LAND ACQUISITION PROCESS AND URBAN EXPANSION IN THE LAGOS METROPOLIS, NIGERIA, 1984 - 2016

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Certification

I hereby certify that this thesis was carried out, under my supervision, by Haruna Olayiwola JIMOH, of the Department of Urban and Regional Planning, Faculty of Social Sciences, University of Ibadan, Nigeria.

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DEDICATION

This thesis is dedicated to Almighty Allah, the Omnipotent, the Merciful.

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Everything that has a beginning must usually have an end, to this, I thank the Almighty Allah that gave me the opportunity to see the end of this phase of my life.

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ABSTRACT

Globally, urban expansion is a common phenomenon. However, its inadequate coordination has resulted in slums, sprawl, paucity of infrastructure and competition for land. Previous studies on urban expansion have identified demographic characteristics, employment opportunities and availability of infrastructure as the major drivers of urban expansion, while limited attention has been focused on land acquisition processes. This study, therefore, was designed to examine the influence of land acquisition process on urban expansion in Lagos metropolis, Nigeria, 1984-2016.

The concept of Urban Land Governance was used, while the survey design was adopted. Ojo, Alimosho, Kosofe and Eti-Osa Local Government Areas (LGAs) were randomly chosen from the 16 metropolitan LGAs in Lagos State, while 22 fringe localities from the selected LGAs, where urban expansion was most rapid were purposively selected. A total of 6,041 residential buildings were identified. Using Krejcie and Morgan's sampling method, 1225 residential buildings were randomly selected [Alimosho (221); Eti-Osa (235); Kosofe (480) and Ojo (289)]. A structured questionnaire which focused on socio-economic characteristics (age, sex, marital status, education, income), sources and procedures of land acquisition was administered on household-heads. Landsat imageries (1984, 2000 and 2016) were obtained from the Global Land Cover Facility to map land use/land cover types using Maximum Likelihood method of supervised classification. Population data from the National Population Commission were used to compare population growth and urban expansion ratios. Data were analysed using descriptive statistics, Chi-square, Logistic regression, and Analysis of variance at $p \leq 0.05$.

Respondents' age was 37±12.65 years; 51.5% were female; 47.5% were married; 10.4% had no formal education, while 14.7% earned more than N100,000 per month. Developed parcels of land were acquired from customary landowners (47.1%), inheritance (22.9%), estate agents (16.1%), statutory allocation (10.3%) and gifts (3.5%). Land acquisition process entailed informal two-stage (identify and purchase) process, through the customary landowners. This was followed by a formal process involving purchase and submission of application forms, issuance of Letter of Offer, payments for allocation, issuance of Confirmation Letter with land identity, signing and registration of Certificate of Occupancy and release to the beneficiary through statutory allocation. About half of the respondents described land acquisition through the statutory allocation as cumbersome, while 28.6% had been duped by customary landowners and estate agents. Relationships existed between sources of land acquisition and compliance to development regulations $\chi^2_{(18)}=1507.80$. Urban expansion was negatively influenced by the process of land acquisition (β=-17.9). Built-up area in the metropolitan fringe increased by 199.0% and vegetation cover decreased by 42.9% between 1984 and 2016. Population growth to urban expansion ratios were 2.57 (1984-2000); 0.93 (2000-2016) and 1.88 (1984-2016). These varied across the LGAs ($F_{(3,8)}=4.93$).

Land acquisition process contributed to uncoordinated urban expansion in Lagos metropolis, 1984-2016. The process should be overhauled to accommodate inclusive urban land governance system.

Keywords: Urban expansion, Land acquisition process, Urban land governance, Customary landowners, Lagos metropolis

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1.0 INTRODUCTION

1.1 Background to the Study

The UN-HABITAT (2011) has described the current rate of urbanization in the world as "unprecedented" as halve of the world's population resides in cities since 2009. The United Nations (2014) revealed that 54 per cent of the world's populations, compared to 30 per cent in 1950, reside in urban areas in 2014. It further projected that 66 per cent would be urban by 2050. Africa, with the least percentage (40%) of the urban population in 2014, compared to other continents, would triple by 2050, and rank second, after Asia, in term of urban population (UN, 2014).

This phenomenal population growth has spatial implications and impacts on urban space. For instance, Angel *et al*. (2005) estimated the built-up area occupied by 1.7 billion people in cities of developing-countries to be 200,000 square kilometres in the year 2000. This was at an average density of 8,000 persons per square kilometre. They further projected that this would triple (600,000 sq.km) by 2030 with every new resident converting 160 square meters (on average) of non-urban to urban land during the period. This unmatched rate of urban expansion, level of preparedness and inadequate development control coupled with other dynamics of urban expansion result in different physical development effects on the fringe.

The fringe was defined by Heimlich and Anderson (2001) as parts of metropolitan counties that are not settled densely enough to be called "urban". It is non-urban land use contiguous to a city at a time. The factors and effects of urban expansion into the fringe have become a major debate over the years, and solutions to it have also generated concerns. The United Nations Population Division (2015:28) has, however, argued that 'the nature of future urban growth and the concomitant need for land and

natural resources will influence countries' ability to achieve an environmentally sustainable and socially inclusive future'. Unfortunately, little emphasis has been placed on the procedures for acquiring the required land for expansion, as a factor of urban expansion. However, in most cases, urban expansion is synonymous to additional use of land. Sourcing for such land by individuals depends on the prevailing situation in different countries, including the land tenure system, which varies from countries to countries, and with different strengths and weaknesses. Land markets can also be formal and informal, contributing to the persistence of informal settlements (Palmer *et al,* 2009) as cities expand.

The study examines the dynamics of urban expansion in the metropolitan fringe of Lagos and how physical development across the fringe has been influenced by the process of land acquisition. The metropolitan Lagos is a primate city with an increasing population and persistent expansion. It expanded into its fringe from 69.68km^2 in 1950 to about 1000km^2 in 2010. This is intensified by the concentration of investments and facilities which continue to attract people of different origin and status. One major resultant effect is the evolution of a sprawl-like metropolis with diverse physical development patterns and challenges across the fringe. Many urban vices have, however, been attributed to urban expansion into the fringe, generally termed sprawl. These include unaesthetic development; poor access to services; and loss of agricultural land (Chin, 2002). Most of these acclaimed effects are borne by the fringe as substantial urban growth occurs on the metropolitan fringe (Browder *et al*, 1995) for reasons including availability of cheap and less regulated land.

Consequently, the fringe remains at the forefront of urban research all over the world and the quest for sustainable urban expansion has inspired researches into different facets of fringe development. These include factors of urban expansion and their effects, with the hope that knowledge of the causes of urban expansion and resultant effects can help in managing the growth and development of sustainable cities. Previous studies have identified physical factors, demographic characteristics, employment opportunities and availability of infrastructure as the major factors of urban expansion, while limited attention has been given to the process of land acquisition for development. Hence, underlying variables for variations in rate and patterns of urban expansion in areas with similar and dissimilar spatial characteristics remain equivocal. It is these possible variations in driving forces that this research sets

out to examine their effects on the physical development of metropolitan fringe of Lagos which is the densely populated and extensively built-up parts of Lagos state.

1.2 Statement of the research problem

The forces stimulating or retarding urban expansion across metropolitan areas and their effects have been widely documented. Many researchers have recognised the link between land and urban expansion. However, much of the emphasis has been on land use/ land cover (LU/LC) change. The procedural aspects of obtaining land for urban expansion have not yet received the same attention. Meanwhile, the fringe of metropolitan areas has continued to account for the growth of cities (Long and DeAre, 1983) due to the availability and affordability of land, and in most cases, the ease of acquiring land in the fringe.

Resulting from urban expansion, authors (including Okuneye *et al.,* 2007; and Clark, 2009) have identified "loss of agricultural and undeveloped lands, unauthorized urban development and industrial operations, environmental degradation and alteration of ecosystems as serious and ever-increasing problems faced by fringe zones". Different authors, based on their experiences and backgrounds, perceive the fringe differently. Otterstrom and Shumway (2003) opined that fringe development increases access to services as a result of amenity migration from the core. Contrarily, Peil (1975) considered the fringe as agglomerations of poverty while The World Resources Institute (1990) described it as concentration of informal residence of about 42 per cent of the Third World's total urban population.

Sarkar and Bandyopadhyay (2013) however described fringe as dynamic areas and ascribed their degeneration into urban slums and squatters to lack of proper planning. Millward (2006) also identified planning as a method for mitigating negative urban growth patterns.

Lagos metropolis witnessed a tremendous expansion into the fringe from 1950 till date. Unlike many cities in developing countries without a plan, there were early plans for Lagos metropolis as Oduwaye (2009) traced planning in Lagos to the colonial period before 1854 and this was followed by different plans including the Metropolitan Plan of 1980-2000 and Review of the Lagos State Regional Plan (2005). Unfortunately, there is no manifestation of planning in most areas of the metropolitan

Lagos identified and planned as metropolitan fringe in the early 1980s with varying degree and patterns of physical development. Researchers (Oduwaye, 2002, Agunbiade, 2006; Alade, 2012) have advanced reasons for this among others to include population explosion, lack of lower-order plans and poor monitoring. In attempt to understand the pattern of development and plan for future expansion of the metropolis, other researchers (including Braimoh and Onishi, 2007; Eyoh *et al.*, 2012; Dekolo, Nwokoro, and Oduwaye, 2013) have also explored and identified factors of urban expansion in Lagos to include the physical characteristics of the fringe, accessibility, land use zoning and population density. Their effects on the evolution of the metropolis were also debated.

Aside from the fact that most of the researchers employed exploratory and contextual methods, little or no attention has been given to the effects of land acquisition procedure on physical development of the metropolis, but Agunbiade and Kolawole (2016) have acquiesced that the nature of land acquisition influenced housing industry in Nigeria. Therefore, in an attempt to fill the gap, this study examined the dynamics of urban expansion with emphasis on land acquisition procedures and their effects on physical development of metropolitan fringes of Lagos. The research focused on identifying the commonalities and differences in dynamics of urban expansion across the metropolitan fringe and effects of the dynamics on physical development over time. Hence, the study focused on answering the following questions:

i) Are there differences in socio-economic characteristics of residents of Lagos metropolitan fringe?
ii) What are the processes of land acquisition for urban expansion in Lagos metropolis?
iii) What is the extent and pattern of physical development and land use change across the fringes of Lagos metropolis from 1984 to 2016?
iv) What are the dynamics of urban expansion across the metropolitan fringe of Lagos?
v) What are the effects of variations in urban expansion dynamics on physical development of Lagos metropolitan fringe?

1.3 Aim and Objectives

This study aimed at examining the process of land acquisition for urban expansion with a view to determining their effects on the physical development of metropolitan fringe of Lagos in Lagos State.

The objectives of this research are to:

i) assess the socio-economic characteristics of residents of Lagos metropolitan fringe;
ii) examine the land acquisition process in Lagos Metropolis;
iii) determine the extent and pattern of urban expansion across the study area from 1984 to 2016;
iv) examine the factors of urban expansion across the metropolitan fringe of Lagos; and
v) analyse the varying effects of urban expansion dynamics on the physical development of Lagos metropolitan fringe.

1.4 Research Hypotheses

This research is premised on the main hypothesis that the process of land acquisition is a function of urban expansion across social divides. The following hypotheses were tested in the research:

i) There is no significant difference in socio-economic composition of residents across the metropolitan fringe;
ii) There is no significant relationship between land acquisition process and compliance to development regulations;
iii) There is no significant difference in the pattern of urban expansion across metropolitan fringe of Lagos
iv) There is no significant variation in the effects of factors of urban expansion across the metropolitan fringe of Lagos.

1.5 Justification/Rationale for the Study

Researchers within and outside Africa and the politicians who govern African countries have taken African's urbanization issues with levity such that the proximate drivers of city growth and the patterns, processes and consequences of the resulting urban dynamics are hardly understood (Agbola, 2014). While high population density in urban centres has slowed down or even decreased in some developed countries,

cities in Africa have not stopped changing. According to the UN (2009), 400,000 square kilometres would be constructed in the developing world for urban use between circa 2000 and 2030, doubling the world's built-up urban area. According to the Organisation for Economic Co-Operation and Development (OECD) (2015:40), changing spatial organisation of cities and their territories, as a result of urbanisation, "directly affects the quality of life of their inhabitants, the demand for transport infrastructure, the surrounding landscape, the directions of human and capital flow, and global environmental footprint of urbanization".

One major part of the city that is directly influenced by transition to urban area is the fringe where most urban development are received due to the availability of land. Natural resource professionals, policymakers and planners are worried by the land consumption trend, because it endangers the ecosystems (Schoonover, Lockaby and Pan, 2005). Over two decades ago, the World Resources Institute (1990) postulated that "approximately 42 per cent of the Third World's total urban population lives in informal settlements, many located on the urban fringe". However, the concept of formal or informal settlements borders on the source and procedures of land acquisition and land administration. The informal procedure thrives where there are deficits in the formal sector. They have different consequences for the emerging cities and the society. Access to formal and secure property rights to land serve as incentives for people to invest in properties and promotes sustainable development, that is the justification for this study.

Lagos State is among the states in Nigeria that witnessed early city planning; probably because it was colonized. Its Regional Master Plan and Metropolitan master plan were commissioned in the 1970s before Lagos was created as a state but partly as Federal Capital and as colony. The plans were produced when the state was still small but had started witnessing 'urban problems as a result of uncoordinated urban development and inadequate development control' (Oduwaye, 2013). The plans made provisions for regeneration of the core and efficient development of the fringe. Other mechanisms were also put in place to ensure that functional fringe evolved. Unfortunately, most parts of the fringe grew in an uncoordinated manner, creating new slum areas. Hence, understanding the effect that the process of urbanization has on fringe communities is important for positive rural-urban transition, and this cannot

be treated in isolation without understanding the process of land acquisition in different parts of the metropolis.

Consequently, this study examined the urban expansion effects, with a focus on the land acquisition procedure, on the physical development of the metropolitan fringe of Lagos. The study explored types of growth, processes of change across the fringe, causes and effects; and addressed opportunities and challenges for sustainable development through good urban land governance. The study is expected to provide answers to bothering questions of 'performance and efficiency of past policies relating to land acquisition procedures and proffer solutions as well.

The choice of the metropolitan fringe of Lagos for this research is justified because Lagos metropolis is the most populated and extensively built-up parts of Lagos state and Nigeria, therefore its fringe is the most vibrant in terms of expansion and modification of space, among the five regions in the state. Expansion into its fringe has passed through different stages, long enough to measure events. In addition, the selection of 1984-2016 (1984-2000 and 2000-2016) study periods was guided by the quest for a meaningful point of reference; relatively long period to measure and compare variations and; nearest to present reality on the fringe. The expiration year of the metropolitan master plan (2000) was selected as a point of reference while 2016 was selected as the most recent year at the commencement of the spatial analysis. To ensure fairness in comparison periods, an equal interval of 16 years (between 2000 and 2016) was selected away from 2000, hence the choice of 1984 as the base year.

A study examining land acquisition process as a factor of urban expansion into the fringe from the core area added to the general understanding of urban dynamics. Development of metropolitan fringe of Lagos is a depiction of a spectacular urban expansion in modern times; therefore, an important case for discussing how land acquisition processes have influenced physical development of the fringe.

1.6 Definition of Terms

1.6.1 Acquisition

Means by which individuals or corporate organization secure or attain ownership of land for utilisation. Government acquisition refers to land compulsorily acquired for public purpose from individual landowners by the government.

1.6.2 Urban

Urban is defined in many ways using one or more of the following criteria:

(a) Administrative or political boundaries;

(b) A threshold population size which varies globally between 200 (in Iceland) and 50,000 (Libya). In Nigeria, this was put at 20,000 people (USAID, 2013)

(c) Population density; area with a large concentration of people

(d) Economic function (e.g., majority of the population is not agrarian) (UNICEF, 2012). Wide range of services and facilities are offered

(d) Act of law. The Lagos Land Use Edict No. 7 of 1978 which was promulgated to give effect to the provisions of the Federal Military Government's Land Use Act No. 6 of 1978 divided Land in Lagos into land in urban areas and land in rural areas. Part I of the Schedule listed the following areas with the towns within them:

  (a) Badagry Urban Area
  (b) Epe Urban Area
  (c) Ikorodu Urban Area
  (d) Metropolitan Lagos Urban Area, comprising of certain village/districts in the Badagry, Ikeja, Lagos Island, Lagos Mainland, Mushin-East and Mush-West Local Government Areas
  (e) Urban Area along Highways one kilometre either side of the Major Highways outside Urban Areas e.g., Highway between the Ikorodu Urban and Metropolitan Lagos Urban Areas.

The term is used in this study based on the definition of Li *et al*. (2013) which defined it as "land covered by an impervious surface (e.g. residential land, industrial land, commercial land, roads)".

1.6.3 Urban Expansion

Generally, urban expansion is 'land use change from a non-urban category to an urban category' (Batty, Xie and Sun, 1999). It is outward spreading of a city and its suburbs to accommodate population growth, usually resulting from natural increase and rural-urban migration. Urban expansion takes different dimensions; it may be planned or unplanned and weird. When unchecked, urban expansion creates a spatial phenomenon commonly referred to as urban sprawl with its negative perceptions.

Urban expansion can hardly be totally separated from urban sprawl and its variants, giving the various definitions of sprawl and as claimed by Burchell *et al*. (1998).

1.6.4 Metropolitan

The term metropolitan is an adjective of the word metropolis which refers to a hierarchy of settlement loosely describing any large city. It ‘is a central city surrounded by suburbs and secondary cities that form a relatively contiguous whole’ (Angel, 2011). During the metropolitan era in the United States (1860–1950), it was described as a large city that socially and economically dominates an urban area; and that is the adopted definition in this thesis. Metropolitan area

1.6.5 Fringe

Johnson (1974) defined fringe as the transition zone between city and countryside. Martin (1953: iii) defines it as "... that area of interpenetrating rural and urban land use peripheral to the modern city ...’ He noted that the fringe varies from city to city and from one time to another, Pryor (1968:206) defined it as, "...the mixed rural and urban area located outside the city’. OECD (2012:14) defined the fringe zone as ‘area that lies just outside the metropolitan built-up area but still within the declared “urban edge’

In literature, the urban fringe, the periphery, peri-urban, ex-urban, suburban, and edge city are sometimes used interchangeably or collectively. For the purpose of this thesis, the urban fringe is simplified as non-urban land uses contiguous to a city at a time. The time factor is essential in this definition because as city metamorphosed in time, the fringe also adjusts.

1.6.6 Physical Development

Physical development is the improvement of an area by building tangible structures. Urban expansion is usually translated in form of physical development. Physical development (e.g. road development) influence urban expansion and urban expansion subsequently affect physical development. Most policies and programmes are ultimately translated into physical development (Adesanya, 1998:133). For instance, the policies designed to reduce the level of illiteracy would eventually be expressed in form of physical development – through the erection of school buildings. The primary

purpose of physical development is to improve human well-being through the creation of efficient, functional and visually pleasing physical environment; which is quite conducive for carrying out all human activities with relative ease, which offers a high degree of safety to man, and where the physical environment is protected (Adesanya, 1998:133).

1.7 Scope of the Study

From an operational perspective, the study focused on assessing the dynamics of urban expansion in relation to land acquisition process and the effects on the physical expansion of Metropolitan fringes of Lagos in Lagos State, Nigeria. It explored the procedures of land acquisition in the development of the fringe between 1984 and 2016. Lagos Metropolis was described (in the Lagos Metropolitan Plan of 1980-2000) to include all "built-up contiguous development of Lagos within and beyond the administrative boundary of Lagos State". This study, however, was limited to the fringe area within the boundary of Lagos State to the exclusion of Ikorodu. The study concentrates on the metropolitan fringe as defined and planned for in the Lagos Metropolitan Master Plan of 1980-2000 and contained in Asiyanbi (2005).

The choice of 1984-2016 (1984-2000 and 2000-2016) study periods was guided by the quest for a benchmark, long enough to measure and compare variations; and nearest to present reality on the fringe. The expiration year of the metropolitan master plan (2000) was selected as a point of reference while 2016 was selected as the most recent year at the commencement of the spatial analysis. To ensure fairness in comparison periods, an equal year of 16 (between 2000 and 2016) was selected away from 2000, hence the choice of 1984 as the base year.

It addressed the fringe area within the delimited boundary of Lagos metropolis in the east, northeast, west and northwest (Atlantic Ocean to the south and the core north was much developed) as described in the 1980-2000 metropolitan plan. The fringe was delineated to encompass part of the metropolis that was not densely settled enough to be called "urban" and but contiguous to the metropolis and parts that have grown within the past twenty years. Because of difficulty in delineation and to avoid edge effects, local government areas, where delineated fringe falls, were used as the basis for spatial analysis

While the study traced expansion from the core to the fringe, sampling of respondents was limited to the fringe settlements within 5kilometre to the metropolitan boundary (Browder *et al*. (1995) and Banu and Fazal (2013)).

In this study, urban expansion was used conterminously with urban sprawl, riding on Burchell*, et al*.'s (1998) opinion that 'sprawl is almost impossible to separate from all conventional development'.

1.8 The study area

Lagos State is situated in the southwestern part of Nigeria. It is positioned between $6^0$27'N $3^0$23'E and $6^0$35'N $3^0$45'E of the equator. It is bounded in the east and north by Ogun State. To the west is the Republic of Benin and flanked in the south by the Atlantic Ocean (See figure 1.1). It occupies an area of 3,577 square kilometres (357,700 hectares), about 22 per cent of which are lagoons and creeks (Lagos State Diary, 2012).

The state was created on May 27, 1967, and took off administratively as five divisions, created by the Administrative Divisions (Establishment) Edict on April 11, 1968. The divisions - Ikeja, Badagry, Ikorodu, Lagos Island and Epe (IBILE) - were created based on the distribution of the indigenous people (*Ikeja, Agbadagiri, Ikorodu Oriwu, Eko Akete and Epe Ogunmodede* respectively). Presently, Lagos State comprises twenty (20) of the 774 Local government areas in Nigeria. However, based on different factors - population distribution, settlement pattern, contiguity, economic activities and development prospects among others, the state was grouped into five distinct regions (Ogunleye and Awomosu, 2010). These are Badagry sub-region made up of current Badagry local government area, Ikorodu sub-region which is conterminous with Ikorodu local government area, Epe sub-region comprising Epe local government, Ibeju-Lekki sub-region spanning Ibeju-Lekki local government area and Lagos Metropolitan Area sub-region comprising sixteen of the 20 local government areas (Figure 1.2). It is a combination of Ikeja, Lagos, and part of old Badagry divisions (Table 1.1). The Lagos Metropolitan Area sub-region is made up of the contiguous and most urbanized areas of Lagos State while the other regions are largely rural or semi-urban.

The study is confined to the fringes of Lagos Metropolitan Area Sub-region

described above as contained in the Lagos Land Use Edict No. 7 of 1978 and defined by Wilbur Smith and Associates (1980) in 'Master Plan for Metropolitan Lagos, which now encompasses seven local government areas excluding Ikorodu). This study falls within four of these local governments, based on other factors (as described in section 1.7.2).

Lagos metropolitan fringe was chosen for this study because it is the metropolis that has witnessed most remarkable expansion over the years out of the five sub-regions in Lagos State (others being Ikorodu, Badagry, Epe and Lekki). The rate of urbanisation and decentralisation of population, favoured by her role as the political and economic centre of Nigeria, makes her a good case study of contemporary urban expansion pattern and factors. Other factors considered for the choice of the study area include relative long period of existence and historical records on the evolution of the metropolis. The opportunities to have been administered by both Federal and state governments during military and civilian regimes were other advantages for the study area. Ability to attract people of different socio-economic background was also considered in the choice of the study area. Understanding its dynamics will help in managing the development of other evolving metropolises.

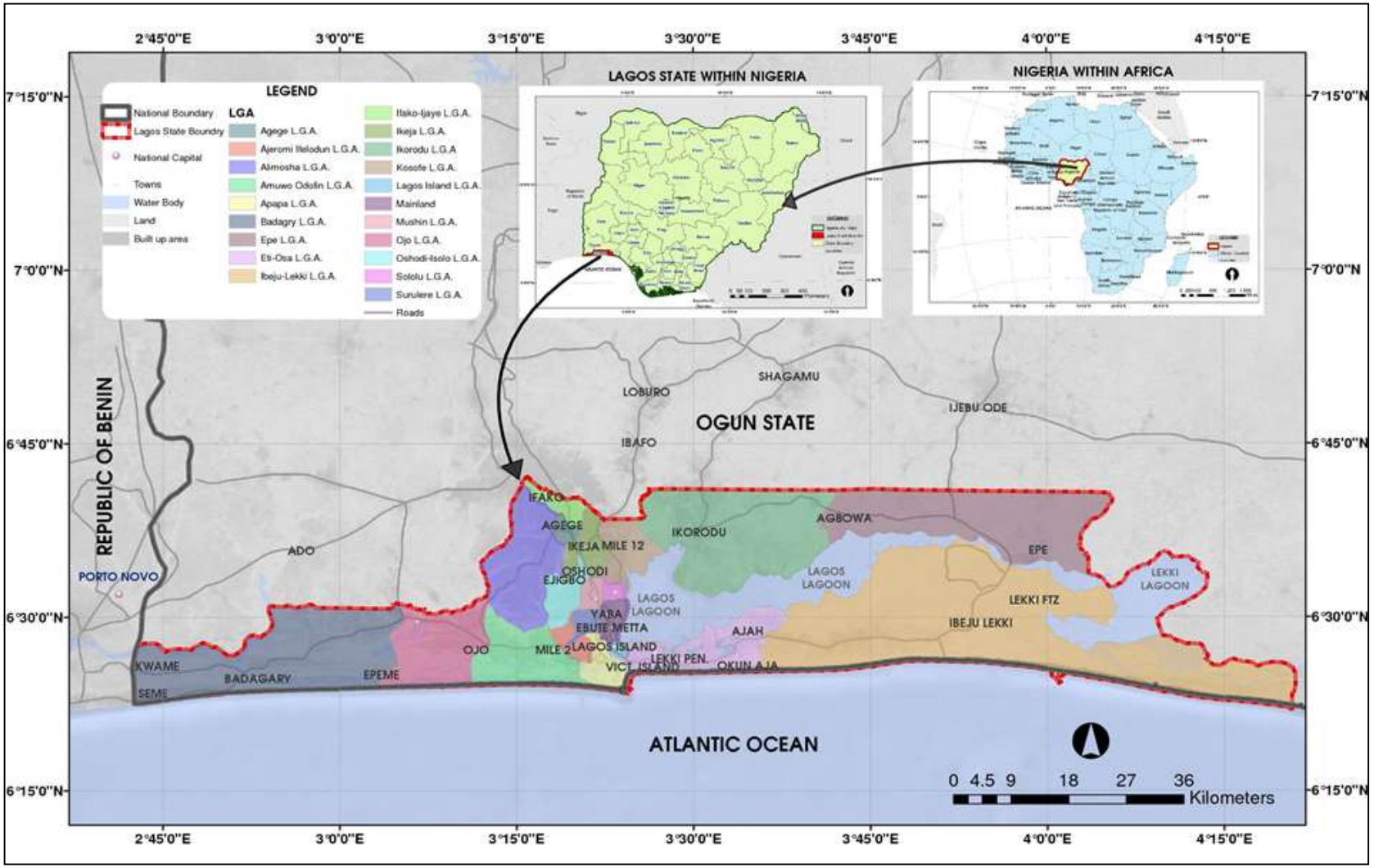


Figure 1.p1: Lagos State in the National Setting
Source: Department of Geoinformatics, UNILAG 2015

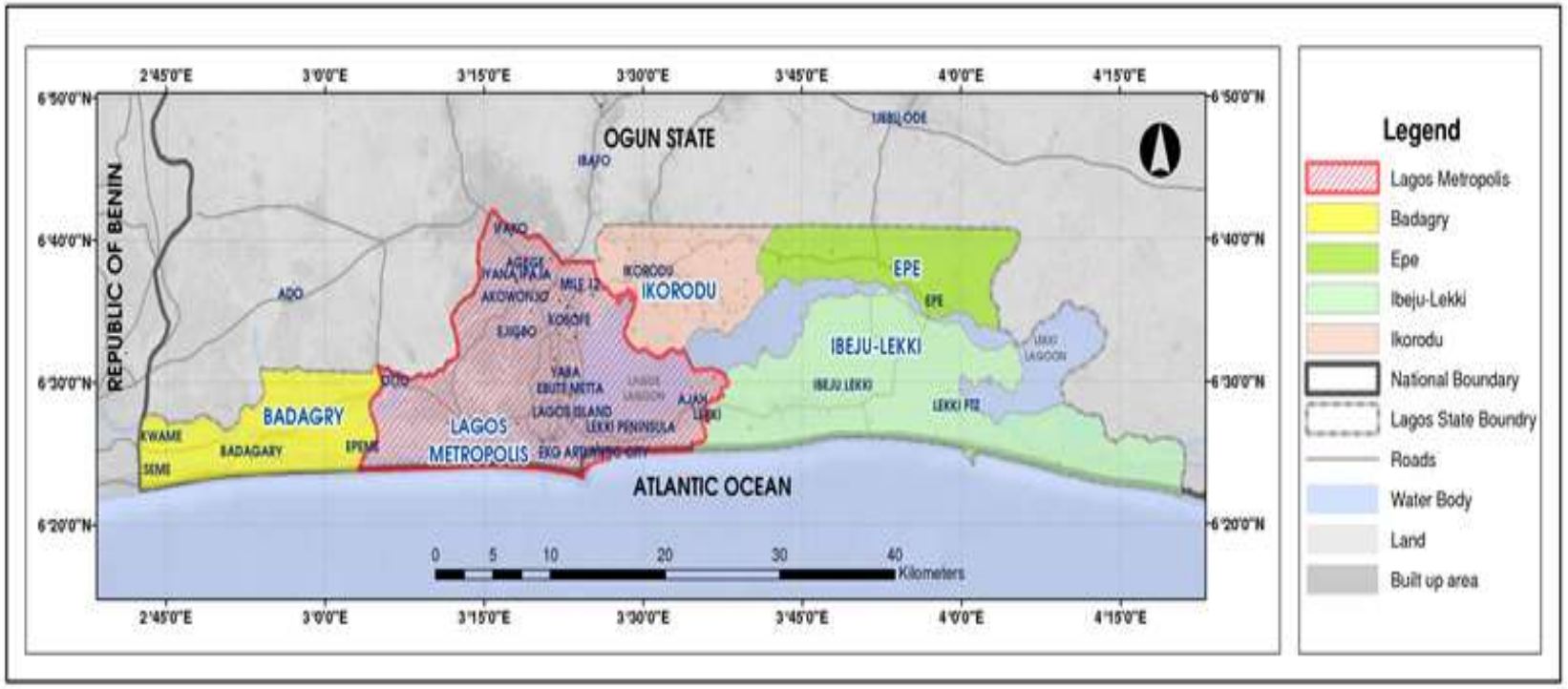


Figure 1.2: Lagos Metropolis and the other Regions within Lagos State
Source: Department of Geoinformatics, UNILAG 2015

Table 1.1: Lagos Regions and their Component Local Government Areas

Divisions	Local Government Area(s) Composition		Regions
	By division (IBILE)	By Region (Presently)	
Ikeja	Agege, Alimosho, Ifako-Ijaye, Ikeja, Kosofe, Mushin, Oshodi, Shomolu	Agege, Ajeromi-Ifelodun, Alimosho, Amuwo-Odofin, Apapa, Eti-Osa, Ifako-Ijaye, Ikeja, Kosofe, Lagos Island, Lagos Mainland, Mushin, Ojo, Oshodi, Shomolu, Surulere	Lagos metropolis
Lagos	Apapa, Eti-Osa, Lagos Island, Lagos Mainland, Surulere		
Badagry	Ajeromi-Ifelodun, Amuwo- Odofin, Ojo, Badagry	Badagry	Badagry
Ikorodu	Ikorodu	Ikorodu	Ikorodu
Epe	Ibeju-Lekki, Epe	Epe	Epe
		Ibeju-Lekki	Ibeju-Lekki

Source: Ogunleye and Awomosu, (2010) and Author's compilation

1.8.1 Lagos Metropolitan Area

Urban researchers (Wolman *et al*., 2005; Parr, 2007; Angel, 2011) have identified definition and delineation as major problems in measuring urban spatial structure. Angel (2011) surmised that using the administrative area is insufficient, as that is subject to change anytime. Similarly, Frey and Speare (1988) had earlier observed that as metropolitan-area terminology becomes more widely accepted and used, its precise meanings and official delineations become murkier. This is not different in the study area as there is no consensus as to what makes the Lagos metropolis. It was described in the Lagos Master Plan of 1980 by Wilbur Smith and Associates to include Ikorodu, which is detached from the contiguous area by the broad delta of the Ogun River and other several minor streams, in the East. Recent studies (including Ashiyanbi, 2005; World Bank, 2005; Aluko, 2010; Lawanson, 2011) however, recognised Ikorodu as a separate entity and defined the metropolitan boundary within the core sixteen local government area of the state, earlier mentioned above. This delineation, excluding Ikorodu, was adopted for this research.

The adopted delineated metropolis covers approximately 1,200 square kilometres of the total state coverage of 3,577sqkm. Geographically, it is bounded in the south by the Atlantic Ocean, in the west by Ojo near Ologe Lagoon, Ogombo near Lekki Peninsular and Lagos Lagoon in the east, Ikorodu in the north-east, parts of Ogun State to the north and northwest (Figure 1.2). The metropolis is characterized by a relatively flat terrain (mean elevation of approximately 24m) and littoral depositional landform features: wetland, barrier islands, beaches, low-lying tidal flats and estuaries. About 75-85% of the population of Lagos State resides in the metropolis which covers only about one-third of the state. The climate is wet equatorial with mean annual rainfall above 1800mm, mean monthly temperature of about 30^0C, and relative humidity ranging from 80% to 100%. The state experiences rainy season from April to October and dry season from November to March.

1.8.2 The Lagos metropolitan fringe

The metropolis was earlier divided into two: the core and the periphery (Fagbohun, 2014). The core is the area where the former colonial settlements were situated. This comprises 4 local governments, namely Lagos Island, Lagos Mainland, Apapa and

Surulere local governments. The periphery of the metropolis or the fringe was the area outside the old Lagos metropolis -the core- and some settlements that were carved out of old Western Region and became part of Lagos State in 1967. These were the remaining 12 local governments of the present metropolis (Fagbohun, 2014).

Urban growth is a dynamic process and urban fringe is a changing space within the entire urban space. This study examined, in retrospect, the transformation of the metropolitan fringe of Lagos with a view to guiding other emerging metropolises within and outside Lagos State. Therefore, historical facts were relied on for the purpose of delineation/classification of the metropolitan fringe in this study. Two studies conducted by the Lagos State Master Plan Project Unit in collaboration with the United Nations in 1976 and 1978-1979, which were used for the preparation of Lagos State Metropolitan Master Plan (1980 - 2000), were utilised. The first was the 1976 Qualitative Land Use Survey (QLUS) which embraced the *developed core* -as at 1976- (Lagos City Council (comprising Lagos Island, Lagos Mainland, Apapa and Surulere local governments)) and the Northern Core (including Mushin and parts of Oshodi-Isolo, Ikeja and Agege) and the internal urban fringe area. The second study was the Urban Fringe Survey (UFAS) of 1978-1979. The UFAS overlapped the QLUS by including a part of the internal fringe (Ajeromi-Ifelodun, Somolu, parts of Agege, Oshodi-Isolo, Ikeja and part of Amuwo-Odofin and Kosofe), as well as the external fringe (Alimosho, Ifako-Ijaye, parts of Ojo, Amuwo-Odofin, Ikeja, Kosofe and Eti-Osa local government areas). The two studies were able to define and distinguish four different parts of the metropolis as the core, northern core, inner fringe and external fringe (See Figure 1.3).

The metropolitan fringe of Lagos for this study was premised and selected from the identified external fringe in the 1979 UFAS. Four local governments (Alimosho, Ojo, Kosofe and Eti-Osa) out of the seven (7) classified as external fringe were selected based on different factors considered (Figure 1.4). For instance, it has been established that *'the structure of metropolitan areas and their fringes consists of a variety of components, ranging from totally built environments to "natural" or semi-natural areas'* (Mumford 1956, McDonnell and Pickett 1990). Today, in term of continuity of development, Lagos Metropolis has engulfed virtually all the sixteen local government areas (including the seven external fringes) but with some areas not

densely settled enough to be called “urban” but contiguous to the metropolis. Contrary to the general belief that the entire metropolitan Lagos is urban, the Ministry of Rural Development in 2009 still classified some communities within the metropolitan local governments as rural and semi-urban (Table 1.2).

The Alimosho Model City Plan (2010) also described the built-up environment of Alimosho Local government as a composite of urban, semi-urban and rural areas. The Ministry of Economic Planning and Budget (2013) surmised that despite the dominance of the metropolitan area, the state includes important rural areas as well as large tracts of inland water. Therefore, availability of sizeable undeveloped land area within the local governments was used as one of the criteria for selection. Ifako–Ijaye did not meet this criterion as it has fully grown into Ogun State, even with no rural areas (Table 1.2), hence it was dropped from the selection.

Both Amuwo-Odofin and Kosofe were mentioned as partly internal and external fringe, but the location of Kosofe at the boundary of another region (Ikorodu), like all other selected areas, made it a selection for the study. Ikeja was not only included in the internal and external fringe but also classified within the Northern core, hence was deselected for the study.

The selected Local governments Ojo, Alimosho, Kosofe and Eti-Osa were thereafter classified as Western, Northwestern Northeastern and Eastern fringes respectively while the rest of the metropolis was classified as the core (Figure 1.4) and the entire south falls within the Atlantic Ocean.

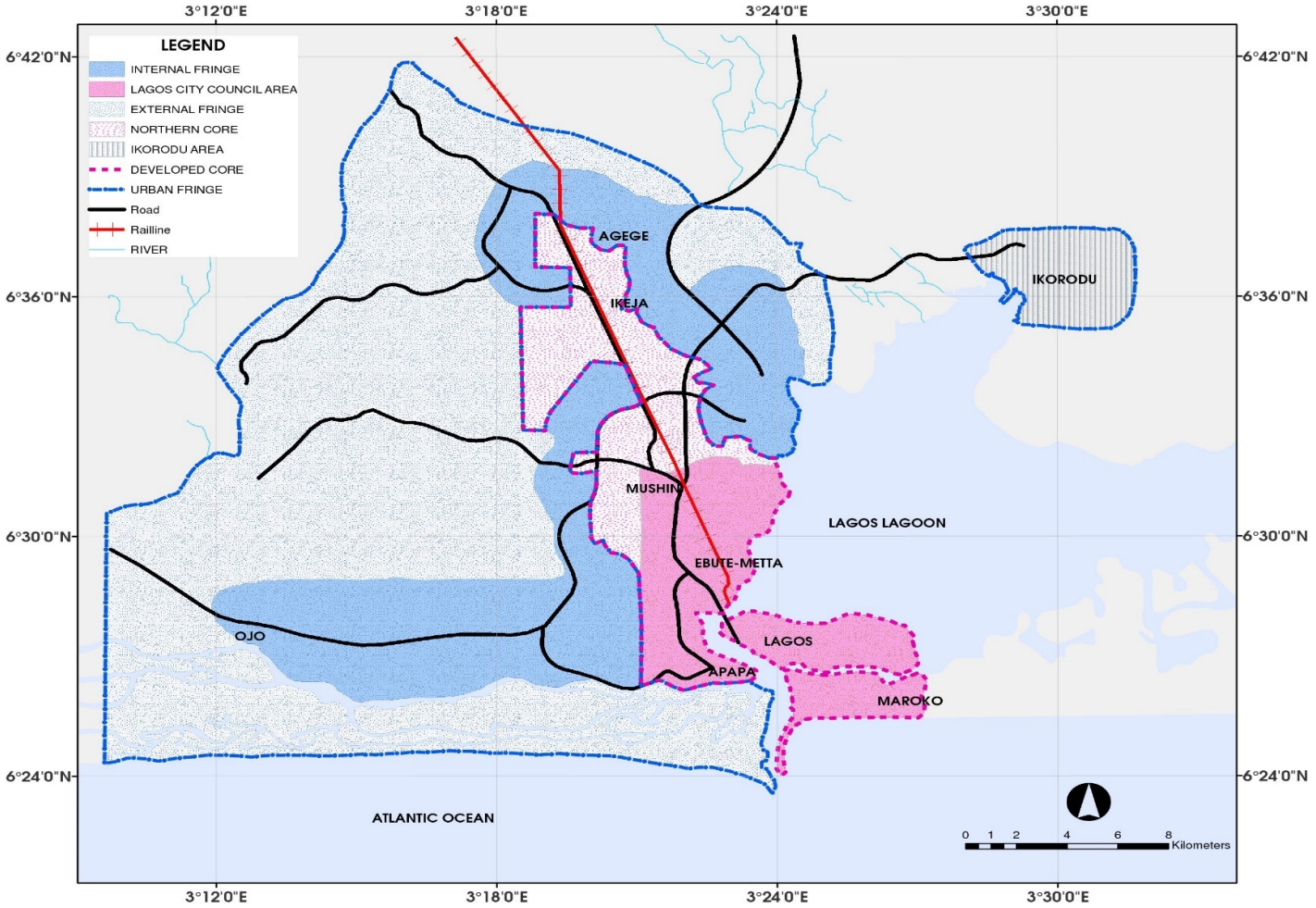


Figure 1.3: Lagos Metropolitan Fringe in 1978-1979
Source: Wilbur Smith and Associates (1980)

Table 1.2: Communities in Lagos State by Local Government Area (LGA) and their Category, 2009

S/N	LGA	RURAL	SEMI-URBAN	URBAN	TOTAL
1	Agege	-	3	75	78
2	Ajeromi/Ifelodun	6	2	53	61
3	Alimosho	22	171	29	222
4	Amuwo Odofin	47	8	12	67
5	Apapa	1	16	15	32
6	Badagry	116	11	9	136
7	Epe	376	23	7	406
8	Eti-Osa	13	27	37	77
9	Ibeju-Lekki	165	15	-	180
10	Ifako-Ijaye	-	28	34	62
11	Ikeja	-	3	38	41
12	Ikorodu	107	54	85	246
13	Kosofe	15	28	20	63
14	Lagos Island	-	9	44	53
15	Lagos Mainland	-	2	56	58
16	Mushin	-	-	31	31
17	Ojo	63	48	22	133
18	Oshodi/Isolo	-	4	23	27
19	Shomolu	-	18	24	42
20	Surulere	-	15	51	66
	TOTAL	**931**	**485**	**665**	**2081**

Source: Ministry of Rural Development, Lagos Bureau of Statistics, 2011; p:73

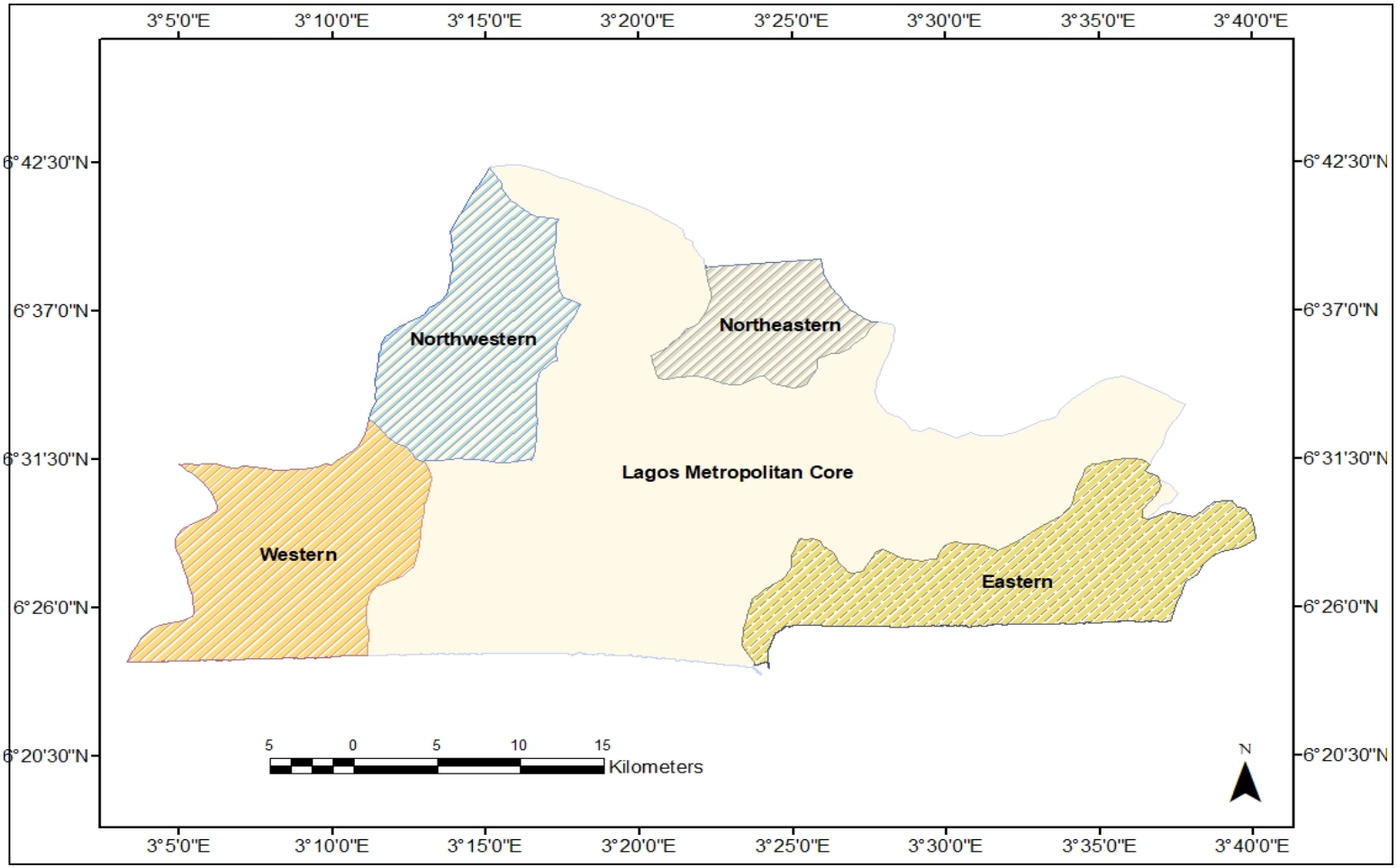


Figure 1.4: Selected Fringe Zones within the Lagos Metropolis
Source: Department of Geoinformatics, UNILAG 2016

1.8.2.1 The Lagos metropolitan fringe communities

As recounted above, urban fringe is a changing area due to city growth and urban expansion and this usually constrained its study and delineation. In selecting these study communities, since this study utilised Geographical Information System (GIS) and municipal survey in obtaining data, Browder *et al*. (1995) and Banu and Fazal (2013) methodologies were adopted in the process of sampling the fringe. Potential neighbourhoods were defined as any identifiable, contiguous, residential cluster that is within Lagos boundary and is less than 5km from the metropolitan boundary with some adjacency to undeveloped land. The outer boundary of the urban fringe was set as the defined boundary of the metropolitan area and the fringe was defined from that boundary inward to include areas within 5 kilometres of the outer margin that are not densely developed. Comparing this with various imageries showing the growth and status of the metropolis, the area within 5km inward from the outer boundary of the metropolis encompassing parts of Ojo, Alimosho, Kosofe, and Eti-Osa Local governments were delineated for the study and they fall within the area delineated in the Lagos Masterplan of 1980 as external fringe.

