

ASSESSMENT OF PARKING SPACE MANAGEMENT OF FEDERAL CAPITAL CITY, ABUJA

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Abstract

The paper assesses the Parking space management in Federal capital city (FCC), Abuja with a view of providing an everlasting solution to the challenges facing the study area. Data for the study were obtained through a semi-structured questionnaire, observation, monitoring, recording and document review. A total of 387 copies of a questionnaire were administered and purposive sampling techniques was adopted. The data was analyzed using descriptive technique with the help of charts, figures and table. The findings from the study showed that the 65% parking method is on-street parking, 31% off-street parking. The parking problems associated within the study area were associated with off-street and on-street parking. The study reveals that, 47% of the problem of parking space management is traffic congestion, 31% accidents, and 15% is related to environmental congestion, while 7% of the parking space management in FCC is obstruction to firefighter. The factors responsible for parking problems were identified to include, 47% constitutes inadequate of parking facilities, the 31% concentration of activities and facilities in FCC, while 15% is due to non-implementation of the FCC transportation policy, and 7% is the violation of building codes and zoning regulations. The study reveals that there is a significant relationship of 95% between the methods of parking and factors responsible for parking problem. The study concluded by suggesting the management strategies for the efficient management of the parking space system in FCC, Abuja by enforcement of traffic rules and regulations, by disciplined law enforcement agent, Introduction of public parking garages, and Enlightenment of parking space users.

Keyword: Parking space, On-street parking, Off-street parking, Parking space, Management.

1.0 INTRODUCTION

On-street parking has many detrimental effects on vehicles, pedestrians, and street vendors. In fact, studies have shown that on-street parking has decreased stream speed or the capacity of the road, endangering road safety, obstructing the view of approaching vehicles, and making it challenging for drivers to see pedestrian crossings (Rudjanakanoknad, 2010; Chen et al., 2017; Box, 2004; Cao et al., 2017). According to Gattis (2000), drivers must exercise considerable caution when navigating their cars on a small, bordered, and parked road in order to regulate their cars' postures and prevent conflicts with pedestrians.

Any urban activity system's ability to function depends on the way infrastructure and transit networks interact (Madu, 2017). The movement of people and commodities, as well as the provision of access to land-based activities, are the two essential services provided by the transportation system in this regard. Therefore, the desire to use transport services is derived from the want to use other services rather than from the demand for them, making transport complementary to or a derived demand coming from the use of other services in an urban area (Ogar, 2015).

Older streets must be enlarged to make room for the rising number of cars. To allow the cars to travel at their top speeds, new roads and highways must be built (Walter, 2015). All these substantial efforts at highway construction and enlargement, however, have not been able to significantly reduce traffic jams or enhance traffic flow along the city's major thoroughfares.

People's decisions to drive to a specific location and whether they decide to purchase a car at all are significantly influenced by the availability and cost of parking spaces. Parks are today owned by both the government and private individuals; however, park ownership has changed over time.

Three issues with parking management are on the rise, according to Rye and Koglin (2014): on-street parking in areas where demand for parking outpaces supply; pre-construction and ongoing operating costs of providing off-street parking facilities; and problems with enforcing on-street parking in areas where parking management has not previously been practised.

Several punishments, including fines and vehicle impoundment, have been proposed to deter vehicle users from breaking parking regulations. In truth, parking fees are a way for governments in wealthy nations to make money. According to studies (RAC, 2005; University of Birmingham, 2005), certain local authorities have received a significant amount of money from penalties, which has led to popular dissatisfaction.

Income has grown through time, which has boosted automobile ownership and, as a result, reduced the amount of urban space (Mingardo *et al.*, 2015). Planning for urban transit is a result of parking concerns. According to Belmore (2019), parking planning has undergone a paradigm change. In the past, it was believed that "transportation" meant driving, that parking lots should virtually never be full, that businesses and governments should cover indirect parking expenses, and that each destination should have enough parking to meet its own needs.

The city's planning has encountered a number of new issues as a result of the recent, significant development in vehicular traffic. The use and management of parking are seen to be the most delicate and troublesome in Federal Capital City (FCC). This is due to the city's numerous commercial activities, which draw more people and motorised traffic than any other city in Nigeria. At the FCC, this leads to complicated traffic issues. Only effective and clearly stated planning policies and persistent effort will be able to address these issues. Parking facilities must consequently be considered in urban mobility management activities through appropriate appraisal. Effectiveness is ensured by placing the facilities in the right locations within the business areas, while non-compliance with standards hinders their effective use. Effective parking facility management in the Federal

Capital City's (FCC) planned business areas will encourage sustainability and efficiency in the efficient operation of the city (Madu, 2017). However, this study introduces new technologies that would enable underground parking systems and strives to provide the best parking space management within the Abuja metropolis.

2.0 Literature review

When a vehicle waits or pauses at a predetermined location at a terminal or terminals to load or unload passengers or cargo to continue or terminate its journey, this behaviour is referred to as parking. Sometimes a car will stop at a park to rest or to terminate the trip; these parks can be either public or private.

