the family and occupation among others as major socio-economic attributes of households that influence their travel behaviour in both developed and developing countries.

Income and car-ownership have been noted as part of the factors that influence travel behaviour (Pucher & Renne, 2003, Fadare, 1989, Ogunjumo, 1986). The consensus here is that the higher the income of a household member the higher the tendency to own and increase the number of vehicles in such households. Owoeye (2018) asserted that in the concept of travel mode choice, individual who often travel by car in related situations may develop a stronger car habit than individuals who travel less frequently or in changing circumstances (e.g. by car, and erstwhile by public transport). Westford (2010) found that self-employed trip makers make short trips than those in regular employment, because many of them are located within close proximity to their homes.

Apart from gender, Srinivasan (2005) established that number of vehicles in the household and the income level were significant socio-economic factors influencing travel or trip making behaviour in Chennai, India. Fadare (1989) observed that household socio-economic attributes (age, sex, income and car ownership) influenced the number and purpose of trips which household members in a neighbourhood make in a week day in Ibadan, Nigeria. Numerous studies in Europe and North America have recognized that residential density or location positively affects individuals and household travel behaviour (Hanson & Hanson, 1981).

Fadare & Hay (1990) noted that a variety of trips exist in the socio-economic attributes of urban households as a result of the density of their residential areas which has repercussions for their trip generation. The nature and degree of influence of these factors however vary from city to city and even within a given urban center; Hanson & Schwab, 1987; Gordon *et al*, 1988; Rimmer, 1986; White, 1990; Garling *et al*, 1994; Bhat & Koppelman, 1999. Rahman *et al*. (2015) in their studies travel behaviour in Khulna Metropolitan City, Bangladesh, show that people with higher income and

more automobile availability make more travel than people with low income and less automobile availability.

Dieleman *et al*, (2002), concluded that household with higher income tend to own and use a car and family with children were more likely to use the car than one-person families. Newbold *et al*, (2005), concluded that factors other than age can also influence travel behaviour. In that daily trip numbers and duration decreased significantly due to changes in employment status and health status of households. Hensher & King, (2001) concluded that travel cost or the influence of pricing also determine travel behaviours of households in term of pattern of travel, length of trip and modal choice of travel by residents in an urban centres.

Best & Lanzendorf (2005) asserted that varieties of socio-demographic factors such as household composition, age, gender, car ownership, employment status, retirement status, educational status and income all influence the choice of travel mode, the length, duration of the journey, travel patterns and behaviours of households. These factors are important but gender and household composition appear to be of particular significance in influencing travel behaviours according to Ryley, (2005).

4. The Study Area and Methodology

4.1 Study Area

Minna is a rapid developing urban centre in North-Central Nigeria and it is the capital of Niger State as shown in Figure 1. Minna is situated between Latitudes 8°20' N and 11°30' N and between Longitude 3°30' E and 7°20' N, and lies entirely within the physical and cultural zone of transition described as the "middle belt of Nigeria". Kaduna and Federal Capital Territory border the State to both North-East and South-West respectively. Minna total land area is 74,344km², it consists of two major ethnic groups: the Nupe and the Gwari. Minna town became a major collecting point for agricultural products, including

peanuts (groundnut), cotton, yams, shea nuts, ginger and rice. While local trade is mainly in sorghum, yams, cotton, shea nuts, indigo, kola nuts, cattle, goats and guinea fowls.

The transport system in Minna incorporates various modes of transport ranging from the use of commercial motorcycle, taxi, buses, tricycles and other public mode of transportation. A point of note is that transport infrastructure in most parts of Minna are grossly inadequate especially roads which enhances the popularisation of the use of commercial motorcycles in accessing the hinterland areas of the

city. Figure 2 and 4 shows the road network system and delineated map of the various neighbourhoods. Minna is known for its woven and dyed cotton cloth, raffia mats and baskets, pottery, and brassware. While, modern industry includes a brick-making plant and a quarry plant. The three homogenous residential densities of low, medium and high were recognised in Minna. These residential areas are differentiated by social, economic and physical patterns. Figure 3 shows landuse distribution into commercial, industrial, educational, recreational, public and residential within the city.