Areas to the north, including Agege and Ifako-Ijaye, did not meet the criteria as they have grown deep into Ogun State. Study areas were defined using observable boundaries such as state and metropolitan boundaries, streets and physiographic features such as waterways. A preliminary survey conducted identified about 20 potential communities. Most parts selected have witnessed development in less than twenty years and were still experiencing expansion and densification. Communities within the delineated area include parts of Ayobo, Abaranje, Ajegunle, Ishasi (along the west to the north-west), Ogombo, Langbasa, Ibeju, Sangotedo (in the east) and Agiliti, Ajelogo, Channels TV, Isheri North, Owode, Ajegunle (in the northeast). For easy computation of land use and change detection analysis, however, all the local governments where these settlements fall were used.

1.8.3 Population growth and urban expansion

Lagos has a diverse and fast-growing population, spread across its twenty local government areas. Its population, which was estimated by Adams at no more than 5,000 in 1800 (Oyeleye, 2001) rose to 25,000 in 1866 (Ayeni, 1981), owing to the immigration of slaves and slavers, the ‘Brazilians’, and the Sierra Leone immigrants (Oyeleye, 2001).

Then, Lagos was one of the smallest settlements (occupying a small part of a small island) in Nigeria (Mabogunje, 1968). Being small, its effect on later development was limited, and a large proportion of its population could easily be absorbed into modern urban activities (Oyeleye, 2001). Its initial growth and development were largely attributed to the influence of European; the chance concentration of traffic imposed by the construction of railways in 1895 and later, improvement of port facilities in 1914 gave her maximum significance in the predominantly export-trade orientation of the Nigerian economy (Oyeleye, 2001). The port locational advantage was complemented by political pre-eminence at the commencement of industrial development era, becoming the centre of urbanisation process in the whole country (Oyeleye, 2001). Between 1950 and 2002 the metropolis expanded from 70km^2 to 845km^2 (Oyesiku (2002). The increment from the 1980s upward was phenomenal (Table 1.3). There was intensification of expansion along Abeokuta expressway in the north, just as the construction of Badagry Expressway became instrumental to the expansion of the west and Lekki – Epe Expressway also opened-up the eastern part. This buttresses the claim that transport infrastructure promotes sprawl development (Besussi, *et al.* 2010). More people migrated to Lagos for different reasons from within and outside the country and the town experienced phenomenal growth in population as well as in area extent. It was based on their origin, time of stay and purposes, that Owolabi Salis categorised people in Lagos into 4 groups of Visitors, Indigenous-Peoples, Para-Indigenous-Peoples and the Settlers (the LAGOS "VIPS").

The National Population Census (NPC) 2006 result for the state was 9 million (Table 1.4). This was contested by the Lagos State government whose population census for Lagos at the same period was 17,552,942; this was projected to 21,883,047 for 2013 with 3.2 growth rate and 23,509,698 for 2015 using the same rate. The population was estimated by the UN at 11.2 million in 2011 and the New York Times put it at 21 million in 2012. The UN-Habitat estimated it at 16.58million in 2005, 20.19 million in 2010, 24.6 million by 2015 and 35 million by 2020. Despite the contrasting figures, it is certain that Lagos is one of the largest agglomerations of people in the world. The UN (World Bank, 1996) estimates that the state would be the third largest megacity in the world by 2015 after Tokyo and Bombay in Japan and India respectively. Its growth from 1.4 million population in 1970 to the present figure has been remarkable. This increase is partially attributed to the influx from the rural areas and other states; giving the state a skewed population in relation to the entire country. It accommodated 6.4% (5.7 million out of

88.99 million) of the total population of the country in 1991 on 0.4% landmass of the country. This was also maintained in the disputed National Population Commission Census of 2006. It controls about 36.8% of Nigeria's urban population (World Bank, 1996). Undisputedly, Lagos is one of the present 20 largest urban centres accommodating sizable numbers of urban population in the world and will be home to more future urban residents. Eight-five per cent of the population resides within the Metropolis which covers about 37% of the state's land area.

With the soaring population, Lagos which originated on islands, separated by creeks, has expanded towards the north to include Ikeja and Agege, southwest end of Ojo-Badagry Expressway, southeast on Lekki-Epe corridor, the northeast along Ikorodu corridor, Alimosho-Igando-Iba-LASU corridor northwest of Metropolitan Lagos and the Lagos-Ibadan axis north of Metropolitan Lagos. Its suburbs remain Ikorodu, Epe, Lekki and Badagry. These four LGAs (Badagry, Epe, Ibeju-Lekki and Ikorodu) contain the greater part of rural areas in Lagos State

Earlier studies (Aduwo, 1999, Kadiri and Ayinde, 2010) have shown that the metropolis is growing towards north, west and east. The north and the west are dominated by the low-income group while the eastern part is occupied by the few rich in the state. Expansion into the fringe is characterized by slum and this has led to the taunting of urban expansion in the state as urbanisation of slum. Major land uses within Metropolitan Lagos include residential, commercial, industrial, recreational, institutional and agricultural. The degree of mixture of land uses varies between low and high-income areas, and from one place to another, depending on the flexibility of the government in applying planning law.

Table: 1.3 Population and Area expansion of Lagos over the years

Year of Census	Area km^2	Total Population
1866	3.97	25,083
1871	3.97	28,518
1901	3.97	41,847
1911	46.08	73,766
1921	51.64	99,690
1931	65.51	126,108
1950	69.68	230,256
1952	69.95	341,596
1963	69.95	665,246
1976	271.20	3,519,000
1991	347.47	5,735,116
2006	818.73	9,113,605
2010	1085.9	20,19,1000
2015 Estimate	-	24,600,000
2020		35,000,000

Source: George (2009), UN Habitat, Kadiri and Ayinde (2010)

Table 1.4: Population Growth and Distribution among Local Governments over the Years

Local Government Areas	Census and Projection Years						
	1984	1991*	2000***	2006*	2015***	2006**	2015****
Agege	279229	417,981	444,238	461,743	613,081	1,033,064	1,371,654
Ajeromi Ifelodun	396523	593,561	649,814	687,316	912,586	1,435,295	2,109,444
Alimosho	287852	430,890	964,099	1,319,571	1,752,064	2,047,026	2,717,945
Amuwo Odofin	150859	225,823	287,714	328,975	436,798	524,971	697,032
Apapa	103197	154,477	195,582	222,986	296,070	522,384	693,597
Badagry	79675	119,267	190,345	237,731	315,648	380,420	505,104
Epe	74462	111,464	153,626	181,734	241,298	323,634	429,706
Eti-Osa	105141	157387	233,229	283,791	376,804	983,515	1,305,864
Ibeju-Lekki	16658	24,937	80,651	117,793	156,400	99,540	132,165
Ifako ijaye	155881	233,341	349,979	427,737	567,929	744,323	988,277
Ikeja	135868	203,383	271,922	317,614	421,713	648,720	861,340
Ikorodu	123370	184,674	390,620	527,917	700,943	689,045	914,882
Kosofe	275505	412,407	574,626	682,772	906,553	934,614	1,240,937
Lagos Island	110892	165,996	194,018	212,700	282,413	859,849	1,141,667
Lagos Mainland	182428	273,079	305,252	326,700	433,777	629,469	835,779
Mushin	360597	539,783	595,027	631,857	838,950	1,321,517	1,754,648
Ojo	144188	215,837	451,839	609,173	808,831	941,523	1,250,110
Oshodi/Isolo	300472	449,781	557,349	629,061	835,238	1,134,548	1,506,399
Shomolu	239684	358,787	385,656	403,569	535,840	1,025,123	1,361,110
Surulere	308809	462,261	486,623	502,865	667,681	1,274,362	1,692,038
Total	3831290	5,735,116	7,762,209	9,113,605	12,100,617	17,552,942	23,509,698

*Source 1: National Population Census, 1991 and 2006
** Source 2: Lagos State Government 2006 Population Census Exercise
***Source 3: Projection from National Population Census using Annual Growth Rate of 3.2%
****Source 4: Projection from Lagos State Bureau of Statistics figure using Annual Growth Rate of 3.2%
Source 5: 1984 figure back-projected from 1991 using UN rate of 5.6
Source 6: www.demographia.com/db-lagos.htm,
http://www.metamorphosisalpha.com/ias/population.php

1.8.4 Infrastructure development and urban expansion

Infrastructure development is one of the factors influencing the development of many cities and has also played a major role in the development of Lagos State from inception. As at creation in 1967, Lagos doubled as the capital of Lagos state and Nigeria. This status, among others, contributed to population drift from other parts of the country causing expansion into the fringe. The increasing challenge of coping with the deteriorating conditions of infrastructure such as roads and environmental sanitation resulting from increasing population led to the official movement of both the state and federal capital from the Lagos Island to Ikeja and Abuja respectively in 1976 (federal capital practically moved in 1991). The movement influenced urban diffusion as development moved towards the (new) Ikeja secretariat. This contributed to the rapid development of the northeastern part of the metropolis. In addition, the northeast has proximity to two major roads viz the Lagos–Ibadan and Lagos Ikorodu Roads. These two roads served as pull factor towards the axis.

The north, with its relatively high elevation, witnessed early development due to the Lagos – Abeokuta Road and the rail line that traverse the sector. The northwest axis was also connected to the core and different areas within and outside Lagos metropolis through the Lagos-Abeokuta Expressway, a major economic and trade route between Lagos and Ogun states. This early connection, coupled with the physical characteristics of the area, positively affected the development of the axis as development radiated outward from the trunk. The opening of LASU-Iba Road in the same axis was also a pull factor towards the axis. This was coupled with nearness to important places such as the airport, proximity or adjacency to developed core northern fringe and border town of Ota in Ogun State.

With the goal of bringing the then newly created Lagos State close to the capital; its first military governor constructed the Lagos-Badagry Expressway linking Nigeria with the neighbouring countries of Benin, Ghana and Togo. The road traverses the western fringe in this study. Other improvements aimed at attracting development into the area also include major landmark institutions, such as Lagos State University (the first State University in Nigeria) established between 1979 and 1983), College of Education, Barracks, among others.

The civilian administration of 1979-1983 embarked on the construction of Lekki – Epe Expressway to open-up the Lekki axis. Lekki-Epe Expressway was a major catalyst in the

development of the eastern sector; the axis was described in the Metropolitan master plan (1980-2000) as 'adjacent to the metropolitan core but essentially virgin because of road inaccessibility'. The expansion and upgrading of the road, which started in 2009, through a public-private arrangement between Lagos State government and Lekki Concession Company Limited (LCC); the construction of new Lekki - Osborne Link/Bourdillon link bridge were also identified as a catalyst for the development of the sector. Aside from this, there were proposed Regional and Lagos Coastal Roads which have also promoted movement of people including speculators into the corridor. Nearness to Lagos old central business district (CBD) where there was concentration of offices including diplomatic offices also influenced the eastern sector development.

1.8.5 Government Policies and urban expansion

There were several government policies instituted to guide the expansion of metropolitan Lagos. Some were employed earlier enough to ensure holistic growth of Lagos and its fringes, even before 1980. Some of such policies and instrument include planning and plan preparations, growth pole method, land acquisition and allocation policies among others.

a) **Planning**

There are different planning activities aimed at guiding the development of Lagos metropolis. Among them is the Lagos Metropolitan Plan of 1980-2000 which was commissioned in the 1970s during the Military regime when Lagos was still the capital of both the state (Lagos) and the Federal (Nigeria). The plan made provision for both Short Range (1985) and Long Range (2000) development programmes to transform Lagos metropolis (the core and the fringe). However, the goal of developing the fringe in accordance with 'a strict schedule for the provision of coordinated physical infrastructure system' was not met as most areas were developed without recourse to planning provisions.

One other planning approach earlier adopted was the growth pole method. In a bid to open up the hitherto rural areas and decongest Lagos, the Federal Government in preparation for the Festival of Art and Culture (FESTAC 77) in 1977, created FESTAC Town in Amuwo-Odofin area. This was with a view to directing development towards the western sector of the state. Similarly, the civilian administration of 1979-1983 provided low and medium housing units in many parts of the state. Some of the housing units were situated at Amuwo

Odofin, Iponrin, Iba, Abule-Nla, Agege, Lekki and some other locations in the state. Like the planning, the effect of this policy on patterns of expansion varied across the fringe.

b) **Government Land acquisition**

The history of acquisition in Lagos state dated back to the 1960s when part of the present Lagos was still in the Western Region. In an attempt to prevent encroachment by the Federal Government and individuals, the Western Region Government built estates at the then boundary of Lagos and Western Region and put global acquisition on major parts of the area where it could not properly monitor. Most of such acquisitions were retained when Lagos state was subsequently created in 1976 and remains till date.

The 1978 Land Use Decree (which has become a constituent part of the 1979 constitutions) also vested all land that had not been registered before its promulgation in Government of the state to which the land falls. Sections 28 and 29 empowered the state governor to acquire land with compensation only for existing buildings or crops. This Decree was used to the fullest by the Jakande administration (1979-1983) when acreages of land were acquired (global acquisition) in different regions of the state including Badagry, Epe, Eti-Osa, Ibeju-Lekki and Ikorodu for different purposes ranging from housing to agriculture. Unfortunately, most of the acquired lands were not utilised for the purposes to which they were acquired and some of them remain untouched. This influenced urban expansion to some parts of the state as land remains practically in the hand of the government and not available for development. Both title document and building development permit were rarely granted in such areas. The policy also affected the pattern of development as those who knowingly encroached on the government acquisitions were not motivated to improve on the land because of insecurity of tenure. This reflects in the structures as developers showed non-readiness to improve their property and environment beyond basic status.

A counter-policy to acquisition is the ‘Village Excision Policy’ The policy makes provision for the release of portions of hitherto acquired land to its ‘owners and generations’ use. It was one of the responses of the Lagos State government in the 1990s to agitations of concerned indigenes and traditional rulers of towns and settlements affected by acquisitions for removal of their landed properties (towns and villages with their surroundings) from acquisitions. One of the conditions attached to approving the excision was the preparation of physical development layouts for the villages before the land sale. The policy had been

in operation since 1991 when a total of 224 villages were excised followed by another 104 villages in 1998 (Ajayi, 2013). Because of the stringent conditions of the policy, its implementation is not quite pleasing in many parts of the state.

CHAPTER TWO

2.0 LITERATURE REVIEW, CONCEPTUAL ISSUES AND THEORETICAL FRAMEWORK

2.1 LITERATURE REVIEW

2.1.1 Introduction

Urban expansion is usually triggered by the need to accommodate more people within the city. Whatever be the nature of the accommodation however, land is central. Therefore, land is a factor in urban expansion. The general interest in land and the associated rigour sometimes involved in its process of acquisition have necessitated its procurement from different sources, just to meet the desired goal of satisfying one of the major needs of man – accommodation. However, Agunbide and Kolawole (2016) have asserted that land ownership and development assessment processes are determined by the means through which land is procured for housing development. This literature review confirms that the resultant effects of the process of land acquisition goes beyond the monetary gain and concludes that the governance of land acquisition processes should be strengthened.

2.1.2 Urban Expansion and Effects

The UN-HABITAT (2011) has identified land use pattern and global climate change as two areas of population dynamics on the environment. However, rural-urban migration persists as a result of uneven distribution of opportunities, adding to the natural population increase that has already created congestion in the city, thereby increasing housing demands and the quest to acquire land. Therefore, there is a rising interest in the issue of land acquisition for housing. Land can, however, be acquired through formal or informal processes. Musyouka (2004) examined the adequacy of the formal land delivery process for the urban poor of Eldoret city in Kenya using qualitative and quantitative techniques. He concluded that the formal land delivery system assures security of tenure, but the supply was inadequate to

cater for the demand, thereby encouraging land acquisition through informal processes across the socio-economic ranks; he suggested that the informal land delivery should be recognized. This is also justified by the challenges of the rate of urban growth to most governments who already lack capacity and funding (USAID, 2013); compounded by ineffective land administration.

Hahs, *et al. (*2009) attributed habitat loss to urban expansion. Haines-Young (2009) also identified urban expansion as the major driver of biodiversity and ecosystem services loss. Urban areas affect their local climate through the modification of surface albedo and evapotranspiration, and increased aerosols and anthropogenic heat sources, resulting in elevated temperatures (Arnfield, 2003). The spatial form of cities affects travel demand (Bento, *et al*), energy consumption (Brownstone, 2009), and automobile use (Vance and Hedel, 2007).

Urban sprawl has been identified as one of the major contributors to environmental problems in developing countries (Gwilliam, Kojima, & Johnson, 2004). Such environmental problems include land consumption resulting from highly inefficient form; and increasing air pollution due to high dependence on vehicular movements (Newman and Kenworthy, 1989; Garcia and Riera, 2003). Relationship between carbon emission and global warming has further given prominence to the air pollution impact of urban expansion. Nozzi (2003) found a positive correlation between length of trips and rate of pollution; and concludes that the more dispersed settlements are, the more the challenge of air pollution.

Urban expansion usually necessitates expansion of infrastructure and services to new areas and this has been argued to be expensive where expansion is dispersed (Burchell and Mukherji, 2003). Economically, it becomes more expensive when the expansion is not planned, and this contributes to the deficit of such services in the expanding area. Societal effects of urban sprawl have been enumerated to include segregation and social equity reduction (Le Goix, 2005). This partially explains poor people living in undesirable areas and being more exposed to air pollution (Hillman (1996). From the foregoing, urban sprawl has widespread and varied effects which are at variance with the tenets of sustainable development. This agrees with the position of Elkin *et al*. (1991) that urbanism fundamentally conflicts with sustainability. However, most of the arguments are contentious (Gordon and Richardson, 1997; Staley, 2001). This left the discourse on urban

expansion, its factors and effects as an open-ended debate that continue to stimulate interest.

Norman *et al*. (2006) examined energy use and greenhouse gas (GHG) emissions associated with high and low-density residential development. They used economic input-output life-cycle assessment (EOI-LCA) model and took samples from Toronto. The work, which utilised three elements of urban development: construction materials for infrastructure, building operations and transportation, found out that low-density suburban development is more energy and GHG intensive than the high-density urban area on a per capita basis. National Research Council (2009) also concedes that the spatial pattern of urban development affects energy use and carbon dioxide emissions.

Studies on the effects of urban expansion in Lagos Metropolis include Akinsanya and Ogunbambi (2010) who identified flooding as effects of urban expansion and population pressure, resulting from the conversion of low-density residential areas to high density without recourse to the need for stormwater management. Kadiri and Ayinde (2010) identified assimilation of existing settlements, among others, as effects of urbanization, resulting in loss of identity of most of these settlements even though some of them are not fully fused into the urban system. Adelekan (2010) examined the vulnerability of selected poor urban coastal communities to climate change in Lagos. It was concluded that the people were susceptible to sea-level rise as a result of the growing pattern of the area. Okuneye *et al.* (2007) examined the associated impact of migration and urban expansion in Lagos and implications on the environment and the wellbeing of the people in Lagos using selected local governments classified as low, middle and high income within the metropolis. The study revealed a relatively high rate of expansion into the low-income area and low contamination of street foods in high-income areas compared to others. Lawanson *et al*. (2012) focused on 'the environmental challenges faced by peri-urban settlements in the Lagos Megacity'. They examined socio-economic characteristics, housing and environmental conditions as well as rural-urban linkages to determine the flow of interaction between the settlements and the Lagos Metropolis. The study revealed growing threats of environmental problems due to outward and uncoordinated growth of Lagos Megacity and unplanned settlements. However, the study concentrated on selected settlements along the Lagos-Ibadan Expressway, just as other reviewed studies have different scope and coverage.

However, the urban fringe that is today vacant will only continue to shrink as it remains the most accessible space for conversion in the process of urban expansion. Unfortunately, research into the problems caused by land acquisition process, which include uncoordinated development of the urban fringe and its attendant vices, is sparse. Based on this, the literature review defines the general problem and proffered solutions. However, further research is required to elaborate on the linkages between land acquisition process and urban expansion; then examine the changing effects of the factors of urban expansion in the transition patterns across the metropolitan fringe of Lagos.

2.1.3 Land Acquisition and Ownership in Nigeria

Acquisition of land is influenced by the systems of land tenure and governance prevailing in any country. Musyoka (2013) noted that the colonisation of Kenya by the British influenced access to, and ownership of land in Kenya. Similarly, Nigeria was influenced by colonisation, hence, the three eras of land ownership in Nigeria: pre-colonial, colonial and post-colonial.

(a) The Pre-colonial era

Like most African countries, before the colonial era, land in Nigeria (including Metropolitan Lagos) was administered under customary law. Therefore, land acquisition was through customary owners. Ownership of land was usually secured either by settlement, conquest, sale, gift and acquiescence (Otubu, 2015). Under this tradition, the land belongs to the group or community (tribe, clan, village, kindred, lineage, and family). The community head holds the land in trust and administers it on behalf of its members (Haruna, et al, 2013). Variations existed in land market transactions among the Northern, Eastern and Western Regions based on their different cultural and social influences.

(b) During the colonial era

During the Colonial Era in Nigeria, multiplicities of land tenure system existed based on colonies. In 1951, the European introduced the English Freehold System in Southern Nigeria (Elias, 1971) through their traders, who acquired land parcel in Lagos Colony with the intention and purpose of English Freehold acquisition. This later resulted in conflict with the customary system of land tenure, which degenerated to litigations (Oluwamotemi, 2010). Atilola and Fajemirokun (1979) recorded that many people, including land

speculators, also took the advantage of the freehold system as a great economic venture to the detriment of other land users, governments and their agencies who were in need of land for development purposes. These systems coexist today. People, including Nwabueze (1972:632), thereafter, advocated for the extension of state ownership of land operating in the North to other parts of the country as a viable direction for the reformation of land tenure in Nigeria.

(c) Post-colonial era

Oloyede et al., (2007) in the study of *informal land delivery system in Lagos state* wrote that many households were able to acquire land for housing development immediately after independence in 1960, with ease, from various land-owning families as allocation of customary land by legitimate right holders was practised and accepted by the society. Rakodi and Leduka (2003) attributed the success of the informal land delivery systems to 'their practical attributes' which made transactions arrangements better suited to all and 'their social legitimacy' i.e. wide understanding and acceptance of the social rules, which enabled smooth transactions. This was, however, short-lived due to anti-informal land administration policies of the government (Oloyede et. Al, 2007).

The role of bad urban governance played out over time. Informal institutions that regulate land transactions and use changed and at times broke down. Similarly, the rules and social relationships governing transactions and regulating land disputes were increasingly strained and sometimes led to the breakdown of law and order (Oloyede et. Al, 2007). North (1990) however, stressed the relevance of institution in land transactions.

Before the introduction of the Land Use Decree in 1978 (Now Land Use Act), two major Tenure Systems operate in Nigeria. The Northern Nigeria Tenure System (NTS) which placed ownership of land in the Government (all the land was held in trust for the community by the traditional leader and given out by leasehold through customary rights or the government) and disallowed private ownership; and the Southern Nigeria Tenure System (STS) that vested the ownership of land in communities, families and individuals. Authors, including Oluwamotemi (2010), opined that the NTS 'aids economic growth and development because it made land easily accessible to Government, investors and others whereas, the STS 'does not aid development and economic growth' because access to land is costly and difficult.

The pursuit of a uniform system of land administration and the quest to make land available to the government for developmental purposes in any part of the country, among other reasons led to the promulgation of the Land Use Act in 1978, where all lands in the country were Nationalized. Currently, Land tenure system in Nigeria is governed by the Land Use Act, 1978, which states in Section 1 that:

> *Subject to the provisions of the Act, all land comprised in the territory of each state in the Federation are vested in the Governor of that state and such land shall be held in trust and administered for the use and common benefit of Nigerians in accordance with the provision of this Act.*

Otubu (2015) identified two major schools of taught on the provision of the Land Use Act as Nationalisation and Private property rights schools. The former believed that the Act expropriates private property rights because the provision nationalises all lands in the country, by vesting the ownership of same in the state via the Governor; while the latter, proclaimed that the provision does not extinguish individual land rights. However, Otubu was of the school of Nationalisation. The existence of these schools of taught manifests in practice as both the customary and statutory ownership run concurrently in the country. Aside from the lacuna in the law, Alden Wily (2012:4) identified some reasons for the continued existence of customary land tenure in African countries as:

a) *gap between what national law dictates and what continues to exist on the ground; best illustrated in overlapping state and community tenure over public lands;*
b) *the reluctance of African governments to formally extinguish customary rights as a genus, and rather to reinterpret what these means; this allows customary norms and interests in land to continue until they clash directly with incoming state or private-sector interests;*
c) *the limited reach of conversionary titling programs; and*
d) *the continuing relevance of customary norms to existing patterns of land use and rights and the way they tightly interweave with social relations" (Alden Wily, 2012:4)*

Odeny (2013) also extols the virtue of Customary tenure administration to include its decentralization to the local level, flexibility and progression with time in implementation. It also provides a safety net to those in need of land. From what operates in Lagos State, assertions of Alden Wily (2012:4) and the conclusion of

Odeny (2013) above, it can be safely concluded that the position of the Nationalisation school of taught that the provision of the Act removed corporate groups, families and chiefs from the trusteeship of land and replaced them with the State governor, may not be totally true as both the customary and the statutory right continues to coexist.

Therefore, land acquisition for development in Lagos metropolis and other cities in Nigeria is through customary (traditional landowners and their representatives referred to as informal) and statutory (from government, termed formal).

2.1.4 Land Acquisition Procedures

Informal land acquisition i.e. through the customary right may involve identification of the property by the buyer and entering into the transaction (make payments) with the seller, in just two steps. Because of the breakdown in the informal land governance system, however, Oluwamotemi (2010:3), itemise five steps to be followed to ensure the genuineness of the transaction. These are

1. *Enquires before Contract*
2. *The Contract for sale*
3. *The Position between contract and completion*
4. *The Completion*
5. *Post Completion (*Oluwamotemi, 2010:3)

To prove ownership and prevent illegality, the claimant to the land must be able to trace his title to the first settler on the land or root of the title and this may involve other processes. To assert ownership, the customary ownership may also be converted by registering the title (or interest in a property) with the government.

Formal land acquisition. Ownership of land in each state of the federation is vested in the governor of the state. For statutory land, the prospective land investor applies to the Governor through the Executive Secretary for statutory rights of occupancy. This will be followed up until the allocation is made. The application usually passes through many people before the final allocation. The procedure involves but not limited to the following steps:

i Purchase and submission of application form to Executive Secretary (ES) Land Use Allocation Committee (LUAC);

ii Issuance of letter of offer of allocation

iii Payment for allocated land (within 90 days);

iv Issuance of letter of confirmation with plot and block number after payment

v Processing of application for C of O by the Scheme Officer,

vi File to be processed with the Executive Secretary LUAC;

vi Issuance of Survey plan by the Surveyor General

vii ES LUAC approves processing and signs letter of allocation.

viii File sent to the Senior Special Assistant (SSA) to the Governor on Lands

ix SSA processes application and sends it to Permanent Secretary Lands Bureau

x PS Lands process the application further to the Governor;

xi Governor approves application and signs the C of O

xii Governor sends file to the Deputy Registrar for further processing;

xiii Processing of application by Deputy Registrar

xiv Registration of C of O by Registrar of Titles,

xv C of O granted to the Applicant (Eribake, 2014))

The above list assumed that the process scales through without going forth and backwards. However, the application does not guarantee land allocation, and the duration cannot be predicted as it may last weeks or years.

2.1.5 Land Administration and Good Governance

Globally, countries have evolved land tenure and land administration system to administer their lands. Generally, however, there is poor land governance in Africa. The issue of corruption is rife. For instance, land acquisition from the government is through application. However, aside from the fact that majority of the citizens are not aware of this process, Musyoka (2013) declared in his study in Kenya that 'application alone is not enough to access land'. It is associated with access to power (Maina and Macoloo (1994:7) i.e. the applicant must be in power or have someone in power. The process of acquisition which should last about three months 'can take eternity if one does not *follow it up'* that is, with unofficial 'facilitation fees' (Musyoka, 2013). Therefore, majority of people cannot afford to acquire land from the government; they turn to informal channels, which is faster, simpler and flexible (Musyoka, 2004, 2013) thereby strengthening informal transactions

that bread informal developments as a result of poor governance. Toumbourou (2018) in his study in Indonesia summarized causes of poor governance to include overlapping or unclear regulations, lack of technical capabilities and accurate maps, unclear land tenure, lack of transparency and public participation. Similarly, and resulting from poor governance, statutory land allocation process in Lagos metropolis is failing to achieve the goal of delivering land for organised development of the city and its benefits. However, Toumbourou (2018) noted that poor land governance leads to loss of revenues to government, inadequate compensation to people and communities affected by use change or land acquisition process. Illegal and informal land transactions undermine the statutory allocation process and discourage socially and environmentally responsible long-term investments (World Bank, 2009). With bad governance, the demerits of urban expansion will always outweigh its benefits.

Ordinarily, the Land Use Act of 1978 was well envisioned. Making government the custodian of land makes it possible to plan for urban and facilitates expansion contrary to where individuals hold on to fragmented land to do anything they like. It facilitates decision making on the use of land and sustainable development of cities. At the promulgation of the Act, the Head of State challenged the state governors to ensure planning of land when it stated that '*Ownership of land per se is irrelevant. What is important is the use to which land is put and* ***no Government should abdicate its responsibility in respect of proper planning of land use within its territory'***. Unfortunately, the right has been widely abused by the government and its agencies. Parcels of Land were acquired without putting them to any use; they were neither planned nor formally made available for the public use, thereby allowing trespass by the 'original' owners of the land who use or sell such to the unsuspecting public. Planning was jettisoned leaving the city to grow organically.

However, Food and Agriculture Organization of the United Nations (FAO) (2007) has hinted that aside from playing a critical role in sustainable development, land use planning and control reduces the number of conflicts that may arise from urban expansion (FAO, 2007). Regrettably, planning and implementation suffer where there is weak governance. People bypassed planning in converting the fringe land to urban use due to the lacklustre attitude of the government and ignorance on the part of individuals. Land use planning requires appropriate laws, regulations and political wills for effective implementation. Proactive land administration is required to reduce the level of planlessness in the process

of urban expansion; therefore, where land is available, the government should plan and make serviced plots available for intending developers. The planning should be transparent and inclusive because of the possible dichotomy in the ownership status of rural and urban land and the location of the fringe. Local governments should collaborate with customary leaders in the conversion of rural land to urban to facilitate planning (FAO, 2007).

Generally, the most effective way for the government to protect an area is to own and plan it. The Land Use Act has simplified land acquisition by the government. Such land acquisition can help governments to achieve multiple community goals, such as the provision of open space and parks. Compulsory land acquisition can also be an important mitigation technique to protect against hazards (e.g. restriction of development in floodplains), by removing the development potential from vulnerable areas. None utilization of this opportunity to the fullest is reflected in the expansion of Lagos metropolis.

This literature review is from the perspective of the nature of land administration as people-to-land relationship. Because of the changing paradigm, modern land administration theory has included land tenure, land value, land use and land development to its primary goal of supporting land market operations, as essential functions of land administration (Enemark *et al.*, 2005). This research focused on assessing how the interactions of these functions influence urban expansion. The current global perspective of land administration also focuses on the efficient land market and effective land use management (Williamson *et al.*, 2010). This has continued to influence the present initiatives by international organisations to address issues of governance, security of tenure, economic empowerment, among others.

Augustinus *(2009:10)* and Palmer *et al.* (2009:1) have, however, described land governance as everything 'about power and the political economy of land'. Scully (1988) equates political economy to rules that govern the relationship of people to land and how this affects activities on land. This activities on land can be likened to developments on land culminating in urban expansion. According to Agunbiade and Kolawole (2016), 'the rules reflect the power structure of the society and are developed in a way to entrench the power relation between individuals, social groups and the entire society.' Agunbiade and Kolawole conclude that the quality of governance determines to a large degree the efficiency and effectiveness of land administration. It is from this perspective that this research anchored the land acquisition process and urban expansion on the concept of good

urban governance and hypothesized that good urban land governance promotes sustainable urban expansion while bad urban governance will promote urban expansion with different vices.

2.2 CONCEPTUAL ISSUES

2.2.1 Concept of Urban Fringe

Fringe suffers unanimous definition and delineation. Therefore, different researchers have presented definitions in line with their specific problems. Using land characteristics and location, Martin (1953: iii) defines the fringe as "... that area of interpenetrating rural and urban land use peripheral to the modern city …' Stone (1962) defined fringe as a region of discontinuous settlement.

Pryor (1968) reviewed many definitions of the term and noted that it is a phenomenon with spatial and temporal variations. He cited examples of the Netherlands cities without discernible fringe; Paris and U.S.A. with mixed and scattered land use; and London with clear Green Belt. Pryor (1968) identified the causes of definition problem to include ranges in time; sizes of urban centre; different regulatory control; differing contexts of studies; and divergent aims of researchers. As an initial step, he submitted that 'the term "rural-urban fringe," or simply, "fringe," is most appropriate to designate the mixed rural and urban area located outside the city'. However, for easy delineation and to provide a framework for a conceptual clarification of the fringe area, Pryor (1968:*206*) described the rural-urban fringe as: *"the zone of transition in land use, social and demographic characteristics, lying between (a) the continuously built-up urban and suburban areas of the central city, and (b) the rural hinterland…." (*Pryor, 1968:*206)*

He further suggested the possibility of dividing rural-urban fringe into:

(1) ***the urban fringe****, that subzone of the rural-urban fringe in contact and contiguous with the central city, exhibiting a density of occupied dwellings higher than the median density of the total rural-urban fringe - a high proportion of residential, commercial, industrial and vacant as distinct from farmland-and a higher rate of increase in population density, land use conversion, and commuting*; *and*

(2) ***the rural fringe****, the subzone of the rural-urban fringe contiguous with the urban fringe, exhibiting a density of occupied dwellings lower than the median density of the total rural-urban fringe, a high proportion of farm as distinct from nonfarm and vacant land, and a lower rate of increase in population density, land use conversion, and commuting (*Pryor, 1968:*206)*

From physical and social characteristics perspectives, Carter (1981:316) defined *rural-urban fringe* as *"the space into which the town extends as the process of dispersion operates..."*.

Friedberger (2000) defined rural-urban fringe in relation to distance from major city centre as 'land extending from *ten to fifty miles outside the centre of a nation's major city'*. In Peri-Urban Land use Relationship (PLUREL) project of the European Union, 'rural–urban-region' (RUR) was considered as a unit of analysis, with a range of area types ranging from the city core to the rural hinterland, shown as nesting circles (Figure 2.1). The first version of the model (a) was built after the concentric theory of Homer Hoyt (1939) while the second model took cognisance of the real poly-centric agglomeration pattern of city development. From the figure, the urban area comprises the city centre and its suburbs (inner-urban and suburban) before the urban fringe (depicted as the first component of peri-urban area, the other being urban periphery. There can still be other layers such as the urban periphery and the rural hinterland, depending on the size of a settlement and other factors, such as region. This is not fixed as the region continues to evolve. "Urban fringe" is the counties neighbouring a city.

In literature, the urban fringe, the periphery, peri-urban, ex-urban, suburban, and edge city are sometimes used interchangeably or collectively. Taherkhani, Eftekhari, and Taghvaee (2009) for instance described the peripheries as places located between the city centers and agricultural lands; the definition merged Inner urban, suburban, urban fringe and periphery as against the distinction in the PLUREL research and other authors earlier mentioned. For the purpose of this thesis, the urban fringe is simplified as non-urban land uses contiguous to a city at a time. The time factor is essential in this definition because as city metamorphosed, the fringe changes.

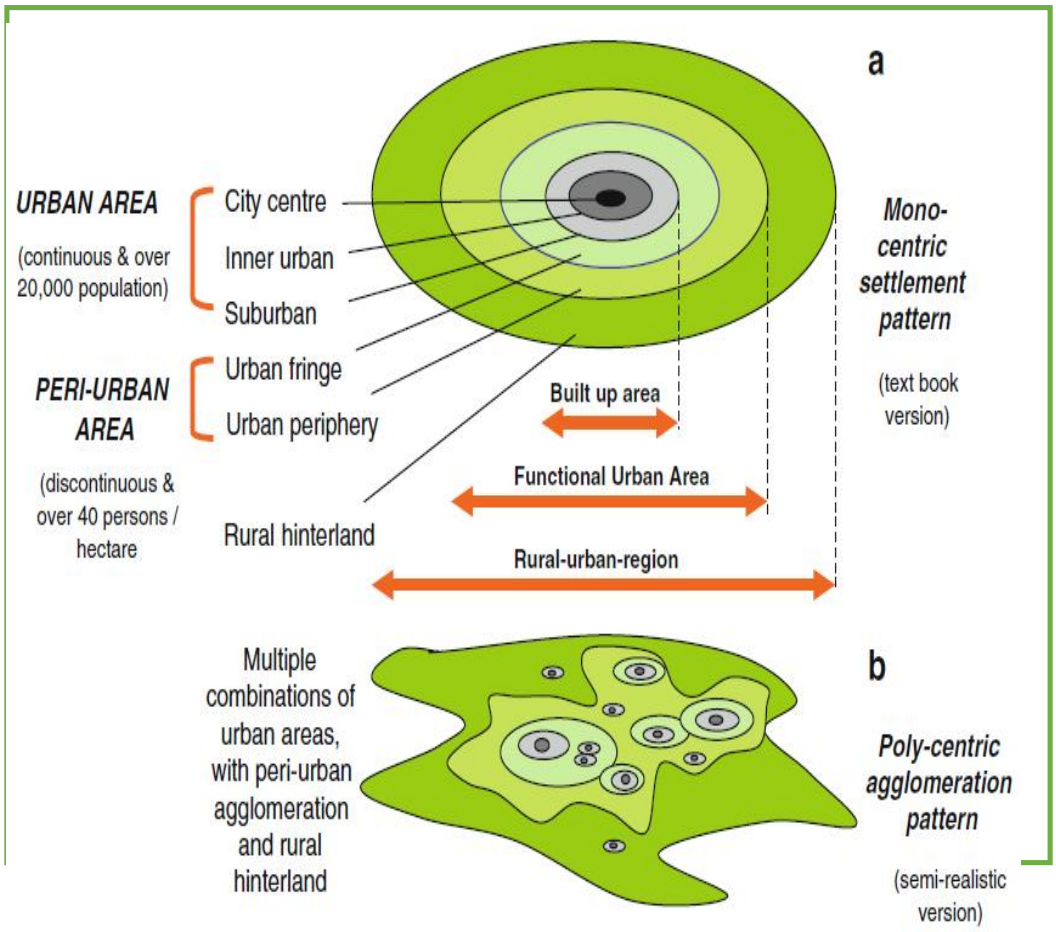


Fig. 2.1: PLUREL Concept of Peri-Urban Areas and Rural–Urban-Region
Source: Ravetz *et al.* (2013)

2.2.1.1 Delineation of fringe

Delineating a rapidly changing system, subject to be managed by overlapping institutions is the main challenge for making plans for urban fringe interface (Allen, 2003). In attempting to overcome delineation problems, a considerable variety of techniques have been employed. Faust (1942) utilised three voting precincts "forming a rough circle with a radius of about seven miles" (eleven kilometres) in Eugene. Wehrwein (1942) used the metropolitan district around the city of Indianapolis, with a minimum of 150 inhabitants per square mile (2.5 square kilometres). Wills (1945) used local Government Areas and parishes around Sydney. Rodehaver's (1947) study of 49 "sections" near Madison was based on the three criteria of the proportion of nonfarm families to the total population, density of nonfarm families per square mile, and buildings per acre. Blizzard and Anderson (1952) investigated the first two tiers of townships around Williamsport, Pennsylvania, delineating the outer boundary of the fringe where "agricultural land use predominated", and the inner boundary where full city utility services ceased. In Columbia, Missouri, Gist (1952) only contacted "open country families who resided at least half a mile beyond the city's boundary and who had one or more household members gainfully employed in Columbia". Martin (1953) in Eugene-Spring-field studied "all territory contiguous to, but exclusive of, the incorporated areas of the two cities and characterised by extensive interpenetration of rural and urban land use".

