ASSESSMENT OF PARKING IN COMMERCIAL ZONES OF WUSE II DISTRICT, FEDERAL CAPITAL CITY (FCC), ABUJA

By

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DEPARTMENT OF URBAN AND REGIONAL PLANNING

FACULTY OF ENVIRONMENTAL DESIGN

AHMADU BELLO UNIVERSITY, ZARIA

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DEPARTMENT OF URBAN AND REGIONAL PLANNING

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DECLARATION

I declare that the work in the thesis entitled **'Assessment of Parking in Commercial Zones of Wuse II, FCC, Abuja'** has been carried out by me in the Department of Urban and Regional Planning under the supervision of Professor Adamu Ahmed. The information derived from the literature has been duly acknowledged in the text and a list of references has been provided. No part of this work has been accepted in any previous application for a higher degree.

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Name:	**Signature**	**Date**

CERTIFICATION

This thesis entitled: ASSESSMENT OF PARKING IN COMMERCIAL ZONES OF WUSE II, FCC, ABUJA by MADU CHIMAOGE ALEXIUS, meets the regulations governing the award of the degree of Master of Science of Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This thesis is dedicated to my beloved gem, friend, soul mate and wife, Mrs. Chika Sylvia Madu who has been beside me all this while. For her understanding even when I travelled long leaving her with the family responsibilities; may she remain blessed. I must not forget to dedicate this work to my unforgettable parents, Late Nze Edward and Late Lolo Adaure Madu who believed that 'I CAN' before they departed this world. May God continue to grant their souls eternal rest. To my brothers: Uchechukwu, Obinna, Onyewuchi, Ifeanyi, Agunnia and sisters: Adanne, Oluchi, Nwanyi Sunday, Nkechi, and Egowure, you are all wonderful people. You supported me with your prayers and encouragements; I also dedicate this work to you.

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ABSTRACT

The research examined the Problems of Parking in Commercial Zones within Wuse II District, FCC, Abuja and the explanations with a view to establishing challenges and providing appropriate recommendations. Data for the study were obtained through a semi-structured questionnaire, observation, monitoring, recording and document review. A total of 86 questionnaires were administered through Stratified Random Sampling. The Nominal Scale was used to classify the various commercial activities and their parking characteristics. The findings from the study showed that the parking problems within the study area were associated with Off-Street and On-Street parking. The On-Street parking predominantly occurs around the Converted Commercial Developments. Among the various commercial activities in the area, Plazas had the highest off-street and on-street parking problems. Among the Streets, Aminu Kano Crescent had the most parking problems. The factors responsible for parking problems were identified to include, inadequate parking facilities, lack of multi storied parking facilities, non-implementation of the FCC transportation policy, and poor enforcement of development control guidelines. The study concluded by suggesting the management strategies for the efficient management of the transportation system in Wuse II, review of Wuse District Plan, introduction of public parking garages, introduction of parking charges, development of mass transit systems, and strengthening of the Department of Development Control.

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CHAPTER ONE

BACKGROUND TO THE STUDY

1.1 Introduction

The viability of any urban activity system is dependent upon interactions of transport systems and infrastructure. In this regard, the transport system provides two fundamental functions: Movement of persons and goods, and provision of access to land-based activities. Transport services are therefore not demanded and utilized for their sake but are derived from the desire to use other services, thus making transport complementary to or a derived demand arising from the use of other services in an urban area (Ogar, 2009).

With the rapid growth of vehicular traffic in recent years, the planning of the city has been faced with a number of new problems. 'Old streets have to be widened in order to accommodate the increasing number of cars. New streets and highways have to be constructed to enable the cars develop full speed' (Walter, 1940, Pg.464-467). Meanwhile, all these extensive activities in the widening and highway construction have proved not to be enough to relieve traffic congestion or to improve traffic flow along the main thoroughfares within the city at large. Walter, in his study also observes that the problem of keeping the cars on the move is definitely related to the question of where to put them when they come to rest.

Parking is a critical component of transportation policy and management for any locale, but especially for the large central cities. The policies and management practices affecting parking lead to outcomes that, in turn, can affect land use, air quality, traffic congestion, travel behavior, safety and economic development, not to mention revenue lines. Yet, effectively managing parking is an ongoing battle for the large central cities as they face competing, and sometimes contradictory, objectives along with an ever-increasing demand for space (Allison,

2002 p.7). As important as parking is, there are relatively few serious analyses and assessments of parking and its problems which are of particular interest to this study.

Wuse II District is one of the ten districts in Phase 1 of the Federal Capital City (FCC). It is considered as the most delicate and most problematic in terms of the use and management of parking. This is as a result of myriads of commercial activities in the district which attract high population and motorized traffic more than any other district within the Federal Capital City (FCC). This gives rise to complex traffic problems in the FCC. These problems can only be solved through appropriate and well-articulated planning policies and actions on a sustained basis. It is therefore necessary that parking facilities are covered in urban transportation management exercises through proper evaluation. The proper location of the facilities within the commercial areas based on standards ensures effectiveness while non-conformity to standards affects their efficient utilization. Good management of parking facilities in planned commercial Districts of the Federal Capital City, (FCC) will promote efficiency and sustainability in the smooth running of the city.

1.2 Statement of Research Problem

Abuja has very elaborate proposals meant to ensure smooth traffic movement and parking. The proposals include various hierarchies of transportation corridors, public and private parking areas and an integrated system of rail and mass transit. In reality, effective as the transportation system is meant to be, parking has now become a major problem that makes travel within the city difficult. Commercial areas across the city exhibit more of the problems and predominantly also within the older Districts of Phase 1. The occurrence of this problem and the factors responsible require investigation to determine possible solutions. This study seeks to explore

these and related issues using Wuse II District as a case study. It examines characteristics and problems of parking and the forces that account for observed shortcomings.

Wuse II District is one of the Districts developed at the take-off of the Federal Capital Territory. It is characterized by large number of commercial activities primarily along the major streets. These commercial activities have been on the increase over time mainly through land use conversion. Across the District, it is observed that on-street parking is very common leading to congestion, environmental pollution and traffic accidents, etc. The introduction of parking fees between 2012 and 2014 across the city did not itself solve the problem suggesting that better strategies are needed.

Parking demand, supply and design have been studied including factors contributing to emergence of problem in many cities (Hamna, 1993; Jane, 2001; McDonald, 2009; Sanusi, 1998). There are studies also on parking strategy, standards, management, parking policy and the pricing of parking (Mitava 2012; Todd, 2006, 2010; Tres and Dana, 1998). In particular, Ogar (2009) has studied urban transportation problems associated with the distortion of the Abuja Master Plan. The contribution of this study is in complementing earlier studies by focusing on characteristics of parking in commercial zones of Wuse II District as bases to better understand the challenges.

1.3 Research Questions

The questions that the study seeks to answer are:

1. What is the nature and pattern of parking problems in the commercial areas of Wuse II, FCC?

2. What are the explanatory factors for the problems?

1.4 Aim of the Study

The aim of this research is to analyze the parking characteristics of commercial areas of Wuse II, Abuja, as a basis for identifying the inherent problems and to make recommendations.

1.5 Objectives of the Study

1. To review relevant concept, policy, standards and management strategies of parking in cities.
2. To examine the characteristics of parking for commercial developments in Wuse II District, Abuja.
3. To identify the parking problems associated with commercial developments in Wuse II and explanatory factors.
4. To make appropriate recommendations.

1.6 Scope and Limitation

This study will focus on characteristics and problems of parking in the commercial areas of Wuse II, Federal Capital City (FCC), Abuja. It will also determine the factors responsible for parking problems and the implications. It is further limited to the problems of parking by commercial developments and by streets. Wuse II District (Cadastral Zone A07) is chosen among other Districts in Phase 1 because of the predominance of commercial activities in the area.

1.7 The Study Area

The Federal Capital City is within the Federal Capital Territory, Abuja and comprises of phases 1, 2, 3, and 4 (see Figure 1.1). The FCT was created in 1976 by virtue of the Federal Capital

Territory Act (AGIS, 2011) and through Decree No. 6. The entire Territory itself was carved out from three states namely, Niger State which contributed 79% of the land area and 71% of the indigenous population, Nassarawa State which contributed 16% and 21% respectively, and Kogi State with a contribution of 5% and 8% respectively (Onlinenigeria .com, 2003). Until the creation of the FCT, the area was among the least developed in the country, lacking any form of developmental amenity and infrastructure (in other words, it was more of a virgin land); now it cannot be matched by any other part of the country. It was a planned city and its construction commenced in the 1980s and officially became Nigeria's Federal Capital Territory, replacing the previous capital, Lagos.

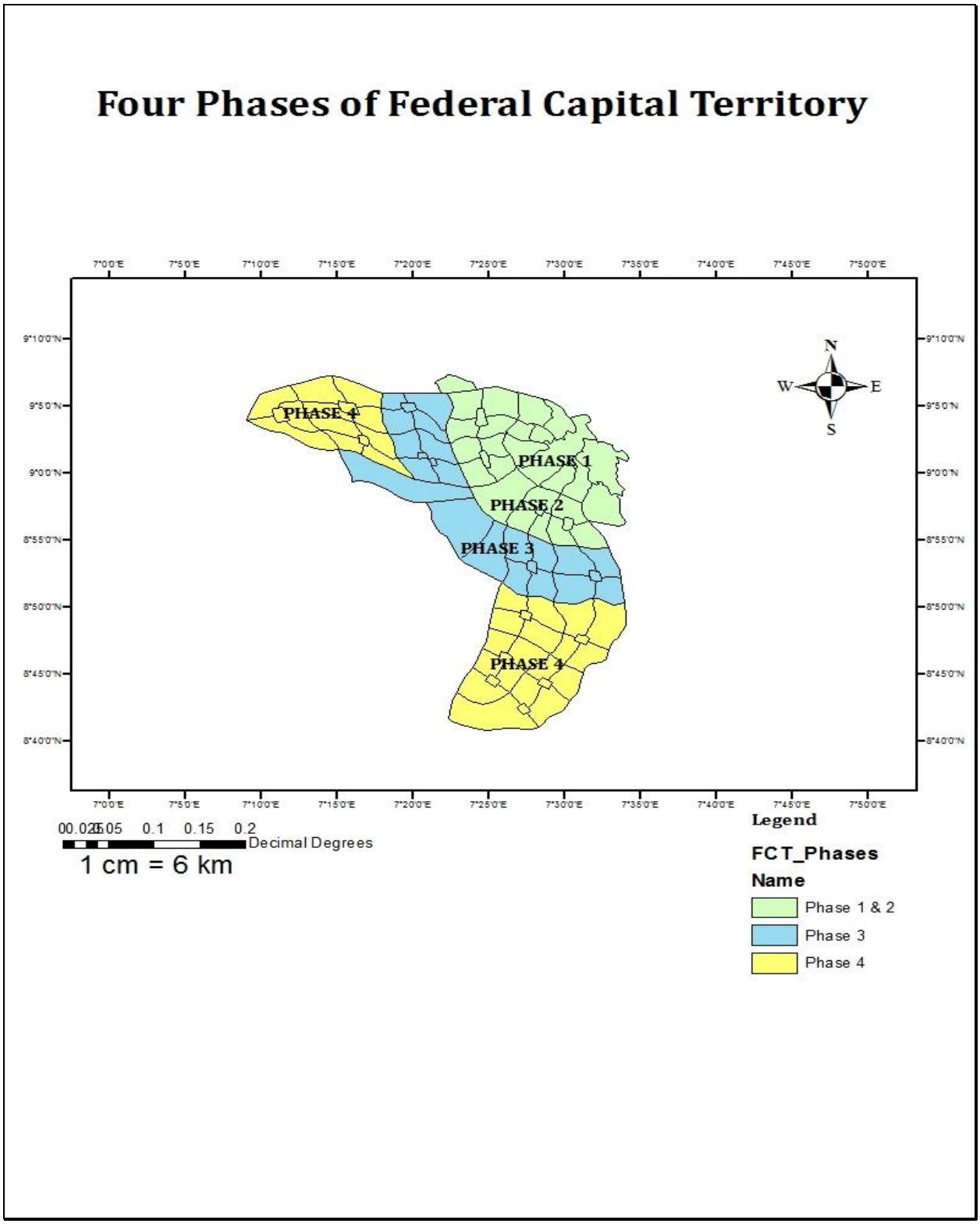


Figure 1.1: Four Phases of Federal Capital City showing the study Area

Source: **Abuja Geographic Information Systems, 2015**

Abuja is in the central region of the country (see Figure 1.4). Unlike the States of Nigeria, which are headed by elected Governors, it is administered by the Federal Capital Territory Administration, headed by a Minister appointed by the President. According to Mabogunje (1999), the reasons for which the seat of government was moved from Lagos to Abuja included:

1. The principle of equal access
2. The principle of equal citizenship
3. The principle of environmental conservation
4. The principle of the city beautiful
5. The principle of the functional
6. The principle of effective regional development
7. The principle of rapid National economic growth

Mabogunje (1999) further explained that the vision of Abuja was a capital that would foster greater integration and promote rapid economic development. The FCT was created with the Federal Capital Development Authority (FCDA) as the sole agency responsible for planning, designing and its development. The territory is currently made up of six local councils, comprising the city of Abuja (Abuja Municipal Area Council, AMAC) and five Local Government Areas, namely: Abaji, Gwagwalada, Kuje, Bwari and Kwali (see Figure 1.3).

The study area which is Wuse II District falls within the Abuja Municipal Area Council. Wuse II District is one of the ten Districts that made up Phase 1 in AMAC namely: Wuse 1, Wuse 2 (A07), Wuse 2 (A08), Garki 1, Garki 2, Central Area, Asokoro, Maitama (A05), Maitama (A06), and Guzape (see Figure 1.2).

Table 1.1: Phases and the Districts

S/N	Phase 1	Phase 2	Phase 3
1	Asokoro cadastral zone (A04)	Dakibiyu cadastral zone (B 1 0)	Gwarimpa 1 cadastral zone (C02)
2	Central Business District cadastral zone (A0O),	Duboyi cadastral zone (B12) s=	Gwarimpa 2 cadastral zone (COS)
3	Garki 1 cadastral zone (A01)	Durumi cadastral zone (B2)	Dape cadastral zone (C04)
4	Garki 2 cadastral zone (A03)	Dutse cadastral zone (B14)	Karmo cadastral zone (C01)
5	Guzape cadastral zone (A09)	Gaduwa cadastral zone (B13)	Galadimawa cadastral zone (C07)
6	Maitama cadastral zone (A05 & A06)	Gudu cadastral zone (B01)	Dakwo cadastral zone (COS)
7	Wuse 1 cadastral zone (A02)	Jabi cadastral zone (B04)	Lokogoma cadastral zone (C09)
8	Wuse 2 cadastral zone (A07 & A08)	Jahi cadastral zone (BOS)	Wumba cadastral zone (C 1 0)
9		Kado cadastral zone (B09)	Wupa cadastral zone (CIS)
10		Kaura cadastral zone (Bl 1),	Bunkoro cadastral zone (C18)
11		Katampe cadastral zone (B7)	
12		Katampe ext. cadastral zone (B 1 9)	
13		Kukwaba cadastral zone (BOO)	
14		Mabushi cadastral zone (B06)	
15		Utako cadastral zone (BOS)	
		Wuye cadastral zone (BOS)	

Source: Abuja Geographic Information System, 2009

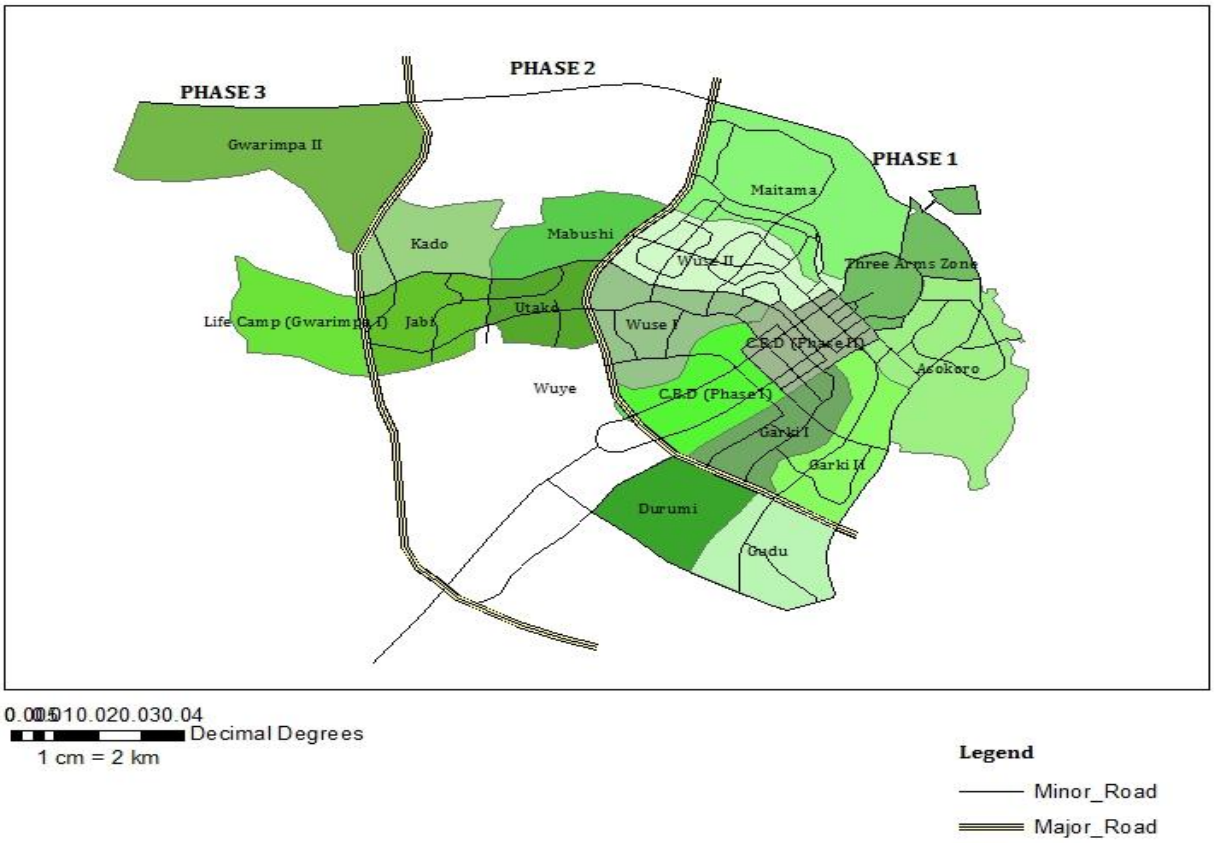


Figure 1.2: The FCC showing the Phases and Districts

Source: **Abuja Geographic Information Systems, 2015**

The Territory is located just north of the confluence of the River Niger and Benue River. It is bordered by the States of Niger to the West and North, Kaduna to the North east, Nasarawa to the East and South, and Kogi to the Southwest. Lying between latitude 8.25 and 9.20 north of the equator and longitude 6.45 and 7.39 east of the Greenwich Meridian, Abuja is geographically located in the center of the country (see Figure 1.4). The Federal Capital Territory has a landmass of approximately 8,000 sq.kms of which the actual city occupies 250 sq.kms (AGIS, 2011). It is situated within the Savannah region with moderate climatic conditions.

