ANALYSIS OF TRAFFIC PATTERN AND CONGESTION ON IPAJA-IKOTUN ROAD CORRIDOR OF LAGOS METROPOLIS, NIGERIA.

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ABSTRACT

The study investigated traffic pattern and congestion along Ipaja/Ikotun road corridor in Alimosho Local Government Area of Lagos State. It calculated the rate of delay at different sections along the road corridor; and projected the monetary cost of delays encountered in the area. A survey research design was used. The study was more effectively based on personal observation and traffic count at different intersections including Iyana-Ipaja, Moshalashi/Egbeda, College/Idimu and Council Bus Stop. The traffic count data was analyzed using simple percentage count and tabulation for clear analysis about the problem of the study. The findings from the traffic count analysis revealed that the rate of delay is very high while the monetary cost of traffic delay was estimated to be ₦10,337,232,906 in 52 weeks. The study observed that the worrisome traffic situation is sequel to high population growth rate in Alimosho local government area of Lagos, and recommended that the traffic congestion problem should not be left until it deteriorates to the level of uncontrollable circumstance. It is therefore obvious that there is urgent need for government intervention particularly in the area of road rehabilitation and traffic control.

Keywords: *Traffic pattern, Traffic congestion, Monetary cost of delay, Road corridor*

1.0 INTRODUCTION

Cities and traffic congestion have developed hand-in-hand since the emergence of earliest large human settlements. One of the key characteristics of transportation problems in Nigeria has been identified as traffic congestion; almost all capital cities in Nigeria today face the problem of traffic congestion (Moses, 2011). Subsequently, the result of this traffic congestion is increasing cost and loss of work hours (Atubi, 2008).

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 increase in commuting distance has a profound impact on trip attraction, fares paid by commuters and traffic build-up in some land use areas.

According to a report of Lagos Metropolitan Area Transport Authority (2014), the transport network in Lagos State is predominantly road based with 90% of total passengers and goods moved through that

mode. The demand for trips across Lagos megacity region by all modes (including walking) was estimated at 22million per day with walk trips accounting for 40% of the total trips. However, the rapid increase in population and standard of living will bring the daily demand for trips to about 40 million/day by 2032 (Lagos Metropolitan Area Transport Authority, 2014).

One peculiar problem along Ikotun/Iyana-Ipaja road corridor in Alimosho is the indiscriminate and often illegal street trading. Several meters of what should have been parking offsets have been converted to makeshift stores, stalls and trading cabins. Also, another problem that bedevils the road corridor can also be linked with the use of road traffic infrastructures. The road infrastructure is grossly inadequate to meet the trips demand of the residents. The road network density, put at 0.6 kilometres per 1000 population, is low. Alternatively, Lagos State has 80 cars per 1000 people, with a high car density of 264 vehicles per kilometer of roadway (LAMATA, 2014). The network's efficiency is similarly low, with a limited number of primary corridors carrying the bulk of the traffic. Inadequately designed interchanges along this road corridor provide only partial access to the primary network. Many tertiary roads play the roles of secondary ones. So far few junctions have been signalized while transport stations, where available, are in a disorganized state.

The main 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. While the study conducted by Ogunsanya (1987); Omiunu (1988); Bolade (1989) and Ameyan (1996) examined the causes and dimensions of traffic problems in Nigeria, Aderamo (1990) and Bello (1993) offer solutions to traffic congestion challenges. However, recent studies of Ukpata and Etika (2012); Olaogbebikan, Ikpechukwu, Akinsulire and Enosko (2013) have assessed traffic management strategies employed in Nigerian cities. However, the 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 solve traffic congestions in many Nigerian cities especially in Lagos Metropolis.

Travel delay makes journey more tiring. Traffic congestion is a consequence of excess time delay for transit experienced by both public and private users, increased vehicle operating costs, excess accident externality costs, as well as excess vehicle emissions externality costs. The pedestrians and the motorists in Lagos metropolis experience noticeable problem of vehicular/vehicular and vehicular/pedestrian conflict. For example, Iyana-Ipaja, Moshalasi/Egbeda, College/Idimu, and Council Bus stop road axis is highly noted for these conflict situations not only at peak periods but unpredictably all periods of socio-economic activities. It is important to note here that longer travel times result in a cost to motorists in the form of value placed on the excess time spent on travelling. The main thrust of this study is to investigate traffic pattern and congestion along Ipaja/Ikotun road corridor in Alimosho local government area of Lagos State. The specific intent of the study includes determining the rate of delay at different sections along the road corridor; and examining the monetary cost of delay

of such delay which could impact negatively on the economy of the State.