Recently, Geographical Information Systems (GIS) and remote sensing have been widely employed in the delineation of urban phenomenon, making it more scientific. Sutton *et.al* (2010) differentiated urban and rural area in Australia using satellite imagery. Eyoh *et al*. (2012) also used GIS for land use classification to identify urban and non-urban areas at different periods in Lagos. In Kumasi, Ghana, Sarkar and Bandyopadhyay (2013) employed GIS techniques to delineate agricultural land in the peri-urban interface region.

Browder *et al*. (1995) used temporal and locational features to define the metropolitan fringe of Bangkok while studying the structure of the metropolitan fringe settlements. They defined the outer boundary of the urban fringe as the margin of the built-up area and defined the fringe inward from that boundary to include all contiguous residential areas not older than 15 years. Banu and Fazal (2013) used a distance interval of 5km from urban edge to delineate *Aligarh* Urban Fringe. Areas within 5km from urban edge was classified as "Immediate urban fringe" while, "Intermediate urban fringe" and "Distant urban fringe"

were used to classify areas within 5–10 km, and 10 km and above respectively.

2.2.2 Conceptual Framework Linking Dynamics of urban expansion and its effects

To achieve the aim of this project, a framework that is able to link the process of land acquisition with urban expansion with the effects and different actions aimed at ameliorating the effects on the fringes is essential. The approach must incorporate a set of indicators that facilitate detection of change in the fringe, highlight possible drivers of change and effects from the change process as well as procedures for evaluating the different components. Many tested conceptual frameworks exist for organizing drivers and pressures (Jabbour and Hunsberger, 2014). In the global environmental change community, the Driving Force-Pressure-State-Impact-Response (DPSIR) framework (Figure 2.3) is widely adopted in integrated environmental assessment (IEA). Researchers including Borja *et al.* (2006); James (2008), and Danjuma & Daura 2014) have demonstrated the usefulness of the DPSIR model. Studies that have applied DPSIR to the issue of urban expansion and fringe include (Feng, 2004), Hosseinzadeh *et al* (2009) (Analysis of Spatial Development of Urban Fringes of Tabriz), Surawar and Kotharkar (2012), and Al Tarawneh (2014). Among the strength of the concept is its adaptability to many different objectives and scales of analysis (Helming, *et al.*, 2011). The DPSIR framework may be tailored to address subject of interest in a country (Nkambwe & Chenje, 2006). The framework is conceived as a chain of causal links starting with '*driving forces*' (economic factors, human activities, demographic forces) through '*pressures*' (emissions, urban expansion) to '*states*' (physical, chemical and biological) and '*impacts*' on ecosystems, human health and functions, eventually leading to political '*responses*' (prioritisation, target setting, indicators).

2.2.2.1 DPSIR Framework

DPSIR is the causal framework for describing the interactions between society and the environment. It addresses happenings in the environment and proffers solutions by answering the following five questions in sequence (Pinter *et al*. 1999): what is the state of the environment? consequences of the state? action taken and effectiveness? available alternative scenarios for future development? and what other action could be taken?

The framework provides "structure within which to present the indicators needed to enable feedback to policy makers on environmental quality and the resulting impact of the political choices made, or to be made in the future" (Kristensen, 2004).

2.2.2.2 Components of DPSIR

The DPSIR consists of five major components: Driving force (or Drivers), Pressures, State, Impact and Response.

Driving forces are socio-economic and socio-cultural forces driving human activities which, increases or mitigate pressure on the environment e.g. the need for housing arising from demographic factors, mobility, need to increase employment level arising from economic factors etc. Pressures are stresses that human activities places on the environment i.e. human interventions in the environment, sometimes referred to as direct drivers (e.g. land use change from rural to urban, municipal solid waste, wastewater, density of motor vehicle usage, overuse of forest resources) in attempt to satisfy need. State is the condition of the environment resulting from the pressures on it (e.g. polluted water resources, degraded land, sealed surfaces, development pattern, environmental quality, etc.) or trends that may reveal environmental change. Impacts are the effects of environmental degradation or functional changes resulting from changes in the characteristics of the environment e.g. biodiversity loss, high volume of runoff, soil erosion, diseases (respiratory disease incidence, waterborne disease incidence), economic damage, flooding, traffic, etc. impact may be environmental, social or economic, contributing to the vulnerability of both people and the environment. The magnitude of impact may depend on a society's vulnerability which varies among social groups. Responses refer to reactions by individuals, society or policymakers to the environmental situation to overcome reduce, correct or prevent negative environmental impacts; correct environmental damage; or conserve natural resources e.g. the regulations, protected areas or land acquisition, changes in management strategies etc. It can be applied to any part of the chain between driving forces and impacts, that is, society *responds* to the *driving forces*, or directly to the *pressure*, *state* or *impacts* through preventive, adaptive or curative solutions (see the linkage in Figure 2.2).

2.2.2.3 *DPSIR framework in relation to urban expansion*

The aim of urban management is to attain sustainable urban growth. It is, therefore, important to quantify and identify the current state of, and impacts on, surrounding fringe areas and how these are changing with time and practices. Using the DPSIR framework to conduct the assessment, questions like those used by Kristensen (2004) in water assessment, were relevant. These include questions on *State of urban and its fringes*- How is it? (pattern of expansion, quality etc.), How much is there? action and policies influencing it (including policies on land acquisition), among others.

The basic summary of the DPSIR model in urban expansion and management is that a shift in human need is driven by socio-demographic, economic and daily activities, thereby putting pressure on land to satisfy the need. Such efforts at meeting the needs change the existing state of the environment, thereby impacting on urban development. The resulting state may be desirable or otherwise depending on the response to the pressure. In land procurement, for instance, the ensuing state may be desirable if the allocation is guided and not left to market forces alone. The response can come in the form of new regulations or adjustment to existing development strategies to achieve sustainable development. The concept of Good Urban Land Governance provides good response in this context (Figure 2.3).

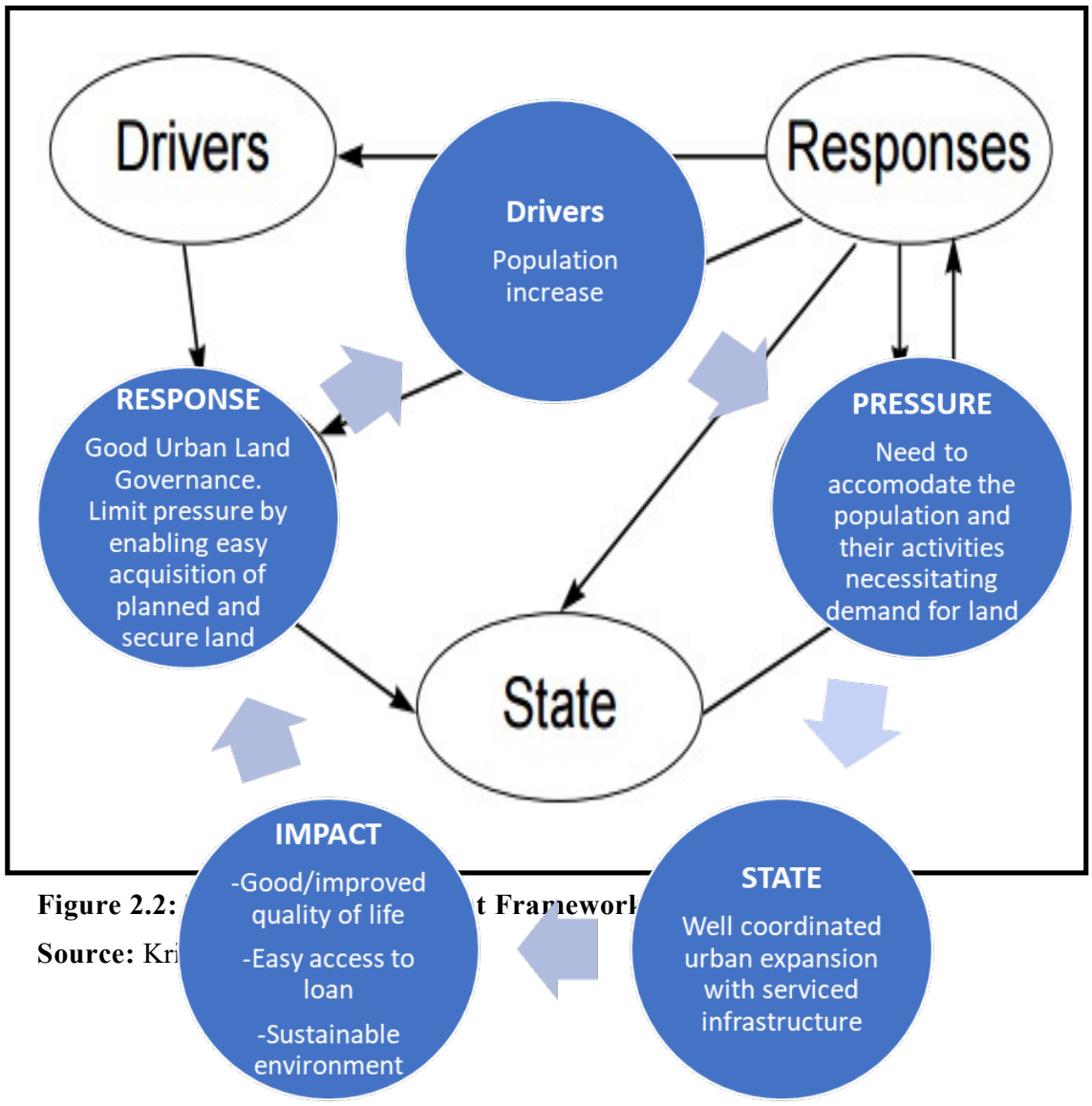


Figure 2.2: t Framework

Source: Kri

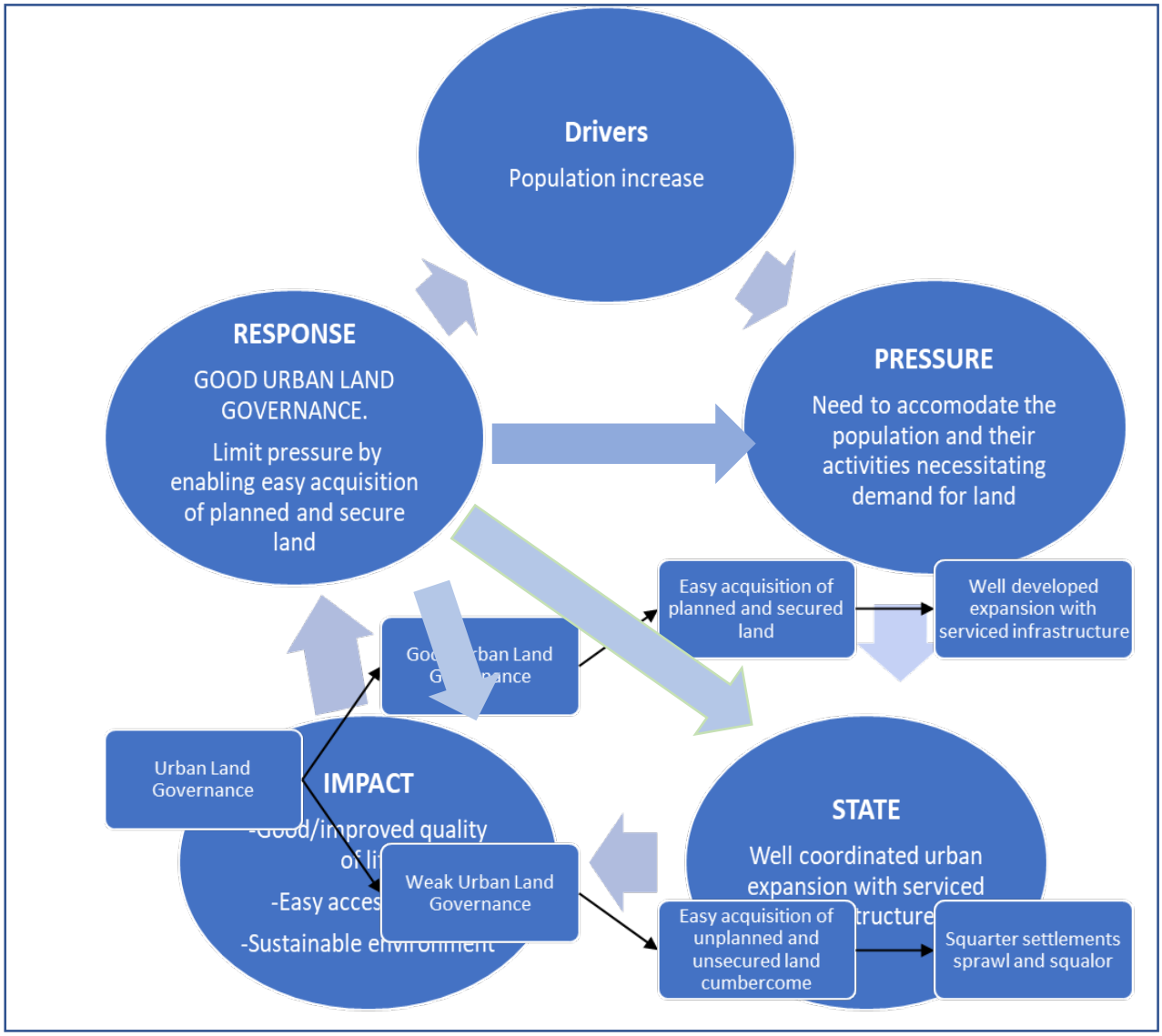


Figure 2.3: Good Urban Land Governance as response to Land Acquisition and Urban Expansion Issues

2.2.3 Concept of Urban Land Governance

FAO (2007) defined Governance as the process by which society is managed and how the competing priorities and interests of different groups are reconciled. It includes the formal institutions of government but also informal arrangements. Governance is concerned with the processes by which citizens participate in decision-making, how the government is accountable to its citizens and how society obliges its members to observe its rules and laws. Palmer *et al.* (2009) construe that Land governance, by extension, concerns the rules, processes and structures through which decisions are made about the use of and control over land, the way the decisions are implemented and enforced, and the way that competing interests in land are managed. It encompasses statutory, customary and religious institutions and actors. It also includes legal and policy framework for land as well as traditional and informal practices that enjoy social legitimacy (Palmer *et al*, 2009).

Land is required for different purposes, which, at times, maybe conflicting. Accommodating conflicting interests and obtaining stakeholders' cooperation for the common good are major aspects of land administration. With good land governance, sustainable development can be easily achieved through well-developed expansion with serviced infrastructure (Figure 2.3)

Attainment of good land governance involves adherence to its nine principles (detailed in Palmer *et al*., 2009) which are:

1. Security
2. Sustainability
3. Equity
4. Effectiveness and Efficiency
5. Rule of law
6. Subsidiarity
7. Transparency
8. Accountability
9. Civic Engagement

Any country that is low or lacking in the principles can hardly achieve good urban land governance and where there is weak land governance, sustainable development will be hampered. Many indicators have been devised to evaluate good urban land governance. One of such, reportedly developed by Land Equity International Pty Ltd 2008 (as documented in Wallace, 2010), is shown in Figure 2.4. It used the Land Administration

Capacity of countries to evaluate the level of governance. The highest level (Level 7) of potential administrative indicators is hardly achieved by many countries except those with effective national-scale Land Administrative System (Wallace, 2010). Unregulated practices without link to formal administration system represent the peak of weak governance. Weak governance in land tenure and administration is a significant feature in developing economies. There are International initiatives focusing on technical improvements of systems and procedures to improve the situation.

Buchanan (2008; cited by Wallace 2010) however clustered the indicators of good governance around three outcomes, namely responsibility, empowerment of people and delivery of an objective legal framework (Figure 2.5). Responsibility implies reliability and accountability to the citizens. Exercising power and authority in a simple and efficient manner. The role of institutions in land administration such as tenure must be clearer. Institutions must be available to explain and take responsibility for their moves. This principle is based on transparency, and its application enables civil society to participate in policymaking at the local level. By empowerment, poor people are enabled to develop their own capabilities as actors in the development process, increase their assets, and move out of poverty. It focusses on participation and local ownership. As primary stakeholders, those who are directly affected shall be an integral part of decisions and activities that impact them. The voice of primary stakeholders is integral to the development process and their involvement helps ensure that development activities meet their needs. Such can also gear them to guide development process. For people to be empowered, they must be informed.

Objective legal framework must be available to guide the decisions and actions of the actors in land governance. The enforcement of the legal framework is also essential. When this and other principles are in place, some social practices e.g. corruption which negates the principles of good urban land governance will be eradicated, land acquisition will be enhanced, and urban expansion will be orderly. The focus on governance in relation to land administration is to deliver sustainable development using tools appropriate for individual country's situation. Empowerment of people will aid in achieving such goal. Buchanan (2008) summarized drivers required to deliver good governance in land administration as:

- Facilitating the effective operation of land administration systems

- Condition of donor organisations to provide funding for land administration Projects
- Required in achieving Millennium Development Goals
- Achieves sustainable development in Land Administration systems (Buchanan, 2008)

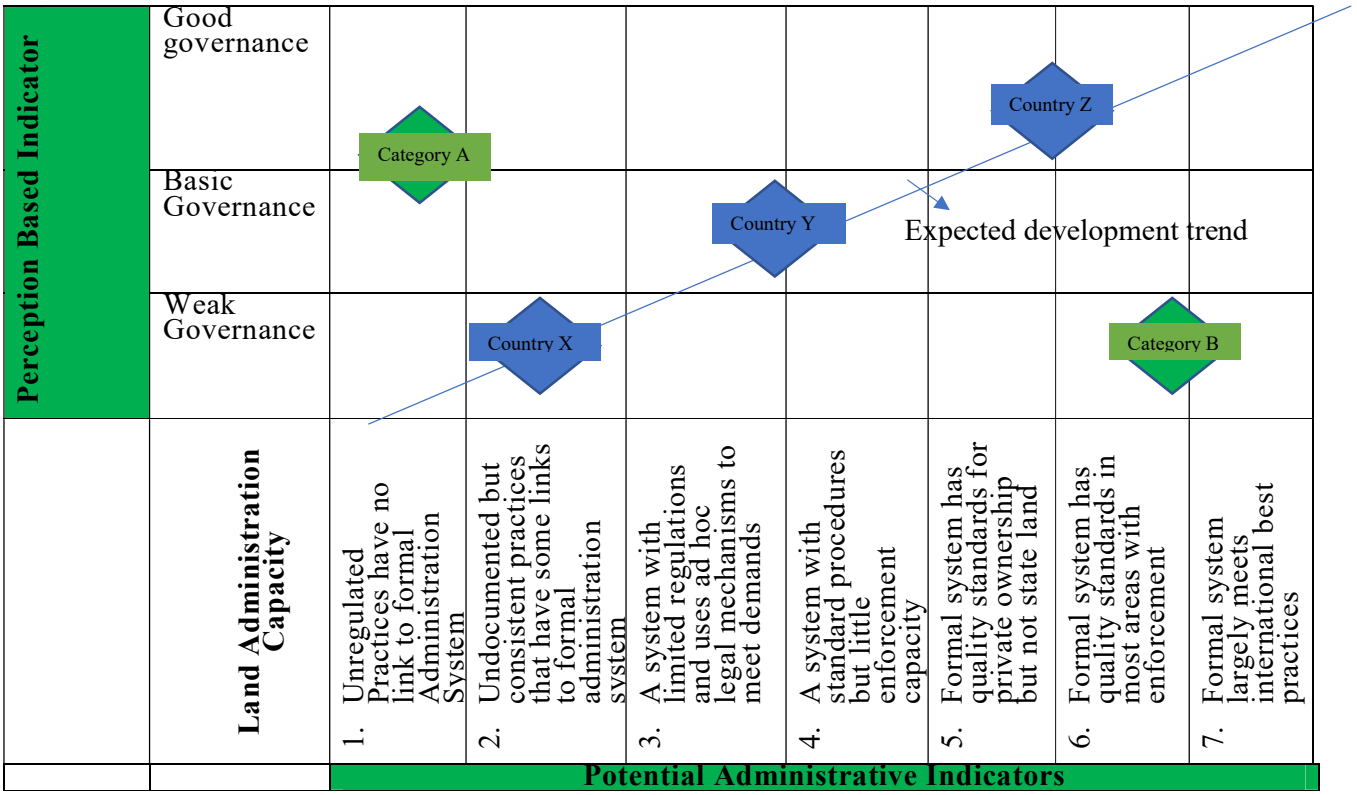


Figure 2.4. Correlation between Governance/Land Administration Developments (Source: Land Equity International Pty Ltd 2008)

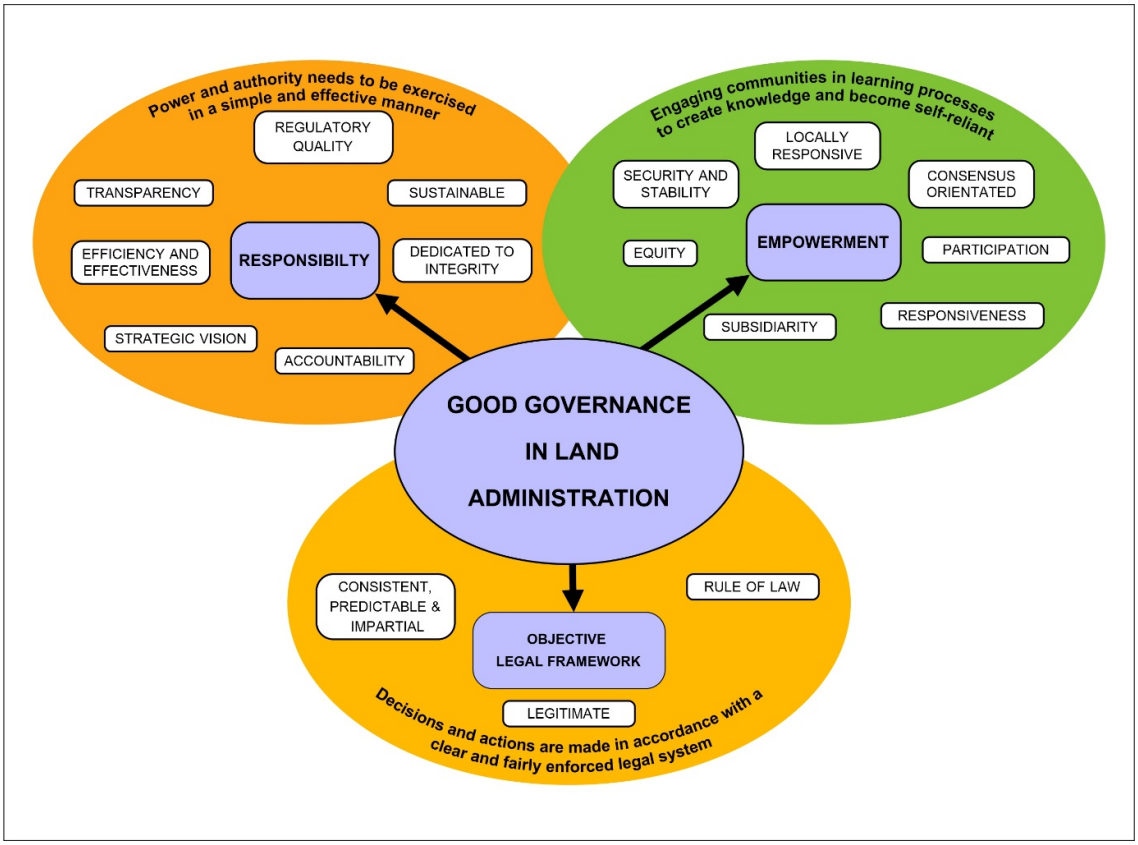


Figure 2.5: Indicators of good governance in land administration
(Source: James Buchanan, 2008; cited by Wallace, 2010)

2.3 THEORETICAL FRAMEWORK

Different regional development models or theory relating to urban expansion dynamics, pattern (urban sprawl, compact city, suburban), factors, effects of urban expansion and sustainability are found in the literature. They include central place theory, concentric zone model, multi-nuclei model, growth poles and urban diffusion models. Some of these theories and their relevance to this study are explored below.

2.3.1 Classical Conceptual Urban Growth Models

Two of the three major theories of urban land use (concentric-zone and sector theories) developed before 1950 are discussed in this section mainly for their assertion on the expansion of urban area and most especially the mono-centric conception of urban areas by most researchers on urban expansion and land use development. Earlier researchers (Fadare, 1987; Oduwaye, 2002, Agunbiade, 2006; Alade, 2012) among others have also reviewed the theories to buttress their claims on the expansion of Lagos State.

a) Concentric Zone Model

Concentric Zone theory of city development was postulated by Ernest W. Burgess (1925). The Theory claims that cities grow like the rings of a tree, starting in the centre and growing outward. He defined a model of concentric rings representing a concrete reality – Chicago in the 1920s. The Loop was surrounded by factories that also bordered the suburbs of less developed areas like ghettos, Little Sicily, and immigrant neighbourhoods. The farther you move from these places the better the homes and economic level of the inhabitants are (but longer the commuting time) until you arrive at the urban limit where you only have isolated houses and bungalows used by commuters.

This model is applicable to the formation of sprawl in developed countries as most urban sprawls begin with the search for better homes away from the city centre believed to be more congested and polluted; resulting in low density or scattered developments at the suburb (at least initially). The model divides a city into six concentric zones:

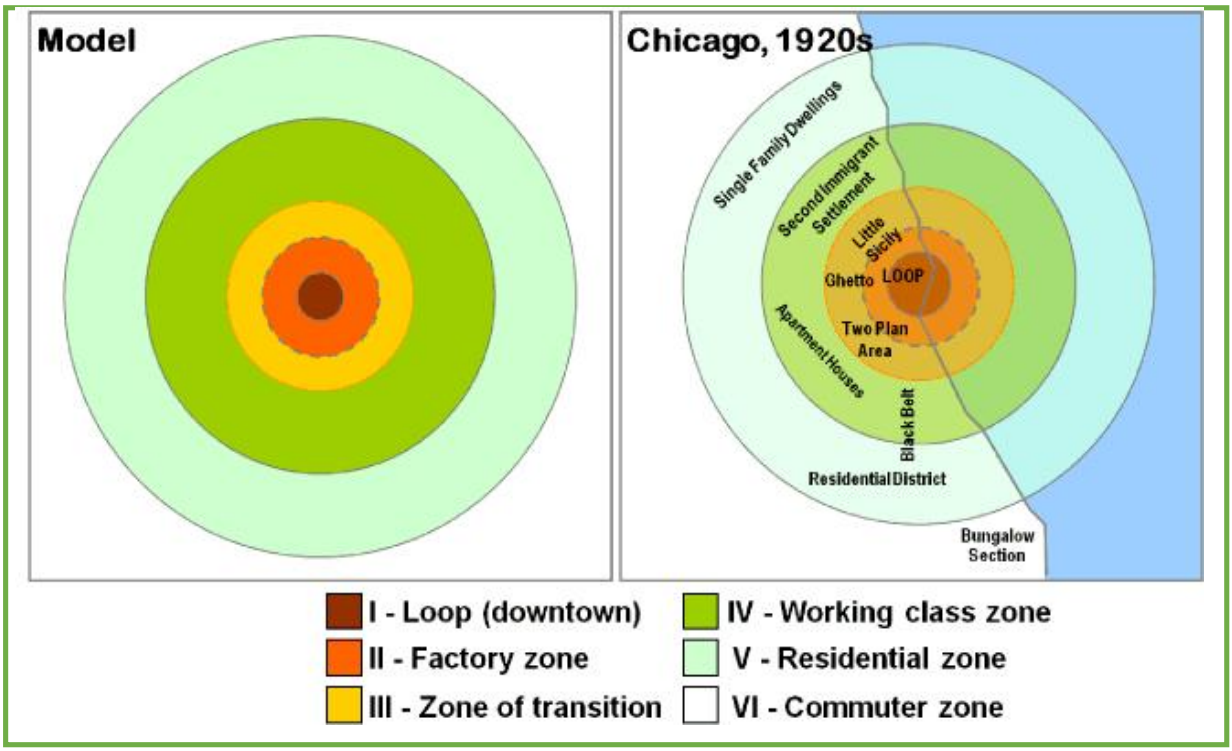
- **Zone I**: Central Business District (CBD).
- **Zone II**: Factory zone with adjacency to the CBD.
- **Zone III**: Zone of first-generation immigrants, characterised by low housing qualities.
- **Zone IV**: Residential zone, mostly of second-generation immigrants.
- **Zone V**: Zone of higher quality housing.

- **Zone VI**: Suburbanized high-quality housing with high commuting costs.

Burgess (1925) defined urban growth as '*a process of expansion and reconversion of land uses, with a tendency of each inner zone to expand in the outer zone'*.
The criticisms of the model include:

- It is too simple and not applicable in recent time
- Its applicability is limited to American cities as development in other cities, even Europe, did not follow the model. Similarly, Alade (2012) observed that pattern of growth in non-industrialised countries portrayed an inverse relationship between social class and distance from the city centre as the central core of the cities are occupied by the elite, while the poor live in the periphery. The emergence of this pattern of city development is brought about by the inadequate and undependable transport system that constricts the upper class to the inner core of the city where their workplaces are located, and the concentration of administrative, cultural and religious function of the city and the civic buildings to the city centre (Alade, 2012).
- Separation of place of work and residence assumption of the concentric model cannot be generalized all the time.

Despite the criticisms, the model's postulation of expansion and reconversion of land uses, remains valid in treating the concept of urban development which entails conversion of other uses (e.g. agriculture land) to residential use. Also, knowledge of this theory is important in order to understand the discourse on urban expansion processes.



Note: Loops numbered from the centre i.e. inner loop is I

Figure 2.6: The Burgess Concentric Urban Land Use Model, Burgess (1925)

b) Sector Theory

Homer Hoyt (1939) observed that concentric pattern was not generic to all city and he developed sectors theory which suggests that cities grow in pie wedge shapes, it suggests that zones of activities (industry, working-residence, etc.) extend outward from a central business district. He attributed the pattern to the actions of the upper class and transportation infrastructures. The upper class influences the location of objectionable uses, such as industry and the low-income. The theory has been criticized based on its "assumption that decisions about development are guided by rational choice and that economic actors outside the upper class play comparatively insignificant roles".

Despite the criticisms, this theory gives credence to the possibility of settlements' expansion in sectors towards the periphery and existence of classes (such as income), making it relevant in this study which aimed at identifying the distribution of income group across the identified fringe zones as one of its objectives. Adalemo (1981) has earlier observed that the sector form of arrangement is evident in the ecological evolution of Lagos city. Although not all the areas of the Lagos metropolis possess the structural attribute of the sector theory formation, specific sectors evident in the pattern of developed land use in Lagos Metropolis lay credence to the postulation of this theory. Findings of this study are expected to reinforce such existing knowledge or provide the existing situation in the study areas.

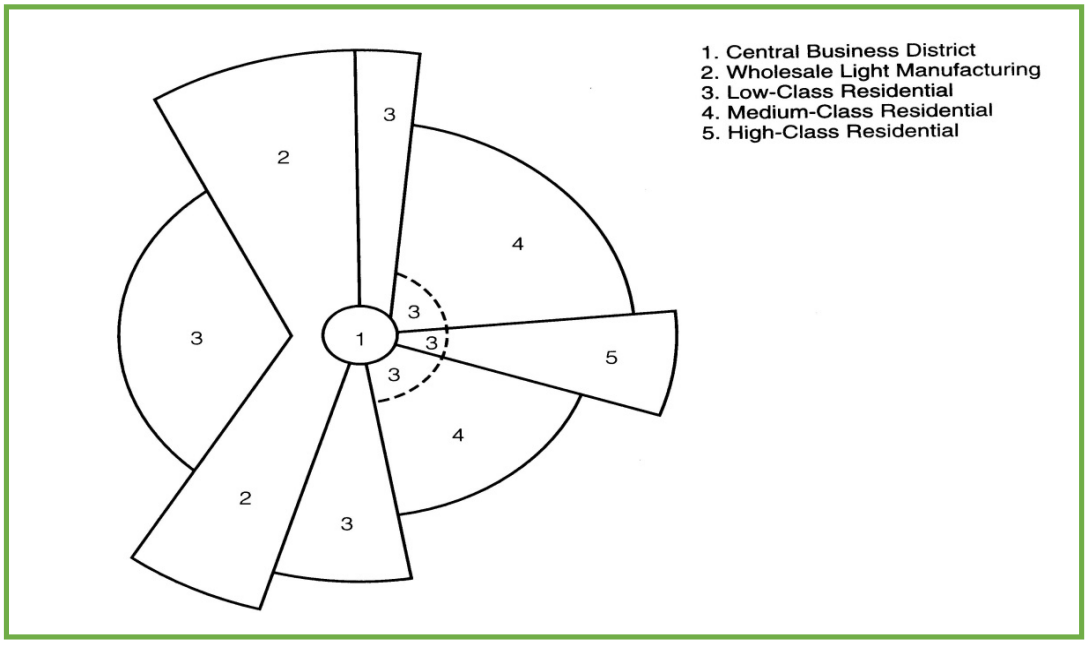


Figure2.7: The Sector Theory of Urban Land Use Model, Homer Hoyt (1939)

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Research Design

The study aimed at exploring land acquisition process and its effects on urban expansion across the metropolitan fringe of Lagos in Nigeria. To accomplish the aim, mixed methods of data collection and analysis were deployed. Social Area Analysis was used at first stage to examine residents' characteristics across the metropolitan fringe and this was followed by examining the relationship between these variables and the pattern of expansion. Since urban expansion involves trend analysis from the past to present, historical research and Cross-Sectional Design were employed using general survey research method and Geographical Information System (GIS) analysis techniques. This involves analysis and estimation of land use and land cover (LULC) changes of Lagos metropolitan fringe using remote-sensed and survey data. The historical research design involved the use of secondary sources and a variety of primary documentary evidence (De Vaus, 2001, 2016). Survey research method allows usage of varieties of data which improves internal reliability (Julian, 1978).

Secondary data were used to complement primary data in the analysis. The data were analysed to measure and compare the cause-effects of urban expansion in the delineated fringe areas. Statistical methods used include descriptive and inferential analysis. Descriptive methods include statistical commentary, tabulated and graphical descriptions to summarise characteristics of respondents, depict time series analysis and relate certain characteristic inherent in the study areas. Inferential statistics used in the analysis include Chi-square, Analysis of Variance (ANOVA) and logistic regression.

3.2 Secondary Data and Source

Secondary data were obtained from textbooks, research reports published in journals related to urban expansion and fringe areas. Masterplans of Lagos State, Lagos Metropolitan Masterplan (1980-2010), Regional Masterplans of the state and Model City Plans were explored. Existing relevant data on efforts of governments (federal, state and local) on urban management and efforts at mitigating negative effects were sourced from the

Ministry of Physical Planning and Urban Development, Ministries of Environment, Transportation, and other state agencies including Lagos State Waste Management Authority and affected local government areas' offices. In addition, relevant maps were obtained from Survey Department of the Land Bureau in the Ministry of Lands and the Directorate of Land Information Systems in the Lands Bureau. These include the acquisition map of Lagos which was obtained in CAD format and converted to format appropriate for analysis. Population data were obtained from different sources including the National (and state) Population Commission publications. Lagos Street Map and Google map were used for sampling and delineation purposes.

Land Use Act of 1978 and Physical Planning laws that are applicable in the study area, which include Lagos State Building Regulations, 1986, 2005, 2010 and other National Urban Development Policy among others were consulted.

In addition to maps from the GIS Centre of Lagos State Physical Planning and Permit Authority, Landsat imageries were used. Digital Elevation Model (DEM) was obtained from relevant websites (including https://lpdaac.usgs.gov/) for the purpose of interpretation, lineament extraction and analysis of the dynamics of urban expansion and effects with Geographic Information System.

3.3 Primary Data and Sources

Sources of primary data include sample survey, direct personal observations and oral interviews of key personalities that have knowledge of the metropolis. Instruments used in sample survey include a set of questionnaire administered to randomly selected residents of the study areas (Appendix I). The questionnaire focused on socio-economic characteristics and activities of the residents, their cultural and environmental relationship (including their involvement in planning-related activities) and perceptions. The questionnaire was structured to obtain data on:

(i) the people, such as age of respondent, income, sex educational status; and their places, these include information on mode of land acquisition, house tenure, household size, and so on.

(ii) where they do their shopping, their place of work and means of commuting.

(iii) attitude, opinions and beliefs.

(iv) existing physical infrastructure and their accessibility such as access to safe water, sanitation, secure tenure, house construction materials, schools within

neighbourhood, health facilities, roads and their interconnectivity, facilities for physical activity, etc.

The questionnaire comprised closed and open-ended questions (to obtain detailed responses or information where necessary). Other instruments used include structured interview for selected individuals, government parastatals and relevant institutions.

3.3.1 Sample Population

Questions were designed to capture variables related to land acquisition procedures, socio-economic, housing and building environment, population structure and distribution across the fringe, the effects of land acquisition process on expansion and the physical development. Data were collected from residents on the fringes, using the questionnaire, administered within selected communities in the study areas (Table 3.1). Browder *et al*. (1995) and Banu and Fazal (2013) methodologies were adopted in the process of identifying the communities that constituted the sample population from where samples were taken. Potential neighbourhoods were defined as all identifiable, contiguous, residential clusters within Lagos metropolitan boundary and less than 5km away from the metropolitan boundary with some adjacency to undeveloped land. It included areas witnessing expansion and parts of their adjacent areas where expansion was relatively consolidated. These include parts of Ojo, Alimosho, Kosofe, and Eti-Osa Local government areas. Sampled areas were defined using observable boundaries such as state and metropolitan boundaries, streets and physiographic features such as waterways.

Communities (of various sizes) were identified with the aid of digital maps, preliminary survey and historical facts from residents and literature. Communities within the delineated area include Ilogbo-Elegba, Isasi, Otto, Ijanikin [in the west (within Ojo Local government area)]; parts of Akesan, Ayobo, Ishefun, Egan [to the north-west (within Alimosho Local government area)], Ogombo, Langbasa, Mopo-Akinlade, Mopo-Onibeju, Sangotedo [in the east (within Eti-Osa Local government area)]; and Agiliti, Ajelogo, Kara/Channels TV, Isheri North, Owode, Ajegunle [in the northeast (within Kosofe Local government area)]. These settlements are twenty-two (22) in number as itemized in Table 3.1 and a total number of 6,041 buildings were identified in 2016 using imagery of Lagos State coupled with ground-truthing through preliminary reconnaissance of the areas. All 6,041 buildings

(mainly residential) within settlements in the delineated fringe settlements (Table 3.1) constituted the study population used for analysis in the study. However, only residential buildings were sampled at random. Selected areas have witnessed development in less than twenty years and are still experiencing expansion and densification.

Table 3.1: Delineated Areas and Number of Buildings sampled

Delineated Sub-regions	Settlements	No. of buildings		Sample proportion (20.3% of buildings)	
East (Lekki – Epe expressway)	Badore	466		95	
	Langbasa	316		64	
	Mopo- Akinlade	118		24	
	Mopo Onibeju	84		17	
	Sangotedo	176		36	
					235
		1160			
Northeast (along Ikorodu Road/Lagos-Ibadan axis)	Agboyi	215		44	
	Agiliti	209		42	
	Ajelogo	103		21	
	Erunkan	349		71	
	Maidan	266		54	
	Owode-Elede	216		44	
	Channels TV/Kara	659		134	
	Isheri North	350		71	
			2,367		480
Northwest (Igando/Akesan axis)	Akesan	211		43	
	Ayobo	303		61	
	Ishefun	245		50	
	Egan	215		44	
	Suberu Oje	118		24	
			1,092		221
West (Lagos - Badagry axis)	Ilogbo-Elegba	276		56	
	Isasi	256		52	
	Otto	397		81	
	Ijanikin	493		100	
			1422		288
Total		**6,041**		1,225	

Source: Author's Fieldwork, 2016

3.3.2 Sample Size

Generally, the acceptable sample size for research depends on the research type (Gay and Diehl, 1992). A minimum of 10% of the sample frame is suggested for descriptive research. This may be increased to 20% for small population while a minimum of 30 subjects is required to establish a relationship in correlational research. The size of the population is inversely proportional to the required sample size (Gay (2003). Neuman (1991) justified this by arguing that the returns on accuracy for sample size shrink as the population size grows. While 100% survey was recommended for populations of 100 or less, Yusuf (2003) opined that about 30% would provide the required accuracy for less than 1,000 population and about 10% for a moderately large population of about 10,000.

Krejcie and Morgan (1970) also suggested a formula for determining the required sample size of a given finite population. Hashim (2010) confirmed its applicability to any defined population.

It is represented as:

$$\mathbf{n} = \frac{x^2 \text{ X } N \text{ X } P(1-P)}{(ME^2 \text{ X } (N-1)) + (x^2 \text{ X } P \text{ X } (1-P))}$$

Where:

n = sample size

x^2= Chi-square for the specified confidence level at 1 degree of freedom

X = multiplication sign

N = Population Size

P = Population proportion (assumed to be .50)

ME = Margin of Error (*Krejcie and Morgan, 1970)*

Applying the above formula with a population size of 6,041 at 95% confidence and 5% margin error, the resulted sample size was 361 while a 2.5% margin error at the same confidence level of 95% produced 1225. To sample enough households with the aim of achieving a good representation (knowing that most buildings have multiple households), the 95% confidence interval at 2.5% margin error figure of 1225 was adopted and distributed proportionality among the selected communities as shown in Table 3.1. Seventeen (17) of the distributed questionnaires were not retrieved at the end of the survey leaving 1208 for analysis. The returned questionnaire (98.6%) was considered adequate for the analysis.