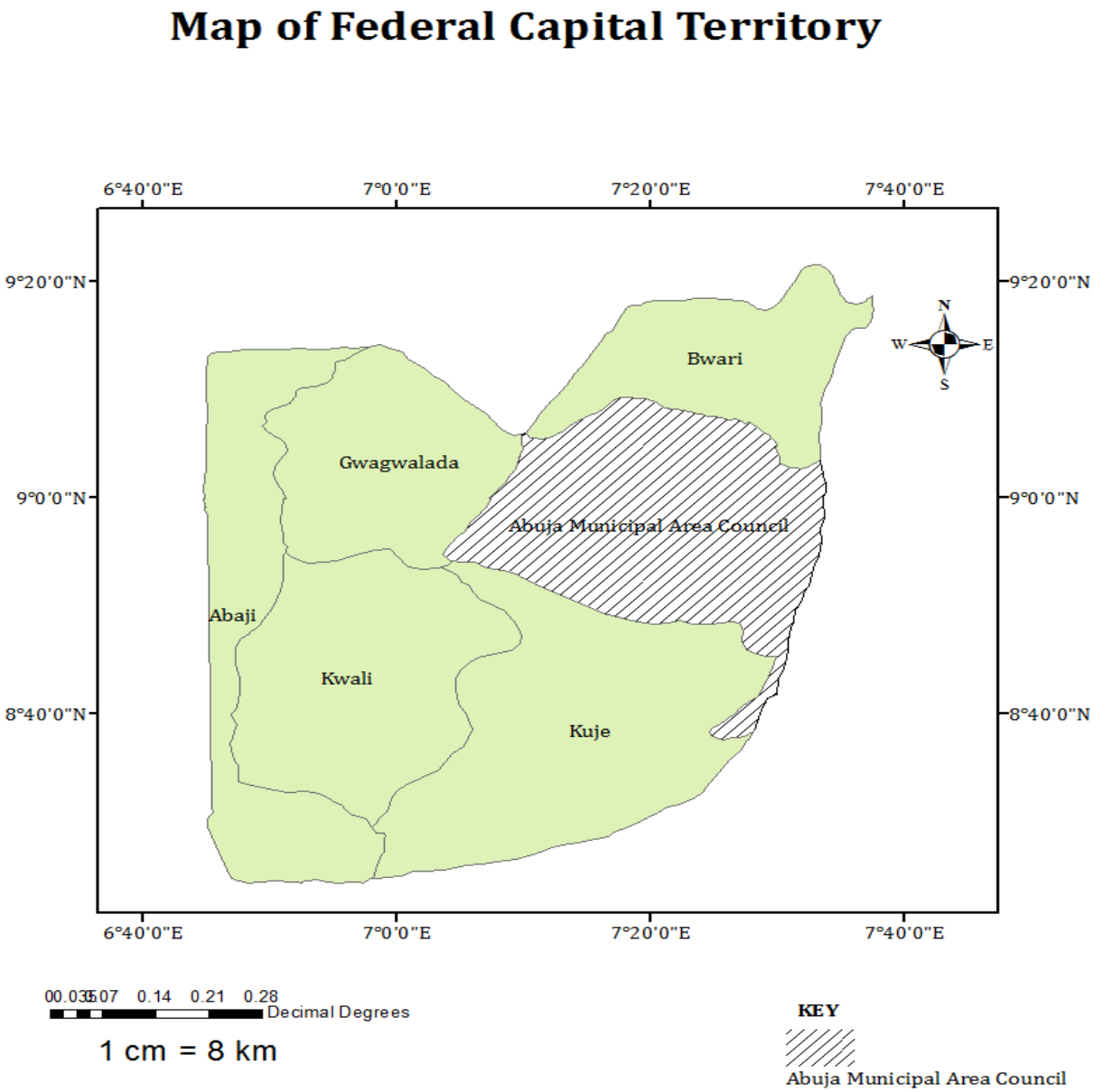


Figure 1.3: Map of FCT, Abuja showing Abuja Municipal Area Council

Source: **Abuja Geographic Information Systems, 2015**

The figure below shows the map of Nigeria showing Abuja. Nigeria is divided into 36 States and Abuja, the Federal Capital Territory (FCT). The 36 States and the FCT are shown below.



Figure 1.4: Map of Nigeria showing the FCT Abuja

Source: **Abuja Geographic Information Systems, 2015**

CHAPTER TWO

LITERATURE REVIEW

2.1 CONCEPT OF PARKING

Parking facilities can play an important role as a point passage for the driver from a car into a building and/or the urban fabric. Alternatively, it can be viewed as the starting and/or ending point of travel for the automobile and its driver. In attempting to solve the complex urban and environmental issues surrounding the use of the automobile, the parking facility can be seen as part of the solution for the integration of different systems of transportation, or as a transfer point between systems, bus, train or air. These solutions are not historically new but are seen to reemerge, as traffic in many urban areas becomes overwhelming and extremely time consuming (McDonald, 2009).

On the other hand, human activities involve the movement of people and goods and when the means of transport are not in use, they are parked. Parking is the temporary storage of vehicle between trips and/or at the end of trips.

2.1.1 Concept of Parking Demand

According to Haruna (1993), the demand for parking is the expressed need by motorists for facilities to store vehicles on a temporary basis. The demand is derived demand because it arises from the need for journeys for various purposes. Parking demand is therefore directly affected by land use. Firstly, parking may either be short term when vehicles are parked for only a few minutes like 10-15 minutes, or long term when they are parked for many hours in the day. Secondly, for any particular area, the demand for parking may vary at different times of the day in terms of the collective need expressed by motorists.

Haruna further said that parking demand has spatial dimensions as it varies from one part of the town to another, being generally higher at the CBD and other commercial areas compared to residential areas. The major activity areas of the town which attract high volume of traffic have higher parking demand. Additionally, the demand for parking is effective if it is backed by the ability to pay in money terms where it is charged. It may also be in terms of motorists' willingness to take the risk of parking other vehicles at a parking area.

2.1.2 Determinants of Parking Demand

There are different factors that affect parking facilities. They have direct and indirect effect on parking demand. Direct effect determinant is land use. Different land uses attract different level of traffic by vehicular movement. This exerts different demand situations for different land uses in the city. Commercial land uses like hotels, banks, plazas, department stores, etc., attract more visitors than the others especially during peak hours. Therefore the demand for parking is expected to be higher in the Central Business District (CBD) of the FCC, especially in some sectors of the CBD which have concentration of commercial, public and semi-public uses.

Secondly, change in time is an aspect of urban activity pattern. The time of day is a determinant of the level of parking demand. For example, demand is higher during working hours on weekdays in areas with a concentration of public uses while in the night, negligible level of parking demand is recorded.

The third one is that vehicle usage affects the level of parking demand in the city. It is common place that the higher the rate of vehicle usage, the higher the demand. The increase in vehicular ownership has been associated with high demand for parking facilities especially in the larger towns with higher income base (Haruna, 1993). However, demand for parking is most prominently determined by factors such as: weather, price and location (Adams Et al, 2011).

2.1.3. Methods of Measuring Parking Demand

Haruna (1993) also put it that the many methods of determining parking demand are: Cordon count, direct interview, patrol survey and the use of standards. These are parking surveys, use of standards and use of vehicle ownership data.

A. Cordon Count

This is the use of cordon lines which delineate the study area. Counting stations are established at points on all roads that cross the line. At the stations, separate counts are made up of various types of vehicles entering and leaving the study area. The difference between the number of vehicles entering and those leaving the area gives the accumulation of vehicles in the area. The accumulation is equivalent to the number of vehicles parked and needing to be parked in the study area. When the accumulation is related to the supply for parking existing in the area, the requirement of parking facilities in the area, the requirement of parking facilities is obtained. The two techniques of counting vehicles and other purposes are automatic counting devices and manual counting (Sanusi, 1998).

B. Direct Interview

The direct interview is also used in the demand survey for the purpose of obtaining data which enriches the quantitative measure of accumulation. This involves stopping a sample of motorists and questioning them about their purpose of trip, their parking problems and preferences, etc. In this way, the share of accumulation taken by different activity areas within the study area and particular problems of parking can be determined.

C. **Patrol Survey**

In this technique, the study area is divided into manageable sections that can be covered by interviewers in reasonable time intervals like 30 minutes, 1 hour, etc. Interviewers are given specific street stretches to keep under surveillance and the number of parked vehicles in particular places is counted. Based on the time units taken for the survey, the number of parked vehicles per time cell may be computed. Statistics like the registration numbers, vehicles types, parking duration, form of parking, nature of parking whether legal or illegal, curbside, off-streets, parking qualitative analysis, etc may be recorded.

The result is reliable when the curbside patrol is covered by the interviewer(s) walking to and fro at the stipulated time interval. This technique enables larger sections to be covered and supports the computation of operating turnover of parking facilities, the characteristics of existing facilities and their usage in various parts of the study area.

D. **Use of Standards**

Studies that detail out existing situation of specific land uses in various urban contexts form the basis of determining planning standards. This means that parking standards may be used to estimate the level of parking demand when various facilities are in an area, example, hotels, plazas, banks etc, are known as the specific requirements in the activity areas, and may be summed up to closely represent the level of parking demand in the study area.

Vehicle ownership may be used for establishing parking demand. This can be determined by using records of ownership in an urban area. The records are often available from vehicle licensing offices.

2.1.4 Concept of Parking Supply

Parking supply is the provision of facilities for the temporary storage of vehicles. The type and level of availability and location of the parking facilities should be on a p1anned basis so that it is adequately related to factors such as the demand, land use policy and economics of land in any urban center. All or some of the following facilities may be associated with planned parking. They are covered garages, paired or unpaired spaces, marked lots, security units, shade trees and coin boxes. The more often vehicle owners use their vehicles, the higher will be the demand for parking facilities. Each time a trip is made; vehicle owners have to park at any intervening and terminal destinations.

The type of vehicles that are most dominant in a city affects parking demand in terms of the space requirement which is smaller for cycles and larger for trucks. Where there is poor mass transit system, as in most Nigerian cities like Abuja, the use of private vehicles will be higher leading to higher demand for parking facilities. Other factors that affect the rate of parking demand are Parking Policy and Population growth (Haruna, 1993).

2.1.5 Determinants of Parking Supply

One aspect of this is data to make correct estimates of parking demand, location and type of parking facilities that may be provided. The aspect of data required includes the number of trip makers to the CBD for different purposes, the level of supply and use of the existing parking facilities. There is the land value as a determinant. The provision of parking involves the acquisition and use of land. The restriction of parking demand on land in the city center is indeed a determinant of supply of parking facilities.

Availability of finance is also a determinant of the supply of parking facilities. Funds to provide parking facilities such as underground, rooftop, storey or mechanized garages are not

really available. Spending on parking is generally not considered economically acceptable as it is not a profitable venture for both the public and private sectors. Only in an indirect way it is considered important for the private commercial sector. For instance, it gives the confidence that attracts trip makers. Also, it is only seen as a service as it is related to the solution of urban transport problems.

2.2 THEORITICAL FRAMEWORK

2.2.1 Studying the effect of Parking Policy

According to Mitava (2012), it is essential to understand why it is important to study the effects of parking policy interventions. Parking policy acts as glue between the implementation of land use and transport policies. Marsden (2006), observed that three specific objectives of "Regeneration" of a specific part of an urban area, "Restraining" vehicular traffic and "Revenue" generation from the parking operation. Parking policy tries to contribute to the promotion of a more efficient uses of the transport network, lower emissions, higher densities and better, more inclusive urban design (Rye, 2007; Stubbs, 2002; Mitava, 2012). Mitava in his work presented a tool which has the capability to investigate the effects of parking policy intervention by considering various factors, which the users take into account while choosing a parking location in the case of the city of Enschede, the Netherlands. Mitava also developed a model which stimulates the choice of parking lot using five location factors: parking charges, notice ability of the facility, condition of parking surface, type of winter provision, safety of the driver and the driver's vehicle assumed to concern vandalism and ease of searching a parking lot. He (Mitava) allocates trips entering a zone (parking demand) at morning and evening peak hours to parking locations (considering the trip purpose, the walking distance from parking location to destination and the parking location choice). The outcome of his research show the

spatial balance of the parking system in the city as well as presents in detail the problem areas and parking lots which are over utilized or underutilized.

2.2.2 Application of Possibility Theory in solving Parking Problems

A crucial role in transportation system is played by car parking supply system. From theoretical and practical stand point, literature shows how research in the field of parking behavior modeling leads to useful tools for planning and design parking policies and facilities. In fact, the proposed models can be specified to face the design problem at different planning level: Long term (strategic), middle term (tactical), short term (real time). (Ottomanelli, 2011). He stated that in literature, parking choice simulation is studied as a "Stand-alone" model as well as module of wider transportation system models (travel demand models, location models, design models, decision support systems, etc). The theory deals with parking choice behavior modeling which is useful for strategic and tactical level planning of parking facilities supply system.

Ottomanelli (2011) further posited that parking policy in urban areas can be considered as one of the most powerful travel demand management (TDM) tool that consists of different kind of measures on the parking supply system such as: parking facilities number and location, parking lots supply, pricing policies, illegal parking control strategies etc. Finally, the study has revealed a parking choice model that is an important step towards parking demand assignment model in an environment as a support tool to design Traveler information system and evaluating parking policies for the reduction of traffic network congestion.

2.2.3 Parking location decisions/Parking Choice Model

Mitava (2012) in his Geospatial analysis of efficiency of parking system discussed the parking model of Ergun (1971) who evaluated impacts of parking policy interventions and the benefits of investment in parking facilities, in particular, location of parking facilities and parking rates. He (Mitava) used a discrete choice approach based on binary logit model. Mitava also used variables like parking cost, walking distance from parking lot to destination point, duration of parking and socio-economic characteristics like age and gender, to explain his model. The results presented a greater sensitivity to parking price than walking distance and socio-economic factors could not help much in explaining parking choice.

2.3 IMPORTANCE OF PARKING

"On average, privately owned cars and light trucks spend 95 percent of the time in a space while their owners work, shop and otherwise go about their daily lives" (International Parking Institute, 2014). Parking matters because nowadays people give up on trying to park close to a destination while they circle severally because they cannot find a space nearby.

According the International Parking Institute, IPI (2014), there is a very good reason parking is a prime consideration when new businesses and housing are constructed: Parking is often the connection between where we are and where we want to go. It keeps people moving. Our jobs, our homes, and how we spend our free time are all affected by where we can leave our vehicles when we arrive. Knowing that, successful cities and towns are making parking a pivotal part of the economic conversation.

What concerns decision-makers are that the number of vehicles on the roads continues to rise. In the third quarter of 2013, an estimated 247.9 million cars and light trucks were on the road, and that number is expected to rise to 284 million by 2025. At present, there are three non-

residential parking spaces per vehicle in the United States (approximate total: 800 million), and only 5 million parking meters. How will we meet the growing need? How will we accommodate all trips people wish to make? How will we provide the right amount or parking? (IPI, 2014).

Therefore, for our cities to be managed and/or perform efficiently, adequate parking must be provided. This will boost the economy of the cities and reduce the numerous problems faced with parking. Considering the increase in the number of vehicles and considering Districts like Wuse II, there is need for policy makers to review the present land use plans to take care of the parking problems which are the realities on ground. This could be done by maximizing the available space meant for parking through the introduction of multi-storied parking systems in the districts to fill-up the gaps between parking demand and supply.

2.4 ECONOMICS OF PARKING

The world is going increasingly urban; 60 percent of the global population is projected to live in cities in 2030. By 2025, urban areas are expected to account for 86 percent of the world GDP. This raises some important questions: where will everyone park? And how much traffic congestion will be created by the search for parking spaces? (IPI, 2014, Pg. 1).

In cities like Los Angeles, drivers put 950,000 miles on their odometers for up to a year looking for parking spaces. This equals to about 38 trips around the planet Earth. From coast to coast, traffic congestion cost the United States (US) a whooping $121 billion in 2011 (IPI, 2014). The resultant effect is high carbon emission. The design and management of an effective, professionally-managed planning strategy can mean the difference between frustrating and costly traffic congestion and efficient, time-saving traffic flow. The technological revolution

that is occurring in the parking industry serves as a powerful tool for local and municipal governments in their quest to improve cities.

2.5 PARKING FACILITY TYPES

Parking facility types can be grouped into three:

2.5.1 Parking Lot or Car Park: According to Wikipedia Encyclopedia (2001), the free encyclopedia, parking lot is a cleared area that is more or less a level land intended for parking vehicles. Usually the term refers to a dedicated area that has been provided with a durable or semi-durable surface. In most countries where cars are the dominant mode of transportation, parking lots are a feature of every city and sub-urban area. Shopping malls, sports stadiums, mega churches and similar venues often feature parking lots of large area coverage.

2.5.2 Multi-Storey Car Park: A multi-storey car park is also called a Parking Garage, Parking Structure, Parking Ramp or Parking Deck. This is a structure designed specially to be for automobile parking and where there are a number of floors or levels on which parking takes place (Wikipedia, 2001). It is essentially a stacked car park. The parking garage has become the dominant form of urban architecture. Scaled to the automobile and the economics of speed, the parking garage is an engineered solution to the desire for the convenience of the suburban trip mall. Examples of the urban multi-storey parking garage types are:

1. Staggered Floors-One-Way Circulation
2. Staggered Floors-Two-Way Center Ramp
3. Flat Floors-Straight, One-Way Ramp

4. Sloping Floors-Two-Way Circulation

5. Sloping Floors-One-Way Circulation

6. Sloping Floors-Cross Connected One-Way Circulation

7. Sloping Floors with Express Helical Down Ramp

8. Concentric Opposed Plane Helical Ramp

2.5.3 Underground Parking:

This is parking done beneath the surface of the earth like a subway system. There are different types of underground parking. They include: Underground parking garage, underground station parking, underground parking system, underground parking lift and grant park underground parking.

2.6 MODES OF PARKING

For most motorized vehicles, there are three basic modes of parking based on the arrangement of vehicles — Parallel Parking, Perpendicular Parking, and Angle Parking. These are self-parking configurations where the vehicle driver is able to access the parking independently. Wikipedia (2001) provides the different modes of parking, thus:

(i) **Parallel Parking**

Wikipedia Encyclopedia (2001), further stated that with parallel parking, cars are arranged in a line, with the front bumper of one car facing the back bumper of an adjacent one. This is done parallel to a curb, when one is provided. Parallel parking is the most common mode of street side parking for cars. It may also be used in parking lots and parking structures, but usually only to supplement parking spaces that use the other modes.



Plate I: Parallel Parking

***Source*: On-line Pictures, 2014**

(ii) **Perpendicular Parking**

This is where the parking spaces are at 90 degrees to the wall or kerb. With perpendicular parking, cars are parked side to side, perpendicular to an aisle, curb or wall. This type of car parking is more scalable than parallel parking and is therefore commonly used in car parking lots and car parking structures. Often, in car parking lots using perpendicular parking, two rows of parking spaces may be arranged front to front, with aisle in-between. Sometimes, a single row of perpendicular car parking spaces is marked in the center of a street. This arrangement eliminates reversing from the maneuver; cars are required to drive in forward and drive out forward (Wikipedia, 2001). They are more difficult to maneuver and need to be slightly wider.

