Appraisal of motorists' behavioral patterns and physical factors influencing vehicular parking in Nigerian Cities

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Abstract

Transportation is critical in sustainable life. It is needed by all in the realization of "The Future We Want," striving to foster economic growth, alleviate poverty, and address accessibility challenges to services across sub-Saharan Africa, and vehicular parking becomes a necessity to manage traffic and congestion for efficient performance of the transportation system. This study focuses on the analysis of vehicular parking dynamics in Nigerian cities, specifically examining the behavior of highway motorists in Ore, Ondo State, Lokoja, Kogi State, and Jos, Plateau State. The aim is to identify prevalent parking challenges and propose mitigation measures. The selected areas are pivotal settlements, nodal points, and transit hubs situated along major expressways in Nigeria, serving as gateways to various local government areas and states. Data collection methods included structured questionnaires, interviews, and field observations. Stratified sampling techniques were employed, with 327 respondents participating in the survey. The study revealed that vehicular parking challenges in Nigeria stem from a variety of factors, including socio-economic characteristics such as income, household size, and trip frequency, as well as behavioral aspects of respondents, poor road conditions, proliferation of illegal on-street parking, and inadequate traffic and parking control. These challenges have significantly contributed to traffic congestion and accidents in Nigerian cities and towns. The study recommends interventions such as road rehabilitation/upgrading, regulatory framework, enforcement of minimum building setback regulations/reviewed of the Urban and Regional Planning Law, provision of off-street parking facilities at strategic locations, and the removal of obstructing structures along roads. Additionally, effective traffic and parking management are recommended to address the identified issues.

Keywords: Commuters, Road transport, highway, Motorists, Nigeria, Vehicular parking

1.0 Introduction

Transportation is universally critical in sustaining the wellbeing of people and goods. One of such means is via "road networks" globally needed in enhancing accessibility and connectivity within and between urban and rural areas. In rapidly urbanizing countries such as China, India, Brazil, Mexico, Bangladesh, Pakistan, and Nigeria, the dynamics of road transport have become increasingly complex due to urbanization, socio-economic growth, and industrialization. Vehicular parking is an integral component of

the transport system (Okosun *et al.*, 2021). Notably, the global rates of vehicle ownership and usage have shown significant growth, particularly in urban areas where vehicle ownership rates have been increasing by 15 to 20 percent annually (Rode *et al.*, 2017; Joseph *et al.*, 2017).

The rise in vehicle ownership has given rise to challenges associated with vehicular parking in urban areas (Bhatti, 2014; Gössling *et al.*, 2019). Vehicular parking emerged to be a serious problem in Western Europe in the 1950s; Japan from the mid-1960; Hong Kong and Singapore in the early 1970s; and the Republic of South Korea, Malaysia and Thailand in the late 1970s and 1980s (Msigwa and Bwana, 2013). With efficient management and the involvement of various stakeholders in the strategies to avoid under-pricing and oversupply, however, many European cities have transformed their parking situation into an economic opportunity and valuable asset for local communities (De Wit, 2006). On the contrary, developing countries including Nigeria are still facing variant degrees of parking menace in their cities/towns.

According to Okosun *et al.* (2021), "no place is as intimately tied to the birth and proliferation of vehicular parking as West Africa, most notably Nigeria". As observed in literatures, Nigerian cities have faced significant challenges of vehicular parking, with studies identifying it as the most visible urban problem, that quickly manifest itself in accident, traffic congestion, delay and environmental pollution (Transport Consult, Osoba, 2012). Vehicular parking issues therefore have garnered attention as a prevailing urban phenomenon, prompting the need for evidence-based urban development and management practices (socially, environmentally, and economically), accordingly, warrant scholarly investigation and thoughtful analysis.

In Lagos, Transport Consult (1976) observed that about 44.4 percent of total parking in metropolitan Lagos obstructs traffic. As pointed out by Adefolalu (1977), roadside and on-road parking are among the major human contributions to urban traffic congestion. In addition, Ogunsanya (2004) opined that; traffic delays, congestion and parking problems are mere symptoms of a malfunctioning urban traffic system.

Parking is an essential component of the transport system and vehicles must park at every destination (Okoko 2006, Tom, 2014). Parking convenience affects the ease of reaching destinations, and therefore affects

overall accessibility (Litman, 2009). Scholars in the built environments has reported that, there are various causes of parking problems in Nigerian cities (Okoko 2006; Ogunbodede and Olurankinse, 2006; Okosun *et al.*, 2021). Therefore, the usage of vehicle directly correlates with the need for parking, as parking convenience directly impacts accessibility. The scarcity of parking facilities, especially in central business districts, exacerbates parking problems in Nigerian cities due to competing demands for limited land resources (Aderamo and Salau, 2013). More so, the absence of clearly designated parking areas, and ineffective regulation further exacerbate the parking challenges (Ogunbodede and Olurankinse, 2006; Okosun *et al.*, 2021).

Okosun *et al.* (2021) maintain that, there is a limited amount of land space within the Central Business Districts (CBDs) of cities and towns in Sub-Saharan African. The reason adduced is that, The CBD of all the cities/capital towns in Nigeria lacks enough parking facilities. Thus making the city centres to be congested as vehicles are parked in any available space, even along the roads. In Ondo, Oyo, Lagos and Edo States, studies have revealed that, there is an evidence of parking space and poor traffic management tussle (Ayo-Odifiri *et al.*, 2017; Oluwajana *et al.*, 2022). In Western (Ondo, Oyo Lagos) and Northern regions (Kano, Kogi, Jos) of Nigeria, there is evidence of parking menace and lack of geospatial information necessary to tackle the spatial problem were some notable other causes of traffic congestion (Oluwajana *et al.*, 2022). Inadequate or improper management of parking spaces was among leading cost of road congestion in Lokoja (Olorunfemi *et al.*, 2014).

Furthermore, parking problem arises due to absence of clearly designated areas for parking which has led to traffic congestion and delay (Aderamo and Salau 2013). According to them, illegal parking is a major problem in Nigerian urban environment and roadside parking is a common phenomenon. The resultant effect leads to delay in travelling time and increases the cost of travelling (Oluwajana *et al.*, 2022). Parking problems become even worse in Nigerian cities and towns, as a result of ineffective regulation. In its wider sense, parking on one side of a road is commonly permitted, but on both sides of a road is often with restrictions (Okosun *et al.*, 2021) and vehicular parking situation is getting worst in Nigeria. In response to mounting parking issues, some Nigerian cities have introduced new measures, such as parking levies, as a means to alleviate the problem and generate revenue.

Despite these efforts, parking challenges persist, underscoring the unique urban development challenges and the need for community-driven solutions.

