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MINNA, NIGER STATE, NIGERIA**

**SCHOOL OF ENVIRONMENTAL TECHNOLOGY
INTERNATIONAL CONFERENCE (SETIC) 2018**

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**CONTEMPORARY ISSUES
AND SUSTAINABLE PRACTICES
IN THE BUILT ENVIRONMENT**

EDITORS:

**Asimiyu M. JUNAID
Olatunde F. ADEDAYO
Richard A. JIMOH
Luqman O. OYEWOBI**

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Editors

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Richard A. JIMOH,
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FOREWORD

The organising committee of the 2nd School of Environmental Technology International Conference is pleased to welcome you to Federal University of Technology Minna, Niger State Nigeria.

The conference provides an international forum for researchers and professionals in the built and allied professions to address fundamental problems, challenges and prospects that affect the Built Environment as it relates to Contemporary Issues and Sustainable Practices in the Built Environment. The conference is a platform where recognised best practices, theories and concepts are shared and discussed amongst academics, practitioners and researchers. The scope and papers are quite broad but have been organised around the sub-themes listed below:

- Architectural Education and ICT
- Building Information Modeling
- Construction Ethics
- Energy efficiency and Conservation
- Environmental Conservation
- Facility Management
- Green Construction and Efficiency
- Health and Safety Issues
- Information Technology and Building Maintenance
- Information Technology and Construction
- Information Technology and Design
- Innovative Infrastructure Development
- Resilient Housing Development
- Smart Cities Development
- Social Integration in Cities
- Sustainable Building Materials Development
- Sustainable City Growth
- Sustainable Cost Management
- Sustainable Property Taxation
- Sustainable Architectural Design
- Sustainable Urban Transportation Systems
- Theory and Practices for Cost Effectiveness in Construction Industry
- Urban Ecology Management
- Urban Land Access
- Disasters, Resilient Cities and Business Continuity

We hope you enjoy your time at our conference, and that you have the opportunities to exchange ideas and share knowledge, as well as participate in productive discussions with the like-minded researchers and practitioners in the built environment and academia.

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SPATIAL ANALYSIS OF ON-STREET PARKING IN KPAKUNGU AREA OF MINNA, NIGERIA

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On-street parking overtime has taken a spatial dimension and become widespread in most urban areas of Nigeria, increase the time taken to places of work, homes and playing areas, invariably affecting the economic time at the larger scale. This research, therefore, aims at analyzing the spatial dimension of on-street parking and its economic impact on the primary Appian along Minna-Kpakungu-Bida area of Niger State. The research adopted both empirical and survey research design in order to achieve the aim of the research work. The empirical data were obtained using a structured questionnaire, while, a comprehensive on-street parking count at various hourly intervals between 8 am and 6 pm was carried out. The researcher observed that various peak and off-peak periods existing in terms of on-street parking in the survey area. The first peak period is found to be between 9 am, and 11 am in the morning which signifies the rush-hour traffic and parking first noticed in the daytime, another peak period was observed between 12 mid-day and 2 pm and the third peak between 6 pm and 8 pm. Furthermore, the research showed that the continuous on-street parking in this area has continued to affect the economic prosperity of residents around this area. While some residents agreed that most of the on-street parkers have come for one form of business or the other, others opined that such parking has continuously affected trading and commercial activities in these traffic zone. The researchers therefore, recommended an immediate relocation of all the motor parks along this traffic zone and enacted laws regulating on-street parking along this traffic zone. In conclusion, therefore, a concerted effort is required to urgently mitigate the negative economic impact of this scenario of on-street parking in the area.

Keywords: *On-street Parking, Traffic Zone, Appian, Economic Impact; Urban area*

INTRODUCTION

An integral part of the transport system which plays a crucial role in the management of traffic and congestion is parking (Allison, 2002). The urban growth in terms of population increase and the spatial expansion of the urban centers which come along with the increase in car ownership and increase in demand for movement for employment, leisure, education and other urban activities (Osoba, 2012). Accordingly, some cities cannot cope with the massive growth in the number of people due to urban activities, especially at the urban centers. The situation is getting worse with the growing population of visitors due to urban revitalization, suburban development and the increasing trend of mobility which makes parking situation more challenging. Therefore, parking is increasingly given attention as an important element of transportation planning (Jeffery, 2007).

Parking is a critical component of transportation policy and management for any place. The policies and management practices affecting parking lead to outcomes that can affect land use, air quality, traffic congestion, travel behavior, safety and economic development. For instance, policies that provide a large amount of on-street parking may encourage automobile use, therefore increasing congestion (Allison, 2002). As important as parking is, there are relatively few serious analyses and assessments of parking and even fewer of on-street parking.

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The interplay between on-street parking and other objectives such as land use or economic developments is not well understood, policies are sometimes misguided and opportunities are missed to utilize parking in ways that could have positive impacts. Parking is one of the experiences that people have when traveling and it plays an important role in traffic management and traffic congestion as it is generally recognized that city centers depend on a rapid turnover of parking to meet the demand for a short-stay visit (Asiyanbola and Akinpelu, 2012). Parking and traffic congestion are synonymous with each other because failure to meet parking demand of the people in a city leads to on-street parking that results in traffic congestion. It plays a crucial role in the management of traffic and traffic congestion (Allison, 2002). On-street parking forms one major problem that makes traffic conditions chaotic in Nigerian cities (Asiyanbola and Akinpelu 2012). The problem of on-street parking in Nigeria is that most roads in Nigerian cities are narrow thereby causing traffic congestion. This is due to the inadequate off-street parking facilities along transportation routes coupled with poor traffic management (Olorunfemi, 2013).