According to Babangana (2020), parking is the act of stopping, disengaging, and abandoning an uninhabited vehicle. Parking is frequently permitted on one or both sides of a road, albeit occasionally with limits. For the benefit of the buildings' occupants, several structures offer parking facilities. Nations and municipal governments have laws governing the layout and utilization of parking spots.



Plate 1. Parking of vehicles at parking space

Source: Author, (2021).

2.1 On-street parking

In opposed to parking your car in a parking garage, on-street parking simply refers to leaving your car parked anywhere along the curb of a street. Some streets allow you to always leave your car parked there, however other streets have restrictions. These limitations are typically displayed on traffic signs. Occasionally, parking is only permitted on one side of the street, while other times, parking is completely prohibited. Cities employ enforcement officials to make sure people abide by these laws and regulations because there are instances where parking on the street requires a permit (Osoba, 2012).



Plate 2. On-Street parking at Aguyi Ironsi street, Maitama.

Source: Author, (2021).



Plate 3. On-street parking at Sheu Shagari way, Maitama

Source: Author, (2021).

2.2 Off-street parking

Off-street parking refers to putting your car somewhere other than a public space. In most cases, these are parking lots and garages. Parking spaces off the street may be either indoors or outdoors. Private parking lots, garages, and driveways are also considered off-street parking (Osoba, 2012).



Plate 4. Parking on parade Ground Area 10, Garki Abuja.

Source: Author, (2021).



Plate 5. Off-Street parking at CAC Building Maitama, Abuja

Source: Author, (2021).

2.3 Car Parking Techniques

i. Parallel parking

Parallel parking refers to positioning your vehicle front bumper to rear bumper in a row with other vehicles parallel to the curb. Due to the space it provides for passing vehicles, parallel parking is typically done on the sides of streets without parking lots. Some people find parallel parking difficult since it necessitates a different approach than pulling directly into a parking place (Parking Network, 2020).



Plate 6. shows parallel parking

Source: Britishparking.co.uk (2017).

ii. Perpendicular parking

Parking cars parallel to a wall, curb, or another object is referred to as perpendicular parking. This style of parking is particularly prevalent in parking lots and garages since it allows for the parking of numerous vehicles in a small area (Parking Network, 2020).

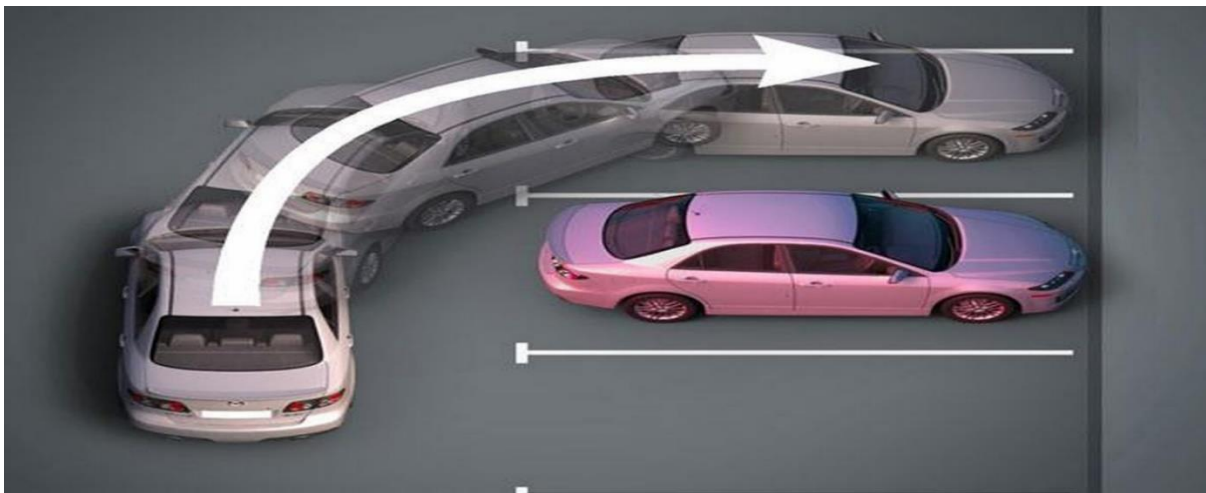


Plate 7. Perpendicular parking

Source: Alamy.com (2017)

iii. Angle parking

Although the cars are placed at an angle, angle parking is identical to perpendicular parking (Parking Network, 2020).

iv. Double parking

Double parking occurs when one vehicle is parked in a way that obstructs the exit of another vehicle. Double parking can occur in a variety of circumstances (Parking Network, 2020).

v. Double parking on-street

You risk receiving a fine for double parking of this sort. Double parking on the street occurs when you park your vehicle next to one that is close to the curb. In this case, double parking prevents the automobile next to the curb from leaving since it is blocked by your vehicle, which frequently also impedes traffic. In larger cities, double parking is regrettably extremely frequent. Sometimes some who double park their cars even leave the hand break off so that anyone who is blocked by it can move their automobile a little bit forward or backward (Parking Network, 2020)



Plate 8. Onstreet-Double parking at Wuse II, Banex Plaza Abuja

Source: Author, (2021).

