Global Journal of Science Frontier Research: H
Environment & Earth Science
Volume 18 Issue 2 Version 1.0 Year 2018
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

Analysis of Vehicular and Pedestrian Flow in Metropolitan Area of Lagos

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Abstract- The crisis in transport is largely as a result of the growing concentration of population, rapid urbanization and economic activities of certain part of the world. Attempt to eliminate the traffic functional problem had led to gradual spatial restriction of pedestrian movement. This is a result of lack of consideration for pedestrian facilities in the road design and construction. Hence pedestrians compete for the use of road designed purely for vehicular use consideration and thereby creating conflicts and accidents on roads most especially within the central business district and other commercial areas. In the light of this, the research study examined the problems associated with pedestrian and vehicular traffic in an Urban Metropolitan Area. Questionnaires were used for data collection from respondents, in addition to secondary data extracted from documented information related to the research on causes, effect and solution to pedestrian and vehicular traffic conflict on Nigeria roads. Finding in this research work revealed that pedestrian and vehicular conflicts in the Urban Metropolitan Area led to traffic jam, delay and congestion. The conflict was found to be associated with roadside, road median and footbridge trading, on-street, parking of commercial transport operators, inadequate traffic and parking facilities.

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GJSFR-H Classification: *FOR Code: 059999*

Strictly as per the compliance and regulations of:

Analysis of Vehicular and Pedestrian Flow in Metropolitan Area of Lagos

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I. Introduction

One of the most serious problems in Nigeria cities today is that of traffic congestion. All over the major cities of Nigeria particularly in Lagos, large numbers of vehicles are seen crawling along the roads within the area. The amount of traffic generated by each land use is a reflection of its role in the social and economic circle of a particular environment (Adeniji 2000). This explains why commercial areas are always experiencing a high pedestrian and vehicular traffic.

The development of mechanical mode of transportation has contributed to changes in intra-urban movement pattern. People, goods and services need to move from home to office, market, schoolsetc. This movement pattern has been greatly aided by mechanized transport system. The fulfillment of those various needs of movements resulted in heavy traffic.

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Traffic is a function of land use and it is an object in motion. It has become a household word has come to be associated mainly with motor vehicles. The Buchman report (1963) stated that "Traffic is a function of activities". All activities however, involve people. Before and after movement of vehicles, pedestrian activities take place within and around area where vehicles are not accessible to or where they are restricted from; pedestrian like any other mode of transport deserves to be treated as traffic in his/her own right not as incidental to other mode of transport. Besides, with increase in population, vehicles ownership and general mobility, more pedestrian traffic is generated particularly at the trip ends. The pedestrian activity has caused great concern in that it has been observed to have a great influence on free flow of vehicle traffic (Kilasho, 2001). The effect rests on its volume that has been noticed to affect traffic flow considerably in areas of high commercial intensity and concentration (Ephiram 2000). This is because in such areas pedestrian traffic is considerably high and t results in competition between pedestrian and vehicles both in motion and at rest

a) Study Area

Oshodi Local Government is a popular commercial/industrial centre located at the core of Lagos. Apart from being the market where different kinds of food items are traded-in, it serves as a park/terminal for various intra and inter-state transport services for various routes in the state and country at large. The ease to it and convenience of getting vehicle to one's destination at any particular time makes Oshodi a very proponent commercial centre that forces people/shoppers from far and near to the centre

Oshodi, a local government at the core of Lagos stretching in the north to Agege motor road including the P & Twireless station, Matori industrial area, the refuse incinerator including Orile-Oshodi forming a common boundary between Ajamogun and Onimotun families of Ewu at Otulu Rivers, and from Badagry Express Road to the Isolo forming a common boundary with Amuwo-Odofin Local Government in the South and in the West with Ojuwoye at Oju-Olobun in the heart of Mushin Market Areas and in West, it stretches to Egbe-Riverine area including the Low Cost Housing Estate and forms a boundary with Isheri Village in Alimosho Local Government and extends to Okota

Palace way development area via Ire-Akari Estate (road), Badagry express road.