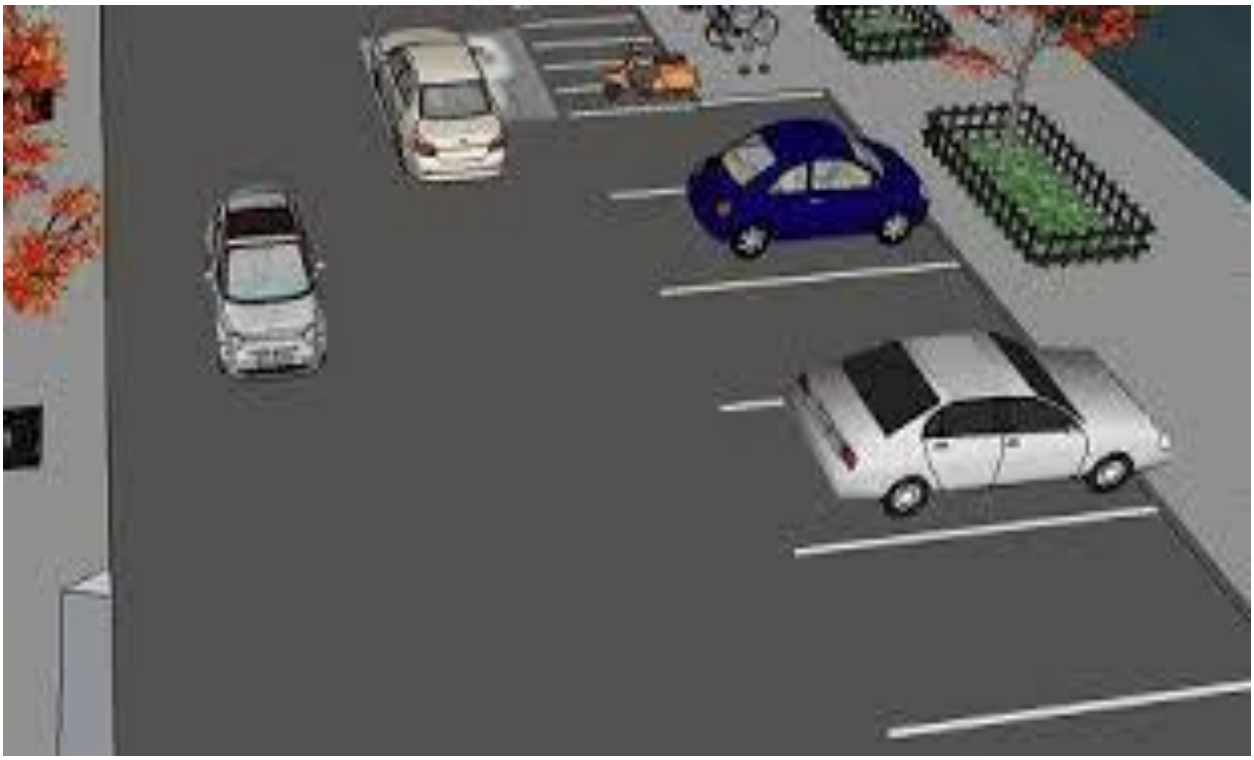


Plate II: Perpendicular Parking

***Source*: On-line Pictures, 2014**

(iii) **Angle Parking/Echelon Parking**

Angle parking is parking spaces that are at an acute angle to the wall or kerb. Angle parking of cars is similar to perpendicular parking for the vehicles, except that cars are arranged at an angle to the aisle (an acute angle with the direction of approach). The gentler turn allows easier and quicker parking, narrower aisle, and thus higher density than perpendicular parking. In theory, the aisles are one way. In practice they are typically wide enough to allow two cars to pass slowly when drivers go down the aisles the wrong way.

Angle parking is very common in car parking lots. It may also be used in street side car parking when there is more width available for car parking than would be needed for parallel parking of cars, as it creates a larger number of parking spaces. Some cities have utilized angled parking on-street (as compared to off-street parking facilities). This has been done mostly in residential,

retail and mixed used areas where additional parking compared to parallel parking is desired and traffic volumes are lower. Most angled parking is designed in a head-in configuration while a few cities have some back-in angled parking.

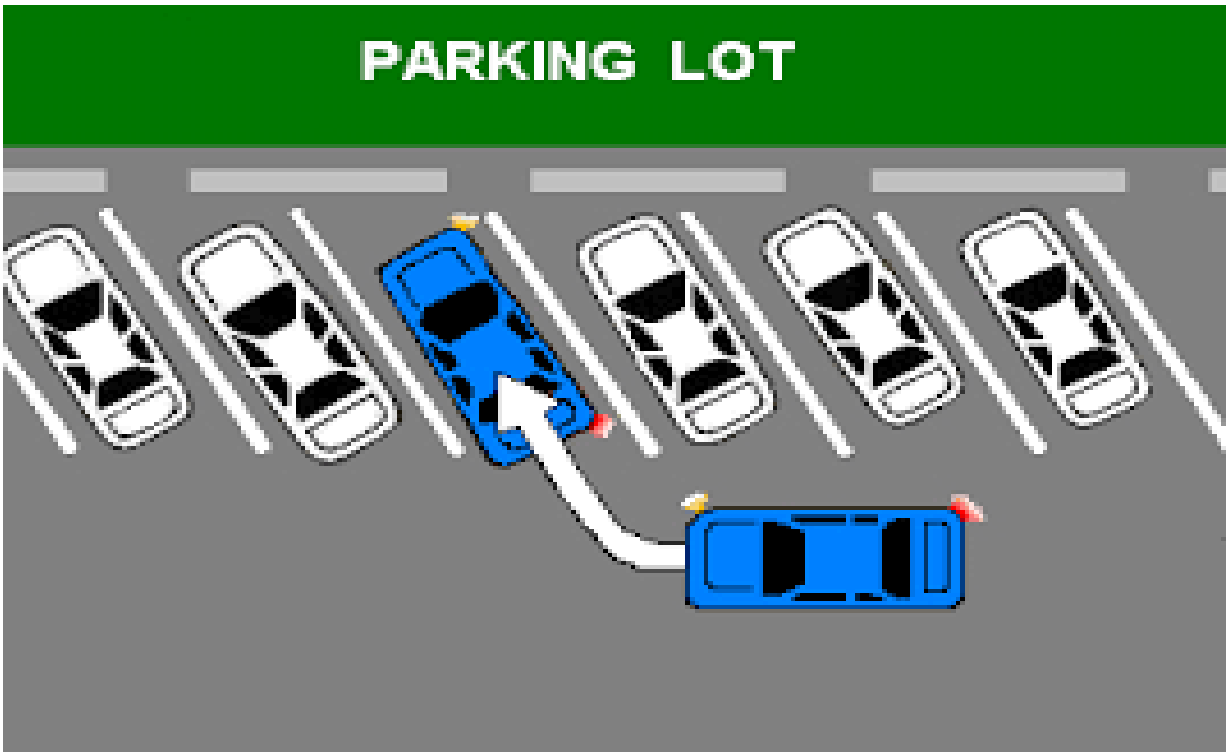


Plate III: Angle Parking

Source: **On-line Pictures, 2014**

(iv) **Performance Parking**

Performance parking or Variable-Rate Parking is based on electronic parking. Electronic parking meters are used so that parking spaces in desirable locations and at desirable times are more expensive than less desirable locations. Other variations also include escalating rates based on duration of parking. More modem ideas use networked parking meters which "bid up

(or down) the price of parking automatically with the goal of keeping 85-90% of the spaces in use at any given time to ensure perpetual parking availability.



Plate IV: Parking Meter

Source: **On-line Pictures, 2014**

(v) **Fringe Parking**: Fringe parking is an area for parking usually located outside the Central Business District (CBD) and most often used by suburban residence who work or shop downtown.

(vi) **Other Parking Methods**

Besides these modes of motor vehicle parking, there are instances where an ad-hoc approach to arranging motor vehicles is appropriate. For example, in parts of some large cities, such as Chicago where land is expensive and therefore parking space is at a premium, there are parking lots for motor vehicles, where the driver leaves the vehicle with an attendant who arranges vehicles so as to maximize the number of vehicles that can be parked in the lot. Vehicles may be packed in combinations of perpendicular and/or parallel parking with limited circulation

aisles for the parking attendant. Such arrangements are known as Attendant Parking. When the lot or facility is provided to serve the customers of a business, it is considered Valet Parking.

Inner city parking is often temporary, the operators renting land which is vacant pending the construction of a new office building. Some inner city lots are equipped with individual lifts, allowing cars to be stored above each other.

Another ad-hoc arrangement is Tandem Parking. This is sometimes done with residential motor parking where two motor vehicles park nose-to-end in tandem. The first motor vehicle does not have independent access, and the second motor vehicle must move to provide access. As with attendant parking, the purpose is to maximize the number of motor vehicles that can park in a limited space. Another more complex type of ad-hoc parking has been created in response to problems of vehicles jamming or backing into each other in parking lots that have large numbers of vehicle leaving at the same time. A parking lot that uses this method has one entrance and one exit. The first vehicles parked in marked spots facing the exit, and the next vehicles park behind the first cars in tandem, leaving an aisle between every two rows. While it does not technically save space, it allows large numbers of vehicles to exit the parking lots at the same time efficiently because there is nobody backing out; in addition, the aisles allow vehicles to leave the event early.



Plate V: Valet Parking

Source: **On-line Pictures, 2013**

2.7 SMART PARKING

Smart Parking is where technology, economics, and the customer experience converge to create more livable, sustainable communities. It is a common denominator for forward thinking. Sustainable communities in transportation and cities that have embraced it know why. Used in tandem with smart phone apps and/or GPS, these systems give diverse real-time direction to an available meter or space. In some configurations, drivers are able to reserve, eliminating the need to circle around the block. By 2020, the industry expects to have 950,000 of these sensor-enabled parking spaces, dramatically changing the picture of parking throughout the U.S. Off-street, smart parking measures such as real-time electronic guidance systems that provide space availability are also having a favorable effect on driver convenience and contributing to sustainability, according to a 2014 study conducted by American City and County magazine.

Coupled with effective parking management strategy and policies, these new technologies are having a significant effect (IPI, 2014, Pg. 2).

Smart parking strategies can yield huge resources for cities. This can be achieved by the incorporation of technologies such as street sensors, real-time way finding systems, and apps that enable drivers find, pay for form and even reserve parking, and reduce congestion drastically. The installation of smart meters (which report both their operational status and whether they are occupied) provides city managers with an effective tool to ensure regular space turnover. The meters can also communicate with smart phones on the other side, letting drivers know their time is about to run out and, where appropriate, allowing them to add time through credit or debit card without actually returning to the meter. This provides the use of fewer tickets and a more pleasant, less stressful parking experience. The revolution in technology is being maximized through equally smart analytics that contribute to parking management policies related to time limits, prices, and more (IPI, 2014, Pg. 2).

2.7.1 Sustainability and the Greening of Parking

Smart parking systems that guide drivers to parking without circling are likely to have the biggest effect on sustainability. Professionals know that today's new technology can make a huge difference in the carbon footprint and economic performance of their facilities and the equality of life in the communities which they serve. Efficient lighting upgrades, solar panels, permeable pavements, charging stations for electric vehicles (EV's), payment automation and sustainable building materials and sustainable building materials are few of the ways that parking facilities are going green.

2.8 PARKING STRATEGY

The development of a comprehensive parking strategy is necessary in order to shape the framework for the future provision, management and maintenance of parking facilities within the borough. At present many aspects of parking are considered in isolation but need to be considered in a much wider context. Walsall Council Parking Strategy, for instance, aims to help tackle congestion as part of a sustainable transport system (Hampshire County Council, 2007). Strategic changes made include new pay and display machines, hours of operation and charges. Also, there are changes to disabled parking and loading zones. It can also be about reducing the hassles of getting around a city, giving everyone a fair go and ensuring a sustainable future (Gold Coast City Council, 2004).

Parking strategy objectives at the community level is involved in ensuring safe and convenient parking. Economically, they promote economic growth through efficiency and reducing community cost; environmentally, they contribute to a city and retaining residential and environmental amenity. According to the International Parking Institution 2014, other sustainable management strategies employed in the management of parking include to:

1. Reduce the number of cars needing to park in residential streets.

2. Enable a reduction in the road pavement space used for parking where a community benefit can be achieved, particularly where pedestrians, cyclists, public transport and persons waiting for public transport will benefit.

3. Plan and manage transportation and public development to minimize the need for people to have to drive cars so that the demand for parking is contained and managed effectively.

4. Install solar panels on roofs, canopies, and even vertical walls that generate enough electricity to run facility, and sometimes even harness enough to even power other parts of the grid.

5. Introduce new lighting technologies and systems that only turn light on when they are needed (not 24/7), and light-colored and reflective paint-together dramatically slashing the amount of electricity needed to light a parking garage.

6. Use automated payment systems that help eliminate lines at the exit, reducing time spent idling and carbon monoxide and other greenhouse gas emissions.

   Design garages that use natural air flow for ventilation and harnesses as much sunlight as possible for daytime interior illumination.

7. Install Automated Vehicle Retrieval Systems (AVRS) that enable the storage of more cars in less space, maximize land use, and reduce required amount of construction materials and power.

8. Use green roofs and walls that filter rain water and reduce the heat island effect.

2.9 MANAGEMENT STRATEGIES OF PARKING

2.9.1 Parking Management Paradigm Shift

According to the Encyclopedia (2010), parking management represents a paradigm shift, which is a change in the way parking problems are defined and potential solutions evaluated.

A. Old Paradigm

Planning for parking in the olden days has to do with 'predict and provide' through parking requirement in the District Plan. Motorists should nearly always be able to easily find

convenient, free parking at every destination. Parking planning consists primarily of generous minimum parking requirements, with cost borne indirectly, through taxes and building rents.

B. New Paradigm

'Throughout New Zealand there is a new emphasis on parking management, which includes a shift in planning away from 'predict and provide' (through parking requirements in the District Plan) to better manage existing parking resources and allow the market to determine appropriate levels of supply. A few cities throughout New Zealand have already begun the process of moving to this parking management process and corresponding plan changes to implement the changes into their District Plan (Whangarei District Council, 2011).

Parking facilities should be used efficiently, so parking lots at a particular destination may often filled (typically more than once a week), provided that alternative options are available nearby, and travelers have information on these options. This means, for example, that parking lots have a sign describing availability, so that motorist may often have a choice between paid parking nearby, or free parking a few blocks away. It also requires good walking conditions between parking facilities and the destinations they may serve. Parking planning can therefore include shared parking, parking pricing and regulations, parking user information and walk ability improvements.

2.10 PARKING POLICY

Marsden (2006) presented the seven parking policies that are considered in transportation system for sustainability as follow, to:

1. Effectively manage and co-ordinate the existing on and off-street public car parking stock through measures including the supply of space, maintenance charges and enforcement.

2. Encourage reductions in existing privately owned non-residential car parking spaces or the usage of these spaces, or both.

3. Introduce parking standards to car parking associated with land use development.

4. Provide adequate cycle parking provision and facilities for cyclists.

5. Ensure that changes to parking provision do not undermine the economic viability of areas or adversely affect local roads and the environment.

6. Promote high quality facilities for people with mobility impairments in all parking areas.

7. Improve safety and personal security standards in parking.

2.11 REVIEW OF PARKING ISSUES IN CITIES

In The Netherlands, parking is provided under the Canal. Two layered underground garages are created for public and private parking with 30 parking spaces. The car park has been designed for visitors to the inner city as well as for guests and also for the occupants of the city houses built on top of the houses. The area surrounding the car park lies in a polder, enclosed by a Canal. All car parks in Deft are being signposted at the approach roads by means of a Parking Route Information System also stating the number of spaces available.

Also in The Netherlands, both residential and commercial areas frequently suffer from problem caused by car parking. This takes the form of cars parked on the road getting in the way of other drivers, cars parked on the road causing cyclist to have to swerve around parked cars or

cars parked on the pavements causing nuisance and danger for pedestrians. The problem was solved by the redesign of the street to provide lanes for cyclists and pedestrians with parking bays.

Parking rules in the Netherlands does not permit parking in places with black and white or yellow curbs and where P-signs prohibiting them are installed. Paid parking exists in almost all the city districts with paid parking lines. In metered parking zone, tickets are gotten at the central ticket office or display machine at the side of the road. The purchased ticket must be displayed in the windshield. Parking fees can be paid in cash or by credit card through ticket machine at the side of the road. Parking on the street is more expensive than parking within the parking facilities. Parking in the parking facilities is secured and unlimited (Parking in Netherlands, 2013).

Russia's parking problems are anything but comedy. Moscow's traffic and parking woes are bye products of successes, down sides to a rising car-purchasing consumer class, and inevitable growing pains of an old megapolis built for public transit, not the automobile, but are now being used by private cars. These problems should have been addressed, and were not, at least until recently (Global Voices, 2012).

Moscow drivers are used to parking on sidewalks, or on the grass. They are accustomed to parking illegally on streets, and blocking traffic or bus tram stops. In neighborhoods, they block alleys into court yards and prevent movement of emergency vehicles. Business owners and petty criminals join the charge for parking illegally on their side walks. In the past, not much was done about this by the Russia's Road Safety Inspectorate. They sometimes conducted enforcement raids but citations had to be handed to car owners who were not deterred by small fines. Drivers claim that Moscow's buildings, apartments and other infrastructure were built with small parking spaces. Supporting the drivers' claims, the Mayor's office declared that with

Moscow's population of 11.5 million people, there are at least 3.5 million vehicles, about three for every resident. It reported also that the city had about 920,000 parking spaces along with some deficit of some 2.3 million. That amounts to about 3.2 million vehicles in Moscow (Moscow Journal, 2011).

An attempt to solve this problem was by introducing repressive measures. This measure did not look at the need to increase the supply of roads and parking but reduced the demand for them. This was done by introducing money fines and penalties. Higher fines were charged from 300 rubles to as much as 3,000. Other charges include heftier impound fees and more vehicles were towed away for fees. Parking lots were built where they did not interfere with road traffic. To cushion the effect, government promised to provide more public parking.

According to Moscow Journal, 2011, on average, journey times in Moscow are 66 percent longer during off-peak periods, 106 percent longer during morning rush hours, and 138 percent longer during the evening peak period. The result is that a trip that should take one hour during periods actually takes 2 hours and 14 minutes on average, according to the report, which was made during advanced GPS tracking technology.

The Journal also puts it that, "Moscow authorities spend more money on road issues than any other city in the world, but the problem remains because solutions being offered are based on Traditional Soviet thinking," said Milkhai Blinkin, Head of the High School of Economics' Road Research Centre. The city government plans to transform at least three Moscow thoroughfares – Lenisky Prospect, Prospect Vernadskogo and Michurinsky Prospects – into full fledged highways by making some parts of them wider and removing traffic lights to increase traffic flow.

