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Examination of the Effects of Inadequate Parking Infrastructure on Traffic Flow in Ikeja Central Business District, Lagos Metropolis

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Abstract
Parking problems are very common in the Central Business District of Nigerian cities as a result of the rapid urbanization and large volume of economic activities that takes place within them. A good example of this within Lagos State is the state capital, Ikeja LGA, with its Central business District having multiple parking challenges both in terms of space provision, distribution and volume of vehicles requiring parking services. In view of the above issue, this research had undertaken an assessment of the impact of inadequate parking infrastructure on traffic flow in Ikeja Central Business District, Lagos Metropolis. This is for the purpose of solving the traffic congestion problem and parking challenges within the Ikeja CBD. Furthermore, the objectives of the research are to: determine the factors responsible for parking problems; identify the determining factors for the distribution and capacity of parking facilities; investigate the effectiveness of the existing parking infrastructure in meeting the demand of the growing parking needs; evaluate how efficient the agencies responsible for parking control and enforcement are in preventing parking related problems; examine the effect of parking related problems on traffic flow and congestion in Ikeja CBD. Clustered and stratified sampling techniques were used to select respondents for questionnaire administration and field measurement. The study found that the most critical parking requirement is for the commercial bus services and followed by shopping services around Ikeja Local Government Secretariat, computer village, Opebi, Kudirat Abiola road, Alausa and Allen Avenue and others. It was also discovered that absence of planned parking infrastructure around Ikeja CBD is the cause of on-street parking and traffic obstruction along the major and minor roads within the CBD. Nonetheless, the study recommended among others, the adoption of parking management, provision of additional standard parking facilities and information system, proper land use allocation and control, traffic control and enforcement.
Keywords: Parking, Traffic, Transport, Congestion, Vehicular, Metropolitan, Central Business District (CBD)
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Introduction

Globally, Parking facilities include indoor and outdoor private property belonging to a house, the side of the road where metered or laid out for such use, a parking lot (North American English) or car park (British English), indoor and outdoor multi-level structures, shared underground parking facilities, and facilities for particular modes of vehicle such as dedicated structures for cycle parking.

Every town, village, city and country strive to attain sustainable development but very few are prepared for the challenges associated with development such as the parking problems in major metropolis of the world, especially in developing nations such as Nigeria and other African countries. Parking problems is one of the few common problems of urban centers. In many metropolises, the parking problems becoming increasingly challenging and getting out of hand in places where the management is totally in existence (Bolade, 2005; Robert, 2013b). In Nigeria for instance, parking problems are very common in the Central Business District of the nation's cities, as a result of the growing concentration of population, rapid urbanization and large volume of economic activities that takes place within them (Olorunnimbe & Balogun, 2015). Following the rapid increment of traffic demands, the imbalance between parking supply and parking demand has been considered as the reason for metropolises parking problems (Yuejun Liu et al, 2012). Largely parking system plays a vital role in the metropolitan traffic system, and parking problems goes in tandem with the traffic congestion, traffic accident, and environmental pollution among others.

In urban settings such as Lagos, which is the fastest growing urban centre in Nigeria, the former capital city of Nigeria and the economic capital of the nation, parking challenges is ubiquitous due to increasing demand for mobility and commodity transportation. Nearly all the commercial areas of the state is challenged with one parking related problem or the other. However, one of the commercial centers in the state is the Ikeja Central Business District. The Ikeja central Business district is also the seat of Government in the state, it houses the three arms of Government (the Executives, the legislators and the judiciary) many commercial entities such as computer village, Shoprite, Ikeja industrial estate, local government secretariat and therefore the need to cater for the large volume of passenger and freight vehicles patronizing the area daily. Also, both private car owners and

commercial mini bus operators constitute a large percentage of road users in the Central Business District (CBD) of Ikeja.

The daily activities of the road users constitute traffic congestion due to problems of parking facilities and lack of adequate space for off road passenger and freight loading and offloading in the area which result into slowdown of human and vehicular movement and consequently result into delay in travel time. There are several factors for the parking problem and the poor traffic situation in the Ikeja CBD and include: high demand for movement, large number business activities, government services, short fall in motor park space, lack of adequate space for bus stop facility and absence of organized private or public parks. These factors are common to major business or commercial city centers of the world. For instance, the main reason for parking problems in Beijing can be concluded as the disparity between the supply of parking facilities and parking demand. *Yuejun Liu et al,(2012)*.

Since Ikeja CBD hosts series of industrial, commercial, recreational and institutional service functions, the supply of parking facility to accommodate the huge influx of vehicular traffic both passenger and freight is grossly inadequate. This is due to the fact that parking requirement for CBD business are grossly under estimated and under supply, because there is no plan provision for expanding the few existing one or constructing new higher capacity parks to accommodate the ever-increasing traffic inflow into Ikeja CBD on daily basis.

The challenges of parking in Ikeja CBD as brought about problem of traffic congestion along Ikeja Airport, Ikeja Local Government Headquarters, computer village, Ikeja general hospital, Allen avenue and Opebi roads, Obafemi Awolowo roundabout, Agidingbi road, Oba Akran road, Alausa secretariat, Elephant house and Guinness road. In fact, none of the mass transit bus scheme that is supposed to reduce automobile inflow in Ikeja CBD is channeled towards the area as all are geared towards solving mobility problem along Oshodi, Iyana-Ipaja, Lagos Island and Ikorodu road. In this area the planners have failed to integrate parking development into the city plan while road traffic management agencies have failed to enforce the parking regulations that requires motorist to park off-road (Olorunnimbe et. al., 2015).

In the same manner, Oni, (1992) noted that under the right conditions, parking policies can be used to reduce the congestion problems as also stated in the study conducted by Litman (2012);. In most cases however, the right conditions where everyone pays the true cost for their parking do not exist. It is arguable however, that the good design of the parking policies in various ways contributes to smoothing the transportation networks, lowering emissions, high densities and betters more of urban mobility (Shaw, 1989; Oni, 1999;), while poor design of parking policy tends to act otherwise (Osoba, 2012).

Also, the findings from Olorunnimbe et. al. on the challenges of parking at Oshodi CBD revealed that the central business district is characterized by traffic congestion, on street parking and inadequate parking facility. This is basically due to lack of adequate planning for appropriate and efficient parking facilities for vehicles in the area. However, series of parking and traffic management programs such as Parks Monitoring Unit, Lagos State Traffic Management Authority (LASTMA), Parks and Market Monitoring Unit of the state had established as corrective measures and implemented same to minimize the parking and traffic problem in the Ikeja Central Business District but none has significantly reduce the problem of traffic congestion due to parking inadequacies.