Oshodi Local Government shares boundary on the west with Ikeja Local Government. It stretches from Mafoluku and Murtala-Mohammed Airport in the south along to Agege Road sharing boundary with Mushin Local Government in the west; it extends to Oshodi Apapa Expessway to Amuwo-Odofin behind Festac '77 Hotel (Formally Durber hotel). It also shares boundary with communities like Ejigbo and NNPC depots.

The land use pattern of Oshodi local Government shows a dominant commercial and industrial use. The inner part serves as residential and industrial use. The movement in and out of this area is usually found very high throughout the day due to high traffic generated by the commercial activities and industrial operations. A very high traffic (both vehicular and pedestrian) generation throughout the hours of the day results to conflict due to inability of the road to accommodate the available traffic

The overall land use composition of the town is as shown below in table1, residential use accounted for 36% of the total built up area in Oshodi Local Government; public use accounted for 4.4% while transportation uses constituted 10.3%. The commercial land area which embraces the C.B.D. district commercial area, banks, supermarket, and other commercial establishment and industrial area constituted 31.6% and 16.9% respectively. This shows the intensity of commercial and industrial activities that accounted for nearly half (48.5%) of the land use pattern in most settlement where residential use mostly constitutes be dominant land use.

II. Methodology

Data for this article were collected though questionnaire survey in Oshodi. Questionnaire on road design and pedestrian facilities was used to collect information on the design characteristics and available facilities for easy and smooth movement of vehicle and pedestrians. The pedestrian questionnaire was used to collect information on the purpose of making trip to this commercial area, mode of transport, things that obstruct free movement of pedestrian in the business district and the attitude of vehicular drivers to the pedestrians. The vehicular driver questionnaire sought answers to issues such as the driver reason(s) for plying the routes of Oshodi Local Government, where they park, when they get to the area, the behaviours or attitudes of pedestrians to the vehicles on the routes as well as those things that were impeding their free movement.

A total of four hundred (400) samples were selected as a true representative of the population drawn from the drivers and passengers of private vehicle owners and commercial buses (light bus and molue), market men and women, shoppers, students and either road users.200 questionnaires each were for both pedestrian and vehicular drivers using simple random survey method such that the entire population was represented. To determine the distribution pattern of the 200 target population for questionnaire administration of vehicle drivers, the National Union of Road Transport Workers Association in the study area we as contacted for interview and in the process, the total number of commercial vehicle plying the routes were known through their registers to be 245 light buses and 115 trucks (molue). 20% samples each were taken using a random number table to elect from the union register.

a) The Research Findings

The traffic volume data were collected through enumeration exercise at various points in Oshodilocal government area. The pedestrian movements along with crossing the road are recorded on hourly traffic flow. The period of the survey is 12hours ranging from 7a.m to 7p.m as presented in the table 2; it was obtained that the pedestrian traffic volume during the weekday on Oshodi area is higher than that of the weekend. A total of 80780 traffic was obtained on weekday traffic volume while 68541 traffic was obtained in weekend traffic volume. This is because journey to work and school, which accounted for substantial part of weekend The heavy volume of pedestrian traffic here is due to the fact that Oshodi is a commercial centre and comprises of various intra and intercity bus terminal.

The peak hour traffic flow between 2-3p.m in the afternoon was 6240 when the school children are returning from school and this is followed by 5397 traffic flow between 4-5p.m in the evening time when the workers are returning home. The weekend pedestrian Peak hour was recorded between 5-6p.m as 5212. The evening peak period on weekend as due to this fact that majorly of the visitors to this area did so in afternoon, after having used the morning time to rest and attend to children, and returned home before 6.00p.m when the traffic holdup would have been at peak.

The total number of people crossing the road is relatively high. The weekday still recorded th highest number with 30129 and weekend being 25463. The peak hour of crossing for weekday was recorded to be 3324 between 2-3p.m. in the afternoon, while that of weekend was recorded to be 3417 between the hours of 5-6p.m. It was also recorded that only 146 (0.50%) and 128 (0.48%) pedestrians make use of footbridges to cross the road struggling with vehicles on the roadway.