vi. Double parking in parking garages with attendees

In order to fit as many automobiles into the parking garages as possible, double parking is used in this case. In contrast to parking on the street, attendees (or valets) park the automobiles in this case. All automobile keys belong to the participant. The visitor just brings the keys to both vehicles and moves the one that is blocking the other if one has to exit but is blocked by another vehicle (Parking Network, 2020).

vii. Parking Control

a. Access and revenue control

A valid parking credential must be presented in order to enter or exit a parking facility, which is controlled by an access control system (ACS). Paying for parking is a part of revenue control, which also entails managing both transitory and non-transient parkers. The servers, terminals, and kiosks used for payment and gate control in a garage (Belmore, 2019).

b. Transient

A short-term parking user, usually one who pays daily or less. Instead of paying for a defined amount of time to park (such as a month, a semester, etc.), transient clients often pay by the amount of time spent (Belmore, 2019).

c. Non-transient

Non-transient parkers, such as monthly parkers, are those who consistently utilise a permit or certificate to park. This may occur in a building with access controls or in a surface lot without a gate.

d. A Revenue Control System (RCS), In a parking lot or other facility, RCS is a system for managing and auditing the payments made by both transient and non-transient parkers (Belmore, 2019).

e. Access and Revenue Control (ARC)

This is also referred to as Parking Access and Revenue Control (PARC) and is offered in several functional and complicated levels. Parking owners and operators can regulate access and collect parking fees from customers thanks to access and revenue systems. When used in conjunction with policy and procedure, ARC systems, which come in a variety of equipment platforms, can expedite entrance and leave from a facility and secure revenues through audit records (Belmore, 2019).

viii. Parking Garages

The demand for parking spaces increased as more individuals acquired automobiles. Cities were searching for a method to park as many automobiles on as little land as possible because parking had become a problem. You could hardly tell that the parking garages served as automobile storage facilities because of how well they merged into the neighborhood. There have been instances where parking garages have doubled as horse stables, charging the same to park a car as to stall a horse (Shannon, 2007).



Plate 9. Federal secretariat (parking space)

Source: Author (2021).

ix. Automated parking system (APS)

The Garage Rue de Ponthieu in Paris, France, which was the first automated parking garage, was constructed in 1905. More parking spaces were required, but there was a shortage of suitable land. The cars in this multi-story parking garage were transported from level to level using an internal lift. On these levels, people did not park their own vehicles; instead, a parking valet would place the vehicle in an open spot. Although Garage Rue de Ponthieu wasn't entirely automated, many people believe it to be the first parking structure with automated features and the progenitor of the APS. In terms of technology, it is a partially automated parking garage (Parking Network, 2020).



Plate 10. Automate Parking system in Liverpool

Source: Britishparking.co.uk (2017)

2.4 Parking Guidelines/Policy

The following are the parking policies that are taken into account by the transportation system for urban sustainability, according to Marsden (2006):

1. Manage and coordinate the available on- and off-street parking spaces in an efficient manner using tools like spot allocation, upkeep fees, and enforcement.
2. Encourage a decrease in the number of already available, privately owned, non-residential parking spaces, their use, or both.
3. Set parking space requirements for vehicles involved in land use development.
4. Give bikers access to sufficient bike parking and facilities.
5. Raising the bar for parking lot security and safety.
6. Encourage the installation of excellent accessibility features in all parking lots.
7. Ensure that modifications to parking options do not jeopardize local economies, local roadways, or the environment.

2.6 Description of the Study Area

Near the northern border of the Territory, where it is located, the Niger and Benue Rivers converge. States like Kogi to the southwest, Nasarawa to the east and south, Kaduna to the north, and Niger to the west and north are

some of its neighbors. Located between latitudes 8.25 and 9.20 north of the equator and 6.45 and 7.39 east of the Greenwich Meridian, Abuja is geographically in the centre of the country. Of the Federal Capital Territory's more than 8,000 sq. km. of area, the actual city only occupies 250 sq. km. (AGIS, 2011). It has a moderate climate and had a population of 776,298 in 2006 (NPC, 2006). It is situated in the Savannah region. The present population is expected to reach 3,478,585 in 2021 with an annual growth rate of 10% (NPC, 2006 and Authors Projection, 2021).