Considering the forgoing backdrop, this study aims to examine the behavioral patterns and physical factors influencing vehicular parking on major highways in Nigeria and propose mitigation measures. The study's objectives include investigating the socio-economic characteristics of motorists and identifying the behavioral pattern and physical factors influencing vehicular parking in the study area. The work extensively reviews existing literature relevant to the aims and objectives of the research. By addressing these critical issues, this study seeks to contribute to a better understanding of the challenges posed by vehicular parking in Nigerian cities and develop targeted solutions to improve urban mobility and accessibility.

2.0 Literature Review

According to Okoko (2006), road inventory is necessary to serve as a guide in the provision of roads in the city/town. Road inventory provides information on the mileage, physical characteristics and conditions of all roads in the city/town. It provides the transport planner with information (parking accumulation, parking load, parking usage) on such issues as the type, dimension and conditions of urban roads, classification of road by type of pavement, physical designs features such as pavement widths, grades, curvature, sight distances, location of road furniture etc.

Parking accumulation/loads as defined by Tom (2014) is the number of vehicles parked at a given instant of time. Normally this is expressed by accumulation curve. Accumulation curve is the graph obtained by plotting the number of bays occupied with respect to time. According to Bhatti (2014), it is conducted to obtain data on the number of vehicles parked in a study area during a specific period of time. First, the number of vehicles already in that area are counted or estimated. Then the number of vehicles entering and exiting during that specified period are noted, and added or subtracted from the accumulated number of vehicles. Accumulation data are normally summarized by time period for the entire study area. The occupancy can be calculated by taking accumulation/total spaces. This study also includes the parking usage surveys, thus useful in determining areas with the greatest parking demand and where parking problems are critical due to inadequate capacity. They are helpful in identifying areas where time limits are not consistent with usage. This will further aid in determining whether

enforcement efforts should be lessened or increased. They evaluate efficiency of parking areas. An efficiency of 85 percent is considered maximum in short-time parking areas and 95 percent is the maximum in long-time parking areas (GlobalSecurity.org, 2015). On another vein, parking load under the accumulation curve is obtained by simply multiplying the number of vehicles occupying the parking area at each time interval with the time interval. It is expressed as vehicle hours (Tom, 2014). Parking load is employed in the calculation of average parking duration. It is applied in this research.

2.1 Theoretical and Conceptual Framework

Most conceptual frameworks on urban transportation problems relate transportation to urban land use. Indeed, transportation is regarded as the heart of urban land-use function. The intimate relationship between transportation and land-use is acknowledged by the fact that at the heart of every city's master plan is a long-run transportation network (Bland, 1982). The distribution of land uses within a city varies greatly and determines the transportation requirements. Since each type of land-use has its own specific mobility requirements, transportation is a factor of activity location and is therefore associated intimately with land use (Aderamo, 2012; Okosun et al,. 2021). Parking is an integral element of the road transport system and as well an indispensable component of transport land use. On this premise, this study considers the review of transport and land use models as important theoretical structure upon which this research lays.

Concentric Urban Land Use Model

The concentric model of Burgess (1925) as shown in Figure 2, suggests that, the city as a complex entity, often exhibits concentric pattern of growth of six notable zones, each with a distinct structure of development. Burgess proposed that a city evolves and expands outwards in a succession of concentric zones from its center.

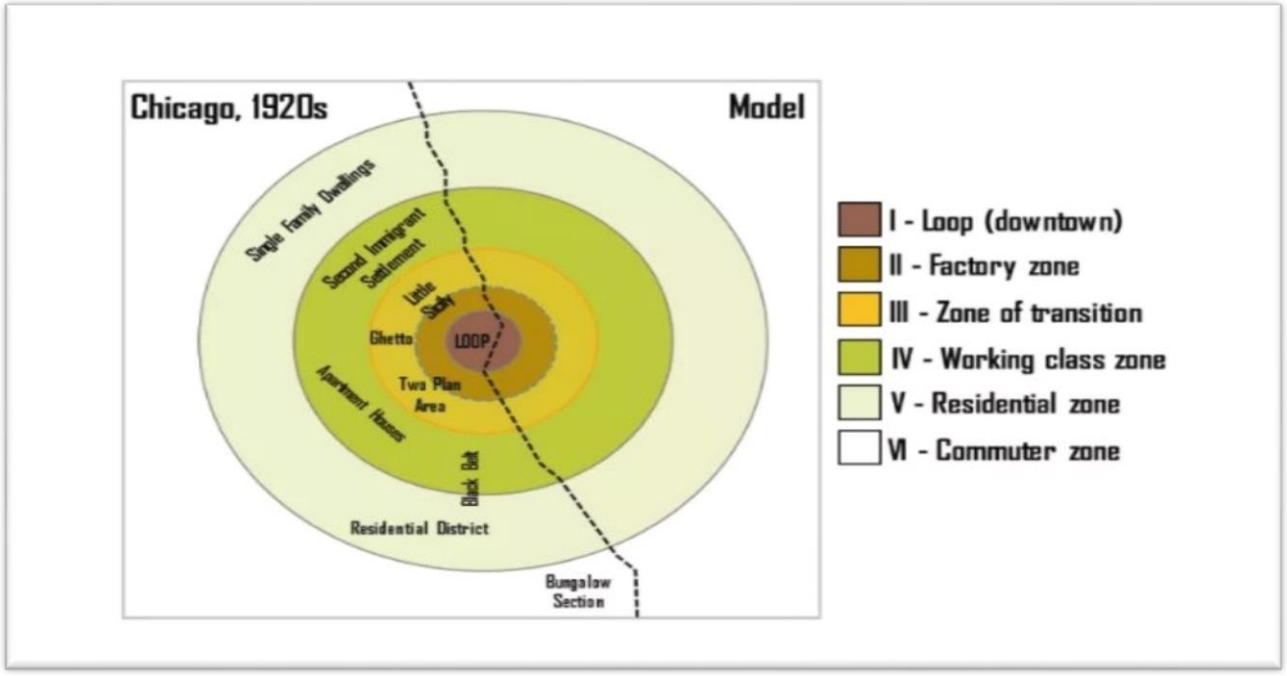


Figure 1. Burgess Concentric Land Use Model
Source: Carter (1995)

The model assumes, among other things, that low-income groups lack transportation and live close to the city center. The theory was concerned that, there is an order of behavior of people in response to certain circumstances as the city continues to grow. On account of daily increase in city's population at the center, people in the inner zone gradually succeed to the next outer zone. The model recognized road transport and mobility were essential factors behind the spatial organization of societies, global urbanization trends in the urban area. This model highlights current challenges faced from commuting distance, identification of central business district, from megacities to towns, and the diverse trajectories of urban development and lessons to be learned from different urban contexts as urbanization continue to reshape our world, whereby, advancing knowledge, fostering dialogue, and promoting innovative solutions to vehicular parking situations in creating a concentric circle which will represents a specific socio-economic urban landscape; as spatial changes in Chicago are still reflective of such today. Coincidentally, Nigeria cities/town (Ore in Kogi state, Lokoja in Kogi State and Jos in Plateau State) is a resemblance of settlements

with physical and structural pattern as described by the zone model.