DESCRIPTION OF THE STUDY AREA

Lagos State lies to the south western part of the Federal Republic of Nigeria on the west coast of Africa. Lagos is located within approximately 6°36'38' North of the Equator and 3°15'21' East of the Greenwich Meridian (See Fig 1). The study area is bounded in the North by Ifako/Ijaiye Local Government Area, in the East by Kosofe Local Government Area, in the West by Agege and Alimosho Local Government and in the South by Oshodi-Isolo and Mushin local government area respectively (Ajibola, Olaniyan-Adekola and Simon, 2012).

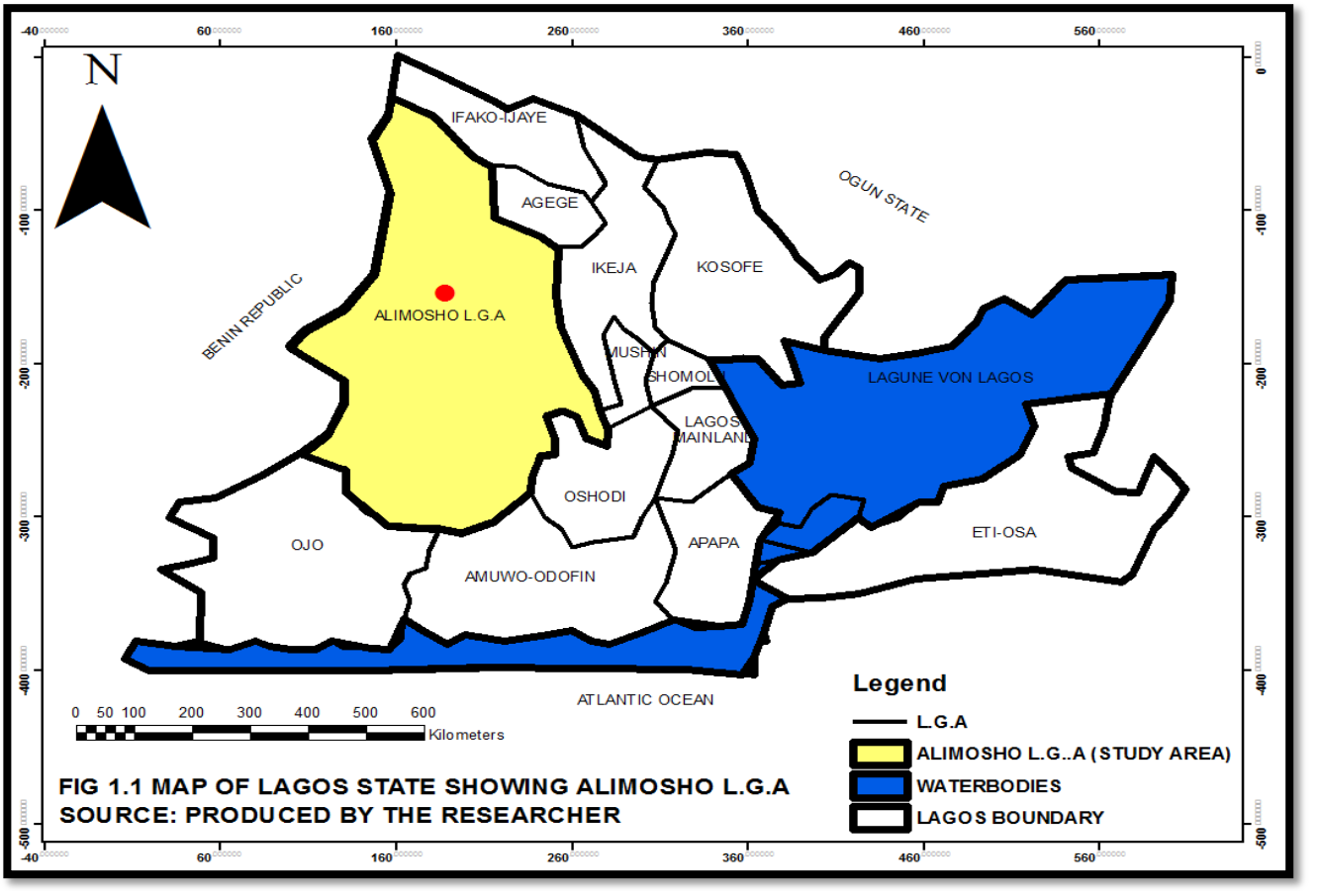

Figure 1: Map of Lagos State showing Alimosho LGA
Source: Produced by the Researcher (2019)

The popular Iyana-Ipaja, as Lagos residents presently know it to be is a town in Alimosho local government. Alimosho, is a local government area in the Ikeja Division, Lagos State, Nigeria. It is the largest local government in Lagos, with over 1,288,714 inhabitants, according to the official Census of 2006.

