Journal of Environment and Earth Science
ISSN 2224-3216 (Paper) ISSN 2225-0948 (Online)
Vol.8, No.1, 2018

Analysis of Traffic Congestion on Lagos/Abeokuta Expressway-Agege Motorway in Lagos Metropolis

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Abstract
Traffic congestion is one of the most persistent problems facing road users and urban planners, across the world and Lagos is not an exception. This study analysed traffic congestion along the Lagos/Abeokuta expressway-Agege motorway in Lagos metropolis. It explored the volume of vehicular traffic (VVT) along the road corridor, conducted a road network analysis, and investigated the causative factors of traffic congestion on the road corridor. Traffic count data of vehicles plying the road between 7 a.m.-8 p.m. was obtained from Lagos Metropolitan Area Transport Authority (LAMATA) to aid the assessment of VVT. Graph theory-based network index was used in determining road connectivity level, and a cross sectional survey of 384 commuters was conducted to obtain information on traffic congestion along the road corridor. Results of the analysis indicated that the VVT is higher at Ikeja (27.4%) than other locations such as (Alimosho 21.5%, Oshodi 16.2%, etc.). Road network analysis showed high connectivity of Lagos/Abeokuta expressway-Agege motorway with gamma, alpha, and beta indexes (0.8, 0.83 & 2.67) respectively, indicating that road connectivity is not a cause of congestion on the corridor. However, the causative factors of traffic congestion include; overdependence on road, shortage of traffic light, insufficient number of traffic warden, and disobeying of traffic laws ($p < 0.05$). In conclusion, overdependence on road is the major cause of congestion in the metropolis. Thus, there is an urgent need to improve alternative transport modes in the Lagos metropolis.
Keywords: traffic congestion, road network analysis, overdependence on road

1. Introduction

Cities and traffic congestion have developed hand-in-hand since the earliest large human settlements and the same forces that draw inhabitants to congregate in large urban areas, also lead to sometimes-intolerable levels of traffic congestion on urban streets and thoroughfares (Organisation for Economic Cooperation and Development, (OECD) 2007). Traffic congestion in cities has been an issue since the beginning of the 20th century and it continues to be one of the most persistent problems facing road users and urban planners, across the world. According to Engwitch (1992), “Global Traffic Volume (GTV) would double between 1990 and year 2020 and again by 2050.” This type of growth pattern, as envisaged by the end of year 2020 and 2050, is an indication of what the future of traffic congestion would signify for people living in urban centres. Throughout the world in both large and small communities, traffic congestion is getting worse and thus, causing inconvenience to intra-city work trip makers. Subsequently, the result of this traffic congestion is increasing cost and loss of work hours (Atubi, 2008).

One of the key characteristics of transportation problems in Nigeria has been identified as traffic congestion; virtually all state capital cities in Nigeria today face the problem of traffic congestion (Moses, 2011). The case of the Lagos metropolis is similar, where elongated traffic jams are observed in many parts of the city and it appears that the road traffic management strategies and officials are incapable of solving it. The salient point here is that ways of mitigating this mobility problem and ensuring a smooth flow of urban traffic have been carried out in different studies as exemplified by the work of urban transport scholars, some identified the causes and dimensions of traffic problems (Aderamo, 1990 & Bello, 1993) some examined solutions to transport problems (Ogunsanya, 1987; Omiunu, 1988; Bolade, 1989 & Ameyan, 1996) while others examined traffic management strategies (Ukpata & Etika, 2012, Olaogbebikan et al., 2013). However, these conventional approaches to traffic management adopted by previous studies such as one way, odd and even numbers, flyovers, construction of new routes, use of para-mass transit, park and ride system, etc. have not been able to eradicate traffic congestions in Nigerian cities particularly Lagos.

Therefore, an in-depth evaluation of the congestion situation and a thorough road network analysis would be highly beneficial in understanding the problem and proffering solutions to it. Thus, the aim of this study is to analyse traffic congestion on the Lagos/Abeokuta expressway-Agege motorway in the Lagos Metropolis and to achieve this aim, the study examined the volume of vehicular traffic (VVT) along the road corridor, conducted a road network analysis, and analysed the factors responsible for traffic congestion on the road corridor.

2. Study Area

Lagos State is an administrative division of Nigeria located in the South-Western part of the country. It is located on latitude 6°35′N and longitude 3°45′. It is the smallest in terms of area extent among Nigerian States with an area of 3,577sq.km of which 22% is water and it is arguably the most economically important state of the country, containing the nation's largest urban area and producing a significant portion of the country's GDP. The state is bounded in the north and east by Ogun state, in the west by the Republic of Benin and in the south by the Atlantic Ocean where it has a 180 km stretch of waterfront. It is however within easy reach of road, rail and air transportation from various parts of the country. The current population stated by the Lagos State Social Security Exercise 2006 Census is 9,013,534. Lagos State was created on May 27, 1967 and Lagos has one of the largest and most extensive road networks in West Africa, it also has suburban trains and some ferry services. Lagos Metropolis is the most heavily motorized part of Nigeria, and almost all movement is made by road, while water and rail accounts for very minute percentage.