It is against this backdrop that this paper examined the parking challenges and the associated traffic flow problems in Ikeja Central Business District (CBD) of Lagos State, Nigeria with the objectives to: determine the factors responsible for parking problems in Ikeja Central District; identify the determining factors for the distribution and capacity of parking facilities in Ikeja Central Business District; investigate the effectiveness of the existing parking infrastructure in meeting the demand of the growing parking needs in Ikeja Central Business District; and examine the effects of parking related problems on traffic flow and congestion in Ikeja CBD.

The importance of this study lies in its intent towards curtailing the numerous transport problems in Lagos CBDs where transport demand is very high and parking facilities for meeting the demand in order to ease traffic flow is grossly limited. Therefore, this study examined the effects of absence of adequate parking facilities on traffic flow and the road congestion in Ikeja CBD.

Study Area

The indigenous people of the Lagos state are the Awori and Egun in Ikeja and Badagry areas respectively and the Ijebus in Ikorodu and Epe. The state has 20 local government areas (fig. 1.0) as recognized by 1999 amended constitution of Federal Republic Nigeria but proposed for additional 37 local government areas which are yet to be considered by the National Assembly. Ikeja CBD is part of the Ikeja Local government Council Area (fig. 1.1) it represents one of the city's urban centres with approximately 1,640 km2 land mass (Lagos Metropolitan Area Transportation Study, 2015).

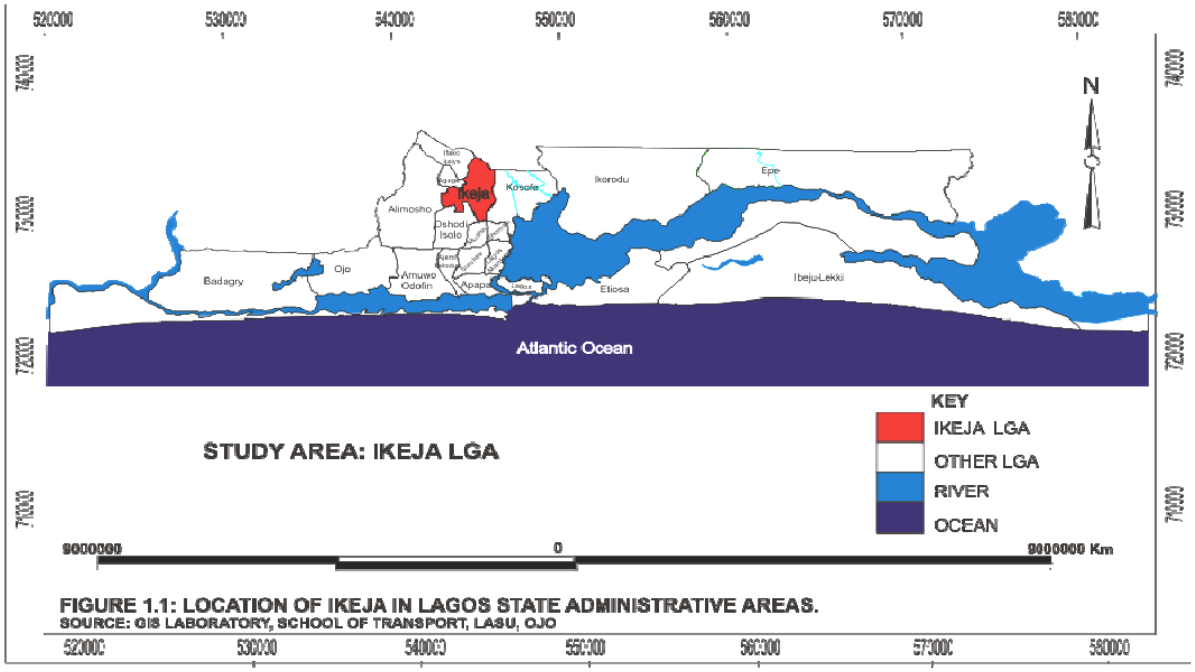

Figure.1.0: Location of Ikeja CBD among the core Metropolitan LGAs of Lagos.
Source: LAMATA, 2020