The essential land use function in Nigeria cities/town is very high and often exceeds supply; particularly transport land use, where the parking space is one of the land uses mostly affected by scarcity of space as described by the model. Commuters traveled daily for different proposes (job opportunities, education, agricultural products, business purpose, shopping among others). This situation creates traffic congestion and accidents especially during the peak hours in highways of inhabitants in the cities/town. However, as the urban area expands in its population and spatial extent particularly with the construction of the Benin-Shagamu express way, Lokoja-Abuja express way, and Jos-Abuja express way, the concentric spatial form of the town is giving way for the growth of new business areas in other parts of the town. This growth pattern is what the sector and Multiple Nuclei land use models explained. Hence, these models are relevant to the study area upon which this research is built.

Sector and Multiple Nuclei Land Use Models

The Sector and Multiple Nuclei land use models (Figure 2) was considered by Harris and Ullman in 1945, because of the emerging impact of motorization on the urban spatial structure. They said the cities and other metropolitan areas frequently have many central business districts. This is especially true in Nigeria (Ore, Lokoja and Jos), as cities/towns grow, smaller towns surrounding their boundaries get swallowed up, according to the model. Meanwhile, as the city grows in size, getting from the periphery to the CBD becomes impossible, and smaller centers sprout up all over the place. The model also considered that transportation infrastructure; occupy specific locations. Other land use models it considered include hybrid land use model, land use market and cellular automata (Rodrigue, 2013). However, all of these models involve some considerations of transport in the explanations of urban land-use structures. They attempt to describe land-use transportation relationship and they are all primarily static models as they explain land-use patterns, but they do not explicitly consider the processes that are creating or changing them. Besides, most of the conceptual approaches related to transportation and land-use relationship been developed using empirical evidence related to North America and Western Europe, this perspective does not necessarily apply to other parts of the world (Aderamo, 2012). Field survey constituted the major source of data on which this research work was based.

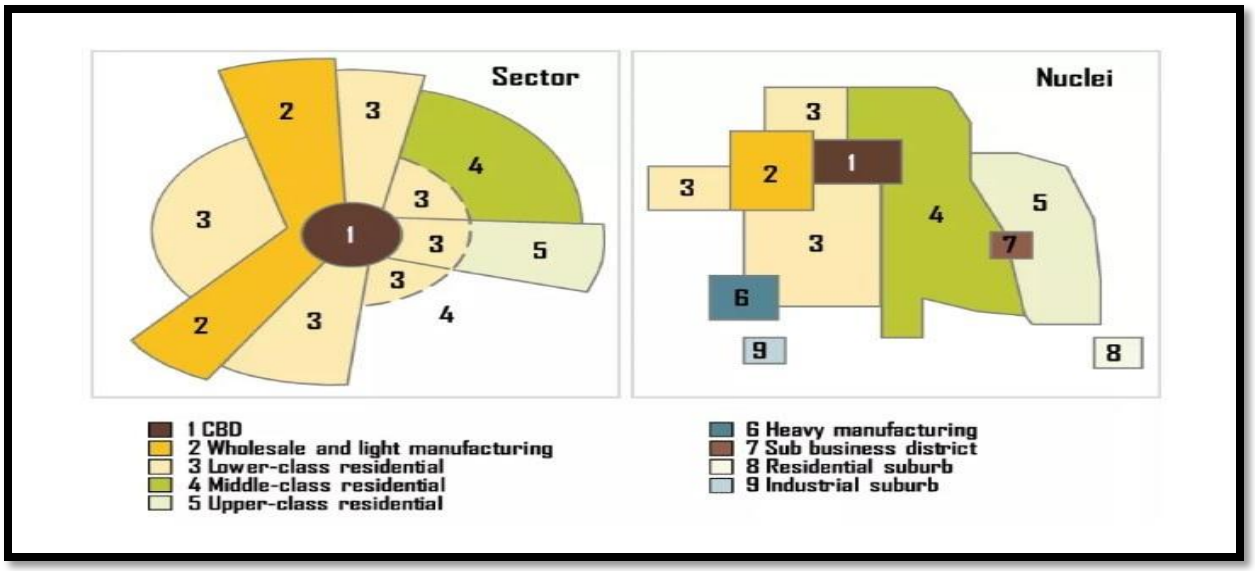


Figure 2. Sector and Nulcei Urban Land Use Models
Source: Carter (1995).

3.0 Materials and Methods

3.1 The study area (Nigeria)

Nigeria, officially the Federal Republic of Nigeria (FRN) is the most populous country in Africa; it is situated between the Sahel to north and the Gulf of Guinea to the south in Atlantic Ocean. Nigeria lies between latitudes 4° and 14°N, of the equator and longitudes 2° and 15°E of the prime meridian. It covers an area of 923,769 square kilometers and with a population of 226 million in 2022 (Lawal, *et al*, 2020; United Nations estimate, 2021). Nigeria is the sixth-most populous country in the world. It comprises of 36 States, including Federal Capital Territory (FCT) Abuja (See Figure 1) and 774 Local Government Areas (LGAs). Among the LGAs in Nigeria, there are three pivotal settlements (Ore in Ondo State, Lokoja in Kogi State, and Jos in Plateau State) with transit hubs situated along major expressways in the country, serving as gateways to various local government areas and states. Nigeria has a population of over 200 million people (Okosun, 2023). In most towns, urban development begins and grows in close proximity to roadways. The increase in human population in the towns/cities has led to vehicular parking dilemma. Urban land-use growth, tourism, and leisure services thrive well within the town/cities, characterized by random, sporadic and fragmented urban growth which has hindered road transport infrastructure towards optimum utilization and services.

3.2 Research Method

A social survey design was adopted for this research, widely used by social scientists in the built environment. Data were collected from both primary and secondary sources. The reconnaissance survey was carried out not only to get familiarized with the study area, but also to delineate it. In this regards, a visit was made to Ore, Lokoja and Jos Metropolis during which the commercial area or central business district was identified and delineated. Oral interview was conducted to elicit some background information of the towns from some selected motorists and commuters in the study area. During the reconnaissance survey, three (3) major roads were identified. They are Ore in Ondo State, Lokoja in Kogi State and Jos in Plateau State. It was discovered that these roads formed the main central area of three (3) out of the 36 states in the country including FCT, Abuja. An in-depth study was carried out on these existing roads and their on-street parking spaces in line with the objectives of this study. The research populations were of two groups, such being selected motorists and commuters in the study area (Ore, Lokoja and Jos). A multiple random sampling techniques approach was employed for use in this study, while The Systematic sampling technique was used to select the unit for detailed survey, which comprised of three hundred and seventy-five (375) motorists from a frame of 1,251. The sampling frame adopted for this study is the total number of motorists involving in on-street parking at selected locations along major roads. It consists of sample elements such as drivers or owners of private and commercial vehicles such as cars, buses, vans, articulated vehicles, lorries and motorcycles riders. It included drivers of public institutions' vehicles in the city/town.