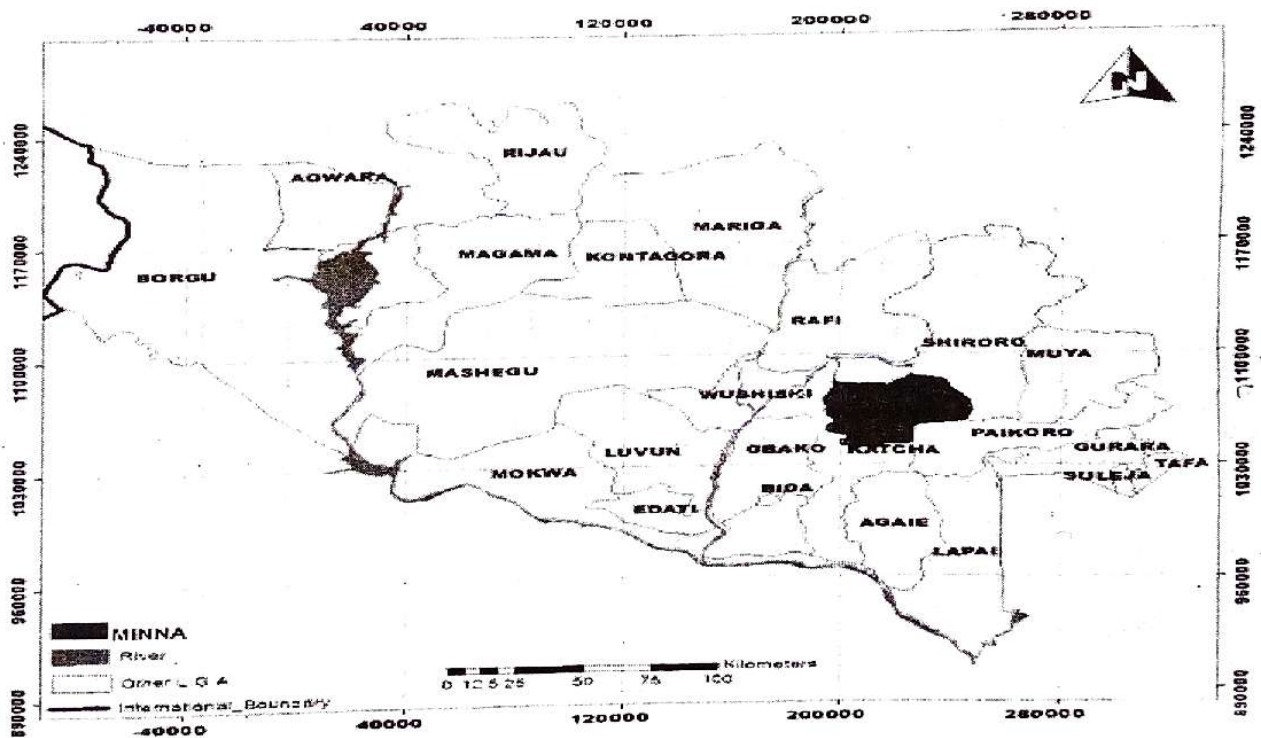


Figure 1 Map of Niger State showing Minna

Source: Department of Transport Management, FUT, Minna (2019)

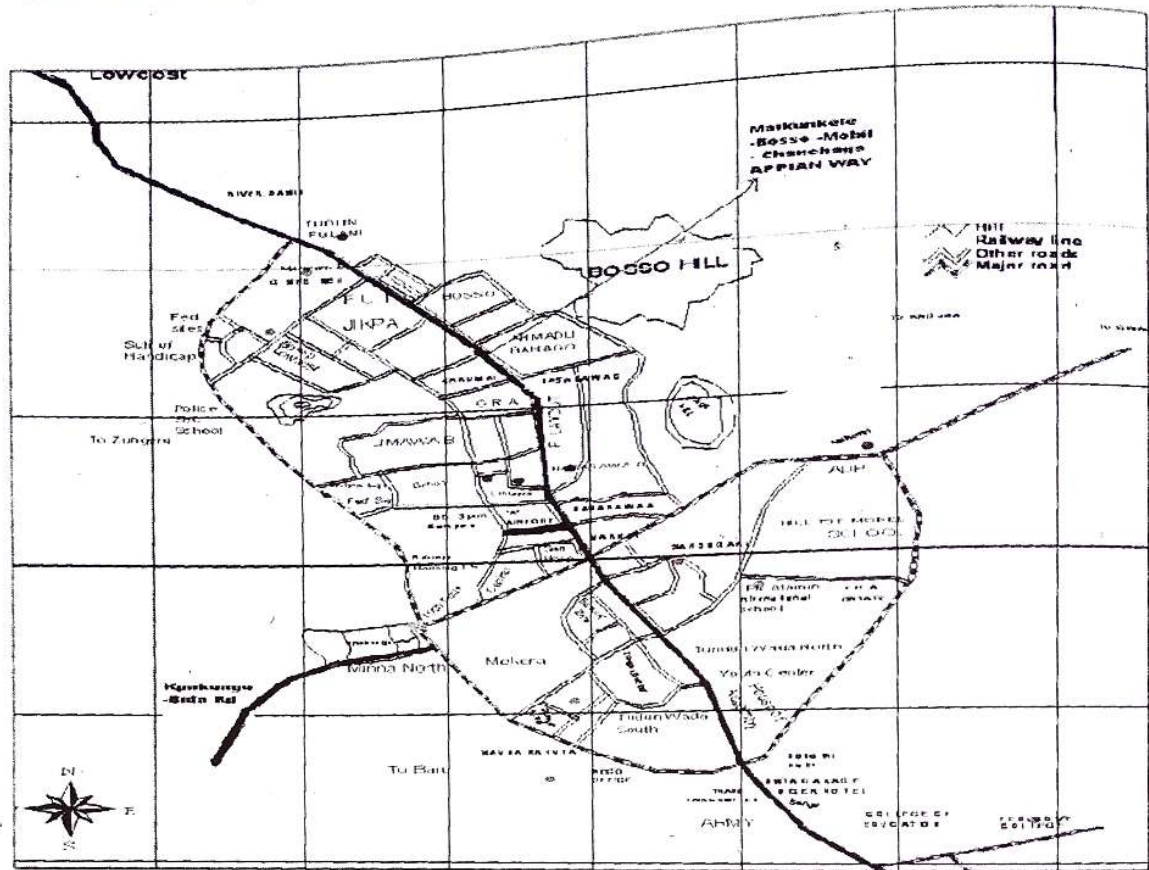


Figure 2: Delineated Map of Minna Road Network and Neighbourhoods
 Source: Department of Transport Management, FUT, Minna (2019)