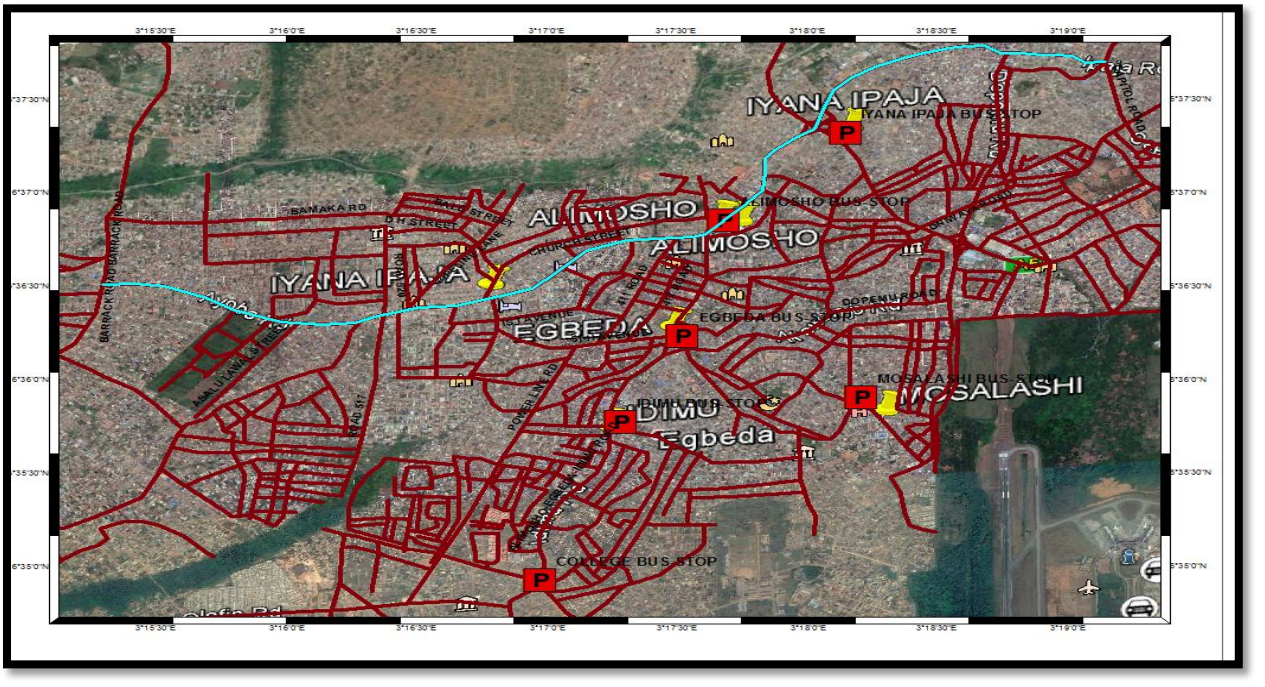

Figure 2: Satellite Imagery of Ikotun/Iyana-Ipaja in Alimosho, Lagos
Source: Produced by the Researcher (2019)

The study area is well served by collector / distributor roads with many access roads linking the residential and commercial areas which depict a well planned nature of the study area (Figure 3). Means of transportation in the study area include buses, cabs, motor bikes and bicycles.