According to European Parking Association, using the car park is made easy by a one way traffic system, column-free parking and different lighting colors for each level, so as to make them easier for the users to memorize. Pedestrian signage is green and contrasts with the red vehicle signage. Also round pastilles painted on the ground indicate the pedestrian walk way. Exit signs refer to well-known areas situated outside the car parks. The floor coating is made of epoxy resin in color. The light driving aisles contrast with dark parking bays. Safety is provided by smoke extractors and central CCTV surveillance. Inside the car park, glass and metal materials are preferably used to give a feeling of space and cleanliness and to offer an open view. The facility is cleaned with an efficient motor-driven scrubber. Rubbish beans are displayed at each level of the car park (Moscow Journal, 2011).

The major cities reviewed have several parking problems ranging from parking on sidewalks, curbs, grasses, blocking of traffic or bus tram stops, to longer time during peak and off-peak periods. Nevertheless, there are few lessons drawn from the innovations brought about by these cities to tackle some of their parking problems. The use of machines (Parking Route Information System) as car approaches to determine the number of spaces available in off-street parking situations is a good approach. In areas where parking supplies cannot be increased probably for want of space, parking demand was reduced drastically by increasing parking charges, encouraging heavy impound and towing fees. One very important measure that Netherlands took was to make parking on the streets more expensive than parking within the parking facilities. Charges also include the use of paid parking meters and payment in cash or by credit card at the side of the road. Close Circuit Television (CCTV) surveillance was adequately used to manage parking problems in most cities. Finally, one way traffic system was used for streets that are prone to parking problems.

The problem of parking experienced in Moscow which is majorly on spending long time during peak and off-peak periods was identified with the use of GPS tracking technology. They were able to solve the problem by expanding about three thoroughfares to highway to increase traffic flow. Traffic lights were also removed to avoid delays on the roads.

2.12 PARKING STANDARDS FOR COMMERCIAL AREAS IN THE FCC.

According to Development Control Manual, there are some Parking Standards for commercial developments. These include the following:

2.12.1 Parking Standards for Commercial Facilities

According to Development Control Manual (2007), these standards are designed to regulate on and off-street vehicle parking and to achieve a high level of convenience, planning in environmental and transportation requirement.

The parking standards are maximum standards unless otherwise stated. They apply to all new development, redevelopment, including extensions and proposals for change of use. In applying the car parking standards to individual site proposals, the following factors are taken into account:

Where an application's proposed use falls within more than one class of use, the parking standards would be applied as appropriate for each type of use. All parking requirements will be rounded to the nearest whole number (0.5 is rounded up). In certain circumstances provision for parking to cater for part-time staff will be calculated on the bases of full-time equivalents (Fm).

Table 2.1: Parking guidelines for Commercial Facilities

Bed, Breakfast and Guest House	1 car space per bedroom plus resident staff accommodation as residential hostels above.
Hotels and Motels	1 car space per bedroom, plus 1 space for every $7m^2$ of net area used by the public, plus I luxury bus space per 100 rooms in hotels with more than 100 rooms, operational parking and servicing as appropriate.
Restaurants and Cafes	1 vehicle space per $7m^2$ for areas used by the public. This is inclusive of operational and staff parking.

Source: **Development control Manual, (2007)**

2.12.2 Vehicle and Parking Access

i. Where rear lane access is available this shall be used for direct vehicular access and service instead of main roads;

ii. On-site car parking at the rear of commercial premises are to be maximized while also giving priority to landscaping around the car park.

i. Vehicle crossing (driveways from curb to boundary) is to be constructed of concrete. These vehicle crossings shall be limited to one per development and be 4.5 to 6m wide to cater for two-way traffic.

a. The minimum dimensions of car parking spaces shall be 2.4m x 5.5m;

b. Minimum headroom in undercover parking is 2.lm and 2.5m for disabled persons;

c. Garage doors and parking spaces can be widened if maneuvering areas are limited;

d. Parking shall be provided within the building envelope (i.e. underground or basement parking) to minimize external hard landscaping on site. Underground construction must not impact on the viability of ground level landscaping;

e. Prior to construction, a vehicle crossing application is to be submitted and approved by Department of Development Control.

2.12.3 Parking Standards for Shopping Developments

(Maximum provision with the exception of heavy goods vehicles)

Table 2.2: Parking guidelines for shopping developments

General Retail	
Shops (take-away food shops with fewer than 8 customer seats	A maximum of one car space for every $40m^2$ gross floor area (gfa) with provision of at least 1 access to an off-street delivery bay.
In addition, there should be adequate provision for overnight parking of delivery vehicles and for the parking and maneuvering of vehicles in loading areas.	
Supermarkets, Superstores and hypermarkets i.e. stores selling primarily food and groceries	
Over 1 ,$200m^2$	1 car space per I $5m^2$gfa.
In addition, there should be adequate provision for overnight parking of delivery vehicles and for the parking and maneuvering of vehicles in loading areas.	
Retail warehouses and Garden Centers	
Over 1 ,$200m^2$	1 car space per $20m^2$gfa.
The floor area includes outdoor sales and display areas. In addition, there should be adequate provision for overnight parking of delivery vehicles and for the parking and maneuvering of vehicles in loading areas.	

Source: **Development Control Manual, (2007).**

The parking standards include provision of essential operational parking and servicing, other shop workers and shoppers.

As much as possible, consideration should be given to the impact of trips generated on adjacent uses, particularly residential, and on the effect of casual on-street parking on traffic flow including only likely congestion of bus lay-bys and bus stops or interruptions to the free flow and safety of traffic or pedestrians.

Proposals for individual shops that generate a requirement for 30 or more parking spaces should normally provide these adjacent to the store and include provision for disabled persons. The parking requirement for smaller shops may be “pooled” or commuted into public car parks.

Table 2.3: Summary of planning requirements for Commercial Development in FCT

S/N	LOCATION	NO. OF SUSPENDED FLOORS		PERCENT AGE COVERAGE		MINIMUM SETBACKS [M]			PARKING REQUIREMENT	USES ALLOWED	NO OF STRUCTURES
		MI	MA	MI	MAX	FRONT	SIDES	REAR			
1	Neighbor-hood center	1	3	25%	50%	6	5	5	1 Car/755M2 OF Floor space	Shops, Restaurant, Informal Mal Commercial and public services Crafts, Manufacturing	1
2	District center	3	5	25%	50%	6	4	4	1 car/75m^2&of Floor space	Offices, Shops, Hotel, Religious Institutions, Libraries, Post and Telecom, Health Centre etc	1
3.	Sector Center	3	7	25%	*50%*	*6*	4	4	1 car/75m^2 of Floor space	Offices, Shops, Hotel, Motels, Embassies, Consulates, Educational Institution, Cultural Facilities, Hospital	1
4	Multi-functional Corridor	2	4	25 %	*50%*	6	4	4	1 car park per 50m^2 of floor space for commercial and 2 car park for 5 every dwelling units	Wholesale activities, Foreign Embassies and Consulate, Offices, Automobile service, Religious/Cultural Institutions, Medical Clinics etc.	1
5	Special Development Area	4	6	40%	50%	5	5	5	1 car/75m^2 of Floor space	Administration, Special shops, Business, Diplomatic Institutions	1
6	Employment Area	2	4	25%	50%	6	4	4	car park per 50m^2 of floor space for commercial and 2 car park f or 5 every dwelling units	Service Industries! Maintenance Workshops, Warehouses for both public and private sectors	1

Source: **Development Control Manual, (2007).**

NOTE: Where the size of land is above 3,000m2' siting more than one structure may be considered.

2.12.4 Parking Solutions

Table 3.1: Parking Solutions

Increase Parking supply	**Use existing parking capacity more efficiently**	**Address variable demand**	**Reduce parking demand**	**Respond to s pill over imp acts**	**Management and design**
Minimum par king requirement	Improve user information	Parking brokerage services	Price parking, Tax parking	Regulate price and enforce	Improved enforcement
Increase on-street parking	Encourage use of remote par king	Overflow parking plans	Commuter par Regulate price king benefits and enforce, compensate for spillover impact		Universal design, parking beat ion
Subsidize off-street parking	Regulate parking	Variable pricing	Improve transport alternatives		Safety and security, aesthetics
Redesign existing facilities	Shared parking , public parking		Reduce parking supply		Reduce storm water and heat gain impact
Car stackers	Access management more accurate parking r requirement, control parking passes		Bicycle parking		

Source: **Encyclopedia, 2010.**

2.13 WUSE II DISTRICT PLAN

2.13.1 Background of Wuse II District

Wuse II is one of the Districts in the Abuja Centre. It falls in the Phase 1 development plan of the Federal Capital City. The study area falls within Wuse II District which is located north-eastern part of Phase 1 and within Cadastral zone A07. It is bounded by Katampe (Cadastral zone B07) and Maitama (Cadastral zone A06) Districts to the north, Wuse 1 (Cadastral zone A02) to the south, Wuse II (Cadastral zone A08) to the east, Mabushi (Cadastral zone B06) and

Jahi (Cadastral zone B05) Districts to the west (Land use of Wuse II District, 2009). The study area is cut across into various halves by Ahmadu Bello Way and Kasheem Ibrahim Way. Aminu Kano Crescent formed a loop round the District and connects both the collector and distributor roads (Streets and Crescent) which in turn connect the Closes.

2.13.2 Land use of Wuse II District

Wuse II District is made up of so many land uses ranging from Residential, Commercial, Public Institution, Industrial, Public Utility Unit, Mixed, Transportation, and Agricultural to Open Space/Green Area. The list of the components is as shown on table 4.0 below:

Table 4.1: Detailed Land Use of Wuse II District (Cadastral Zone A07)

S/N	LAND USE								
	Residential	**Commercial**	**Public Institution**	**Industrial**	**Public Utility Unit**	**Mixed**	**Transportation**	**Agriculture**	**Open Space/ Green area**
1.	High Density	Gastronomy	Educational	Heavy Industry	Post and Telecommunication	Special Development	Road reservation	Agricultural	Recreational
2.	Medium Density	Employment Area	Administration/ Executive & Judiciary Authorities	Light Industry	Gas, Electricity & Water Supply	Multifunctional Development	Public Transport Utility		Green Area
3.	Low Density	Employment Area	Religious Institution	Manufacturing & Packaging Industry/ Metal Fabrication		Comprehensive Development	Railway		Lake
4.		Shopping & Office	Health Facility				Foot Path & Circle Track		
5.		Sales							
6.		Other Services							

Source: **Abuja Geographic Information Systems, 2011**

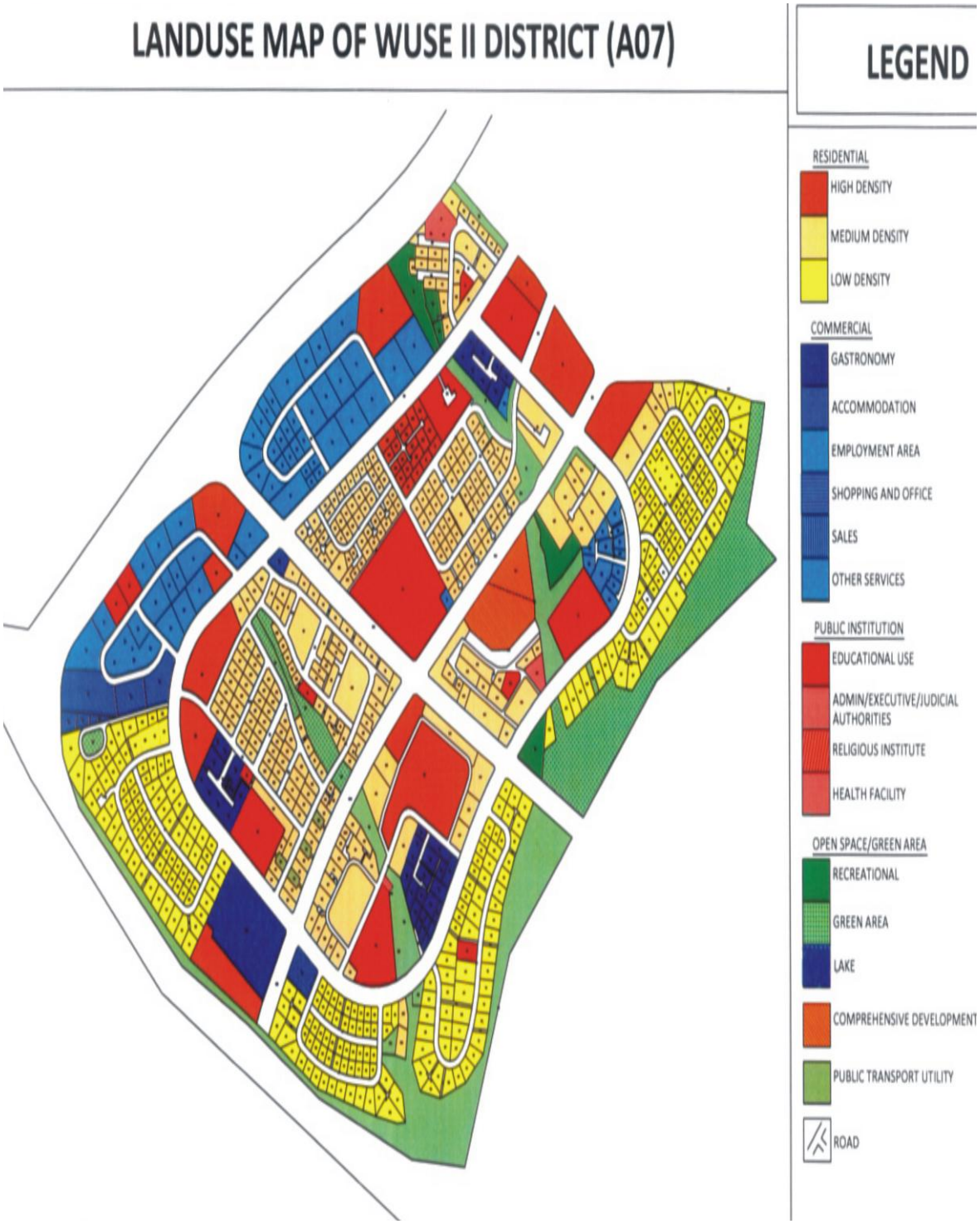
2.13.3 Pattern of Development

The study area is fully developed with infrastructure. Most plots in the area except few are also fully developed. All the land uses in the District were zoned with different densities. Some are for high density while others are for medium and low densities respectively. The development pattern generally is tilting towards commercial uses than other ones due to the influx of people and commercial activities.

2.13.4 Commercial Development Pattern (Land Use Map of Wuse II District)

Examining the original land use Map of Wuse II District, it will be noticed that residential land use cover the highest percentage size but recently, commercial land use has overtaken it. This is due to high level of commercial activities taking place in the area. This has led to most residential and few other land uses been converted for commercial use based on high demand for commercial activities in the area. This is mostly noticeable across the other side of Aminu Kano Crescent which is opposite a predominantly proposed commercial area (see figure 2.0).

Apart from Aminu Kano Crescent, all other major Ways, Streets, Crescents and Closes have commercial activities on the increase. The commercial plots in the area were earmarked for high rise buildings while others are mainly medium densities. Therefore, buildings of medium densities used for commercial purposes can be seen to have been converted. This is the trend of commercial development pattern in the area.



SOURCE: Field Work 2012

Figure 2.1: Land Use Map of Wuse II

CHAPTER THREE

METHODOLOGY OF THE RESEARCH

3.1 DATA TYPES AND SOURCES

This study relied upon primary and secondary data. Secondary data was sourced from published and unpublished sources. These included extracts from maps, literature, reports, documentations, records and information from both technical and administrative department of Development Control and agencies of the Federal Capital Development Authority (FCDA). Primary sources of data involved field work through observation, questionnaire administration and interviews. These were collected on site and from numerous field surveys (See table 5.0).

Table 5.1: Data Requirements and Sources

Data Types	Data Requirement	Source
Primary Data	Data on spatial pattern of commercial development: i) Characteristics (types) of Commercial developments. iii) Type of commercial activities.	Field survey by visitation of commercial developments and facilities. Use of land use map of Wuse II. Use of satellite imageries. Observation and recording.
	Data on Parking Characteristics.	Field survey. Use of satellite imageries. Use of land use map
	Determination of parking demand and supply of the commercial developments	Questionnaire administration by observation and recording
Secondary Data	Data on Policy, Guidelines and Measurement of parking	Literatures
	Data on parking standards, issues and Management of parking in cities	Literatures
	planning standards for parking in the FCT	Department of Development Control
	Problem of on-street parking and implications	Literatures
	Identification of streets where the Commercial facilities are located	Satellite imagery (AGIS) and land use map

Source: Field work, 2015.

3.2 APPROACHES TO DATA COLLECTION

The approach to data collection adopted in this research deals with learning and understanding the purposes and processes of parking in cities as presented in the reviewed literature. Secondly, it identified the characteristics of commercial developments, activities and parking. Thirdly, the methodology identified the problems of on-street parking and implications in Wuse II District. Lastly, explanations of parking problems in Wuse II were proffered and potential solutions evaluated.

3.2.1 Data Collection Instruments

The instruments used in the collection of data include the questionnaire which contains sets of questions to be answered by the data collectors through observation, ticking, counting and recording of information on parking characteristics, name and type of commercial developments and design of off-street parking. The interview method was also used for direct interaction between the interviewer and the interviewee.

3.2.2 Mapping and Field Investigation

The reconnaissance survey was conducted which led to the proper observation and mapping of the area and the identification of the various commercial and parking facilities in the area. It defined all the features of the district and gave the actual positions and locations of the commercial plots and facilities. The reconnaissance survey was aided with the adoption of patrol survey technique. In this technique, the study area was divided into manageable segments that can be covered by the data collectors in reasonable time intervals of 30 minutes, 1 hour, etc. The locations of commercial facilities, spatial pattern of commercial developments, distribution of parking, demand, management characteristics, and parking problems were observed while on patrol. The different forms of parking characteristics which involved off-

street and on-street were equally observed. Observers were positioned on every commercial facility to observe and count the number of vehicles that came to park at time intervals, those that parked on-street and off-street.

3.2.3 Data Collection Procedure

Data was collected using both the nominal and the interval scales. The nominal scale is classificatory in nature. It was used to classify commercial developments into different commercial activities or the parking characteristics into off and on-street. Classification between parking for week days and weekends (parking demand) was determined using the nominal scale. The interval scale was used to determine parking demand in the study area. An instance is to determine the number of vehicles parking at interval of between 7 - 8am, 8 - 9am, etc.

3.3 DATA COLLECTION METHOD

In order to achieve the objective of the survey, the techniques used for this study were the total enumeration or complete survey. Total enumeration technique involves counting and measuring all the observable occurrence of a particular phenomenon (Okoko, 1999). Data was collected through observation, questionnaire data collection and interviews and physical mapping of all commercial developments which include originally proposed and converted commercial land uses and their entire facilities. These formed the bulk of the primary data.