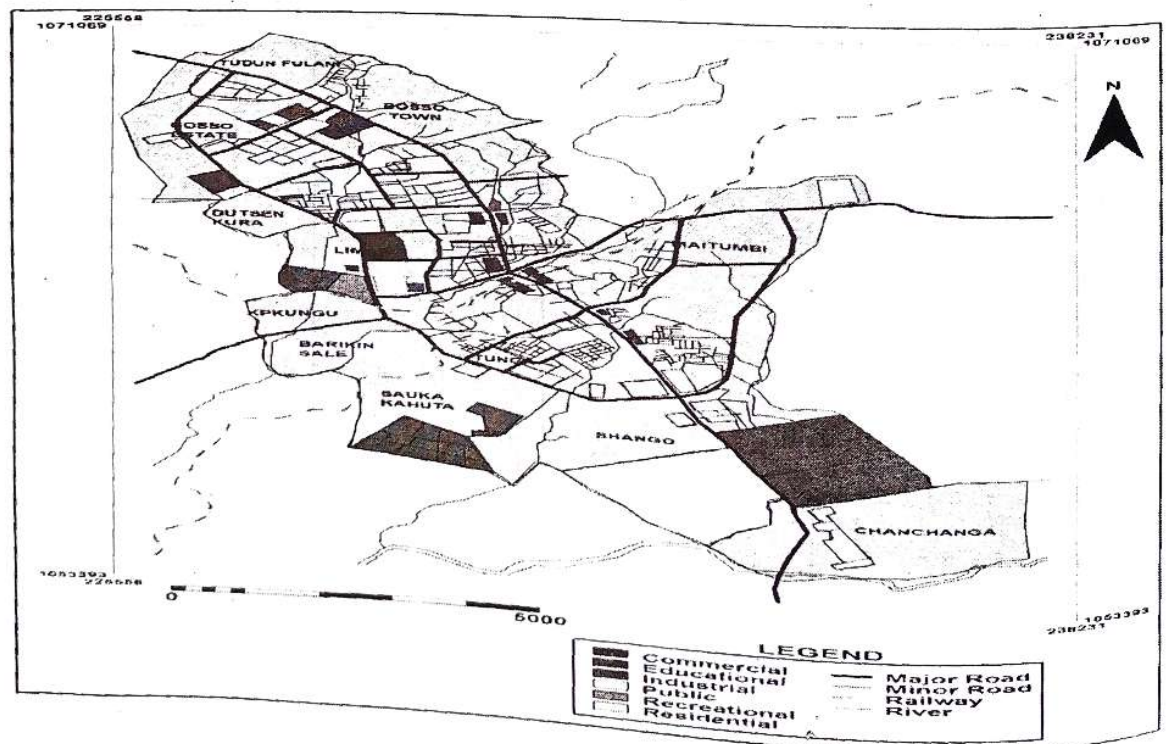


Figure 3: Land Use Map of Minna
 Source: Adopted from Owoeye A.S (2018)