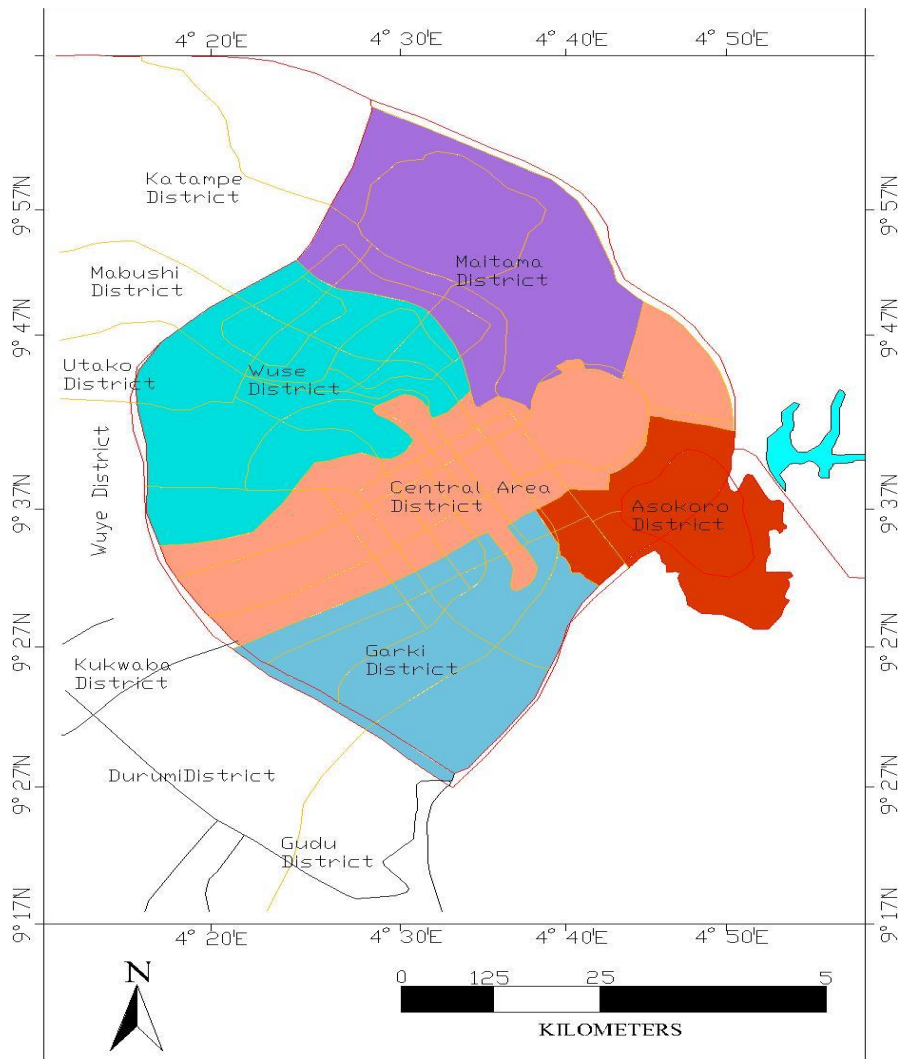


Fig. 1: Map of FCC, Abuja.
Source: AGIS, 2020.

3.0 Research Methodology

This paper used both primary and secondary data. The Primary sources of data involved the field work through observation, questionnaire administration and interviews.

This study adopted survey research design based on descriptive technique because it contributes positively towards testing and increasing the validity and reliability of the obtained data.

The sample was taken from this population using Yamane Approach. The approach is valid for 95% confidence level and proportion of 0.5 and size sample is given as (Israel, 2003):

$$n = N / (1 + Ne^2) \quad (1)$$

Where:

n = Sample size base on normal distribution N = Population value e = Margin of Error.

The data were analyzed using descriptive and inferential statistics.

4.0 Result and Discussion

4.1 Parking space characteristics

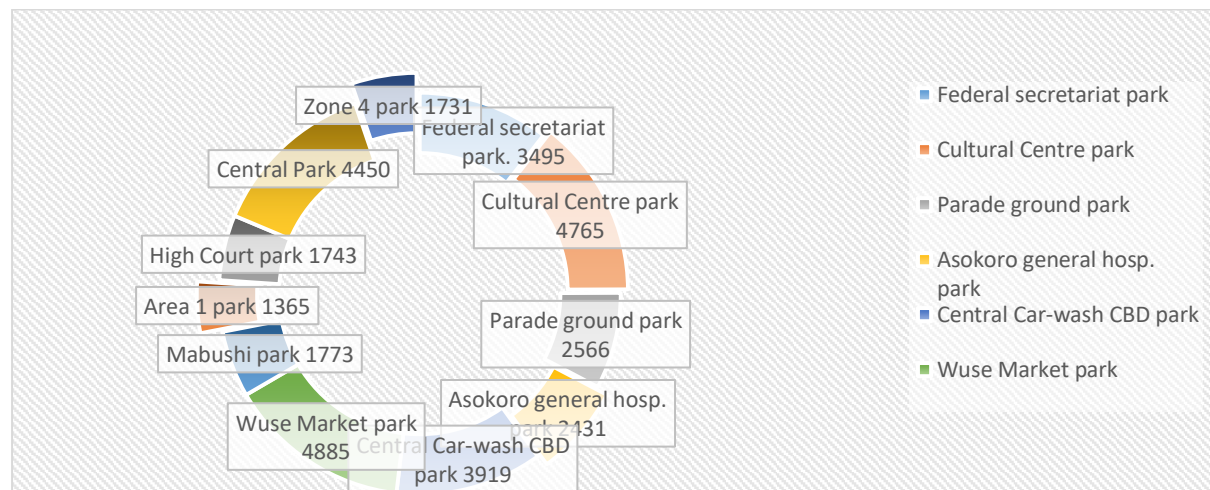


Fig. 2: Parking Accumulation at FCC, Abuja.

Source: Authors survey (2021).