This was attributed to the location of the footbridge that required pedestrian walking lengthy distance to reach because of distance to reach because of distance apart between bus stops and the footbridge From the survey data collected and presented in the table 3, vehicular traffic volume counts in Oshodi is

tremendously higher. This according to survey was due to the fact that the daily business activities in this place attract traffic from far and near. The weekday's traffic volume is higher with an average of 71,699 counted as against 66,012 traffic counted for the weekend traffic volume. The higher traffic volume was recorded on weekdays because journey to work and school, which counted for substantial part of weekday travel pattern, is not undertaken during the weekend.

The peak hour traffic flow between 7-8a.m in the morning was 6349 traffic during weekdays while that of the weekend was between 4-5p.m with 6857 traffic. The peak hour during the weekday accounted for high traffic rush in the morning when journey to work, schools and offices are undertaken. Afternoon peak period varies but mostly between 3-4p.m on weekdays with 6057 traffic counted and this is counted and this is influenced by school children returning from schools and evening peak hour was recorded between 5-6p.m on weekdays and 4-5p.m on weekend with an average of 5801 and 6857 traffic respectively. Morning peak hour traffics is often sharper and heavier than afternoon peak hour, which is often lighter because of extension over relatively long period of time.

Main purpose of visiting Oshodi: This is used to determine the cause of attraction of pedestrians to study area. From the table 4, the highest percentage (39.5) of pedestrians visiting the study area did so on other to enable them board vehicles to their various final destination. Pedestrian that came to buy one thing or the other accounted for 29percent while those that came to sell accounted for 23percenmt, other purpose accounted for the remaining 8.5 percent.

Mode of Transportation to the study area: According to table 5, 34,5 percent of the pedestrian came to the study area private transport. Those that came by public transports took the highest shire of 51 percent while the remaining 14.5 percent make their visit-on-foot. Therefore, it is easier to say that majority of the people of the found in this area came by public or commercial vehicles.

Reasons for buying and selling in Oshodi: From the survey data collected and presented in table 6, 33.5 percent of the pedestrians attributed their reasons to availability of variety of goods and services. 28 percent are for nearness/easy access to various commercial centres, while 36.5 percent of the pedestrians give reasons for cheap articles/many customers. 2 percent of pedestrians gave others different reasons for being in the study area such as availability of inter andintra city transport to others places in and outside the state

b) *Problems encountered in the Transportation system of the Study Area*

Congestion is the most common problem facing this study area, as vehicles hold up are seen everywhere and pedestrians finding it difficult to walk. 47 percent of the pedestrian interviewed complained seriously about this as major problem facing them. 32.5 percent of the people are also confronted with the problem of poor condition of roads. 16 percent of the people faced problem of unstable transport fare most especially on weekends and daily traffic peak hours while 45 percent of the people interviewed mentioned other problems encountered like theft. See table 7.

c) *Ways/method of solving the problems of pedestrian/vehicular conflicts in the study areas*

As can be seen in table 8, when the pedestrian were interviewed on ways of solving the problems of conflicts between them and the vehicular trafficsegregation; 24% accounted for those that support the provision of side walk while 8 percent sees the provision of the crossing facilities as a solution. The remaining 32 percent are those that recommend other ways such as organizing education seminal on the safety use of road to the pedestrian and enforcement of law and order prohibiting traders from displaying their goods on the road median and road side