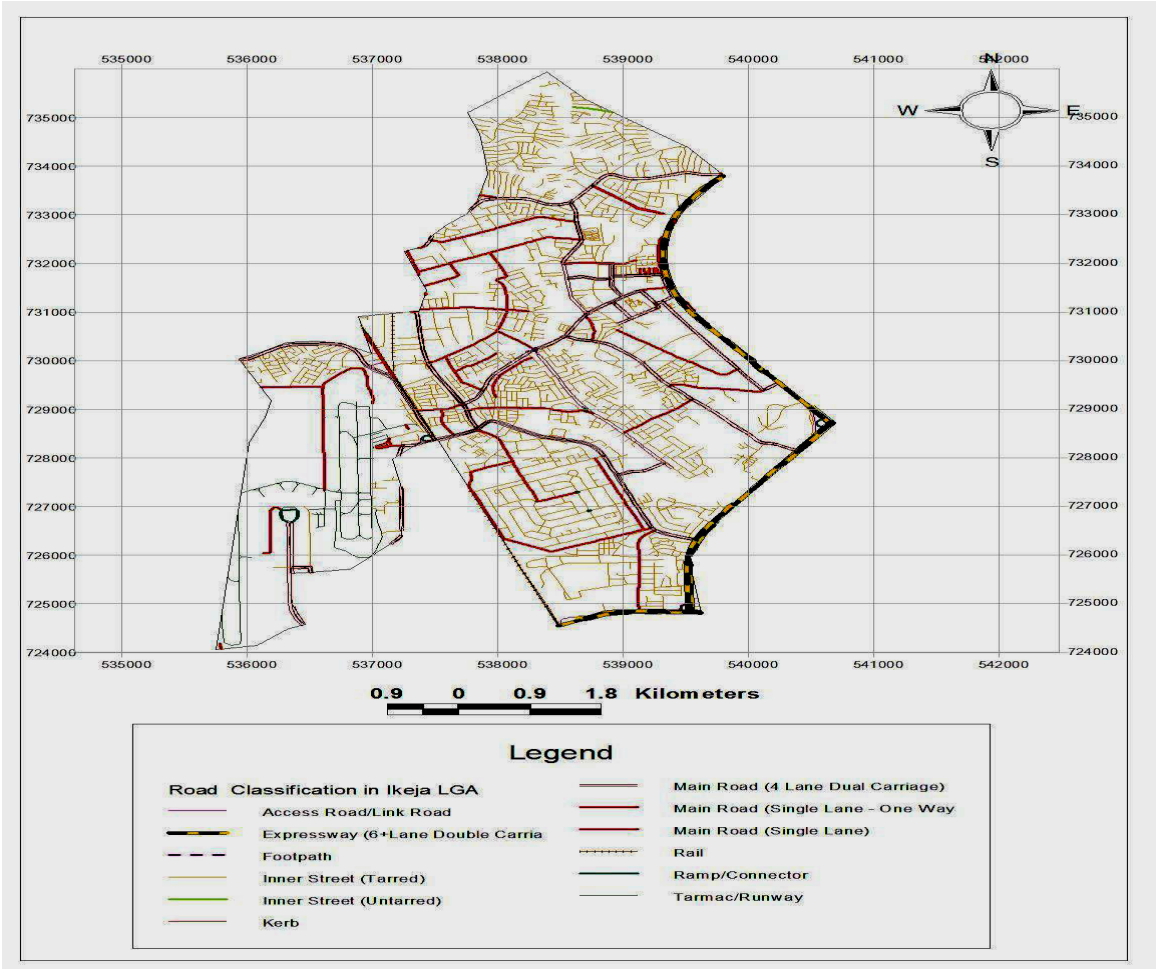

Figure 1.1: Road Network of Ikeja Local Government Area.
Source: modified from Adebayo, O. H., 2019

Theoretical and Conceptual Consideration

A. Traffic Assignment Model

This model assigns vehicles to the traffic and parking network given an origin- destination matrix. According to Austin (1973), two processes are used for the allocation of parkers to parking stations in a Central Business District (CBD) area. Firstly, using trip generation model to determine the number of trips destined to a particular zone in the CBD. Second, Parkers were then distributed to parking stations depending on the cost of parking and walking distance.

B. Traffic Flow Theory

This theory was propounded by Wattle Worth (1976). Since then there has been much significant development in traffic flow theory. Some of these developments have led to very useful relationship while some application has not been all that useful. Wattle Worth (1976), affirms that the most useful result of traffic flow theory is the development of the relationship among the macroscopic variables of traffic stream flow, that is, flow rate, speed and density. Traffic Engineering uses the flow theory for the development of the level of services concept. However, there has been some criticism of the traffic flow theory regarding the lag between the theoretical development and the application of some portion of the flow theory work. The traffic flow theories have largely looked into the basic relationship (why things happen).

C. Urban Car Parking Model

This model is of significance importance both at the local and at the strategic level of planning, parking policy and supply play a major role in traffic management systems in dense urban areas. The general approach has been extended (Le & Young, 1989) to take into account mixed land uses. The distinguishing features of the models that should be used to investigate parking policy are that they should accurately represent these relationships. S. B. Osoba, (2012).

There are two main reasons for modelling urban centre parking, they are as follows:

- to ensure that the forecasts of the demand for travel to the urban centre by car are consistent with the forecasts of the available parking spaces; and, within that constraint,
- to ensure that the car vehicle trips end at zones containing car parks as opposed to zones where the a ctivities of the occupants take place and where there might be insufficient parking. Agyemang, Ernest (2009)

IV. Research Methods

A comprehensive reconnaissance study was carried out in the study area. This took into consideration the use and design of parking lots, the size and location of parking lots and the landuse activities in the study area. The data for this research was obtained from both primary and secondary sources. The primary data was derived through field observation and measurement of parameters on parking facilities and function. These include the location and capacity of parking infrastructure in Ikeja CBD, the determination of parking pattern and condition of facilities, the management type, effects of parking on traffic flow, congestion delay and traffic count at each location of parking facility, or in areas needing parking facility. The secondary source of data was obtained from the published and unpublished literature and electronic media such as internet, journals, textbooks and other publications.

The study population comprise of all commercial and private parking facility available in Ikeja CBD which accommodates at least 20 vehicles and above. The distribution of these facilities across Ikeja CBD was tabulated and their characteristics determined. All identified public and private parking area except residential building parks were examined as the study population. However, 14 parking facilities in the Ikeja CBD met this research's criteria.

The sampling procedure entails a combination of cluster, stratified and systematic sampling techniques which were used at the locations of study (in a predetermined system that is fixed by the GPS on the map of Ikeja LGA) to identify, measure and observe the parameters of interest. However, the stratified sampling grouped the park facilities into classes based on capacity, nature of operation and condition of infrastructure during the field observation and measurement.

Importantly, one-week traffic survey was carried out in Ikeja CBD while the results obtained are presented in section 4.2. Also, the traffic count was carried out along the road sections of the parking lots and bus stop spaces in order to determine the effects of parking activity on traffic flow within Ikeja Central Business District. The effect of parking obstruction on traffic flow was measured using simple analytical metrics such as mean traffic flow, daily total traffic flow, locational volume, average hourly flow, average delay flow, total weekly flow and queue length at each parking zone. Results were presented using tables, graphs, charts, photographs and frequency distribution tables.

V. Results and Discussion

The analysis of the data derived from field measurement and traffic events observation within Ikeja Central Business District are presented below. A total of nineteen (19) parking locations were studied across different

traffic locations in the CBD. The result of the analysis pointed out the effects of parking challenges on the persistent traffic problem in Ikeja CBD area of Lagos state.

D. Analysis Of factors demanding parking and traffic flow in Ikeja CBD

Findings from the fieldwork as revealed in table 4.1 shows that a total of 78% of the respondents attests to the dominance of employment and business activities as the most important factors influencing the need for parking due to high vehicular flow into Ikeja Central Business District (CBD). This was followed by shopping and patronage of recreational facilities (18%) located in and around the Ikeja CBD. Other factors which form just 4% of the responses obtained include: transit journey, medical attention and visit for administrative services.

Furthermore, 66% of the respondents affirmed that the distribution and usage of parking facilities within Ikeja CBD is determined by nearness of these facilities to their offices, shops and destinations. Also, 16% believed it is due to lack of parking space at their destination while 14% of the respondents utilized them for in order to avoid traffic congestion. On the other hand, it was discovered that 78% of the respondents reside outside the CBD and travel through buses, cars and tricycle to Ikeja on daily basis. Therefore, the influx of vehicles transporting the commuters to Ikeja CBD daily is usually one of the causes of traffic congestion in the area.

Considering the means of commuters' travel, table 4.1 further revealed that majority of the respondents travel to the CBD through privately owned vehicle (52%), this is followed by public transport (44%) and lastly pedestrianization (4%). This implied that vehicles density along the Ikeja CBD roads will be high due to prevalence of private automobiles which convey only small proportion of the commuters at once. This may be another reason for road traffic congestion in the study area.

An examination of the time delay experienced by respondents as shown in table 1 revealed that most of the respondents spend between 30 minutes and 1 hour in traffic delay. The delay caused by traffic congestion has a negative impact on business transaction, consequent to man-hour loss to traffic delay.