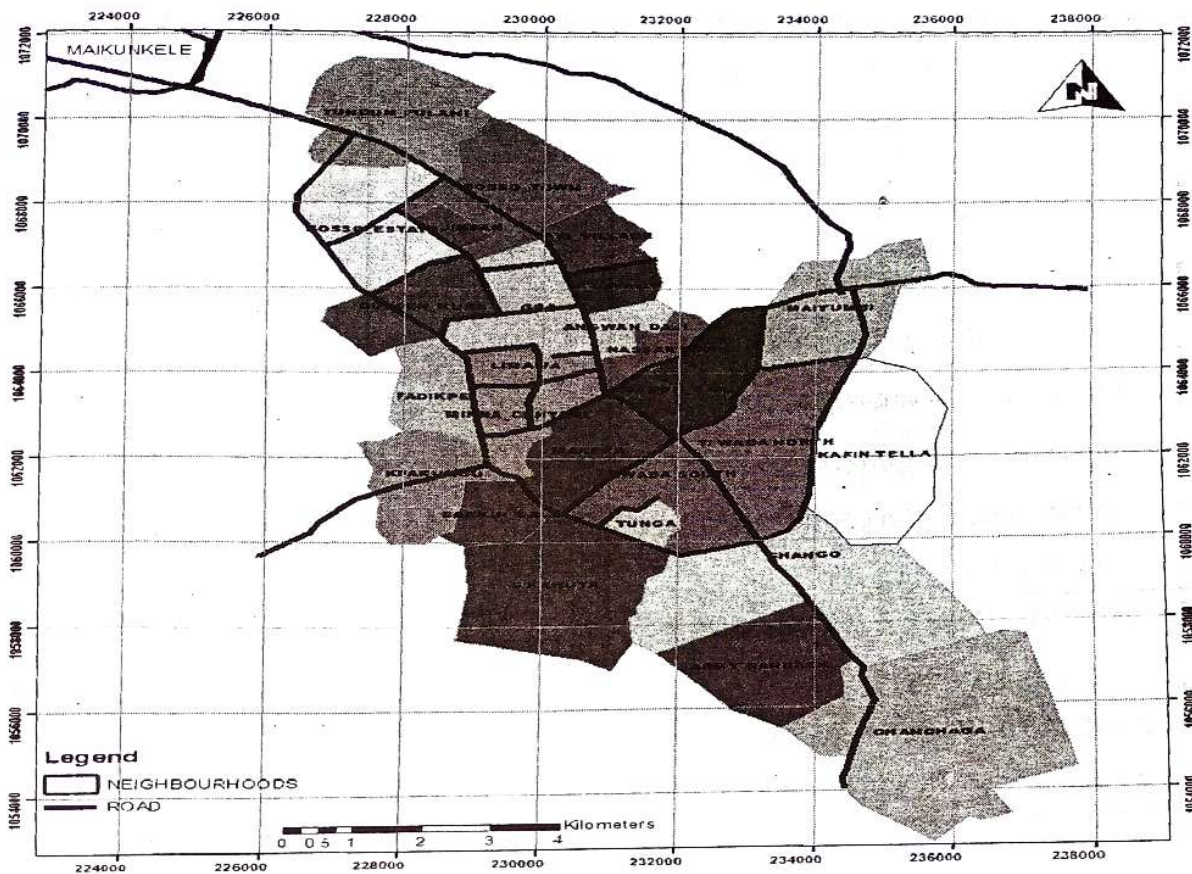


Figure: 4 Map of Minna Residential Neighbourhoods

Source: Adopted from Owwoeye, A.S (2018)

4.2 Methodology

A cross sectional survey approach was adopted from which statistical data were gathered to examine the socio-economic characteristics and factors influencing urban residents travel in 12 selected neighbourhoods in Minna. A multistage sampling technique was chosen for this study. Minna was divided into four clusters using the major traffic corridors as boundaries. In each cluster, three neighbourhoods of low, medium and high densities were selected in the neighbourhoods. To determine a suitable sample size, the current population of Minna was obtained from National Population Commission record (NPC, 2006) and was projected to 2019 to arrive at estimated population of 182,543 for the 12 selected residential neighbourhoods. Since the household is the target population, according to Nigerian Bureau of Statistics

(NBS, 2010), an average number of 6 persons reside in a household. The population is therefore divided by 6 which gave rise to 30,423 urban residents.

Though, this population size is considered too large; a Dillman (2007) sample size formula was adopted to determine the appropriate sample size for the study. A total number of 1,299 sample size was arrived at using the sample size formula. Therefore, 1,299 questionnaires were randomly administered to selected households in the 12 residential locations within the city out of which 888 questionnaires were returned valid making up 68.4% of the total questionnaires administered. The locations were chosen based on the characteristics and densities of residential land uses. The selected neighbourhoods were listed in Table 1. Systematic random sampling method was adopted for questionnaire distribution on

residents based on the population with a minimum age of less than 30 years old in each neighbourhood.

$$N_s = \frac{(Np)(p)(1-p)}{(Np-1)(B/C)^2 + (p)(1-p)} \dots\dots\dots 1$$

Where;

Ns= completed sample size needed (notation often used is n)

Np= Size of Population (notation often used is N)

P= Proportion expected to answer a certain way (50% or 0.5 is most conservative)

B= Acceptable level of sampling error (0.03) = (3%)

C= Z statistic associated with confidence interval (2.17) = 97% Confidence level

$$N_s = \frac{(182,543)(0.5)(1-0.5)}{(182,543-1)(0.03/2.17)^2 + (0.5)(1-0.5)}$$

$$N_s = \frac{(45,635.75)}{(182,542)(0.000191) + (0.25)}$$

$$N_s = \frac{(45,635.75)}{(35.1141)}$$

$$N_s = 1,299$$

Hence, a total number of 1,299 sample size was arrived at only 888 were correctly administered and returned valid which is 68.4% of the total questionnaires administered.

Table 1: Proportional Samples per Neighbourhoods

S/N	Neighborhoods	2006 Census Results	2019 Projected Population	Sample Frame	Sample Size Per neighbourhood
01	Maitumbi	17,775	26,770	4,462	190
02	Angwan Daji	612	922	154	7
03	GRA	4,274	6,437	1,073	44
04	Barkin Sale	5,862	8,828	1,471	63
05	Tudun Fulani	583	878	146	6
06	Jikpan	6,604	9,946	1,658	71
07	Tudun-Wada South	4,274	6,437	1,073	46
08	Shango	6,494	9,780	1,630	70
09	F-Layout	6,604	9,946	1,658	71
10	Tunga	6,494	9,780	1,630	71
11	Kpakungu	17,775	26,770	4,462	190
12	Bosso Town	43,856	66,049	11,009	470
	Total	121,207	182,543	30,424	1,299

Source: NPC, (2006) and Author's projection (2019)

5. Results and Discussion

5.1 Socio-economic Characteristics of Respondents

The socio-economic attributes analyzed in Table 2 reveals the dominance of Male respondents with 63.9% over Female respondents with 36.1% among the sampled population. It also shows that respondents below 30 years were more pronounced with 42.7%, followed by age grouped between 31-40 years while the least age group were respondents with age greater the 60 years with 5.3%. The analysis of educational ranking of respondents reveals that 84.5% of respondents have formal education on the aggregate with 15.5% having no formal

education. In term of occupation level study reveals that 84% of respondents are employed (50% Formal and 34% Informal). In the context of prevailing income ranking in Minna Metropolis three income groups were identified (i.e. Low, Medium and High income earners). Findings shows that 31.2% were low income earners, 49.1% were medium income earners while, 19.7% were high income earners respectively. The households distributions in term of sizes also shows that respondents with household's size between 5 and 8 were predominant with 54.5% while car owning households are more than non-car owning households with 54.3% and 45.7% respectively.