The study road corridor is the Lagos-Abeokuta expressway- Agege motorway, the length of the road spans 33km long and the road corridor stretches across six local government areas of Alimosho, Agege, Ifako-ijaiye, Ikeja, Oshodi/Isolo, and Mushin. 1 km buffering was carried out on the road corridor to enable an effective road network analysis. The Abeokuta-Agege motorway is the road corridor essential for the study because it is a critical congestion area. A critical congestion area is one where a network of roads converges and a large amount of traffic needs to traverse the common congestion area (Jain, Sharma & Subramanian, 2011).

3. Theoretical Framework and Literature Review

3.1 Graph Theory

Graph theory is concerned with the encoding and analysis of graphs, which consists of links and nodes. Network analysis and graph theory-based network indices are used for determining road connectivity. A link is an imaginary straight line representing a finite length of road, railway, or bus route. A node is an imaginary point where links intersect. It represents network intersections like junctions or bus stop. The graph theory-based concepts employ alpha (a), beta (b), and gamma (c) indices to determine road connectivity. The alpha index (α) measures the circuitry of a network, or the degree to which it provides alternative paths for travelling from one node to another. The beta index (β) reflects the complexity and completeness of a network, by expressing the ratio of links (edges) to nodes. The gamma index (ɤ) is a measure of the extent to which the nodes are connected, and is called connectivity. It yields the ratio between the links and nodes of a given network (Kansky, 1963). In general, the higher the values of these indices, the higher degree of circuitry, complexity, and connectivity.

where: e is the number of edges/link

v is the number of nodes/vertex

The alpha index: (α) = $\frac{e-v+1}{2v-5}$

The beta index: (β) = $\frac{e}{v}$

The gamma index: (ɤ) = $\frac{e}{3(v-2)}$

3.2 Traffic Congestion and Causative Factors

Traffic congestion is a physical phenomenon relating to the manner in which vehicles impede each other's progression as demand for limited road space approaches full capacity; congestion is a situation in which demand for road space exceeds supply (OECD, 2007). Supporting the OECD (2007) statements is the work of Downie (2008) according to him, traffic congestion "occurs when the volume of vehicular traffic is greater than the available road capacity, a point commonly referred to as saturation." It is concerned with the corresponding decrease in the capacity of road at a given point and successful increase in the number of vehicles required for the movement of people and goods. Similarly, Ogunbodede (2009) asserted that traffic congestion "occurs when a city's road network is unable to accommodate the volume of traffic that uses it." Aworemi et al. (2009) studied traffic congestion in Lagos Metropolis where he noted the following causes of traffic congestion; poor road condition, inadequate road infrastructure, accident, inadequate traffic planning, drivers' behaviour, and lack of integrated transport system.

Aderamo & Atomode (2011) examined the problem of traffic congestion at road intersections in Ilorin, Nigeria, and discovered that road intersections form a major component of urban roads and are generally prone to traffic congestion. The study also found that "traffic wardens and parking problems are the greatest causes of traffic congestion/delays at road intersections." Ukpata and Etika (2012) affirmed that, "Poor driving habit is the most significant cause of traffic congestion in Nigerian urban cities." Other causes of traffic congestion include poor parking habits, poor road network, inadequate road capacity, lack of parking facilities, poor traffic control/management, poor drainage, presence of heavy vehicles, poorly designed junctions/roundabouts, and lack of efficient mass transport system. It is from these causes of traffic congestion that the factors responsible for traffic congestion in our study area were determined, these include; inadequate road network, misuse of the existing roads, inadequate traffic lights, insufficient traffic officials, and several other factors.

3.3 Road Network Characteristics and Traffic Congestion

Ogunleye (2011) stated that the extent to which a nation's landmass is covered by road network is an index of the degree of mobility of people, goods and services within the country, and the quality of the network measures the

Journal of Environment and Earth Science
ISSN 2224-3216 (Paper) ISSN 2225-0948 (Online)
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ease and cost of that mobility. Roads dominate the transport sector in most developing countries carrying eighty to ninety per cent of passenger and freight. It plays a critical role in the entire transportation chain in that it connects other modes of transportation and permeates all aspects of modern economic activities in the economy. Ogunleye (2011) examined the topological characteristics of the transportation network in Ekiti State, using the graph theoretic measurement of the Beta (β) index, the Gamma (γ) index, and the Alpha (α) index to determine the connectivity of road networks in the State. The results showed that the connectivity level is low with Beta index 1.39, Gamma index 0.49, and Alpha index 0.24.