Overall, 375 copies of questionnaire were administered in situ at the different parking areas, based on the numbers of motorists by using a purposive sample, thus representing a sample of 30% administrated questionnaire on the motorists. The sample of 30% was deemed adequate to avoid repetitions based on homogenous characteristics (cultural composition, physical characteristics, and economic level/occupation) of the motorists. However, the 30% was used to gain more in-depth view of their opinions (thoughts, and beliefs) regarding the motorist's behavioral pattern and physical factors influencing vehicular parking in Nigeria. That helped with the selection of a subset of a population to represent the entire population of interest (Okosun et al, 2023). However, to determine the sample size for this research understudy, the population of each of the three selected

cities/town was used to determine the numbers of questionnaires to be administered. Those include Ore (1445), Lokoja (549), and Jos (861). The questionnaires were administered in situ at the different parking areas.

As shown in Table 1, the on-street parking areas in Ore were: Ore-Okitipupa, Ore-Ondo, Benin-Shagamu and Ore-Lagos, In Lokoja the on-street parking areas were, Lokoja-Abuja, Lokoja-Okene/Benin, Lokoja-Enugu, Lokoja-Lagos. In Jos (Plateau state), they includes Jos-Bauchi , Jos-Kaduna, Jos-Nassarawa , Jos-Abuja. The sampled elements in each of these parking areas were approximately 93 (Ore), 111 (Lokoja) and 171 (Jos) respectively being 30% of total population of motorists involving in on-street parking.

The observed variation in number of questionnaire administered in the parking areas was as a result of differences in their size and concentration of commercial activities. Information about socio-economic characteristics and parking behavioural factors such as travel origin, purpose of travel, frequency of trips, and mode of travel among others were sourced from the respondents in order to provide objective answers to the various research questions of this study.

Table 1: Questionnaire Administration Schedule

Sample frame	Zone/Location	Population (Motorists)	Sample Size (30%)	Questionnaires Retrieved
Ore (Ondo State)	Ore-Okitipupa/Ore-Ondo/Benin-Shagamu, Ore-Lagos	311	93	82
Lokoja (Kogi state)	Lokoja-Abuja, Lokoja-Okene/Benin, Lokoja-Enugu, Lokoja-Lagos	370	111	95
Jos (Plateau state)	Jos-Bauchi , Jos-Kaduna, Jos-Nassarawa , Jos-Abuja	570	171	150
	Total	**1,251**	**375**	**327**

Source: Author's Preliminary Survey, 2024

In all, there were 1,251 motorists in the research environ as shown in Table 1. It was collected through a preliminary parking volumetric survey conducted at selected on-street parking spaces in the study area. During the parking volumetric survey, the occupancy

count in the selected parking spaces was purposely taken at the beginning of the survey. The duration of the survey was 8am-6pm daily on Monday, Wednesday, Friday and Saturday of the week and it lasted for two (2) weeks. At interval of 30minutes, the number of vehicles that parked and exited the parking areas were recorded. The count was repeated until the end of the survey duration each day. The 30minute interval was considered adequate and capable of taking care of short time parkers. At the end of the survey, the final occupancy or number of vehicles parked at the various parking areas were recorded. The data collected were subsequently employed to compute parking volume and relevant statistics in the study area. Field assistants were employed and trained on how to objectively carry out the traffic count with the aid of facility usage sheets. The major types of vehicles counted were cars, buses, articulated vehicles, lorries and motorcycles. Data were collected with the aid of field note, check-list, measuring tape, and camera among others.

Out of the 375 copies of questionnaire that was distributed in the research environ, only 327 were retrieved in usable manner, thus was used for the analysis. The four most active transportation routes in each identified research environ were purposely adopted for the administration of the questionnaire. This unit (30%) was considered adequate due to accessibility, and the fact that the views of the respondents were from the similar perceptive. In achieving this, the researcher consulted the Chairman of the Road Transports/representative in the study area. A chairman/secretary/representative was interviewed with the aid of an interview guide. They were purposively interviewed because of the relevance of their activities in this study. The other source of data collection, such as in-situ observations were used to obtain relevant data for this research, all of which were subjected to analyses using the Statistical Package for Social Sciences (SPSS) version 21 which was presented using tables and figures. Inferences were made about the general population understudy, based on the research findings from the sampled.

4.0 RESULTS AND DISCUSSION

The findings of the motorist's behavioural pattern and physical factors influencing vehicular parking in Nigeria highways (parking accumulation) are presented below

4.1 Parking accumulation at sampled parking areas in Nigeria

The daily parking accumulation at the research environ on-street parking areas is shown in Figure 3. The parking accumulation survey shown in the Figures revealed that,

parking accumulation in Nigeria ranged from 12-45 vehicles which indicated the parking areas were intensively used throughout the day. It can be deduced that parking accumulation peaked in almost all the parking areas at two distinct periods.

The first peak period was 10.30am-11.00am in the morning and the second peak period was between 15.30pm-16.00pm in the afternoon. Business transactions and mobility were at their peak in these periods in the study area. It implied that parking problem was equally at its peak between 9.00-11.00am in the morning and between 15.00-16.00pm in the afternoon in Nigeria.