Table 2 Socio-economic Characteristics of Respondents

Variable	Attribute	Frequency	%
Gender N = 888	Male	567	63.9
	Female	321	36.1
Age N = 888	<30 years	379	42.7
	31-40 years	209	23.5
	41-50 years	152	17.1
	51-60 years	101	11.4
	> 60 years	47	5.3
Education Status N = 888	No Formal Education	138	15.5
	Primary School	25	2.9
	Secondary School	182	20.5
	Tertiary Education	543	61.1
	Formal	444	50
	Informal	302	34
	Retired	62	7
Occupation N = 888	Student	44	5
	Unemployed	36	4
	Low	277	31.2
	Middle	436	49.1
	High	175	19.7
Income N = 888	Btw 1-4	215	24.2
	Btw 5-8	484	54.5
	> 8	189	21.3
	Car Ownership N = 888	Yes	482
	No	406	45.7

Source: Author's Computer Analysis (2020)

5.2. Factors Influencing Urban Travel in Minna

In order to identify the most significant determinant factors among the socio-edaphic and travel characteristics variables influencing urban residents travel in Minna, a principal component analysis with varimax rotation was used as shown in Table 4 and 5. A total of twenty variables were considered these include; Gender, Marital status, Age, Position in household, Household size, Education status, Household income, Occupation of Household, Number of employed in household, Number of license driver, Car Ownership, Number of cars in households, Totalweeklytrip, Total weekly tripdistance,

Mode choice of travel, Totaltime of weekly travel, Totalcost of weeklytrip, Travel difficulties experienced, Frequency of call, and Cost of call.

The principal component s technique used seeks to maximize the sum of loadings of each factor extracted in turn. Also, the variables were entered into factor analysis for the purpose of data transformation and data reduction so as to reduce the chance of multicollinearity among predictors. Factor analysis was computed and instructed into retain eigen-values above 1. Eight factors were retained and these explained roughly 59.4% of the variation in the data (See Table 5)

Table 3 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.594
Bartlett's Test of Sphericity	Approx. Chi-Square	2422.852
	Df	190
	Sig.	.000

Source: Author's Computer Analysis (2020)

The KMO and Bartlett's Test in Table 3 was used to test the adequacy and validity of the data used for the study, which shows that it was significantly adequate.

Table 4 **Communalities**

	Initial	Extractio n
Gender	1.000	0.749
Marital status	1.000	0.860
Age	1.000	0.460
Household size	1.000	0.700
Position in Household	1.000	0.843
Education status	1.000	0.463
Household income	1.000	0.603
Occupation of household	1.000	0.877
Number of employed household	1.000	0.640
Number of License driver	1.000	0.676
Do you own a car	1.000	0.574
Number of cars in Household	1.000	0.574
Total number of weekly trips	1.000	0.229
Total weekly trips distance	1.000	0.170
Mode choice of travel	1.000	0.282
Total time of weekly trips	1.000	0.407
Total cost of weekly trips	1.000	0.376
Travel difficulties experienced on trip	1.000	0.799
Frequency of daily phone call	1.000	0.891
Cost of daily call	1.000	0.877

Extraction Method: Principal Component Analysis. Source: Author's Computation (2020)

Table 5

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.596	12.982	12.982	1.850	9.248	9.248
2	1.860	9.302	22.283	1.835	9.175	18.423
3	1.601	8.005	30.288	1.786	8.932	27.355
4	1.348	6.740	37.028	1.623	8.114	35.469
5	1.275	6.376	43.404	1.378	6.889	42.358
6	1.141	5.704	49.108	1.197	5.987	48.345
7	1.043	5.213	54.321	1.141	5.703	54.048
8	1.020	5.101	59.422	1.075	5.374	59.422
9	.978	4.889	64.310			
10	.936	4.680	68.990			
11	.904	4.518	73.508			
12	.832	4.159	77.666			
13	.770	3.848	81.514			
14	.722	3.609	85.123			
15	.687	3.433	88.556			
16	.602	3.011	91.567			
17	.571	2.857	94.424			
18	.551	2.756	97.179			
19	.304	1.521	98.700			
20	.260	1.300	100.000			

Extraction Method: Principal Component Analysis.
Source Author's Computation (2020)

Using the eigenvalue-one criteria (i.e. Kaiser 1960 criterion) Table 5 explains the results of the total variance of factors influencing travel behaviour of households in the study area. The result of the Factor Analysis indicates that 8 factors whose eigenvalues were greater than 1 accounted for 59.4%. leaving about 40.6% of the total variance unaccounted for by the factors.

Table 6

Rotated Component Matrix^a

Variables	Component							
	1	2	3	4	5	6	7	8
Gender						.749		
Marital status		-.860						
Age						-.418		.460
Household size				.700				
Position in Household		.843						
Education status			.463	-.409				
Household income			.603					
Occupation of household								.877
Number of employed household				.640				
Number of License driver			.676					
Do you own a car					.574			
Number of cars in Household					.573			
Total number of weekly trips				-.424				
Total weekly trips distance					-.549			
Mode choice of travel			.589					
Total time of weekly trips							.407	
Total cost of weekly trips								
Travel difficulties experienced on trip							.799	
Frequency of daily phone call	.891							
Cost of daily call	.877							

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 25 iterations.

Source Author's Computation (2020)

*Note: Component loadings less than 0.4 are not shown as such were classified low loadings.

Furthermore, the rotated component matrix in Table 6 shows which variables are loaded highly (From 0.4 and above) on each of the eight components. It is on this basis that each of the eight components are identified

and named to reflect the combination of the variable assigned to each component as factor influencing travel behaviour of households in the study area.