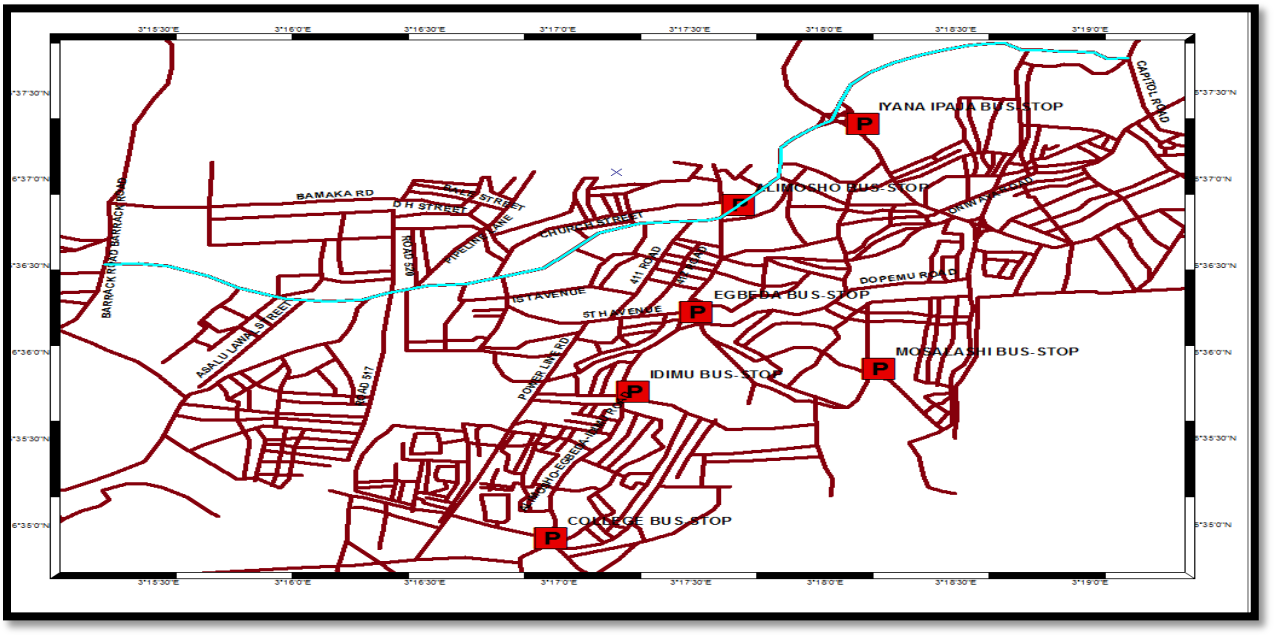

Figure 3: Road network map of Ikotun/Iyana-Ipaja in Alimosho, Lagos
Source: Produced by the Researcher (2019)

2.0 LITERATURE REVIEW

Congestion according to Rodrique (2009) can be perceived as an unavoidable consequence of scarce transport facilities such as road space, parking area, road signal and effective traffic management. He posits that urban congestion mainly concerns two domains of circulation, passengers and freight which share the same infrastructure. Thus, traffic congestion condition on road networks occurs as result of excessive use of road infrastructure beyond capacity, and it is characterized by slower speeds, longer trip hour and increase vehicular queuing.

Downie (2008) observed that traffic congestion occurs when the volume of vehicles are greater than the available road capacity, a point commonly referred to as saturation. He describes a number of specific circumstances which causes congestion. Most of such circumstances are concerned with reduction in the capacity of road at a given point over a certain length, or increase in the number of vehicles required for the movement of people and goods. He argued further that economic surge in various economy has resulted to a massive increase in the number of vehicles that overwhelm transport infrastructure, thus causing congestion on road in cities.

Another contributing factor to congestion as suggested by Herman (2001), cited in Downie (2008) is parking. He is of the view that road parking, which consume large amount of space has become a land issue that greatly inflates the demand for urban-land, causing congestion in cities. He

added that highly urban mobility rate also contribute to the congestion menace. The massive use of cars does not only have an impact on traffic congestion but also leads to decline in public transit efficiency, thereby creating commuting difficulties in cities. Indeed, the over-dependence on cars has tremendously increased the demand for transport infrastructure. Unfortunately the supply of transport has never been commensurate with the growth of mobility needs. Consequently, several vehicles spend most of the time in traffic as a result of traffic space limitation (Yan and Crooks, 2010).

In Nigeria, Ogunbodede (2009) submitted 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) further noted the following causes of traffic congestion along the road corridors of Lagos metropolis to include; poor road condition, inadequate road infrastructure, accident, inadequate traffic planning, drivers' behaviour, and lack of integrated transport system.

According to Olagunju (2015) the causes of traffic congestion peculiar to major Nigerian cities include vehicular density. This occurs when the vehicular density exceeds the designed capacity of a road network. Thus "dead weight" or "traffic congestion" sets in and the intensity increases with more vehicles getting to the spot than leaving the point. Closely related to vehicular density is urbanization which leads to increased motorization. Urbanization and increased motorization without corresponding increase in infrastructure and transport services form major causes of congestion. Odeleye (2008) postulated that the traffic congestion problem of Lagos is as a result of the imbalance in the travel supply-demand in the road traffic environment. This imbalance, according to him is visible in the geometric increase in the level of motorization and population of the city, without a commensurate level of growth in the provision of road traffic infrastructure, as well as multimodal mass transit facilities. The frequent breakdown of vehicles and those involved in crashes that are not immediately cleared away from the road often cause traffic to build up and hence the inevitable resultant traffic congestion (Olagunju, 2015). Other causes of road traffic congestion that are distinctive to Nigeria urban roads includes poor road infrastructures and travel information; traffic law violations and indiscipline among motorists of different categories; and road construction activities (Olagunju, 2015).