Table 1: Purpose of Visit to Ikeja Central Business District

Factors/Purpose of Travel	**No. of Respondents**	**Percentage (%)**
Employment	16	32
Business	23	46
Shopping	6	12
Recreation	3	6
Others (Specify)	2	4
Total	50	100
Reasons for usage of parking facilities	**No. of Respondents**	**Percentage (%)**
Nearness to my destination	33	66
No Parking space in my destination	8	16
To avoid traffic congestion	7	14
No reason	2	4
Total	50	100
Location of Respondents' residential areas	**No. of Respondents**	**Percentage (%)**
Within the Business District	11	22
Outside the Business District	39	78
Total	50	100
Means of Respondents' Travel	**No. of Respondents**	**Percentage (%)**
Private vehicle	26	52
Public Transport	22	44
Walking	2	4
Total	50	100
Traffic Delay experienced at Ikeja CBD	**No. of Respondents**	**Percentage (%)**
Less than 30 minutes	23	46
Between 39 minutes – 1 Hour	24	48
Above 1 Hour	3	6
Total	50	100

Source: Author's Survey, 2020.

Nonetheless, it is pertinent to undertake full assessment of the parking facilities and traffic situation within Ikeja CBD in order to determine the effect of inadequate parking facilities on traffic flow in the area.

E. Analysis of Parking Characteristics in Ikeja CBD

Parking survey in the Ikeja CBD was under taken through the two basic parking methods, namely: On-Street and Off-Street parking facilities. On-Street Parking is the resting of vehicles on the sides of the road, it may be planned or unplanned. Terminal parking or off-street parking involve parking in a lot, garage, shopping center,

private driveway or motor parks. Bus-stop – Is a parking space provided for motorists along the road way for buses to load and unload passengers for temporary period, it may be in the central business districts or other major roads or districts. The results obtained from the survey are presented in tables 2- 5.

F. Parking Infrastructure Analysis

Table 2: Nature and Characteristics of Parking Facility at Ikeja CBD

S/N	Name of park	Location	Capacity	Parking pattern	Condition of facility	Nature of operation	Parking charges	No. of vehicle parked
1	no name & not planned	Oba Akran Way	Not planned	parallel	On-street Unplanned	Commercial	NURTW loading fee - commercial buses	51 commercial buses
2	Old Ikeja park	Medical road	15 HOVs	45 degree	Tarred and planned	Commercial	Not yet known	15spaces HOVs
3	New Ikeja park	Simbiat Abiola way	72 HOVs	45 degree	Tarred and planned	Commercial	Not yet known	72 spaces for HOVs
4	No name Private car park	Simbiat Abiola Way	20 buses	90 degree	Tarred and planned	Commercial and private	#500 -7am-6pm	20 buses
5	no name & not planned	Simbiat Abiola way	Not planned	90 degree & parallel	On-street Unplanned	Private and commercial	#200 by cars and NURTW fee - buses	Cars-151, commercial bus-16, truck 6
6	no name & not planned	Adegbola street	Not planned	parallel	On-street Unplanned	Private and commercial	NURTW loading fee by com. Buses	Commercial bus 33, private car-21, truck-9
7	no name & not planned	Oduyemi street	Not planned	parallel	On-street Unplanned	Private and commercial	NURTW loading fee by com. Buses	Tricycle-10, motor cycle-16, car-5
8	no name & not planned	Medical road-Awolowo way	Not planned	parallel	On-street Unplanned	Commercial	NURTW loading fee by com. Buses	Tricycle-59, ruck-3commercial bus-28, t
9	no name & not planned	Akinremi street	Not planned	parallel	On-street Unplanned	Private and commercial	NURTW loading fee by com. Buses	Tricycle-10, ruck-2commercial bus-14, t
10	no name & not planned	Shodipe street	Not planned	parallel	On-street Unplanned	Private and commercial	NURTW loading fee by com. Buses	Tricycle-8, commercial bus-15
11	no name & not planned	under bridge-Kodeso street	Not planned	parallel	On-street Unplanned	Commercial	NURTW loading fee by com. Buses	Tricycle-39 Taxi-20
12	no name & not planned	Opebi junction	Not planned	parallel	On-street Unplanned	Commercial	NURTW loading fee by com. Buses	Tricycle-41, commercial bus-8,
13	no name & not planned	Oba Akinjobi Road-LASUTH	Not planned	parallel	On-street Unplanned	Commercial	NURTW loading fee by com. Buses	Tricycle -53
14	no name & not planned	ASSBIFI Road	Not planned	Parallel on both sides	On-street Unplanned	Private and commercial	None	Taxi-51, cars-94,
15	Staff car park	ASSBIFI Road	75 cars	Formerly in Parallel	Now changed to LIRS office	Private	Formerly #200	Formerly 75 cars now occupied by LIRS Building
16	no name & not planned	Off-ASSBIFI Road	Not planned	parallel	On-street Unplanned	Private and commercial	None	Taxi-78
17	no name, private park	CIPM Road	48 buses	Organized in Parallel	space provided off-street	Commercial	NURTW loading fee by commercial buses	Buses-48
18	no name & not planned	CIPM Road	Not planned	Parallel on both sides	On-street Unplanned	Private	None	Cars-52
19	Alausa Secretariat	Alausa Secretariat	Approved and planned	Organized in Parallel roles and clusters	Park space provided but still radiated out to the roads	Private or institutional	None	Min. of Edu.-40 Min. of Inform. & Health-30 Min. of Work-100 Min. of Housing, Tour. & Water-100 Min. of Finance- 50 Min. of Civil Service Com.-30 Min. of Wealth, Energy & Minerals-45 Min. of Home Affairs & Liaison-30 Min. of Justics-80 Min. of Transport-60 Min. of Sport, Budget, Science & Tech and Women Affairs-80 Staff bus Park- 30 GTB park -25
20	Alausa Secretariat	Alausa Secretariat	unapproved parking	Parallel	On-street Unplanned	Private or institutional	None	Min. of Edu.- 32 Min. of Inform. & Health-22 Min. of Housing, Tourism & Water-20 Min. of Finance- 11 Min. of Civil Service Com.-15 Min. of Wealth, Energy & Minerals-18 Min. of Home Affairs & Liaison-25 Min. of Justics-20 Min. of Transport-30 Min. of Sport, Budget, Science & Tech and Women Affairs-21 Staff bus Park- 22

Source: Author's fieldwork, 2020.

Table 3: Distribution of Planned Parking Facilities in Ikeja CBD.