3.3.1 Physical Mapping

The entire area was divided into 8 different segments for easy coverage. The segments were used to determine the detailed existing situation of specific land uses in the area. This aided for easy determination of the actual areas meant for commercial purposes out of the 8 segments. The different shades of blue colors as seen in the land use Map (Fig.2.0) were used to

determine the commercial facilities distinct from other land uses. Stratified random sampling was used for the selection of sample through the subdivision into categories to avoid undue bias. The example used here was on data relating to the 6 different types of commercial activities (Plazas, Hotels, Offices, Banks, Petrol Filling Stations and Eateries) and the various streets where commercial activities took place in Wuse II District.

3.3.2 Questionnaire Administration

The demarcation of the entire area into segments and/or strata by the use of stratified random sampling technique helped to achieve 100% coverage of the 86 commercial developments in the area for questionnaire usage and data collection. The division brought the area to 8 strata. All the commercial developments in each stratum were covered with questionnaire; while some have more commercial developments others have less. The 86 questionnaires were used to collect data through observation, ticking and recording in the 86 commercial developments. This occurred along the 13 Streets where commercial activities existed in the study area and based on the pattern and design of commercial developments and distribution of parking facilities by commercial developments (supply). Data was also collected by observation and recording for on-street parking survey. This involved 5 working days and a Saturday for the weekend. Direct assessment and recording of activities and parking facilities existing in each commercial land use development was also undertaken.

3.3.3 Interview

Interview guide was used for the recording of information targeted on transport Officers. Questions were directed to the Staff of the Federal Road Safety Commission directly on the level of congestions and the streets seriously affected by it in the study area. The interview also

helped to determine the areas prone to high level of accident and other factors contributory to parking problems in Wuse II District.

3.3.4 Review of Secondary Data

These were sourced from published and unpublished materials. They included works of various scholars, maps, data records, documents and information from relevant technical and administrative departments and agencies of the Federal Capital Territory Administration (FCTA), like Department of Development Control and Abuja Geographic Information System (AGIS). Other information was gotten on-line. Published material such as the Development Control Manual provided information on the various parking standards used to estimate the level of parking demand for the various facilities such as Plazas, Hotels, Banks, etc.

Maps were used which are the land use and satellite imagery maps of Wuse II District. The Maps deal with the use of standards. Land use and satellite imagery maps were used in the sub-division of the area into different segments for easy coverage. They were used to determine the detailed existing situation of specific land uses in the area. The satellite imagery which determined the aerial view provided the present features of the area based on the current level of development in the commercial areas. It also showed the clear demarcation between the cadastral zone (A07) which is the study area, the Streets and the plots.

3.4 DATA ANALYSIS AND PRESENTATION

The data was analyzed using descriptive statistics. This helps to describe, show or summarize the data in a meaningful and manageable way such that patterns may emerge from them. It is used to analyze data on: parking characteristics in commercial areas, types of on-street parking, design of on-street parking facilities, off-street commercial facilities, problem associated with parking in commercial areas, and pattern of distribution of problem.

Data obtained from the study were presented using the analytical method of percentage format and graphic techniques such as, tables for easy comprehension. This statistical procedure was adopted to analyze the responses generated in the study. This method was used because of its simplicity in analyzing data and easy differentiation of results according to percentage share of each. Other methods of presenting the data collected included: Use of maps, graphs, diagrams, photographs and statements. Inferences were drawn from the data derived from the field survey using the parking management indicators.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 INTRODUCTION

This chapter examines the characteristics of commercial developments and parking problems in Wuse II. It is structured into three parts. The first part presents data analysed on the characteristics of commercial developments in two categories of planned and converted commercial areas. The second part discusses data on parking characteristics in commercial developments which involve on-street and off-street parking. The third presents the findings on the pattern of parking problems in commercial developments of Wuse II.

4.2 CHARACTERISTICS OF COMMERCIAL DEVELOPMENTS IN WUSE II

The characteristics of commercial developments within Wuse II are shown in Table 6.1. Hotel developments have a total at 15 out of which the planned commercial developments are 8 while the converted ones are 7 (see table 6.0). The total commercial developments used for Plazas are 34 in number. Those planned originally for this purpose is shown to be 19 while the converted ones are 15 (see table 6.0). Apart from 3 eateries which exist as planned, the rest, six in number are converted, within the district, no banks were proposed, but they are currently are ten.

The overall result shows that there are more commercial developments existing as converted buildings in Wuse II than those planned for (see table 6.0). The details of commercial developments in the district are shown in table 6.1 below. It shows the various plots where the commercial developments are located and the commercial activities within them. There are a total of 83 plots existing as commercial developments in the area out of which 37 were originally planned for while 46 plots are not.

TABLE 6.1: AGGREGATE ANALYSIS OF COMMERCIAL DEVELOPMENTS

S/No	Commercial Developments	Planned	Converted	Total
1	Hotels	8	7	15
2	Plazas	19	15	34
3	Eateries	3	6	9
4	Petrol Filling Stations	3	-	3
5	Offices	2	9	11
6	Banks	-	10	10
	Total	35	47	82

Source: **Field work, 2015**

Part of the findings which also has implication on parking relates to plot utilization by commercial developments. In many cases, more than one commercial development is found on one plot. Four commercial activities for instance namely, Metcho hotel, Drumstix/Distribution shop, Samsung and Yamoyus Filling Station are sharing the same plot (plot 177) thereby overstretching it (see table 6.1). Contrarily, Wadata Plaza is occupying two plots. Furthermore, the table also shows that Southern Fried Chicken and LG distribution Shop are situated in one commercial building on plots 353 and 591 respectively. A plot (plot 683) located in the converted area is subdivided to accommodate Funky and DHL Plazas thereby over utilizing it.

TABLE 6.2: ANALYSIS OF COMMERCIAL DEVELOPMENTS AND ACTIVITIES

PLANNED COMMERCIAL DEVELOPMENTS			CONVERTED COMMERCIAL DEVELOPMENTS		
S/NO	**PLOT NO**	**COMMERCIAL ACTIVITY**	**S/NO**	**PLOT NO**	**COMMERCIAL ACTIVITY**
HOTELS			**HOTELS**		
1	177A	Metcho Hotel	1	310	Beverly Hills Hotel
2	522	1st Forty Hotel	2	602	Ballyz Place
3	534	Gombe Hotel	3	661	Agape Motels
4	733	Villa U Hotel	4	665	Enara Homes
5	911	Hotel	5	685	Kekere Heaven Hotel
6	1149	Hotel De Horizon	6	926	Paches International Hotel
7	1364	Hotel Dabras	7	965	Mean Time Lounge
8	729	Yahan Hotel	**PLAZAS**		
PLAZAS			8	169B	Plaza
9	177B	Drumstix /Distributor shop	9	290	RoseBud African Hotel/Plaza
10	177C	Samsung	10	326	Leather World
11	527	Omega Plaza	11	328	Gold Finger Plaza
12	528	K-City Plaza	12	340	Kryxtal Plaza
13	598	NNPC Station Plaza	13	353/591	Southern Fried Chicken/LG Distribution Shop
14	730	Habiba Plaza	14	666	Xtacy
15	734	A.U.A Plaza	15	683A	Funky Plaza
16	735	Plaza	16	683B	DHL Plaza
17	739	Sherif Plaza	17	687	Mums 2 Be Plaza
18	740	Sherif Plaza /Park shop	18	698	Assorted Food Plaza
19	741	Banex Plaza	19	1221	CTL House Plaza
20	743	Banex Plaza	20	1380	DBM Plaza
21	750	Banex Plaza	21	1420	DBM Plaza
22	751	Emab Plaza	22	1422	DBM Plaza
23	1198	Easterly Park Plaza	**EATERIES**		
24	1247/1417	Wadata House	23	351	Beer Barn
25	1259	Plaza	24	593	West End Restaurant! Bar

26	1335	Glory Mojec Plaza
27	1336	Sahem Plaza
	EATERIES	
28	731	Tourist Special Restaurant
29	2019/1127	Tantalizer/Restaurant
30	2019	Mr Biggs
	PETROL FILLING STATIONS	
31	177D	Yamoyus Filling Station
32	178	Austoma Filling Station
33	913	AP Filling Station
	OFFICES	
34	1110	Glo Office
35	1130	Etisalat Sales Office `
25	600	Home kitchen
26	658	Eat . Com
27	678A	Chicken Republic
28	1204	Cook Hall Ltd
OFFICES		
29	79	Furniture Palace
30	82	ARM Pensions
31	1 69A	Interior House Ltd
32	176	Zoom Mobile
33	646	Zita Beauty home
34	652	Flash Multi Services Ltd
35	654	Life images
36	697	M-tel Communications
37	1223	Path Care Nig
BANKS		
38	78	Somo vision/ Fin Bank
39	80	JHN Micro Finance Bank
40	642	First generation Home
41	660	UBA
42	678B	Platinum savings &loans
43	678/681	Zenith Bank
44	682	Eco bank
45	928	Main Street bank
46	1195	Access bank
47	1205	Zenith bank

Source: **Field work, 2015**



Plate VI: A Commercial Development as planned (Sherif Plaza)

Source: **field work, 2015**



Plate VII: A Converted Commercial Development

Source: **field work, 2015**

4.3 PARKING CHARACTERISTICS IN COMMERCIAL DEVELOPMENTS

Parking around commercial areas in Wuse II District occurs in two forms, either as on-street or off-street. On-street parking takes place within the road reservation while off-street parking occurs outside of it mainly within premises. This analysis examines the nature of each category of parking as it occurs by type of commercial developments and streets. Their problems and the associated patterns are explored and determined in the second part.

4.3.1 On-Street Parking

Most of the commercial facilities in Wuse II District are associated with on-street parking (see figure 3.4). The total vehicular count from the field per day as shown in table 6.2 is 28,010. Plazas generated the highest number of on-street parking at 71% and Offices accounted for the least at 2%. Petrol filling stations are the second largest contributors explained mainly by the dual functions that most of them serve, either as shopping outlets or for retailing of fuel products. Other activities attracted by the Petrol filling Stations (black market sale of fuel, street hawking, and Taxi operation) help account for this pattern. Banks also constitute a significant amount of on-street parking estimated at 7%. For this category, customers generally park and often stay long periods either waiting or undertaking transactions.

In Wuse II District, where all the streets experience on-street parking, there are no parking charges to check parking excesses. Vehicles park as long as the whole day without paying a price and this is compounding parking problems in the area. Major streets like Aminu Kano Crescent, Ahmadu Bello Way, Njamena Crescent, etc increasingly lose a lot of tax revenue as a result of lack of parking charges. When government loses a lot of revenue due to poor planning, it hampers its budgeting system.



Plate VIII: On-Street Parking by Banex Plaza

Source: **field work, 2015**

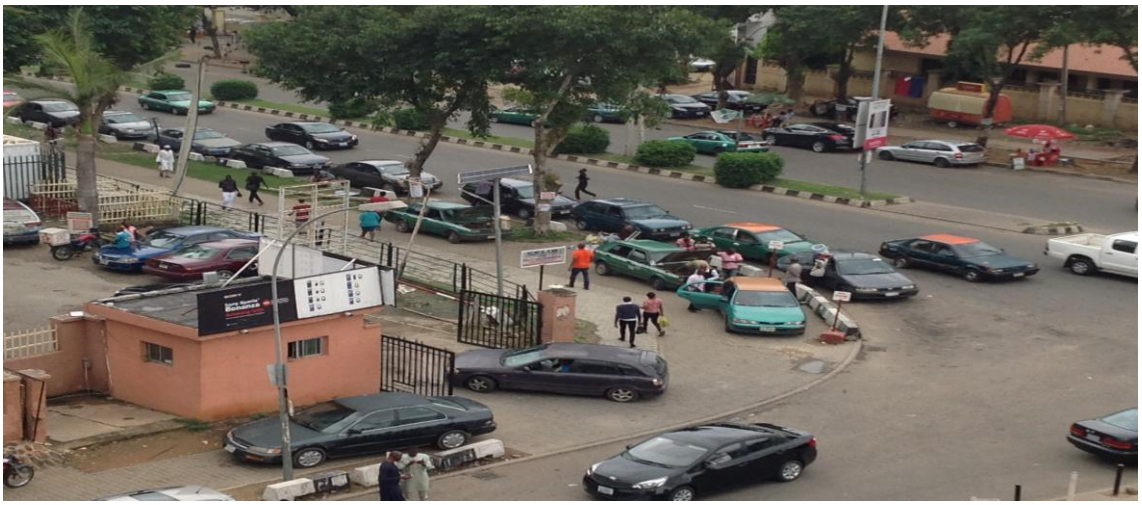


Plate IX: On-street parking along Aminu Kano Crescent.

Source: **field work, 2015**

Most of the Banks in this category operate from residential buildings while the Eateries can be found in almost all converted buildings (see figure 3.1). Therefore, it suggests that their locations are not suitable hence they generate high volume of traffic. Hotels are second to the least commercial facility in the area at 4%.

Table 6.3: On-Street Parking Associated by Commercial Developments

S/N	Commercial Developments	No of Vehicles (On-Street Count)	Percentage Coverage (%)
1	Plazas	19851	71
2	Petrol filling stations	2585	9
3	Eateries	1917	7
4	Banks	1902	7
5	Hotels	1147	4
6	Offices	608	2
	Total	28,010	100

***Source*: field work, 2015**

Further analysis was carried out to determine the spatial pattern of on-street parking. As shown in table 6.5, Aminu Kano Crescent had the highest on-street parking at 75% (see figure 3.4). This is explained by high concentration of plazas and other commercial activities like Banks and Hotels (see figure 3.2). Khums Close had the least number of on-street parking which is not unconnected with location of fewer commercial activities in the area. The few commercial activities on the street generally have commensurate number of off-street parking provisions.



Plate X: On-Street Parking along Aminu Kano Crescent

Source: **Field work, 2015**

Ahmadu Bello Way had the second highest concentration of on-street parking. The reason was that the two major petrol filling stations which had the third largest number of on-street parking were located on this street. This, coupled with major Plazas justified the large volume. The third major street that had high on-street parking was Njamena Crescent. It was on this street that other minor plazas were located which constituted an increase in the level of on-street activities. The result also shows that on-street parking reduce down the table in the area (see table 6.3). They had minor commercial activities like those in offices. An example of such offices was the Etisalat Office.

The table indicates that from Mediana close down to Libreville Street there was very few on-street parking. Their values decreased as the level of commercial activities they experienced decreased. They fell within the interior part of the study area which had less commercial activities and thus had lesser consequences of parking problems.

Table 6.4: On-Street Parking By Streets

S/N	Names of Street	On-Street Count	Percentage Coverage (%)
1.	Aminu Kano Crescent	21,085	75
2.	Ahmadu Bello Way	2,038	7
3.	Njamena Crescent	1317	5
4.	Alexandria Crescent	849	3
5.	Lingu Crescent	566	2
6.	Kikuyu Close	434	2
7.	Mediana Close	389	1
8.	Kade Street	352	1
9.	Agades Street	331	1
10.	Barthust Street	284	1
11.	Kandi Close	160	1
12.	Libreville Street	143	1
13.	Khums Close	62	0.2
	Total	28,010	100

***Source*: field work, 2015**

The availability of on-street parking facilities was also examined by the study. Four types of facility were identified as shown in Tables 6.4 and 6.5 respectively. Generally, most of the parking facilities have been provided in vertical position, which represented 58% of all on-street parking in the area. A sizable parking facility is also provided in parallel on-street position. Back-in Angled position is not popular. This represented 4% of all on-street parking in the study area. The result equally shows that the Plazas have the most organized parking design which is vertical. This is followed by the design that is aligned parallel to the road. The least parking design witnessed around the commercial facilities is the back-in angled type.

Table 6.5: Design of On-Street Parking Facilities

S/N	Commercial Facility	Parking Design			
		Angled	**Vertical**	**Parallel**	**Back-In Angled**
1	Plazas	1985	13102	3970	94
2	PFS	129	388	2068	0
3	Eateries	192	1246	383	96
4	Banks	342	571	951	38
5	Hotels	161	688	229	69
6	Offices	61	365	182	0
	Total	2870	16360	7783	297

Source: **field work, 2015**

Table 6.6: Summary of On-Street Parking Facilities

S/No	Parking Design	No. of occurrence	% Coverage
1	Angled	2870	10
2	Vertical	16360	58
3	Parallel	783	28
4	Back-In Angled	997	4
	Total	**28,010**	**100**

Source: **field work, 2015**

The figure below shows the various ways that vehicles park in the commercial areas. Most vehicles parked in angular positions such that they can maneuver their way out. Some are in vertical position and the bus is parked in back-in angle position (figure 3.5). Figure 3.6 also shows vehicles that parked in angular position.



Plate XI: Parking Designs at Banex Plaza

Source: **Field Work, 2015**



Plate XII: Parking Design at Park N Shop

Source**: Field Work, 2015**

4.3.2 Off-Street Parking

As shown earlier, off-street parking is accommodated within activity premises. In the case of commercial premises, they are designed as integral part of the building whether as basement or surface parking. From the survey conducted, commercial facilities in Wuse II District collectively have 2,450 of off-street parking. This compares to the total demand in the area estimated at 30,369. As shown in table 6.6, Hotels accounted for the highest number of off-street parking at 1,391. The commercial facility with the least off-street parking count is the Petrol Filling Stations at 24. Plazas have the highest parking demand in the area. They also have the corresponding highest short fall at 71%. The facilities that have the least parking demand are the Offices with the least short fall at 1.9%. The table also shows that the total difference between parking demand and supply is given at 27,914 (see table 6.6).

The deficit established implies that none of the commercial facilities have adequate design capacity to accommodate the demand for parking in the area. Worst of them are the Plazas which have the highest demand for parking in the area (see table 6.6). This is not far from the fact that most of the conversions that took place in the area occurred within the Plazas. The high parking demand constituted a short fall from the supply which leads to on-street parking in the area. Therefore, off-street parking facilities in all the commercial developments in Wuse II are grossly inadequate.