REVIEW OF TRAFFIC CONGESTION RELATED STUDIES IN LAGOS METROPOLIS

The study conducted by Bashiru and Waziri (2008) on the inherent problems of intra-urban traffic congestion in Lagos State revealed that 57% of commuters and motorists spend between 30 to 60 minutes on the road due to traffic congestion. They found that the worst traffic congestion occurred on Mondays. Traffic congestion is a common sight when talking about mega city like Lagos. A common view of participants at a conference on traffic management held in 2010 according to Olorunponmi (2010) was that the congestion on Lagos roads was mainly caused by the drivers. Four out of the six people interviewed declared drivers' attitudes as a major problem on the road.

It is evidenced in the study of Adebiyi (2011) that traffic congestion in Lagos metropolis is caused partly by road users. Lagos road users are known to

be very impatient and very bad at obeying traffic rules. Traffic jams develop simply because a driver is refusing to give way to another motorist. He established further that most drivers do not acknowledge road signs because many do not understand the meaning of different road signs like "U-Turn", "One Way", "Zebra Crossing etc (Adebiyi, 2011).

The most up to date available data on the cost-effect of congestion in Lagos metropolis is from a research study conducted by ROM Transportation Engineering between year 2007 and 2009. According to Olorunpomi (2010) the research established the estimated costs of congestion to be $1billion (about ₦160billion) yearly. These conclusions were reached based on the official population figure of 17million for Lagos State. The research concludes further that Lagosians collectively lose 3billion hours to traffic congestions yearly, and that if that time were reduced by 20 percent, it would save the State at least $1billion (about ₦150 billion) yearly. These figures underscore the seriousness of the issue of traffic congestion in Lagos and the impetus for a reasoned and thorough response towards improving the transportation system in Lagos State.

3.0 METHODOLOGY

A descriptive survey research design was adopted for this study. The design was used to gather detailed information that described existing traffic situation, identify problems and justify its monetary cost of delay on the economy. Personal observation, traffic count and interview guide were used as data collection techniques. The purpose of the physical observation was to have an insight of all the existing conflict points that are derivable from intersection and the conflicting areas where traffic jam usually occurred.

Traffic count was carried out at Iyana-Ipaja, Moshalashi/Egbeda, College/Idimu and Council Bus Stop during the week days and weekends primarily to understand and analyse the traffic behaviour. The selection of assessment points was based on the outcome of the researcher's physical observation of the major traffic intersection. Hence, the following assessment points were selected.

(a) Major intersection – Zone A (Iyana-Ipaja) and B (Moshalasi/Egbeda Bus stop).

(b) Major intersection - Zone C (College/Idimu) and D (Council Bus stop).

(c) Point of ascending and descending in Agege/Iyana-Ipaja road axis (2 points).

Three (3) survey days was used. Two (2) working days and a weekend in the structure described below:

Table 1: Observation Points for Traffic Count

Days	Survey area/zone
Day 1 (working day)	Iyana-Ipaja/Moshalasi/Egbeda Bus stop
Day 2 (working day)	College/Idimu/Council Bus stop
Day 3 (weekend)	Agege/Iyana-Ipaja road corridor

Source: Researcher's computation, 2019

The traffic count analysis was sorted using simple percentage count and tabulation to present the data gathered on the field. The analysis of the minute delay was adapted from the study of Ege, Asenime and Akiri (2015) where hourly basis for each vehicular type was aggregated to obtain the delay per hour using standards of delay for each class per day.

4.0 RESULTS AND DISCUSSION

EVALUATIONS OF THE RATE OF DELAYS AT DIFFERENT INTERSECTIONS (TRAFFIC COUNT ANALYSIS)

This section of the study presents the analysis and interpretations of traffic count in each of the sampled zones.

Table 2: Average Daily Vehicle Characteristics in Zone A and B

IYANA- IPAJA **MOSHALASHI/ E**GBEDA

Vehicle Type	A1 Day 1	A2 Day 2	A3 Day 3	**A0 Average**	B1 Day 1	B2 Day 2	B3 Day 3	**B0 Average**
Cars	6773	6416	6930	**6706**	2451	5515	6046	**4671**
Motorcycle	551	243	418	**404**	341	417	2386	**1048**
Tricycle	7924	914	4213	**4350**	1487	1986	1935	**1803**
Buses	5202	3020	5746	**4656**	2165	5462	3451	**3692**
HDV's	55	36	42	**44**	21	41	61	**41**
BRT	41	32	38	**37**	34	42	49	**42**
Bicycles	13	9	10	**11**	16	14	18	**16**
Luxury	36	22	31	**30**	19	23	32	**25**
Mini bus	2668	1957	3758	**2794**	1256	3925	3561	**2914**
Total	23263	12649	21186	**19032**	7790	17425	17539	**14251**

Source: Researcher's fieldwork (2019)