On-street parking refers to the parking space made available along the curb of a street or road that are designed to accommodate vehicles. If a city provides on-street parking, especially in commercial areas, it makes conscious choices to provide better access to adjacent land use at the expense of more efficiently moving traffic (Olorunfemi, 2013). Richard and David (2007) opine that on-street parking affects the traffic movement in three ways; it reduces the street's capacity, it reduces safety on the road and increases service conflict.

On-street parking is an important factor in promoting business in cities, especially within central business districts. On-street parking provides easy access to businesses located on city streets and occupies less land space than off-street parking. On street parking is an efficient means for allowing multiple users to use the same space at different times to reach multiple destinations. On-street parking creates a barrier between moving traffic and individuals walking on the sidewalks, providing a measure of safety and reducing the level of perceived noise for pedestrians (Edwards 2002).

Despite the importance, on-street parking also has its downside. The same barrier between moving traffic individuals on the sidewalks can create a visual obstruction for pedestrians to cross intersections and vehicles moving along the street, thus increasing accidents. On-street parking also competes with other uses of roadways, including additional lanes for traffic flow, bike lanes, and wider sidewalks. Also, as drivers search for open spaces, congestion on roadways is increased. Lastly, on-street, like all forms of parking, attracts vehicles which increase traffic.

Parking is essential to ensure people have access to goods and services, which they need. It plays a significant role in city's economy. Parking becomes a necessity when one recognizes the fact that urban centers are characterized by interrelated and complex land use activities which require well-planned and efficient performance of the transportation system. Buses, trucks, and cars move goods and passengers in and out of cities on a daily basis. The way cities are organized constitutes a potential for increasing demand for motor-based travel (Akinpelu and Asiyanbola, 2012).

One major objective of transportation planning is to ease the movement of passengers and goods on urban roads. However, in many towns and cities all over the world, there is an undesirable degree of traffic congestion on urban roads. The provision of new roads is often expensive and most municipal government usually considers the option of widening existing roads which involves the destruction of houses and properties in the area. But the widening of roads and destruction of buildings are not necessarily the solution needed in controlling traffic congestion on our roads (Akinpelu and Asiyanbola, 2012).

Unlike other urban problems, the crisis in urban transportation rapidly manifests itself in congestion, delay, crash, parking difficulties and environmental pollution. Ayeni (1983) described these as the most pressing and most visible urban problem of Nigeria cities. Oduola (1981) explained that most urban congestion problems are caused by the less than the optimal manner in which the roads are used. Roadside and on-street parking, roads side trading and total disregard of traffic regulation by road users are a significant human contribution to the traffic problem.

According to Simmon (1996) in the developing countries, parking is a complex and long-term problem which cannot be totally eradicated but managed. Buses and trucks have to load and unload passengers and goods. They all need space to park and this poses a problem if

required spaces are not available. From the above, it is seen that the usage of a vehicle has a direct linkage with parking. This is because after the vehicle is driven to a destination, its usefulness greatly diminishes if there is difficulty in parking. To be effective, therefore, transportation system must include adequate parking facilities in all places that attract vehicle traffic. The research on the impact of on-street parking on traffic shows that on-street parking has socio-economic and environmental benefits as well as challenges, but these are yet to be worked on in Kpakungu. The aim of the study is to analyse the impact of on-street parking on traffic in Kpakungu, Minna; the objectives that would be carried out for the success of this project are to:

- i. Examine the various land uses along the major road corridor (minna-bida apian);
- ii. Assess the various parking facilities and determine the status of the parking facilities;
- iii. Investigate the condition of the parking facilities;
- iv. Evaluate the prevalence of on-street parking; and;
- v. Interrogate the causes of on-street parking;

Study Area

This study is restricted to Kpakungu neighborhood in Minna, Niger state. The research is based on the disturbing effect of on-street parking on traffic and other land use in Kpakungu. The scopes of this research are to identify the causes of on-street parking, identify the contribution of on-street parking to traffic congestion. It also entails examining the extent on-street parking has affected traffic flow in Kpakungu. The findings of the research bring ideas of necessary recommendations needed to battle the problems then the conclusion of the research. The study area will be Kpakungu Minna Niger state which covers an area approximately 114 hectares and is located on latitude $9^{\circ} 35'55.00''\text{N}$ and longitude $6^{\circ} 32' 00.00''\text{E}$ with a population of 28,924. Kpakungu is one of the wards in Minna with the following ethnic groups: Nupe, Gwari, Yoruba, Igbo, Hausa, and Edo. Kpakungu is dominated mostly by the Nupe and Gwari people who engage themselves mostly with agricultural activities. Kpakungu which is one of the oldest wards in Minna has increased with a growing number of people embarking on the neighborhood.