The figure 2 above shows the parking accumulation at FCC, Abuja. The Federal Secretariat park has parking accumulation of 3495, Cultural Centre Park has 4765, Parade Ground park has parking accumulation of 2566, Asokoro General Hospital park has 2431 parking accumulation, Central Car wash has 3919 parking accumulation, Wuse market has the highest parking accumulation of 4885, Mabushi park has 1773 parking accumulation, Area 1 park has 1365, High court has 1743 parking accumulation, Central park has 4450 parking accumulation and Zone 4 park has 1731 parking accumulation respectively.

4.2. The Parking volume is the total number of vehicles parked through a given time duration or survey period. It is noteworthy that it doesn't account repetition of the same vehicle. So, it only reckoned the number of vehicles entered during the survey period.

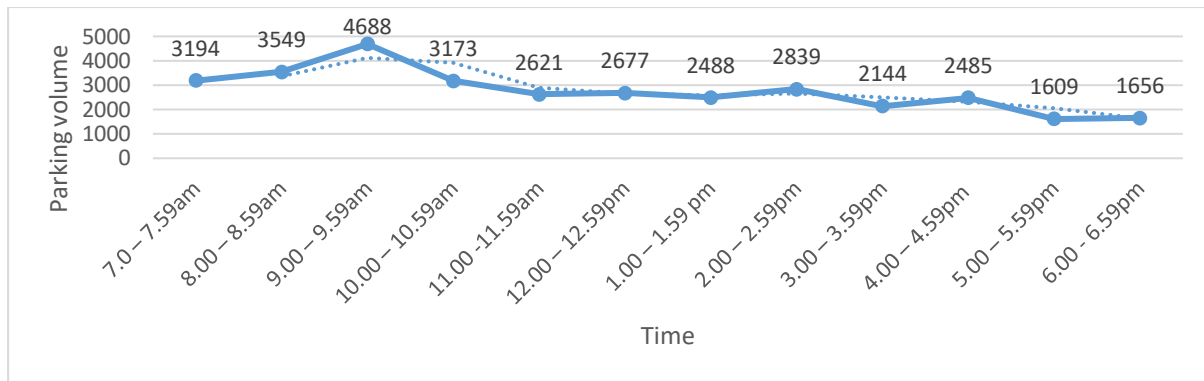


Fig. 3: Parking volume at FCC, Abuja.

Source: Authors computation, (2021).

The parking volume as expressed in figure 3, shows that 3194 parking volume at 7-7:59am, 3549 at 8-8:59am, 4688 is the parking volume at 9-9:59am and its equally the peak period of the parking volume, 3173 is the parking volume at 10-10:59am, 2621 is the parking volume at 11-11:59am, 2677 is the parking volume at 12-12:59pm, 2488 is the parking volume at 1-1:59pm, 2839 is the parking volume at 2-2:59pm, 2144 is the parking volume at 3-3:59pm, 2485 is the parking volume at 4-4:59pm, 1609 is the parking volume at 5-5:59pm, and 1656 is the parking volume at 6-6:59pm.

4.3. Capacity is the total number of parking space/bays available for parking at a particular parking lot. The figure 4 below shows the design capacity of respective parking space under study area. The study reveals that, Zone 4 parking space has a design capacity of 600, Central parking space has capacity of 1600, Mabushi parking space has capacity of 500, High court parking space has capacity of 800, Area 1 parking space has capacity of 300, Wuse market parking space has capacity of 1400, Central car wash CBD parking space has a capacity of 1200, Asokoro general hosp. parking space has capacity of 700, Parade ground parking space has a design capacity of 800, Cultural central parking space has a capacity of 1700 and Federal secretariat parking space has a design capacity of 1500 respectively.

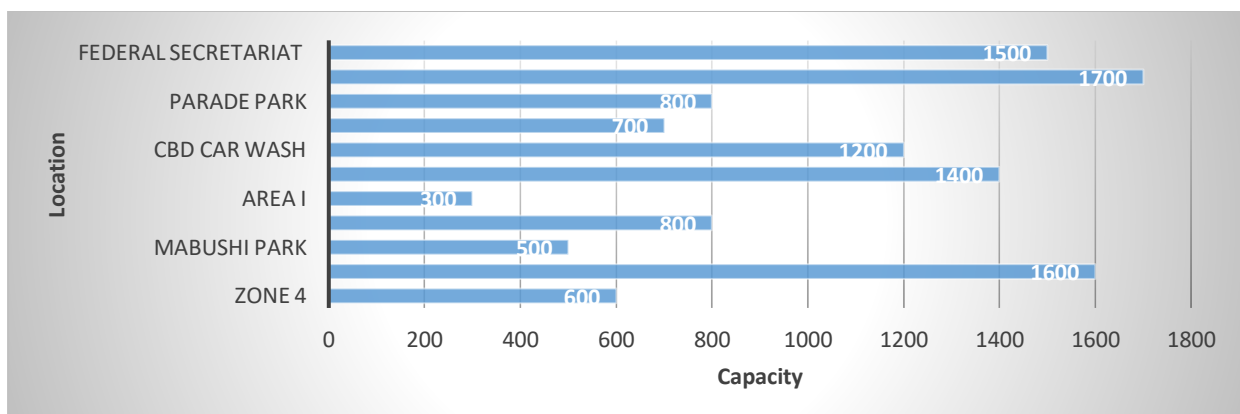


Fig. 4. Design Park Capacity of study area

Source: Authors design 2021.