Table 2 shows the average daily vehicle characteristics in Zone A and Zone B. From the average computation of the three days, it was observed that car was the major means of transport in Zone A with average frequency of 6706. Closely related are buses with the frequency of 4656, Tricycle and Keke had 4350, while Minibuses accounted for 2794 of daily average. This statistics is similar in Zone B (College/Idimu/Council Bus stop) where daily average of 1048/1803 was recorded for Motorcycles/Tricycles, 4671 for cars, 3692 for buses, 2914 for Minibuses, while BRT buses accounted for 42. The result indicates that cars, buses, minibuses, motorcycles and tricycles are the predominant means of mobility in the zones. This is attributed to the bad state of the road. However, since most of the road users were working class they could not afford to waste time on traffic, therefore, their final resort was motorcycles and tricycles for mobility which require little space to maneuver traffic congestion. Cars constitute a large percentage after motorcycle which may be ascribed to the car ownership mentality in this part of the world where individual wishes to have sense of belonging with the trend of technology and innovation. The trucks and trailers plying this road corridor are those conveying goods for delivery to neighboring states (See Plate 1).

Plate 1: Motorcycle and tricycle: the dominant means of commercial transport in the study area
Source: Fieldwork (2019)

Table 3: Average Daily Vehicle Characteristics in Zone C and D

COLLEGE/IDIMU **COUNCIL BUSSTOP**

Vehicle Type	C1 Day 1	C2 Day 2	C3 Day 3	**C0 Average**	D1 Day 1	D2 Day 2	D3 Day 3	**D0 Average**
Cars	4504	2456	6877	**4613**	4132	4485	4102	**4240**
Motorcycle	1423	846	1951	**1407**	956	852	923	**911**
Tricycle	2456	1241	2652	**2116**	3200	2145	3017	**2787**
Buses	4707	1452	5682	**3947**	3521	4251	3102	**3625**
HDV's	51	21	51	**41**	78	64	68	**70**
BRT	32	13	44	**29**	53	41	52	**48**
Bicycles	15	11	23	**15**	12	13	10	**11**
Luxury	36	22	56	**38**	49	44	47	**47**
Mini bus	3479	2408	3985	**3291**	2431	2331	2521	**2428**
Total	16703	6860	21321	**14961**	14432	14226	13842	**14166**

Source: Researcher's fieldwork (2019)

Table 3 presents the average daily vehicle characteristics in Zone C and Zone D. The statistics shows that cars, buses, minibuses and tricycle constitutes the highest daily vehicle characteristics in Zone C with an average frequency of 4613 cars, followed by buses with average of 3947, minibuses accounted for an average of 2431, while Tricycle had average of 3200. Similarly, in Zone D tricycle accounted for 2787 as the means of transportation in the zone, cars had 4240, buses had 3624, minibuses had 2428, motorcycles had 911, HDV's had 70 on average, while BRT had 48 on average. The statistical data recorded in this zone is also an attribute of what is obtainable in Zone A and B.

MONETARY COST OF DELAY ALONG THE ROAD CORRIDOR

In the course of the study, effort was made to ascertain the monetary cost of delay resulting from traffic congestion along the road corridor.

TRIP TIME ANALYSIS

Trip time is the total time spent on a journey. Commuters sometimes spend more than 2 hours on trip time which is a consequence of traffic congestion caused by population of many road users on inadequate road arteries. The perceived effects of traffic delay include low productivity and reduced quality of life due to longer hours spent on trips. Traffic count carried out on these road corridors is presented in the below.

Table 4: Traffic Count at Zone A-D from 7am-7pm

Iyana- Ipaja/Moshalashi/Egbeda-College/Idimu-Council Bus stop

Vehicle Type	Monday	Wednesday	Friday
Cars	5734	4300	4013
Motorcycle	1420	1014	1215
Tricycle/Keke	2753	2055	2241
Buses	4213	3811	3146
HDV's	152	127	193
BRT	103	93	123
Bicycles	2	-	4
Luxury	81	42	103
Minibuses	946	813	1256

Researcher's fieldwork (2019)

Monetary cost of traffic delay on residents of the study area was generated through traffic count survey carried out for three days. In evaluating the monetary cost of delay, the vehicles trapped in delay were counted and the time spent in delay was also recorded.

The impact of congestion and monetary cost of delay in the study area was generated using delay technique analysis. A traffic count survey was carried out to ascertain the delay. The delay per minute for designated stops was obtained at 40meter distance and vehicles within that distance were recorded according to vehicular type to obtain the delay for each segment of the traffic. The traffic survey was carried over a 12-hour period from 7am-7pm. The cost of delay for all vehicular type annually was estimated for the selected zones using standards of delay for each class per day as indicated in the study of Ege, Asenime and Akiri (2015).