S/N	Name of park	Location	Capacity	Parking pattern	Condition of facility	Nature of operation	No. of vehicle parked
1	Old Ikeja park	Medical road	72 HOVs	45 degree	Tarred and planned	commercial	72 spaces HOVs
2	New Ikeja park	Simbiat Abiola way	15 HOVs	45 degree	Tarred and planned	commercial	15 spaces for HOVs
3	Private car park	Simbiat Abiola Way	20 buses	90 degree	Tarred and planned	Commercial and private	20 buses
4	Staff car park	ASSBIFI Road	Formerly 75 cars	Formerly organized in Parallel roles	Now converted to LIRS Tax office	Private	Formerly about 75 cars but now occupied by LIRS Building
5	No name	CIPM Road	50 buses	Organized in Parallel roles	Park space provided off-street	commercial	Buses-48
6	Alausa Secretariat	Alausa Secretariat	700 cars	Organized in Parallel roles and clusters	Park space provided but still radiated out to the roads	Private or institutional	Min. of Edu.-40 Min. of Inform. & Health-30 Min. of Work-100 Min. of Housing, Tour. & Water-100 Min. of Finance- 50 Min. of Civil Service Com.-30 Min. of Wealth, Energy & Minerals-45 Min. of Home Affairs & Liaison-30 Min. of Justics-80 Min. of Transport-60 Min. of Sport, Budget, Science and Women Affairs-80 Staff bus Park- 30 GTB park -25
Total Planned Park Capacity = 932 vehicles							

Source: Author's fieldwork, 2020.

Table 4: Distribution of Unplanned Parking Locations in Ikeja CBD

S/N	Name of park	Location	Capacity	Parking pattern	Condition of facility	Nature of operation	No. of vehicle parked
1	No name	Oba Akran Way	Not planned	Parallel	On-street Unplanned	Commercial	51 commercial buses
2	No name	Simbiat Abiola way	Not planned	90 degree & parallel	On-street Unplanned	Private and commercial	Cars-151, commercial bus-16, truck 6
3	No name	Adegbola street	Not planned	Parallel	On-street Unplanned	Private and commercial	Commercial bus 33, private car-21, truck-9
4	No name	Oduyemi street	Not planned	Parallel	On-street Unplanned	Private and commercial	Tricycle-10, motor cycle-16, car-5
5	No name	Medical road-Awolowo way	Not planned	Parallel	On-street Unplanned	Commercial	Tricycle-59, commercial bus-28, truck-3
6	No name	Akinremi street	Not planned	Parallel	On-street Unplanned	Private and commercial	Tricycle-10, commercial bus-14, truck-2
7	No name	Shodipe street	Not planned	Parallel	On-street Unplanned	Private and commercial	Tricycle-8, commercial bus-15
8	No name	Under bridge-Kodeso street	Not planned	Parallel	On-street Unplanned	Commercial	Tricycle-39, Taxi-20
9	No name	Opebi junction	Not planned	Parallel	On-street Unplanned	Commercial	Tricycle-41, commercial bus-8,
10	No name	Oba Akinjobi Road- LASUTH	Not planned	Parallel	On-street Unplanned	Commercial	Tricycle -53
11	No name	ASSBIFI Road	Not planned	Parallel, both sides	On-street Unplanned	Private and commercial	Taxi-51, cars-94,
12	No name	Off-ASSBIFI Road	Not planned	Parallel	On-street Unplanned	Private and commercial	Taxi-78
13	No name	CIPM Road	Not planned	Parallel, both sides	On-street Unplanned	Private	Cars-52
14	Alausa Secretariat	Alausa Secretariat	Not planned	Parallel	On-street Unplanned	Private or institutional	Min. of Edu.- 32 Min. of Inform. & Health- 22 Min. of Housing, Tourism & Water-20 Min. of Finance- 11 Min. of Civil Service Com.- 15 Min. of Wealth, Energy & Minerals-18 Min. of Home Affairs & Liaison-25 Min. of Justics-20 Min. of Transport-30 Min. of Sport, Budget, Science & Tech and Women Affairs-21 Staff bus Park- 22
Total Unplanned Park Capacity = 1107 vehicles.							

Source: Author's fieldwork, 2020.

Table 5: Comparative Analysis of the Capacity of Planned and Unplanned Parking Locations in Ikeja CBD

S/N	Location	Planned (Off-street) park capacity (no. of vehicles)	Unplanned (On-street) park capacity (no. of vehicles)	% of planned Parking	% of unplanned parking	Total no. of parked vehicles at location
1	Oba Akran Way	0	51	0%	100%	51
2	Simbiat Abiola way	72	173	35%	65%	265
3	Adegbola street	Nil	66	0%	100%	66
4	Oduyemi street	Nil	31	0%	100%	31
5	Medical road-Awolowo way	Nil	90	0%	100%	90
6	Akinremi street	Nil	26	0%	100%	26
7	Shodipe street	Nil	23	0%	100%	23
8	Under bridge-Kodeso street	Nil	59	0%	100%	59
9	Opebi junction	Nil	49	0%	100%	49
10	Oba Akinjobi Road-LASUTH	Nil	53	0%	100%	53
11	ASSBIFI Road	Nil	145	0%	100%	145
12	Off-ASSBIFI Road	Nil	78	0%	100%	78
13	CIPM Road	48	52	48%	52%	100
14	Alausa Secretariat	700	214	76.6%	23.4%	914
Total number of vehicular parking space required within Ikeja CBD = 2041						

Source: Author's Fieldwork, 2020.

The results obtained from the field findings as shown in table 2, 3, 4 and 5 revealed that the challenges of parking need within Ikeja CBD is enormous, the available planned and off-street parking facilities (932 vehicle parking spaces) are grossly below the required number (2041 vehicular parking spaces) of parking demand within the CBD. This mean that less than 50% of the required parking demand within Ikeja CBD is been supplied by both the government and the private businesses. The implication is that the roads are been converted to parking lots thereby causing obstruction to moving traffic and therefore the cause of traffic congestion being experienced in Ikeja Central Business District. The traffic challenges and the delays resulting from the on-road parking are discussed in the next sub-section.

Traffic Volume Analysis and Delay Associated With the Absence of Parking Infrastructure

Table 6: Hourly Traffic Flow on Adegbola Street, Ikeja CBD

S/N	Time	Monday	Wednesday	Friday	Week Days Total	Average	Average delay due to parking obstruction (in minutes)
1	7:00am-8.00am	172	165	186	**523**	174.3	15 min.
2	8.00am-9.00am	189	156	183	**528**	176	21min.
3	9.00am-10.00am	182	174	178	**534**	178	17 min.
4	10.00am-11.00am	126	118	164	**408**	136	12 min.
5	2.00pm-3.00pm	118	112	154	**384**	128	8 min.
6	3.00pm-4.00pm	165	154	188	**507**	169	10 min
7	4.00pm-5.00pm	196	184	203	**583**	194.3	22 min
8	5.00pm-6.00pm	204	192	242	**638**	212.6	28 min
	Total	**1352**	**1255**	**1498**	**4105**		133 min. (in 8 hours)

Source: Author's Fieldwork, 2020.