Table 1. Parking index of the study area

Location	Parked vehicle (Accumulation)	Capacity	Parking index (P.i)= Accumulation (P.a)/Capacity (C)
Federal secretariat park	3495	1500	2.3
Cultural Centre park	4765	1700	2.8
Parade ground park	2566	800	3.2
Asokoro general hosp. park	2431	700	3.5
Central Car-wash CBD park	3919	1200	3.3
Wuse Market park	4885	1400	3.5
Mabushi park	1773	500	3.5
Area 1 park	1365	300	4.6
High Court park	1743	800	2.2
Central Park	4450	1600	2.8
Zone 4 park	1731	600	2.9

Source: Authors computation, (2021).

Parking index for particular parking facility is the total number of parked vehicles at a specified duration, i.e., accumulation divided by the capacity. It is also obtained by dividing the parking load by the capacity for a given time interval. It is a measure of efficiency of parking lot and how effectively it is being utilized.

P.i (Parking index)= p.A (Parking aumulation) / C (Capacity)

$$P_i = P_a / C$$

The parking index the area under study are revealed in the table 1 above. Federal secretariat has a parking index of 2.3, Cultural Centre Park has a parking index of 2.8, Parade ground has a parking index of 3.2, Asokoro general hosp. park has a parking index of 3.5, Central car wash CBD has a parking index of 3.3, Wuse market has a parking index of 3.5, Wuse II has a parking index of 3.5, Area 1 park has a parking index of 4.6, High court park has a parking index of 2.2, Central park has a parking index of 2.8 and Zone 4 park has a parking index of 2.9.

Table 2. Parking Load.

Location	Vehicle occupying parking space	Time (7am-6.59pm)hrs	P.l = Vop x t(v/hrs)
Federal secretariat park	3495	12	41940
Cultural Centre park	4765	12	57180
Parade ground park	2566	12	30792
Asokoro general hosp. park	2431	12	29172
Central Car-wash CBD park	3919	12	47028
Wuse Market park	4885	12	58620
Mabushi park	1773	12	21276
Area 1 park	1365	12	16380
High Court park	1743	12	20916
Central Park	4450	12	53400
Zone 4 park	1731	12	20772

Source: Authors computation, (2021).

The table 2: Parking load represents the total area under the accumulation curve. It is generally obtained by multiplying the number of vehicles occupying parking space for the particular time interval with that time interval. It is expressed as vehicle-hours.

Parking load (P.l)= Vehicle occupying parking space (Vop) x Time (t) (v.hrs).

4.5 The Parking Method (Parking Characteristics).

Parking surveys are intended to supply all information required for suitable parking and terminal facilities effectively. Parking in both the business districts during the survey were under taken through the two basic parking methods, namely: On-Street and Off-Street parking facilities. On-Street Parking: Is the adequate space for vehicles at the side of the road. Terminal Is a parking space whether at the earth or off-street in a lot, garage, shopping center or private driveway. Bus-stop is a parking space provided for motorists along the road way in the Central Business Districts and also at designated place.

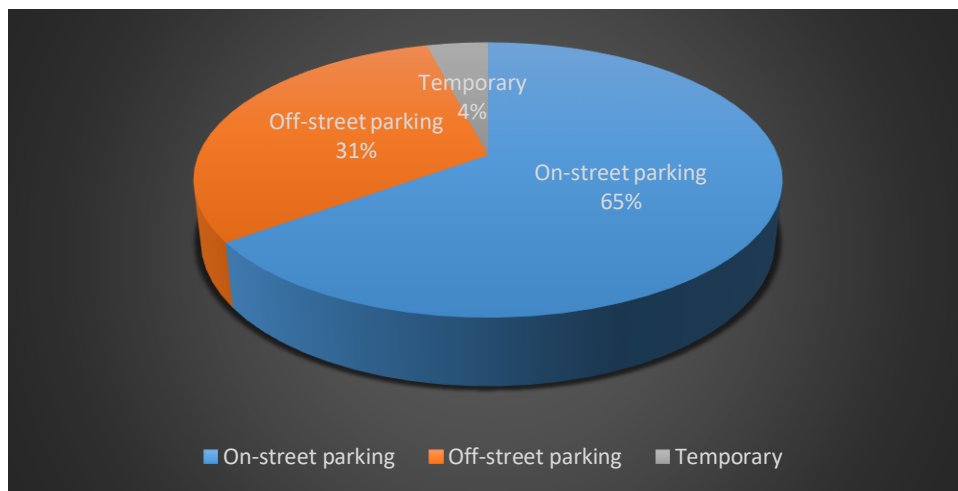


Fig. 5. Parking Method

Source: Authors design, (2021).