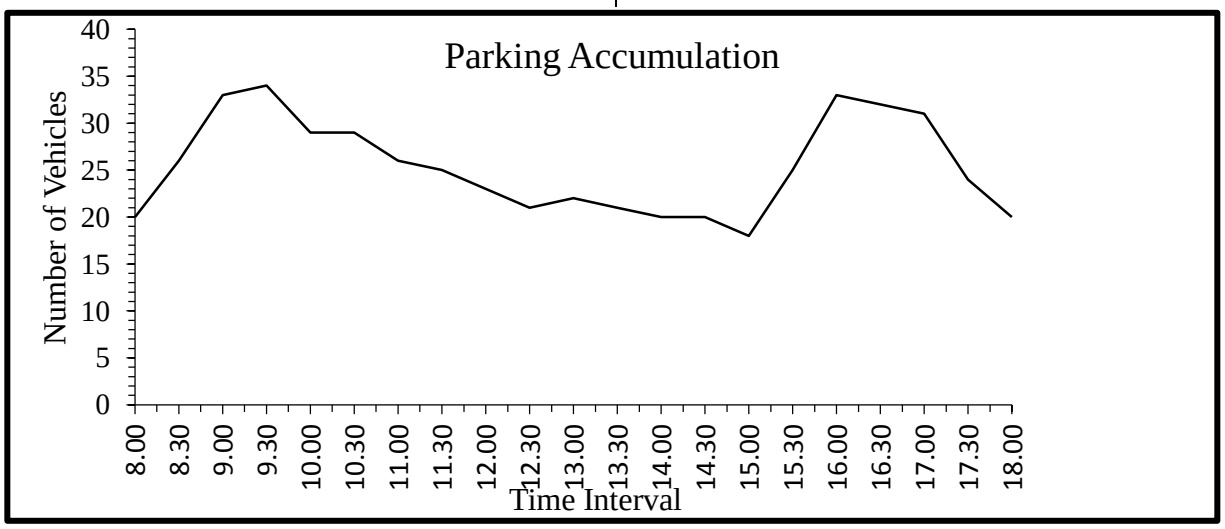


Figure 3a. Parking Accumulation at Owo, Ondo State, Nigeria
Source: Author's Fieldwork (2024)

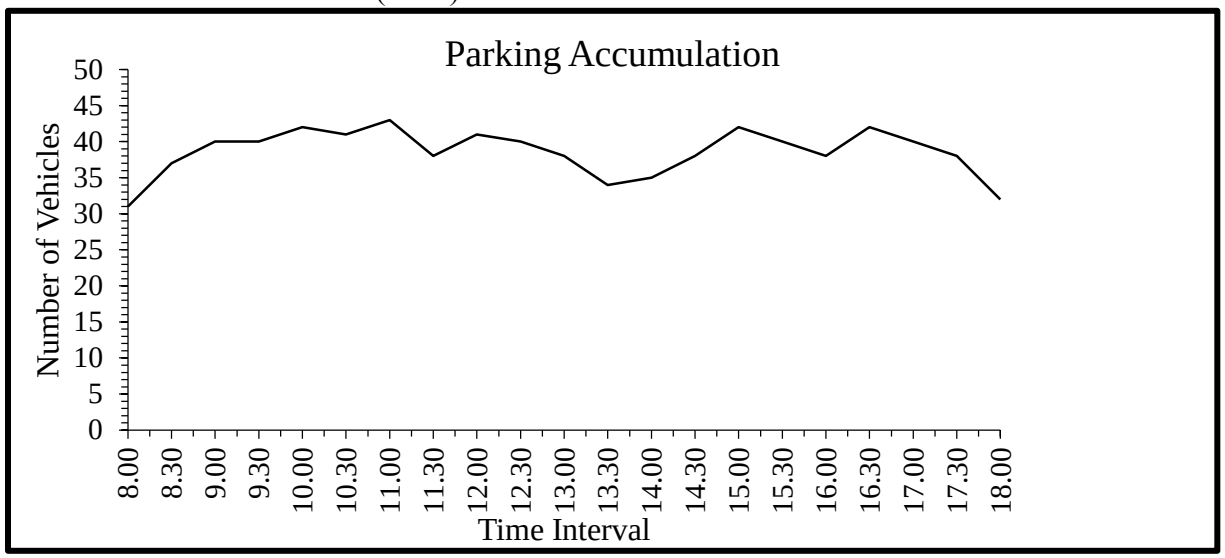


Figure 3b. Parking Accumulation at Lokoja, Kogi State, Nigeria
Source: Author's Fieldwork (2024)

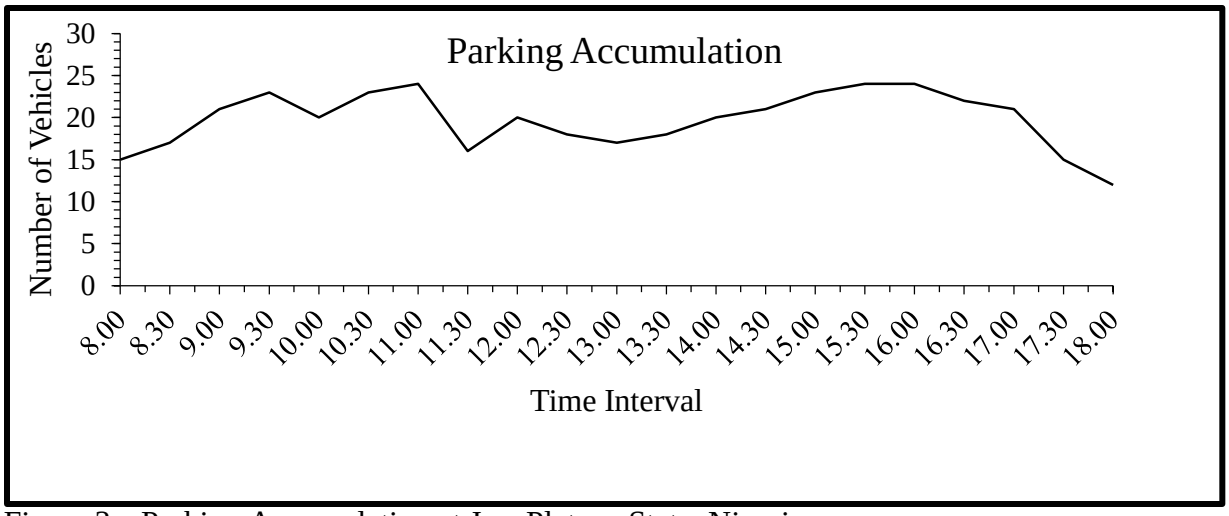


Figure 3c. Parking Accumulation at Jos, Plateau State, Nigeria
Source: Author's Fieldwork (2024)

4.2 Socio-Economic Characteristics of Motorists

Of the total of 315 sampled motorists in the study area, 86% were male while the remaining 14% were female. The finding indicates that men were the dominant motorists and parkers in the study area. This is due to the fact that, car ownership and driving were prevalent among men than women. See Table 2 for the summary.

Table 2: Sex Distribution of Motorists

Sex	Frequency	Percentage
Male	270	86
Female	45	14
Total	315	100

Source: Author's Fieldwork (2024)

The age distribution of sampled motorists in the study area as shown in Table 3 was such that, 8 % of them were less than 20 years, 52% were between 21 and 40 years, 31% were between 41 and 60 years while 9% were 61 years and above. The finding showed that, majority of the respondents was within the active population since 52 and 31% of them were between 21 and 40 years and 41 and 60 years respectively. These groups formed the working class of the study area.

Table 3: Age Distribution of Motorists

	Frequency	Percentage (%)
< 20 years	25	8
21-40 years	164	52
41-60 years	98	31
61years and above	28	9
Total	315	100

Source: Author's Fieldwork (2024)

10 percent of the sampled motorists were single, 61 percent of them were married and 29 percent of them come under other

categories. Since the percentage of them that were married had larger share (61 percent), it logically implied that majority of motorists in the study area were married. The result is in line with the view of Okosun *et al,* (2021) that motorists activities contributes significantly to the economic development of residents in Nigeria.