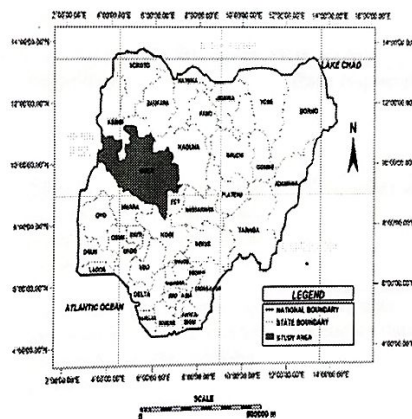


Figure 1: Niger state in the National Context
Source: Ministry of Lands Niger State (2017)

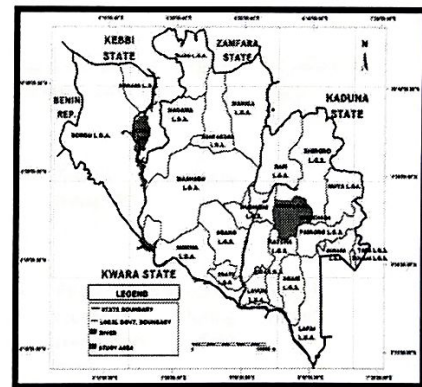


Figure 2: Administrative Delineation of Niger State
Source: Ministry of Lands Niger state (2017)

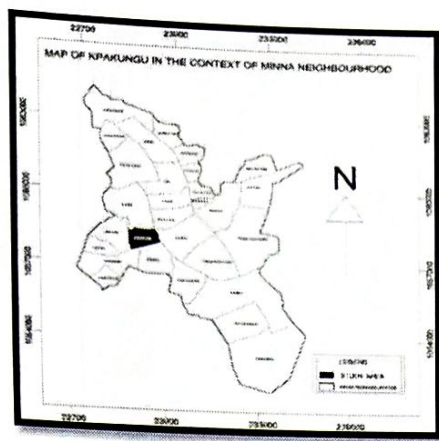


Figure 3: Minna Neighbourhoods showing Kpakungu

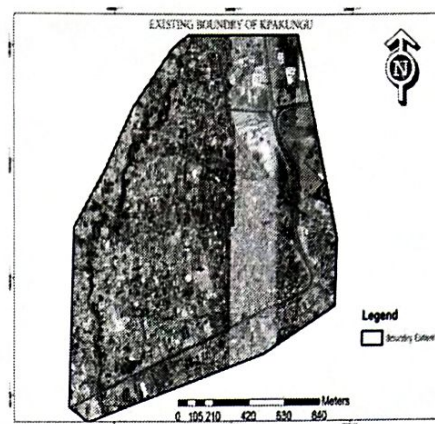


Figure 4: Boundary of Kpakungu

RESEARCH METHOD

Survey research was carried out to ensure the appropriate result for the analysis of the impact of on-street parking in Kpakungu. The research involves cross-sectional research. Distribution of questionnaire to different households to obtain adequate data to quantify the impact of on-street parking on traffic in Kpakungu. The questionnaire aimed towards answering traffic and on-street parking related questions. The questionnaire gives the provision of on the spot data collection. It also involves using physical observation and oral interviews to acquire data. Parking survey would be carried out over a period of one week. The continuous inspection of the cars parked along Kpakungu and also the time interval. It will provide information for the peak periods in which the cars are parked and also information for when on-street parking is at the minimum.

Random sampling will be adopted for this research. In order to achieve the objectives of the research, Table 1 shows the objectives of the research, data required for each objective, the instruments and methods of collection as well as the method of data analysis. The empirical research will provide for the researcher the opportunity to assess the impact of on-street parking on traffic in Kpakungu.

Table 1: Summary of the Research Methodology

S/N	Objectives	Data required	Instrument and method of data collection	Method of data analysis
1	Examine the various land uses along the major road corridor (Minna-Bida Apian)	Secondary data	• Spatial mapping using GPS	Map
2	assess the various parking facilities and determine the condition of the parking facilities	Primary data Secondary data	• Physical observation recorded during researchers field work • Questionnaire administration	Table Graph
3	evaluate the prevalence of on-street parking	Primary data Secondary data	Parking survey census will be conducted during selected period	Table Graph
4	interrogate the causes of on-street parking.	Primary data	• Questionnaire administration	Table Graph

Source: Author's research work (2017)

RESULTS AND DISCUSSION

Mapping of the land use along the major road corridor

This research is based on Kpakungu road corridor along Minna-Bida road which is characterized by the problem of on-street parking leading to traffic congestion. The land use along the road corridor is mainly commercial which is represented in figure 4.1.

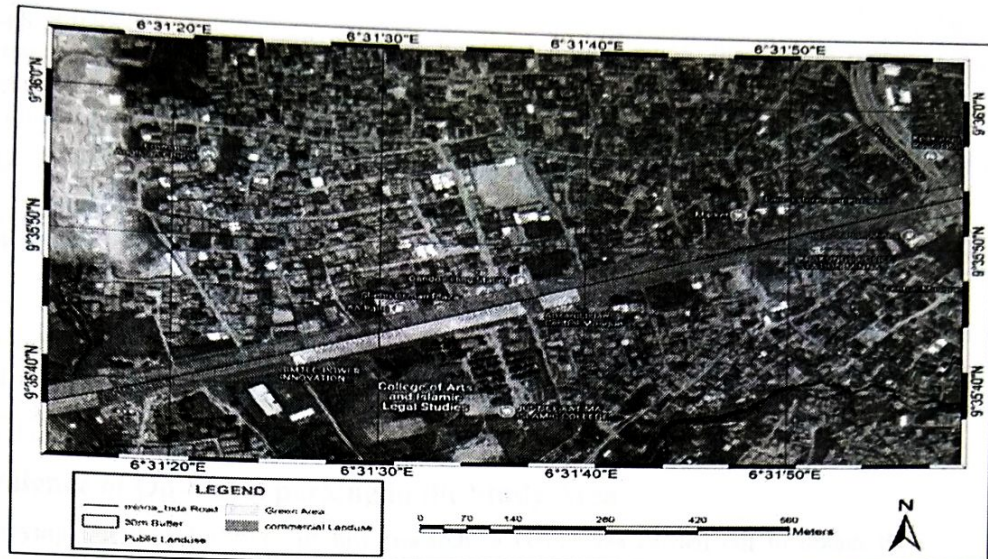


Figure 5: showing the google earth image of the existing land use of the study area
Source: Author's work