The respondents' response as shown in figure 5, shows the types of parking method popular in the area of study. The pie chat shows that 65% of the parking are On-street parking, 31% of the parking are Off-street parking and 4% of the parking are temporary parking. This implies that major parking in the study area are On-street and Off-street parking. The popular parking method can be related to the problems of traffic congestion associated with parking in Abuja.

4.6. The Impact of packing at FCC, Abuja.

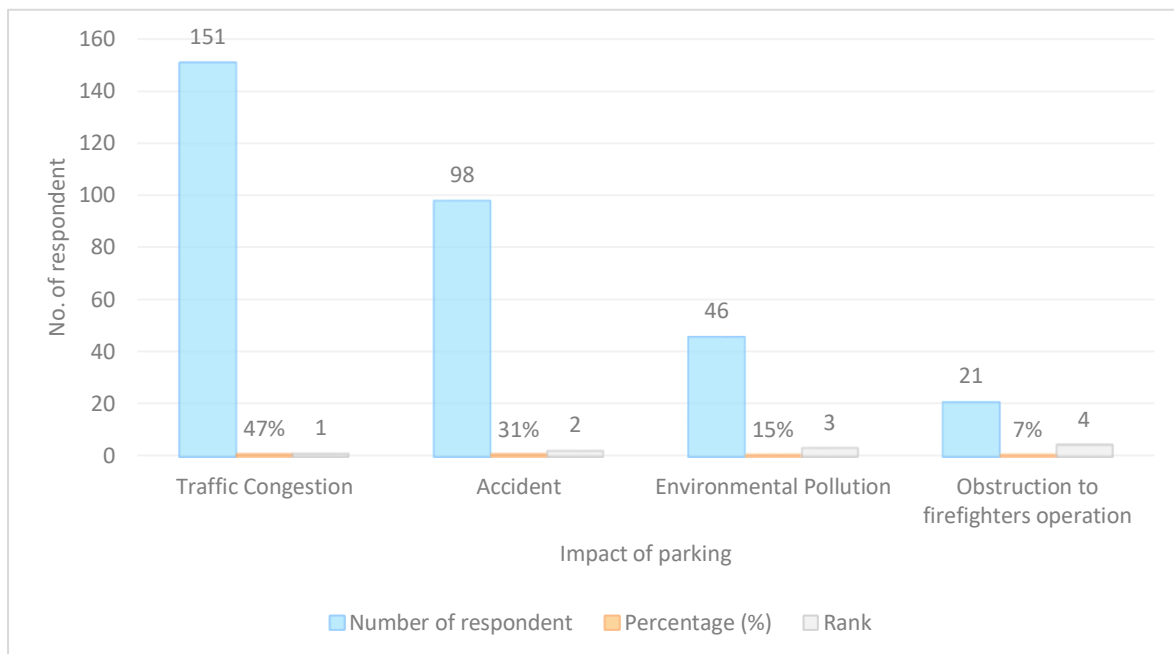


Fig. 6. Impact of packing at FCC, Abuja.

Source: Author survey, 2021.

Figure 6 shows that, the Traffic congestion has 47% impact on parking and it is the highest as compared to others, accident has 31% of impact on parking, Environmental pollution has 15% impact on parking and 7% impact on parking is constituted by Obstruction to fire operation in the respective area of study. Furthermore, the impact of parking in the study area are ranked, Congestion is ranked 1st, Accident is ranked 2nd, Environmental pollution is 3rd and the 4th ranked is Obstruction to fire operation.

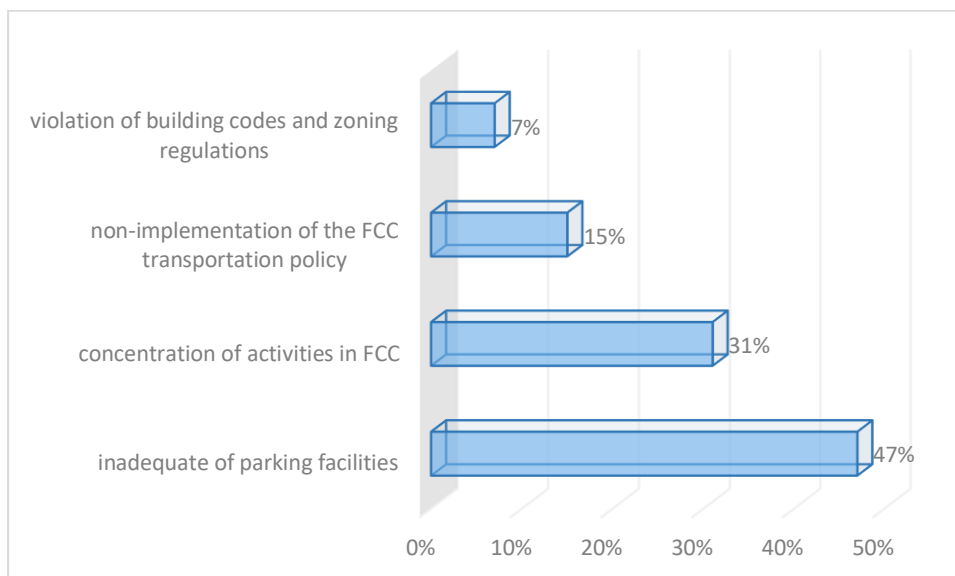


Fig. 7. factors responsible for parking problems at FCC, Abuja.