Table 6 revealed that traffic along Adegbola road in Ikeja CBD is been affected by vehicular parking on this road. The table also shows that peak period traffic along this road is above 1200 vehicles on daily basis. It can also be observed on the table that more than 2 hours of traffic delay was recorded during the 8 hours peak period studied. This means that the unplanned and on-road parking around Ikeja CBD contributed to the long hours of delays and traffic congestion in Ikeja CBD. Figure 4.4 shows the long queues of commercial buses parking and complete overtaken a lane on Adegbola Street causing traffic build up and delays to other vehicles travelling along the road.

Table 7: Hourly Traffic Flow on Medical Road, Computer Village Ikeja CBD

S/N	Time	Monday	Wednesday	Friday	Week Days Total	Average	Average delay observed due to parking obstruction (in minutes)
1	7:00am-8.00am	456	412	432	**1300**	433.3	20 min.
2	8.00am-9.00am	640	568	652	**1860**	620	26min.
3	9.00am-10.00am	488	479	680	**1647**	549	25 min.
4	10.00am-11.00am	424	420	560	**1404**	468	14 min.
5	2.00pm-3.00pm	320	312	521	**1153**	384.3	12 min.
6	3.00pm-4.00pm	410	412	588	**1410**	470	16 min
7	4.00pm-5.00pm	611	568	602	**1781**	593.6	22 min
8	5.00pm-6.00pm	679	596	698	**1973**	657.6	32 min
	Total	**4028**	**3787**	**4733**	**4105**		167 min. (in 8 hours)

Source: Author's Fieldwork, 2020.

However, the volume of traffic and the delays recorded on medical road around Ikeja Local Government Secretariat is higher than other locations. As shown in table 7 Daily Peak Hours Traffic on this road above 4000 vehicles and delay recorded is almost 3 hours (2hours 47 minutes in 8 hours of traffic monitored). The magnitude of this delay signifies the urgent need to put in place planned and control parking facilities within Ikeja CBD as vehicular parking influences the traffic obstructions.

Table 8: Hourly Traffic Flow on Akinremi Street, Ikeja CBD

S/N	Time	Monday	Wednesday	Friday	Week Days Total	Average	Average delay observed due to parking obstruction (in minutes)
1	7:00am-8.00am	198	156	201	**555**	185	10 min.
2	8.00am-9.00am	240	198	254	**692**	231	14min.
3	9.00am-10.00am	248	223	263	**734**	245	11 min.
4	10.00am-11.00am	210	201	208	**619**	206	8 min.
5	2.00pm-3.00pm	178	143	174	**495**	165	6 min.
6	3.00pm-4.00pm	198	186	202	**586**	195	8 min
7	4.00pm-5.00pm	245	213	268	**726**	242	17 min
8	5.00pm-6.00pm	252	232	272	**758**	252	21 min
	Total	**1769**	**1552**	**1842**	**5165**	H. AVR.= 215	95 min. (in 8 hours)

Source: Author's Fieldwork, 2020.

In the same vein, table 8 shows that the volume of traffic and the delays Akinremi street around Ikeja Local Government Secretariat is moderate compared to the previous locations known for bus and car parking. The table revealed a Daily Peak Hours Traffic of above 1700 vehicles and delay recorded is 1 hour 35 minutes. This indicated that delay due to vehicular parking on this road is lower than the previous three locations discussed.

Table 9: Hourly Traffic Flow on Oba Akran Road, Ikeja CBD

S/N	Time	Monday	Wednesday	Friday	Week Days Total	Average	Average delay observed due to parking obstruction (in minutes)
1	7:00am-8.00am	810	710	796	**2316**	772	5 min.
2	8.00am-9.00am	840	804	864	**2508**	836	6min.
3	9.00am-10.00am	882	834	886	**2602**	867	11 min.
4	10.00am-11.00am	724	756	804	**2284**	761	8 min.
5	2.00pm-3.00pm	425	452	502	**1379**	460	5 min.
6	3.00pm-4.00pm	624	462	622	**1708**	569	7 min
7	4.00pm-5.00pm	789	658	856	**2303**	768	10 min
8	5.00pm-6.00pm	842	798	896	**2536**	845	12 min
	Total	**5936**	**5474**	**6226**	**17636**		64 min. (in 8 hours)

Source: Author's Fieldwork, 2020

Along Oba Akran Road, information on table 9 revealed that traffic is higher than that of Akingbola, Akinremi and Medical roads around the computer village. The volume of traffic on this road during the peak period is about 6000 vehicles (in 8 hours) while the delays observed (64 minutes out of 8 hours) was very low compared to the three roads discussed above. This reduction in traffic delays may be due to the removal and prevention of vehicles from parking along the road and under the Awolowo Bridge in Ikeja CBD.

Table 10: Hourly Traffic Flow on Allen Avenue, Ikeja CBD

S/N	Time	Monday	Wednesday	Friday	Week Days Total	Average	Average delay observed due to parking obstruction (in minutes)
1	7:00am-8.00am	1120	910	1111	**3141**	1047	15 min.
2	8.00am-9.00am	1220	1087	1310	**3617**	1206	21min.
3	9.00am-10.00am	1025	910	1080	**3015**	1005	17 min.
4	10.00am-11.00am	986	656	911	**2553**	851	12 min.
5	2.00pm-3.00pm	542	532	543	**1617**	539	8 min.
6	3.00pm-4.00pm	667	634	711	**2012**	671	10 min
7	4.00pm-5.00pm	1168	898	986	**3052**	1017	22 min
8	5.00pm-6.00pm	1196	987	1046	**3229**	1076	28 min
	Total	**7924**	**6614**	**7698**	**22236**		133 min. (in 8 hours)

Source: Author's Fieldwork, 2020.