Assessment of the parking facilities and their condition

Among the objectives of this research is the assessment of the parking facilities and the conditions of the parking facilities. In the course of the research, it was noticed that parking facilities are provided for the business owners but a provision was not made for the customers in some business areas. A survey was carried out to show the business areas with parking facilities provided for the business owners and customers and also areas with parking facilities provided for only the business owners. Figure 4.2 shows the percentage of businesses with parking provided for the customers and the business areas without the provision of parking facilities.

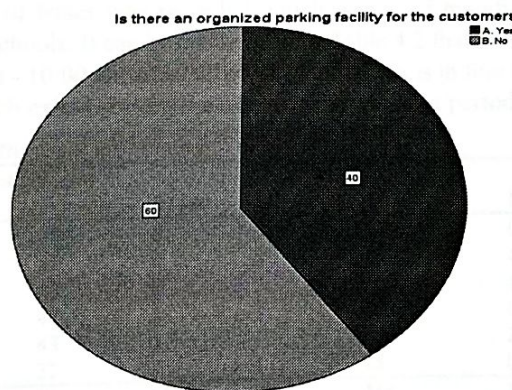


Figure 6: The percentage of business with parking facilities for the customers
Source: Field Survey, 2017

40% of the business in the area is provided with parking facilities for the customers while 60% of the business does not have provision for the customers. It was understood that some business areas were provided with parking spaces but the spaces are now rented out to small retail business which now forced customers to park on the street. Upon further research, it was understood that these retail business owners were approved by the government. So the government is the contributing factor for the condition of the parking facility been abused. In those areas with retail business in front of the already established business areas, business owners are also forced to park their cars on the street. Different commercial transport agencies in the area were also analyzed and also their parking condition. The condition of the car park of the commercial transport workers within Minna i.e. the Niger State Urban Transport Workers (NURTW) is not suitable. There are no available car parks for these commercial transport users and they are forced to park in front of business areas and also get their customers parked on the street. A survey was carried out to know the condition of the facilities of the car parks provided for the road transport workers. Figure 6 shows the condition of the facilities provided for the car parks.

Though different facilities were provided for the transport union, there is no proper maintenance of these facilities. 48% agreed that these facilities are bad and either needs to be replaced or properly maintained. It was understood that there is no proper maintenance team allocated for the facilities this is shown in Table 2.

Table 2: The condition of facilities in the car park

	Frequency	Percent
Very good	8	13.3
Good	1	1.7
Fair	11	18.3
Bad	29	48.3
Very bad	11	18.3
Total	60	100.0

Source: Field Survey, 2017

Prevalence of On-Street parking in the Study Area

In carrying out the objectives of this research, a count was carried out to obtain the prevalence of on-street parking over a selected period of time along the road corridor of the study area. The parking survey was carried out between the hours of 6:00 am to 6:00 pm at intervals of two (2) hours on Monday 24th July 2017 to Saturday 29th July 2017. The result of the volumetric parking survey has been collated accordingly and presented thus:

Volumetric parking survey along Kpakungu road Corridor Minna-Bida Road on Monday

Table 3 reveals that a total number of 1146 vehicles parked on the street of Kpakungu during observed hours of the day. The traffic constitutes of 535 cars, 230 tricycles, 22 buses, 37 trucks, 315 motorcycles and 7 bicycles. This shows that cars are the most frequently used vehicles on the road corridor. Monday recorded a considerable large number of cars which are mainly commercial vehicles; it also recorded a large number of trucks which consisted of petrol tankers, and trailers offloading loads to different commercial business. A considerable number of buses was recorded which was used mainly to pick and convey students of different schools. It can be deduced from Table 4.2 that on-street parking is at its peak between 8:01 am - 10:00 am and 2:01p - 4:00 pm. This is in line with the reality of the two peak periods which exist between the morning and evening periods.

Table 3: Volumetric Traffic count for Monday

Time Period	Types of vehicles						Total
	Cars	Tricycle	Buses	Trucks	Motorcycle	Bicycle	
6am-8am	82	19	2	8	17	0	128
8:01-10pm	82	52	4	6	90	4	238
10:01-12pm	90	42	6	7	50	1	196
12:01-2pm	100	47	2	5	80	0	234
2:01-4pm	98	43	5	7	53	2	208
4:01-6pm	83	27	3	4	25	0	142
Total	535	230	22	37	315	7	1146

Source: Field Survey, 2017

Volumetric parking survey along Kpakungu road Corridor Minna-Bida Road on Tuesday

Table 4 shows the volumetric count for Tuesday, which differs slightly with that of Monday. It reveals a total number of 1067 transport vessels were counted during the observed hours of the day. The traffic constitutes 466 cars, 236 tricycles, 50 buses, 61 trucks, 251 motorcycles and 3 bicycles. Motorcycles recorded the second highest number that parked on the street. Tuesday also recorded the peak periods between 8:01 am - 10:00 am and also 2:01 - 4:00 pm.