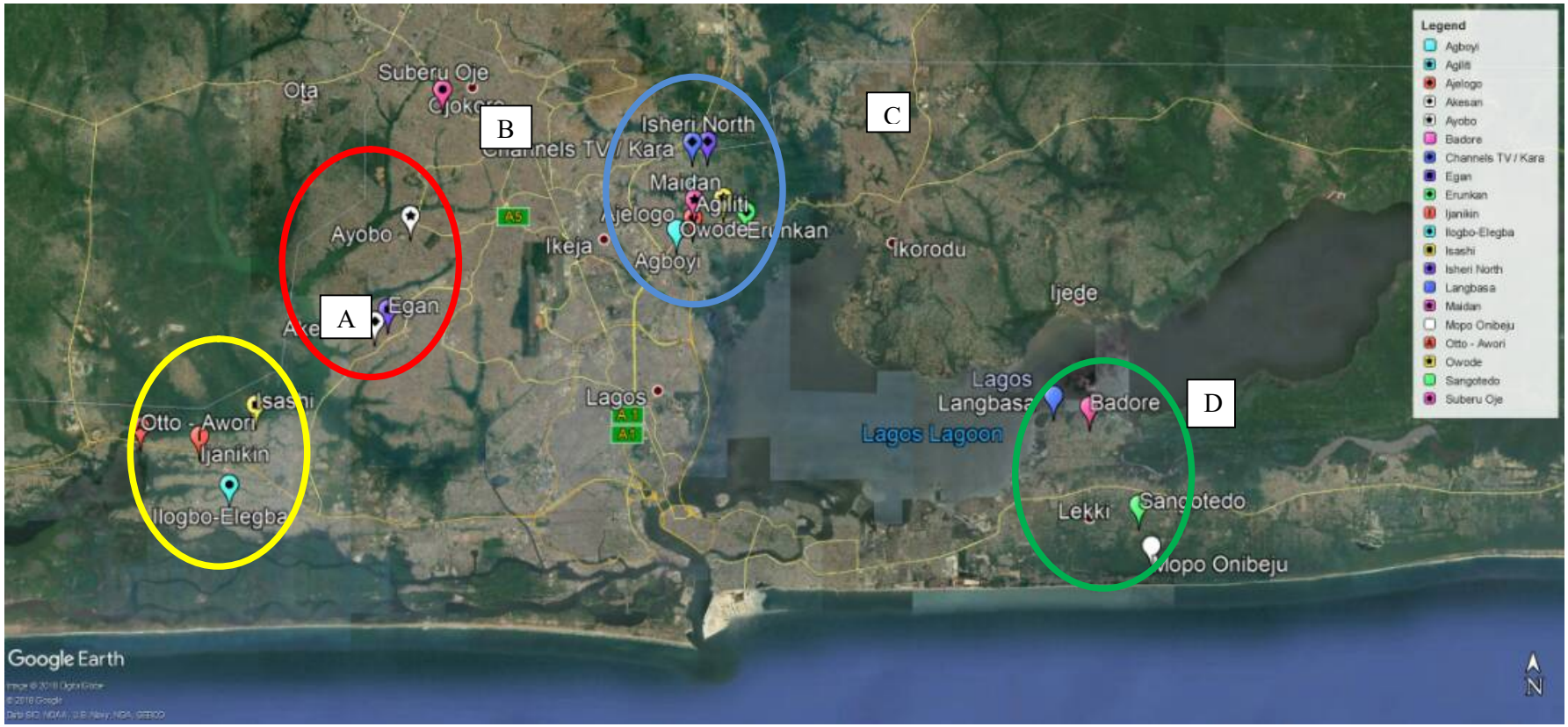
3.3.3 Sampling Technique

Using Multi-stage sampling technique, the study area was divided into west, northwest, northeast and east sectors from where settlements for sampling were selected (Figure 3.1). Further, the study adopted random sampling for the administration of questionnaire in the delineated fringe settlements. Out of 6,041 houses, 1225 households were sampled in proportion to size of the communities as shown in Table 3.1. The selection involved both 'desktop' and field operation. At the desktop level, houses in the study area were numbered on a good resolution map and Random Numbers Generator was used to randomly select the buildings to be sampled on the field. Thereafter, the researcher proceeded to the study areas and identified pre-selected houses with the aid of street maps. The questionnaire was then administered to one of the available head of households or their representative in each of the randomly selected building. Where there were no respondents in the selected buildings, or it happened to be non-residential, new samples were drawn as replacements. The questionnaire addressed socio-economic characteristics, physical and environmental quality, the type and access to services, modalities for land acquisition among others.

3.4 Interview

In dealing with the dynamics of urban expansion of Lagos Metropolis, this project borrowed from the methodology used by Forrester (1989:7) in studying the dynamics of the city of Boston by consulting *".....advisers who knew a great deal about cities from personal experience, not those whose knowledge came only from study and reading... people who had struggled with cities, worked in them, and knew what really happens."* To complement the survey, therefore, city managers who have practised in the state both in private and public sectors were engaged in personal in-depth interview for proper explanations on observed phenomena and intricacies of land acquisition and urban expansion in Lagos. Officials of the Ministry of Rural Development and Infrastructure, as well as Physical Planning Agency and other bodies involved in physical planning, were also interviewed concerning the policy and strategies guiding land acquisition and the city's expansion.

Selected key informants from each of the delineated area were interviewed about the historical development of their community. The informants were selected using criteria such as age (not less than 50 years), willingness to provide information, length of stay (minimum of 15 years residency in the community), knowledgeable about land acquisition and urban expansion issues (Haregeweyn, *et al.*, 2012). Personal in-situ observations and photographing were also employed in visualisation of pattern of development and existing situations.



NOTE: A=East; B =Northwest; C=Northeast and D=East Sector
Figure 3.1: **Sample Zones and** Settlements Sampled
Source: Google Map

3.5 Data Analytical Techniques

Different statistical methods were used in this research. These include descriptive and inferential statistical analysis. Descriptive statistics include tabulated and graphical description and statistical commentary to summarise characteristics of respondents, depict time series analysis and relate certain characteristic inherent in the study areas while inferential statistics include ANOVA and regression analysis.

Statistical Package for Social Scientist (SPSS v 22) software was employed to analyse and present socio-economic data among others in readable form. Semi-Automatic Classification Plugin (SCP) was used as add-on to Quantum GIS (QGIS) in combination with ArcGIS to compute temporal change and specific transitions with a view to identifying changes in the study areas. The population growth rate compared with land consumption rate was also examined using GIS methods and population figures from the National Population Commission (NPC) to establish patterns of expansion in relation to population growth. Table 3.2 summarises the analytical techniques used in the study.

Table 3.2: Summary of Data and Data Analysis, Hypotheses and Testing Techniques

Objectives	Hypothesis	Data required	Analytical technique	Theoretical underpinning
i). Access the socio-economic characteristics of residents of Lagos metropolitan fringe	There is no significant difference in socio-economic composition of residents across the metropolitan fringe	Socio-economic variables acquired through surveying (age, gender, marital status, place of birth, language, education, occupation, income level	Respondent's socio-economic data were captured and descriptively analyzed across the fringe zones. The income was used as sole variable to classify their response into low, middle and high income. This was further used to test the hypothesis for significant difference among the four fringe zones using Analysis of Variance (ANOVA).	Social Area Analysis
ii examine the land acquisition process in Lagos Metropolis		Survey to obtain information on access, process, sources and procedure of by which respondents obtained their developed land	Contextual analysis	Urban Land Governance
ii. determine the extent and pattern of urban expansion across the study area from 1984 to 2016;	There is no significant difference in the pattern of urban expansion across the metropolitan fringe of Lagos	Administrative boundaries shapefile, (metropolis, local government), Landsat imageries, Population censuses	Land use land cover analysis of classified imageries to determine and quantify the extent of urban expansion. Used Urban Land Expansion Index to compare patterns of expansion across the fringes. Comparisons among the different pattern that expansion displayed (compact or sprawling, polycentric connected cities, etc.).	Sector theory, Concentric theory
iii). Examine the factors of urban expansion across the metropolitan fringe of Lagos;	There is no significant variation in effects of factors of urban expansion across the metropolitan fringe	DEM of the area (for slope /elevation analysis) Population data, Lagos acquisition map, infrastructure data (Road shapefile) of study area	Descriptive analysis of factors such as population, physical characteristics of the fringes, infrastructure (distance to road), and government policy. The factors were statistically tested using logistic regression to verify factors' contribution across the fringe.	Distance Decay Theory; Theory of Relative Urban Attractiveness
iv. analyse the varying effects of urban expansion dynamics on the physical development of Lagos metropolitan fringe	Effects of urban expansion dynamics on physical development do not vary across the metropolitan fringe of Lagos	DEM of the area, Population data, Lagos acquisition map, infrastructure data (Road shapefile) of study area, Google clip and photographs	Descriptive and contextual analysis. The factors were statistically tested using logistic regression to verify difference across the fringe.	DPSIR framework

Author's construct, 2016

3.6 Assessment of Socio-Economic Characteristics of Residents

Competition among groups for space utilisation and dynamics of integration or assimilation was identified by Le Gales (2015) as central to understanding the dynamics of metropolis and remains a central mechanism to explain urban change. He also identified the knowledge of how this competition is regulated and the groups in the competition as essential. Therefore, in analysing the pattern and factors of expansion across the fringes, composition of residents was first examined using Social Area Analysis (SAA) variant to establish the competitors. SAAs, as propounded by Shevky and Williams (1949), studied how neighbourhoods differ in terms of family patterns, social class, and race or ethnicity. It is a technique for constructing indices that summarize the residents and residential characteristics of small areas within cities.

The interpretive frame of reference suggested by Shevky proposes that as the social organization of society increases in scale, at least three basic forms of social differentiation develop. These are social rank (also known as socio-economic status dimension), urbanization (also termed "family status" dimension) and segregation or ethnic dimension. Originally, these three indices were composed of seven individual variables of occupation, education, and rental levels for social rank index (with high rank being indicated by high proportions of non-manual workers, high proportions with long formal education and high rental levels). The next three variables - fertility, women in labour force (WLF) and single-family dwellings unit (SFDU) – are urbanisation index (High urbanization is indicated by low fertility, high WLF ratio and low SFDU) while segregation is a variable on its own, measuring concentration of ethnic groups in a section of a city in relation to their proportion in the urban area as a whole. Using the technique, urban social areas were formed by aggregating units on the basis of their similarity with respect to Shevky's three basic indexes. The scope of the concept is not restricted to the urban area. The three constructs are effective to summarise the total society as well as its cities and could be used for comparative study of different areas at one point in time to determine 'recurrent space-time-value patterns' (Robson, 1969).

Variables that were captured in this section are gender, age, marital status, educational status, occupation, income level, place of birth and languages. The variables were

descriptively analyzed as a single fringe and disaggregated into the study zones. ANOVA was finally used to test variation in income across the zones.

3.7 Measuring Growth Pattern and Dynamics in the study area

Pattern of growth was studied using image processing and GIS-based method. GIS was used to analyse and compare Landsat Imageries of the study area for 1984, 2000 and 2016; this was complemented with personal observations. The Landsat datasets were downloaded from usgs.gov website (available from the U.S. Geological Survey) for land use classification to identify changes over periods of time. Processing and supervised classification of data were done using ArcGIS and SCP in Quantum GIS (QGIS). Land cover in the metropolis was broadly divided into:

1. Built-up (residential commercial, industrial, institutional, etc.);
2. Vegetation (all forms of vegetation including different forests and shrublands);
3. Water (lagoon, creeks, rivers and other water bodies)
4. Bare soil (open soil waiting for development or fallow land, and other exposed soil).

The methodology involved in studying the growth pattern can be broadly divided into data acquisition, image processing and spatial change analysis

3.7.1 Data acquisition

The study used Landsat images as data in measuring and detecting spatio-temporal urban expansion from 1984 to 2016. Landsat data (which falls in the category of medium resolution (10-100m) satellites) have been widely used for urban area analysis since 1972 when it was launched because it has wide coverage and is freely available. Landsat archive data with its long record allows detection of long-term urban expansion (Fu, 2013). Landsat 5, 7 and 8, acquired at different periods of 1984, 2000 and 2016 (18/12/84; 6/2/2000 and 10/02/2016) by three respectively Landsat imaging sensors - Multispectral Scanner (MSS), Thematic Mapper ™ and Operational Land Imager (OLI) were used for land cover classification. Landsat images are stored in tiles and because of the difference in the imaging sensors' swatch, the study area spans two tiles (Row/Path: 191/055 and 191/056) in the Worldwide Reference System (WRS) for Landsat MSS 1984 and Landsat ETM^{+} 2000 while a single tile (Row/Path:

191/055) of Landsat8 OLI 2016 covers the study area. Therefore, two tiles were mosaicked for each of 1984 and 2000 images before the study area was clipped for analysis using vector layer of the area obtained from the Ministry of Land and Survey of Lagos State and GADM database of Global Administrative Areas. Landsat MSS has courser spatial resolution than TM/ETM+ and OLI images. Landsat MSS 1984 has 80 metres resolution (but processed to 60 m) while Landsat 7 and 8 have 30 metres resolution; hence, MSS 1984 image was resampled to 30 metres resolution to achieve uniformity with the two other images. The Multi-temporal Landsat data were obtained from earth explorer website.

Landsat 5 MSS has four bands while Landsat 7 and 8 have eight and eleven bands respectively all carrying reflectance information for the raster cells from different parts of the electromagnetic spectra. The electromagnetic spectrum (useful for distinguishing different features) differs for each band. Aside from urban planning and monitoring, the Landsat is useful in other fields like forestry, agriculture and geology, with different choice of spectral bands of Landsat satellites to discriminate different types of land cover. Three of the bands measure reflectance in the visible light (one each in the red part, the green part and in the blue wavelengths (RGB)). The RGB image can be used to lineate between some of the land cover types but it would be very difficult to distinguish between e.g. different types of forests. However, the satellite image consists of much more information that can be used for this purpose.

3.7.2 Image processing

Processing and classification of land cover were done using Semi-Automatic Classification Plugin (SCP) in QGIS environment to identify the following major land cover classes:

(1) Built-up (all categories of developed land);
(2) Vegetation (all forms of vegetation including different forests and grasslands);
(3) Water (creeks, lagoon and other open water bodies
(4) Bare soil (open soil waiting for development or fallow land and other exposed soil).

Processing of the image for classification was in three stages – pre-processing, processing and post-processing.

3.7.2.1 Pre-processing

Multi-temporal Landsat data acquired with Multispectral Scanners with different characteristics were used for land use change classification in the project. Pre-processing was involved to enhance and ensure that all images used for processing have the same spatial parameters and reference system (projection, cell size, spatial extent, spatial resolution and rows and columns) towards improving the classification results. The pre-processing includes conversion of raster bands from Digital Numbers (DN) to the physical measure of Top of Atmosphere (TOA) reflectance and simple atmospheric scattering correction using the Dark Object Subtraction 1 (DOS 1) method. Converting the images to Top of Atmosphere (ToA) reflectance from Digital Numbers (DN) eliminates the problems of comparing data with different levels of quantization (MSS with a 6-bit system (64 brightness values), TM / ETM+ and OLI data in 8-bit system (256 brightness values).

Conversion from DN to ToA is usually achieved by first converting the DNs to radiance thereafter, conversion of radiance data to ToA reflectance. The process can be cumbersome but was automated in SCP with option for DOS1 to implement image-based atmospheric correction which can remove likely atmospheric contamination. MSS 1984 image was resampled to 30 metres resolution using arc toolbox in ArcGIS to achieve the same spatial resolution with other Landsat data. All other layers were also projected to UTM WGS-84 datum

3.7.2.2 Image classification

In order to detect LULC change dynamics and observe urban expansion pattern into the fringe, supervised classification was performed for the study area with Landsat dataset. Land cover classification can either be through unsupervised or supervised methods (Campbell, 1987). Unsupervised classification involves the use of spectral values to identify features in an image (Parece *et al*., 2015). It uses algorithms such as ISODATA (Iterative Self-Organizing Data Analysis), K-means clustering etc., to identify spectral clusters from image data. It is commonly used when there is no prior knowledge of the classes or study area.

Supervised classification is used where there is adequate knowledge of the area of interest. It required predefining of classes. Thematic maps are generated based on the signatures obtained from the training samples. The steps involved in the supervised

classification are: creation of a multiband raster, production of training samples, developing and editing of the signature file, and the final classification

Supervised classification of data was done with SCP Plugin, available in Quantum GIS (QGIS); therefore, all the above steps were executed seamlessly. Multiband rasters were created within the pre-processing window of the SCP plugin. Composite bands are useful in creating false colour composites for easy identification of features. Therefore, false colour composites 4,2,1; 4,3,2, and 5,4,3 for the three years1984, 2000 and 2016 respectively, were used.

Based on the knowledge of the study areas, training samples were created for the intended classes (built-up, water, vegetation and bare soil). With the creation of the training shapefile, for the Region of Interest (ROI) collection, the signature list file was created. SCP automatically calculates the spectral signatures using the pixel values under each ROI.

Fu (2013) observed that accurate thematic maps are important for high-quality change detection results and the choice of an appropriate classification technique is critical to generate accurate classification maps. For the final classification, the maximum likelihood (ML) classifier was used because it has been adjudged to provide satisfactory LULC classification results in urban area studies using Landsat data (Rogan & Chen, 2004; Deng *et al*., 2009; Afify, 2011). The classified maps for the three years were assessed and the changed pixels computed and converted to hectares and square kilometres for the assessment of dynamics of urban expansion across the fringe.

Accuracy assessments of the land cover classifications were conducted with error matrix.

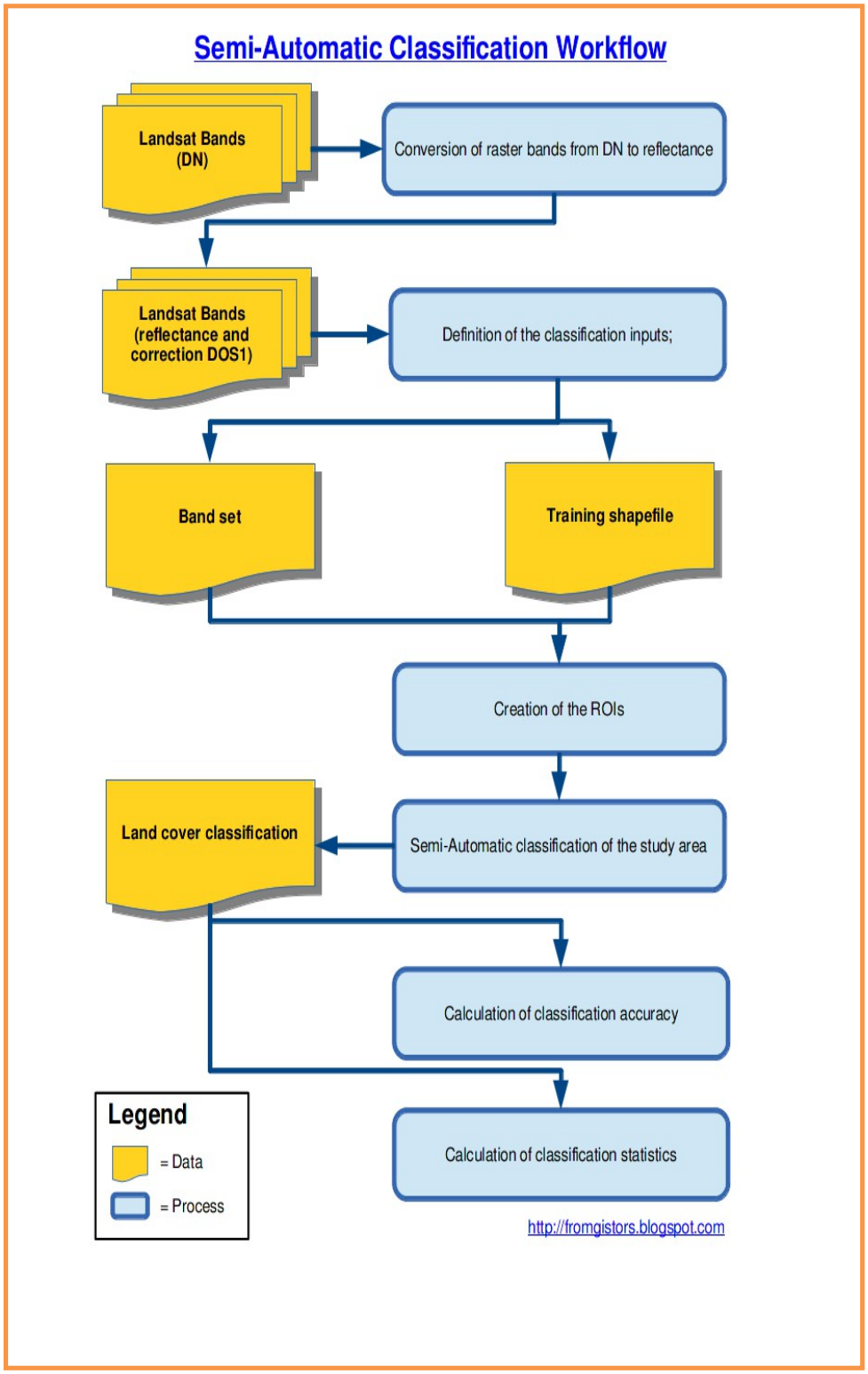


Figure 3.2: Process of Image Classification

Source: Congedo, 2013.

3.7.3 Spatial Change and Pattern Analysis

To examine changes and pattern of expansion of the metropolis on the metropolitan fringes of Lagos from 1984 through 2000 to 2016, spatial change analysis was conducted on the classified imageries. Indices commonly used for computing intensity were used to compare rate of expansion across the fringe. They are Urban Land Expansion Rate (UE) and urban expansion intensity (UI) (Chen *et al*., 2014). UE measures average expansion while UI quantifies the average expansion intensity. They are useful for comparing urban land expansion in different time periods (Chen *et al*., 2014). The two indices are similar but while UE uses "total built area of the initial year" in the normalizing factor, UI uses "total built area of the ending year"; UE is greater than UI (Chen *et al*., 2014) and their values are expected to decrease as urban expansion increases. The two indices were computed using the following equations (Zhu & Li, 2003; Wu, Zhang, Mao, & Wu, 2008):

$$UE = \frac{U_b - U_a}{U_a} X \frac{1}{T} X 100\%$$

Where

U_a = area of land-use type at the beginning of the study period

U_b = area of land-use type at the end of the study period

T = study period

$$UI = \frac{U_b - U_a}{U_b} X \frac{1}{T} X 100\%$$

Urban Land Expansion Rate (UE) was computed from the classified data (map). Subsequently, the derived change for each time interval was compared with each other and the uniform rate of urban expansion (uniform intensity [UI]). The UI is the rate of change for the entire time extent of the land change analysis (Aldwaik and Pontius 2012) i.e. the expansion rate for the circa 1984-2016.

Two-period intervals (1984 – 2000 and 2000 - 2016) were considered in the study.

Using Aldwaik and Pontius (2012) scale, if the UE in a period interval is less than the rate for the entire study duration rate (1984 – 2016) then the UE is slow; else; it is fast.

Estoque and Murayama (2016) however, considered two category levels (CL) to be too broad and expanded the scale to six CL of very slow, slow, medium-slow/medium-fast, fast, and very fast using the equation:

$$CL\ (\%) = \frac{UE - UI}{UI} \times 100$$

Where CL is the category level, ACI is urban expansion rate for a period interval (e.g. 1984 -2000 and UI is urban expansion rate for the entire period (1984 – 2016).

The grading of the proposed land change intensity scale is displayed in Table 3.3.

Table 3.3: Land Change Intensity Category Levels

	CL value (%)	Class
1	<-60	Very slow
2	-60 - < -20	Slow
3	-20 – 0	Medium slow
4	>0 – 20	Medium fast
5	>20 – 60	Fast
6	>60	Very fast

Source: Estoque and Murayama (2016)

3.8 Factors or Driving Force of Urban Expansion and Variables

There are many factors of urban expansion and pattern in literature and their selection varies for different studies (Geneletti, 2013; Wang and Maduako, 2018). They are however generally classified into push and pull factors. For this study, list of assumed factors was based on prevalent theories (Lambin *et al.,* 2001) and knowledge of the study area. Factors relevant to the study area considered are demographic or population, physical characteristics (i.e. the inherent characteristics of site), infrastructure, government policies and socio-political factors. The factors were treated separately, and inferential statistics conducted to ascertain their effects and contributions to the emerging pattern over the study periods.

3.8.1 Population of the study area

Population is a common factor of urban expansion in literature. However, as earlier discussed in chapter one of the thesis, the population of Lagos State is controversial and not available at the right interval of ten years. In addition to this, none of the landmark years for this project (1984, 2000 and 2016) is a census year. Therefore, their population figures were projected from the census population of 1991 and 2006 that remains the official National Population Commission figures. For 1984, exponential decay/growth formula was used to compute 1984 population from 1991 census population at a decay rate of 5.6% (UN, 2000; Braimoh and Onishi, 2007). The Exponential growth/decay formula is expressed as:

$P(t) = P_0 \times (1 + r)^t$, *where*

$P(t)$ = Population value at desired time.
P_0 = initial population.
r = growth rate when r>0 or decay rate when r<0, in per cent.
t = time intervals.

Similarly, the 2016 population was projected from the year 2006 population census using the same formula at 3.2% (NPC) growth rate for the area. For the year 2000 population, 1991 and 2006 NPC population census were used to compute the annual growth rate for the period using the geometric model. Oshungade (1995) affirmed that this method was used by NPC to estimate the population of states in Nigeria from 1988 to1990 before the 1991 census

$r = (P_2/P_1)^{(1/N)} - 1$

where
r = annual growth rate
$\mathbf{P_1}$ = initial population figure
$\mathbf{P_2}$ = population figure at the second census
N = time interval between the censuses

Intercensal (between two census periods) population of 2000 was thereafter estimated using Postcensal (estimate after census) estimate from 1991 population, based on the assumption that yearly changes in population are equal.

The intercensal population model (Oshungade, 1995) is:

$$\mathbf{P=P_1 + (n/N)\ (P_2-P_1)}$$

where:
$\mathbf{P_1}$ = population figure at first census
$\mathbf{P_2}$ = population figure at the second census
N = intervals between the two censuses
n = number of years between first census and the date of the estimate (P)

Due to unavailability of lower-order census data, the analysis was done using local government boundaries which remained unchanged between 1984 and 2016

3.8.1.1 Exploring Population and Pattern of Urban Expansion in the Study Period

There are several attempts at categorising development patterns across landscapes with combination of various measures (Galster *et al*., 2001; Schneider and Woodcock, 2008; Angel 2011; Ottensmann 2017). However, one common variable to all the measure is density (housing or population density) in various forms. Ottensmann (2017) described density as the most basic and most familiar measure of the urban pattern. The objective was to explore a set of readily understandable measures of urban patterns that capture the important ways in which variation in dynamics of urban expansion influenced development patterns across the fringe. Relationships between urban expansion and increase in population were measured using the following indices:

(i) Land Coefficient Ratio (LCR) or Land Consumption Rate
(ii) Land Absorption Coefficient (LAC)
(iii) Density; and
(iv) Population growth to urban expansion (PU)

i) **Land Coefficient Ratio** measures the degree of urban expansion (Yeates & Garner, 1976). It measures a city's compactness and progressive expansion. It is expressed as:

$$LCR = A/P$$

where:
A = areal extent of study area (hectares);
P = population.

ii) **Land Absorption Coefficient** is a measure of consumption of new urban land by each unit increase in urban population, it is given as:

$$LAC = (A_2 - A_1)/(P_2 - P_1)$$

where:
A_1 and A_2 are the areal extents (in hectares) for the beginning and ending years; P1 and P2 are their respective populations (Yeates and Garner, 1976). The formula used to calculate predicted population of the required period is:

$P = P_b(1+R/100)^n$ (Swanson & Siegel, 2004):

where:
P = Projected population;
Pb = Population of the base year;
R = Population growth Rate;
n = Number of years.

iii) **Urban population density (PD)** is a measure of total urban population per total built-up area in a year (table 3.4).

iv) **Population growth to urban expansion ratio (PU)** measures urban compactness (Dempsey, 2010). Seema Dave (2010) among others adjudged higher-density developments as a means to achieving sustainable city growth. PU was calculated as the ratio of PR to UE

i.e. $PU = \frac{PR}{UE}$ *where PR* = population growth rate; and
UE = urban expansion rate (See Table 3.4)

Decision: Urban expansion is considered as sprawl if the resulting value is less than 1 and compact if greater than 1, the higher the value, the higher the level of compaction

PR was calculated for each of the required units of the metropolis using available NPC population figure of 1991 and 2006 projected as required (see table 3.4).

Urban expansion for the year 2030 was estimated based on the current rate of expansion and 2030 population were projected from 2006 census to project the LCR and LAC

Table 3.4: Indices for the computation of urban expansion and population growth

	Index	Equation
1	Average Annual urban expansion (UE)% *Schneider and Woodcock (2008), Seto et al. (2011), Xu and Min (2013)*	$UE = \frac{U_b - U_a}{U_a} X \frac{1}{T} X 100\%$ Where U_a is total built-up area at the initial period, U_b is total built-up area at the final period and T is the time period
2	Average Annual population growth rate (PR)%	$PR = \frac{P_b - P_a}{P_a} X \frac{1}{T} X 100\%$ Where P_a is total population at the initial period, P_b is total population at the final period and T is the time period
3	Population growth to urban expansion (PU)%	PR UE
4	Urban population density (PD) person per km^2	PD = P*i*/U*i*; where P is the urban population and U is the built-up area in year *i*
5	Population projection	$P(t) = P_0 \times (1 + r)^t$ where: Pt = Population of the desired time period; P_0 = Population of base year; r = growth rate; t = time in year in number (e.g. 1, 2, 3, . . ., n).
6	Land coefficient ratio (LCR	*LCR = A/P* Where: A = areal extent of the city in hectares; P = population.
7	Land absorption coefficient *LAC = $(A_2 - A_1)/(P_2 - P_1)$*	***LAC = $(A_2 - A_1)/(P_2 - P_1)$*** where: A_1 and A_2 are the areal extents (in hectares) for the early and later years; P_1 and P_2 are population figures for the early and later years respectively

Source: Sajjad & Iqbal, (2012), Chen *et. al*., (2014) and author's compilation

3.8.2 Physical Characteristics of the Studied Area

Physical characteristics have been acknowledged among the important factors of urban expansion (Braimoh & Onishi, 2007; Ye, Zhang, Liu, & Wu, 2011). Elevation in the metropolitan Lagos ranged between -23m and 75m above mean sea level (AMSL). This implied that parts of the metropolis were below the mean sea level (-23m), mostly water bodies, while parts of the northwest fringe were as high as 75m above mean sea level and it spans areas northwest of Lagos - Abeokuta expressway from Ayobo – Ajasa Command Road in Alimosho Local government towards Agbara in neighbouring Ogun State. It is relatively free of water bodies and tributaries. The northwest fringe has the highest points characterized by buildable land that requires less investment than other areas. The zone was virtually devoid of water bodies and tributaries that characterized other areas, which could serve as a negative factor to development due to cost implications.

These physical characteristics (high elevation) in the northwest spread to the western part of the northeast which slopes towards the Ogun River on the east and Lagos Lagoon on the south to as low as 2m AMSL. The northeast was also constrained by its boundary with Lagos Lagoon, presence of Ogun River and its tributaries that made it unattractive.

Elevation in the west fringe ranged between -23m to 7m AMSL. Most parts of the sector were characterised by waterlogged areas and swamp forest. The western fringe stretches into the Ocean in the south and is crisscrossed by water bodies including Ologe River; it extends towards the Badagry sub-region which still contains largely untouched natural environments that are by-passed as a result of difficult terrain characterised by swampy ground conditions.

The eastern sector towards the Lekki sub-region was also characterised by similar physical characteristics of the western fringe (low mean sea level). It is sandwiched by water bodies (the Atlantic Ocean, Lagos Lagoon and several tributaries) and the entire area is below 3msl. The Metropolitan Master Plan (1980-2000) described the constraints in the area as such that prohibits continuous urban development.

3.8.2.1 Physical Characteristics and Urban Expansion

The terrain of the area in relation to urban expansion was examined using Digital elevation model. Like the Landsat data, DEM is provided in tiles (5 deg x 5 deg.) and available in GeoTiff format. The most globally available data (which was used in this study) was 3-arc seconds resolution (approximately 90m). It is a processed data from which no-data (holes where water or heavy shadow prevented the quantification of elevation, specifically over water bodies) problem has been eliminated (Jarvis *et al*., 2008). Absence of no-data regions improves the usefulness of DEM data (Jarvis *et al*., 2008). The properties of the downloaded tile, where the study area falls is presented in Table 3.5

Elevation of the study area was generated from the Digital elevation model (DEM) and was classified into nine classes. The classified values were later extracted into generated sample points with *Fishnet* in ArcGIS and used as physical characteristics variables for regression analysis.

Table 3.5: Characteristics of the Digital Elevation Model (DEM used

Product	SRTM 90m DEM version 4
Data File Name	srtm_37_11.zip
Mask File Name	srtm_mk_37_11.zip
Latitude min	5 N max:10 N
Longitude min	0 W max:5 E
Centre point	Latitude 7.50 N
	Longitude 2.50 E

Source: CGIAR - Consortium for Spatial Information (CGIAR-CSI), 2004

3.8.3 Infrastructure Development and Urban Expansion

Among the factors commonly used in the analysis of urban expansion is Infrastructure development. In this study, proximity to road was used as infrastructure variable. Road layer (shapefile) of the study area was secured and buffer zones created at multiple equal intervals of 100m to the major roads. Values in the buffer zones were extracted into generated sample points as infrastructure variables for analysis.

3.8.4 Policies and Urban Expansion

Compulsory land acquisition was used in this study as the policy factor. To this effect, land acquisition map of Lagos state was obtained from the Ministry of Physical Planning in Lagos. The map was converted to raster and reclassified into 0 and 1 for acquisition and non-acquisition area respectively. The values were extracted as policy variables for regression analysis.

Logistic Regression

Contribution of the factors to urban expansion of metropolitan Lagos to the fringe was examined with Logistic regression using the created layers of physical characteristics (elevation), proximity to infrastructure (distance to road) and government policy (acquisition) as predictors. Classified map of the fringe was reclassified into built (1) and un-built (0) to serve as the dependent variable. The reclassified land use map was then overlaid with other reclassified maps depicting the variability in biophysical conditions, nearness to road and other infrastructure (proximity) and government influence/policy (acquisition map) in the study area using GIS software. Subsequently, *Fishnet* in ArcGIS was used to create systematic point sampling at an interval of 1000 metres across the study area (see Figure 3.3). This yielded 581 points which were used to capture background features (elevation, proximity and acquisition status) of selected points using the *extract to point feature* in ArcGIS. The points were exported to excel file for regression analysis to further explore contribution of each factor to urban expansion across the fringe zones.

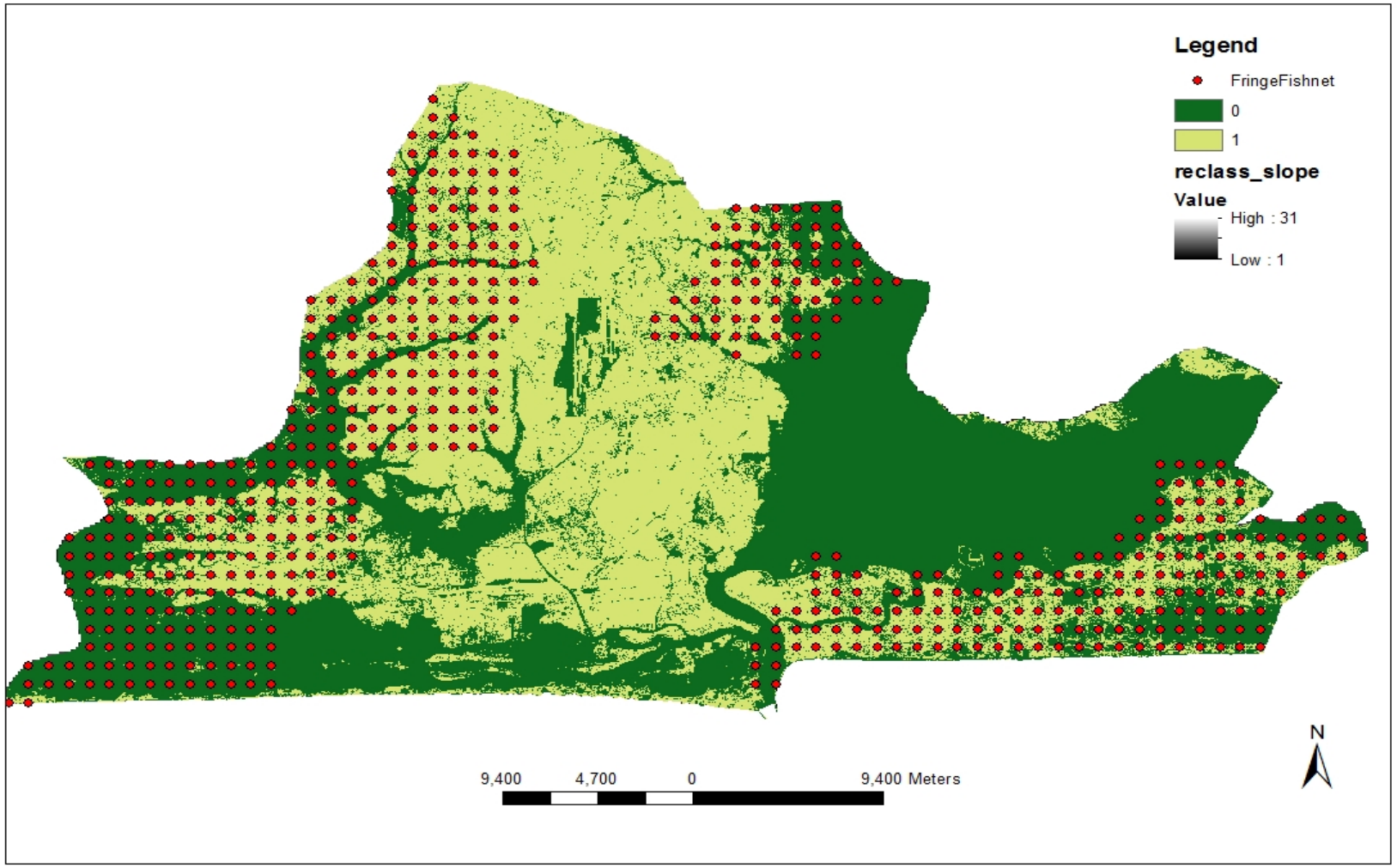


Figure 3.3: Sample Points for Extraction of Background Data for Regression Analysis

CHAPTER FOUR

4.0 CHARACTERISTICS OF THE RESIDENTS OF LAGOS METROPOLITAN FRINGE

4.1 Profile of Respondents

This section presents the results of the questionnaire administered to the fringe residents. Out of the 1225 copies of questionnaire administered, 1208 (98.6%) were returned for analysis.

The results showed that 48.5% of the respondents were males while 51.5% were females (Table 4.1). The higher proportion of female respondents could be attributed to the housekeeping role of women while the men fend for the family and were not likely to be met at home like the female. When disaggregated, the highest proportion of female respondents was in the northwest (61.5%) and eastern sector (62.1%), while male dominated the respondents from the two other sectors [northeast (51.9%); west (59.2%)]. It could generally be inferred from these results that most men worked outside the fringe community, which suggested that the level of socio-economic activities within the neighbourhoods (i.e. neighbourhood mix) was very low (highly residential) and insufficient to keep the men fully engaged. Therefore, they had to travel out of their dwelling area for their daily activities. This is in conformity with the general notion that most urban fringes are dormitories with concentration of residences. It confirms the existence of separate business zones (Burgess, 1925), or sectors (Hoyt, 1939) such as the Central Business District and factory zones within the city structure. Most fringe residents are employed in such zones or sectors away from their residences and interact through the urban transport infrastructure.

Results of data analysis showed that 8.3% of the respondents were less than 20 years old and the majority (88.4%) were in their active working age (20-60years), while 3.3% were above 60 years. This age structure, with only 3.3% above 60 years confirms growing suburbanized areas, contrasting core urbanized sub-areas expected to be characterized by a distinctive age structure with the elderly composing the bulk of the dependent population as

posited by Shevky and Williams (1949). Along the zones, more than 80% of respondents from each of the zones were within the active age bracket of 21 to 60 (non-dependents). None of the respondents sampled from the northeast and west was above 60 years. However, only 1.7% of the respondents from the east were above 60 years. The result further showed that none of the respondents from the northwest was less than 20years, while 16.5% were above 60 years. This relatively high percentage of old people from the zone (northwest) could be ascribed to the early development of the zone before others.

Result of marital status of respondents revealed that 38.4% were singles while 47.5% and 6.0% were married and widows respectively. It can be deduced from the figures that despite the age composition earlier explained, the population of the study areas was tending towards stability as the percentage of the unmarried residents were comparatively lower than other groups. Across the sectors, the northwest had the highest percentage (13.8%) of widows and least of single respondents. This also affirms the observation that this fringe zone started witnessing development before the others. The west had the highest proportion of singles (62.7%). This may not be unconnected with the relatively high percentage of respondents who were less than 20years sampled from the zone.

Place of birth and language spoken are variables of segregation to measure concentration of ethnic groups in sections of a city (Shevky and Williams (1949). There is general notion (including Burgess' (1925) Concentric Zone Model) that most residents of the fringe are migrants from the city centre or new entrants from rural areas in search of new locations. This was confirmed in this survey as only 15.1% of the respondents were born within the study area while the rest (84.9%) were migrants. Out of these 84.9% migrants, 10.4% were from within the same local government of the fringe, 42.9% migrated from the city core and other parts of the state, while 31.6% migrated from other locations outside Lagos State.

When further disaggregated into study zones, the result showed that none of the respondents from the eastern zone was born within the fringe. Some (22.4%) moved into the fringe from somewhere else within the local government (Eti-Osa), other groups (36.2%) were from other parts of Lagos State, while the majority (41.4%) migrated from outside Lagos State. Similarly, the majority (51.4) of the respondents in the northwest sector migrated from outside Lagos into the fringe, 36.7% were from other parts of Lagos (including the core) while the remaining 11.9% were migrants from other parts of Alimosho

local government. None of the respondents was a descendant of the fringe where they resided.

The result further showed that respondents from the west zone were totally from outside the region with 81.7% from other parts of Lagos and the rest 18.3% from other places outside Lagos. Unlike the other zones, residents of the northeast fringe cut across the strata as 38.4% of respondents were born within the fringe, 10.1% migrated from other locations in the local government (Kosofe). The rest were from other parts of Lagos State (25.7%) and different locations outside Lagos State (25.7%).