Obafemi et. al. (2011) also assessed the road network system of Trans-Amadi industrial layout using a Geographic Information System (GIS). The connectivity level in the road network was determined with the use of Beta Index (BI) and the connectivity level of road network was high (0.77) showing that the road network in Trans-Amadi Industrial Layout was an organized network, which was evenly distributed in the area. To ease traffic flow along the routes, better road network characteristics must be ensured, roads have to be better connected to improve their accessibility, and roads have to be widened to more lanes to increase their carrying capacity (Atubi, 2012). Better road network characteristics would not only lead to a faster flow of traffic along the routes, it would also make for a well-structured road network system and a faster pace at curbing congestion problems in the area of study.

4. Methodology

4.1 Data Collection

Primary and secondary data sources were used in this study. Traffic count data for the selected road corridor was obtained from Lagos Metropolitan Area Transport Authority (LAMATA) to aid the assessment of volume of vehicular traffic (VVT) along the selected corridor. A cross sectional survey of 384 commuters was carried out to obtain information from road users within the study area on traffic congestion and factors responsible for congestion. The instrument used for the cross sectional survey was questionnaire and the respondents were selected based on random sampling technique.

4.2 Sample Frame and Size

The sample frame for this study is the total population of the six local government areas (LGAs) in Lagos State (Alimosho, Agege, Ikeja, Ifako-ijaiye, Oshodi/Isolo and Mushin) that fall within the road corridor, and according to the 2006 population census of the Federal Republic of Nigeria, the six local government areas have a total population of 3,733,245. The sample size was determined according to the Krejcie and Morgan's sample size formula, and three hundred and eighty four copies of questionnaires were administered on the road corridor across the six LGAs.

$$n = \frac{x^2 NP\,(1-P)}{\{d^2\,(N-1)\} + \{x^2 P\,(1-P)\}}$$

where; n= Sample Size

X^2= the table value at desired confidence level at 95% confidence interval = 1.96.

N = given population size

P = population proportion (assumed to be 0.5 to provide the maximum sample size).

d = the degree of accuracy as reflected by the amount of error that can be tolerated (0.05).

$$n = \frac{1.96^2 * 3{,}733{,}245 * 0.5(1-0.5)}{\{(0.05)^2 * 3{,}733{,}245-1\} + \{1.96^2 * 0.5(1-0.5)\}}$$

$$= 384$$

4.3 Method of Data Analysis

Statistical Package for Social sciences (SPSS) and Microsoft Excel was used to analyse the quantitative data that were collected during the fieldwork. This study was subjected to both descriptive and inferential statistics. The descriptive statistics comprised of simple percentage, tables, and frequency distribution. Inferential statistic included multiple linear regression analysis that was used to determine the relationship between the causative factors of congestion (i.e. poor road condition, drivers' behaviour, accident, lack of integrated transport system etc.) and traffic volume. Finally, narrative statements were used to present the data.

4.4 Road Network Analysis

This study assessed the road network system of Lagos State focusing particularly on the Lagos-Abeokuta expressway-Agege motorway using Geographic Information System (GIS). Topographical map of scale 1:100000 and Google Earth 2010 version were the sources for the acquisition of the data. 1 km buffering was carried out on the road corridor to enable an effective road network analysis. Both the topographical map and the imagery were geo-rectified in ArcGIS 10.3 and geographic data of roads and road junction were captured. Road junctions were digitized as points, which are otherwise referred to as nodes or vertex while the street roads were digitised as lines, which are also called edges or links. The road network connectivity was obtained by calculating the Beta, Gamma, and Alpha indexes.

5. Results and Findings

5.1 Volume of Vehicular Traffic

The volume of vehicular traffic (VVT) is the number of vehicles passing a cross-section of a road in a unit of time. The VVT for Lagos-Abeokuta expressway- Agege motorway is considered in line with the number of vehicles that ply the road hourly from 7 a.m.-8 p.m. These vehicles range from cars to bicycles, small trucks, heavy trucks, medium trucks, motorcycles, large buses, mini buses, and coaster buses. The VVT is the parameter used to define traffic congestion, because when the VVT is lesser congestion may not occur but once the VVT increases, traffic congestion may occur.