Table 6 shows the rotated components matrix of variables loadings highly on Component 1 to include variables like phone call (0.891) and cost of daily call (0.877). It shows the significant of the service provision GSM usage which is labelled "Telecommunication" as a strong influence on household travel. Variables that loads highly on component 2 are marital status (-0.860) and position in the households (0.843) termed "family-class".

Also, variable loadings on component 3 are number of license driver (0.676) and house income (0.603) which is labelled as "auto-income" also influence house travel behaviour. On component 4 households size (0.700) and number of employed (0.640) are prominent variables loading highly and is labelled "Household- job". On component 5 car ownership (0.574) and number of car own (0.73) loads highly which is termed "Auto-commuting". Component 6 has only one variable-Gender highly loaded on it. Moreover, variable loading highly on component 7 are travel difficulties (0.799) and total time of weekly trips (0.407)

labelled "Mobility-obstacles". While variable loading highly on component 8 is occupation of household (0.877). The finding is similar to the findings of Alade, 2010; Fadare 2010; Samson, 2012; Adetunji & Aloba, 2013; Owoeye, 2018; & Ojekunle et.al, 2018. Which implies that urban resident's interaction is significantly influenced by their socio-economic characteristics.

A cursory look at the scree plot in Figure 5 shows that 8 factors were extracted (point of sharp and sudden change in slope) of which factor 1-8 account for more than 59.4% of the changes in variance which is relative to the remaining 12 factors (i.e. 9-20). The eight components derived and identified at the end of the rotated components matrix in Table 6 which were renamed as factors influencing travel behaviour of households in the study area includes; Telecommunication, family-class, auto-income, households-jobs, Auto-commuting, Gender, mobility-obstacles and occupation of households.

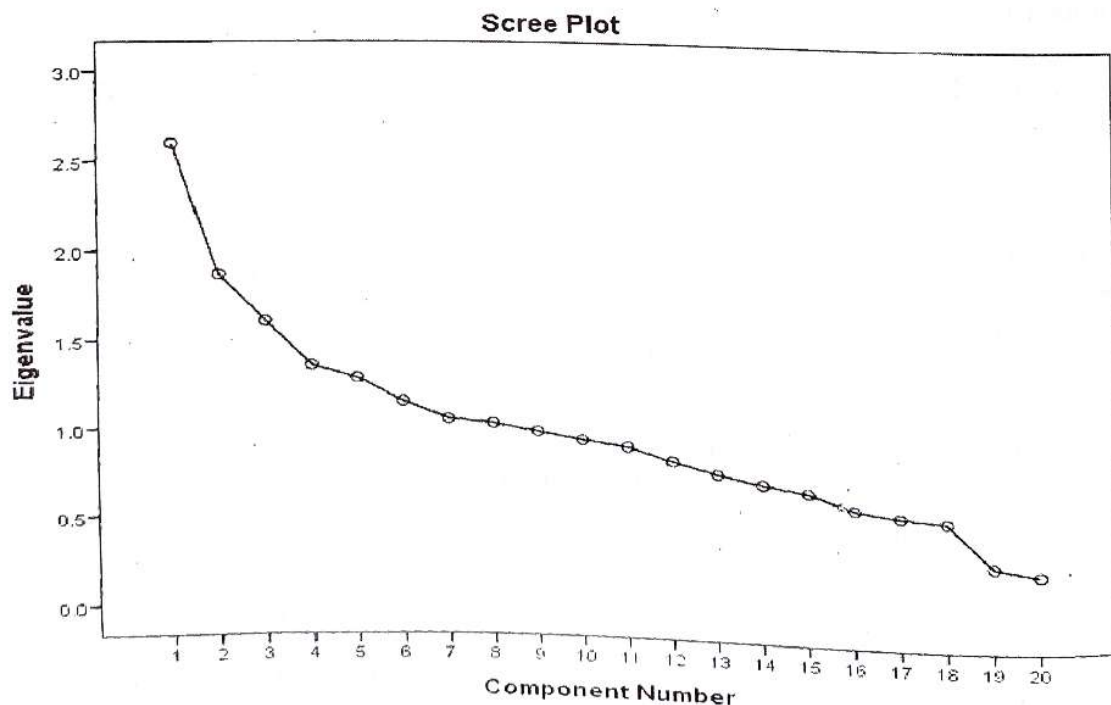


Figure 5: Scree Plot
Source: Author's Computation (2020)

7.1 Conclusion

The study has shown that there are eight (8) underlying factors that influence travel behavior of households in Minna Metropolis, Nigeria. More so, findings revealed the significant roles of household's socio-economic attributes and Telecommunication (GSM) played as a major influence in urban resident's interaction in the study area.

The findings have important implications for urban mobility in Nigeria. In the first place, the identification of socio-economic characteristics and demographic composition as a major determinant of urban travel is necessary to better understand the dynamics of urban resident's interaction in Nigeria which will provide a platform for urban mobility policy plan. Secondly, the impact of GSM ownership and usage among residents has shown in this study how significant its complement, substitute and save trips of households in Nigeria.

Finally, the research provides a basis in generalising the determinant of urban resident's interaction with what is applicable in major urban centres in Nigeria.