Table 4.1: **Socio-economic Characteristics of the Respondents**

Gender	**Fringe zones**								**Total**	
	East		Northeast		Northwest		West			
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Male	88	37.9	264	51.9	84	38.5	168	59.2	586	48.5
Female	144	62.1	228	48.1	134	61.5	116	40.8	622	51.5
Total	232	100	474	100	218	100	284	100	1208	100
Age of Respondents	**Fringe zones**								**Total**	
	East		Northeast		Northwest		West			
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
< 20	20	8.6	48	10.1	0	0	32	11.3	100	8.3
20-30	32	13.8	176	37.1	38	17.4	108	38.0	354	29.3
31-40	104	44.8	114	24.1	38	17.4	56	19.7	312	25.8
41-50	72	31.0	52	11.0	50	22.9	32	11.3	206	17.1
51-60	0	0	84	17.7	56	25.7	56	19.7	196	16.2
61+	4	1.7	0	0	36	16.5	0	0	40	3.3
Total	232	100	474	100	218	100	284	100	1208	100
Marital Status	**Fringe zones**								**Total**	
	East		Northeast		Northwest		West			
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Single	56	24.1	192	40.5	38	17.4	178	62.7	464	38.4
Married	160	69.1	184	38.8	124	56.9	106	37.3	574	47.5
Divorced	4	1.7	0	0	0	0	0	0	4	0.3
Separated	12	5.2	56	11.8	26	11.9	0	0	94	7.8
Widow	0	0	42	8.9	30	13.8	0	0	72	6.0
Total	232	100	474	100	218	100	284	100	1208	100
Place of Birth	**Fringe zones**								**Total**	
	East		Northeast		Northwest		West			
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
in the house presently residing	0	0	182	38.4	0	0	0	0	182	15.5
somewhere else within the local government (LG)	52	22.4	48	10.1	26	11.9	0	0	126	10.4
outside the LG but within State	84	36.2	122	25.7	80	36.7	232	81.7	518	42.9
outside Lagos State	96	41.4	122	25.7	112	51.4	52	18.3	382	31.6
Total	232	100	474	100	218	100	284	100	1208	100
Language Spoken	**Fringe zones**								**Total**	
	East		Northeast		Northwest		West			
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
English	200	86.2	236	49.8	50	22.9	48	16.9	534	44.2
French	0	0	20	4.2	0	0	0	0	20	1.7
Hausa	0	0	6	1.3	0	0	0	0	6	0.5
Ibo	12	5.2	0	0	22	10.1	88	31.0	122	10.1
Yoruba	20	8.6	182	38.4	146	67.0	148	52.1	496	41.1
Others	0	00	30	6.3	0	0	0	0	30	2.5
Total	232	100	474	100	218	100	284	100	1208	100

Language spoken by respondents were probed to determine the level of mix across the zones. Table 4.1 revealed that 44.2% of the respondents, made up of different tribes, communicate primarily in English language and its variants. The next majority (41.1%) speaks and writes Yoruba as their major language while 10.1% mainly speaks Igbo Language. Only a few of the respondents speak other languages which include Hausa (0.5%) and French (1.7%). In terms of ethnicity, 73.56% of the remaining 55.8% of respondents (excluding mixtures of English speakers) were Yoruba and 18.1% were Igbo descendants. The pattern was a representative of what obtains across all the study areas and conforms to earlier studies such as Mabogunje (1968) and Oduwaye (2002) among others. In terms of distribution across the fringe, the result revealed that there was diversity of ethnic composition dominated by the Yoruba ethnic and followed by the Igbos across the fringe. There was no clear tribal segregation or ethnic concentration across the fringe as shown in the proportion of the respondents using English as common language except for the Igbo tribe whose 72.1% out of the 10.1% sampled were in the western sector (Badagry axis).

Reasons for choosing the fringe by the respondents were dominated by cheaper land/rent (48.3%) and followed by the place of birth (17.4%), closeness to work (16.2%) and closeness to relatives (6%). Other reasons include social status (1.7%), business purposes (1.7%), safety/security (1.5%), availability of infrastructure (1.2%) and other pecuniary reasons (6%) which include the cost of construction and availability of land free from government acquisitions (Table 4.2). Disaggregating this into zones, cheaper land /rent ranked highest in west, northwest and northeast whereas in the eastern zone it was not a dominant reason.

Table 4.2: Residents' reasons for choice of Location

Reason for choice of fringe	Fringe zones								Total	
	East		Northeast		Northwest		West			
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Place of Birth	16	6.9	140	29.3	18	8.3	38	13.4	212	17.6
Cheaper land/rent	68	29.3	244	51.5	120	55.0	152	53.5	584	48.3
Closeness to relatives/ kinsmen	24	10.3	0	0	0	0	48	16.9	72	6.0
Closeness to work	100	43.1	36	7.6	60	27.5	0	0	196	16.2
Good for business	20	8.6	0	0	0	0	0	0	20	1,7
Available Infrastructure	0	0	14	3.0	0	0	0	0	14	1.2
Social status	0	0	0	0	20	9.2	0	0	20	1.7
Safety/security	4	1.7	0	0	0	0	14	4.9	18	1.5
Others	0	0	40	8.4	0	0	32	11.3	72	6.0
	232	100	474	100	218	100	284	100	1208	100

Source: Author's Fieldwork, 2016

4.2 Socio-Economic Characteristics of Residents

The result in Table 4.3 shows the distribution of respondents based on their maximum level of educational accomplishment. It revealed that 10.43% had no formal education, while 3.15%, 21.19% and 65.23% attained primary, secondary and tertiary level of education respectively. Disaggregating this into sectors revealed that the majority of respondents in the east (74.14%), northwest (50.92%) and northeast (58.23%) had tertiary education. On the other hand, the western sector had the highest proportion (30.3%) of respondents with no formal education and the least of respondents with tertiary education (12.0%). Deducible from this analysis was that educational attainment varies across the metropolitan fringe.

Analysis of occupational status (Table 4.4) revealed that more than one-tenth of respondents (10.3%) on the fringe were unemployed and other 6.6% were engaged in unpaid household work while 35.3% claimed to be self-employed. Majority of the self-employed were engaged in a range of occupations with varying degrees of marginality in terms of incomes. Nineteen per cent were employed by government/ public sector while 16.9% were employed in the private corporate sector and 11.8% were artisans. Sectorally, the unemployment was highest (4.9%) in the western fringe (Badagry axis) where the majority (10%) of the respondents claimed to be self-employed, 1.8% were engaged in public service and 3.58% were engaged by private corporate companies. Claim of unemployment was also severe (4.8%) in northeastern fringe where an additional 2.3% were unpaid household workers; 13.7.0% owned businesses and 7.6% were artisans. No respondent from eastern fringe claimed to be unemployed but the percentage of unpaid household workers (2.6%) was high. The northwestern fringe respondents were dominant in government employment (7.5%) while the west and northeast were dominated by self-employed respondents and the east had concentration of private/corporate employees.

A crosstabulation of gender and occupation status (Table 4.5) revealed that out of 51.5% female respondents, only 2.3% were unemployed compared to 20.5% unemployed men, and 9.6% females were engaged in unpaid housework. The remaining 88.1% were fully engaged as government employee (23.2%), private/corporate company employee (17%), self-employed (44.1) and artisan (3.9%). The result revealed high level of active women in employment i.e. women in labour force (WLF) ratio in the study fringe, which is one of the indices of high urbanisation (Shevky and Williams, 1949). From this index, (WLF), it could be inferred that the study area had high urbanisation index i.e. fast urbanising. According to Shevky and Williams (1949), high WLF ratio is an indication of high urbanisation.

Table 4.3: Educational Status of Respondents

	No Formal Education		Primary Education		Senior Secondary Education		Tertiary			
Zone	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq..	%
East	0	0.00	16	6.90	44	18.97	172	74.14	232	19.21
N/West	56	25.69	31	14.22	20	9.17	111	50.92	218	18.05
West	86	30.28	122	42.96	42	14.79	34	12.0	284	23.51
N/East	70	14.77	22	4.64	106	22.36	276	58.23	474	39.24
TOTAL	126	10.43	38	3.15	256	21.19	788	65.23	1208	100.0

Source: Author's Fieldwork, 2016

Table 4.4: Population distribution by Occupation across the fringe

	Government/ Public		Private/ Corporate		Self-employed/own business		Artisan		Unpaid household work		Un-employed		*Total*	
Zones	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
West	22	1.8	42	3.5	121	10.0	23	1.9	17	1.4	59	4.9	284	23.5
NW	90	7.5	38	3.1	60	5.0	20	1.7	3	0.2	7	0.6	218	18.1
NE	94	7.8	36	3.0	166	13.7	92	7.6	28	2.3	58	4.8	474	39.2
East	24	2.0	88	7.3	80	6.6	8	0.7	32	2.6	0	0.0	232	19.2
Total	230	19.0	204	16.9	427	35.3	143	11.8	80	6.6	124	10.3	1208	100

Source: Author's Fieldwork, 2016

Table 4.5: Gender and Occupation Status of Respondents

Gender of Respondents		Respondents Occupational Status						
		Governm-ent/Public employee	Private/Corporate company employee	Self-employed (own business)	Artisan	Unpaid household work	Unemploy-ment	**Total**
Male	**Frequency**	86	98	214	68	0	120	586
	% within Gender	14.7	16.7	36.5	11.6	0.0	20.5	100.0
	% within Occupational Status	37.4	48.0	43.9	73.9	0.0	89.6	48.5
Female	**Frequency**	144	106	274	24	60	14	622
	% within Gender	23.2	17.0	44.1	3.9	9.6	2.3	100.0
	% within Occupational Status	62.6	52.0	56.1	26.1	100.0	10.4	51.5
Total	**Frequency**	230	204	488	92	60	134	1208
	% within Gender	19.0	16.9	40.4	7.6	5.0	11.1	100.0
	% within Occupational Status	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Author's Fieldwork, 2016

Monthly income analysis results (Table 4.6) indicated that 25.8% of the respondents earn less than N20,000 while 29.0% earned between N20,000 and N39,000, 17.7% earned between N40,000 and N59,000, 7.9% earned N60,000 - N79,000 while 4.8% earned between N80,000 and N99,000 and 14.7% earned more than N100,000. Data on income was obtained and presented based on the classification of N18,000 minimum wage and 1.25 dollar per day poverty line. However, given the present situation of the economy, the data was reclassified to below N40,000, N40,000-N99,000 and above N100,000 for low, medium and high-income earners respectively in this analysis.

Generally, the result showed concentration at the lower rung of income class as 54.8% earn below 40,000 and fewer respondents in the middle (N40,000-99,000) and high income (100,000 and above) classes (30.4% and 14.76% respectively). The data revealed sharp variation in the distribution of income across the fringe with a clear concentration of high-income group in the eastern sector (along Lekki-Epe axis) where 40% of the respondents earn above N100,000 monthly. The low income dominates the western fringe with 38.7% earning less than N20,000 and none earn above N80, 000. There was high mixture of income groups in the two other sectors (northwestern and northeast). ANOVA test was performed on the data and the result reveals a significant variation [the computed F value of 77.940 ($p<0.05$) (Table 4.7)] in respondents' income across the fringes

The inferred variance in the income of respondents across the sectors is an assertion of socio-economic differentiation/segregation across space as argued by Burgess (1925) and supported by Hoyt (1939). However, rather than concentration of different groups in bands (concentric form) as suggested by (Burgess, 1925), the result confirms the Sector Theory where Hoyt (1939) had argued that zones of activities extend outward from a central business district in a sector form and that upper class (high-income earners) influence the location of undesirable neighbours, including the poor (low-income earners).

Table 4.6: Respondents Average Monthly Income

	<N20,000		N20,00-39,000		N40,000-59,000		N60,000-79,000		N80,000-99,000		> N100,000		Total	
	Freq.	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq.	%
West	110	38.7	120	42.3	14	4.9	40	14.1	0	0.0	0	0.0	284	23.8
NW	50	22.9	56	25.7	70	32.1	12	5.5	10	4.6	20	9.2	218	18.2
NE	118	24.9	146	30.8	108	22.8	26	5.5	8	1.7	68	14.3	474	39.6
East	31	14.1	25	11.4	20	9.1	16	7.3	40	18.2	88	40.0	220	18.4
Total	309	25.8	347	29.0	212	17.7	94	7.9	58	4.8	176	14.7	1196	**100**
%	25.8		29.0		17.7		7.9		4.8	30.4	14.7		130.4	

Source: Author's Fieldwork, 2016

4.3 Test of Hypothesis One

Hypothesis one of this research is hereby tested using Analysis of Variance (ANOVA) to confirm the above findings. The hypothesis stated that,

> There *is no significant difference in socio-economic composition of residents across the metropolitan fringe of Lagos;*

The results of ANOVA in Table 4.7 showed that there are statistically significant differences in socio-economic characteristics of the residents across the fringe (zones) as a whole. Multiple Comparisons using Schefffe post hoc in table 4.8 established groups that differed from each other. The table shows that there was a statistically significant difference in income of eastern residents and all other zones, similarly, there was a statistical significant difference in the income of the residents in the west and the rest of the other zones (p = 0.000). However, there were no significant differences between the income of the northeast and northwest (p = 0.549).

The two post hoc analyses used (Tukey Band Scheffe) grouped the residents based on income into three Homogeneous subsets (Table 4.9). Having earlier identified the low and high sector (west and east respectively), therefore, it could be inferred that there is concentration of different income groups in different parts of the metropolitan fringe as shown in Table 4.9 with high-income earners concentrating along the east (Lekki), middle income in the northwest (Ayobo/Igando axis) and northeast (Ikorodu/Lagos Ibadan axis) while the low-income earners dominate the west (Badagry) fringe. This finding upholds other studies earlier conducted in the areas including the 2006 ward classification by Independent National Electoral Commission (INEC)

Therefore, the hypothesis that *there is no significant difference in socio-economic composition of residents across the fringe* is rejected.

Table 4.7: ANOVA Test of Respondents Average Monthly Income

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	604.574	3	201.525	77.940	0.000
Within Groups	3082.065	1192	2.586		
Total	3686.639	1195			

Source: Author's Fieldwork, 2016

Table 4.8: Multiple Comparisons of Income across the fringe zones

(I) Zones	(J) Zones	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
East	Northeast	1.456*	.131	.000	1.09	1.82
	Northwest	1.265*	.154	.000	.83	1.70
	West	2.184*	.144	.000	1.78	2.59
Northeast	East	-1.456*	.131	.000	-1.82	-1.09
	Northwest	-.191	.132	.549	-.56	.18
	West	.727*	.121	.000	.39	1.07
Northwest	East	-1.265*	.154	.000	-1.70	-.83
	Northeast	.191	.132	.549	-.18	.56
	West	.919*	.145	.000	.51	1.32
West	East	-2.184*	.144	.000	-2.59	-1.78
	Northeast	-.727*	.121	.000	-1.07	-.39
	Northwest	-.919*	.145	.000	-1.32	-.51

*. The mean difference is significant at the 0.05 level.

Source: Author's Fieldwork, 2016

Table 4.9: Classification of Zones into Homogeneous Subsets

Respondents Average Monthly Income					
	Zones	N	Subset for alpha = 0.05		
			1	2	3
Tukey B[a]	West	284	1.94		
	Northeast	474		2.67	
	Northwest	218		2.86	
	East	220			4.13
Scheffe[a]	West	284	1.94		
	Northeast	474		2.67	
	Northwest	218		2.86	
	East	220			4.13
	Sig.		1.000	.589	1.000

Means for groups in homogeneous subsets are displayed.

Source: Author's Fieldwork, 2016

4.4 Building Types, Tenancy and Accessibility

Result of house ownership status in Table 4.10 shows that house owners and tenants are of the same proportion (34.8%) in the entire study sphere, while relatives to house owners formed 13.4%. Transient workers, occupying houses where they work (either completed or under construction) especially in areas where owners were still feeling insecure (as confirmed on site) to move into completed houses, made up of 17.1%. The percentages, however, vary across the study area. For instance, while 34.8% of the entire respondents were owner-occupiers, this ranges from 17.2% in the eastern sector to 65.1% in the northwest and the tenant status ranges from 17.4% in the northwest to 58.6% in the east.

The owner-occupier decreased proportionally to the relative development sequence of the fringe i.e. the older the zone, the more the number of houses occupied by the owners and the newer the fringe zone the more the number of tenant occupiers. The east to which developments were more recent had the highest proportion (58.6%) of tenant-occupied buildings and the least owner-occupied while the northwest that earlier witnessed development had the least of tenant dominated houses. The result is in line with Anderson (2016) findings in Dar-es-Salaam that 'demand for self-built, owner-occupier housing' used to be significant, but the demand for non-ownership housing has now increased. Hence, it could be inferred that while some sectors were being developed by those in dare need of accommodation; others were witnessing development for commercialization. The growing interest in building to sell or rent is, therefore, one of the factors contributing to increase in built-up area and land consumption ratio.

4.10 House Ownership Status of Respondent across the Study Zones

Ownership Status of Respondent			Study Zones				Total
			East	Northeast	Northwest	West	
1	House owner	Frequency	40	146	142	92	420
		% within Ownership	9.5	34.8	33.8	21.9	100.0
2		% within Study Zones	17.2	30.8	65.1	32.4	34.8
	Tenant	Frequency	136	134	38	112	420
3		% within Ownership	32.4	31.9	9.0	26.7	100.0
		% within Study Zones	58.6	28.3	17.4	39.4	34.8
4							
	Worker	Frequency	44	110	38	14	206
		% within Ownership	21.4	53.4	18.4	6.8	100.0
		% within Study Zones	19.0	23.2	17.4	4.9	17.1
	Relative to owner or tenant	Frequency	12	84	0	66	162
		% within Ownership	7.4	51.9	0.0	40.7	100.0
		% within Study Zones	5.2	17.7	0.0	23.2	13.4
Total		Frequency	232	474	218	284	1208
		% within Ownership	19.2	39.%	18.0	23.5	100.0
		% within Study Zones	100.0	100.0	100.0	100.0	100.0

Source: Author's Fieldwork, 2016

The result of house type in the study area showed a high proportion of single household building (55%). Other types are multi-household with less than 5 units (30.5%), multi-household with 5 to10 units (8.1%), highrise building with 10 units and above (1.2%) and incomplete buildings (5.3%). The preponderance of single household unit design was found along eastern (Lekki-Epe) axis, northwest (Igando/Ayobo) and Lagos-Ibadan expressway section of the northeast zone. However, some buildings designed as single household provided accommodation for more than a single household/family as responses to *number of household occupying building* showed that buildings with more than two households dominated the study area (57.6%); about 42.4% of the respondents were living in houses with 1 or 2 families while the rest (57.6) live in houses with 3 to 8 households and above. It was also observed on the field that incremental housing development thrives in some parts of the study area like Mopo Alade in the east, Owode and Channel's TV area in the northeast which accounted for the relatively high number of the recorded single-family units. Some of the single units were work in progress with available spaces for expansion or addition of extra units. In all, houses with single-family living were low when compared to other types among the respondents in the study area. This, however, should not be misconstrued for multi-storey buildings as bungalow dominated the study area covering 54.8%, followed by 2-floor buildings (39.7%). Three-floors and 4-floors residential developments were not common in the Lagos metropolitan fringe zone as they constitute 3.6% and 1.7% respectively.

As shown in Table 4.11, commuting to places from the communities in the study area was mostly by motorised means as walking accounted for less than 40% in all the places requiring movements. An infinitesimal proportion (between 0 (to schools) and 6.2% (to Recreation Ground/Centre)) used bicycle and the rest journeys were accounted for by motorcycling, private car and public buses (Table 4.11).

Commuting to places of work by the residents in the study area was dominated by motorised means as only 28.6% of respondents accessed their places of work through walking and 0.8 used bicycles (Table 4.11). Majority (33.7%) relied on private cars and 13.4% utilised public bus while 18.4% relied on motorcycle. Results of means of journey to other places by the respondents are also contained in Table 4.11

The result of the mode of transportation at the zonal level (Table 4.12) also revealed dominance of motorised movement among the residents in the zones except for the northwest. The northwest respondents showed higher preferences for pedestrian movement (60.6%) while residents from all the other zones showed heavy dependence on motorised (especially private car) means of transport to work. The east and west residents depended largely on private cars, 37.9% and 46.5%, respectively. In addition, the western fringe residents also depended to a large extent (31.7%) on motorcycle to access their workplaces. Except for the variation in the northwest, the findings corroborate the general theory that expansion into the fringe increase dependence on motorised means of transportation (Anas and Rhee, 2005) (Table 4.12). The analysis of variance test (Table 4.13) reveals that there is significant variation in respondents travel mode across the fringe (computed F value is 36.279 ($p \leq 0.05$). Further analysis through Post hoc revealed variation in the northwest fringe against all the other zones, but there was no significant difference among the rest of the zones.

The difference in the usage of vehicle in the northwest can be attributed to closeness to place of work of most residents (60.6%) due to the availability of work within 2km (Table 4.14). It has been established (Ewing et al, 2002) that expanding locations with 'neighbourhood mix of homes, jobs, and services; strength of activity centres; and accessibility of street network' are usually less affected by the negative effects (arising from dependence on motorised mode of journey) of urban expansion (sprawl)

The result of the survey on distance from place of work to residences revealed that the residents worked in diverse places with varying distances to work. It takes 41.4% of the respondents less than 30 minutes from their residences to place of work (mostly the self-employed), 43.5% spent between 30 and 59 minutes while the rest (about 15%) spent hours to their places of work. Cost of commuting to places of work was also examined and it was revealed that substantial members (44.2%) of the residents spent more than N200 to their places of work. The need for journey to workplace also showed the reason while majority of the people were always on the road thereby compounding traffic situation on intervening corridors.

To examine whether there was a relationship between mode of transport to work and distance to place of work, a Pearson chi-square test was performed. The results

established a significant relationship between the two variables (Chi-square value = 958.637, df =25, $p < .001$). Walking was the dominant mode of transport for residents within 2km from their place of work, while private car was mostly used for places of work above 5km away from home.

This confirms that neighbourhood mix of homes, jobs, and services reduces the demand for travel.

Table 4.11 - Regular Modes of Transport to common Places

Regular mode of transport /Destination	Place of work		Nearest Recreation ground/Centre		Nearest Shopping Centre/Market		Nearest hospital/clinic		Nursery/Primary School		Secondary School		Worship centre	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Walking	346	28.6	193	16.0	161	13.3	284	23.5	476	39.4	407	33.7	350	29.0
Bicycling	10	0.8	75	6.2	32	2.6	22	1.8	0	0	0	0	4	0.3
Motorcycling	222	18.4	127	10.5	328	27.2	209	17.3	113	9.4	115	9.6	151	12.5
Private Car	407	33.7	208	17.2	294	24.3	308	25.5	254	21.0	254	21.0	387	32.0
Public Bus	162	13.4	146	12.1	240	19.9	289	23.9	248	20.5	244	20.2	286	23.7
Not Applicable	61	5.0	459	38.0	153	12.7	96	7.9	117	9.7	188	15.6	30	2.5
TOTAL	1208	100	1208	100	1208	100	1208	100	1208	100	1208	100	1208	100

Source: Author's Fieldwork, 2016

Table 4.12: Regular Mode of Transport to Places of Work across the Fringe

Mode of transport		Study Zones East	Northeast	Northwest	West	Total
Walking	Frequency	52	148	132	14	346
	% within Zones	22.4	31.2	60.6	4.9	28.6
Bicycling	Frequency	0	9	1	0	10
	% within Zones	0.0	1.9	0.5	0.0	0.8
Motorcycling	Frequency	32	80	20	90	222
	% within Zones	13.8	16.9	9.2	31.7	18.4
Private Car	Frequency	88	145	42	132	407
	% within Zones	37.9	30.6	19.3	46.5	33.7
Public Bus	Frequency	60	32	22	48	162
	% within Zones	25.9	6.8	10.1	16.9	13.4
Not Applicable	Frequency	0	60	1	0	61
	% within Zones	0.0	12.7	0.5	0.0	5.0
Total	Frequency	232	474	218	284	1208
	% within Zones	100.0	100.0	100.0	100.0	100.0

Source: Author's Fieldwork, 2016

Table 4.13: ANOVA Test of Respondents mode of transport to place of work

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	321.796	3	107.265	36.279	.000
Within Groups	3559.856	1204	2.957		
Total	3881.652	1207			

Source: Author's Fieldwork, 2016

Table 4.14: Distance from Residence to workplace

		Fringe Zones				
Distance		East	Northeast	Northwest	West	Total
Less than 2km	Freq.	40	100	132	102	372
	% within Zones	17.2	21.1	60.6	35.9	31.0
2-4km	Freq.	60	146	26	66	298
	% within Zones	25.9	30.8	11.9	23.2	24.7
5-7km	Freq.	12	0	42	0	54
	% within Zones	5.2	0.0	19.3	0.0	4.5
8-10km	Freq.	92	32	0	14	138
	% within Zones	39.7	6.8	0.0	4.9	11.4
More than 10km	Freq.	28	196	18	102	344

Source: Author's Fieldwork, 2016

4.5 Mode and Procedures of Land Acquisition

Table 4.15 revealed that out of the 1208 respondents, 34.3% (mainly tenants) did not know how the land on which the buildings they inhabited were acquired. From the majority (794) who knew, 10.33% claimed government allocation, 16.12% acquired through estate agents, 22.92% inherited the land and 47.10% bought from *Omo-Onile* (customary landowners). The rest (3.53%) acquired theirs from other sources such as gift from friends and families.

Ease of land acquisition in the study area was explored and the result showed that aside from the cost of land (30.5%), duping by way of selling a piece of land to many buyers was the highest (16.6%) encumbrance to land acquisition in the study area among the informal transactions. Despite the limited transaction through government (10.33%), more than half (51.2%) of the respondents, who went through the statutory allocation process, reported cumbersome application procedure as a major setback to land acquisition.

Legality status of their tenure was explored, and the analysis showed that only 27.13% of those who knew about ownership title had Certificate of Occupancy while 9.3% had Customary Right of Occupancy; 41.60% had written agreement from the private owners, 1.55% had verbal agreement while 20.42% had no form of title. It may be inferred that more than 60% of the residents were illegal occupiers (without legal title). The fact that government acquisitions abound in parts of the fringe, though the people did not understand the importance of such, gives credence to these findings as some of the government acquired parcels had been resold to individuals. These uncoordinated methods of land acquisition had great implication for infrastructure development in the fringe. The only facility provided before land was sold out to the people was the Trunk A road, many kilometres away from most plots; other facilities followed piecemeal development after site occupation. Major facilities such as schools were owned by private individuals and organisations who also acquired their land from private owners.

The mode of land acquisition also had consequences on the type of houses and pattern of development found on the fringe as government regulation was minimal. It was observed that most parts of the fringe were characterized by haphazard and uncoordinated buildings without layout plan. Although more than half (52.8%) of the

respondents claimed to have valid building permit (16.4% did not have while 30.8% were not sure), the pattern of development, as observed, in some sector did not give credence to this claim, more so that the approved documents were not sighted during the survey exercise.

Table 4.15 Land Acquisition in metropolitan Lagos

Source of Acquisition	Source of Landed Property Frequency	% of total	% of known Sources
Government Allocation Registered	82	6.8	10.33
Private Estate Agent	128	10.6	16.12
Inherited	182	15.1	22.92
Omo-Onile (Private owners)	374	31.0	47.10
Don't Know	414	34.3	0
Other Sources	28	2.3	3.53
Total	1208	100.0	100

Encumbrances	Ease of Land Acquisition Frequency	% of Total
None	508	42.1
Cost of Land	368	30.5
Cumbersome application procedure	42	3.5
Fear of duping	200	16.6
Others	90	7.5
Total	1208	100.0

Ownership Title	Legality status of Building Frequency	% of total	% of those who knows
Certificate of Occupancy	210	17.4	27.13
Customary Right of Occupancy	72	6.0	9.30
Written Agreement	322	26.7	41.60
Verbal Agreement	12	1.0	1.55
None	158	13.1	20.41
Don't Know	434	35.9	0
Total	1208	100.0	100

Granted Permit	Availability of Building permit Frequency	Per cent
Yes	638	52.8
No	198	16.4
Not Sure	372	30.8
Total	1208	100.0

4.5.1 Height of Building and Plot area: Although there was no restriction on the type of structures buildable in most places except in government and private estates, bungalow was predominant in the fringe and this was followed by 2-floors buildings

In term of plot coverage, the results of the analysis revealed that about one-fifth (20.5%) of the buildings on the fringe were erected on plots that were less than 500sq.m (mostly referred to as half plot), while more than half (54.1%) were on 500-1000 square metres plots (which are the average normal plot size). Buildings on 1001-1500 square metres land accounted for 20.0% and the remaining 5.3% were erected on plots that were 2000 square metres and above (super-low plots). It can be inferred from the analysis that the general notion of large plot sizes on the fringe and suburb was not proven in the metropolitan fringe of Lagos.

Landscaping culture is very poor among the people within the fringe with only 31% of respondents having either trees or grasses within their compound. 37.9 % used concrete while 31.1% used none. High usage of concrete instead of soft landscape usually contributes to heavy runoff and erosion resulting from poor percolation of water into the soil during rainfall. Increasing sealing of the surface also contributes to global earth warming due to surface glare.

4.5.2: Compliance with Planning Regulations

Using Lagos State Planning Regulations' setbacks of 6 metres and airspace of 3 metres as criteria for compliance in this analysis, buildings with non-conforming attachments within their setbacks were described as partially compliant while the noncompliant are mostly the informal structures. The result of the analysis revealed that only 23.2% were fully compliant while 56.8% partially complied and 20% flagrantly disregarded the regulations. At the zonal level, 31% of structures in the east were found to be in full compliance while 44.8% complied partially and 24.1% did not comply. The northeast recorded 23.2%, 54% and 22.4% full, partial and no compliance respectively. Similarly, 11.9%, 67.9% and 20.2% in that order were fully, partial and not complied in the northwest. In the west sector (Badagry axis), 25% of structures fully complied, 62.7% complied partially while 12% did not comply.

4.6 Test of Hypothesis Two

One of the problems of uncontrolled urban expansion is the development of haphazard structures in deviance to known regulations. The above compliance scenario was, therefore, cross-tabulated with source/mode of land acquisition to validate the relationship between land acquisition process and pattern of urban expansion. Chi-Square was then computed to test the second hypothesis of the research which stated that

> *There is no significant relationship between sources of land acquisition and compliance with development regulations;*

The results (in Table 4.16) however revealed that there was a significant relationship between sources of land acquisition and compliance to development regulations *(Chi-square value* = 1507.80*, df =18, p < .001).* The strength of the relationship was also revealed, Cramer's V value was significant (Cramer's V = .65, $p <$ .001) and it indicated a high strength of the association.

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Table 4.16: Chi-Square Tests of the relationship between mode of acquisition and Compliance to development regulations

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1507.792[(a)]	18	.000
Likelihood Ratio	348.138	18	.000
Linear-by-Linear Association	.581	1	.446
N of Valid Cases	1208		

CHAPTER FIVE

5.0 EXTENT AND PATTERN OF URBAN EXPANSION ACROSS THE METROPOLITAN FRINGE

5.1 Land Use Progression and Urban Expansion from 1984 to 2016

The results of land use classification of the entire metropolis for the three years (1984, 2000 and 2016) are graphically displayed in Figure 5.1(a-c) while Table 5.1 shows the statistical composition of the classified metropolis and its component parts (core, fringe and fringe zones) for the three years. The table revealed that the entire metropolis was about 1270.009 square kilometres (127,009.44 hectares) out of which the core area was 689.2632 square kilometres (54.27%) and the metropolitan fringe covered 580.8312sq.km (45.73%). By 1984, the total built-up area of the entire metropolis was 29.58%, while vegetation, water and bare land covered 44.68%, 24.65% and 1.09% respectively. The built-up area increased from 375.67 to 422.67 square kilometres between 1984 and 2000, while vegetation decreased from 567.48 to 532.09. Bare soil and water also decreased from 13.83 km^2 to 2.97km^2 and 313.11km^2 to 312.34km^2 respectively (Table 5.1 and Figure 5.2). The trend (increase in built-up at the expense of other land use classes) was maintained between 2000 and 2016, but at a higher rate (Figure 5.2). The built-up area increased significantly during the entire period of 1984–2016 into the fringe. Built-up portion of the metropolis grew from 29.58% in 1984 to 33.28% in 2000 and 47.81% in 2016 (Table 5.1). During 1984-2016 the built-up grew by 61.65% (81.54% of which was in the fringe), there was a momentous expansion of 43.67% between 2000 and 2016 compared to marginal growth of 12.51% from 1984 to 2000 (see table 5.1). This is in line with Oduwaye's (2013) finding that Lagos Metropolis witnessed one of the highest levels of urbanization from 1980 to 2013. He attributed this to globalization trend in economic activities fuelled by advancements in science and technology in the area of information technology, the global economy, telecommunication, resources utilization and management. The finding also supports Boori *et al*'s (2016) assertion that urban

expansion rate and its dynamic change of the spatial structure of a city vary in temporal sequence.

In complementing Table 5.1, Figure 5.3 shows the land use in the metropolitan fringe area for the period of study. As at 1984, less than one-sixth (94.9953sq.km or 16.35%) of the 580.8312sq.km fringe was built-up. The larger proportion (66.55%) was vegetation, while water and bare soil accounted for the remaining 17.09% (16.36% water and 0.73% bare soil).

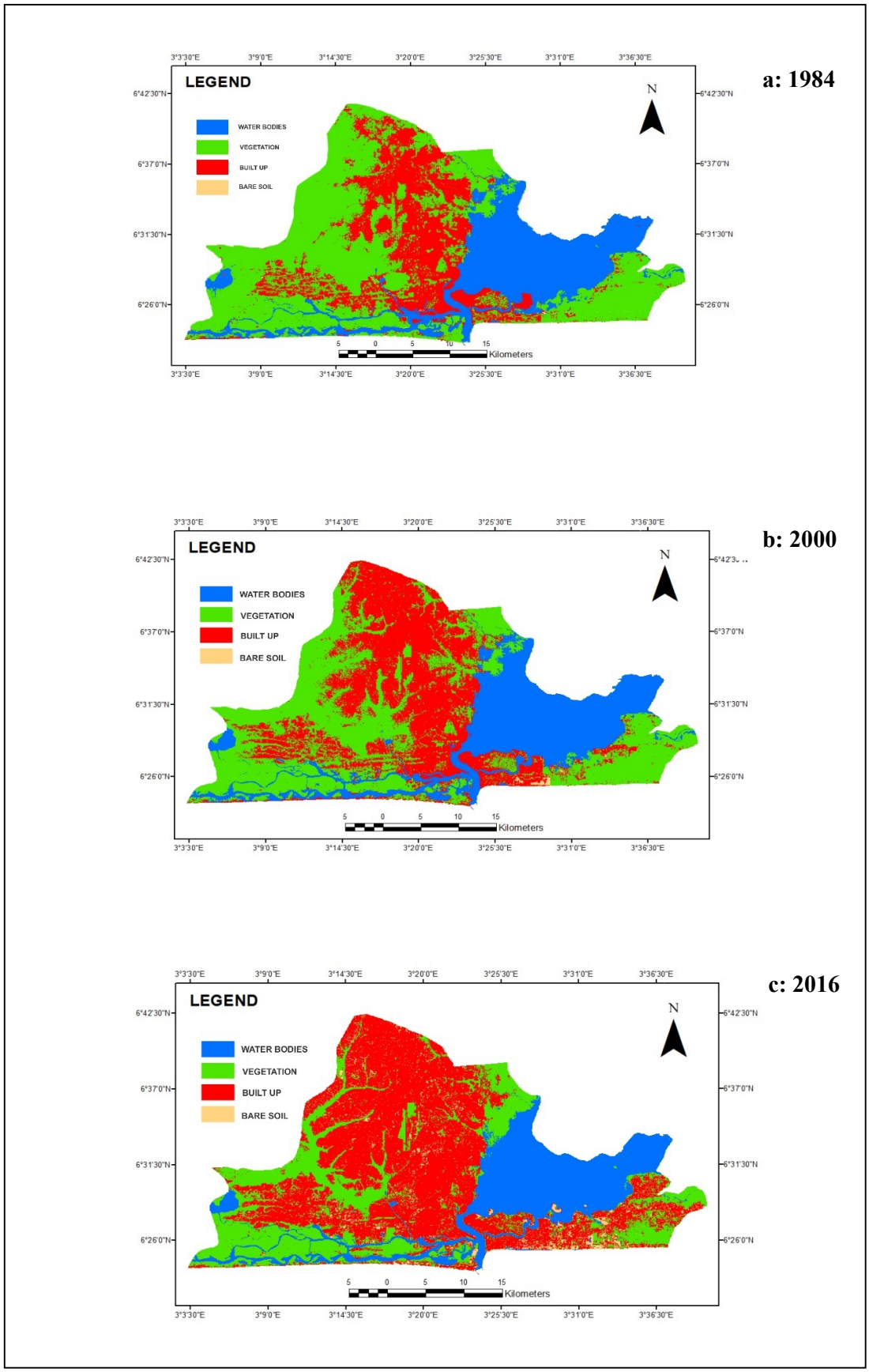

Figure 5.1: Land Use Classification of Lagos metropolis

Table 5.1: Land Use Classification Results

Land Cover Class	Year 1984		Year 2000		Year 2016		Percentage Change		
	Area (km2)	%	Area (km2)	%	Area (km2)	%	1984-2000	2000-2016	1984-2016
ENTIRE METROPOLIS									
Water	313.1112	24.65	312.3414	24.59	272.6595	21.47	-0.25	-12.70	-12.92
Vegetation	567.4788	44.68	532.0845	41.89	344.3913	27.12	-6.24	-35.28	-39.31
Built-up	375.6708	29.58	422.6751	33.28	607.275	47.81	12.51	43.67	61.65
Bare soil	13.8336	1.09	2.9709	0.23	45.7461	3.6	-78.52	1439.81	230.69
	1270.0944	100	1270.0719		1270.072	100			
CORE-METROPOLIS (OTHER LOCAL GOVT AREAS)									
Water	218.0782	31.639	241.7337	35.076	223.2135	32.39	10.85	-7.66	2.35
Vegetation	180.91226	26.247	183.6684	26.651	123.7023	17.95	1.52	-32.65	-31.62
Built-up	280.6755	40.721	263.5758	38.246	323.4429	46.93	-6.09	22.71	15.24
Bare soil	9.59724	1.3924	0.189	0.0274	18.8082	2.73	-98.03	9851.43	95.98
	689.2632	100	689.1669	100	689.167	100			
METROPOLITAN FRINGE AREAS									
Water	95.033	16.362	70.6077	12.155	49.446	8.51	-25.70	-29.97	-47.97
Vegetation	386.56654	66.554	348.4161	59.978	220.689	37.99	-9.87	-36.66	-42.91
Built-up	94.9953	16.355	159.0993	27.388	283.8321	48.86	67.48	78.40	198.79
Bare soil	4.23636	0.7294	2.7819	0.4789	26.9379	4.64	-34.33	868.33	535.87
	580.8312	100	580.905	100	580.905	100	0.01		
West - Lagos/Badagry Axis (Ojo LGA)									
Water	20.6714	11.53	20.6361	11.51	17.8794	9.97	-0.17	-13.36	-13.51
Vegetation	128.29534	71.56	125.5536	70.04	105.7815	59.01	-2.14	-15.75	-17.55
Built-up	29.2053	16.29	33.0444	18.43	53.5005	29.85	13.15	61.90	83.19
Bare soil	1.11156	0.62	0.0234	0.01	2.0961	1.17	-97.89	8857.69	88.57
	179.2836		179.2575		179.2575				
Northwest - Alimosho-Igando-Iba-LASU corridor (Alimosho LGA)									
Water	-	-	-		-			0.00	
Vegetation	122.67	83.31	81.7407	55.49	26.5383	18.02	-33.37	-67.53	-78.37
Built-up	24.5736	16.69	65.556	44.5	114.0831	77.44	166.77	74.02	364.25
Bare soil	0	0	0.0153	0.01	6.6906	4.54		43629.41	
	147.2436	100	147.312	100	147.312	100		0.00	
Northeast (Ikorodu Road/Lagos-Ibadan Axes (Kosofe LGA)									
Water	0.4752	0.64	8.3124	11.27	0.5544	0.75	1649.24	-93.33	16.67
Vegetation	50.076	67.9	41.4882	56.25	35.0487	47.52	-17.15	-15.52	-30.01
Built-up	23.1336	31.37	23.9427	32.46	36.738	49.81	3.50	53.44	58.81
Bare soil	0.0612	0.08	0.0135	0.02	1.4157	1.92	-77.94	10386.67	2213.24
	73.746	100	73.7568	100	73.7568	100		0.00	
East (Lekki-Epe Axis (Eti-Osa LGA)									
Water	73.8864	40.92	41.6592	23.07	31.0122	17.17	-43.62	-25.56	-58.03
Vegetation	85.5252	47.37	99.6336	55.17	53.3205	29.53	16.50	-46.48	-37.66
Built-up	18.0828	10.01	36.5562	20.24	79.5105	44.03	102.16	117.50	339.70
Bare soil	3.0636	1.7	2.7297	1.51	16.7355	9.27	-10.90	513.09	446.27
	180.558	100	180.5787	99.99	180.5787				