Table 2 shows the hourly vehicle count on the road corridor, the hourly count was compressed into three segments: the morning peak, afternoon, and evening peak. The morning peak starts from 7 a.m.-11 a.m. afternoon starts from 11 a.m.-4 p.m. while the evening peak starts from 4 p.m.-8 p.m. in the night. From the table the morning and evening peaks have the higher volumes than the afternoon peak however; the VVT is higher in the morning than evening by 27%. Traffic congestion on the road corridor is more at Ikeja (27.4%) than the rest of the locations: Oshodi (16.2%), Ifako-ijaiye (12.3%), Mushin (6.5%), Agege (15.8%), and Alimosho (21.5%). This possible because Ikeja is the state capital of Lagos State and it has many road intersections that link other roads to the Lagos-Abeokuta expressway-Agege motorway, thereby making it a critical congestion area.

5.2 Road Network Analysis

The alpha, gamma, and beta indexes were calculated to determine the connectivity of the road network, the total number of edges (e) in the road corridor is 2506 while the total number of nodes (v) is 941.

where, e =2506

v= 941

The alpha index: $(\alpha) = \frac{e-v+1}{2v-5}$

= 2506-941+1/2(941)-5

= 1566/1877

= 0.83

The alpha index usually ranges from 0 to 1, and can be expressed by percentage. The higher the (α) value, the higher the connectivity of a network. The (α) value of 0.83 implies that 83% of the road is connected.

The beta index: $(\beta) = \frac{e}{v}$

= 2506/941

=2.67

(β) < 1 indicates a disconnected network; (β) = 1 indicates a single circuit; (β) > 1 implies greater complexity of network connectivity (i.e., more than one circuit). The minimum value of (β) is 0 and the maximum is 3. The (β) value of 2.67 implies that there is greater complexity of the connected network.

The gamma index: $(\gamma) = \frac{e}{3(v-2)}$

=2506/3(941-2)

=2506/2817

=0.8

Gamma index values range between 0 and 1 (or percentages) and a value of 1 denotes a completely connected network. The (ɤ) value of 0.8 implies a high completeness of the connected network.

The result of the road network analysis showed that the Lagos/Abeokuta expressway-Agege motorway is a well-connected road corridor with alpha index of 0.83, beta index of 2.67, and gamma index of 0.8, thus road network connectivity is not the cause of traffic congestion along the corridor.

5.3 Causative Factors of Traffic Congestion

Result of the cross sectional survey revealed that the causes of traffic congestion on the road corridor includes; trading and commercial activities along road (62.0%), insufficient number of traffic wardens/officials (52.9%), inadequate amount of traffic light (73.2%), over dependence on road as the main mode of transportation (73.2%), high population (73.4%), disobeying of traffic laws by drivers and the motorist (84.1%), insufficient parking spaces and indiscriminate parking by commercial drivers (87.0%), increase in the number of vehicle along the corridor (63.8%), insufficient road network (81.8%), rough driving and bad habits while driving (81.0%), vehicular brake down on the road (86.7%), accidents (77.1%) and poor road condition (93.2%) but (53.4%) claimed that movement of people, and goods from residential to commercial/industrial areas cannot cause traffic congestion (Table 3).

From the multiple regression in table 4, it showed that there was positive relationship between the independent variables (factors responsible for traffic congestion) and dependent variable (volume of traffic) (R = 0.741). The coefficient of determination is 71% (0.71 * 100) which implies that when combined, the predictor variables predicted about 71.0% of the variability in traffic congestion. Thus, the remaining 29.0% can be attributed to other factors that may be causing congestion aside from the ones analysed above.

As shown in table 5, there was a joint prediction of the independent variables on the dependent variable ($F_{(14,369)} = 2.023$; $p<0.05$). This implied that, factors such as (insufficient number of traffic wardens/officials, over dependence on road, drivers' behaviour, etc.) significantly influence traffic volume.

5.4 Independence Influence of Causative Factors on Traffic Congestion

This reveals the summary of the relationship and the impact of each independent variable on dependent variable with; shortage of traffic wardens ($\beta = 289.349$; $t = 2.155$; $p<0.05$); shortage of traffic light ($\beta = 374.798$; $t = 2.718$; $p<0.05$); over dependence on road ($\beta = 437.162$; $t = 2.804$; $p<0.05$); disobeying traffic laws ($\beta = 399.856$; $t = 2.064$; $p<0.05$); trading activities ($\beta = 13.362$; $t = .092$; $p>0.05$); movement of people from residential to commercial areas ($\beta = 174.234$; $t = 1.153$; $p>0.05$); high population ($\beta = 164.809$; $t = 1.061$; $p>0.05$); indiscriminate parking ($\beta = 188.357$; $t = .880$; $p>0.05$); increase in the number of vehicles ($\beta = 188.357$; $t = .880$; $p>0.05$); insufficient road networks ($\beta = 61.566$; $t = .338$; $p>0.05$); rough driving ($\beta = 55.362$; $t = .304$; $p>0.05$); accident along the road ($\beta = 109.843$; $t = .561$; $p>0.05$); vehicular break down ($\beta = 36.948$; $t = .165$; $p>0.05$); and poor road condition ($\beta = 212.589$; $t = .720$; $p>0.05$) (Table 6).