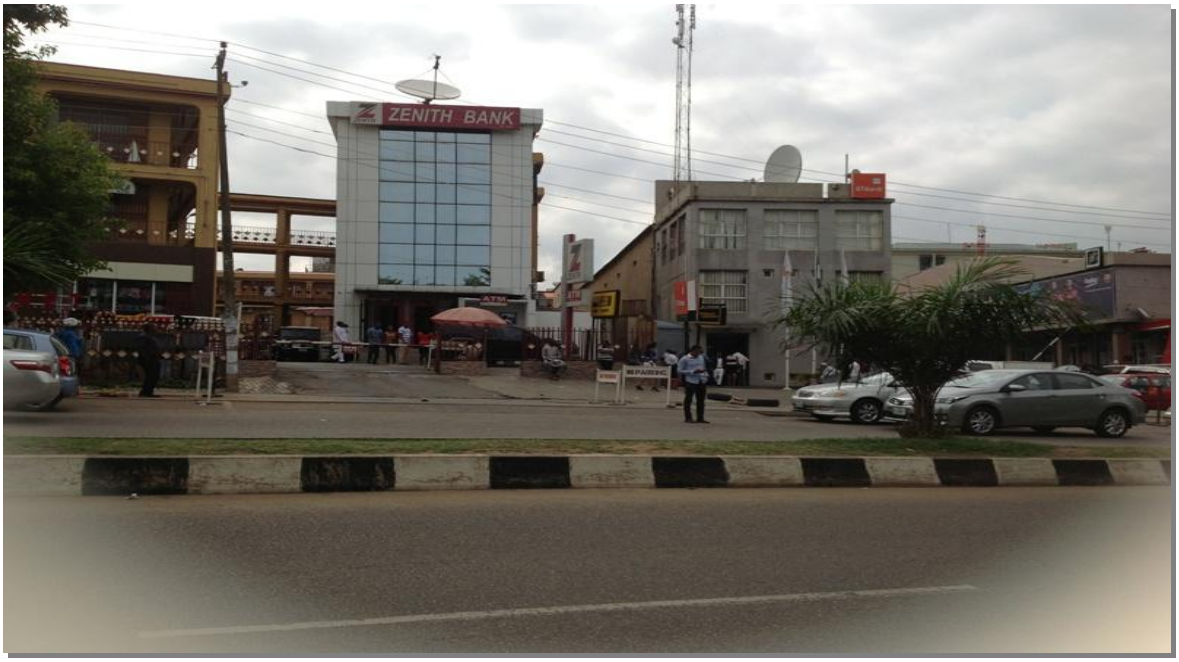


Plate XIII: Picture of Two Banks attached to a Plaza.

Source: **Field Work, 2015**

Table: 6.7: Off-street Parking by facility

S/N	Commercial Facility	Design Capacity (Supply)	Parking Demand	Short Fall	Percentage
1.	Hotels	1391	2547	1151	4.1
2.	Plazas	717	20538	19821	71.0
3.	Eateries	165	2078	1913	7.9
4.	Offices	87	629	542	1.9
5.	Banks	66	1968	1902	6.8
6.	PFS	24	2609	2585	9.3
	Total	**2,450**	**30,369**	**27,914**	**100**

Source: **Field Work, 2015**

The figure below shows off-street parking facility provided for part of the Banex Plaza. The building is about four floors and the ground floor with few parking lots as shown on figure 4.1.

The shortage of off-street parking facilities encourages on-street parking in the commercial areas.



Plate XIV: Off-Street Parking within the Banex Plaza

Source: **Field Work, 2015**

The result as established in table 6.7 showed that all the streets affected by off-street parking in Wuse II District have a total of 2350 parking facilities. They equally have a total parking demand at 30,360. The total shortfall between supply and demand is given at 38,010. Aminu Kano Crescent has the highest off-street parking facilities at 1,016 as well as the highest parking demand at 22,101. It equally has the highest shortfall representing 75% of total. The street that has the least number of off-street parking facilities is Libraville Street. It is represented at 4 while the demand for parking is given at 66. The least shortfall still falls within the same street and is represented at 0.2% of the total.

The entire result also represented a certain level of inadequacy. All the streets involved with parking have inadequate off-street parking facilities when compared with the level of demand.

The street that has the most demand for parking is Aminu Kano Crescent showing that most commercial activities take place along it (see table 6.7). It is also along this street that most large commercial activities in Wuse II occurred. Libreville Street on the other hand has the lowest commercial activities hence the very low demand for parking. Further analysis can be seen in the table below.

Table 6.8: Off-Street Parking by Streets

S/N	Name of Street	Off-Street Count (Supply)	Parking Demand	Short Fall	Percentage Coverage
1.	Aminu Kano Crescent	1,016	22,101	21,085	75
2.	Alexandria Crescent	532	2570	2038	7
3.	Kandi Close	329	1646	1317	5
4.	Njamena Crescent	270	1119	849	3
5.	Agades Street	83	649	566	2
6.	Kikuyu Close	45	479	434	2
7.	Kade Street	25	44	389	1
8.	Lingu Crescent	14	366	352	1
9.	Barthust Street	10	341	331	1
10.	Ahmadu Bello Way	9	293	284	1
11.	Mediana Close	9	169	160	1
12.	Khums Close	4	147	143	1
13.	Libraville Street	4	66	62	0.2
	Total	**2350**	**30360**	**28010**	**100**

Source: **Field Work, 2015**

The table below shows the level of parking supply and demand in the proposed commercial areas of Wuse II District. The total parking facilities supplied in the area is given at 2450. The Hotels had the highest count at 1391. This is followed by the plazas at 717. The PFS had the least parking supply in the area at 24.

The total parking demanded in the area is given at 30369 (see table 6.8). Contrary to the level of parking supply in the area, the Plazas accounted for the highest parking demand at 20538. The gap was much compared to the other commercial developments indicating the level of parking problem caused by the Plazas in the area. Following the Plazas are the PFS at 2609. The Offices had the least parking demand in the area at 629.

TABLE 6.9: COMMERCIAL PARKING SUPPLY AND DEMAND

S/N	Commercial Developments	No of Commercial Developments	Parking Supply	Parking Demand
1	**Plazas**	35	717	20538
2	**Hotels**	15	1391	2547
3	**Eateries**	11	165	2078
4	**Petrol Filling Stations**	4	24	2609
5	**Offices**	11	87	629
6	**Banks**	10	66	1968
	TOTAL	**86**	**2450**	**30369**

Source: **field work, 2015**

4.4 NATURE AND PATTERN OF PARKING PROBLEMS ASSOCIATED WITH COMMERCIAL DEVELOPMENTS

4.4.1 Nature of problems

4.4.1.1 Congestion

There is high level of congestion in the area especially during the peak periods (between 12noon-1pm and 2-3pm,see table 7.0). For instance, the Plazas have high on-street parking count at 71% (see table 6.6) explaining that they sometimes congest the roads. This amounted to series of problems hindering efficient traffic movement in the area. One of the serious implications was the loss of street space (right of way). When traffic congestion occurs along the streets of the area especially during the peak periods, 12-1pm (see table 7.0), the capacity reduces, traffic speed drops between dead to slow (0-20km/h) and the time spent during trips increases (see figure 5.0). This leads to increase in operational cost. Congestion also occurs around where there is concentration of other facilities due to the presence of commercial activities with increase of on-street parking around them. This had made the right of way not enough to take the volume of vehicles in the area.

Most commercial activities cause serious obstructions to the free flow of commercial activities in Wuse II. One of the major obstructions this could cause could affect fire-fighting operations. When vehicles are parked on the streets, they obstruct the movement of vehicles on essential duty like fire-fighting vehicles, Ambulances, etc which greatly impede their operations. They blocked access to hydrants and buildings. The effect is that properties that were on flame would be greatly damaged before fire-fighters could attend to them and those on essential duties may be delayed. The delay might cause fire to engulf other nearby properties and lives thereby causing a great loss to individuals and the economy of the state.

Congestions along the streets of Wuse II contribute to lack of terminal facilities as a result of the overstretching and inaccessibility of the available facilities in the area. For instance, the streets are totally utilized, the pedestrian paths are blocked and the curbs meant for landscaping and beautification of the area are covered. When the District is inaccessible due to high level of on-street parking, it drives away investors who shift their investment to other areas free of such problems.



Plate XV: Traffic Congestion along Ahmadu Bello Way.

Source: **Field Work, 2015.**

4.4.1.2 Road Accidents

Road accidents are associated with most of the streets having high counts of on-street parking. Road accidents are some of the consequences associated with wrong parking. They also occurred through the careless opening of the doors of parked vehicles. Most road users who parked their cars without carefully watching the movement of other vehicles could be hit by them. Efforts to get traffic accident data from FRSC for the study area and beyond proved

abortive. “Deaths from reckless driving are the third leading cause of deaths in Nigeria. Nigeria has the second highest rate of road accidents among 193 ranked countries of the world” (Agbonkhese O. Et al, 2013, Pg. 90). According to their research, between 2012 and 2013, about 755 deaths occurred on road accidents in Nigeria. Between June 2006 to May 2014 using Nigeria Watch database shows that 15,090 lives were lost to fatal road accidents in 3,075 events and FCT has the highest relative number of deaths, that is 0.6 deaths per 100,000 population (Victus N. U., 2014). Crash data from 1965 and 1966 revealed that 16% of crashes in American cities directly involved cars parking along the road (Wesley et al, 2008). During the peak periods, accidents do occur either due to vehicles trying to bring their cars to the parking location from the mainstream of traffic or negotiating from one or more streets and trying to join the traffic.

4.4.1.3 Health/Environmental Hazards

On-street parking around commercial developments and along the streets of Wuse II causes some hazards. The effect of the high level of on-street parking in the area is environmental hazards. Vehicles that parked along the streets of the area degrade the environment. Cars that park into every little available space in the area debase the visual aesthetics, and buildings seemed to be seen from a plinth of cars. The stopping and starting of cars resulted in noise and fumes which were hazardous health-wise.

During congestion, the odor and/or smell from vehicles carrying refuse is capable of causing people to vomit, with the consequent diseases. The summary of these results was that the high level of on-street parking in all the commercial facilities in Wuse II District constituted serious problems to the immediate environment.

One-Street Parking by commercial facilities is represented using the Bar Chart in figure 5.1.

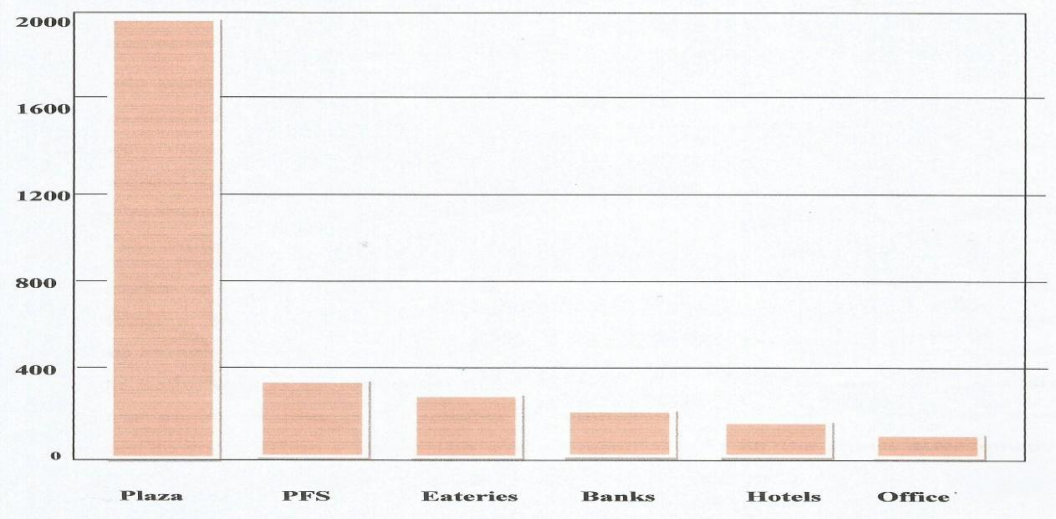


Figure 5.1: Bar Chart Representing On-Street Parking Levels by Commercial Facilities

***Source*: field Work, 2015**

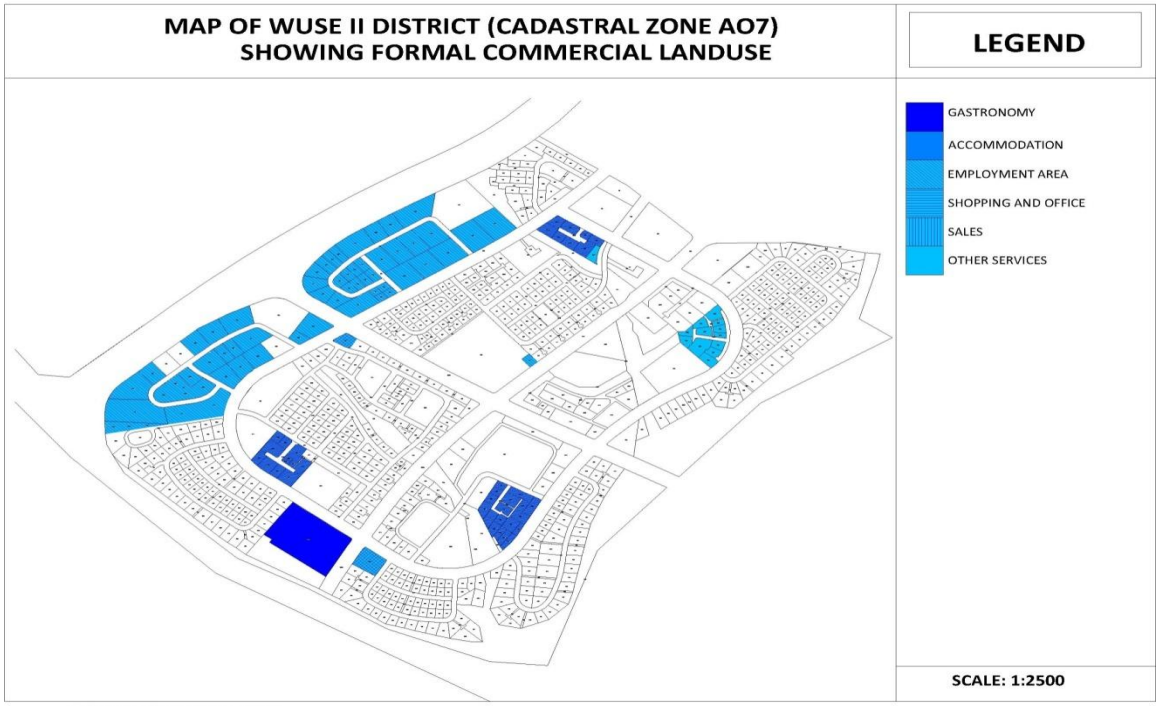
4.4.2 Distributional Pattern of problems

The result of the study on table 6.9 suggested that all the streets in Wuse II District that have commercial activities are affected by on-street parking problems. Aminu Kano Crescent is the busiest street with the highest level of commercial activities. This has made it the most problematic street in the District that exhibits the negative qualities of a congested street. As wide as this street is, vehicles are seen parked on-street along the walk ways, curbs and sides of the road after the off-street parking facilities are filled up. Congestions occur at intervals along this street and Ahmadu Bello Way which are major roads in the District. This occurs especially during the peak periods of week days, 12noon-1pm and weekends, 2-3pm (see table 7.0). The available traffic lights are not helping matters because the volume of traffic is more than the rate for which the lights change. There is always traffic grid lock during these periods such that vehicles appear stand still. This, most often requires the help of a Traffic Warder to resolve the situation.

The parking type in the area poses another big problem. Parking on wider streets takes different shapes. This is due to non-availability of parking managers to control parking in the area. The presence of the Vehicle Inspectorate Officers and Road Safety Officers are not felt due to the chaotic nature of parking in the area. Along Aminu Kano Crescent alone, vehicles park in parallel, vertical and horizontal directions. The vehicles also park based on available spaces, sometimes not minding how long they would inconvenience others. This is a serious situation because it is only in off-street parking situation that one finds private security guards that often control vehicles to park but not so in on-street situations.

A close examination of table 6.9 below will show how visible the problems of on-street parking are in either ascending or descending order. The problem is most from Aminu Kano Crescent and decreases to Khums Close. This shows that there are more commercial activities from

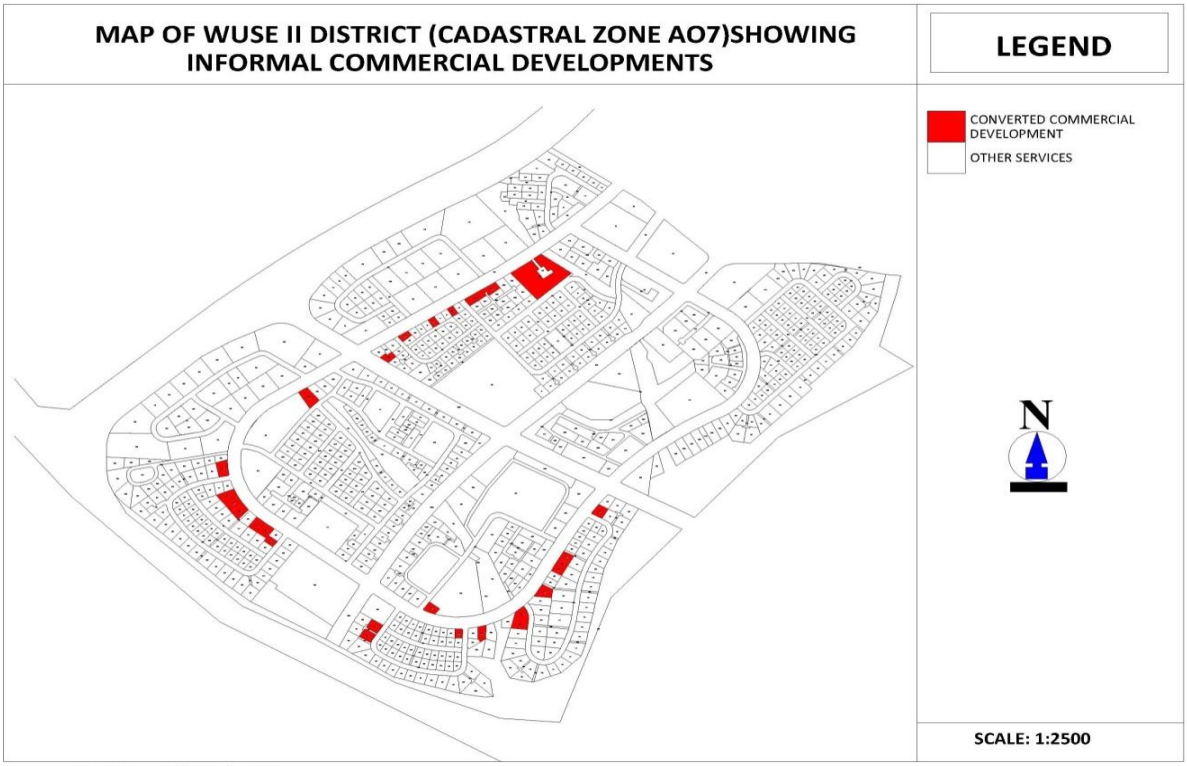
Aminu Kano crescent descending down to Khums Close. From Aminu Kano Crescent to Lingu Crescent, there are the presence of traffic lights indicating the presence of high volume of traffic while there are none between Kikuyu Close and Khums Close. Among the streets between Aminu Kano Crescent and Alexandria Crescent where commercial activities and traffic are high, on-street parking are more intense and are mostly affected by peak periods than the later set. These problems are more visible along the first set of streets mostly during the day and lesser at night. It is intense at night around areas where Eateries and Hotels are located. All the streets involved with on-street parking in Wuse II District contain residential houses converted either from residential use to commercial ones or from commercial to other purposes. Sometimes vehicles park on one half of the road causing serious obstructions.



SOURCE: Field Work, 2012

Figure 6.1: Formal (Planned) Commercial Land Use

The spaces depicted with different shades of blue are areas originally allocated for commercial developments (see fig. 6.0). This is as it appeared on the land use map of Wuse II District. Over time, commercial activities have increased by extension to other areas meant for other purposes.