Source: Author's construct, 2016

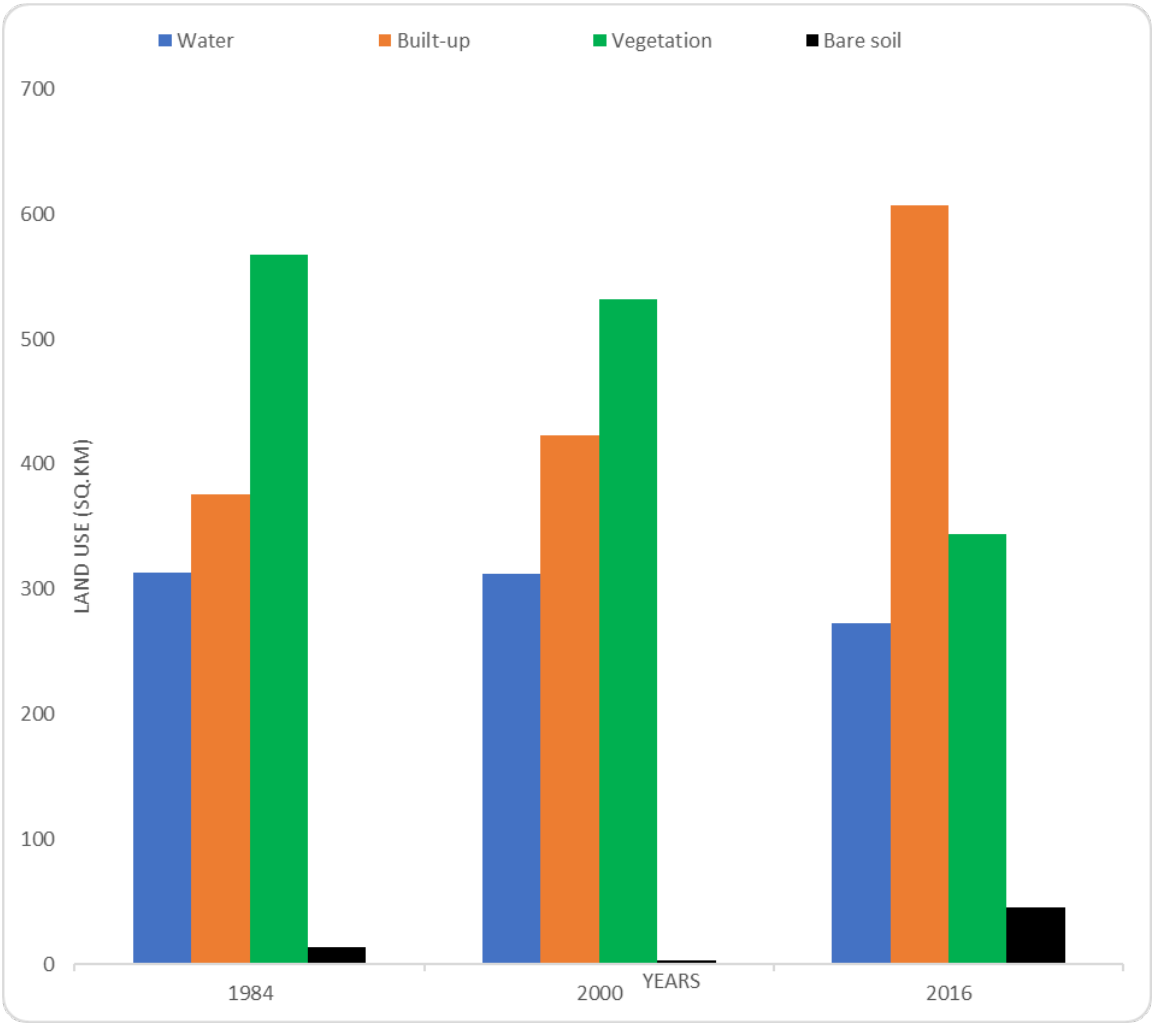

Figure 5.2: Land Use Pattern from 1984 to 2016 in the entire Lagos metropolis

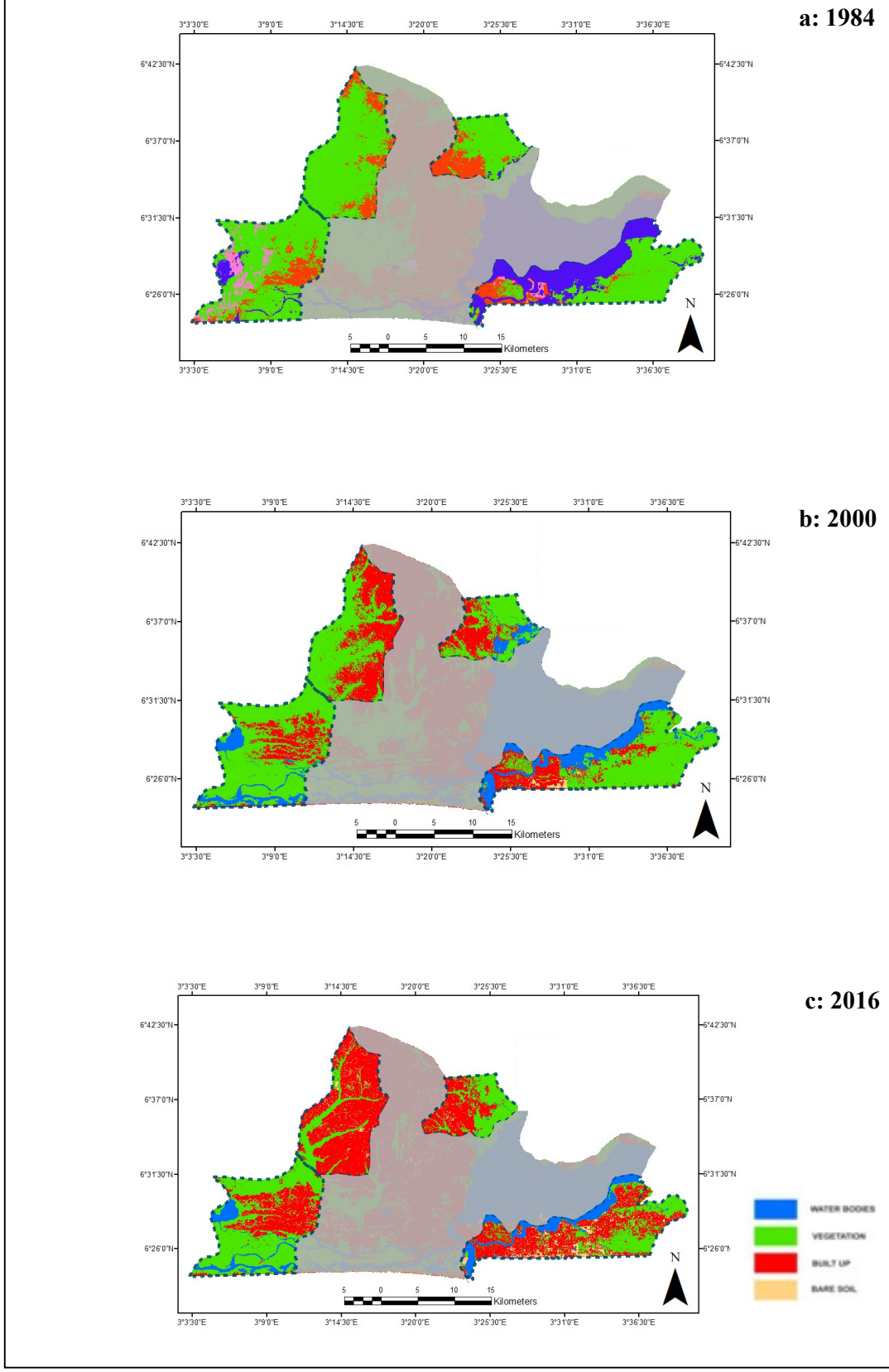

Figure 5.3: Land Use Classification of the Fringe Area

The built-up area of the fringe grew three times its original size of 94.9953sq.km to 283.8321sq.km in 2016. It progressively increased from 16.35% in 1984 to 27.39% and 48.86% in 2000 and 2016 respectively. The expansion of urban land (built-up area) on the fringe has its toll on the size of vegetation and water body as vegetation reduced from 386.56654sq.km (66.55%) in 1984 to 220.689sq.km (37.99%) in 2016 and water body also reduced from 95.033sq.km to 49.446sq.km (Figure 5.4). A comparison of urban expansion (increase in the built-up area) during 1984-2000 and 2000-2016 in the metropolitan fringe as shown in Table 5.1 revealed a greater expansion (78.40%) in 2000-2016 period over 1984-2000 (67.48%). Similarly, there was greater depletion of vegetation (-36.66%) in 2000-2016 period than 1984-2000 (-9.87%) in the entire fringe

Table 5.1 further revealed the land coverage of each sector of the metropolitan fringe [west (179.2836 sq.km or 30.9%), northwest (147.2436sq.km or 25.4%), northeast (73.746sq.km or 12.7%) and east (180.558sq.km 31.1%)]. Pattern and composition of land use and urban expansion within and across the fringe over the study period were also shown in Figure 5.5

A comparison of expansion towards the sectors (as shown in Table 5.1) revealed an increment of 13.15%, 166.77%, 3.50% and 102.16% for circa 1984-2000 and 61.90%, 74.02%, 53.44% and 117.50% for circa 2000-2016 in the west, northwest, northeast and east respectively (Table 5.1). The results of the classification revealed that the expansion was initially concentrated towards the northwest metropolitan fringe (Figure 5.3) as the area witnessed increment in built-up land from 24.5736 square kilometres in 1984 to 65.556 square kilometre in 2000 (about 166.77%). This was followed by the eastern sector that expanded from 18.0828km^2 in 1984 to 36.5562 km^2 (more than doubled) in 2000. The west had 13.15% and northeast 3.50% change in the built-up area during 1984-2000. While expansion to the northwest fringe subsided between 2000 and 2016 (74.02%), the extension of built-up areas towards the eastern sector intensified till 2016 with 117.50% between 2000 and 2016 to remain the extant fastest growing sector (see Figure 5.2). The western fringe witnessed 61.90% increase in the built-up area, while the northeast had 53.44% increment in the built-up area during 2000-2016 to remain the least growing fringe (Table 5.1).

The classification revealed that the northwest fringe witnessed the highest urban expansion between 1984 and 2016 (24.5736km^2 to 114.0831km^2 (364.3%) followed by the eastern sector (18.0828km^2 to 79.5105km^2 (339.7%), the west and northeast grew by 83.19% (29.2053km^2 to 53.5005km^2) and 58.8% (23.133 km^2 to 36.738km^2) respectively (Fig. 5.5).

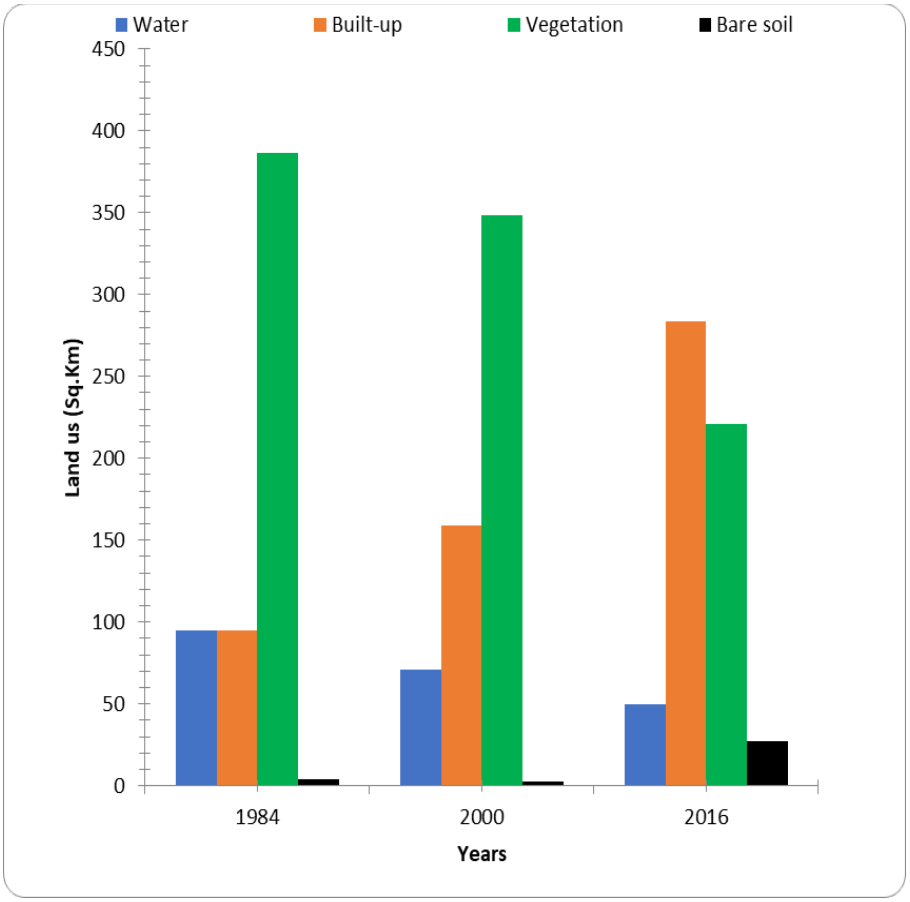

Figure 5.4: Land Use Progression from 1984 to 2016 in the Metropolitan Fringe

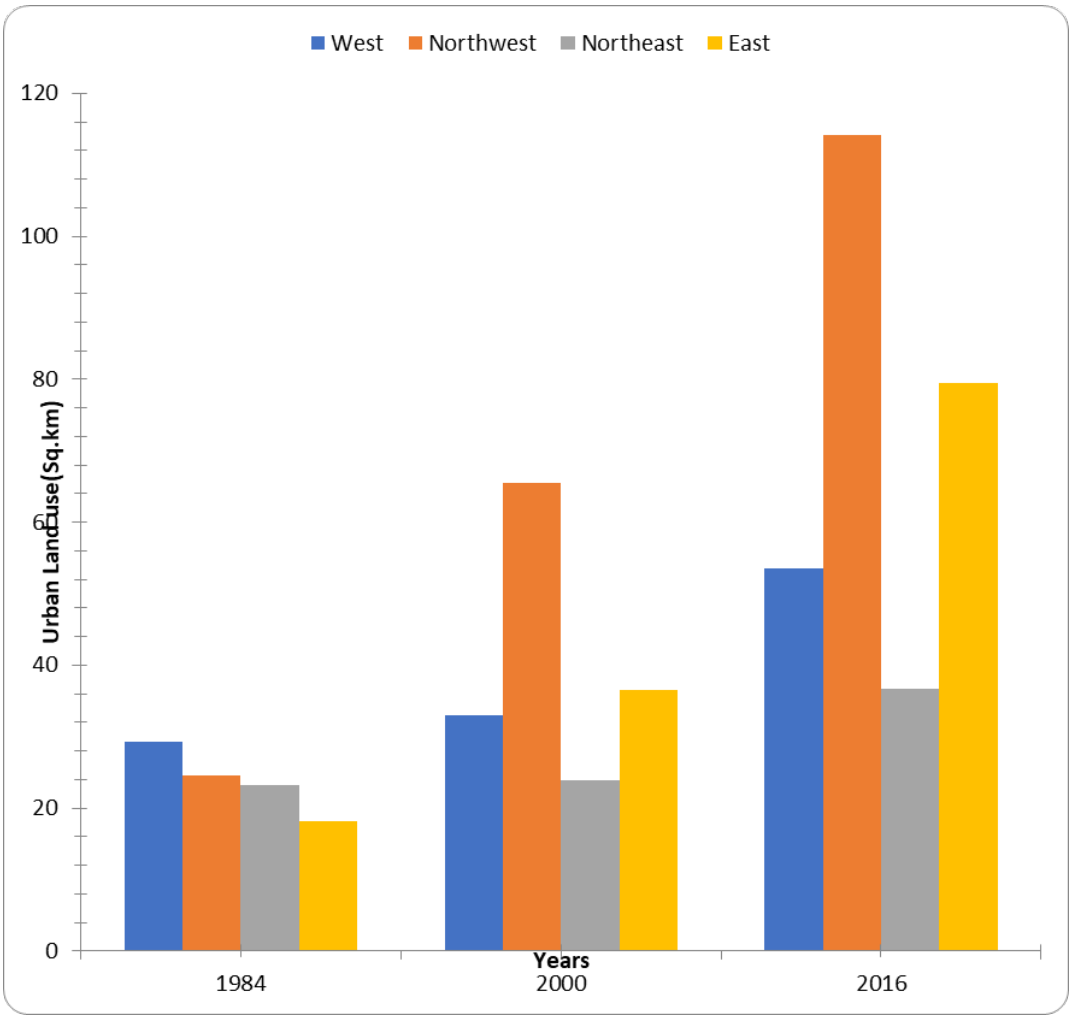

Figure 5.5: Urban Expansion from 1984 to 2016 in different sectors of the fringe

A comparison of development in the core with the fringe during the study period showed that there was a 15.24% increase in built-up areas in the core between 1984 and 2016 compared to 198.78% for the metropolitan fringe during the same period. The built core grew from 280.6755sq.km in 1984 to 323.4429sq.km in 2016 and the fringe grew three times its original size of 94.9953sq.km to 283.8321sq.km. The expansion of urban land on the fringe had its toll on the size of vegetation and water body as shown in Table 5.1 where vegetation has reduced drastically from 386.56654sq.km in 1984 to 220.689sq.km in 2016. Water body also reduced from 95.033sqm to 49.446sq.m.

5.2 Classification accuracy

Accuracy Assessments are performed on classified images to determine how well the classification process accomplished the task. Usually, an accuracy assessment compares classified image to an image which is assumed to be correct (such as an aerial photo).

This task was accomplished in this project using the Semi-Automatic Classification Plugin (SCP) in QGIS. The overall accuracy computed for all the maps was 91.4%. Classification accuracy is considered fit if Cohen's kappa coefficient is > 80% (Congalton and Green, 2009). Zheng et al., 2016 described it as strong to perfect agreement if greater than 90%. With 91.4%, the classified images were accurately fit to conduct change analysis.

5.3 Comparison of Pattern of Urban Expansion Using Land Expansion Index

The results of urban land expansion index in the study area are presented in Table 5.2 and graphically in Figure 5.4. The results revealed that the entire metropolitan built-up area increased by 61.65% for the entire study period (1984 to 2016) at an annual rate of 1.93%. For the first half of the study period (1984 – 2000), the entire metropolis increased by 12.51% at the rate of 0.78 per annum while it increased by 43.67% at the rate of 2.73% per annum during the 2000-2016 years. The outcome confirmed that the rate of expansion between 1984 and 2000 (0.78%) was low compared to the period of 2000 to 2016 when the rate of expansion increased almost fourfold (2.73%) and the entire study period (1984-2016) of 1.93 (Figure 5.6).

Table: 5.2 Urban Land Expansion Index

Study Area	1984-2000				2000-2016				1984-2016		
	Area Km^2	%	UE	CL	Area Km^2	%	UE	CL	Area Km^2	%	UE
Metropolis	47.0043	12.51	0.78	-60.68	184.5999	43.67	2.73	46.41	231.6042	61.65	1.93
Fringe	64.104	67.48	4.22	-34.23	124.7328	78.40	4.90	-18.49	188.8368	198.79	6.21
West	3.8391	13.15	0.82	-69.38	20.4561	61.90	3.87	53.79	24.2952	83.19	2.60
Northwest	40.9824	166.77	10.42	-11.29	48.5271	74.02	4.63	-58.00	89.5095	364.25	11.38
Northeast	0.8091	3.50	0.22	-88.48	12.7953	53.44	3.34	87.81	13.6044	58.81	1.84
East	18.4734	102.16	6.39	-41.73	42.9543	117.50	7.34	-28.51	61.4277	339.70	10.62

$1km^2$ = 100Hectares

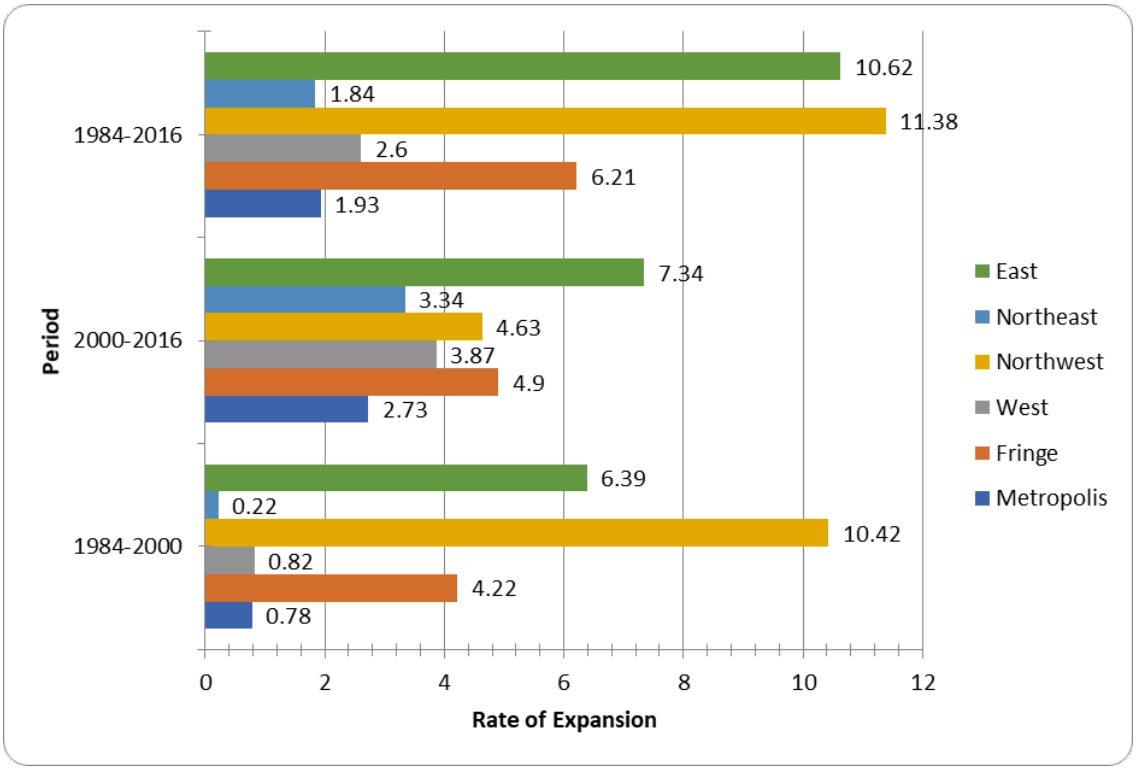

Figure 5.6: Rate of Expansion across Different Sectors of the Metropolitan Fringe at different periods between 1984 and 2016

By 2016, expansion into the entire fringe was about 199% of the 1984 built-up area at an average of 6.21% per annum. Like the entire metropolitan expansion scenario, the index (4.22) was lower in the first half (1984-2000) compared to the second half of the study period (2000-2016) and the entire study period (1984 – 2016) of 4.9 and 6.21 respectively. Comparing the index for the entire metropolis and the fringe also revealed the dominance of expansion in the fringe during the two periods of study and the entire study circle (Figure 5.4). While densification continued in the core, expansion to the fringe was enormous during the study period.

One of the objectives of this study is to compare the pattern of expansion into the metropolitan fringe of Lagos. From the table, it was established that the rate of expansion towards the northwestern sector was higher than any other sector. The sector had UE coefficient of 11.38 for the study period of 1984 – 2016 which was highest in all parts of the metropolis and it was closely followed by the eastern sector with 10.62 annual urban expansion rate. In term of proportion, land use intensity along the northwestern axis was also huge (89.5095km^2 or 89509.5 hectares). Urban expansion rate in the northwest between 1984 and 2000 was very high (10.42 annually) but was lower (4.63%) in the second circa of 2000-2016. Densification had begun in the sector during this period. Overall expansion rate to the eastern sector was second to the northwestern sector but remains the fastest growing sector with an annual expansion rate of 7.34% between 2000 and 2016 (Figure 5.6).

The western fringe had an overall expansion index of 2.68% (1984-2016). Expansion rate between 1984 and 2000 was very low (0.82%) in the area but this increased to 4.13% in 2000-2016 period. The northeast had the lowest (1.89%) expansion rate over the entire period of 32 years. The major reason for this could be attributed to the fact that the area is constrained by the lagoon and not quite attractive enough to justify huge investments involved in construction in the area.

The expansion index for the entire metropolis and each of the sectors during 1984-2000 were very low when compared to the entire period (1984-2016) with CL value generally less than 0 (Table 5.2). Between 2000 and 2016, the fringe and its individual components had a striking expansion with west and northeast having CL values of 53.79 and 87.81 respectively with UE surpassing those of the entire study period. The CL value for the east sector during the period also increased from -41.73 to -28.51(i.e. from very slow to medium

slow), an indication of expansion in the area extent.

This section has accomplished the goal of comparing the rate of expansion among the study units and between the two periods of study (1984-2000 and 2000-2016). Urban land expansion (UE) index measures and compares average expansion rate in a specified period and has proved useful as suggested by Ma and Xu (2010); Schneider and Woodcock (2008); Seto *et al*. (2011); Xiao *et al*. (2006) and Xu and Min, 2013). The index measured urban expansion in the Lagos metropolis as a whole and the delineated fringes from 1984 to 2016. It compared the rate of expansion among them and between the two periods of study (1984-2000 and 2000-2016).

5.4 Hypothesis three:

For confirmatory analysis, the conclusions above were further subjected to hypothesis test that:

> *There is no significant difference in the pattern of urban expansion across the metropolitan fringe of Lagos*

A one-way ANOVA was conducted to compare the pattern of urban expansion in the west, northwest, northeast and the eastern fringe.

The Analysis of Variance in Table 5.3 displayed a significant difference in patterns of expansion across the four fringe zones at the $p<.05$ level for the four zones [$F(3, 8) = 4.93$, $p = 0.032$].

The result revealed that at least one of the groups is significantly different in pattern than the others. Post hoc comparisons, using the Least Significant Difference (LSD) test was further employed to establish which of the groups are significantly different. The Post hoc results (Table 5.4) indicates that the mean score for the west fringe ($M = 16.20$, $SD = 10.87$) was significantly different than the northwest fringe ($M = 59.67$, $SD = 26.11$), but did not significantly differ from the northeast and east. Similarly, the northwest pattern ($M = 59.67$, $SD = 26.11$) was significantly different than the northeast pattern ($M = 9.07$, $SD = 7.17$) but did not significantly differ from East. The northeast did not significantly differ from the east sector fringe.

The Post hoc indicated that the mean score for the northwest fringe ($M = 59.67$, $SD = 26.11$) was significantly different from the west fringe ($M = 16.20$, $SD = 10.87$) and

northeast pattern (M = 9.07, SD = 7.17) but did not significantly differ from East (M = 40.95, SD = 21.55). Pattern of expansion among other groups are not significantly different (Table 5.4).

Summarily, the result suggested that the conditions in different sectors of the fringe coupled with other factors at the different intervals of study (1984-2000 and 2000-2016) differently influenced the patterns of expansion across the fringe. However, except for the northwestern fringe, rate of expansion during the (2000-2016) was higher in all the sectors compared to the (1984-2000) period.

Therefore, the hypothesis that *there is no significant difference in the pattern of urban expansion across the metropolitan fringe of Lagos* is rejected.

Table 5.3: ANOVA Test for Difference in Spatial Pattern of Expansion

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	4860.850	3	1620.283	4.926	.032
Within Groups	2631.601	8	328.950		
Total	7492.450	11			

Table 5.4: Multiple Comparisons of Fringe Zones for Variation Using LSD

(I) Fringe Zone	(J) Fringe zone	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
West	Northwest	-43.47333*	14.80878	.019	-77.6224	-9.3242
	Northeast	7.13040	14.80878	.643	-27.0187	41.2795
	East	-24.75180	14.80878	.133	-58.9009	9.3973
Northwest	West	43.47333*	14.80878	.019	9.3242	77.6224
	Northeast	50.60373*	14.80878	.009	16.4546	84.7528
	East	18.72153	14.80878	.242	-15.4276	52.8706
Northeast	West	-7.13040	14.80878	.643	-41.2795	27.0187
	Northwest	-50.60373*	14.80878	.009	-84.7528	-16.4546
	East	-31.88220	14.80878	.063	-66.0313	2.2669
East	West	24.75180	14.80878	.133	-9.3973	58.9009
	Northwest	-18.72153	14.80878	.242	-52.8706	15.4276
	Northeast	31.88220	14.80878	.063	-2.2669	66.0313

*

.

The mean difference is significant at the 0.05 level.Dependent Variable: Urban Expansion

5.5 Land Consumption Indices to Compare Pattern of Urban Expansion

Table 5.5 presents the results of Land Consumption Indices (Land Coefficient Ratio (LCR) and Land Absorption Coefficient (LAC)) in the study area. Land consumption rates were computed for the metropolis as a whole; its core and the fringe components which was further broken down into sectors for the three studied years. The land coefficient (consumption) ratio for the metropolis decreased from 0.0106 in 1984 to 0.0061 in 2000 and 0.0057 in 2016. While this pattern of change was replicated at the core, the situation on the fringe differed as it decreased from 0.0117 in 1984 to 0.0072 in 2000 and increased again to 0.0074 in 2016. The increase in the land coefficient ratio on the fringe was largely attributed to the eastern sector (Figure 5.7). This further confirms the findings in section 5.3 that the eastern sector of the fringe sprawls while the other axes were compactly developed/developing and witnessing densification (Plates 5.1-5.8)

The Land Absorption Coefficient, on the other hand, was on the rise in all the units, an indication that there had been an increase in land absorbed by a unit increase in population. Over the 32year period (1984-2016), the entire metropolis had 0.0032 which was still on the increase as seen between 1984-2000 and 2000-2016 of 0.0014 to 0.0049 respectively. The fringe LAC increase of 0.0045 to 0.0077 between circa 1984-2000 and 2000-2016 further reinforced high expansion into the fringe. The full trend, rate and magnitude of the observed changes for each of the sectors are presented in Table 5.5. Like the LCR, the LAC was highest in the eastern sector. This may be linked to the high rate of expansion and high-income plot size (Plate 5.2) in the area (average of 24 X 36) which is relatively bigger than average regular plot in low-income areas (average of 18 X 36). In addition, single plots were usually co-habited by two to three people in the low-income area. Based on the percentage change, annual rate of change as computed and the land consumption rate, one may conclude that encroachment into the fringe was immense but inevitable as the increasing population had to be accommodated.

As shown in this chapter, the comparison of land use/land cover statistics with population figures had proved useful in identifying the percentage change, trend and rate of change in land use in response to the pressure of population change in the study area. The role of population as a driving force of urban expansion was also buttressed.

Table 5.5: Land Consumption Indices

Study Area	Land Coefficient Rate			Land Absorption Coefficient		
	1984	**2000**	**2016**	**1984-2000**	**2000-2016**	**1984-2016**
Metropolis	0.0106	0.0061	0.0057	0.0014	0.0049	0.0032
Core	0.0103	0.0056	0.0047	-0.0009	0.0028	0.0010
Fringe	0.0117	0.0072	0.0074	0.0045	0.0077	0.0062
West	0.0203	0.0073	0.0066	0.0012	0.0057	0.0037
Northwest	0.0085	0.0068	0.0065	0.0061	0.0062	0.0061
Northeast	0.0084	0.0042	0.0041	0.0003	0.0039	0.0022
East	0.0172	0.0157	0.0211	0.0144	0.0299	0.0226

Source: Author's Fieldwork, 2016

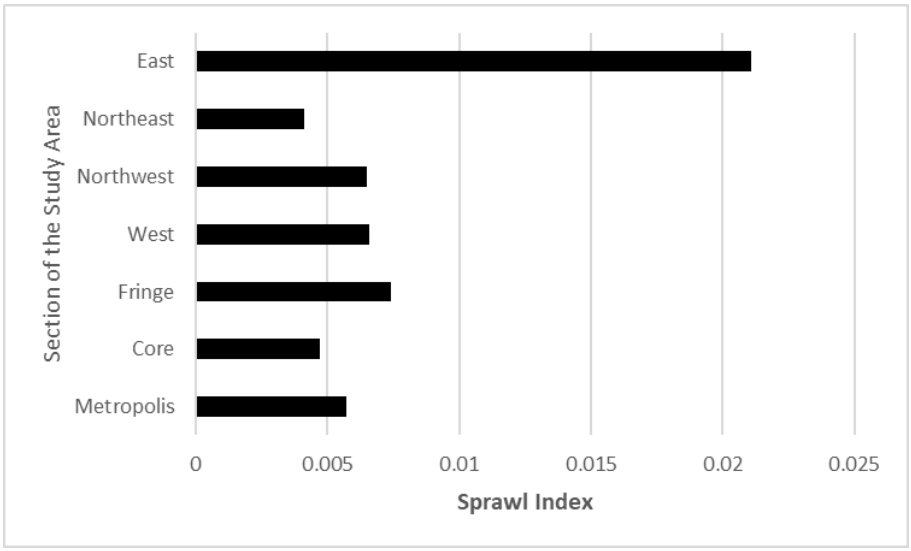

Figure 5.7: Land Coefficient (consumption) Rate in the Study Area
Source: Author's Analysis, 2016

Plate 5.1: Development Pattern in the Eastern Zone - Grid Pattern at *Sangotedo*,
Source: Google Map

Plate 5.2: Sprawling Section of the Eastern fringe - Large Plot Size at *Sangotedo*,

Plate 5.3: Compactly Built but unorganized Section of *Isasi* in the Western fringe

Source: Google Map

Plate 5.4: Buildings and Infrastructure Pattern within *Isasi* in the western sector

Plate 5.5: Compactly developing Section of *Ayobo*/Captain Davies in the northwest zone
Source: Google Map

Plate 5.6: Development Pattern in *Ayobo*/Captain Davies Road in the northwest zone
Source: Google Street view

Plate5.7: Unorganised but Compact Development at *Erukan* in the Northeast
Source: Google Map

Plate 5.8: Development Pattern and Plot Size Arrangement in *Erukan*, Northeast

5.6. Pattern of Physical Development across the Fringe.

As noted above, the pattern of expansion varied across the metropolitan fringe and this was also reflected in the pattern of physical developments i.e. the way different functions and elements of the settlement were distributed and spatially mixed. Most parts of the developing eastern fringe were laid out and the buildings structurally arranged while this was not the case in other sectors. A further probe of this scenario from the administered questionnaire revealed that out of 52.8% per cent of the entire respondents that claimed that they obtained building permit, 68.3% were from the eastern sector. It could, therefore, be inferred that the high-income people were more conscious of planned development than the low-income respondents. This corroborates Fouberg, *et al.* (2009) that a city's spatial organization reflects the culture that built it. It was quite apparent that the areas occupied by the lower socio-economic groups were more compact but less organised than the higher socio-economic class area. Similarly, the results also reflected the source of acquisition of land by the developers; areas with dominant allocation from *Omo-Onile* were less organised compared to those areas acquired from government allocation or Registered (organised) Private estate agents

5.7 Summary of Chapter

This chapter traced the pattern of expansion across the metropolitan fringe and compared the changes among the units. It revealed that expansion was highest in the northwest followed by the eastern sector and least in the northeast. This chapter showed the usefulness of land use/land cover and population statistics comparison in identifying change pattern. It established that urban expansion was in response to the pressure of population growth. The role of population as a driving force of urban expansion was also buttressed. Largely, the chapter linked the pattern of expansion to socio-economic characteristics of the people in the area as the high-income sector was more orderly developed than the low-income and medium-income areas

CHAPTER SIX

6.0 FACTORS OF URBAN EXPANSION INTO THE METROPOLITAN FRINGES OF LAGOS

The last chapter revealed that there was significant difference in the pattern of expansion across the Lagos metropolitan fringe between 1984 and 2016; this chapter examined some identified factors of expansion into the fringe and how they have influenced expansion during the different stages of development and those that influenced development in which sector.

6.1 Physical Characteristics of the Studied Area

A visual exploration and overlay comparison of land use classification and elevation map of the study area revealed that pattern of expansion into the fringe followed the physical characteristics of the study area during the first period of study (1984-2000). Areas within the northwestern fringe with high elevation above mean sea level (Figure 6.1) witnessed early development. The percentage increase of 166.77% in the northwestern fringe during 1984-2000 was the highest and incomparable with other fringe zones. The built-up area during the period coincided mostly with the areas with high elevation points across the fringe. The physical influence, however, waned during the second circa (2000-2016) as the percentage of development dropped down to (74.02%) while areas with low elevation above mean sea level witnessed higher rate of development as evidenced in the eastern fringe. Unlike the west fringe with similar physical characteristics, the eastern fringe witnessed high rate (117.50%) of development at the second circa of this study (2000-2016). This may, however, be attributable to other factors external to the physical characteristics of the site such as the opening up of the area through the construction of Lekki – Epe expressway and some other attractive factors that appeased and attracted high-income class who had the wherewithal to invest in the difficult terrain. This action of the high-income class follows one of the three forces in urban dynamics theory, which is the *perceptions of relative attractiveness,* as postulated by Forrester (1969) that to any

particular population class, all geographical areas tend to become equally attractive or all areas tend to become equally unattractive, just as seen in the case of the east and northwestern fringe respectively during the second period. In essence, despite the good physical characteristics, the development tempo slowed down while other sectors with less favourable physical condition thrived in development. The results corroborate Li (2013) findings that urban expansion is a temporal dynamic process, in which not only its spatial patterns but also its driving factors vary over time (Li, et al, 2013).

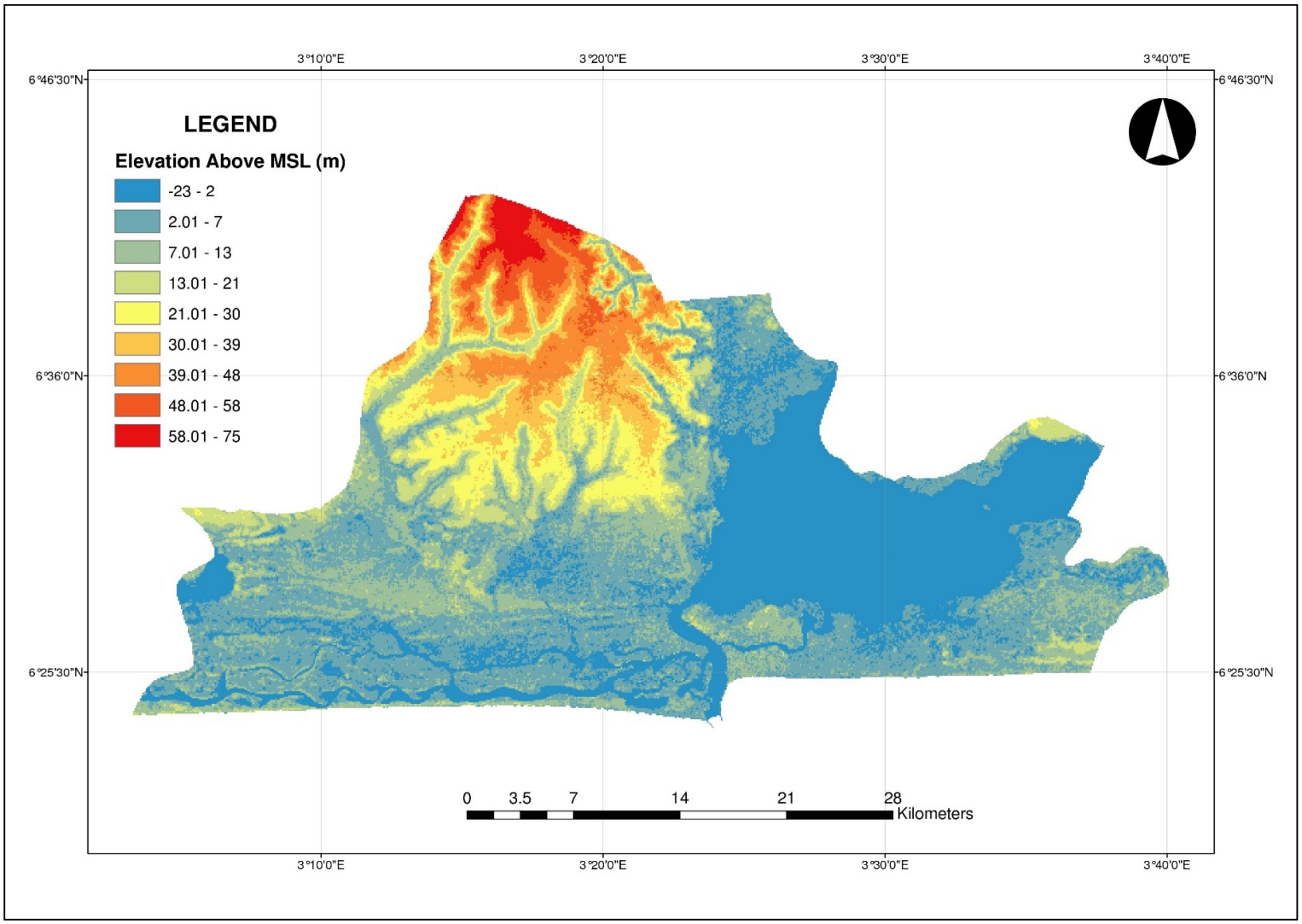

Figure 6.1: Physical Characteristics of the study Area
Source: Author's Analysis

6.2 Population and Urban Land Expansion

The results in Table 6.1 revealed that urban expansion varies with population size and rate over the years. As shown in the Table, the PU in the entire metropolis was greater than one throughout the study period of 1984-2016 (3.28). However, the index was higher (7.72) in the first circa (1984-2000) than during 2000-2016 when it decreased to 1.23. This was an indication that the population spread more during the second period. Similarly, the index was higher between 1984 and 2016 than between 2000 and 2016 in the entire fringe. The decrease from 2.57 to 0.93 between the two periods revealed spreading out of the population and coverage of more land.

Table 6.1 revealed that the index was higher in 1984-2000 periods than 2000-2016 in all the fringe zones. It decreased from 16.26, 1.41, 30.84 and 1.19 to 1.28, 1.11, 1.08 and 0.52 in the west, northwest, northeast and east fringe respectively. This general decrease may be partly attributed to the decline in population growth rate as opposed to the increased rate of urban expansion between the two periods. A comparison of the index across the fringes revealed that population concentration was still higher in the west than the other sectors. However, the population growth to urban expansion ratio (PU) was greater than zero in most part of the study area throughout the study period except in the east. This implies that population increase during 1984-2016 on the entire fringe was more than the rate of expansion except in the eastern fringe (Lekki axis) where the rate of urban development was slightly more than population influx (0.76). Hence, it can be inferred that the expansion of the metropolis to the fringe is a response to high rate of population increase rather than the general notion of urban sprawl which is usually associated with low-density development. The urban expansion ratio was also in tandem with the high population density across the metropolis except for the east where there was low population density. This also confirms the fact that the eastern axis of the metropolitan fringe is a low-density enclave. While both west and east fringes share similar physical characteristics, the patterns of urban expansion and population concentration differ.

Table 6.1: Population Growth and Urban Expansion

Study Area	1984-2000				2000-2016				1984-2016			
	PR	UE	PU	PD	PR	UE	PU	PD	PR	UE	PU	PD
Metropolis	6.03	0.78	7.72	9,415	3.59	2.91	1.23	16,436	6.52	1.99	3.28	17,597
Fringe	10.85	4.22	2.57	8,555	4.86	5.23	0.93	13,977	12.03	6.41	1.88	13,544
West	13.34	0.82	16.26	4,937	5.27	4.13	1.28	13,674	14.87	2.68	5.55	15,118
Northwest	14.68	10.42	1.41	11,714	5.45	4.93	1.11	14,706	16.41	11.75	1.40	15,358
Northeast	6.79	0.22	30.84	11,909	3.85	3.56	1.08	24,000	7.39	1.9	3.89	24,676
East	7.61	6.39	1.19	5,814	4.10	7.83	0.52	6,380	8.33	10.95	0.76	4,739

Note and decisions
PR = Population growth rate
UE = Urban expansion rate; at equilibrium, if the value at a given interval (e.g. 1984-2000) is equal to the rate for the entire study duration (1984 – 2016), low if less and fast if it is greater
PU = Population growth to urban expansion ratio (PR/UE); equilibrium if the value is 1, sprawl if less than 1 and compaction if more than 1
PD = Urban population density

Source: Author's Fieldwork and computations, 2016

6.3 Infrastructure Development and Urban Expansion

The results show that transportation played a major role in expansion into the fringe as developments radiated from the major corridors (Figure 6.2). The northeast has proximity to two major roads viz the Lagos–Ibadan and Lagos Ikorodu Roads (Figure 6.3) from where developments radiated. The roads coupled with the closeness of the sector to the Lagos State Secretariat stimulated the early growth of the fringe (31.37% built as at 1984). This influence was however slowed down and became the slowest growing fringe during 1984 – 2016. This may be attributable to distance decay effect of the road and the difficult terrain in some parts of this fringe, abutting water bodies and swamp, which created leapfrog development even beyond the coverage of this study area along the corridors.

The northwest axis witnessed early connection to the core and different areas within and outside Lagos metropolis through the Lagos-Abeokuta Expressway (a federal trunk road) and a major economic and trade route between Lagos and Ogun states. This early connection, coupled with physical characteristics of the area, positively affected the development of the axis as development radiated outward from the trunks (Figure 6.3). The opening of LASU-Iba Road in the same axis was also a pull factor. This was coupled with nearness to important places such as the airport, proximity or adjacency to developed core northern fringe and border town of Ota in Ogun State. This saw an increment in the built-up area from 16.69% in 1984 to 77.44% in 2016.

Like the northwest and northeast stimulus, the construction of Lagos-Badagry Expressway linking Nigeria with the neighbouring countries of Benin, Ghana and Togo through Badagry town may not have played major role in development of the sector, as the western fringe (Badagry axis) remained one of the least developed fringe zones, but pattern of development to a larger extent was influenced by the road. As seen in Figure 5.3, flash development at the initial year of construction rallied around the road.