According to the standardized Beta coefficient, it can be seen that over dependence on road has the greatest influence on the volume of traffic, followed by disobeying traffic laws, then shortage of traffic light and insufficient traffic warden while other factors play little influence on the volume of traffic. This implies that over dependence on road, disobeying traffic laws, shortage of traffic light and insufficient traffic warden are good enough to predict the volume of traffic." But other factors like trading activities, movement of people from residential to commercial areas, high population, indiscriminate parking, increase in the number of vehicle, insufficient road network, rough driving, accident along the road, vehicular break down and poor road condition, contribute little or nothing to traffic congestion in the Lagos/Abeokuta expressway-Agege motorway.

6. Conclusion

Having critically analysed traffic congestion in Lagos metropolis focusing on the Lagos/Abeokuta expressway-Agege motorway that stretches across six LGAs in the metropolis, the study found that congestion occurs mostly on the road between the hours of 7 a.m.-11 p.m. in the morning and 4 p.m.-8 p.m. in the evening with its highest peak experienced at Ikeja LGA. This location is a critical congestion area where a network of roads converges and a large amount of traffic needs to traverse the common congestion, it is also the state capital, which explains for the heavy traffic congestion in the location.

Results of the road network analysis revealed that the road corridor is well connected, this implies that road network connectivity is not a cause of traffic congestion in the study corridor. The cross sectional survey revealed that the factors influencing traffic congestion on the corridor include; over dependence on road as the major mode of transportation, disobeying of traffic laws, inadequate amount of traffic light on the road, and insufficient number of traffic wardens/officials. However, the most significant cause of traffic congestion according to this study is over dependence on road as the main mode of transportation in the metropolis.

One of the ways out of the Lagos perpetual traffic congestion is to develop other transport modes in the State apart from the road transport mode. Fast and efficient rails should be constructed like the Light rail, Metro etc. and water transport mode should be harnessed in the State since Lagos is made up of about 20% water. Another recommendation is to decentralise Lagos by moving industrial and commercial activities out of Lagos to other cities in a bid to reduce the thronging population in Lagos State. Suggested areas for further research could be to investigate cost effective modes of transport that can compete favourably with the road or to examine the cost of traffic congestion on economic productivity in the metropolis.

References

Aderamo, A. J. (1990). Road Development and Urban Expansion: The Case of Ilorin, Nigeria. Ph.D. Thesis submitted to the Department of Geography, University of Ilorin, Ilorin. Kwara state.

Aderamo, A. J & Atomode. T. I. (2011). Traffic Congestion at Road Intersection in Ilorin, Nigeria. Australian Journal of Basics and Applied Sciences, 5 (9). 1439-1448.

Ameyan, O. (1996). "Environmental and Energy Issue in Urban Transport System Development" Paper Presented at the FUMTA Seminar on Urban Transport Policy for Nigeria.

Atubi, A. (2008). Journey to work pattern in the Niger Delta: An Empirical Analysis of Warri and Environs Department of Geography and Regional Planning, Delta State University, Abraka.

Atubi, A .O. (2012). An Analysis of Traffic Flow and Network Characteristics in Lagos Mainland, Nigeria. Journal of Environmental Science and Resources Management 4, June 2012

Aworemi, et al (2009). A study of the causes, effects, and Ameliorative Measures of Road Traffic Congestion in

Lagos Metropolis. European Journal of Social Sciences. II (1), 2009.

Bolade, T. (1989). "Transport in Metropolitan Lagos" Transport Review. Vol. 16 No. 2.

Bello, S. A. (1993). Urban Public Transport in a Growing City: The Case of Ilorin, Nigeria. Ph.D. Thesis Submitted to the Department of Geography, University of Ilorin, Ilorin. Kwara state.

Downie, A. (2008). The World Worst Traffic Jams time. Available at: http://www.time/world/article/0,8599,1733872,00.html. (Retrieve on 28th May, 2015.

Engwitch, D. (1992), Towards an Eco-City; Calming the Traffic. Envirobook Publishers.

Jain, V., Sharma, A., & Subramanian, L. (2011). Road Traffic Congestion in the Developing World.

Kansky, K. J., (1963). Structure of Transportation Networks: Relationships between Network Geometry and Regional Characteristics. Ph.D. Dissertation, Department of Geography, University of Chicago, Chicago, Illinios, USA.

Moses, S. O. (2011). Information technology applications in transportation system. Proceedings of the National Conference of Nigerian Society of Engineers in Calabar.