7.2 Recommendations

Considering the significant socio-economic characteristics of household's urban resident's interactions, it is hereby recommended that government and other policy makers should take into cognisance socio-economic characteristics of urban residents in the design, construction, planning of roads and provision of public transportation services. Due to the important roles Telecommunication plays in urban interactions, residents are advised to make more phone calls to save, generate and substitute trips instead of physical interactions. As results of the covid-19 pandemic ravaging the country, urban residents are advised to make use of telecommuting services and virtual communication medium for their meetings, business dealings in order to reduce more physical contact.

References

- Adeniyi, S. A. (1981). *Public transportation and urban development strategy in Nigeria*. Unpublished Ph.D. Thesis, University of Wales.
- Adeniyi, S.A. (1981). A public transportation and urban development in Nigeria. Unpublished Ph.D. Thesis, University of Wales.
- Adeniji, K. (2000). Transport challenge in Nigeria in the next two decades. Monograph Ibadan, Nigerian Institute of Social and Economic Research (NISER) Transport Studies Unit.
- A.A. (2012). *Intra-urban variation of households' travel in Lagos, Nigeria*. Unpublished PhD Thesis, Department of Urban and Regional Planning, Obafemi Awolowo University, Ile-Ife, Nigeria, Pp. 22-51.
- Adetunji, M. A.; Aloba, O. (2013). Urban spatial structure and work trip patterns in South-western Nigeria: The example of Ilesa. *Journal of Geography and Regional Planning* 6 (4): 93-102.
- Aditjandra, P.; Cao, X.; Mulley, C. (2010). Understanding neighbourhood design impact on travel behaviour: An application of structural equations model to the British micro-analysis data. Presented at the 12th World Congress on Transport Research in Lisbon, Portugal, July 11-15, 2010.
- Auclair, C. (1999). Measures of travel time in Cities. Urban Age Spring, World Bank.

- Ayeni, M.A. O. (1974). Predictive modelling of urban spatial structure: the example of Jos, Benue-Plateau State, Nigeria. Unpublished PhD. Thesis, University of Ibadan.
- Badejo, B.A.(2011). Transportation, Removing the Clogs to Nigeria's Development. Lagos, Nigeria: Anchorage Press and Publishers.
- Best .H. & Lanzendorf, M. (2005). Division of the labour and gender differences in metropolitan car use: An empirical study in Cologne, Germany. *Journal of Transport Geography*, 13(2), 109-121.
- Bhat C. B. & Koppelman, F.S. (1999). A retrospective and prospective survey of time use research, transportation, 26, 119-139.
- Clifton, K. J., & Handy, C.L. (2001). Qualitative methods in travel behaviour research. Paper presented at the International Conference on Transport Survey Quality and Innovation, Kruger National Park, South Africa.
- Dielman, F. M., Dijst, M., & Burghouwt, G. (2002). Urban Form and Travel Behaviour Micro-level Annals of the Social Science Council of Nigeria, No. 3. Pp.13-30.
- Dillman, D.A. (2007). Mail and Internet Surveys-the tailored designs method, 2nd ed. New York, 2007. <https://www.researchgate.net>.
- Fadare, S. O., & Hay, A. M. (1990). Housing densities, lifestyle and travel behaviour in Third World City: the example of Ibadan. *Nigerian Journal of Economic and Social Studies*, 32(2),177-191.
- Fadare, S. O. (1989). Analysis of factors affecting Household trip generation in the Residential Area of Ibadan.Ife Research Publications in Geography, 3.
- Fadare, S. O. (1987). *Intra-urban travel characteristics' study of Socioeconomic attributes in Ibadan.* A Ph.D. thesis submitted to the University of Sheffield, England.
- Fadare, S.O. (2010). *Urban form and households travel behaviour: implications for Nigeria cities'*, Inaugural Lecture 230th, Obafemi Awolowo University, Ile-Ife, Nigeria.
- Fadare, S. O., & Salami, B.T. (2004). Telephone uses and the travel behaviour of residents in Osogbo, Nigeria; an empirical analysis. of *Journal of Transport Geography*, 12, 159-164.
- Fadare, O., & Alade, A. (2009). Intra-urban variation of households' trip generation in Lagos metropolis. *Journal of the Nigerian Institute of Town Planners*, XXIII,(1), 74-87.
- Fadare, S. O., & Morenikeji, W. (2001). Gender-bias in intra-urban trip patterns in Niger State, Nigeria. *International Journal of Transportation Studies*.1(1), 73-85.
- Fujiwara, A., Soehodho, S., Hyodo, T., & Montalbo, C. (2005). Urban travel behaviour characteristics of 13 Cities based on household interview survey data. *Journal of the East Asia Society for Transportation Studies*, 6, 23-38.
- Garling, T. K., & Golledge, R. G. (1994). Computational process modelling of household activity scheduling. *Transportation Research*, 28B(5), 355-364.
- Gordon, P., Kumar, A., & Ricahrdson, H. W. (1988). Beyond the journey to