SOURCE: Field Work, 2012

Figure 7.1: Informal (Converted) Commercial Developments

The map shown above is the land use of Wuse II District displaying areas meant for purposes other than commercial. These are majorly residential areas that are converted for commercial purposes. The areas in question are represented with red color. Other areas not depicted with blue and red colors both in figure 6.0 and 7.0 are not affected by commercial activities in the study area.

Table 7.1: Problems of On -Street Parking by Streets

S/N	Names of Street	Off-Street Count	Percentage Coverage (%)
1.	Aminu Kano Crescent	21,085	75
2.	Ahmadu Bello Way	2,038	7
3.	Njamena Crescent	1,317	5
4.	Alexandria Crescent	849	3
5.	Lungu Crescent	566	2
6.	Kikuyu Close	434	2
7.	Mediana close	389	1
8.	Kade Street	352	1
9.	Agades Street	331	1
10.	Barthust Street	284	1
11.	Kandi Close	160	1
12.	Libraville Street	143	1
13.	Khums Close	62	0.2
	Total	**28,010**	**100**

Source: **field Work, 2015**

The above result is represented using the Bar Chart

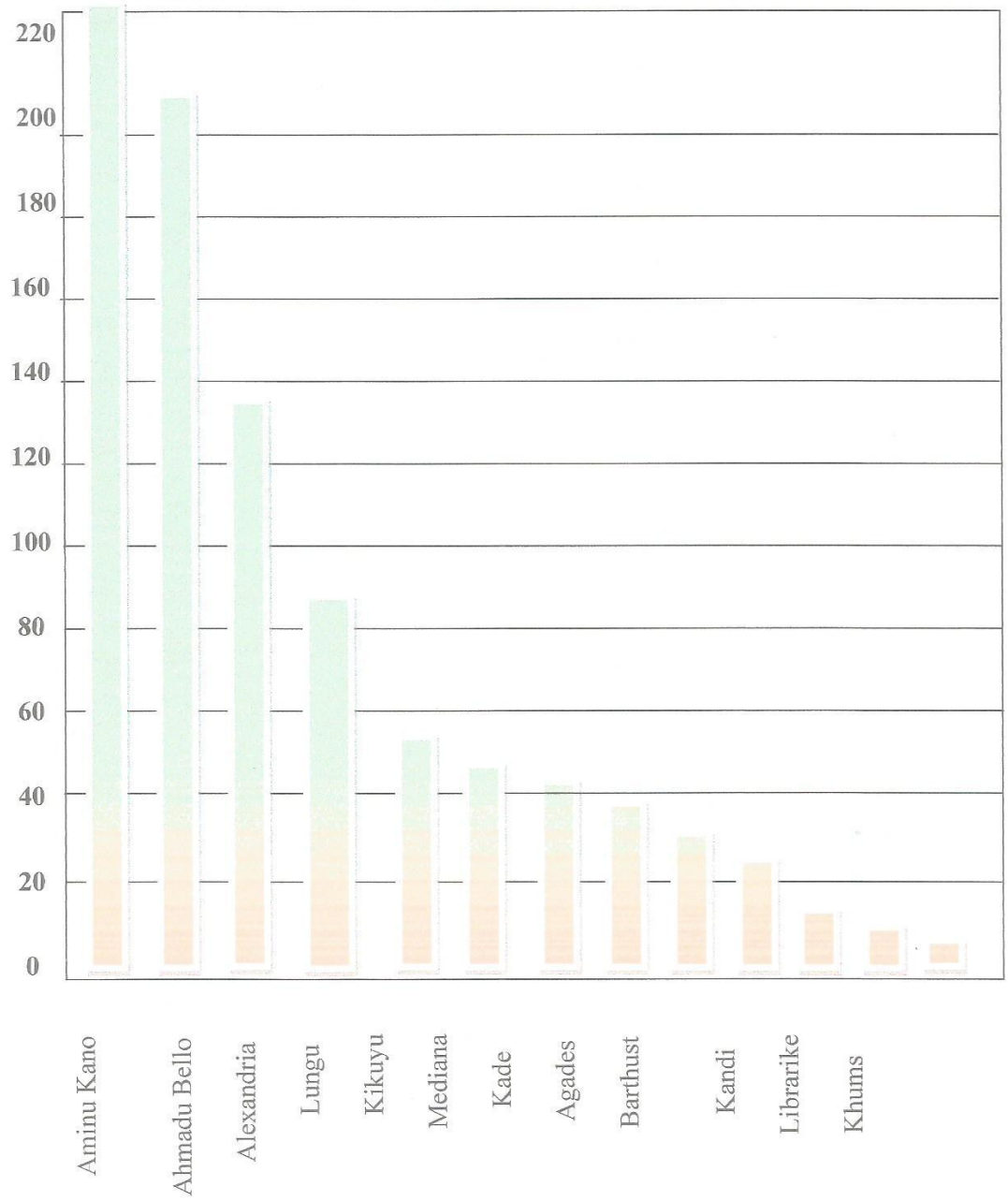


Figure 8.1: Bar Chart showing Problem of On-Street Parking by Streets

Source: **field Work, 2015**

The result of the table below implied that during the week days, on -street parking and traffic congestion was always high in the afternoon between the hours of 12 noon to 1pm. This was the period when most people went out for school runs as well as break time for workers who utilized the period to go out and engage in one transaction or the other (see table 7.0).

During the weekends, the count suggested that most people came to the Federal Capital City between the hours of 2 to 3pm. This was the peak period when people must have finished their home chores to come out for transaction hence the high level of on-street parking and traffic congestion during this time. This showed that the peak periods were mostly when on-street parking problems and traffic congestion occurred in Wuse II District.

Table 7.2: Parking Duration Survey for Commercial Developments

Day	Duration (AM)					Duration (PM)						Total
	7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	
Week day	1157	2413	2759	2763	2790	2838	2806	2832	263 3	2603	2103	27697
Week end	885	1342	1725	2134	2250	2297	2241	2759	2424	2217	1577	21,851

Source: Field work, 2015

4.5 FACTORS RESPONSIBLE FOR PARKING PROBLEMS IN COMMERCIAL DEVELOPMENTS

4.5.1 Inadequate Parking Facilities

The study showed the level of inadequacy of parking facilities within the six commercial facilities in Wuse II. There was a total deficit of 236 of all the commercial facilities. Out of the six commercial facilities, only the hotels were adequate, covering 14% (see Table 6.8). The plazas were grossly inadequate at 40%. Research conducted showed that the plazas experienced

a lot of commercial activities hence the high level of inadequacy. Eateries were next to the plazas with a high deficit. These facilities also harbored high rate of parking activities.

The offices were also inadequate at 12% of the total. The banks and the petrol filling stations had the least deficit (see Table 7.1). This showed that they were more adequate when compared to other facilities down the table. The overall result showed that five out of six commercial facilities in Wuse II were inadequate which was a very big problem considering the working of the city at large.

Table 7.3: Inadequate Parking Facilities

S/N	Commercial Facility	Deficit	Percentage coverage
1.	Hotels	+ 46	14
2.	PFS	-21	6
3.	Banks	-35	11
4.	Offices	-38	12
5.	Eateries	-56	17
6.	Plazas	-132	40
	Total	**-236**	**100**

Source: field work, 2015

4.5.2 Lack of Multi storied Parking Facilities

There was non-provision of other parking facilities in the area. Such public parking types as multi-storied car parks, surface car parks, roof car parks, underground car parks, park and ride etc., were not introduced in the area due to the unforeseen commercial explosion being experienced. Parking type in Wuse II was restricted to only ground and/or surface parking within the commercial developments. Most commercial facilities in Wuse II like Banex Plaza

had land wide enough for the construction of multistoried and underground car parks which would have taken three times the number of vehicles that parked on-street. There are many empty plots in Wuse II lying waste which can be revoked and utilized for off-street parking, yet parking facilities are lacking in the area. This also can be attributed to faulty parking projections during the design stage. The high rate of private car ownership was evidently not envisaged and projected for.

4.5.3 Outdated and Non-Review of Wuse II District Plan

The land use design to cater for the future increase in the number of vehicles and the periodic demand for parking are faulty. The private car ownership rate has overgrown the supply of parking facilities which is a major source of concern on the lingering problems of parking in Wuse II. The design does not also take into cognizance that there is bound to be spillover from the area earmarked for commercial activities to the other side meant for residential purposes. Adequate right of way to take care of the volume of traffic in Wuse II especially along Aminu Kano Crescent is not in place. To compound the problem is that the insufficient road has been taken over by on-street parking which causes very slow movement of vehicles. There is equally loss of valuable trees due to the space created to park on-street which is not justifiable as this alters the master plan of the city.

The agencies responsible for the making and reviewing of plans have fallen below expectation to reviewing the district plan of Wuse II. Successive administrations had not given enough attention to reviewing the District Plan which would have taken care of myriads of parking problems dominant in the area. The reasons for this are lack of the will to take drastic actions, lack of funds, and much government attention geared towards the development of other Districts of choice. This remains a serious problem in administering the Federal Capital Territory. On the one hand, Wuse II had been over flooded with a lot of commercial activities

over a period of time without an attempt to have a holistic review of such activities. An attempt made to allow some of the commercial activities to be in place have worsened the situation. On the other hand, inability of the government to develop other phases and their corresponding districts contributed to parking problems. This has caused the overstretching of the parking facilities resulting in on-street parking problems in the area. The practice of successive governments in failing to address the problem of abuse of the master plan is a big one.

A situation where the government neglects the development of Federal Capital Territory in phases as provided by the master plan is also another problem. Lands are allocated in phases 4 and 5 without commensurate infrastructure thereby inhibiting the spread of commercial activities and increasing parking problems in developed part of the city like Wuse II.

4.5.4 Non-Implementation of the FCC Transportation Policy

There is poor enforcement of traffic regulations in the Federal Capital City which had affected the transport system in Wuse II. Mass transit system has been newly introduced in the Federal Capital Territory (FCT) but this does not cover most areas with high volume of traffic like Wuse II. The problem of unavailability of mass Transit System led to the increase of private car ownership in the area. Large percentage of private vehicles plying the major streets of Wuse II has one or two occupants inside them. This means that the spaces covered by these vehicles and those left within the vehicles if avoided would have reduced both traffic and parking problems in Wuse II. Therefore, the absence of Mass Transit system in Wuse II is a serious setback in resolving the problem of on-street parking in the area. Another serious effect is high cost of transportation around Wuse II and its environs. Movements in the area either require one owning a car, or boarding a taxi. Buses are not available, a situation which leads to high cost of transportation in the area.

4.5.5 Poor Enforcement of Development Control Guidelines

There are abuses of building code; densities, zoning formula, and change of use (see fig. 7.1), that take place in the course of development. Most buildings where commercial activities take place along Aminu Kano Crescent are not of the same densities. Some are still at a storey level while others have been elevated to two or three floors. Example is the building housing LG sales shop. The conversions that have taken place in parts of the study area have affected the original zoning formula. These contribute to the parking problems both on the side of developers and managers. The land and building use of most part of the area were either altered from one commercial use to the other or from residential to commercial use. For instance, most of the residential buildings along Aminu Kano Crescent and Ahmadu Bello Way were converted for commercial uses. An example is the Glory Mojek Plaza. Most buildings meant for small scale commercial activities were redesigned and converted for large scale commercial activities. Most buildings meant for retail shops were converted and extended for plazas thereby causing more on-street parking (see Figure 9.0). There is also poor management and enforcement of regulations on the provisions of parking in the Federal Capital City.



Plate XVI: Space meant for Retail Shops converted for Plaza.

***Source*: field work, 2015**

CHAPTER FIVE

SUMMARY, RECOMMENDATIONS AND CONCLUSION

5.1 SUMMARY OF FIDINGS

The characteristics of parking for commercial developments in Wuse II District have been examined thoroughly and problems inhibiting adequate and smooth parking in the area identified. The problems were looked into in terms of the commercial developments that exist within the areas designated for commercial use and those within the converted areas. On the other hand, most of these commercial developments are affected by off-street and on-street parking problems. Off-street parking constitutes lesser problems within most of the commercial developments which do not have adequate parking facilities for the corresponding demand. On-street parking on the other hand, constitutes the most problems of parking being experienced in the commercial city.

Among the various commercial activities in the area, Plazas generated the highest off-street and on-street parking at 71% of total each. The Plazas also commands the highest demand for on-street parking. Petrol Filling Stations generated the least off-street parking in the area at 10% while Offices accounted for the least on-street parking at 2% of total. The overall result also revealed that the highest level of off-street and on-street parking were generated along Aminu Kano Crescent at 43% and 75% of total respectively and with the highest demand for parking. Libreville Street generated the least off-street and demand for parking while Khums Close has the least on-street parking at 0.2% of total. The causes of on-street parking are majorly due to insufficient off-street parking facilities, conversions and high volume of commercial activities.

In the study area, four types of direction for which vehicles park were identified. These include: angled, vertical, parallel and back-in-angled types of parking. Most of the vehicles in the area

park in vertical positions (68%) around the facilities as well along the streets. The least direction that vehicles park is back-in-angled position at 4% of total.

The study revealed the nature of problems experienced in Wuse II District. These include: congestion, road accident, poor accessibility, and environmental hazards. The Plazas which mostly fell along Aminu Kano Crescent are grossly congested. This is due to myriads of commercial activities around them. The same street is highly prone to accidents more than the others. When most roads in the study area are congested especially during peak periods, accesses to other exit streets are affected with difficulties to ply on. During this period, users of the commercial streets of Wuse II district are exposed to environmental hazards such as noise and fumes.

Apart from parking problems, there are some implications. These include: blockade of foot paths and curbs, disorganization of traffic lights, loss of man hour, overstretching of available facilities and loss of revenue. The problem of parking can be explained in the following: non-provision of other types of parking facilities, outdated land use design, poor planning and enforcement of traffic regulations in the FCT, compromise and non-conformity to standards, and non-review of Wuse II District Plan.

5.2 RECOMMENDATIONS

5.2.1 Review of the Wuse District Plan

The District plan of Wuse II should be reviewed to accommodate the present and future increase in population and commercial activities. It was observed that the existing plan did not provide enough space for the expansion of the ground surface parking lots. The provision did not specify the use of underground and/or storey type of parking facility.

5.2.2 Introduction of Public Parking Garages

Wuse II as a big district that commands huge commercial activities needs a systematic plan for high rise parking facilities (Multistoried Car Parks), Surface Car Parks, Roof Car Parks, Park and Ride and Underground Car Parks to take care of the numerous parking problems in it. These should be introduced within the commercial areas especially in areas where large commercial facilities are located. They can take as much as 6-10 times what the ground surface parking system can take. Most empty plots existing in Wuse II can be converted for this purpose (especially the empty plot opposite Banex and Sherif Plazas). The empty plots can be converted for public use while other commercial facilities like plazas, offices and hotels that have bigger spaces can introduce multi-storied parking facilities (examples are: Park and Shop, Hotel Dabras, Emab Plaza, Wadata House, Omega Plaza, etc.). For bigger commercial developments like plazas of up to 3 floors and above, underground parking should be introduced. This can equally take several floors underground (as seen in most high rise buildings in the Central Area) depending on the size of the commercial development, plot, and future activities. The traffic problems being experienced in the commercial areas of Wuse II would be solved if on-street parking is reduced to a barest minimum. Cities like New York and London are where such regulations prohibiting curb parking entirely especially around main cross streets have been enforced. This has proved very successful in speeding up through traffic (Walter, 1940).

5.2.3 Introduction of Parking Charges

The high rate of private car ownership in the Federal Capital Territory is alarming. This is as a result of inadequate mass transit system that can help to reduce the number of cars plying the road and to take care of myriads of transportation problems. Recently, the Minister of the FCT introduced a reform in the transport sector through the introduction of some mass transit buses,

and taxis. To enhance the current improvement of the transport system by the Minister of FCT, more mass transit buses and taxis should be introduced at every major road in the commercial areas of the city. Presently, commercial buses do not ply the major streets of Wuse II. This is one of the major reasons why private vehicles and taxis congest every part of the district.

Sometime in the past, between the year 2013 ad 2014, the then Minister of the FCT introduced the 'Park and Pay Policy'. This policy did not stand the taste of time due to lack of proper legislation backing it. Therefore, the government should re-introduce this policy and provide the legal framework and/or backing for it. The new policy should address some of the problems experienced with the former policy. Such problems to be corrected are: applying considerable charges and varying them based on locations and time of parking, the use of a uniform card system for all the contractors to enable people that have purchased cards in advance use them at any location they find themselves within the FCT, and to conduct adequate training of staff to avoid the recurrent clashes and conflicts between them and their customers. When this policy is in place, it is capable of discouraging the inflow of private vehicles to the city and to encourage the use of mass transit system.

Alternatively, when adequate mass transit system is put in place, a ban on private cars especially taxis plying roads in the commercial area between 9am and 5pm during week days should be enforced. Meters that are self-enforceable should be put in place. Technologies already exist that allow meters to enforce themselves (automatically generating tickets, recognizing when a vehicle has left so the meter is set back to 0, or recognizing when a vehicle has exceeded the time limit (Allison, 2002). There are other technologies, like pay by phone, free flow parking, smart cards and in-vehicle meters which are less expensive to drivers and likely to give a more optimal result.

5.2.4 Development of Mass-Transit and Pedestrian friendly Initiatives

The introduction of light rail Mass Transit system to pass across the District will help to ease on-street parking problems in the area. FCT residences are not used to walking some distances to do one transaction or the other. People are always found in their private cars struggling to park in the commercial premises for their transactions. This is due to high level of encouragement in the use of private cars because of lack of mass transit system. Efforts should be made to improve the perception of safety and the pedestrian-friendly initiatives that will greatly enhance parking users' willingness to walk a couple of blocks from parking to destination.

5.2.5 Strengthening the Department of Development Control

The Department of Development Control was established to approve and monitor developments in the Federal Capital Territory. This aim has been long defeated due to huge level of compromise by the staff of the Department. Most commercial developments in Wuse II do not meet the required standards. This is either because the developers have built to their taste before approval is given or after approval the developer influences the site officer in order to have his way. Some of the compromises occur right in the office of the Department especially where people of influence are concerned. There should be proper strengthening of the Department to change the orientation of its Staff and to curb incessant violation of standards which has close link to parking problems. Contravention charges against violators of standard should be reviewed upwards. This is to deter developers from indulging in such acts.

5.3 AREAS OF FURTHER RESEARCH

This research revealed the various parking characteristics and the problems which they contribute in commercial areas. Due to the scope of the issue and the limitations of the study,

the results are not able to represent the generalized situation for all urban centers/cities in Nigeria. This study only looks at the two characteristics of parking and the problems associated with them. However, further studies could focus on the following:

1. Factors responsible for conversions in the commercial areas of cities and the affect on parking.
2. The use of 'Public Private Partnership' to proffer solutions to parking problems in commercial cities.
3. Proposal on the building of light rail system across Wuse District as a means to ease transportation problems.
4. The introduction and use of multistoried and underground parking system in Wuse II to solve parking and transportation problems.
5. The total conversion of Wuse II District from commercial area to a residential area as a means of resolving the clash between commercial and residential uses in the area.