Table 4 Volumetric Parking Survey for Tuesday

Time period	Types of vehicles						Total
	cars	Tricycle	Buses	Trucks	Motorcycle	Bicycle	
6am-8am	62	21	8	17	25	0	133
8:01-10pm	105	37	9	9	40	1	201
10:01-12pm	66	36	7	10	40	2	161
12:01-2pm	87	42	7	11	51	0	198
2:01-4pm	89	62	12	9	58	0	230
4:01-6pm	57	38	7	5	37	0	144

Total	466	236	50	61	251	3	1067
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Source: Field Survey, 2017

Volumetric parking survey along Kpakungu road Corridor Minna-Bida Road on Wednesday

Table 5 differs greatly with the previous days due to it being the middle of the week. A total number of 870 vehicles parked on the street of Kpakungu during observed hours of the day. The traffic constitutes of 458 cars, 140 tricycles, 42 buses, 64 trucks, 165 motorcycles and 1 bicycle. Bicycles recorded the least which reveals that most commuters don't use bicycles. It can be deduced from Table 4.4 that on-street parking is at its peak between 8:01 am - 10:00 am and 2:01 pm - 4:00 pm. While the off-peak periods were between 6:00 am - 8:00 am and 4:01 pm - 6:00 pm with a total number of 124 transport vessels and 82 transport vessels respectively.

Table 5: Volumetric Parking Survey for Wednesday

Time period	Types of vehicles						Total
	Cars	Tricycle	Buses	Trucks	Motorcycle	Bicycle	
6am-8am	65	14	9	21	15	0	124
8:01-10pm	117	30	3	13	38	0	201
10:01-12pm	76	22	4	11	18	1	132
12:01-2pm	68	22	7	5	24	0	126
2:01-4pm	86	37	15	10	57	0	205
4:01-6pm	46	15	4	4	13	0	82
Total	458	140	42	64	165	1	870

Source: Field Survey, 2017

Volumetric parking survey along Kpakungu road Corridor Minna-Bida Road on Thursday

A significant increase in traffic was noticed on Thursday along the same road corridor. Table 6 reveals that 1286 transport vessels parked on the street of the study area. The survey constitutes of 387 cars, 376 tricycles, 36 buses, 29 trucks, 453 motorcycles and 5 bicycles. Cars, motorcycles, and tricycles are the most frequently used transport vessels along the corridor. The morning peak period was between 8:01 am - 10:00 am with 233 transport vessels while the evening peak period was between 4:01 pm - 6:00 pm with 281 transport vessels. The traffic was least between the hours of 6:01 - 8:00 am with a total of 82 transport vessels.

Table 6: Volumetric Parking Survey for Thursday

Time period	Types of vehicles						Total
	cars	Tricycle	Buses	Trucks	Motorcycle	Bicycle	
6am-8am	48	16	1	5	12	0	82
8:01-10pm	58	68	12	7	87	1	233
10:01-12pm	51	67	3	4	90	0	215
12:01-2pm	83	74	3	5	69	2	236
2:01-4pm	62	68	10	3	95	1	239
4:01-6pm	85	83	7	5	100	1	281
Total	387	376	36	29	453	5	1286

Source: Field Survey, 2017

Volumetric parking survey along Kpakungu road Corridor Minna-Bida Road on Friday

Friday the end of the working days has a volumetric count that differs with the other days of the week observed. Table 7 reveals that 1422 transport vessels were counted during the observed hours of the day. The peak and off-peak periods were also observed. The table revealed that on-street parking was at its peak between 10:01 am - 12:00 noon and 12:01-2:00 pm. The evening peak was noticed to have a significant increase in on-street parking due to the Muslims gathering to observe their Friday Jummat prayer. It was also noticed that the period of 4:01 - 6:00 pm had a considerable number of on-street due to the fact that most dwellers were traveling for the weekend.

Table 7: Volumetric Parking Survey for Friday

Time period	Types of vehicles						Total
	cars	Tricycle	Buses	Trucks	Motorcycle	Bicycle	
6am-8am	54	10	0	13	12	1	90
8:01-10pm	57	46	12	13	84	0	212
10:01-12pm	100	104	9	10	100	2	325
12:01-2pm	89	91	7	37	111	0	335

2:01-4pm	69	40	15	10	68	5	207
4:01-6pm	86	98	4	13	52	0	253
Total	455	389	47	96	427	8	1422

Source: Field Survey, 2017

Volumetric parking survey along Kpakungu road Corridor Minna-Bida Road on Saturday

The weekend traffic was also observed for the road corridor of the study area. Table 8 revealed that the weekend traffic had a considerable number of vehicles parked on the street. 1178 transport vehicles were counted during the observed hours of the day. It was noticed that the reason for the traffic was due to the fact that Saturday is the market day in the town. Locals coming from different location to the market to sell their goods increased the traffic. Also, a considerable number of trucks were counted, different trailers bring goods of various kinds to the market were counted. The traffic was at its peak during the hours of 8:01 am – 10:00 am and also at 4:01 pm – 6:00 am. It is said noticed the reason for the weekend traffic was due to commercial interest of the people.