Table 4: Marital Status of Motorists

	Frequency	Percentage (%)
Single	32	10
Married	192	61
Others	91	29
Total	315	100

Source: Author's Fieldwork (2024)

From Table 5, it can be established that the prevailing household size of the sampled motorists in Ore was between 8 and 10 persons. This finding was a reflection of the prevailing population growth rate and maternal fertility rate in Nigeria. However, the large household size of the sampled motorists could increase transport demand and in turn increase parking demand.

Table 5: Household Size of Motorists

Size	Frequency	Percentage (%)
2-4	35	11
5-7	97	31
8-10	142	45
11-13	28	9
14 and above	13	4
Total	315	100

Source: Author's Fieldwork (2024)

Only 11 percent of the motorists had no formal education, 24 percent had primary education, 49 percent had secondary education while 16 percent had tertiary education. The findings showed that majority of the respondents were literate. The implication of this finding is that, motorists would easily understand Highway Code and parking regulations in the study area. This is expected to enhance parking practice and experience in Nigeria, especially in Jos, Plateau state.

Table 6: Educational Attainment of Motorists in Nigeria

	Frequency	**Percentage (%)**
No Formal Education	36	11
Primary	76	24
Secondary	153	49
Tertiary	50	16
Total	315	100

Source: Author's Fieldwork (2024)

Table 7 provides information about occupation distribution of the selected motorists in the study area. The table indicated that 19 percent of the motorists interviewed were public servants, 15 percent were company employees, and 53 percent were in business and trading. It can be inferred that business and trading activities (53 percent) were the dominant form of occupation among the selected motorists in Nigeria. The reason behind this was the fact that Ore and Lokoja have a regional market town and known as a commercial hub in Ondo and kogi state. This

finding, however, in turn implied a high level of dependence and usage of automobiles which equally affected parking experience in the town by increasing parking demand that was difficult to meet.

Table 7: Occupation Distribution of motorists

	Frequency	Percentage
Public Servant	60	19
Company Employee	47	15
Self-Employed	167	53
Others	41	13
Total	315	100

Source: Author's Fieldwork (2024)

Table 8 shows the distribution of monthly income of selected motorists in the study area. The findings showed that, 1 percent earned less than ₦20,000; 50 percent earned ₦20,000-₦59,000; 40 percent earned ₦60,000-99,000 while 9 percent earned ₦100,000 and above. It therefore follows that ₦20,000-₦59,000 was the dominant monthly income group of motorists in the study area. This was approximately equivalent to between $14 and $40 monthly with Naira exchange rate of ₦1450 per $1 (The Nation Newspaper, 2024). Given the economic recession facing the country, the monthly income of the motorists was poor. But, income is therefore one of the socio-economic variable that influenced trip and in turn affected vehicular parking.

Table 8: Respondents' Monthly Income

	Frequency	Percentage (%)
Less than 20,000	3	1
20,000-59,000	158	50
60,000-99,000	126	40
100,000 and above	28	9
Total	315	100

Source: Author's Fieldwork (2024)

4.3 Motorists Behavioural Pattern and Physical Factors influencing Vehicular Parking

Shown in Table 9 is the distribution of mode of travel of the sampled motorists in the research environ. As presented in the Table, public buses (48 percent) were the dominant modes of long travel in the study area. The public buses were majorly used in the provision of inter-city transport services. This accounted for their larger number. During the rush hours, the demand for parking was aggravated and in turn created parking problems in the central business area thereby leading to indiscriminate on-street parking in the study area.

Table 9: Travel mode in the study area

Mode	Frequency	Percentage
Private Vehicle	59	19
Public Buses	150	48
Taxi	50	15
Motorcycle	41	13
Others	15	5
Total	315	100

Source: Author's Fieldwork (2024)

Findings on the respondent's trip origin to their destination were presented on Table 10. From the Table, majority of the respondents (61%) travelled to outside the town/state from the Central Business Area/core area followed by those from the periphery areas. This contributed to an increasing use of commercial vehicles since the operation of private vehicles is expenses to achieved, and that it usage has been hindered, due to the current cost of fuel price per little in Nigeria, which range between one thousand and thirty naira (N1 030,00) to one thousand and two hundred and fifty naira (N1.250.00). This is approximately equivalent to less than $1 with Naira exchange rate of ₦1450 per $1 (The Nation Newspaper, 2024). Thereby making individuals to use their private vehicles for commercial activities, especially for intra-state/intra-township mobility, which was very high due to bad access roads in the study area. The situation led to on-street parking of vehicles due to inadequate off-street parking spaces within the central business area of the research locale.

Table 10: Origin of travel of sampled motorists

Origin	Frequency	Percentage
Within the Core	91	29
Peripheral Area	32	10
Outside the town	192	61
Total	315	100

Source: Author's Fieldwork, (2024)

The various purposes of travel of the surveyed were presented in Table 11 motorists. The finding showed that business and employment were the dominant purposes of travel to the core area by motorists. This situation was due to high accumulation and concentration of commercial activities in the town. The study area is a host to a number of commercial land uses such as a regional market (Sabo market), banks, hotels and restaurants, shopping mall, warehouses, offices. These activities in turn influenced parking experience in the town in such a way that, demand for parking spaces increased enormously. This was because; business activities were highly accessibility and mobility dependent.

Table 11: Major purpose of travel in Nigeria

Purpose	Frequency	Percentage
Employment	98	31
Business	126	40
Shopping	69	22
Recreation	22	7
Total	315	100

Source: Author's Fieldwork (2024)

It can be inferred from Table 12 that majority of the sampled motorists made more than 7 trips daily. The frequency of trip of sampled motorists was high, a situation that led to dramatic increase in demand for parking spaces. This was because in every trip made, there would usually a corresponding demand for parking space which may be difficult to meet. This situation led to chaotic on-street parking of vehicles especially during the peak periods in the town (Plate 1)

Table 12: Prevailing frequency of trip in Nigeria

	Frequency	**Percentage**
1-2 daily	28	9
3-4 daily	79	25
5-6 daily	44	14
7 and above	164	52
Total	315	100

Source: Author's Fieldwork, (2024)



Plate 1. Typical Indiscriminate on-street parking at Ore, Ondo State
Source: Author's Fieldwork (2024)

Investigation was also conducted on parking regulations and signs on the sampled roads in Ore. Findings were presented in Table 13. It can be established that 72 percent of parking regulations and signs was 'No Parking "Sign Post' put in front of buildings, 21 percent were No Parking "Sign Posts" erected along the roads' sides while 7 percent in were "Signs" put on the roads' surface. It can be inferred from this finding that, the prevailing form of parking regulation and control in the study area was No Parking "Sign Posts" put in front of buildings/properties. This parking regulation was employed at the whims of property owners and not in consideration of the study area in its entirety.