The construction of Lekki – Epe Expressway to open-up the eastern fringe i.e. Lekki axis (Plate 6.1), unlike the western fringe, despite the similarity in their physical characteristics, engendered a tremendous increment developed land from 10.01% in 1984 to 44.03% in 2016. Lekki - Epe Expressway was a major catalyst in the development of the eastern sector. Development is concentrated along the road from where they spread outward. The axis was hitherto described in the Metropolitan master plan (1980-2000) as ‘adjacent to the

metropolitan core but essentially virgin because of road inaccessibility' was rapidly transformed with the construction of the road.

This finding corroborates previous studies (including White *et al*., 1997) that the transportation network and land-use suitability are the factors that determine urban expansion, to a great degree. Vacant areas in a city with high accessibility and the right suitability conditions (e.g. good terrain) are highly prone to development (urban expansion). However, the sharp distinction in the development of western fringe (with age-long Lagos – Badagry expressway) and the east fringe (with lately Lekki – Epe expressway) with other similar nature revealed variation in the influence of the factors of urban expansion across the fringe. The *perceptions of relative attractiveness (*Forrester, 1969) in the development process may have played out in this scenario.

In further corroboration of the findings, the result of residents' survey, with reference to the influence of transport facility (road) and locational proximity, revealed that more than half (56%) of the respondents were influenced by the presence of such facilities.

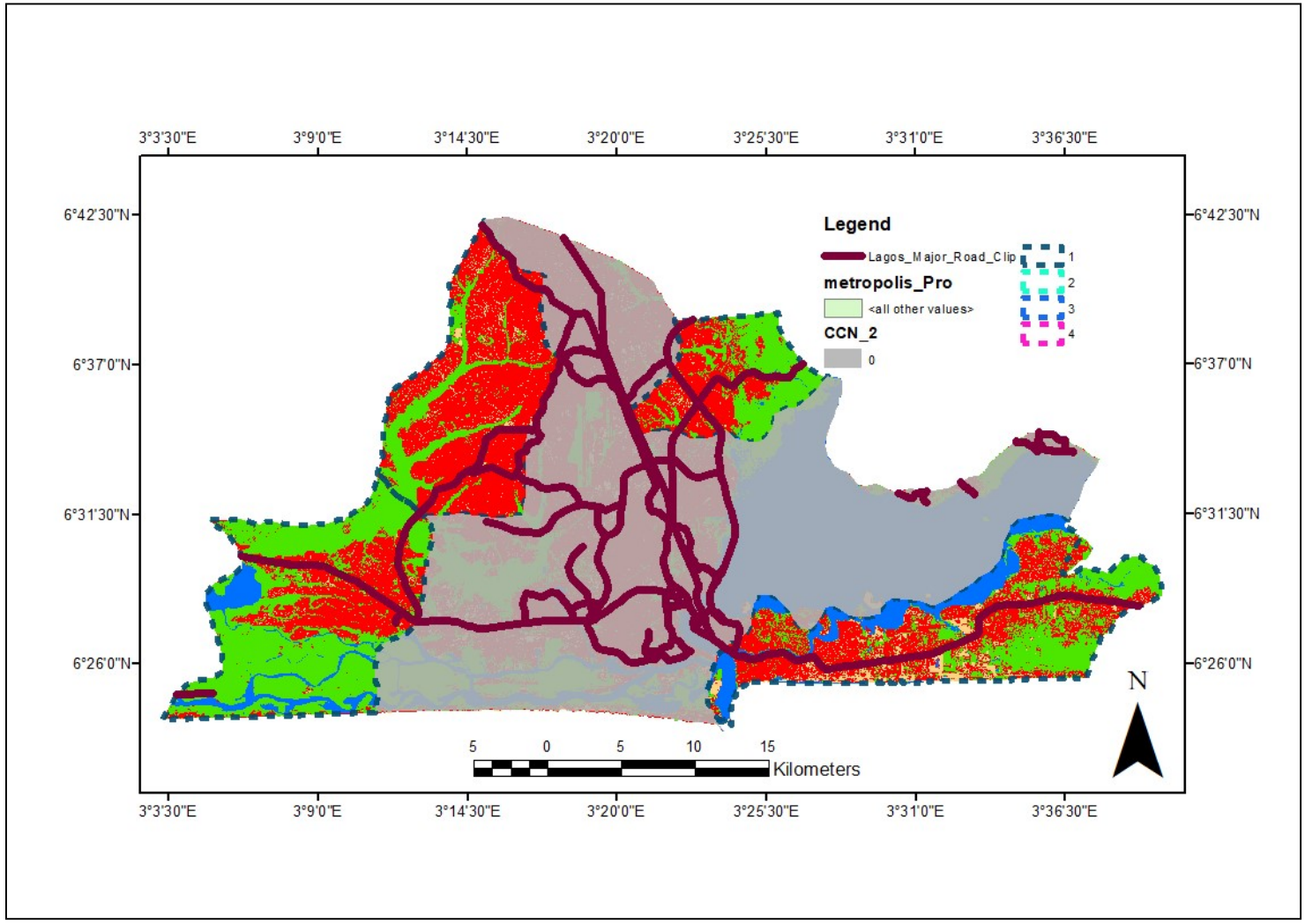

Figure 6.2: Major roads connecting the Fringes to the Core

Plate 6.1--Lekki – Epe Expressway (Providing access to fringe Communities such as *Langbasa, Mopo Akinlade*)

6.4 Government Policies and Urban Expansion

The findings of this research showed that government acquired lands cut across the metropolitan fringe of Lagos. While some of the acquisition remains undeveloped, most of them were haphazardly developed. The western fringe was replete in global acquisition and this factor, coupled with the physical nature of the axis, had contributed to low rate and pattern of development of the area as land is legally unavailable for development. Both the title document and building development permit were rarely granted in the axis. To a certain extent, the policy also affected the pattern of development in the north-eastern fringe where daunting developers encroached on the government acquisitions willingly or unwillingly and developed unfit structures on them.

The phenomena did not exclude the other fringe zones but in case of the northwest, as revealed in the course of this study, the tempo of development was such that the developers were less moved by the policy. People encroaching on the land were of the opinion that with time the land would be released to them by the government. The eastern fringe was also affected by the preponderance of acquisition. However, the village excision policy was more efficient in the zone. Some acquired lands have been revoked and made available for the general public to laid out and develop. Because of the cost implication and level of awareness, the excision policy was not as efficient as it were in the east in other sectors. The attractiveness of the eastern sector to the Registered Private Estate Agents (who invest in such land) contributed to the success of the policy in the sector and accounts for the high percentage (40.6%) of residents that acquired their plots from private registered agents.

6.5 Hypothesis Four:

The fourth hypothesis of this study stated that:
There is no significant variation in the effects of factors of urban expansion across the metropolitan fringe of Lagos.

The factors above were subsequently subjected to hypothesis testing using Logistic Regression to examine the contributory factors to urban expansion of metropolitan Lagos to the fringe using physical characteristics (slope, elevation), proximity to

infrastructure (distance to road) and government policy (acquisition) as predictors. A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably contributed to metropolitan expansion to the fringe, (chi-square = 220.932, p < .001 with df = 39). The model explained between 31.9% (Cox & Snell R^2) and 42.5% (Nagelkerke R^2) of the variance in urban expansion to the fringe and correctly classified 75.3% of cases (better by 23% than with only the constant included before any coefficient which was 52.3%). Nagelkerke's R^2 of .425 indicated relationship between prediction and grouping (i.e. the explained variation in the dependent variable based on the model is 42.5%). The Hosmer and Lemeshow goodness-of-fit test statistics were not statistically significant, with a value of 0.817, P > .05, therefore the model was quite a good fit. Prediction success overall was 75.3% (78.7% for non-urban and 71.6% for urban).

In Table 6.2, the coefficients (B), their standard errors (S.E), the Wald test statistic (Wald) with associated degrees of freedom and p-values, and the exponentiated coefficient (also known as an odds ratio (Exp(B))) were displayed. The Wald test determines statistical significance for each of the independent variables (found in the "Sig." column). The results in the table show that slope (p = .001) and DistoRoad (p = .000) added significantly to the model/prediction, but government acquisition (p =.695) did not add significantly to the model. While acquisition is not statistically significant, the overall effect of elevation and DistoRoad were statistically significant, as against the terms for their categories.

The logistic regression coefficients (column B) gave the change in the log odds of the outcome for a one-unit increase in the predictor variable. This made it possible to envisage the changes among the different categories of predictors and their contribution. The indicator variables for slope/elevation showed that locations with an elevation of 1(1m) versus a location within 30 (30m), decreases the log odds of expansion by 39.433 (column B). Similarly, the indicator variables for DistoRoad show that locations with a DistoRoad of 1(1000m) versus a location with a DistoRoad 10 (10,000m), increases the log odds of expansion by 21.534 times. Hence, increase in elevation increases the chances of expansion while distance to major roads decreases the rate of expansion in

the study areas. Acquisition was not a significant predictor. Its Odd Ratio (OR) was less than one, and it was not significant. Increasing elevation was associated with an increased likelihood of expansion to the fringe, but increasing distance to road (DistoRoad) was associated with a reduction in the likelihood of expansion.

While associating increasing elevation with an increased likelihood of expansion to the fringe may be contrary to many findings worldwide (Dubovyk *et al*., 2011; Ye *et al*., 2011; Li, 2014), it corroborates findings of Dewan & Yamaguchi (2009) and that of Braimoh & Onishi (2007) in the study area. Increased elevation is usually associated with an increased cost of construction. However, most parts of the study area were below the mean sea level and required higher cost for foundation and development. Areas higher are thus preferred for development. It can be inferred from the foregoing that physical characteristics of the site and proximity to infrastructural facilities were the major factors that influenced expansion into the fringe and that government policy such as land acquisition has not done much in influencing urban expansion into the metropolitan fringes of Lagos.

The model was further tested and compared at sectors level to examine the contributory factor at different zones. The results in Table 6.4 revealed that the logistic regression model was statistically significant for all the fringe zones (northwest (χ^2 *=43.79, df=3, p<.000),* northeast (χ^2 *=23.528, df=3, p<.000*), east (χ^2 *=10.36, df=3, p<.016*); and west (χ^2 *=48.975, df=3, p<.000*)). The model explained 37.3%, 37.0%, 76.0% and 34.3% (Nagelkerke R^2) of the variance in urban expansion to the northwest, northeast, east and west fringe respectively and correctly classified 83.1%, 71.2%, 67.4% and 74.0% of cases in that order. The results of the regression (table 6.4) showed that slope/elevation (p = .000) and DistoRoad (p = .012) added significantly to the model/prediction, but acquisition (p =.755) did not in the northwestern sector. Like the main model, table 6.2, physical characteristics and infrastructure contributed to urban expansion in the sector while acquisition was not a significant predictor.

In the other sectors (northeast, east and west), only distance to road ((northeast (*Wald=11.329, df =1, p<.001*), east (*Wald=5.463, df=1, p<.019*) and west

(*Wald=21.113, df=1, p<.000*) was the major significant predictor. Neither slope/elevation nor acquisition was significant (table 6.3). The B coefficients for distance to road was significant and negative, indicating that increasing distance to road is associated with increased odds of urban expansion in the sector.

Consequently, the hypothesis that *there is no significant variation in the effects of factors of urban expansion across the metropolitan fringe* is rejected.

The significant effects of distance to road (representing infrastructure) across the metropolitan fringe and that of elevation (physical characteristics) corroborates previous studies (including White *et al*., 1997) that transportation network and land-use suitability are the determinant factors that drive development, to a great degree. However, non-significance of physical factors in parts of the metropolis can be explained by the human ingenuity to overcome physical challenges which necessitate variation in the influence of physical factors as earlier identified. The utter nonsignificant effect of government policies (compulsory land acquisition) as revealed in the model was, however, attributable to non-implementation ability of the government as earlier identified by Oduwaye (2013) among others.

Table 6.2: Logistic Regression for the entire fringe

Variables in the Equation		B	S.E	Wald	df	Sig	Exp(B)
Step 1[a]	Slope			58.388	29	.001	
	slope(1)	-39.433	56837.504	.000	1	.999	.000
	slope(2)	-41.632	56837.504	.000	1	.999	.000
	slope(3)	-41.455	42789.209	.000	1	.999	.000
	slope(4)	-21.207	40187.399	.000	1	1.000	.000
	slope(5)	-20.497	40187.399	.000	1	1.000	.000
	slope(6)	-20.796	40187.399	.000	1	1.000	.000
	slope(7)	-20.501	40187.399	.000	1	1.000	.000
	slope(8)	-21.278	40187.399	.000	1	1.000	.000
	slope(9)	-20.835	40187.399	.000	1	1.000	.000
	slope(10)	-20.397	40187.399	.000	1	1.000	.000
	slope(11)	-17.883	40187.399	.000	1	1.000	.000
	slope(12)	-20.508	40187.399	.000	1	1.000	.000
	slope(13)	-19.607	40187.399	.000	1	1.000	.000
	slope(14)	-18.978	40187.399	.000	1	1.000	.000
	slope(15)	-18.216	40187.399	.000	1	1.000	.000
	slope(16)	-18.402	40187.399	.000	1	1.000	.000
	slope(17)	-17.408	40187.399	.000	1	1.000	.000
	slope(18)	-18.882	40187.399	.000	1	1.000	.000
	slope(19)	.930	44638.205	.000	1	1.000	2.534
	slope(20)	1.676	42901.890	.000	1	1.000	5.346
	slope(21)	-18.408	40187.399	.000	1	1.000	.000
	slope(22)	.900	43187.067	.000	1	1.000	2.460
	slope(23)	-19.257	40187.399	.000	1	1.000	.000
	slope(24)	1.362	44828.301	.000	1	1.000	3.906
	slope(25)	-.118	56837.504	.000	1	1.000	.888
	slope(26)	.411	44793.931	.000	1	1.000	1.509
	slope(27)	1.014	48261.712	.000	1	1.000	2.756
	slope(28)	-.118	56837.504	.000	1	1.000	.888
	slope(29)	-.118	56837.504	.000	1	1.000	.888
	Acquisition	-.118	.302	.154	1	.695	.888
	DistoRoad			55.436	9	.000	
	DistoRoad(1)	21.534	14110.034	.000	1	.999	2250474009.033
	DistoRoad(2)	20.642	14110.034	.000	1	.999	921967283.999
	DistoRoad(3)	19.740	14110.034	.000	1	.999	374009713.949
	DistoRoad(4)	20.274	14110.034	.000	1	.999	638330421.939
	DistoRoad(5)	19.902	14110.034	.000	1	.999	439680481.517
	DistoRoad(6)	18.561	14110.034	.000	1	.999	115113331.057
	DistoRoad(7)	18.918	14110.034	.000	1	.999	164466836.697
	DistoRoad(8)	17.966	14110.034	.000	1	.999	63464718.437
	DistoRoad(9)	-.074	21493.036	.000	1	1.000	.929
	Constant	-.213	42590.966	.000	1	1.000	.808

a. Variable(s) entered on step 1: slope, acquisition, DistoRoad

Table 6.3: Logistic Regression for the sectors

Zones	Variables	B	S.E	Wald	df	Sig.	Exp(B)	95.0% C.I for EXP (B)	
								Lower	Upper
Northwest	Slope	0.289	0.062	22.007	1	0.000	1.335	1.183	1.506
	Acquisition	0.232	0.742	0.097	1	0.755	1.261	0.294	5.399
	DistoRoad	0.000	0.000	6.385	1	0.012	1.000	0.999	1.000
	Constant	-1.689	0.806	4.395	1	0.036	0.185		
Northeast	Slope	0.079	0.060	1.738	1	0.187	1.082	0.962	1.216
	Acquisition	0.284	0.658	0.000	1	0.999	9.842	0.000	.
	DistoRoad	-0.001	0.000	11.329	1	0.001	0.999	0.998	0.999
	Constant	1.556	0.888	3.073	1	0.080	4.740		
East	Slope	0.054	0.075	0.516	1	0.473	1.055	0.911	1.222
	Acquisition	-0.666	0.416	2.561	1	0.110	0.514	0.227	1.162
	DistoRoad	0.000	0.000	5.463	1	0.019	1.000	0.999	1.000
	Constant	0.186	0.599	0.097	1	0.756	1.205		
West	Slope	0.174	0.100	2.997	1	0.083	1.190	0.977	1.449
	Acquisition	-0.541	0.561	0.928	1	0.335	0.582	0.194	1.749
	DistoRoad	-0.001	0.000	21.113	1	0.000	0.999	0.999	1.000
	Constant	-0.372	0.842	0.196	1	0.658	0.689		

Source: Author's Fieldwork, 2016

CHAPTER SEVEN

7.0 EFFECTS OF URBAN EXPANSION ON PHYSICAL DEVELOPMENT

7.1 Introduction

As shown in previous chapters, patterns and factors of urban expansion vary from one section of the fringe to the others, it has also been shown that the expansion affected quantity of water, vegetation, pattern and buildings across the fringe. This section explored the availability of physical developments, including social infrastructure within the metropolitan fringes. It sought to establish associations between neighbourhood socio-economic facilities and healthy physical environment, to measure the effects of patterns of metropolitan expansion on the fringe environment.

7.2 Social and Infrastructural Facilities:

Social infrastructure considered within the metropolitan fringes includes educational facilities, health facilities, recreation and commercial facilities. Data collected include their availability, accessibility (distance to residents and time to access) and residents' perceptions of their qualities.

7.2.1 Educational facilities

Data from the Lagos State Ministry of Economic Planning (2015) revealed 205 public primary school and 162 secondary schools (85 junior and 77 senior) in the entire study area. They were spread in the selected areas as shown in Table 7.1. The northwest had the highest number of public primary schools (76) while the northeast had the highest number of students per school (563). The east had the least number of primary schools (35) and the least number of students per classroom (30 students). This low number of students in the classroom may be attributed to the status of residents who may give preference to private schools

over public schools. Available private schools were numerous and vary in sizes and characteristics in the entire study areas.

The study revealed the dominance of private schools in the area, an indication that government presence was not felt much and this may negate the Global Education Initiatives for compulsory, free and good quality education which Nigeria is pursuing. Private schools are out of reach of the poor since they were established for profit. In the context of the second goal of the Millennium Development Goals (MDGs), which focused on the achievement of universal primary education by 2015, the available number of public primary education was further explored across the fringe zones.

Table 7.1: Available Educational Facilities within the Study Areas

Fringe Zone	No. of School.	No. of Classrooms	No. of Pupils	No. of Teachers	Average No. of Pupils per		
					School	Teacher	Class
			Primary Schools				
West	54	580	27,040	560	501	48	47
Northwest	76	557	23,827	523	336	46	43
Northeast	40	572	22,537	767	563	29	39
East	35	428	12,645	234	361	54	30
	205	**2,137**	**86,049**	**2,084**			
			Junior Secondary Schools				
West	17	222	20,792	481	1,223	43	94
Northwest	35	427	40,278	1,396	1,151	29	94
Northeast	13	190	16,222	536	1,248	30	85
East	20	201	12,045	258	602	47	60
	85	**1040**	**89,337**	**2,671**			
			Senior Secondary Schools				
West	15	205	14,797	532	986	28	72
Northwest	25	357	31450	1205	1,258	26	88
Northeast	17	199	14,401	646	847	22	72
East	20	200	9,087	313	454	29	45
	77	**961**	**69735**	**2696**			

Source: Lagos State Ministry of Economic Planning and Budget, 2016

7.2.1.1 Nearness to Educational Facilities

Closeness of school to residence was identified by Duze (2010) as one of the major considerations for choice of school for children at the primary level in Nigeria. Nearness of public nursery/primary school within the fringe was explored to ascertain accessibility of the facilities to the fringe populace. The results in Table 7.2 revealed that more than 50% of the respondents could access private nursery/primary school within 2km (<1km=17.7%, 1-2km=36.9%) from their homes. Contrary to this, only 30.3% (<1km =4.5% and 1-2km=25.8%) could access public primary school within 2km while majority 38.2% could access it at a distance more than 6km away from their residences. This result corroborates earlier findings by Arubayi, (2005) and Duze (2010) that majority of Nigerian pupils and students walk long distances to and from school every day, especially in the rural areas.

It could be concluded from the result that the fringe lacks public primary schools as only 4.5% had access within 1km distance. Duze (2010) reported that head-teachers posited that distance on foot for children between the age of six and seventeen should be less than 1km as contrary to this might affect the achievements of goals and objectives set for the children. It was in line with this that States implementing the compulsory free education programme in Nigeria stipulated that schools should be located at not more than one kilometre from the residences of the communities to be served (Duze, 2010). However, the result of this study shows that children within the fringe travelled long distances to and from school. This paucity usually resulted in over-populated schools and attendant problems such as overcrowded classrooms, inadequate provision of services, staff, and infrastructure, and poor attendance by pupils due to lack of seating places (Duze, 2010).

Disaggregation of the result revealed different patterns across the fringe zones. As observed in Table 7.1, average number of students per class was smaller in the eastern fringe. Similarly, Table 7.3 revealed that over sixty per cent of the primary school age pupil from the eastern fringe could access public primary school within 2km distance from home. The opposite was the case in the medium (northwest and northeast) and the low income (western fringe) sector. Despite early development of the northwest zone,

64.2% of the respondents would cover more than 6km, if they must attend public primary school. The results buttressed the Institute of Medicine and National Research Council' (2013) findings that levels of residential segregation shape environmental differences across neighbourhoods with residents who are mostly low-income or minorities being less able to advocate for resources and services; therefore, the concentration of facilities in high-income fringes or zones.

Table 7.2: Distances to Educational Facilities

Distance	Private Educational Facilities				Public Educational Facilities			
	Nursery/Primary		Secondary		Nursery/Primary		Secondary	
	Count	%	Count	%	Count	%	Count	%
<1km	214	17.7	168	13.9	54	4.5	106	8.8
1-2km	446	36.9	440	36.4	312	25.8	234	19.4
3-4km	268	22.2	286	23.7	352	29.1	236	19.5
5-6km	82	6.8	164	13.6	28	2.3	166	13.7
>6km	198	16.4	150	12.4	462	38.2	466	38.6
Total	1208	100.0	1208	100.0	1208	100.0	1208	100.0

Source: Author's Field Work, 2016

Table 7.3: Distances to Public Primary Schools across the Fringes

Distance	Frequency	Study Zones				Total
		East	Northeast	Northwest	West	
<1km	Frequency	0	54	0	0	54
	% within Study Zones	0.0	11.4	0.0	0.0	4.5
1-2km	Frequency	144	86	0	82	312
	% within Study Zones	62.1	18.1	0.0	28.9	25.8
3-4km	Frequency	52	122	78	100	352
	% within Study Zones	22.4	25.7	35.8	35.2	29.1
5-6km	Frequency	20	8	0	0	28
	% within Study Zones	8.6	1.7	0.0	0.0	2.3
>6km	Frequency	16	204	140	102	462
	% within Study Zones	6.9	43.0	64.2	35.9	38.2
Total	Frequency	232	474	218	284	1208
	% within Study Zones	100.0	100.0	100.0	100.0	100.0

Source: Author's Field work, 2016

7.2.1.2 Journey time to Public Primary Schools

Since travel time is a factor of distance, result of travel time to public primary school in Table 7.4 revealed that only 10.3% of the children could access school within 15 minutes while 42.1% would spend more than sixty minutes (one hour) on the road to public nursery/primary school, if they must attend one. Out of the remaining groups, 30.1% would spend 16-30 minutes while 13.4 would require 46 – 60 minutes to enjoy the facility.

More than three-quarters of pupils from the eastern fringe would access the facility in less than 30 minutes while the majority (48.8% and 74.3%) from the northeast and northwest fringe respectively would require additional 60 minutes.

7.2.1.3 Residents' Perception of the Quality of Schools

Respondents were asked to rate the quality of schools within their reach on a five scale of very poor, poor, good, very good and excellent. Table 7.5 revealed that 63.4% of the respondents perceived the quality of public primary school to be either very poor (34.8%) or poor (28.6%) while 35.3%, 1.2% and 0.2% rated them good, very good and excellent respectively. On the other hand, majority of the respondents commended the quality of private nursery and primary school, to an extent, as 46.9%, 23.7% and 3.5% perceived it to be good, very good and excellent respectively. Others 15.3 and 10.8 rated it as very poor and poor respectively. Deducible from the analysis was that the private schools rated better than public schools in the metropolitan fringe of Lagos in Lagos state. This may be attributable to nearness to school coupled with adequate provision of services that aid learning.

Break down of the result of perception into zones (Table 7.5) revealed that one-third of the respondents from the eastern fringe believed the quality of public school was poor (51.7%) or very poor (24.1%), the remaining 24.1% considered it good. Majority (68.8%) of the respondents from the northeast fringe considered the school as very bad while another 12.7% consider it poor. Only 18.1% and 0.4% rated them good and excellent respectively. About one-third of the respondents from the west rated the schools within their reach as either poor 58.8% or very poor (13.4%). The

situation was, however, different in the northwest zone where all the respondents considered the available public schools as good. This may be connected to the spate of renovation on the schools in the area. The results of this analysis suffice to conclude that the Lagos metropolitan fringe generally lacks quality public educational facilities required for the attainment of the Millennium Development Goals.

Table 7.4: Travel Times from home to Nearest Public Primary School

Travel Times		Study Zones				
		East	Northeast	Northwest	West	Total
0-15mins	Frequency	16	2	0	106	122
	% within Study Zones	6.9	0.4	0.0	37.3	10.3
16-30mins	Frequency	164	86	38	76	364
	% within Study Zones	70.7	18.1	17.4	26.8	30.1
31-45mins	Frequency	0	130	18	14	162
	% within Study Zones	0.0	27.4	8.3	4.9	13.4
46-60mins	Frequency	16	34	0	0	50
	% within Study Zones	6.9	7.2	0.0	0.0	4.1
>60mins	Frequency	36	222	162	88	508
	% within Study Zones	15.5	46.8	74.3	31.0	42.1
Total	Frequency	232	474	218	284	1208
	% within Study Zones	100.0	100.0	100.0	100.0	100.0

Table 7.5: Residents' perception of the quality of Primary Schools in their vicinity

Public Primary School	**Fringe zones**								**Total**	
	East		Northeast		Northwest		West			
Ratings	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Very Poor	56	24.1	32	68.8	0	0.0	38	13.4	420	34.8
Poor	120	51.7	60	12.7	0	0.0	166	58.5	346	28.6
Good	56	24.1	86	18.1	218	100	66	23.2	426	35.3
Very Good	0	0.0	0	0.0	0	0.0	14	4.9	14	1.2
Excellent	0	0.0	2	0.4	0	0.0	0	0.0	2	0.2
Total	232	99.9	474	100	218	100	284	100	1208	100

Private Primary School	**Fringe zones**								**Total**	
	East		Northeast		Northwest		West			
Ratings	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Very Poor	0	0.0	184	38.8	0	0.0	0	0.0	184	15.3
Poor	20	8.6	72	15.2	0	0.0	38	13.4	130	10.8
Good	92	39.7	218	46.0	160	73.4	96	33.8	566	46.9
Very Good	96	41.4	0	0.0	58	26.6	132	46.5	286	23.7
Excellent	24	10.3	0	0.0	0	0.0	18	6.3	42	3.5
Total	232	100	474	100	218	100	284	100	1208	100

7.2.2 Accessibility to Health Facilities

This analysis was limited to the public health facilities in the study area namely public /general hospital, government health clinic and teaching hospital with a view to assessing respondents' access (in term of distance) to health facilities which are believed to be at an affordable price compared to the private owned facilities. There were 24 general hospitals spread across the 20 local government areas of the state, a teaching hospital at Ikeja and minimum of four Government clinics (Primary health centre (PHC) per each of the 54 Local Council Development Areas. In term of spread across the study area, data from the Lagos State Ministry of Economic Planning (2011 and 2015) revealed that Alimosho (Northwest), Eti-Osa (East), Kosofe (Northeast) and Ojo (West)Local governments had 24, 17, 44 and 22 public/health centres respectively. However, as the urban area expands, the distribution of the facility thins out. Hence, respondents were asked to confirm the accessibility of the facilities in their neighbourhood.

Penchansky & Thomas (1981) characterized access to health into five dimensions of accessibility (distance to health facility), availability, affordability, acceptability, and accommodation. Kadobera *et al*. (2012) have established a decline in primary health care usage patterns with increasing distance or travel time to facility. Hence, average distance to health facility was used as a factor to determine the utilisation of health services in Lagos metropolitan fringes

The result showed that less than 15% of the respondents were within 2-kilometre radius to any form of government health facility, while the distance to any government health facility from majorities (up to 59.1%) was more than 10 kilometres. Correspondingly, it was revealed that only 26.4% of the respondents could access health facilities within 15 minutes from their residences, 45% would spend between 16 and 30 minutes, 15.6% and 7.9% would spend 31-45 minutes and 46 – 60minutes while 5.1% would spend above one hour to access health facilities. Access to health facility was generally poor in the study area just as its provision was inadequate. Given the conventional standard of one Primary Health Centre for every 5,000 people (Ayuba and Wash, 2016), Lagos requires about 4000 clinics with a conservative population of 20,000,000. However, as documented by Lagos Bureau of Statistics Lagos (2011, 2015) in Digest of Statistics, as at 2010, Lagos

State had 1750 health facilities (231 public and 1519 private) and this increased to 2691 (283 public and 2,408 private) in 2015. This indicates a gross deficiency in the provision of Primary Health Centres, and the areas far from the city centre such as fringe are bearing most part of the burden.

Government Health Clinic, a neighbourhood facility, was disaggregated into fringe zones as shown in Table 7.7 to evaluate the accessibility of health facility across the fringe. The result showed that the facility was at a distance of more than 10 kilometres to more than half (52.6%) of the entire fringe residents. More than two-thirds (72.5%) of residents from the northwest and 62.1% from the east fell within that category.

The analysis of variance (Table 7.8) showed a significant variation in distance to health facility across the fringe ($F = 12.76$ ($P \leq 0.05$)).

The Post hoc further showed that the variation is significant among all the four groups without a spectacular pattern.

Table 7.6: Access to Health Facilities

Distance from Residences to the nearest Government Health Facilities

Health institutions	Public hospital		Government health clinic		General hospital		Government Specialist hospital	
Distance (km)	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Less than 2	180	14.9	122	10.1	128	10.6	108	9.0
2-4km	150	12.4	122	10.1	136	11.3	140	11.6
5-7km	296	24.5	236	19.5	60	5.0	112	9.3
8-10km	90	7.5	92	7.6	170	14.1	210	17.4
More than 10	492	40.7	636	52.6	714	59.1	638	52.8
Total	1208	100	1208	100	1208	100	1208	100

Minimum Time Spent to reach the closest Health Facility from Home

Time spent	**Frequency**	**Per cent**
Less than 15mins	318	26.4
16 - 30mins	544	45.0
31 - 45mins	188	15.6
46 - 1hour	96	7.9
More than 1 hour	62	5.1
Total	1208	100

Table 7.7: Distance of Nearest Government Health Clinic to residence across the fringe

Distance of Nearest Government Health Clinic to residence		Study Zones				
		East	Northeast	Northwest	West	Total
Less than 2km	Frequency	16	54	22	30	120
	% within Study Zones	6.9	11.4	10.1	10.6	10.1
2-4km	Frequency	12	32	38	40	122
	% within Study Zones	5.2	6.8	17.4	14.1	10.1
5-7km	Frequency	24	150	0	62	236
	% within Study Zones	10.3	31.6	0.0	21.8	19.5
8-10km	Frequency	36	22	0	34	92
	% within Study Zones	15.5	4.6	0.0	12.0	7.6
More than 10km	Frequency	144	216	158	118	636
	% within Study Zones	62.1	45.6	72.5	41.5	52.6
Total	Frequency	232	474	218	284	1208
	% within Study Zones	100.0%	100.0%	100.0%	100.0%	100.0%

Table 7.8: ANOVA Test of Distance from Government Health Clinic to residences

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	75.028	3	25.009	12.760	.000
Within Groups	2359.767	1204	1.960		
Total	2434.795	1207			

7.2.3 Available Recreational facilities

Availability of recreational facilities encourages residents to participate in recreational activities which are essential for body fitness. Availability of facilities was probed in this survey. The result showed that most of the fringe communities lack access to recreational facilities. Observations in the study areas revealed that open spaces for playing were not spared in the development of the zones. Available schools lack playing ground while amusement park was a high order facility to the fringe communities. Out of the 1208 respondents, 42.2% (510) never engaged in recreation activities since they moved to their location, 25.7% rarely participated, 17.5% occasionally participated while only 14.4% frequently participated. The low participation was a function of availability of the facility and it corroborates a review by Pearce and Maddison (2011) which had associated access to open space (parks and other green spaces) in neighbourhoods with physical activity levels in both the United States and Australia.

Analysis of variance test (Table 7.9) showed significant variation in distance to recreation facility across the fringe ($F = 19.595$ ($P \leq 0.05$)).

Further exploration of the result revealed significant variation in the east, northwest and west but not the northeast. Hence, the east and northeast were grouped together under the same homogeneous subset.

Table 7.9: ANOVA for proximity to Recreation Facility

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	58.517	3	19.506	19.595	.000
Within Groups	1198.526	1204	.995		
Total	1257.043	1207			

7.2.4 Access to Market/shopping Complex

Availability of commercial facilities such as community market or shopping complex is one of the indices for measuring neighbourhood mix. It is a facility expected within five minutes trek from home. The result of analysis in Table 10 revealed that very few (13.8%) of the residents could access market or shopping complex within five minutes trek from home, while the majority (41.4%) would trek more than 20 minutes to get a market. At the zonal level, the result (table 10) showed that the western fringe was the most affected by limited access to commercial facility within short distance as 59.2% would trek 20 minutes or more to access a market/shopping mall. None of the respondents from the sector could access such facility in less than 5 minutes trek. It could be deduced that there was no sufficient mix of uses within the fringe which usually lead to discretionary travel and dependency on car travel.

However, the degree of paucity of mix varied from zone to zone as earlier indicated that the western fringe was the most affected. Computed analysis of variance (Table 7.11) confirmed significant variation in access to commercial facility across the fringe (F = 35.678 ($P \leq 0.05$).

Further exploration of the result revealed a significant difference between the east and the west but not among the east, northwest and northeast. Hence, there was no clear homogeneous subset grouping along socio-economic line.

This result corroborates Pearce et al (2011) findings, in a New Zealand study, that area deprivation was not always consistently associated with lack of community resources (including recreational amenities, shopping, educational and health facilities), however, it contrasts another study in the United States, which established relationship between neighbourhood socio-economic disadvantage and the absence of public health resources (Diez Roux and Mair, 2010).

As this section revealed, an increasing shortage of urban services and facilities has become an effect of urban expansion on the fringe. Majority of the populace on the fringe are deprived of essential facilities which decrease in provision as settlement expands.

This often results in the deplorable condition of the available facilities as they are usually overstretched.

Table 7.10: Distance to Market/Shopping Complex from residences

Trekking Duration		Fringe Zones				
		East	Northeast	Northwest	West	Total
Less than 5 mins trek	Frequency	56	88	22	0	166
	% within Zones	24.1	18.1	10.1	0.0	13.8
5-10mins	Frequency.	40	86	78	34	238
	% within Zones	17.2	18.1	35.8	12.0	19.7
11-20mins	Frequency	44	98	80	82	304
	% within Zones	19.0	20.7	36.7	28.9	25.2
above	Frequency.	92	202	38	168	500
20mins	% within Zones	39.7	42.6	17.4	59.2	41.4
Total	Frequency.	232	474	218	284	1208
	% within Zones	100.0	100.0	100.0	100.0	100.0

Source: Field survey, 2016

Table 7.11: ANOVA for proximity to commercial Facility

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	114.928	3	38.309	35.678	.000
Within Groups	1292.781	1204	1.074		
Total	1407.709	1207			

7.3 Traffic and Transportation

The major physical effects of urban expansion on the fringe have been identified in chapter five as depletion of water bodies and vegetation including agricultural land. Poor air quality is often associated with urban areas where vehicle and domestic emissions of PM10 are major contributors to air pollution. Pollution can have significant detrimental effects on people's health, as well as being detrimental to the beauty of the physical environment. Other effects include high car density with attendant traffic problem and time wastage on roads. Availability and proximity of transportation facilities have been identified as major factors promoting the expansion of cities into fringes. Residents on the fringe rely on vehicles to commute with the rest of the metropolis and beyond, especially, as a result of inadequate mix of uses as earlier identified in section 7.2.4. This factor was examined in the questionnaire administered by probing car ownership in the study area and means of commuting to various places including place of work, recreation centres, shopping centres, schools, hospital and worship centres.

7.3.1 Vehicle ownership

Vehicle ownership is a means of assessing road congestion and the density of motor (number of motor vehicle used per 1000 person) vehicle usage can also serve as a proxy of transport sector contribution to air pollution. A breakdown of car ownership in the study area revealed a high car density of 0.56 as 55.8% of the household had between one and five motorised means of commuting ranging from motorcycle to bus while 44.2% had none. Table 7.11 showed that bus ownership within households was 3.3% and 32.8% had between 1 and 5 cars/SUV, another 3.3% had tricycles and 16.4% had 1-3 motorcycles. Motorcycle was a major mean of community transport in parts of the study area such as Owode, Alapere and Ketu in the northeast axis; *Sibiri* in the west and major parts of Ayobo/Igando in the northwest axis. Not until motorcycle was outlawed on major roads in the city, many fringe residents acquired motorcycle for commuting to work and other places in a bid to avoid congestion because of the malleability of this means of transport. The high density of motor vehicle in the study area (556 per 1000 residents) explains the traffic congestion, which is one of the major challenges of fringe residents in the study areas. The major roads (Lagos – Ikorodu, Lagos – Ibadan, Lagos – Badagry, Lagos –

Abeokuta and Lekki - Epe) promoting expansion into the fringe (as identified in previous chapter) are notable in term of congestion especially during peak periods (Plate 7.1). Traffic situation rating by the respondents ranged between bad and worse (26.1%), good (15.9%) and fair (57.9%).

Table 7.12: Vehicle Ownership in the Study Area

Travel means	Quantity owned by household							Total Per cent	
	1		2-3		4-5		>5		
	Freq.	%	Freq.	%	Freq.	%		Freq.	%
Bus	40	3.3		-	-		-	40	3.3
Car/SUV	228	18.9	154	12.7	14	1.2	-	396	32.8
Tricycle	40	3.3	-	-	-		-	40	3.3
Motorcycle	132	10.9	66	5.5	-		-	198	16.4
Others specify	-	-			-		-	-	-
None	534	44.2						534	44.2

Source: Field survey, 2016

Plate 7.1: Typical Gridlock along Lagos - Ikorodu Road

7.3.2 Road infrastructure: As earlier noted, road is the main means of transport within the Lagos metropolitan fringe. However, despite the availability, the status of the roads was deplorable except for the Trunk A roads. Other roads that provide access to houses were either not available or in bad condition.

As shown in Table 7.13, about 17% of the respondents access their residence by footpaths only and in some cases footbridge; and 58.9% access theirs by untarred but motorable roads while only 7.9% access their residences via tarred roads in good condition, such include the respondents on *Alhaji Aratumi* Road that had recently been renovated and turned to a link road between Badagry Expressway and Iyana-Ipaja – Igando Road by the state government. Others access their residences via untarred and non-motorable roads (7%) and paved roads in bad conditions (9.3%). Depending on location, movement of residents on this type of road lasted 2km (35.6%), 2-3km (39.4%). 4-5km (16.2%), 6-7km or more than 7km (1%) before getting to a major road from their place of abode.

Residents of the fringe identified the major problems associated with roads within the fringe as lack of or poor drainage (29.6%) and bad road surface (Plate 7.2-7.5). Lack of drainage has made some roads in the study areas impassable especially in areas where there was gully erosion such as Egan, Ojo-Igbede, Owode-Elede and Irawo where roads were usually flooded during raining seasons

Personal observation revealed that the road network in most parts of the study areas e.g. Egan and Igando was good in terms of design and size but poor in terms of their conditions. The roads were neither tarred nor properly maintained. When it rains the road-surfaces were often flooded. Residents claimed that the cost of transport was relatively expensive to the distance covered in most parts of the fringe. This was attributed to the nature of the roads.

Table 7.13: Access to House in the Study area

Access to house		Study Zones East	Northeast	Northwest	West	Total
Footpath	Frequency	12	90	38	64	204
	% within Zones	5.2	18.9	17.4	22.5	16.9
Untarred but motorable road	Frequency	88	268	180	176	712
	% within Zones	37.9	56.5	82.6	62.0	58.9
Untarred and unmotorable road	Frequency	36	48	0	0	84
	% within Zones	15.5	10.1	0.0	0.0	7.0
Tarred/paved road in bad condition	Frequency	44	68	0	0	112
	% within Zones	19.0	14.3	0.0	0.0	9.3
tarred/paved road in good condition	Frequency	52	0	0	44	96
	% within Zones	22.4	0.0	0.0	15.5	7.9
Total	Frequency	232	474	218	284	1208
	% within Zones	100.0	100.0	100.0	100.0	100.0

Source: Field survey, 2016

Plate 7.2: Access to house through Plank footbridge over swamp in *Isashi* Area

Source: Field survey, 2016

PLATE 7.3: Common Internal Road ***/ Drainage condition in the study area: Fadipe Street Igando***

Source: Field survey, 2016

7.4 Drainage System

Drainages on access roads to buildings of respondents were observed and their nature recorded. The result in Table 7.13 shows that open concrete drain dominated (41.2%) drainage facility in the study areas. Next was earth drain (mostly natural and self-help type) which accounted for 19.5% while covered concrete drain constituted (6.5%). The proportion of road/building without drainage accounted for 32.8%. This category usually becomes waterlogged, especially during raining season. Poor drainage and nature of development have contributed to incessant flooding in parts of the fringe and it rated high as one of the problems plaguing the fringe residence after infrastructural facilities. This effect of expansion was attributed to development without recourse to planning and infrastructural provision.

Table 7.14: **Categories of Drainage in the Study Area**

Category	Frequency	Per cent
Open Concrete drain	498	41.2
Covered concrete drain	78	6.5
Earth	236	19.5
None	396	32.8
Total	1208	100.0

Source: Field survey, 2016

7.5 Source of water and toilet facilities

Poor quality drinking water can create health risks from water-borne diseases and contaminants. Access to safe drinking water is an indicator of physical environment that measures the percentage of the population receiving drinking water that complies with the United Nations (2000) Millennium Development Goals drinking water prescription. Improved drinking water sources, according to the UN includes household connection, public standpipe, borehole, protected dug well, protected spring and rainwater collection. Unimproved drinking water sources include unprotected well, unprotected spring, rivers or ponds, vendor-provided water and tanker truck, while unimproved toilet facilities include public or shared latrine, open-pit latrine and bucket latrine

The sources of water vary from public piped-borne, borehole, tanker services to surface water (such as river). Few areas (close to the city centres) have access to public piped borne water (e.g. Alhaji Aratumi area, a section in Ojo, Badagry axis with the presence of the Lagos Water Corporation which was responsible for the distribution of water in the region) while others rely mainly on self-dug borehole and well. Therefore, availability of water was neither a major problem nor an expansion factor in the study area but the qualities of available water call for clarifications due to sources and modes of distribution.