Furthermore, the Allen Avenue road as shown in table 10 is also usually known for congestion especially during the peak periods due to high volume of traffic coupled with the vehicle movement (in and out) of shopping mall, banks, restaurants and clubs. The lack of required parking spaces at these service centers usually result in incessant traffic obstruction and the flow delay commonly being experience along this road. The vehicular traffic (7924 vehicles /8 hours) on this road is the fifth highest compared to other locations within the Ikeja CBD. The observed daily traffic delay in this location is more than 2 hours (133 minutes in 8 hours

Table 11: Hourly Traffic Flow on Opebi Road, Ikeja CBD

S/N	Time	Monday	Wednesday	Friday	Week Days Total	Average	Average delay observed due to parking obstruction (in minutes)
1	7:00am-8.00am	2546	2142	2424	**7112**	2371	14 min.
2	8.00am-9.00am	2680	2368	2702	**7750**	2583	19min.
3	9.00am-10.00am	2801	2710	2946	**8457**	2819	12 min.
4	10.00am-11.00am	1971	2010	2012	**5993**	1998	11 min.
5	2.00pm-3.00pm	1201	1202	1102	**3505**	1168	7 min.
6	3.00pm-4.00pm	1988	1422	1899	**5309**	1769	16 min
7	4.00pm-5.00pm	2402	1892	2486	**6780**	2260	21 min
8	5.00pm-6.00pm	2854	2342	2921	**8117**	2706	26 min
	Total	**18443**	**16088**	**18492**	**53023**	17674	126 min. (in 8 hours)

Source: Author's Fieldwork, 2020.

Also, the findings as shown in table 11 revealed that the traffic flow along Opebi road is the highest within

Ikeja CBD. The road conveys 18,492 in 8 hours and recorded 2hour and 3 minutes of traffic daily within the 8 hours traffic count. This road is similar to that of Allen Avenue in terms of traffic delay due to the fact that they both serve the busiest shopping and servicing outlets within the CBD. More so, they are both known for on-street parking of vehicles both private and commercial vehicles loading and unloading passengers.

Table 12: Hourly Traffic Flow on Toyin Street, Ikeja CBD

S/N	Time	Monday	Wednesday	Friday	Week Days Total	Average	Average delay observed due to parking obstruction (in minutes)
1	7:00am-8.00am	932	1021	1212	**3165**	1055	3 min.
2	8.00am-9.00am	1632	1392	1622	**4646**	1549	7min.
3	9.00am-10.00am	1324	1010	1322	**3656**	1218	8 min.
4	10.00am-11.00am	1120	936	1098	**3154**	1051	5 min.
5	2.00pm-3.00pm	896	688	910	**2494**	831	3 min.
6	3.00pm-4.00pm	910	710	988	**2608**	869	5 min
7	4.00pm-5.00pm	1342	968	1324	**3634**	1211	7 min
8	5.00pm-6.00pm	1542	1032	1560	**4134**	1378	8 min
	Total	**9698**	**7757**	**10036**	**27491**		46 min. (in 8 hours)

Source: Author's Fieldwork, 2020

Another recreational and service area in Ikeja CBD is Toyin Street. This road as shown in table 12 is the third highest in terms of traffic flow within the CBD. The observed daily traffic on this street is 10,036 vehicles in 8 hours of observation. However, the daily traffic delay recorded is 46 minutes in 8 hours. This shows that Toyin street have more private parking space within the service centers which make traffic delay lesser than that of Allen Avenue.

Table 13: Hourly Traffic Flow on Kudirat Abiola Road, Ikeja CBD

S/N	Time	Monday	Wednesday	Friday	Week Days Total	Average	Average delay observed due to parking obstruction (in minutes)
1	7:00am-8.00am	1448	1023	1389	**3860**	1287	9 min.
2	8.00am-9.00am	1644	1434	1622	**4700**	1567	12min.
3	9.00am-10.00am	1498	986	1344	**3828**	1276	8 min.
4	10.00am-11.00am	1023	895	989	**2907**	969	10 min.
5	2.00pm-3.00pm	926	806	892	**2624**	875	7 min.
6	3.00pm-4.00pm	1062	765	1036	**2863**	954	11 min
7	4.00pm-5.00pm	1334	996	1245	**3575**	1192	18 min
8	5.00pm-6.00pm	1532	1346	1611	**4489**	1496	19 min
	Total	**10467**	**8251**	**10128**	**28846**		94 min. (in 8 hours)

Source: Author's Fieldwork, 2020

More specifically, the location with the second highest traffic within Ikeja CBD is Kudirat Abiola road. Table 13 shows that traffic on this road is above 10,000 vehicles in 8 hour and the road is known for long stretch of on-road parking especially by the commercial tricycle, motor cycle and Danfo buses. There is no planned parking facility on this road and traffic delay is 1 hour 34 minutes in 8 hours. This increases the travel time on this road and affect businesses.

Table 14: Hourly Traffic Flow on CIPM Road, Ikeja CBD

S/N	Time	Monday	Wednesday	Friday	Week Days Total	Average	Average delay observed due to parking obstruction (in minutes)
1	7:00am-8.00am	1061	1010	974	**3045**	1015	4 min.
2	8.00am-9.00am	1198	986	1420	**3604**	1201	6 min.
3	9.00am-10.00am	1210	865	986	**3061**	1020	7 min.
4	10.00am-11.00am	1101	786	1034	**2921**	973	5 min.
5	2.00pm-3.00pm	810	568	910	**2288**	763	3 min.
6	3.00pm-4.00pm	924	876	985	**2785**	928	5 min
7	4.00pm-5.00pm	1212	967	1056	**3235**	1078	6 min
8	5.00pm-6.00pm	1298	1035	1324	**3657**	1219	7 min
	Total	**8814**	**7093**	**8689**	**24596**		43 min. (in 8 hours)

Source: Author's Fieldwork, 2020

Lastly, CIPM road in Alausa is another service and commercial area in Ikeja CBD. This road carries the fourth highest traffic among locations studied. The observed daily traffic on this road is 8,814 vehicles in 8 hours of observation as shown in table 14. More so, the observed daily traffic delay recorded is 43 minutes in 8 hours. This shows that CIPM road has the least obstructing influence on traffic flow within Ikeja CBD.

Conclusively, it is very glaring that the absence as well as the inadequate provision of parking infrastructure within Ikeja CBD is one of the major causes of traffic congestion. The result of the analysis revealed that parking activities has significant effect on traffic flow in the area judging from the traffic delay of between 43 minutes and 2 hours, 13 minutes recorded as a result of traffic obstruction due to parking activities within the CBD. This means that urgent effort should be geared towards providing more parking infrastructure through PPP arrangement in order to improve the traffic situation within Ikeja CBD.

In light of the foregoing, the respondents proffered suggestion on ways to improve traffic situation in the study area.

They are:

a. Provision of more public parking spaces some distance away from the road junctions and Off-Street Parking.
b. Effective traffic Control Measures such as no parking signs and enforcement through arrest.
c. Effective Development Control Measures to prevent changes in landuse from residential to commercial and strict enforcement of parking space provision for any servicing development proposed
d. Enlightenment Campaign on the use of road for motorists and collaboration with transport unions to enhance drivers' compliance.