- work. *Transportation Research, A*(22), 419-426.
- Handy, S., Weston, L., & Mokhtarian, P. L. (2005). *Driving by choice or necessity?* *Transportation Research Part A: Policy and Practice* Positive Utility of Travel, 39(2-3), 183-203.
- Hanson, S., & Hanson P. (1981). The travel activity pattern of urban residents: dimensions and relationships to socio-demographic characteristics. *Economic Geography*, 332-347.
- Hanson, S. & Schwab, M. (1987). Accessibility and Intra urban travel. *Environment and Planning*, 735-748.
- Hensher, D. A., & King, J. (2001). *Parking demand and responsiveness to supply, pricing and location in the Sydney central business district.* *Transportation Research Part A: Policy and Practice*, 35(3), 177-196.
- Ibrahim, R. Babatunde (2012). Evaluating Intra-Urban Transportation and Gender Travel Behaviour in Ilorin, Nigeria. *Global Journals of Human Social Sciences Arts and Humanities* 12(14): 7-17.
- Leautier, F., & Melita, M. (2006). Urban performance profile: the impact of globalisation and the challenge of Africa in cities in a globalising world Governance, Performance and Sustainability, F. Leautier (ed.), World Bank Institute.
- Morikawa, T., Yamoto, T., Dissanayake, D., Sanko, N., Kurauchi, S., Maesoba, H., Ohashi, S., Tiglao, N., Rubite, C., & Rivera, M. (2001). *Travel behaviour analysis and its implication to urban transport planning for Asian cities: Case studies of Bangkok, Kuala Lumpur, Manila and Nagoya.* International Cooperative Research Activity (ICRA) Report, Graduate School of Environmental Studies, Nagoya University, Japan.
- Muili, A.B. (2013). Analysis of Infantry and Intra-City Transportation System in selected cities in Nigeria. Unpublished Ph.D Thesis submitted to Department of Urban and Regional Planning, Ladoké Akintola University of Technology, Ogbomosho, Oyo State, Nigeria.
- Nass, P.; Strand, A.; Nass, T.; Nicolaisen, M. (2011). On their road to sustainability? The challenge of sustainable mobility in urban planning and development in two Scandinavian capital; regions. *Town Planning Review* 82(3): 285-315. Doi: 10.3828/tpr.2011.18.
- NBC. Socio-economic Survey. www.nigeria.gov.ng 2010.
- Newbold, K.B., Scott, D.M., Spinney, J.E.L., Kanaroglou, P., & Paez, A. (2005). Travel behaviour within Canada's older population: a cohort analysis. *Journal of Transport Geography*, 13(4), 340-351.
- Ogunjumo, A. (1986). The pattern of trip current at Ile-Ife. *Journal of Town planner*. 6&7, 99-113.
- Ogunsanya, A.A., 2002. Maker and Breaker of Cities. 59th Inaugural Lecture, University of Ilorin, Ilorin.
- Ojekunle, J.A. & Owoeye, A.S. (2018). Spatial pattern of household travel in Minna metropolis, Nigeria. *International Journal of Granthaalayah*. 6(15), 276-289.
- Ojo, O.E. (1990). Urban travel –activity pattern: A case Study of Ibadan, Nigeria. Unpublished Ph.D Thesis, University of Ibadan, Ibadan.
- Okoko, E. E. (2007). Gender and transport: women's proclivity to minimise car use in Akure, Nigeria. *Pakistan Journal of Sociology*, 4(1):56-63.

- Osoba, S.B., 2011. Variation in the ownership of global system for mobile communication GSM among socioeconomic group in Lagos, Nigeria. *J. Logist. Transport*, 3(1): 79-94.
- Owoeye, A. S. (2018). Travel behaviour of households in Minna, Niger State. Unpublished M.Tech. Dissertation, Department of Transport Management Technology, Federal University of Technology, Akure.
- Owoeye, A. S., Fadare, S.O & Ojekunle, J.A., (2018), Households' socioeconomic characteristics and urban travel behaviours in Minna metropolis, Nigeria. *International journal of research publications*. 9(1), 2018.
- Pucher, J., & Renne J. (2003). Socioeconomics of urban travel: evidence from the 2001 national household travel survey. *Transportation Quarterly*, 57(3), 49-77.
- Rahman, A., Syed, A. A., & Quazi, S. H. (2015). Analysis of travel behaviour in Khulna Metropolitan City, Bangladesh. *Civil and Environmental Research*, 7(2), 23-30.
- Raji, B.A., (2013). Spatial analysis of pedestrian traffic in Ikeja, Lagos State, Nigeria. Unpublished Ph.D Thesis, University of Ibadan.
- Rimmer, P.J. (1986) Rikisha to rapid transit: Urban public transport system and policy in South-East Asia, Sydney, Pentagon.
- Ryley, T. (2005). Use of non-motorised modes and life stage in Edinburgh. *Journal of Transport Geography*, (35), 27-49.
- Samson, B.O. (2012). An analysis of intra-city patterns of residents in Lagos metropolis, Nigeria. *International Journal of Development and Sustainability* 1(2):560
- Solanke, M.O. (2014). Socioeconomic determinants of intra-urban trips generation in Ogun State, Nigeria. *Current Research Journal of Social Sciences*, 6(1), 15-20.
- Srinivasan, S., & Rogers, P. (2005). Travel behaviour of low-income residents: studying two locations in the city of Chennai. *Journal of Transport Geography*, 13, 265-274.
- Tanangsnakool Koranis (2011). Urban form and Travel Behaviour. Evidence among individuals from two districts within Bangkok. M.sc Degree Project No 2011:31, Environmental Management Sciences, University of Gothenburg.
- Westford, P. (2010). Neighbourhood design and travel: A study of residential quality, child leisure activity and trips to school. Doctoral dissertation. Royal Institute of Technology, Stockholm.
- White, P.R. (1990). Inadequacies of urban public transport system, in Dimitriou, H. T. (ed.), *Transport planning for Third World Cities*, London, Routledge, Pp. 85-116.
- Zegras, C. (1997). Urban transportation in world resources: The Urban Environment, UN- Habitat.