Table 8 Volumetric Parking Survey for Saturday

Time period	Types of vehicles						Total
	cars	Tricycle	Buses	Trucks	Motorcycle	Bicycle	
6am-8am	78	16	3	19	11	0	127
8:01-10pm	79	38	7	4	70	0	198
10:01-12pm	113	83	16	9	95	0	316
12:01-2pm	75	50	0	4	55	0	184
2:01-4pm	87	27	3	7	45	0	169
4:01-6pm	93	28	0	10	53	0	184
Total	525	242	29	53	329	0	1178

Source: Field Survey, 2017

Summary of Traffic Distribution for the observed days of the week along corridor

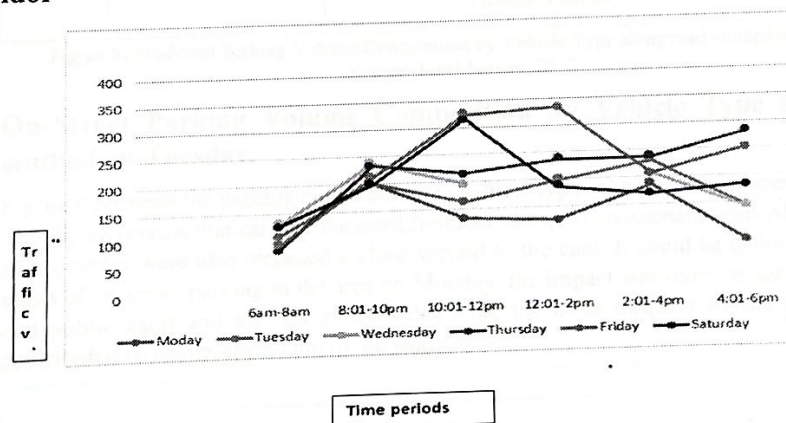


Figure 6: -Traffic distribution for the observed days of the week along corridor A.
Source: - Field Survey, 2017.

Figure 6 summarizes the traffic distribution for the observed days of the week along the corridor of the study area. The most noticeable period of on-street parking along the study area was during the peak hour between 8:01 am – 10:00 am. This is because of individual workers, staff, and students of Technology, Minna who have activities to engage in at Gidan Kwano campus.

It could be deduced from Figure 7 that the two (2) peak periods were constant for most days of the week observed. The hours of the day associated with the peak periods are from 8:01 am – 10:00 am for the morning peak and 2:01pm-4: 00 pm for the evening peak. Figure 8 reveals that the on-street parking is at its highest on Friday. This is due to the increase in on-street parking from the traffic that came to observe their Jummat prayer in the central mosque of the study area.

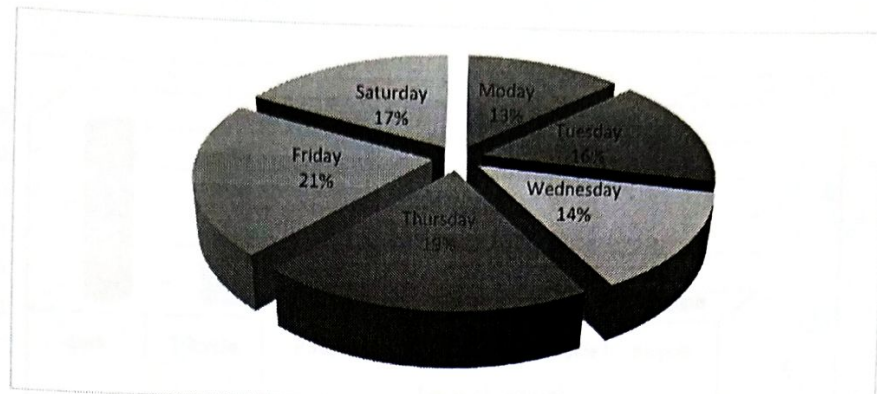


Figure 7: Percentage Composition of Traffic for the days of the week selected.
Source: Field Survey, 2017.

On-Street Parking Volume Composition by Vehicle Type along road studied on Monday.

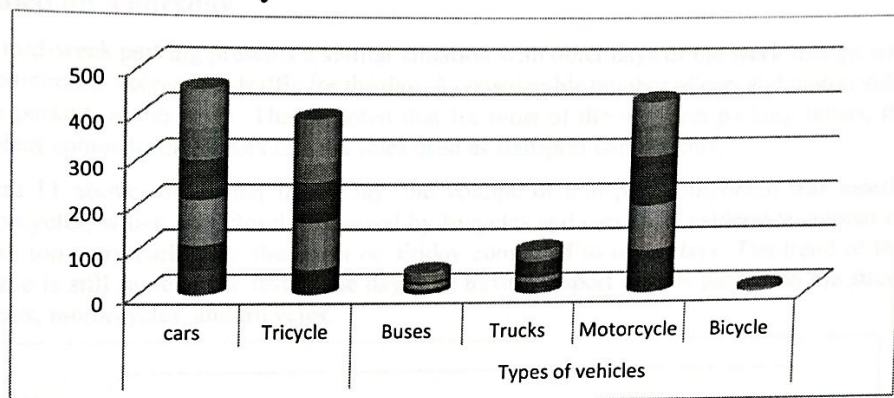


Figure 8: On-Street Parking Volume Composition by Vehicle Type along road studied on Monday
Source: Field Survey, 2017

On-Street Parking Volume Composition by Vehicle Type along road studied on Tuesday.