OECD (2007). (Organisation for Economic Cooperation and Development) and ECMT (European Conference of Ministers of Transport). Managing Urban Traffic Congestion. Joint Transport Research Centre.

Obafemi A. A. et al. (2011). Road Network Assessment in Trans-Amadi, Port Harcourt in Nigeria Using GIS. International Journal for Traffic and Transport Engineering, Vol. 1, No. 4, pp. 257-264.

Olaogbebikan, J. E, Ikpechukwu, N., Akinsulire, E. S. & Enosko, O. (2013). Traffic Management Problems in Lagos: A Focus on Alaba International Market Road, Ojo, Lagos State Nigeria. Journal of Economics and Sustainable Development, Vol. 4, No. 4.

Ogunbodede, E. F. (2009). Assessments of Traffic Congestions in Akure (Nigeria) using GIS approach: Lessons and Challenges for Urban Sustenance; at http://download.sue-mot.org/Conference-007/Papers/Ogunbodede.pdf. Retrieved on 28th May, 2015.

Ogunleye O.S. (2011). Spatial Structure of Road Infrastructure in Ekiti State, Nigeria: Options for Transformation. Advances in Natural Science Vol. 4, No. 2, 2011, pp. 138-142.

Ogunsanya, A. A. (1987). "Traffic Congestion in an Urban Centre: The Case of Ilorin, Nigeria." Nigerian Geographical Journal. Vol. 27, No. 1 & 2, pp. 84-95.

Omiunu, F. G. I. (1988). "Flooding and Traffic Management in Benin City Region" in Sada, P.O. and Odemerho, F.O. (eds) Environmental Issues and Management Development Published by Evans Brothers (Nig.) Ltd.

Trading Economics, Nigeria (2015). Available at www.tradingeconomics.com. Retrieved on 10th August, 2015.

Ukpata J.O. & Etika A.A. (2012). Traffic Congestion in Major Cities of Nigeria. International Journal of Engineering and Technology Vol. 2, No. 8.

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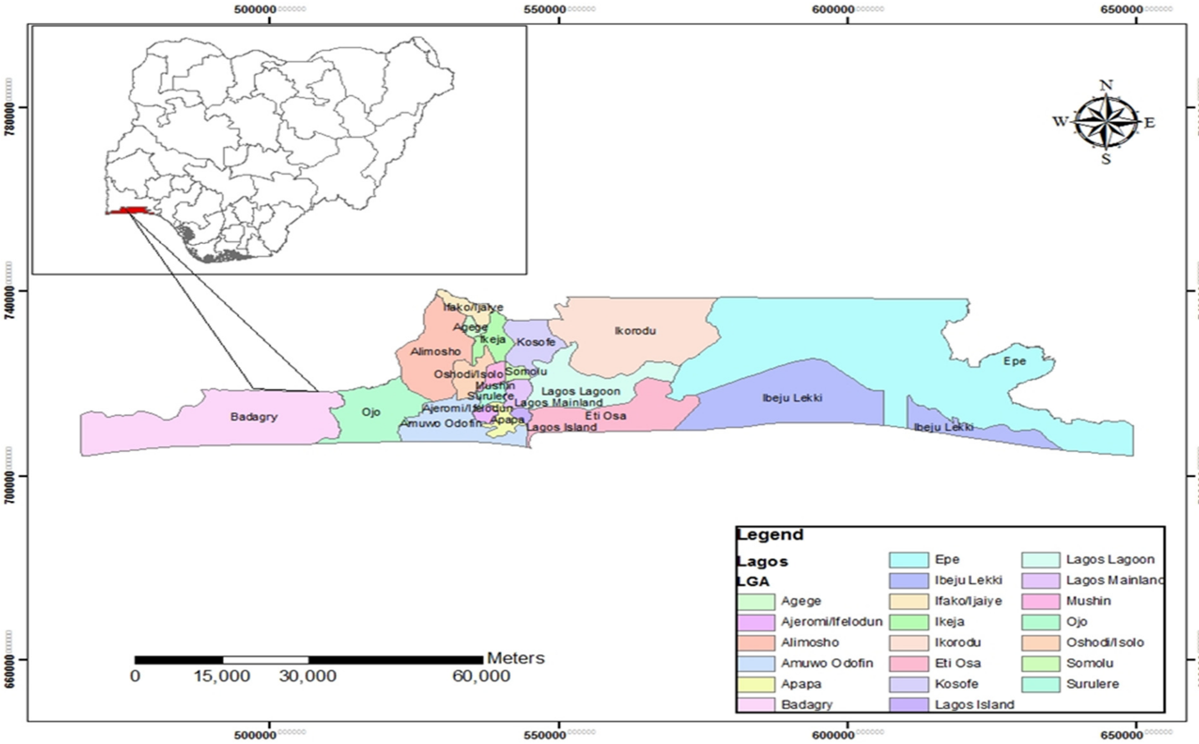

Figure 1: Map of Lagos State
Source: GIS Lab. University of Lagos.