Result of the analysis in Table 7.15 revealed that17.9% of the respondents had water piped into their dwelling while 16.9% could access public tap. Majority of them (54.6%) relied on borehole, while 8.9% got their water supplied from covered dug well. The remaining, about two per cent, got supply from unimproved drinking water sources through small scale water vendor (0.2%) and tanker truck (1.5%). A breakdown of the respondents into sectors revealed that the few ones (1.7%) who still got water from unimproved sources were from the northeast fringe. None of the respondents got portable water from the surface water (lagoon, creeks, and river) though the metropolis is abundant in this; however, investigation revealed that surface water was been used for other purposes. For instance, based on information obtained from the field, the Ogun River, which flows through Ogun State into Lagos State was being used by some people who live on its shore in areas like Owode-Elede, for bathing and washing. It also served

as drain for mostly organic wastes from abattoirs located along its course.

When broken down into fringe zones, 43.1%, 39.7% and 17.2% of the residents from the east had piped water into dwelling, borehole and covered dug well respectively. In the west, majority (71.1%) got their water from borehole, 21.1% got supply from the public tap while the rest got from covered dug well. Similarly, in the northwest, while only 17.4% piped water into their dwellings, majority (70.6%) relied on borehole and 11.9% had access to public tap. The result revealed that none of the residents exceeded 1km to access water in the study areas as 69% had the source directly within their dwellings or compounds and 29.5% had it within 500metres. Only 1.5% of the respondents travelled between 500 metres and 1km to get water.

In order to ascertain the residents' sanitary conditions, types of toilet facilities in use were probed. The result revealed that a greater percentage (69.7%) of the household in the study area used septic tanks (water closet) for their toilet facility while 21.7% utilised covered pit latrine. About 8.1% of the residents still employed unimproved sanitation facilities. This comprised Pan/bucket (0.5%), hanging toilets/toilet on open water bodies (1.3%) and bush/open field (6.8%). Breakdown of the result revealed that 85.4% of the few respondents that still used unimproved sanitation facilities were from the northeast. In term of the location of the toilet facilities, 68.2% of the households had it within their buildings, 27.5% had to go out of their buildings but within the same plot before defecating, while the remaining 4.4% used public toilet or any other place outside their plots.

Generally, it could be inferred that the fringe residents had good access to water sources. The preponderance of borehole as source of water and use of septic tanks within premise, however, should be regulated as studies in parts of Lagos (e.g. Ladipo, 2013) had revealed that residents who use water from boreholes constructed within their compounds in Lekki, Ikoyi, Victoria Island might unknowingly be drinking or using water contaminated with their own human wastes because the water table in the areas (like most parts of the metropolis) is too shallow. The study (Ladipo, 2013) concluded that the construction of septic tanks in those areas of Lagos was not a good

idea. However, as the result of this survey showed, more than half of the population relies on borehole and they could hardly do without septic tank in the absence of centralised wastewater treatment plant where the effluent emanating from households could be treated. However, in the study area, there is no such facility and each household had to provide septic tank and borehole next to each other, due to uncoordinated development. The Lagos Water Corporation had discouraged sinking of boreholes in the Lagos metropolis (Ladipo, 2013) but in a city where a large percentage of the residents do not have easy access to pipe-borne water, this may be a futile plea. The Lagos State Government had also expressed concern over the proliferation of boreholes in the state citing long term environmental problem as a reason. However, better alternatives such as public piped borne water were not provided in many parts of the fringe areas.

Plate 7.4: Public Borehole at *Isefun* Community

Source: Field survey, 2016m

Table 7.15: Water Sources and Toilet Facilities

Facilities	Frequency	Per cent
Main Source of Water for Household		
Piped water into dwelling	216	17.9
Public tap/standpipe	204	16.9
Borehole	660	54.6
Covered dug well	108	8.9
Small scale water vendor	2	.2
Tanker truck	18	1.5
Total	**1208**	**100.0**
Distance to water source from home		
Inside dwelling	834	69.0
Within 500 meters	356	29.5
Between 500 meters and 1km	18	1.5
Total	**1208**	**100.0**
Adequacy of Water Supply		
Very Poor	278	23.0
Poor	232	19.2
Good	388	32.1
Very Good	188	15.6
Excellent	122	10.1
Total	**1208**	**100.0**
Toilet facilities		
Flush to septic tank	842	69.7
Covered pit latrine	262	21.7
Pan/Bucket	6	.5
Hanging toilet/toilet on water	16	1.3
Bush/Open filed	82	6.8
Total	1208	100.0

Source: Field survey, 2016

Plate 7.5:Section of Ogun River at Owode-Elede in Kosofe local government surrounded by development and litters

Source: Field survey, 2016

7.6 Waste Disposal

The issue of city waste management has been on for long. Ajayi (1975) identified inadequate facilities for waste disposal along with inadequate housing and growth in slums, traffic congestion, shortage of water and power supply as problems facing Nigerian cities. Abiodun (1997) described Lagos as one of the dirtiest cities in the world due to the inability of the city's authorities to cope effectively with waste disposal. Waste management is malfunctioning leaving tons of waste on the streets, as a reality for an increasing number of inhabitants (Kuvaja 2001). Oduwaye (2009) also described solid waste as one of the physical and environmental problems of Lagos State built-up areas. The problem of waste disposal is of considerable concern to planners as well as policymakers. It was given due recognition as Target 6 in Sustainable Development Goal 11: '*by 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality, municipal and other waste management'*

However, in assessing the administration of Governor Babatunde Fashola in the area of infrastructure provision, Oluwa (2015) posited that the administration impacted positively on the lives and general well-being of Lagosians and cited construction of transfer loading stations for efficient solid waste management, improved public sanitation and efficient waste disposal by Lagos State Waste Management Authority (LAWMA), as well as Private Sector Participation (PSP) in waste collection system, as the achievement of the governor. As the population increases and more people occupy the fringe, handling of wastes has become a major problem which may persist if adequate and concerted efforts are not deployed. There is problem of waste contaminating the groundwater systems. Pathways of entry of contaminants into groundwater systems depend largely on patterns of waste disposal and human interaction with the environment (Bianet Jago-on *et al*.). In urban areas, most of the contaminants in groundwater can come from point sources such as septic systems, earlier mentioned, landfills, fuel storage tanks that may leak gasoline or other petrochemicals, or wastewater systems that may leak effluents from metals and others. Waste buried in landfills and other garbage dumps is subject to leaching by percolating groundwater.

Hence, systems of waste disposal prevalent in the metropolitan fringe were examined and the result of the survey showed that 24% of the respondents burn their waste, 12.7% used open dumping. Some of these wastes find their ways into drainage channels causing blockage and water stagnation and consequent flooding. The proportion of those who deposit their waste into flowing water and lagoon was 6% while 53% patronize PSP operators and 4.3% used sanitary landfill (Table 7.7)). Although, more than half of the residents claimed patronage of PSP, the information obtained through informant interview in selected areas revealed that the collection was at a long and irregular interval. For instance, the PSP collects wastes once a week in some of the areas like Owode Elede, unlike the core where the PSP operators are more frequent. Hence, refuse collection and disposal remains one of the major challenges in the study area, like any contemporary Nigerian settlements. Open dump method of solid waste disposal was a common practice in the study areas as presented in Plates 7.6. The wastes dumped in unauthorized places find their ways into the drainage channels consequently resulting in flooding. Lagos Lagoon and its creeks serve as drainage for the entire Lagos. Dumping of refuse into the water has exposed it to eutrophication which has led to blooms of a wide variety of blue-green algae. Sources of nutrient pollution to the lagoon were identified (Abe *et. al*, Alo *et al*) to include untreated industrial discharge, municipal sewage, and nonpoint source runoff from the land during raining periods.

Table 7.16 Residents Methods of Waste Disposal

Disposal methods	Frequency	Per cent
Burning	290	24.0
Open dumping	154	12.7
Water/Lagoon dumping	72	6.0
PSP Operators	640	53.0
Sanitary Landfill	52	4.3
Total	1208	100.0

Source: Field survey, 2016

Plate 7. 6: Refuse dumpsite on the road at Owode-Elede fringe settlement

7.7 Summary of the chapter

The major problem of Lagos metropolitan expansion into the fringe from 1984 to 2016, as identified by the respondents, was infrastructure, dominated by bad road and poor drainage. Facilities necessary for the proper functioning of settlements were grossly lacking. This may largely be attributed to the development of the fringes without government involvement or intervention. Acquisition of land was grossly from the *Omo-onile* whose role was solely to sell land without consideration for the provision of infrastructure or orderliness. Therefore places, especially those along the bank of Ogun River were developed as slum from inception thereby waiting for government intervention. Problems in the zones are similar and epitomized lack of consensual or integrated planning of most part the fringe before allocation.

As this section revealed, the increasing shortage of urban services and facilities is a major effect of urban expansion on the studied fringe. Majority of the populace on the fringe were deprived of essential facilities which decreased in provision and quality as the metropolis expands and the available ones became overstretched. The prevailing condition in the studied fringe corroborates Toblers's (1970) Distance Decay theory, as the population dispersed farther into the fringe, the quality and quantity of infrastructure provision decreased. Although the advent of travel means and advanced communication technology have decreased the effects of distance (Hecht and Moxley, 2009) and contributed to human spreading to vast area; the cost of infrastructure provision remains on the increase as the population spreads.

CHAPTER EIGHT

8.0 SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

This chapter summarized the findings of the study; conclusions were based on the findings and recommendations made. A mixed research design was used. The first part of the process profiled the residents of the study area by sampling 1225 members of the community out of which 1208 sufficiently responded. The second part examining the pattern of expansion and effects; it supplemented questionnaire administration and personal observations with geospatial analysis.

8.1 Summary of Findings

Findings from the questionnaire administered to probe socio-economic characteristics of residents across the fringe showed that majority (88.4%) of the fringe residents were in age bracket 21-60 while only 3.3% were above 60 years and 8.3% were below 21years; this was similar across the fringe. Greater part (65.2%) of the population had tertiary education and 21.2% attained secondary school level; 3.2% had primary school education while 10.4% had no formal education. Zonal analysis revealed that majority of respondents in the east (74.2%), northeast (58.2%) and northwest (50.9%) had tertiary education while the western sector had the highest proportion (30.3%) of respondents with no formal education. Findings from monthly income analysis indicated that there was concentration at the lower rung of income class as 54.8% earned below N40,000, 30.4% and 14.76% earned N40,000-99,000 and N100,000 or more respectively. The result revealed sharp variation in the distribution of income across the fringe with a clear concentration of high-income group in the eastern sector where 40% of the respondents earned above N100,000 monthly. The low income dominates the western fringe with 38.7% earning less than N20,000 and none earn above N80, 000. There was high mix of

income groups in the two other sectors (northwestern and northeast). Result of multiple comparisons using Schefffe post hoc further revealed that there was a statistically significant difference in income of eastern residents and all other zones, similarly, there was statistical significant difference in the income of the residents in the west and the rest of the other zones (p = 0.000). However, there are no significant differences between income of the northeast and northwest (p = 0.549). The results of the two post hoc analysis reclassified the respondents from the four zones into three income groups [high (east), middle (northwest and northeast) and low (west)].

Land administration in Lagos metropolis is governed by customary and statutory law. The customary remains largely accessible to the populace as revealed in the study which showed that only 10.33% acquired land from government (statutory allocation), while the rest were from one form of customary tenure or the other. Ease of land acquisition was threatened as informal transactions are exposed to dubious characters while acquisition through statutory allocation process involved cumbersome application procedure without assurance. The dichotomous and uncoordinated process of land acquisition had great implication for urban expansion especially infrastructure provision. The mode of land acquisition also had consequences on the type of houses and pattern of development found on the fringe as government regulation was minimal. Most parts of the fringe were characterized by haphazard developments without layout plan.

The results of land classification algorithm to determine patterns of urban expansion from 1984 to 2016 across the study area showed that 45.73% of 1,270sq.km of the Lagos metropolis constituted the fringe in 1984 out of which 16.35% (95sq.km) was built-up. The rest were natural vegetation (66.6%), water bodies (16.36%) and bare soil (0.72%). The built-up area increased on the fringe by 198.8% (from 94.99km^2 to 283.8321 km^2) at an annual rate of 6.4% over the period of study (1984-2016) to cover about half (48.86%) of the fringe. The annual rate of expansion was 4.2% during 1984-2000 and 5.2% for circa 2000-2016. The study revealed variations across the fringe at different period. A comparison of expansion towards the sectors showed that built-up area in the northwest increased from 24.57km^2 to 114km^2 (364.25%) in 1984 to 2016; the eastern sector increased built-up areas from 18.08km^2 to 79.51km^2 (339.7%) while the west and

northeast sectors increased by 83.19% and 58.81% respectively within the same period. The growth was intensified throughout the two periods in the zones except for the northwestern sector where growth subsided and densification set in during the second circa. While expansion to the northwest subsided between 2000 and 2016, expansion towards the eastern sector intensified till 2016 with 117.50% increment between 2000 and 2016 to remain the present fastest growing sector. *The results of ANOVA test (*$p<.05$ [$F(3, 8) = 4.93$, $p = 0.032$]*) revealed a* significant difference in patterns of expansion across the four fringe zones.

Exploration of the relationship between urban land expansion and population growth to compare pattern of expansion revealed that between 1984 and 2016, population growth rate was 12.03% and urban expansion rate was 6.41% resulting in population growth to urban expansion ratio (PU) of 1.88 for the entire fringe. This however varied across the fringe with highest (5.55) and lowest ratios (0.76) from the west and east respectively. It also varied temporally as it decreased from 2.57 in circa 1984-2000 to 0.93 for circa 2000-2016. The results also showed average population density of 13,544 across the fringe with highest (24,676) in the northeast and lowest in the east (4,739/km^2). The result of land consumption intensity showed that land consumption ratio for the metropolis decreased from 0.0106 in 1984 to 0.0061 in 2000 and 0.0057 in 2016. On the fringe LCR decreased from 0.0117 in 1984 to 0.0072 in 2000 and increased marginally to 0.0074 in 2016. The land coefficient ratio in the eastern sector increased from 0.0157 in 2000 to 0.0211 in 2016. The LAC, on the other hand, is on the rise across the fringe with 0.0032 over the period of 1984-2016. It rose from 0.0045 in circa 1984-2000 to 0.0077 during 2000-2016.

Selected factors of urban expansion (physical characteristics), proximity to infrastructure and government policy were subjected to Logistic regression analysis to examine their contribution to urban expansion of metropolitan Lagos to the fringe. The predictors as a set reliably contribute to metropolitan expansion to the fringe, chi square = 220.932, $p < .001$ with df = 39). The model explained between 31.9% (Cox & Snell R^2) and 42.5% (Nagelkerke R^2) of the variance in urban expansion to the fringe and correctly classified

75.3% of cases. Results of the analysis showed that slope (p = .001) and distance to road (p = .000) added significantly to the model/prediction.

Land classification results revealed that 165.88km^2 of vegetated land were converted between 1984 and 2016 while water body within the fringe depleted by 47.97% from 95.033km^2 in 1984 to 49.446km^2 in 2016. The study showed differences in the effect of expansion across the metropolitan fringe. In the northwest, the negative effect of expansion on vegetation was severe as 78.4% of vegetated areas in 1984 had been converted to built-up areas in 2016 (122.67km^2 to 26.54km^2). This was followed by 37.66% in the eastern sector, 30.01% of swamp forest had been encroached by physical development in the northeast and 17.55% in the western sector. In the eastern sector, 58.03% of 1984 water body was converted to built-up area in 2016. However, only 17.55% and 16.67% of land use classified as water bodies in 1984 were converted in the west and northeast in 2016 while no form of water depletion was revealed in the northwest where the physical effect of urban expansion was largely on vegetation depletion.

Level of compliance with planning regulations was low in the study area. The eastern sector with the highest percentage (31%) of full compliance also recorded the highest percentage (24.1%) of none compliance structures when compared to other zones while the northwest with the lowest percentage of full compliance (11.9%) recorded only 20.2% of none compliance others being partial compliance.

8.2 Conclusion

The Lagos metropolitan fringe comprises all the social groups. However, the growth of the fringe gave credence to sector development as the high-income group concentrated in the eastern sector, middle income in the northeast and northwest, while the western sector has the low-income group. Based on the Driving force-Pressure-State-Impact-Response (DPSIR) assessment framework, the research concludes that population explosion (accompanied with increasing yearning for shelter and other human activities) remains one of the major *driving forces* exerting *pressure* on the metropolitan fringe of Lagos State thereby changing its quantity and quality over the years with the resulting poor

quality of environment and infrastructure in many places due to poor land governance. The fringe residents vary in terms of their socio-economic characteristics. Although it was not total segregation, there was high concentration of high-income groups in the eastern fringe and low-income group in the west. This to a greater extent affect the fringe sectors differently. It was established that there was correlation between the socio-economic characteristics of the residents and the nature of development and depravity in different section of the metropolitan fringe. Development of structures on marginal land was common among the low-income sectors compared to other areas. Responses to these changes through government policies have not yielded meaningful result and the need for further action is required for sustainable development of the fringe and to transform the fringe into centre of opportunities for people whose yearning and aspiration to live in the city cannot be doused.

Pattern of expansion into the fringe varies spatially and temporally over the study periods. The increase in land coefficient ratio on the fringe was attributed to rise in LCR in the eastern sector that increased from 0.0157 in 2000 to 0.0211 in 2016 due to intensive reclamation and conversion of vegetation to urban use.

Increase in population size affected the extent of built-up areas and expansion into the fringe during the study period. The results of the population growth to urban expansion ratio indices revealed that population increase on the entire fringe is more than the rate of expansion. Expansion of the metropolis towards the fringe is a response to high rate of population increase rather than the general notion of urban sprawl which is usually associated with low-density development. However, the eastern fringe presently sprawls as the indices revealed. Aside from closely built-up development, the three sectors said to be compact were devoid of other characteristics of a compact city.

While acknowledging that the overall pattern of expansion was influenced by many other factors including physical characteristics and infrastructure variables, considerable differences in physical development pattern across the fringe were also explained by socio-economic variables of the sectors. The western sector was characterised by similar characteristics and factors of the east sector but unlike the west, the east was at the

second circa of this study witnessing high rate of development because of some other attractive factors that appease and attracts high income class who had the wherewithal to invest in the difficult terrain. This action of the high-income class follows one of the three forces in urban dynamics theory, *perceptions of relative attractiveness,* as postulated by Forrester (1969). Urban policy aimed at controlling the expansion failed as it did not contribute to the equation.

Depletion of vegetation by 42.9% and encroachment on water bodies, through land reclamation, by about 48% was revealed as resultant effect by the study. This shows that there was higher rate of expansion in circa 2000-2016 than 1984-2000 while urban population increased at a decreased rate (10.85 to 4.84).

Despite the fact that population also spill into the other regions (Ikorodu, Epe, Badagry and Ibeju-Lekki) of Lagos state, the result of the research revealed that encroachment into the fringe was serious but inevitable as the increasing population had to be accommodated. However, if the population continues to grow at the current pace and LCR remains at present 0.0057, by 2030 and 2050 there would be need for 97,700.95 hectares (977.01sq.km) and 183,439.46 hectares (1,834.40sq.km) of land when the population of the metropolis would have grown to 17,140,518 and 32,182,361 respectively. This portends dangers as the total land area of the entire metropolis including difficult terrain but excluding water bodies stands at 1,171.28 sq.km.

Car density in the study area was high (0.56) as 55.8% of the household had between one and five motorised means of commuting ranging from motorcycle to bus. The high density of motor vehicle in the study area (556 per 1000 residents) explains the traffic congestion, which is one of the major challenges of fringe residents in the study areas.
Given the complexity of urban land tenure, property rights and the limited capability (or willingness) of government to meet the increasing challenge, no single form of tenure can meet the diverse and changing needs of large urban populations. It is therefore important to consider a range of pragmatic approaches to improving tenure security and access to public services.

8.3. Theoretical Implications of the Study

The study has theoretically demonstrated how different dynamics of urban expansion (socio-economic characteristics of people, demographic factors, biophysical characteristics of places, proximity to infrastructure and government policies) affect the growth and development of Lagos metropolitan fringe in different sectors. Sectoral expansion based on different factors was first postulated by the Sector Theory of Homer Hoyt (1939). In his critique of the Concentric Zone Theory of Burgess (1925), Hoyt indicated that spatial competition is not the only source of a city's growth but other factors like prestigious locations (hills, waterfronts), social kinship and affinity also play a role. The theory also accorded a large role to transportation infrastructures in the expansion process. However, it observed that lower-income districts are not necessarily in a separate zone but could co-exist with more fashionable/ prestigious areas. Therefore, this research was premised on the Sector Theory, using Driving Force-Pressure-State-Impact-Response framework. The framework is of the notion that there is a chain of causal links starting with *driving forces* through *pressure* to *states* and creating *impacts*' which requires appropriate *responses* in form of good urban land governance. With the framework, intervention or response is expected at any stage and when this is not done, greater impact is created.

Upon all the criticism of Sector Theory, it was further substantiated by the study and established that the effects of urban expansion are determined to a larger extent by the factors of expansion in different sectors. The research was able to provide and communicate knowledge of the current state of the Lagos metropolitan fringe and causal factors regarding expansion and development making it possible to proffer necessary response by willing authority as at when due.

While it was acknowledged that the sector theory is of age and, like any urban theory, is partial in attempt, this study concludes that it provides an effective theoretical underpinning for the DPSIR framework, to explore the causal link among demographic and socio-economic characteristics of people, biophysical characteristics of place, infrastructural proximity, form and pattern of emerging fringe and government response. Based on the DPSIR framework, urban population explosion with the attendant human need triggers expansion while physical characteristics of the site, proximity and

availability of infrastructural facilities and socio-economic status of the people were the major factors influencing pattern of expansion into the Lagos metropolitan fringe. These, in turn, determine the state of the fringe and response.

8.4. Empirical Implication of the Study

The essence of this research is to contribute knowledge towards better understanding of the concept of fringe with focus on different forces propelling development towards different sectors of Lagos metropolitan fringe and variant effects. It is believed that it will contribute to the empirical literature in urban expansion management and urban study in general.

The research findings show that resident's socio-economic characteristics, biophysical nature of area, proximity and government policies affect the resultant pattern of metropolitan fringe. The findings further show that non-implementation of policy or lack of it is the bane of urban expansion in the study area. Contrary to Browder et al (1995) finding the metropolitan fringe is populated mainly by middle- and lower-middle-income households, this research revealed that the fringe has composition of all income groups but with dominance in different sectors.

The established significant relationship between the migrant/households' socio-economic characteristics and effects on the fringe. It shows that socio-economic status and the biophysical characteristics of site affect the fringe. The research revealed the power of attractiveness before the attractiveness equilibrium sets in. Areas in the east with power of attractiveness witnessed expansion with investment from private people and makes it more attractively developed compared to the western sector with the same biophysical characteristics but devoid of such power being developed in a lopsided manner. Early study by Forrester (1969) has revealed that people migrate to areas that they perceive as being relatively attractive.

8.5. Implications of Findings for Urban Management and Policy Recommendations

One important step towards creating a sustainable urban environment is the assessment of policies, infrastructure, socio-economic factors, resource use and any other processes that

contribute to and profit from the city's metabolism, prosperity and quality of life. This research has accomplished this task which will allow city planning officials, and governments in general, to identify areas of opportunity as well as concern, and to respond by developing realistic sustainability goals. In other words, the result of this research is of immense benefit to urban planning and management. It is expected to serve as basic information to guide urban planning practitioners and policymakers on the subject of urban expansion in metropolitan Lagos and the State as a whole.

Knowledge of factors of urban expansion and effects in different sector of the metropolitan fringe is a viable tool to selectively deal with any part of the fringe or the entire fringe for project implementation depending on the available resource at the disposal of policymakers. Awareness of the challenges of land acquisition procedures and its influence on urban expansion can motivate the government to act on the issue of good urban land governance.

The research has further informed the policymakers that urban expansion cannot be stopped but can be planned to achieve sustainable development. For such planning purpose, these research findings become handy. It will assist planners and policymakers in embarking on proactive planning to ensure sustainable development

The research has further established that urban expansion (for the past 30 years) into the fringe has largely occurred in the absence of a viable spatial structure and resulted in crowded slums settlements and inefficient land use patterns in the urban fringe. Cities are consuming land, which may not be sustainable in the long run. Poor land acquisition procedure also results in increased occupation of marginal land. As a result, living conditions deteriorate as the provision of services and infrastructure has become inefficient.

In order to create the structure for sustainable expansions and densification, proper Urban Land Governance framework should be put in place. Plans are needed to enable cities to accommodate the expected growth in the next decades in a sustainable way and the result of this research is available to guide policymaker in achieving the desired goal of sustainable development.

City expansions and densification plans should provide for a balanced urban structure to minimize transport costs, optimize the use of land and provision of social and infrastructural services, and support the protection and organization of urban open spaces. Fringe should be planned as growth pole with complementary uses and allocated to users as at when required while guiding against land speculations. City enhancement programme should include fringe densification plan, area redevelopment, layout of new areas to link old areas, building redevelopment and conversions where necessary.

This research finding is a guide to promote sustainable urban expansion with adequate access to land, infrastructure and services to support the rapid socio-economic development of metropolitan Lagos and entire Lagos state

8.6. Areas of Further Research

The research generally explored expansion of metropolitan Lagos into the fringe viz-a-viz internal demographic and spatial growth, dynamics, forms and patterns and effects. It dealt deeply into the variation of the dynamics and effects across a metropolitan fringe; it revealed variations in urban dynamics across the metropolitan fringe, their varying degree of effects and made some suggestions.

Further studies should be directed to comparison of dynamics of expansion between two or more metropolis of equal or similar standard within the country.

Comparison of the dynamics of expansion of Lagos metropolis into the fringe with any other standing region (Badagry, Epe, Ikorodu, Ibeju) which are at diffusion stage of development will also foster good research in the area.

Further research into the policies and management strategies for urban governance towards guided urban expansion into the fringe is also an area worthy of more exploration.

From the inception, the research did not segregate urban sprawl from expansion because of the intrigues involved, however, some variables (population density and land density) commonly used to describe sprawl was used towards the end of the study to measure the

phenomena and concluded that the study area did not sprawl but has reached coalesce stage. This area may be further studied using other factors of urban sprawl.

8.7 Recommendation

To achieve sustainable development, inclusive planning and development should be employed while taking cognisance of biophysical characteristics of the fringe and socio-economic components of the people. The government should be proactive and futuristic in planning and development of the urban and its fringe areas and avoid development chasing planning syndrome, in this respect, government should improve capacity development of implementing agencies to monitor development and improve city management.

Knowing fully that Lagos metropolis is a region out of five regions making up Lagos State, this study suggests that lessons of Lagos metropolis should guide and prevail in the development of other regions which are relatively still rural.

8.8 Contribution of the Study to Knowledge

This study has contributed to the existing body of knowledge on the forces of urban expansion in the metropolitan Lagos and established the roles of these forces in the characteristic pattern across the metropolitan fringe. It succinctly provided clear link and detailed information on the *Driving forces* and the resulting *Pressures* on the *State* of Lagos metropolitan fringe viz-a-viz its quantity and quality and *Impacts* resulting from changes caused by expansion on the fringe and its residents with policy *Response* to the changes.

The research has contributed to the land use/land cover field and further proved its usefulness in identifying the change, trend and rate of change in land use in the study area.

The research revealed the weakness of government policy at controlling expansion into the fringe and therefore suggested measures to strengthen public support for policy implementation of guided metropolitan expansion.

The study collated a comprehensive database and revealed the strength and weakness of Lagos metropolitan fringe that has exonerated it from sprawling. Through this, it has not

only contributed to the debate on the concept of urban expansion but suggested different levels of planning to policymakers to deal with different regions/sectors and the entire state to foster sustainable development.

The study revealed that there are variations in the dynamics of urban expansion (socio-economic, demographic, biophysical, infrastructural proximity and policies) across the study fringe. The forces affect urban expansions differently and this directly affects the pattern of expansion and its effects across the study area. The effects can be positively managed by building capacity for good land administration to achieve proper allocation and acquisition processes.

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APPENDIX I

UNIVERSITY OF IBADAN

DEPARTMENT OF URBAN REGIONAL PLANNING

RESEARCH QUESTIONNAIRE ON

LAND ACQUISITION PROCESS AND URBAN EXPANSION IN THE LAGOS METROPOLIS, NIGERIA, 1984-2016

Questionnaire

I am a student from the University of Ibadan; your household has randomly been selected to participate in this research survey. The exercise is purely for **academic purpose** and your responses will be protected. By taking a few moments to respond, you will be greatly contributing to the success of this research.
While thanking you for your cooperation, your assistance is greatly appreciated.

This questionnaire is to be answered by the head of household or a senior household member.

ID: Sample identification
Street Name_____
House/Apartment Number _____
Community name and Ward Name_____
Local Government Area/ LCDA_____

SECTION A: SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENTS

1. Respondent's gender?
   (1) Male (2) Female
2. Your age?
   (1) <=20 (2) 21-30 (3) 31-40 (4) 41-50 (5) 51-60 (6) 61 and above
3. Marital status?
   (1) Single (2) Married (3) Divorced (4) Separated (5) Widow (6) Widower
4. Status of respondent
   (1) House owner (2) Tenant (3) Worker (4) Relative to owner
5. Which of the following languages can you read and write? *(Tick as many as applicable)*
   (1) Arabic (2) English (3) French (4) Hausa (5) Ibo (6) Yoruba (7) Others.....
6. Highest level of education attained
   (1) No formal education (2) Pry 6 (3) JSS 3 (4) SS 3
   (5) Polytechnic/College of Education (6) First degree (7) Postgraduate degree
   (8) Others (specify)…….
7. Your occupation?

(1) Government/Public employee (2) Private/Corporate company employee

(3) Self-employed (own business) (4) Artisan (5) Unpaid household work (6) Unemployed

8. Average amount (in Naira) spent on transport to and from your workplace?
(1) Less than N200 (2) N200 - 399 (3) 400 – 599 (4) N600 or more

9. Estimated distance from your dwelling place to your workplace?
(1) Less than 2km (2) 2-4 km (3) 5-7 km (4) 8-10 km (5) More than 10km

10. Location of your place of work (e.g. Oshodi)_____
Average time taken from your dwelling place to your place of work?
(1) Less than 30 minutes (2) 30- 59 mins. (3) 1-2hrs (4) > 4hrs

11. Your average monthly income?
(1) <N20,000 (2) N20,000-N39,000 (3) N40,000-N59,000
(4) N60, 000-N79,000 (5) N80,000-N99,000 (6) >=N100,000

12. Place of birth of respondent?
(1) in the house presently residing (2) somewhere else within this local government (3) Outside the local government but within Lagos state
(4) Outside Lagos state (Specify)……...

13. Other household members?

Code	Age range	Sex	
		Male	Female
1	Less than18		
2	18-45		
3	46-65		
4	More than 65		

14 How many of the following transport means do you own in your household?

Code	Travel means	Quantity owned by your household			
		1	2-3	4-5	>6
1	Bus				
2	Car/SUV				
3	Ferry/Canoe				
4	Tricycle				
5	Motorcycle				
6	Others (specify)				
7	None				

15. Indicate your (or your household) most regular mode of transport to the following places:

	Destinations	**Modes of Transport**							
		Walking	Bicycling	Motor-cycling	Private car	Public Bus	Boat/ Ferry	Train	Not Applicable
1	Place of work								
2	Nearest recreation ground/centre								
3	Nearest Shopping Centre/Market								
4	Hospital/clinic								
5	Nursery/Primary								
6	Secondary School								
7	Worship centre								

SECTION B: FACILITIES WITHIN THE FRINGE COMMUNITIES

(I) EDUCATIONAL FACILITIES

16. Numbers of available educational facilities within your community/ward.

	Educational Institutions	Available number				
		None	<3	3-5	6-8	>8
1	Private Nursery / Primary school					
2	Public Nursery and Primary school					
3	Private Secondary school					
4	Public Secondary school					
5	Others (specify)					

17. Nearest educational facilities to your residence.

	Educational Institutions	Distance to facilities from residence (km)				
		<1	1-2	3-4	5-6	>6
1	Private Nursery /Primary school					
2	Public Nursery / Primary school					
3	Private Secondary school					
4	Public Secondary school					
5	Others (specify)					

18. Travel time from home to the nearest school?

	Educational Institutions	Distance to facility (in minutes)				
		0-15	16-30	31-45	46-60	>60
1	Private Nursery / Primary school					
2	Public Nursery / Primary school					
3	Private Secondary school					
4	Public Secondary school					
5	Others (specify)					

19. Rate the general quality of educational facilities within the community/ward. (Note: 1=Very poor, 2=poor, 3=good, 4=very good and 5=Excellent)

Code	Educational Institutions	Rate from V/ poor (1) to Excellent (5)				
		1	2	3	4	5
1	Private Nursery / Primary school					
2	Public Nursery / Primary school					
3	Private Secondary school					
4	Public Secondary school					

(II) HEALTH FACILITIES

20. Available health facilities within your community/ward?

	Health Institutions	Available number				
		None	<3	3-5	6-8	>8
1	Private hospital					
2	Public hospital					
3	Private health clinic					
4	Government health clinic					
5	General hospital					
6	Government Specialist hospital					
7	Traditional clinic					
8	Others (specify)					

21. Distance of nearest health facilities to your residence?

	Health Institutions	Distance (in km)				
		< 2	2-4	5-7	8-10	>10
1	Private hospital					
2	Public hospital					
3	Private health clinic					
4	Government health clinic					
5	General hospital					
6	Government Specialist hospital					
7	Traditional clinic					
8	Others (specify)					

22. How many times did you visit the following establishment in the last 1yr for treatment?

	Health Institutions	Frequency					
		None	1-2	3-4	5-6	7-8	>8
1	Private hospital						
2	Public hospital						
3	Private health clinic						
4	Government health clinic						
5	General hospital						
6	Specialist hospital						
7	Traditional clinic						
8	Others (specify)						

23. Why don't you patronize health facilities?
(1) Cannot afford to patronize them (2) facilities not adequate (3) No cause for patronage (4) Not applicable (5) Not available
(6) Others (specify)_____(7) None

24. For which of the following diseases were you (or any member of your household) diagonised over the years (tick as applicable)
(1) Cholera (2) Diabetes (3) Feaver (4) High Blood Pressure (5) Obesity (6) Others (specify).....(7) None

25. How long does it take to reach the closest health facility from your home?
(1) Less than 15 minutes (2) 16 minutes - 30 minutes (3) 31 minutes - 45 minutes (4) 46 minutes - 1 hour (5) More than 1 hour

26. In general, how would you rate the quality of health facilities in your area?

	Health Institutions	Quality Rating from Very poor (1) to excellent (5)				
		1	2	3	4	5
1	Private hospital					
2	Public hospital					
3	Private health clinic					
4	Government health clinic					
5	General hospital					
6	Specialist hospital					
7	Traditional clinic					

1=Very poor, 2=poor, 3=good, 4=very good and 5=Excellent

(III) RECREATIONAL FACILITIES

27. Which of the following recreational facilities is/are available within your neighbourhood?

	Recreation Facilities	**Number available**					
		None	1-2	3-4	5-6	7-8	More than8
1	School Playing fields						
2	Community Playing field						
3	tennis and basketball courts						
4	amusement parks						
5	recreation centres						
6	golf courses						
7	Others (specify)						

28. How often do you recreate/play within this neighbourhood**?**
(1) Never (2) Seldom (3) Occasionally (4) Frequently

29 How close is the nearest recreation facility to your house?
(1) Less than 5 min trek (2) 5-10 min trek (3) 11 -20 min trek (4) More than 20 min trek

(IV). COMMERCIAL FACILITIES

30. Which of the following commercial facilities is/are available within your neighbourhood?

	Facilities	**Number available**					
		None	1-2	3-4	5-6	7-8	More than8
1	Local market (Name?)						
2	Shopping mall or complex						
3	Makeshift kiosks						
4	Commercial Banks						
5	Event centre						
6	Others (specify)						

31 How close is the nearest market/shopping complex to your house?
(1) Less than 5 min trek (2) 5-10 min trek (3) 11 -20 min trek (4) above 20 min trek

SECTION C: LAND ACQUISITION AND HOUSING FEATURES

32. Source of your landed property?

(1) Government allocation (2) Registered Private Estate Agent (3) Inherited
(4) Acquired from *Omo-onile* (5) Don‘t now (6) Other source (specify)_____

33. Type of house

(1) Single-household (2) Multi-household with less than 5 units
(3) Multi-household with 5 - 10units (4) High rise building with 10units and above
(5) Incomplete building

34 Status of house

(1) Residential (2) Commercial (3) Mixed-use (4) Others (specify_____

35 Estimated area of plot used for construction of building?

(1) less than 500 sqm (2) 500-1000sqm (3) 1001-1500sqm (4) 1501-2000sq.m (5) More than 2000sq.m

36 Type of unit occupied by your household?

(1) 1 – room (2) 1 room and parlour (3) 1-bedroom self-contained
(4) 2-bedroom flat (5) 3-bedroom flat (6) 4-bedroom flat
(7) Duplex (specify no of living rooms)_____(8) Others (Specify) _____

37. On average, how many people occupy each of your rooms?

(1) 1- 2 (2) 3-4 (3) 5-6 (4) Above 6

38. How many households are dwelling in this building?

(1) 1-2 (2) 3-4 (3) 5-6 (4) 7-8 (5) More than 8

39. Number of floors in the building? (1) Bungalow (2) 2 floors (3) 3-floors (4) 4-floors (5) 5floors and more

40 To what extent does the building conform to building plan regulations?

(1) Fully (2) Partially (3) Not at all

41 Is there any building permit for the house?

(1) Yes (2) No (3) Not sure

42 How would you rate the compatibility of other uses in your surroundings to your building?

(1) Highly compatible (2) Compatible (3) Fairly compatible (4) Not compatible

43. What form of landscaping element(s) exists on the building site?

(1) Planted trees, (2) Grasses, (3) concrete (4) None

44. Where did you and your household live before coming to this community?

(1) None (born here) (2) Another community in Lagos (specify)_____
Other state in Nigeria (specify)_____ (3) Outside Nigeria
(2) (specify)____

45. Major reason for choosing this area?

(1) Place of Birth (2) Cheaper Rent/land (3) Closer to relatives and kinsmen
(4) Closer to Work (5) Good for Business (6) Availability of Infrastructure
(7) Social status (8) Safety/security (9) Others (Specify)_

46. Is this building owned or rented by you or a member of your household?

(1) Owned (2) Rented (3) No rental payments, contract or ownership

47. What ownership title do you have to the land on which this house is built?

(1) None (2) written agreement (3) Verbal agreement (4) Don‘t know (5) Certificate of occupancy (6) Customary right of occupancy (7) Other (specify)

48. What are constraints to land ownership in this area (pick as many options as applicable)

(1) None (2) Cost of Land (3) cumbersome application procedure

(4) Fear of duping (5) others (specify)…….

49. For how long have you been living here? (1) < 10yrs (2) 11-20yrs (3) 21-30 (4)>30

50 General Characteristics of building

CHARACTERISTICS	**Yes**	**No**
Permanent building materials are used for walls, roof and floor?		
In dilapidated state?		
Complies with building codes?		
In need of major repairs?		
rDwelling located on flood plain?		
Dwelling located on steep slope?		
Building located within right of way of (railway/ highway/ power line/ airport /water channel/ drainage, etc.		
Others (specify)		
Specify Number of floors		

51. Access to house is by …….

(1) Stilt (2) Footpath (3) Un-tarred but motorable road (4) untarred and unmotorable road (5) Tarred/paved road in bad condition (6) Tarred/paved road in good condition (7) others (specify)----------

52. What is the main problem with roads in your community?

(1) Poor drainage (2) Bad road surface (3) Poor connectivity (4) Narrow roads

53. Specify average distance covered to access the nearest major road from your dwelling place

(1) Less than 2km (2) 2-3km (3) 4-5km (4) 6-7km (5) More than 7km

54. Access the traffic situation in your community

(1) Good (2) Fair (3) Bad (4) Worse

55. What type of drainage system is on your street?
(1) Open concrete drain (2) Covered concrete drain (3) Earth (4) None

56. How is your refuse disposed of? (1) Burning (2) open dumping (3) water/lagoon dumping (4) PSP Operators (5) sanitary landfill (6) others (specify)_____

57. What type of toilet facility is available to your household?
(1) Flush to septic tank (2) Covered pit latrine (3) Uncovered pit latrine (4) Pan/Bucket (5) Hanging toilet/toilet on water (6) Bush/open field

58. Where is the toilet facility located?
Inside house (2) Outside the house, within the plot (3) Outside plot/public toilet

59. What is the main water source for your household?
(1) Piped water into the dwelling (2) Public tap/standpipe (3) Borehole

(4) Covered dug well (5) Uncovered well (6) Rainwater (7) Small scale water vendor (8) Tanker truck (9) Surface water (lagoon, river, dam, lake, pond, stream, spring)

60. How far from your dwelling is this water source?
(1) Inside dwelling (2) within 500 meters (3) between 500 meters and 1km (4) >1 km

61. Is the house connected to the public electricity grid?
(1) yes (2) no

62. On average, how many hours per day do you have electricity supply from public source?
(1) Not at all (give reasons)…….. (2) 1- 4
(3) 5-8 (4) 9-12 (5) 13-16 (6) 16-20 (7) 21-24

63. What other sources of electricity do you and your household use (tick many as applicable)?
(1) Generator (2) Solar Energy (3) Battery (4) Local Lamp (Kerosene, Palm oil, candle etc.) (5) None (6) Others _____

64. On average, how many hours a day do you use any of the following sources to generate light?

	Sources	Frequency (in hours)					
		<1	1-5	6-10	11-15	16-20	21-24
1	Generator						
2	Solar Energy						
3	Battery						
4	Local Lamp						

65. Which of the following, is used by your household for cooking (tick as many as applicable)?

(1) Firewood (2) Charcoal/coal (3) Refuse/Garbage (4) Kerosene (5) Gas (6) Electricity (7) others (specify) _____

66 To what level are the following infrastructures and facilities in the surroundings adequate to meet your needs?

	Infrastructure facilities	Quality Rating from Very poor (1) to excellent (5)				
		1	2	3	4	5
A	Water Supply					
B	Sewage disposal					
C	Road network					
D	Health care facilities					
E	Transportation By (a) Bus (b) Route taxi (c) BRT Buses (d) Private vehicle					
F	Entertainment facilities					
G	Education (a) Basic/Primary school (b) Secondary school					
H	Environmental quality					

1=Very poor, 2=poor, 3=good, 4=very good and 5=Excellent

SECTION D: COMMUNITY PARTICIPATION

67. How would you rate the community spirit in your neighbourhood?

(1) Very good (2) Good (3) Average (4) Poor (5) Very poor

68. Tick (as many as applicable) any of the following groups, within the community, which you or your household members belong to Community Development

(1)	Association	(2)	Neighbourhood security/watch
(3)	Cooperative business organization	(4)	*Esusu*/contributory group
(5)	Religious groups	(6)	Parents-teachers association
(7)	None	(8)	Any other (specify)_____

69 How would you rate your social interaction with other people within the community?

(1) Cordial (2) Fairly cordial (3) Not cordial (5) No interaction

70. What worries you most about your community?

_____

Thank you for your time.