III. Summary of Findings, Recommendation And Conclusion

a) *Summary Findings*

In the study area, it was observed that the volume of both pedestrians and vehicular traffic is higher on the weekday than weekend, and the traffic flow facilities are inadequate and those that are available were not properly enforced in order to ensure proper traffic management. The attitude of the pedestrian to footbridge as an option for road crossing varies from one area to the other and this is influenced by the type of road involved, that is, number of lanes and how busy such roads are. For instance, at Oshodi area, few people are found making use of this crossing facility instead they cross the road without making use of footbridge because the road is just two lanes with a wide median that allows for rest. Meanwhile most of these median have been taken over by the hawkers selling various good items that attract pedestrians in their hundreds, crossing the road and consequently causing obstruction to flow on traffic The use of road side and footbridge for commercial activities has been found to be a serious problem and a factor that contribute in no small measure to pedestrians and vehicular traffic conflict. The business activities on various footbridge is the study area have been found to have hindered its usage. Over half of the space that is meant for pedestrian traffic on the bridges are used up by traders who displayed goods on them, thereby causing congestion on them and consequently making them unattractive to pedestrians. Similarly, the use of roadside, walkway, sidewalk, road-median by traders and hawkers for commercial activities force the pedestrians to walk on the carriage way and thus

causing conflicts to traffic flow. This problem is found more pronounced at Oshodi area being a commercial centrewhere there is no adequate space for people that intend buying and selling goods and services It was observed that public transports as well as private car drivers usually engaged in on-street of vehicle which disturbs free flow of traffic. The commercial vehicle on-street parking are designation called bus/top. At Oshodi on the other hand, there is no slow lane. Hence, commercial buses are found paring along the road loading and unloading their vehicles thereby causing a reduction in the road width that is available to motorist, thus resulting in congestion, which also impacts free flow of traffic

IV. Recommendations

Provision of parking facilities: The space for parking vehicle is a basic requirements in a society where mechanical means of transport is of paramount sine the utility derivable from this means of transport diminished as working distance to point of final destination increases when parking is found missing. Thus, it will be a good thing, if parking facilities are made available in sufficient numbers to meet the parking needs of the motorist. Off street parking should be provided by the companies, industries and commercial enterprises/offices to meet the needs of their various visits that usually find parking on the roadside which in turn result to congestion

Parking Control: On-street parking should be prohibited totally on all roads within the study area to ensure a free flow of traffic. This should be done through the use of roadside sign which will be enforced by traffic wardens and staff of Lagos State Transport Management Authority (LASTMA).

Where on-street parking is inevitable like Oshodi, length of time permissible to stay should be controlled and the feasible methods recommended is introduction of parking pricing mechanism that discourages long time parking.

Traffic Control Device: Adequate provision should be made for road signs and carriage way marking for effective control.

These sign should show among others; NO PARKING, NO WAITING, NO HAWKING, direction and approaches to intersection. They should be in simple meaning. Conspicuously located easily recognizable, fulfill a need, command attention and also located at distance that give motorist sufficient time to take action (Hay, 1980)

Traffic warding should be placed at all intersection in the study area to ensure good conduct by motorists especially commercial transport operators and anyone found causing obstruction to traffic flow should be made to face all possible punishment so as to stop future occurrences.

Speed control: Speed limit should be introduced as part of traffic management measures. The main reason for this is to influence driver's behavior rather than to control traffic volume. With this, drivers will be conscious of pedestrians who partly own the right of way.

Road maintenance: Most roads in the study area are suffering from potholes. This is very serious because they forcer vehicle to crawl when approaching these roads and thus resulted to traffic hold up. Likewise, pedestrian with their two eyes widely open still sometimes miss their steps and consequently fall down on the roadway. As such, the authorities concerned should see to the regular maintenance of these roads. Effort should be made to ensure that potholes are patched as soon as when they are noticed before getting out of hand.

Pedestrian Traffic Management: The essence of this is to reduce the delay of pedestrian traffic and avoid lengthy delays. This will be achieved through frequent education by relevant agencies like Federal Road Safety Commission and Nigeria Police to the public especially the pedestrians on the needs to make use of pedestrian overhead bridge that segregate from vehicular traffic. Likewise, the law enforcement agent should assist to put right the use of pedestrian's walkway, as against what is presently on ground where pedestrians are forced to walk on the road, having been hijacked by traders and traders.

Enforcement of edicts and By-laws: The activities of the street traders, hawkers and refuse disposers have taken over roadside, road media and on-street parking area of commercial vehicles along most roads in the study area. The over spillages of commercial activities of street traders and refuse on the road is also a common phenomenon in Lagos, this to traffic congestions which disrupt free flow of traffic. As a result of these, edicts and byelaw should be enforced strictly by the Environmental Sanitation Task Force in order to yield the expected result.