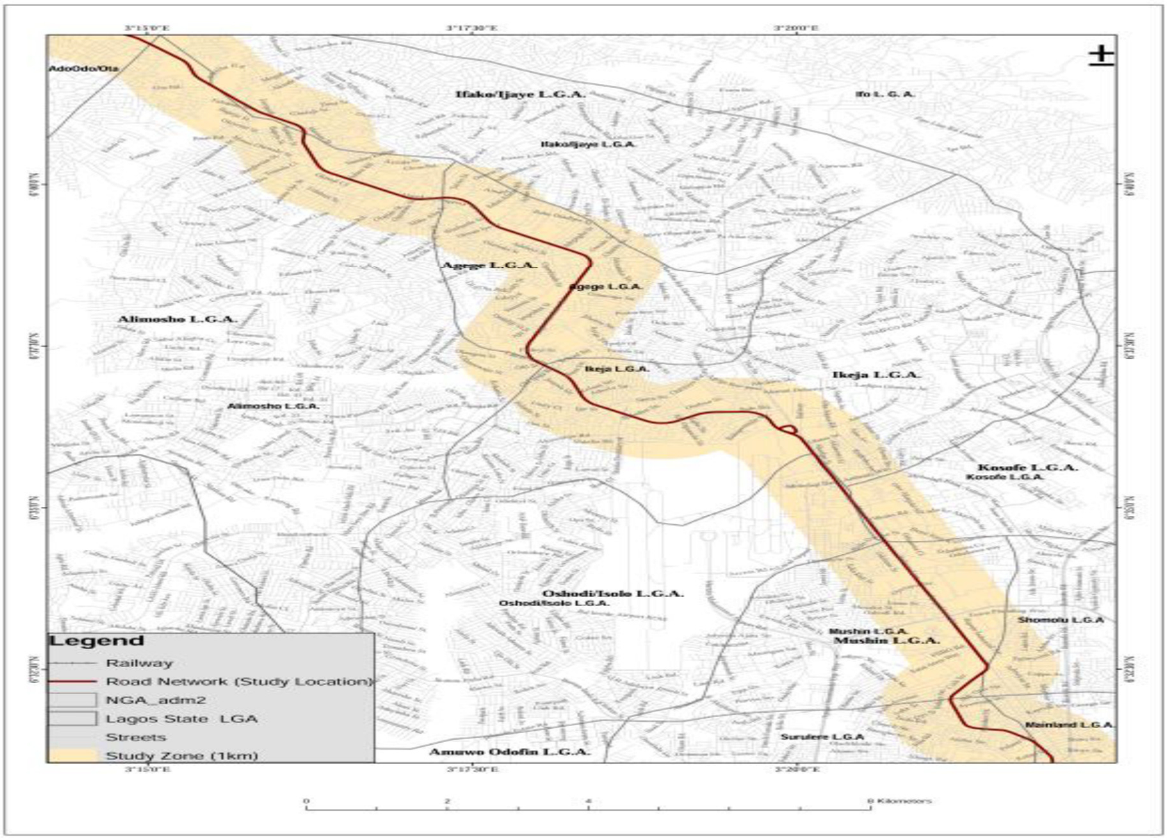

Figure 2: Map of the Road Corridor
Source: Fieldwork, 2015

Figure 3: Showing Congestion at Morning Peak
Source: Fieldwork, 2015

Table 1: Summary of Sample frame and Sample size

S/n	LGA	Population (Sample frame)	Sample size
1	Agege	459,939	47
2	Alimosho	1,277,714	131
3	Ifako Ijaye	427,878	45
4	Ikeja	313,196	33
5	Mushin	633,009	65
6	Oshodi Isolo	621,509	63
Total		**3,733,245**	**384**

Source: Fieldwork, 2015

Journal of Environment and Earth Science
ISSN 2224-3216 (Paper) ISSN 2225-0948 (Online)
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Table 2: Hourly Vehicle Count on the Abeokuta-Agege motorway