Figure 9 presents the parking composition by vehicle types along the study area for Monday. The figure reveals that cars are the most frequent transport components parked on the street. The figure also revealed a close second to the cars. It could be deduced that in the event of on-street parking in the area on Monday, the impact was more on cars (private cars and public cars) and also on motorcycles were the most frequent transport vessels that contributed to on-street parking in the study area.

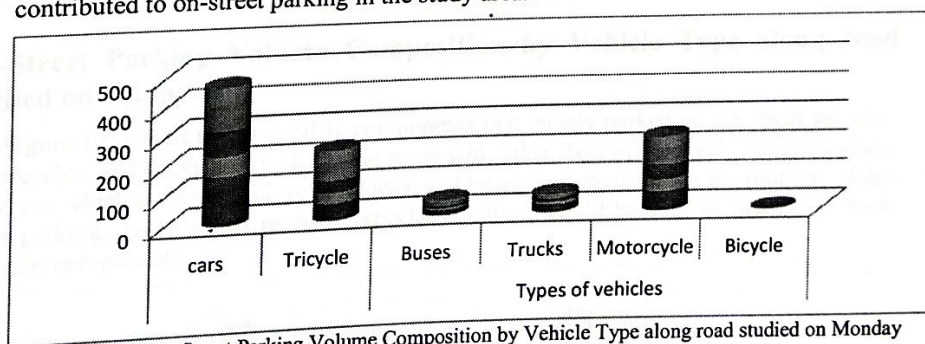


Figure 9: On-Street Parking Volume Composition by Vehicle Type along road studied on Monday
Source: Field Survey, 2017

On-Street Parking Volume Composition by Vehicle Type along road studied on Wednesday

Figure 10 shows that the most transport component that was parked mostly were cars, tricycles, and motorcycles. Cars recorded the most frequently parked transport vessels, followed by tricycles and then motorcycles. It could be deduced that the transport vessels that constitute the problem of on-street parking are cars, motorcycles, and tricycles. The problem of on-street parking stems from these transport vessels.

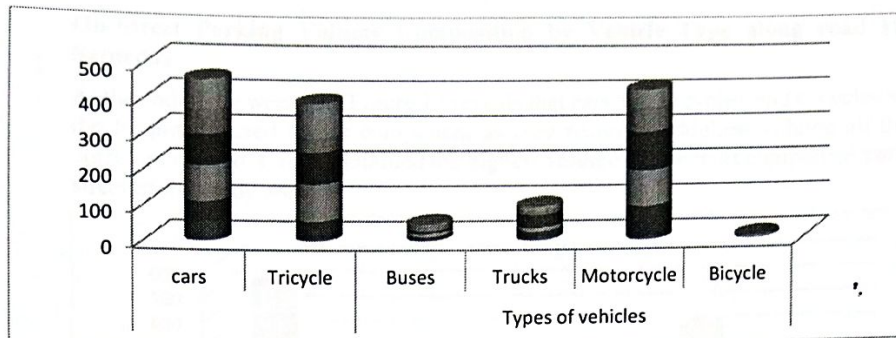


Figure 10: On-Street Parking Volume Composition by Vehicle Type along road studied on Wednesday
Source: Field Survey, 2017

On-Street Parking Volume Composition by Vehicle Type along road studied on Thursday

The mid-week parking presents a similar situation with other days of the week though with a considerable decrease in traffic for the day. A considerable number of cars and motorcycles were parked on the street. This is noted that for most of the on-street parking issues, the problem comes from the cars and tricycles used as transport components.

Figure 11 above shows that for Friday, the volume of transport component was mostly motorcycles, which was closely followed by tricycles and cars. A considerable amount of trucks too were parked on the street on Friday compared to other days. The trend of the volume is still same as the rest of the day. The most transport vessels parked on the street are cars, motorcycles, and tricycles.

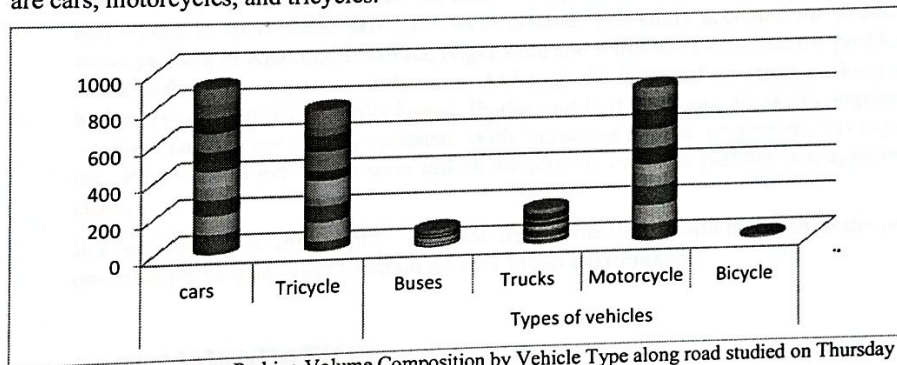


Figure 11: On-Street Parking Volume Composition by Vehicle Type along road studied on Thursday
Source: Field Survey, 2017

On-Street Parking Volume Composition by Vehicle Type along road studied on Friday.

The Figure 12 reveals that the traffic components that mostly parked on the street are cars, motorcycles, and tricycles which are the same with other days of the week. Here, a pattern is noticed which shows that bicycles, trucks, and buses contribute less to the problem of on-street parking. To curb this problem, special attention would have to be placed on these transport components.