Source: Author survey, (2021).

The factors responsible for parking problems at FCC, Abuja reveals that, 47% constitutes inadequate of parking facilities, while 31% factor is the concentration of activities in FCC. The 15% factor is non-implementation of the FCC transportation policy and 7% as a result of violation of building codes and zoning regulations. The factors identify are the reasons to properly managed the parking space management in FCC, Abuja. Doing so, will enhance free flow of traffic and effective transportation activities in the study area.

4.7. The Test for significant relationship between the parking method and factors responsible for parking problems.

H₁; There is a statistical significant relationship between the parking methods (On-street and Off-street parking) and factors responsible for parking problems (inadequate of parking facilities, concentration of parking facilities, non-implementation of transport policy, and violation of parking facilities and zoning regulations).

Therefore, if the value of r (i.e. correlation) calculated is greater than table-value (0.05) significance level then we accept the null hypothesis. Also if the value of r (i.e. correlation) calculated are less than table-value (0.05) significance level then we reject null hypothesis and accept the alternative hypothesis.

From the correlations table below, it reveals the correlation between On-street parking and inadequate of parking facilities at .964 (96.4%), .934 (93.4%) concentration of parking facilities, .781 (78.1%) non-implementation of transport policy, and .798 (79.8%) violation of parking facilities and zoning regulations. From the output, there is a strong positive correlation between the on-street parking and the factors responsible for parking problems in FCC, Abuja.

The significant relation value between on-street parking and inadequate of parking facilities .000 (95%), .000 (95%) concentration of parking facilities, .000 (95%) non-implementation of transport policy, and violation of parking facilities and zoning regulations is also .000 (95%). Therefore, there is a strong significant relationship between the On-street parking and inadequate of parking space, concentration of parking facilities, non-implementation of transport policy, and violation of parking facilities and zoning regulations.

Similarly, from the correlations table 3 below, it reveals the correlation between the Off-street parking and inadequate of parking facilities at .924 (92.4%), .949 (94.9%) concentration of parking facilities, .784 (78.4%) non-implementation of transport policy, and .800 (80%) violation of parking facilities and zoning regulations. From the output, there is a strong positive correlation between the off-street parking and the factors responsible for parking problems in FCC, Abuja.

The significant relation value between Off-street parking and inadequate of parking facilities .000 (95%), .000 (95%) concentration of parking facilities, .000 (95%) non-implementation of transport policy, and violation of parking facilities and zoning regulations is also .000 (95%). Therefore, there is a strong significant relationship between the Off-street parking and inadequate of parking space, concentration of parking facilities, non-implementation of transport policy, and violation of parking facilities and zoning regulations.

In conclusion: H_1 is accepted, since there is a strong significant relationship between the parking methods and factors responsible for parking problems in FCC, Abuja.

Table 3. Correlations between the parking methods and factors responsible for parking problems in FCC, Abuja factors responsible for parking problems

		inadequate of parking space	concentration of activities	non- implementation of transport policy	violation of building codes and zoning regulations
On-Street parking	Pearson Correlation	.964**	.934**	.781**	.798**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	387	387	387	387
Off-street parking	Pearson Correlation	.924**	.949**	.784**	.800**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	387	387	387	387

**-. Correlation is significant at the 0.05 level (2-tailed).

Source: Extract from SPSS analysis. (2021)

5.0 Conclusion

The required parking space posed by the various parking characteristics in FCC, Abuja and the corresponding problems had been revealed and explained in this study. Federal capital city has always been the busiest and problematic commercial areas and had been used to showcase the numerous parking problems in other cities of Nigeria in general. Most of parking problems experienced in the study area were caused through off-street and on-street parking but mostly by the latter. This study helped in providing solutions to many parking problems in major cities of Nigeria and to deter property owners, businessmen and government agencies from aiding corruption and conversion of original land uses to another. Federal Capital City fell short of modern methods and systems of parking and they could easily bounce back if adequate modern parking facilities were provided where these had been recommended accordingly in this study.

6.0 Recommendations

The study recommendations are as follow:

1. The provision of parking spaces in conjunction with new structures should be specified and enforced by the Federal Capital Development Authority (FCDA). Additionally, the outdated structures at FCC need to be renovated to provide room for enough parking spaces.
2. To avoid affecting the land use master plan, the Federal Capital Development Agency should strictly enforce compliance with violations.
3. In the Federal Capital City of Abuja, enlightenment and educational awareness are fundamental instruments for attaining successful traffic management control. The majority of drivers in FCC, Abuja, are not familiar with traffic laws and regulations, and their disregard for traffic signs and signals causes congestion, accidents, and access obstructions on most of the roads. However, the commendable educational initiatives launched by the government and private organizations will aid in altering drivers' attitudes.
4. Parking facilities are located in the FCC in Abuja. Due to its business activities, the FCC has a minimum need for parking spaces. In order for the region to fulfil its primary purpose of serving as an approachable, appealing, and lucrative market place, parking facilities/lots must be made available.

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