Location	Time	Type of Vehicle									Total
		Cars	Bicycles	Small Trucks	Heavy Trucks	Medium Trucks	Motor Cycles	Large Buses	Mini Bus	Coaster	
Agege Motor way Oshodi	07:00-11:00	7744	1	449	239	243	6085	486	6458	405	22110
Agege-motorway Oshodi	11:00-4:00	8069	5	925	277	231	4453	326	4011	108	18405
Agege-motorway Oshodi	3:00-8:00	6736	2	468	272	408	6450	287	2436	199	17258
Lagos Abeokuta expressway Ifako-ijaiye	7:00-11:00	6673	2	248	67	165	4012	97	4876	184	16324
Lagos Abeokuta expressway Ifako-ijaiye	11:00-4:00	6195	1	341	89	246	3301	71	2846	129	13219
Lagos Abeokuta expressway Ifako-ijaiye	4:00-8:00	6788	5	359	105	223	3950	67	2920	148	14565
Agege motor way Mushin	7:00-11:00	2686	12	137	100	124	2227	155	2242	48	7731
Agege motor way Mushin	11:00-4:00	3165	3	135	152	189	1708	105	1621	34	7112
Agege motor way Mushin	4:00-8:00	3862	3	172	119	117	2487	78	1684	76	8598
Agege Motor Rd Agege	7:00-11:00	8349	2	382	227	211	12662	495	4567	290	27175
Agege Motor Rd Before Abattoir	11:00-4:00	5863	0	333	219	222	3528	275	2416	109	12965
Agege Motor Rd Agege	4:00-8:00	7880	0	322	138	155	4405	346	2796	122	16164
Agege Motor way Alimosho	7:00-11:00	12732	16	755	326	351	13636	448	4485	264	33013
Agege Motor way Alimosho	11:00-4:00	8577	9	683	464	179	7764	310	3353	159	21498
Agege Motor way Alimosho	4:00-8:00	7161	3	605	479	334	10030	313	3124	171	22220
Agege Motor Rd Ikeja	7:00-11:00	17385	4	1261	275	179	11808	558	9302	324	41096
Agege Motor Rd Ikeja	11:00-4:00	12035	3	897	271	205	7179	392	6182	195	27359
Agege Motor Rd Ikeja	4:00-8:00	12086	6	755	349	178	8227	428	6866	312	29207

Source: LAMATA, 2015

Table 3: Factors responsible for traffic congestion along the study corridor

Variables	Yes		No	
	Frequency	**Percentage (%)**	**Frequency**	**Percentage (%)**
Poor road condition	358	93.2	26	6.8
Insufficient parking spaces and indiscriminate parking	334	87.0	50	13.0
Vehicular brake down on the road	333	86.7	51	13.3
Disobeying traffic laws by drivers and the motorist	323	84.1	61	15.9
Insufficient road network and routes	314	81.8	70	18.2
Rough driving and bad habits while driving	311	81.0	73	19.0
Accident along the road	296	77.1	88	22.9
High population in the area	282	73.4	102	26.6
Inadequate amount of traffic light	281	73.2	103	26.8
Over dependence on road as the main mode of transportation	281	73.2	103	26.8
Increase in the number of vehicle along this road	245	63.8	139	36.2
Trading and commercial activities	238	62.0	146	38.0
Insufficient number of traffic wardens/officials	203	52.9	181	47.1
Movement of people and goods from residential to commercial/industrial areas	179	46.6	205	53.4

Source: Fieldwork, 2015

Table 4: ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	45424562.469	14	3244611.605	2.023	0.015
Residual	591853417.320	369	1603938.800		
Total	637277979.789	383			
a. Predictors: (Constant), over dependence on road as the major mode of transportation, inadequate amount of traffic light on the road, insufficient number of traffic wardens/officials d. Dependent Variable: volume					

Source: Fieldwork, 2015

Table 5: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.741	0.71	0.036	16.5
Predictors: (Constant), over dependence on road as the major mode of transportation, disobeying traffic laws, inadequate amount of traffic light on this road, insufficient number of traffic wardens/officials.				

Source: Fieldwork, 2015

Table 6: Summary of multiple regressions showing independent influence of factors responsible for traffic congestion and volume of traffic

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
Predictors	B	Std. Error	Beta		
(Constant)	2795.507	535.969		5.216	0.000
Insufficient of traffic wardens	289.349	134.250	.112	2.155	0.032
Shortage of traffic light	374.798	137.908	.145	2.718	0.007
Over dependence on road	437.162	155.901	.150	2.804	0.005
Disobeying traffic laws	399.856	193.710	.113	2.064	0.040
Trading activities	13.362	144.777	.005	.092	0.927
Movement of people	174.234	151.162	.062	1.153	0.250
High population	164.809	155.381	.057	1.061	0.290
Indiscriminate parking	188.357	214.079	.049	.880	0.380
Increase in the number of vehicle	93.236	142.728	.035	.653	0.514
Insufficient road network	61.566	181.969	.018	.338	0.735
Rough driving	55.362	182.273	.017	.304	0.762
Accident along the road	109.843	195.640	.036	.561	0.575
Vehicular break down	36.948	224.465	.010	.165	0.869
Poor road condition	212.589	295.085	.041	.720	0.472
Dependent Variable: volume of traffic					

Source: Fieldwork, 2015