5.4 CONCLUSION

The demand posed by the various parking characteristics in Wuse II and the corresponding problems had been revealed and explained in this study. Wuse II being one of the busiest and problematic commercial areas had been used to showcase the numerous parking problems in the Federal Capital City in particular and other cities of Nigeria in general. Myriads of parking problems experienced in the study area were caused through off-street and on-street parking but mostly by the latter. Most of the off-street parking facilities in the area were highly demanded for because they were in short supplies, thereby leading to the overstretching of the facilities. This led to vehicle owners parking on-street. The various policies, concepts, standards and

management of parking were reviewed from other cities while the problems caused by parking characteristics were identified. The identification of parking problems in Wuse II led to the proffering of adequate policy proposals and recommendations for corrective actions. This study helped in providing solutions to the numerous 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. Government has a big role to play towards revisiting the District plan of the study area which is characterized by the change of use, accidents, environmental hazards, poor transportation system etc. therefore, this study will provide avenue for government's timely review of District Plans. Wuse II fell short of modern methods and systems of parking. The area could easily bounce back if adequate modern parking facilities were provided where these had been recommended accordingly in this study.

The study also provided the basis for proper urban management, land use and urban administration which could bring about possible directions for other research work. Finally, it had provided the enabling research and reference document for scholars in planning and urban management studies.

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APENDIX A

DEPARTMENT OF URBAN AND REGIONAL PLANNING

FACULTY OF ENVIRONMENTAL DESIGN

AHMADU BELLO UNIVERSITY, ZARIA

QUESTIONNAIRE FOR PARKING DURATION

CHARACTERISTICS AND PROBLEMS OF PARKING IN THE COMMERCIAL AREAS OF WUSE II, FCC, ABUJA

Introduction:

This research questionnaire aims at collecting data for purely academic purpose and shall be treated confidentially. The truthfulness of your response will make a successful research. Thanks for your co-operation.

MADU C.A. (M.Sc Urban Management)

INSTRUCTIONS: Please fill and/or tick ( ) where appropriate

OFF-STREET PARKING

1. Name of Commercial Development? …….

2. Type of Commercial Development?

   (a) Hotels ( ) (b) PFS ( ) (c) Banks ( ) (d) Offices ( ) (e) Eateries ( )

   (f) Plazas ( ).

3. What type of design is the parking facility?

(a) Angled ( ) (b) Vertical ( ) (c) Parallel ( ) (d) Back-In-Angled ( )

ON-STREET PARKING

Monday-Friday

4. Count and record the number of vehicles that will come to park within the time intervals below:

(a) 7-8am …… Total ( )

(b) 8-9am …… Total ( )

(c) 9-10am ……....Total ( )

(d) 10-11am ……...Total ( )

(e) 11am-12noon ……...Total ( )

(f) 12-1pm ……..Total ( )

(g) 1-2pm ……..Total ( )

(h) 2-3pm ……..Total ( )

(i) 3-4pm ……Total ( )

(j) 4-5pm ……...Total ( )

(f) 5-6pm ……..Total ( )

Saturday

(a) 7-8am …… Total ( )

(b) 8-9am …… Total ( )

(c) 9-10am ……....Total ( )

(d) 10-11am ……...Total ( )

(e) 11am-12noon ……...Total ( )

(f) 12-1pm ……..Total ( )

(g) 1-2pm ……..Total ( )

(h) 2-3pm ……..Total ( )

(i) 3-4pm ……Total ( )

(j) 4-5pm ……...Total ( )

(f) 5-6pm ……..Total ( )

APPENDIX B

PARKING SUPPLY AND DEMAND FOR PROPOSED COMMERCIAL DEVELOPMENT

S/N	Plot No.	No. Of Parking lots (Supply)	Aggregate N o. of Vehicles /Day (Demand)	Short Fall	Remark
HOTEL					
I	177A	147	101	46	Adequate
2	522	99	190	91	Inadequate
3	*534*	192	160	32	Adequate
4	733	119	123	4	Inadequate
5	911	183	-	-	-
6	1149	329	169	160	Adequate
7	1364	178	128	50	Adequate
8	729	114	36	78	Adequate
PLAZA					
9	177B	8	517	509	Inadequate
10	177B	9	198	189	,,
11	527	57	1217	1160	,,
12	528	23	736	713	,,
13	598	5	1464	1459	,,

14	730	22	33	11	“
15	734	6	190	186	,,
16	*735*	*4*	195	191	,,
17	739	21	182	161	,,
18	740	18	6131	6113	,,
19	741	86	1699	1613	,,
20	743	88	*543*	*455*	,,
21	*750*	81	1999	1918	,,
22	751	68	1475	1407	,,
23	1145	10	163	163	,,
24	1198	10	244	234	,,
25	1247/1417	*75*	321	246	,,
26	1259	17	41	24	,,
27	1335	8	256	248	,,
28	1336	7	256	249	“

EATERIES					
29	731	27	-	-	-
30	738	32	249	217	,,
31	1127	41	639	*598*	,,
32	2019	27	480	*453*	,,
PETROL FILLING STATION					
33	177D	*5*	1044	1039	,,
34	178	4	949	*945*	,,
35	913	5	552	*547*	“
OFFICE					
36	1110	9	398	*389*	“
37	1130	8	157	*149*	“

Source: Field Word, 2015

TABLE: …. SUPPLY AND DEMAND ANALYSIS FOR PROPOSED COMMERCIAL FACILITIES

S/N	Plot No.	No. Of Parking lots (Supply)	Aggregate No. of Vehicles/Day (Demand)	Short Fall	Remark
HOTEL					
1	310	4	142	138	Inadequate
2	602	4	66	62	Inadequate
3	661	4	105	101	Inadequate
4	*665*	4	19	15	Inadequate
5	*685*	4	57	*53*	Inadequate
6	926	10	66	*56*	Inadequate
7	965	10	156	146	Inadequate
8	169B	12	108	96	Inadequate
9	290	4	219	215	,,
10	326	4	84	80	,,
11	328	4	175	171	,,
12	340	4	160	156	,,
13	353/591	4	147	143	,,
14	666	4	*25*	21	,,
15	683A	4	125	121	,,

16	683B	4	272	268	,,
17	687	4	235	231	,,
18	698	4	257	253	,,
19	1221	12	*65*	43	,,
20	1380	10	298	288	,,
21	1420	10	*295*	285	,,
22	1422	10	294	284	,,
EATERIES					
23	351	4	97	93	Inadequate
24	593	10	152	142	,,
25	600	4	90	86	,,
26	658	4	78	74	,,
27	678A	4	232	228	,,
28	1204	12	124	112	“

29	79	10	130	120	Inadequate	
30	82	10	176	166	,,	

31	169A	12	110	98	,,	
32	17A	10	27	17	,,	
33	646	4	67	63	,,	
34	652	4	*58*	54	,,	
35	654	4	64	60	,,	
36	697	4	74	70	,,	
37	1223	12	144	132	,,	
BANK						
38	78	10	184	174		Inadequate
39	80	10	52	42		,,
40	642	4	128	124		,,
41	660	4	428	424		,,
42	678B	4	153	149		,,
43	678/681	4	414	410		,,
44	682	4	176	172		,,
45	928	10	*65*	*55*		,,
46	1195	4	162	158		,,
47	1205	12	206	194		,,

Sources: Field Work, 2015

AGGREGATE ANALYSIS SHOWING DIFFERENCE BETWEEN PARKING LOTS AND HEIGHT OF PROPOSED DEVELOPMENTS

PLOT NO.		**NO OF PARKIG LOTS**		**HEIGHT OF BUILDING**		**SHORTFALL**	**REMARK**
		APPROVED	**EXISTING**	**APPROVED**	**EXISTING**		
	HOTEL						
1	177A	147	23	4-5	3	124	
2	2522	99	31	6+	3	423	
3	*534*	192	105	6+	4	342	
4	733	119	8	6+	4	111	
5	911	183	15	6+	4	168	
6	1149	329	6	*4-5*	4	323	
7	1364	178	*50*	6+	2	128	
8	729	114	10	6+	3	104	
	PLAZA						
9	**117B**	8	30	6+	2	22	
10	117C	9	30	*6+*	3	21	
11	527	57	56	6+	3	1	
12	528	23	78	6+	2	55	
13	*598*	5	*75*	1-2	2	70	

14	730	22	20	6+	3	2	
15	734	6	28	*6*+	3	22	
16	*735*	*4*	*15*	6+	3	11	
17	739	21	81	6+	3	60	
18	740	18	64	6+	4	46	
19	741	86	86	6+	4	0	
20	743	88	118	6+	3	20	
21	750	81	100	6+	3	19	
22	751	68	169	6+	3	101	
23	1145	10	21	4-5	4	11	
24	1198	0	26	6+	3	16	
25	1417	*75*	40	6+	4	35	
26	1259	17	20	6+	4	3	
27	1335	8	43	6+	3	*35*	
28	1336	7	60	6+	4	53	
	EATERIES						
29	731	27	-	*6*+	**3**	27	
30	**738**	**32**	**20**	**6+**	**1**	**12**	
31	1127	41	10	6+	1	31	
32	2019	27	10	6+	1	27	
	PETROL FILLING STATION						

33	177D	*5*	*45*		*6+*	1	40
34	178	4	42		6+	1	38
35	913	*5*	32		6+	1	27
	OFFICE						
36	1110	9	16	4-5	4	7	
37	1130	8	12	6+	4	4	

Source: Field Work, 2015

AGGREGATE ANALYSIS SHOWING DIFFERENCES BETWEEN PARKING LOTS AND NUMBER OF FLOORS FOR CONVERTED COMMERCIAL DEVELOPMENT

S/N	Plot No.	No of parking lot		Short fall	Height of floor		Short fall	Remarks
		Approved	Existing		Approved	Existing		
1	310	*4*	19	*-15*	1-2	2	0	
2	602	*4*	16	-12	1-2	2	0	
3	661	4	8	*-4*	1-2	3	-1	
4	665	4	10	-6	1-2	2	0	
5	685	*4*	-	4	1-2	3	-1	
6	926	10	8	2	4-5	3	2	
7	965	10	-	10	4-5	2	3	
	PLAZA							
8	169	12	25	-13	6+	2	4	
9	290	4	21	-17	1-2	3	-1	
10	326	4	6	-2	1-2	2	0	
11	328	4	8	-4	1-2	2	0	
12	340	4	8	-4	1-2	2	0	
13	*353/591*	*4*	14	-10	1-2	2	0	
14	*666*	*4*	5	-1	1-2	2	0	
15	683A	4	10	-6	1-2	**2**	**0**	
16	683B	4	7	-3	1-2	**2**	**0**	
17	687	4	6	-2	1-2	**2**	**0**	
18	698	4	8	-4	1-2	2	0	
19	1221	12	16	-4	6+	2	4	
20	1380	10	20	-14	4-5	4	1	
21	1420	10	*25*	-19	4-5	4	1	

22	1422	10	15	-9	4-5	4	1	
	EATERIES							
23	351	4	16	-12	1-2	2	0	
24	*593*	10	9	3	4-5	2	3	
25	600	*4*	8	-4	1-2	2	0	
26	*658*	*4*	*4*	0	1-2	3	-1	
27	678A	4	14	-10	1-2	1	1	
28	1204	12	10	2	6	2	4	
	OFFICE							
29	79	10	6	4	4-5	2	3	
30	82	10	12	-6	4-5	2	3	
31	169A	12	15	-3	6+	2	4	
32	176	10	4	2	4-5	2	3	

33	646	4	10	-6	1-2	2	0	
34	*652*	*4*	*4*	0	1-2	2	0	
35	*654*	*4*	*6*	**-2**	**1-2**	**2**	**0**	
36	697	4	10	-6	1-2	1	**1**	
37	1223	12	10	2	6+	2	4	
	BANK							
38	78	10	6	4	4-5	2	3	
39	80	10	10	4	4-5	2	3	
40	642	4	8	-4	1-2	2	0	
41	660	4	8	-4	1-2	2	0	
42	678B	4	4	0	1-2	2	0	
43	678/681	4	40	-36	1-2	4	-2	

44	682	4	7	-3	1-2	2	0	
45	928	10	7	1	4-5	2	3	
46	1195	4	11	-7	1-2	3	-1	
47	1205	12	8	4	6+	2	4	

Source: Field Work, 2015

TABLE SHOWING FORMAL COMMERCIAL SPACES.

S/ N	Proposed commercial developments	No of parking lots		Shortfall 1	% Approved	% existing	Height of floors		Shortfall
		Approved	Existing				Approval	Existing	
1	Hotel	1361	248	11113	63	16	6	3	3
2	Plaza	623	1160	537	29	72	6	3	3
3	Restaurant/ Eatery/ Kitchen	127	40	87	6	3	6	2	4
4	Petrol Fishing Station	14	119	105	1	17	6	1	5
5	Office	17	28	11	1	2	*5*	*4*	1
	Total	2142	1595	1859	100	100			

TABLLE SHOWING INFORMAL COMMERCIAL SPACES

S/n	Informal Commercial Developments	No of parking lot		Short fall	% Approval	% Existing	Height of Floor		Short fall
		Approved	Existing				Approved	Existing	
1	Hotel	40	53	-13	13	11	20	17	3
2	Plaza	94	194	-100	31	39	47	37	10
3	Restaurant/ eatery/ kitchen	34	61	-27	11	12	17	10	7

4	Office	70	77	-7	23	16	35	17	18
5	Bank	66	109	-43	22	22	33	16	17
	Total	**304**	**494**	**100**	**100**	**152**	**97**	**97**	

Sources: field work, 2015

Aggregate Inadequacy of Parking in Formal Commercial Developments

S/N	**Formal commercial Developments**	**Parking Supply**				**Total Parking Demand**	**Parking Demand/ Day**	**Short fall**
		Approval	**Existing**	**Total**	**Total [%]**			
1	Hotel	1361	284	1609	43	901	150	454
2	Plaza	623	1160	1783	47	17860	2977	-17237
3	Restaurant/ Eatery/ Kitchen	127	40	167	*5*	1368	228	-1241
4	Petrol Filling Station	14	119	133	4	*2545*	424	-2531
5	Office	17	28	*45*	1	*555*	*93*	*-538*
	Total	**2142**	**1595**	**3737**	**100**	**23229**	**3872**	**21547**

Sources: Field work, 2015

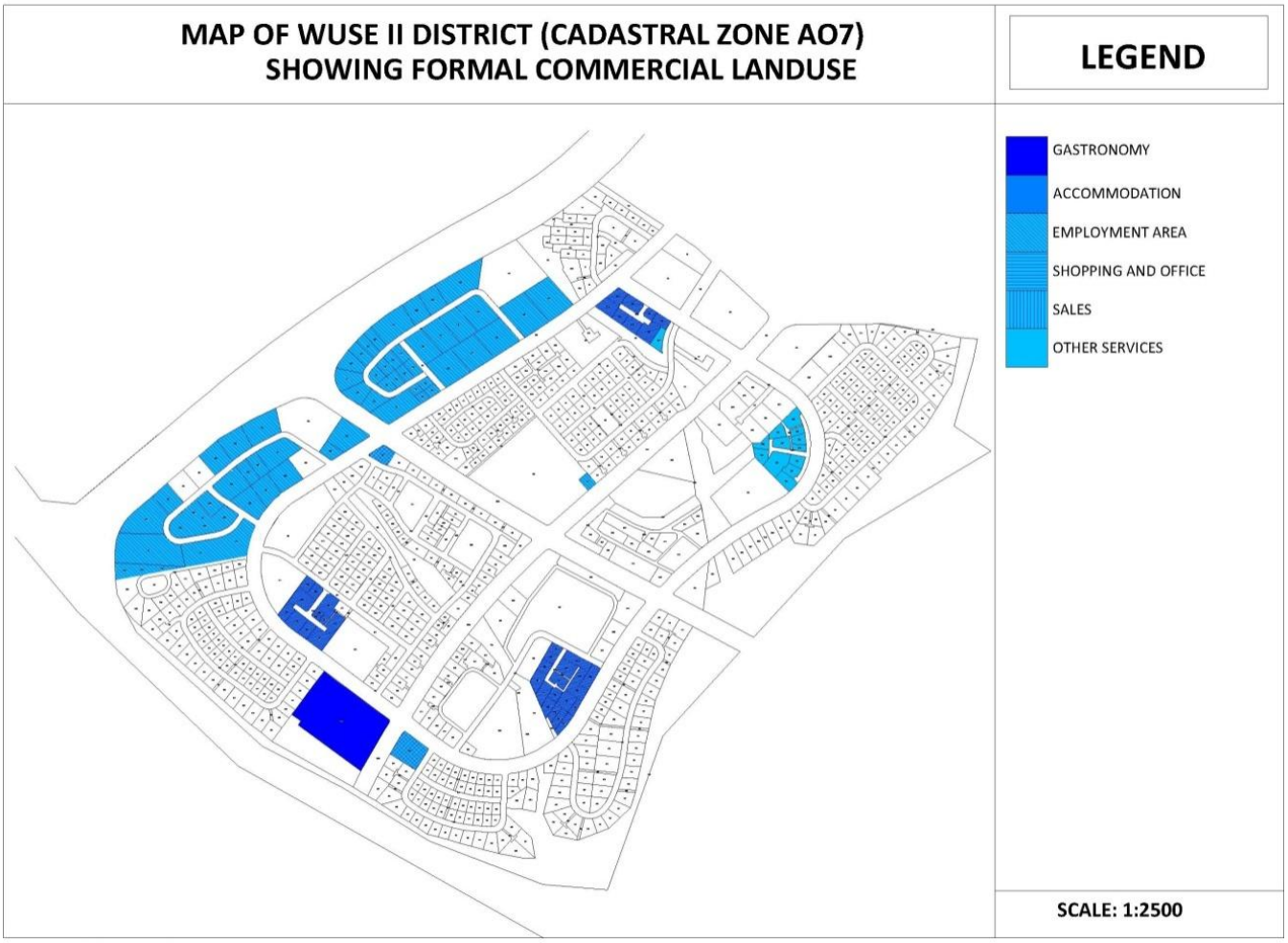
Aggregate Inadequacy of Parking in Informal Commercial Developments

S/N	**Formal commercial Developments**	**Parking Supply**				**'Total Parking Demand**	**Parking Demand Day**	**Shortfall**
		Approval	**Existing**	**Total**	**Total (%)**			
1	Hotels	40	*54*	93	12	611	102	*581*
2	Plazas	94	194	288	36	*2759*	460	*2665*

3	Restaurant/Eatery! Kitchens	34	61	*95*	12	773	129	735
4	Petrol Filling Stations	70	77	147	18	850	142	780
5	Offices	*66*	109	*175*	22	1968	328	1902
	Total	**298**	**494**	**798**	**100**	**6961**	**1161**	

Source: Field work, 2015

Fig 2: Formal Commercial plots! Developments



SOURCE: Field Work, 2012

MAP OF WUSE II DISTRICT (CADASTRAL ZONE AO7)SHOWING INFORMAL COMMERCIAL DEVELOPMENTS



LEGEND

CONVERTED COMMERCIAL DEVELOPMENT

OTHER SERVICES

N

SCALE: 1:2500

SOURCE: Field Work, 2012