Table 5: Number of Vehicles involved in delay in Zone A, B, C and D

Vehicle Type	Monday	Wednesday	Friday	Total
Cars	659	641	776	2076
Motorcycle	102	94	98	294
Tricycle	218	147	256	621
Buses	298	220	354	872
HDV's	34	32	29	95
BRT	53	42	48	143
Bicycles	2	-	2	4
Luxury	41	34	36	111
Minibuses	127	121	104	352

Researcher's fieldwork (2019)

Table 5 present the number of vehicles involved in a delay from Zone A-D. The numbers of vehicles involved were totaled from zone A – D.

Table 6: Average Cost of Chartering a Vehicle per day based on the common average

Vehicle Type	Chartering
Cars	12,000
Motorcycle	6,000
Tricycle	9,000
Buses	40,000
HDV's	35,000
BRT	80,000
Bicycles	500
Luxury	120,000
Minibuses	11,000

Researcher's fieldwork (2019)

An enquiry was made through interview guide on selected leaders of Road Transport Employers Association of Nigeria on the average cost of chartering a vehicle per day based on the common average. Table 6 indicates that the cost of chattering Tricycle in Lagos is approximately ₦9,000, cars cost ₦12,000, while buses ₦40,000. Also HDVs cost ₦35,000, Bicycles cost ₦500, Luxury ₦120,000, minibuses cost ₦11,000, BRT cost ₦80,000, while motorcycle cost ₦6,000 per day.

Table 7: Average Cost per hour is based on 12 hours used

Vehicle Type	Workings	Average Cost per hour (12 hours)
Cars	12,000/12hours	₦1,000
Motorcycle	6,000/12hours	₦500
Tricycle	9,000/12hours	₦750
Buses	40,000/12hours	₦3333.3
HDV's	35,000/12hours	₦2916.6
BRT	80,000/12hours	₦6666.6
Bicycles	500/12hours	₦41.6
Luxury	120,000/12hours	₦10,000
Minibuses	11,000/12hours	₦ 916.6

Source: Researcher's fieldwork (2019)

Table 7 presents that average cost per hour for motorcycle/tricycle was ₦750; cars cost ₦1000, while buses cost ₦3333.3. Also the BRT cost ₦6666.6, Luxury cost ₦10,000, Minibuses cost ₦916.6, HDV's ₦2916.6, and Bicycles ₦41.6.

Table 8: Delay in minutes at Zone A (Iyana-Ipaja), Zone B (Moshalashi/Egbeda) Zone C (College-Idimu) - Zone D (Council)

Vehicle Type	Monday	Wednesday	Friday	Total
Cars	305	263	219	787
Motorcycle	16	13	12	41
Tricycle/Keke	28	23	21	72
Buses	44	47	42	133
HDV's	47	44	43	134
BRT	52	54	49	125
Bicycles	4	2	3	9
Luxury	37	34	39	110
Minibuses	41	44	38	123

Source: Researcher's fieldwork (2019)

Table 8 shows delay in minutes at Zone A – D. The total cost of delay in minutes according to the categories is by dividing total seconds and multiplying by 60 as shown in Table 9.

Table 9: Delay in minutes at Zone A-D

Vehicle Type	Total Cost of delay in minutes
Cars	787×60 (47220/3600) = 13.2
Motorcycle	41×60 (2460/3600) = 1
Tricycle	72×60 (4320/3600) = 1.2
Buses	133×60 (7980/3600) = 2.2
HDV's	134×60 (8040/3600) = 2.2
BRT	125×60 (7500/3600) = 2.1
Bicycles	9×60 (540/3600) = 0.15
Luxury	110×60 (6600/3600) = 1.8
Minibuses	123×60 (7380/3600)=2.0

Source: Fieldwork, 2019

Table 10: Vehicles types and their associated costs

Vehicle Type	Delays Contribution in Hours	Cost per hour per Vehicle	Total Cost per Vehicle	Total Number of Vehicle	Total Cost
Cars	13.2	1000	13,200	2076	27,403,200
Motorcycle	1	500	500	294	147,000
Tricycle	1.2	750	900	621	558,900
Buses	2.2	3333.3	7333.3	872	6,394,637.6
HDV's	2.2	2916	6416.5	95	609,567.5
BRT	2.1	6666.6	13,999.8	143	2,001,971.4
Bicycles	0.15	42	6.3	4	25.2
Luxury	1.8	10,000	18,000	111	1,998,000
Minibuses	2.0	916.6	1,833.2	352	645,286.4
					39,758,588.1

Source: Researcher's fieldwork (2019)

The total cost per day as a result of traffic delay in zone A (Iyana-Ipaja), B (Moshalasi/Egbeda Bus stop), C (College/Idimu) and D (Council Bus stop) is given as ₦39,758,588.1 However, in 52 working weeks, it will give 39,758,588.1× 5days × 52weeks = ₦10,337,232,906.