Table 13: Distribution of parking regulation and signs on sampled roads in Nigeria

	Frequency	Percentage
No Parking Sign post at building's frontage	227	72
No Parking Sign Post along the roads	65	21
Designated Marks on the Roads' surface	23	7
Total	315	100

Source: Author's Fieldwork (2024)

Table 14 contains information regarding the factors responsible for reduction of width of that were responsible for reduction in the width of selected roads. Motorists were asked what they considered as the critical factor affecting widths of selected roads. The finding showed that, 8 percent of the factors were abandoned vehicles on the roadside, 29 percent were due to street hawking and trading, 9 percent was due to pedestrians and 54 percent was due to on-street parking. It followed that on-street parking was the prevailing factor responsible for reduction in the width of roads in the study. Noticeably, on-street parking was being practiced unchecked in the town. Street hawking activity was considerably high in each of the sampled roads. However, roads in the research environ were encroached with both permanent and temporary structures, such as: shops and kiosks and it in turn encouraged on-street parking. Normally, roads' shoulders among other functions serve as off-street parking spaces which normally free the road sides of parked vehicles. In the same way, street hawkers and traders carried out their businesses along the streets in order to enhance accessibility and sales of their commodities. These led to a problematic and chaotic parking situation in the study area.

Table 14: Factors influencing reduction of roads' width in Nigeria

	Frequency	Percentage (%)
Abandoned Vehicles	25	8
Street Traders	92	29
Pedestrians	28	9
Illegal On-Street parking	170	54
Total	315	100

Source: Author's Fieldwork, (2024)

Table 15 provides information regarding factors promoting un-authorized on-street parking in Nigeria. According to the sampled motorists who were asked what they considered as most important factor promoting on-street parking on the sampled roads, 38 percent of the factors was due to inadequate off-street parking spaces, 24 percent was due to convenience and nearness

to destination, 31 percent was due to poor parking control and management while other reasons constituted 7 percent. It can be deduced from the findings that, inadequate off-street parking spaces; and poor parking control and management were the critical factors promoting on-street parking on the sampled roads. This situation was evident in the typical indiscriminate manner public vehicles were parked in Nigeria as depicted in Plate 1.

Table 15: Factors promoting illegal on-street parking on major roads in Nigeria

	Frequency	Percentage
Inadequate Off-Street Parking Spaces	119	38
Convenience & nearness to destination	75	24
Poor Parking Control and Management	97	31
Others	24	7
Total	315	100

Source: Author's Fieldwork (2024)

Table 16 revealed that, the major effect of transport unions such as the NURTW on Vehicular parking in the study area was the operation of illegal on-street motor parks (59%) at different locations. This obvious situation arose out of inadequate off-street parking spaces and out of the need to enhance their accessibility and patronage. However, this development must be halted because it led to traffic congestion and accidents on the major roads in the study area.

Table 16: Major effect of transport workers' unions on vehicular parking

	Frequency	Percentage
Illegal On-street Motor Parks	186	59
Indiscriminate picking and dropping of Passengers	88	28
Violation of Parking Related Regulations	41	13
Total	315	100

Source: Author's Fieldwork (2024)

Information provided in Table 17 is on the major effects of parking problems on intra/inter-township mobility as revealed by the sampled motorists in Nigeria. The motorists were asked to give what they considered as the most critical effect of parking problems on mobility in the study area. The finding showed that, 44 percent was traffic congestion, 35 percent was traffic accident, and 12 percent was long journey time while other effect such as air pollution was 9 percent. It follows therefore that traffic congestion and accidents were the prevailing effects of parking problems in Nigeria especially in Lokoja. This hindered smooth intra and inter-township mobility in the town.

Table 17: Major effects of parking problems on intra/inter-township mobility in Nigeria

	Frequency	Percentage
Congestion	138	44
Traffic Accidents	110	35
Long Journey Time	39	12
Others	28	9
Total	315	100

Source: Author's Fieldwork (2024)

Figure 4 showcased the parking control measures suggested by selected motorists in the study area. However, effective traffic control and management; and provision of off-street parking spaces constitutes the dominant measures, in order to address parking related menace in Nigeria, unlike in Abuja and Lagos where parking management was taken as a serious business, in order to discourage indiscriminate on-street vehicular parking in those cities.

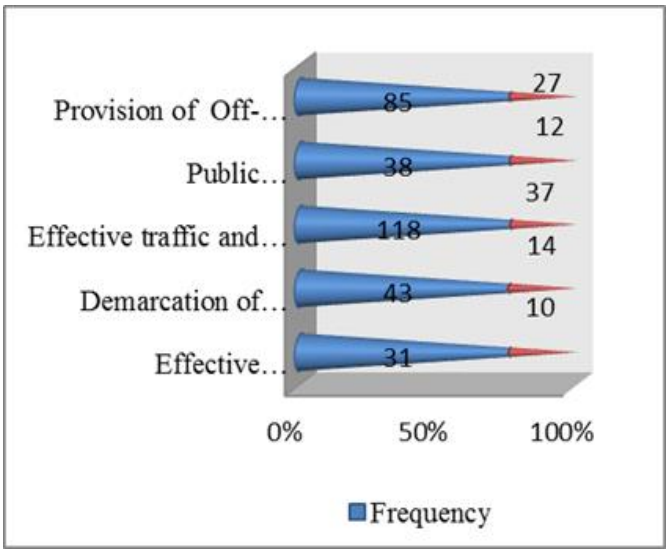


Figure 4: Suggested Parking Mitigation Measures

Source: Author's Fieldwork (2024)

The Pearson product moment correlation analysis was employed in this study to establish an empirical relationship between trip frequency and socio-economic characteristics (income, household size and occupation) of sampled motorists in Nigeria. For this research, data were further analyzed, using the Pearson product moment correlation analysis. The result showed that trip frequency had 0.787 correlation coefficient (r) with income distribution, 0.846 with household size and 0.886 with occupation distribution of the sampled motorists in Nigeria.