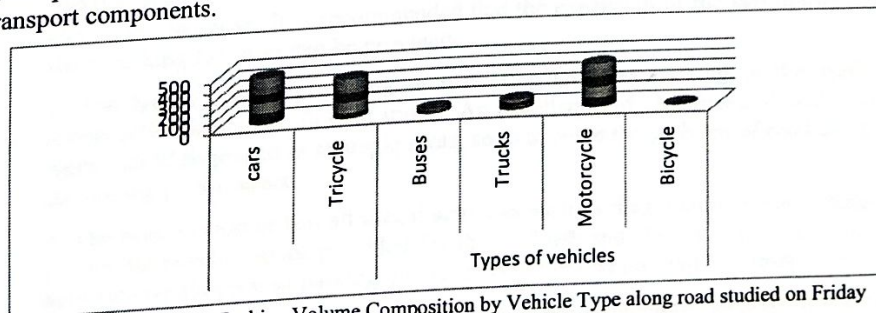


Figure 12: On-Street Parking Volume Composition by Vehicle Type along road studied on Friday
Source: Field Survey, 2017

On-Street Parking Volume Composition by Vehicle Type along road studied on Saturday

At the end of the week, the Figure 13 reveals that cars, motorcycles, and tricycles still remain the frequently used traffic component as they record the highest volume all through the corridors studied. Cars maintained the highest volume of transport component parked on the street of the study area.

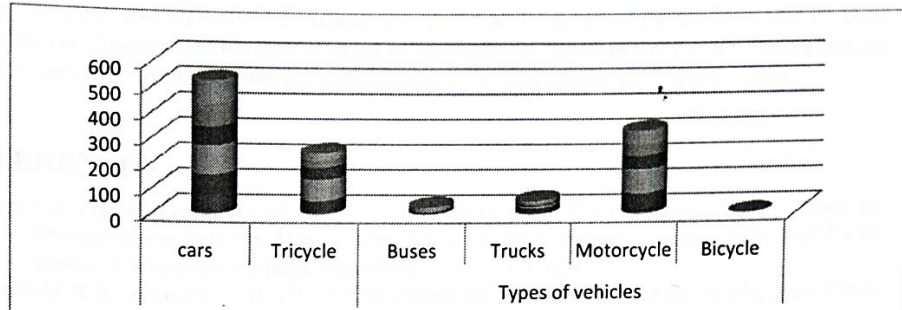


Figure 13: On-Street Parking Volume Composition by Vehicle Type along road studied on Saturday
Source: Field Survey, 2017

CONCLUSION

The conclusion of this research work is based on the research findings. An integral part of the transport system which plays a crucial role in the management of traffic and congestion is parking (Allison, 2002). This study has been able to identify the nature, impact, and extent of on-street parking and its effect on traffic in Kpakungu. Some useful suggestions on ways and means to solve these problems were offered. The study accessed the problem of on-street parking in Kpakungu, Minna, Niger state and it has been seen that the problems of on-street parking are apparent in the area. Although the issues of on-street parking are not as bad of those of large cities like Lagos, Ibadan and Port Harcourt, signs of congestion due to on-street parking are already apparent. With increasing population growth, it is expected that the situation will get worse soon unless we provide efficient parking management for our cities.

In conclusion, it is important to note that urgent attention should be given to the problem of on-street parking in order to attain a better urban environment.

RECOMMENDATION

The prevalence of on-street parking is a huge hindrance to the flow of traffic. On-street parking forms one major problem that makes traffic conditions chaotic in Nigerian cities (Asiyanbola and Akinpelu 2012). In the course of the research findings detailed in the previous chapter, the following recommendations have been proposed in order to efficiently and effectively deal with the problems of on-street parking in the study area.

1. The narrowness of the carriageway do not give enough space for on-street parking (side kerb parking) and due to the absence of the provision of on-street parking on the street parking, road users resort to parking on the street. This leads to constricting the already narrow carriageway. It is recommended that the expansion of the carriageway so that on-street parking facilities can be provided.
2. The lack of policies guiding or restricting on-street parking in the study area has immensely affected the flow of traffic. An installation of "No Parking" and "No Waiting" signs should be placed in strategic spots, so as to solve the problem of road users that insist on parking on the street.
3. The need to stop or ban all illegal activities such as illegal commercial activities carried out on the parking space provided for the land use and also on the street. Banning these activities would prevent parking on the street thereby improving the traffic flow.
4. Tax should be allocated or fines should be issued to on-street parking for the duration of the time a road user would park on the street. If this is clearly followed, it would prevent the problem of on-street parking, thereby improving traffic flow.

5. The commercial road users should be given a suitable space off-street, also a sign should be issued to the passengers indicating that they should go into the allocated car parks to use the transport service. This medium would prevent passengers from standing on the roadside waiting for the commercial cars. This would prevent traffic congestion.
6. The use of mass transit is advantageous in moving more people and reduces the transport vessels ploughing the road. Also, the space occupied by smaller vehicles would be greatly reduced. Mass transit lanes should be incorporated in order to reduce traffic congestion
7. An alternate route should be created for trucks and Lorries. The constant use of their vehicles has caused more harm than good to the road and the other road users. If an alternate route is provided, it would prevent traffic congestion and improve the traffic flow.

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