5.0 CONCLUSION

The paper has been able to establish the contributory factors of traffic congestion and its associated cost of delay along Ipaja/Ikotun road corridor. The nature of identified traffic congestion around Ikotu/Iyana-ipaja needs urgent solution. The study found that the traffic flow problem around this road corridor is a consequence of man hour wasted in traffic. Hence, there is need to evolve more effective traffic management method for the city. The paper concludes that as population increases and as much people become affluent to technology, traffic congestion problem becomes worse.

6.0 RECOMMENDATIONS

It was found that Ipaja-Ikotun road is characterized with daily traffic congestion. Thus, the following recommendations were made based on findings:

- Sequel to high population growth rate of Alimosho local government, traffic congestion issues should not be left until it deteriorates to the level of uncontrollable circumstance. There is urgent need for road rehabilitation by government of the day especially the road arteries that serve as alternative routes to major road users in the study area.
- Relocation of Iyana-Ipaja motor-park garage will pave way for free flow of traffic along the road corridor and thus minimize the incidence of man hour wasted in traffic.
- There is need for government to integrate transport system that links road, rail and waterway networks into the Strategic Transport

Master Plan of Lagos. Also, the development of mixed-use urban phenomenon combining residential and commercial areas to reduce the number of journeys people need to make will further address the problem of traffic congestion in Lagos Metropolis.

REFERENCES

Adebiyi, A. (2011). On the motivation and challenges faced by commuters using bus rapid transit in Lagos, Nigeria. *The Social Sciences, 10*(6), 696-701.

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

Ajibola, M. O., Olaniyan-Adekola, M., & Simon, R. F. (2011). Assessing the effects of Urban Planning on residential property values in Agege, Lagos. *European Scientific Journal, 8*(11), 12-19.

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

Aworemi, J. R., Abdul-Azeez, I. A., Oyedokun, A. J., & Adewoye, J. O. (2009). A study of the causes, effects and Ameliorative Measures of Road Traffic Congestion in Lagos Metropolis. *European Journal of Social Sciences, 1*, 119-128.

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.

Bashiru, A. R., & Waziri, O. O. (2008). Analysis of intra-Urban Traffic Problems in Nigeria : A study of Lagos Metropolis. *Indonesian Journal of Geography, 40*(1), 31-51.

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.

Bolade, T. (1989). Transport in Metropolitan Lagos. *Transport Review, 6*(1), 1-30, DOI: 10.1080/01441648608716616

Downie, A. (2008). *The World Worst Traffic Jams time.* Available online at: http://www.time/world/article/0,8599,1733872,00.html. (Retrieved on 28th October, 2019).

Lagos Metropolitan Area Transport Authority (2014). Public Transport. Annual publication of LAMATA on the state of Lagos traffic situation. (Retrieved 25 April, 2019)

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

Odeleye, J. A. (2008). *A study of Road Traffic Congestion in selected Corridors of Metropolitan Lagos*. Unpublished Ph.D. Thesis, University of Lagos, Nigeria.

Ogunbodede, E. F. (nd) *Assessment of Traffic Congestions in Akure (Nigerian) Using GIS Approach: Lessons and Challenges for Urban Substances.* Department of Geography and Planning Sciences, Adekunle Ajasin University, Ondo State, Nigeria.

Ogunsanya, A. A. (1987). Traffic Congestion in an Urban Centre: The Case of Ilorin, Nigeria. *Nigerian Geographical Journal*, *27*(1&2), 84-95.

Olagunju, K. (2011). Road Sense with Kayode OLAGUNJU. Kaduna. Veragap Nig. Ltd.

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*, *4*(4), 144-153.

Olorunpomi, G. (2010). How Lagosians lose N150b to traffic yearly. Available at http://www.nigerianbestforum.com/generaltopics/how-lagosians-lose-n150bto-traffic-yearly/

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

Rodrigue, J. P. (2009). *The Geography of Transportation System*. New York: Routledge. Available at: www.en.wikibooks.org/wiki/Gravity of migration (Accessed 24th November, 2018).

Ukpata, J. O., & Etika, A. A. (2012). Traffic Congestion in Major Cities of Nigeria. *International Journal of Engineering and Technology*, *2*(8), 1433-1438

Yan, X.Y. & Crookes R.J. (2010). Energy demand and emission from road transportation vehicles in China. *Journal of progress in Energy and Combustion Science*, *36*, 657-676.