The various data collected within Ikeja Central Business Districts as discuss has clearly shown that traffic is increasing in the area, so also is parking challenges becoming greater in the area. This scenario has shown that traffic obstruction due to on-road and unplanned parking facility will continue to be experienced in the CBD if proper action to expand facility and control parking is not urgently taken in the area.

5.1 Conclusion

Urban population growth in developing countries fuels the challenges of traffic congestion. This affects virtually every facet of human endeavours, including socio- economic activities within the CBD areas. Demand for parking spaces and other facilities are high. The inability of the existing situation to cope with the demand has later led to parking problem and traffic congestion in Ikeja CBD.

The study realized that for sustainable transport management, parking survey is part of transportation planning process which must be undertaking to collect information about the physical location, type of layout, capacity of layout, and operation characteristics of existing on and off-street parking facilities within the Ikeja CBD. Although the new parking terminal is a good starting point, but this is not open to the conventional public bus and still did not make any meaningful improvement at present. Provision and management of parking plan in any given area should be a part of town planning and transport culture; this is because the prominent role being played by parking infrastructure and the parking of vehicles at a proper location cannot be over emphasized.

5.2 Recommendations

In light of the findings of this study, the following recommendations are suggested to reduce and possible eradicate the problems of parking and traffic congestion confronting the Ikeja CBD.

- ❖ Proper enforcement of parking regulation must be implemented in Ikeja CBD. No vehicles should be allowed to park on-street during the peak hours of the day.
- ❖ Strict regulations on the use of parking facilities for parking purpose only and not for street trading must be enforced at within Ikeja CBD.
- ❖ The newly completed modern motor parks at Ikeja CBD should be test run by allowing the conventional yellow buses to operate within it till the arrival of the proposed bus improvement scheme expected to arrive September 2018.
- ❖ Street improvement and lane marking should be implemented to allow for standard and efficient street parking along the corridors where the yellow buses dock for their passenger service operations.
- ❖ The designated bus stop for loading and unloading passengers by all motorists within Ikeja CBD must be extended or expanded has this is grossly inadequate and could not permit the berthing of more than 3 mini buses and 2 high occupancy buses.

REFERENCE

1. Adaramo, J.A. (2012). "Urban Transportation Problems and Challenges in Nigeria". *Prime Research on education. Vol. 2(3)* P. 198-203.
2. Adediran Adejuwon, (2007). "Vehicular situation in Lagos Metropolis; bottlenecks & wayout".
3. Adeniji, K. (2004). Public Transportation: a basic need in Nigeria. ITCC review, 46(1983, 92, 2005), 5- 6.

"Urban Development and Public Transportation in Nigeri" Third World Planning review, 4, 383 - 389.

4. Adenle J.A. (1997). "Factors militating against free flow of traffic in metropolitan Lagos". In transportation in Nigeria national development, by S.O. Onakomaiya and Ekanem. *NISER publication*, Ibadan Nigeria. Pp392
5. Agyemang Ernest, (2009). "Traffic Congestion: The Bane of a Bus Rapid Transit System in Accra, Ghana". An unpublished M.Phi. Thesis in Development Studies (specializing in Geography), *Department of Geography, Norwegian University of Science and Technology, Trondheim, Norway*.
6. Atubi Augustus O., (2010). "Road Transport System Management and Traffic in Lagos, South Western Nigeria". *An international multi-Disciplinary Journal, Vol. 4 (Pp. 459-470).*
7. Atubi Augustus O, (2012). "An analysis of Traffic flow & network characteristics in Lagos mainland". *Nigerian Journal of Environmental Sciences & Resources Management. Vol. 4 (pg 59-66)*.
8. Asiyanbola R.A. and Akinpelu, A.A. (2013). "The challenges of on-street parking in Nigerian Cities' transportation routes". *International Journal of Sustainability Development, Vol.1, Pg 476-489.*
9. Badejo D. (2003), "Organizational structure for mass transit / public transport management and Operations by state and local governments.
10. Dar-Al-Hardasah. (2008). *Demand for Travel: Lagos Mass Transit Option Study for Master Plan for the Metropolitan Lagos.* Wibur Smith and Associates, Lagos. pp. 74
11. Durojaiye O, (2010). "Improving the operations of Traffic Agencies in ensuring effective Traffic flow in Lagos metropolitan area". *Journal of Estate Surveying Research (pg 15-26).*
12. Filani, M. O., & Osayimnes. (2006). Intra-City Traffic Flow Problems in Nigeria: The case of Ibada Metropolitan Area. *National Geographic Journal, 22*(1), 17-31.
13. Foster, C. D. (2002). *The Transport Problem Groom Helm, London Urban Passenger Transportation in Nigeria*. Heinemann Education Books Nigeria Plc Lagos.
14. Olayiwola.K. O et al, (2014). "Traffic Congestion Problems in Central Business District Ikeja, Lagos Metropolis, Nigeria". *Research on Humanities & Social Sciences. Vol. 4, (pg 23-32)*
15. Ogunbodede, E. F. (2006). "Assessment of Traffic Congestions in Akure using GIS approach & challenges for urban sustenance". *Department of Geography & planning sciences, Adekunle Ajasin University*, P.O. Box 001, Akungba-Akoko, Ondo State, Nigeria. pp.4-16
16. Olusina J.O & Desalu T., (2014). "Prediction of Parking Lot Availability Using Elang's Loss Model". *International Journal of Engineering and Applied sciences Vol. 5 (pg 63-70)*
17. Olorunnimbe R.O., & Balogun I.I. (2015). Evaluation of the Impact of Inadequate Parking Infrastructure in on Traffic Flow in Oshodi CBD, Lagos Metropolis. In *an International Journal of School of Transport, Lagos State University, Ojo, Lagos 1 (1),23-34*
18. Oni S.I. (1999). Parking, parks and terminal. A paper delivered at a one week intensive executive course in urban transportation and traffic management. *University of Lagos, Nigeria.*
19. Osoba, S. B. (2012). "Appraisal of parking problems and Traffic Management Measures in Ikeja Central Business District in Lagos, Nigeria". Journal of Sustainable Development, Vol. 5, No 8, 2012, (pg. 105-115).
20. Robert B. Kiunsi, (2013). "A Review of Traffic Congestion in Dar es Salaam City from the Physical Planning Perspective". *Journal of sustainable development, Vol. 6, Pg 94-103.*
21. Subair Muhammed, (2013). "Car parks: The rich also cry". *News watch Times September 12, 2013 edition*.
22. Yuejun Liu et al. (2012). "Metropolis parking problems and Management planning solution for Traffic effectiveness". *Mathematical Problems in Engineering, Volume 2012, and Article ID: 678952.*