V. Conclusion

Oshodi Local Government being an area that accommodated high level of commercial and industrial activities in Lagos is being faced with an apparent problem of vehicular and pedestrian traffic conflict and this is because the land-use is capable of attracting high vehicular and pedestrian traffic. The recommendations put forward have been in the light of findings from the field survey.

It is hoped that the successful, implementation of these recommendations will help to resolve a traffic conflict situation between the pedestrian and motorists in the study area thereby making the transportation in the area more efficient, functional and attractive to all road users.

Appendices

Table 1: Landuse Composition in Oshodi

Uses	Percentage (%)
Commercial	31.6
Residential	36.8
Industrial	16.9
Public	4.4
Transportation	10.3
Total	100.0

Source Akinlawon, O.A. 1992

Table 2: Hourly Pedestrian Traffic Flow in Oshodi

Time	Along the Road		Across the Road			
	Weekend	Weekdays	Weekday		Weekend	
			Road	Footbridge	Road	Foot Bridge
7-8am	2810	2854	2786	14	2543	16
8-9am	3196	3704	2614	18	2815	17
9-10am	2400	2654	2314	12	1986	11
10-11am	4671	3481	2276	16	1741	13
11-12am	2962	3128	2312	14	1853	14
12-1pm	2454	2396	2181	11	1747	15
1-2pm	3426	4547	2274	17	1668	8
2-3pm	3590	6240	3324	18	1717	6
3-4pm	4804	4668	2580	8	1316	9
4-5pm	3019	5397	2477	12	2114	11
5-6pm	5212	5014	2743	2	3417	5
6-7pm	7534	4668	2102	4	2418	5
Total	43,078	50,651	29,983	146	25,335	128

Source: Author's Field Survey, December, (2017)

Table 3: Hourly Vehicular Traffic Flow In Oshodi

Time	Weekdays	Weekends
7-8A.M	6349	5628
8-9	6298	6147
9-10	6241	6414
10-11	6005	5934
11-12	6025	5647
12-1	5664	5782
1-2	5981	6002
2-3	6003	6075
3-4	6057	6126
4-5	5696	6128
5-6	5801	5784
6-7	5579	5616
TOTAL	71,699	67,012

Source: Author's Field Survey, December, (2017)

Table 4: Main Purpose of Visiting Oshodi Local Government

Purpose	No. of Respondents	Percentage
To sell goods	46	23
To buy good	58	29
To board vehicles to other places	79	23
Site seeing	17	8
Total	200	100

Source: Author's Field Survey, December, (2017)

Table 5: Mode of Transportation of the Study Area

Mode	No. of Respondent	Percentage
Private means of Transport	69	34.5
Public means of Transport	102	51.0
On foot	29	14.5
Total	200	100

Source: AUTHOR'S field Survey, December, (2017)

Table 6: Reasons for Buying and Selling at Oshodi Local Government

Reasons	No. of Respondent	Percentage
Availability of variety of Goods and Services	57	33.5
Nearness/Easy Access to various centers	56	28.0
Cheap Articles/Many Customers	73	36.5
Others	4	2.0
Total	200	100

Source: Author's Field Survey, December, (2017)

Table 7: Problems Encountered in the Transportation System of the Study Area

Problems	No. of Respondents	Percentage
Congestion	94	47.0
Poor Road Condition	65	32.5
Unstable Transport Fare	32	16.0
Others	9	4.5
Total	200	100.0

Source: Author's Field Survey, (2017)

Table 8: Ways/Methods of Solving the Problems of Pedestrian/Vehicular Conflicts in the Study Area

Ways/Methods	No. of Respondents	Percentage
Vehicular/pedestrian	72	36
Provision of Sidewalk	48	24
Provision of Crossing Facilities	16	8
Others	64	32
Total	200	100

Source: Author's Field Survey, December, (2017)

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