Table 18: Pearson product moment correlation analysis of the research hypothesis

Variable		Trip Frequency	Income	Household Size	Occupation
Trip Frequency	Pearson Correlation	1			
	Sig. (2-tailed)				
Income	Pearson Correlation	.787**	1		
	Sig. (2-tailed)	.000			
Household Size	Pearson Correlation	.846**	.848**	1	
	Sig. (2-tailed)	.000	.000		
Occupation	Pearson Correlation	.886**	.765**	.897**	1
	Sig. (2-tailed)	.000	.000	.000	

**. Correlation is significant at 0.01 level (2-tailed). N=315

Source: Computer Output

As indicated in the Table, these correlation coefficients were significantly high. Similarly, the socio-economic variables of the motorists had significantly high correlation coefficients with one another. In view of these findings, the null hypothesis (H_o) is rejected and the alternative hypothesis (H_1) is accepted. This means that there is a significant relationship between trip frequency and socio-economic variables of the respondents. It implies that motorists' trip frequency was being significantly influenced by their socio-economic characteristics which in turn influenced parking demand in Nigeria. This is because; in every trip made there is a corresponding demand for parking space.

5 Conclusion

This research has revealed that the vehicular parking situation in Nigeria is problematic and appalling. The study revealed that the dominant parking challenges were mostly traffic congestion and accidents. The ugly situation is brought about by several factors such as poor parking and traffic management, deplorable condition of roads, proliferation of On-Street parking areas. Traffic congestion and accidents were common place effects of parking problems in the study area. The prevailing parking condition hinders smooth inter and intra-urban mobility, and reduces accessibility to corporate institutions and major activity areas. Most major roads were encroached and lack parking regulatory signs that prevent indiscriminate parking.

The study recommends i) Rehabilitation of roads and removal of structures on the roads' shoulder, enforcement of minimum building setback bye-laws, and provision of off-street

parking areas at strategic locations in order to reduce/eliminate the ugly development in the country. Governments through their relevant agencies have major roles to play in this regards; including motorists, road users and owners of business activity or properties. In addition, this is the need to effect parking control and management in the research locality. ii) Parking regulatory signs should be provided at designated sections along major roads. iii) Relevant traffic control agencies and the Police should be empowered and equipped to enforce parking control and other relevant conventional regulations; iv) Fines for traffic offenders should be determined and stated in clear terms; the fines should be reasonable and should correlate with the prospective offenses;; v) Enlightenment for motorists is inevitable. Motorists should be taught periodically the proper ways the roads should be used; vi) Minimum building setback should be enforced by the Town planning authority especially within the core area of Ore and Lokoja. This singular action will reduce the number of vehicles being parked on-street. Related to this is the need to prohibit on-street trading and hawking during the rush hours; and vii) Public designated off-street parking facilities should be provided in the study area particularly in Lokoja, in order to reduce the volume of on-street parked vehicles.

References

Adefolu, A.A. (1993). Bottleneck and other constraints to traffic flow in the Lagos Metropolitan area. Nigerian Transport Handbook and who media Research, pp.205-213

Aderamo, A.J. & Salau, K.A. (2013). Parking patterns and problems in developing countries: A case from Ilorin, Nigeria. *African Journal of Engineering Research*, 1(2), pp.40-48.

Australian Standard/New Zealand Standard 2890.1. (2004). *Parking Facilities, Part 1: Off-street car parking*. Sydney, NSW: Standards Australia and Standards. New Zealand.

Ayo-Odifiri, O.S**,** Egenti C, Bada, A.O and Okosun, S.E, (2017): The planning implications for changing the use of residential buildings in Auchi, Nigeria. *Peaks Research Journal of Physical Science and Environmental Studies. 2(4).* 306-316 http://pearlresearchjourbals.org/journals. ISSN 2488-8796

Bashiru, A.R.& Waziri, O.O. (2008). Analysis of intra-urban traffic problems in Nigerian Cities: A case of Lagos metropolis. *Indonesia Journal of Geography,* 40(1), pp. 31-55.

Bhatti, M.B. (2014). *Parking studies for provision of parking lots*. Retrieved from https://www.linkedin.com/pulse/parking-studies- provision-lots- bhatti, 2015.

Burgess, E. (1925). The growth of the city: An introduction to a research project. In Park, R.E. *et al.* (Eds.). *The City Chicago.* Chicago: University Press.

De Wit, J.G. (2006). Hub Development at Amsterdam Airport Schiphol. In *Hub airport Strategies &cases in 21st century* (pp. 95-122). Incheon: University of Incheon.

Dukiya, J.J., Zubairu, S.N. & Ayuba, P. (2014). The problems of articulated vehicles on road parking at Mokwa and Tegina in Niger State, Nigeria. *Herald Journal of Geography and Regional Planning,* 3(1), pp. 16-22.

Global Security. (2015.). P*arking Studies*. Retrieved from http://www.globalsecurity.org/military/library/policy/army/fm/19-25/CH27.htm

Lawal, K. A, Ogundiran, R. O, Ogunsesan, A. S, Olagunju, D. O and Okosun, S.E (2020). Urban Public Space Quality Evaluation in Ibadan: A Prerequisite for Public Space Design Guidelines and Management Solutions in Nigeria. *51st National Conference of the Nigerian Institute of Town Planners.* Pp 141-164.

Msigwa, R.E. and Bwana, K.M. (2013). Parking Challenges Facing Urban Cities in Tanzania. Evidence from Dases Salaam City. *Journal of Economics and Sustainable Development.* 4(15).

Ogunbodede, E.F. & Olurankinse, F. (2006). Reducing Mobility Barriers for Sustainable Intra-Urban Transport Development in Nigerian cities. *Journal of Geograpphy and Planning Sciences,* 2(1), pp. 40-50.

Ogunbodede, E.F., Olurankinse, F. & Ilesanmi, A.O. (2008). Luxurious Buses as a Means of Night Journey in Nigeria: Challenges and Implications for Transportation Planning. *Ethiopian Journal of Environmental Studies and Management.* 1(3), pp.52-62.

Okosun, S.E; Oluwajana, S.M; Johnson, N.G, Abel, O.A, and Olowookere, C.A (2021). Time and cost Model for Road Construction Project in Nigeria. In J. N. Mojekwu, W. Thwala, C. Aigbavboa, L. Atepor, S. Sackey (Eds.): *Sustainable Education and Development*. Pp 109–119. https://doi.org/10.1007/978-3-030-68836-3_11.

Okosun, S.E, Ayo-Odifiri, O.S, Popoola A.S and Ige, V.A (2020). An assessment of stakeholder's perception of Old Oyo National Park, Nigeria. *International Journal of Advanced Research in Social Sciences,* (5)1 Pp 179 -192.

Olorunfemi, S.O., Olowosegun, A., Koffi, A.E., Okoko, E.E., & Mobolaji, S. (2014). Examination of On-Street Parking and Traffic Congestion Problems in Lokoja. *Journal of Civil and Environmental Research,* 6(4).

Rodrigue, J.P. (2011). Transportation and Urban Form. Geography of Transport System. *An Online Textbook Authored by Jean-Paul Rodrigue.* Department of Economics and Geography, Hofstra University, New York.

Tim, S.and Cherie, U. (2007). *Parking control Manual, Land Transport* (Part 13). New Zealand.