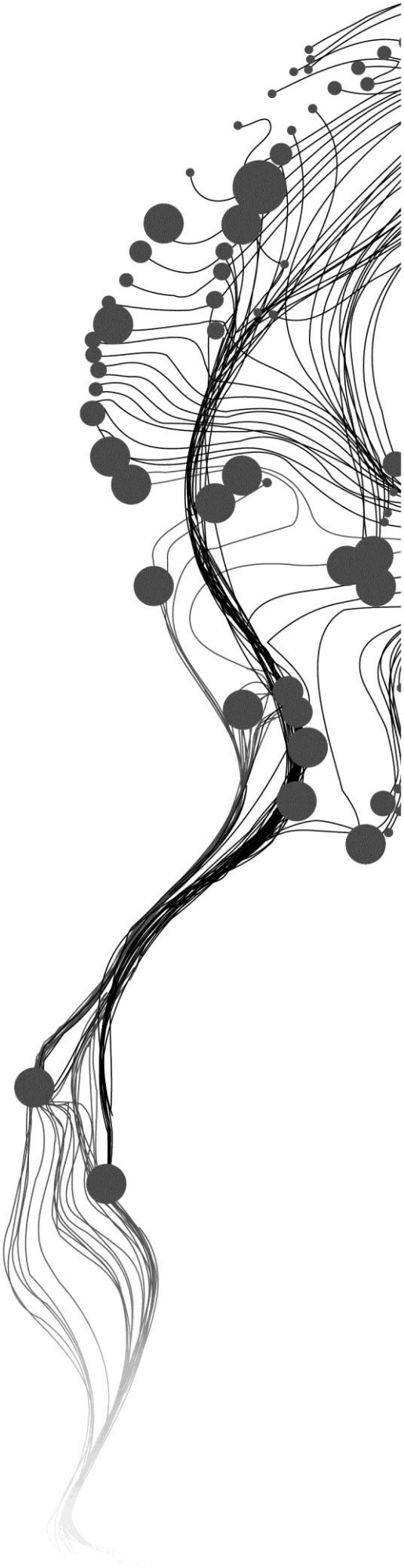

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CHIEDOZIE – UDEH, NNEKA

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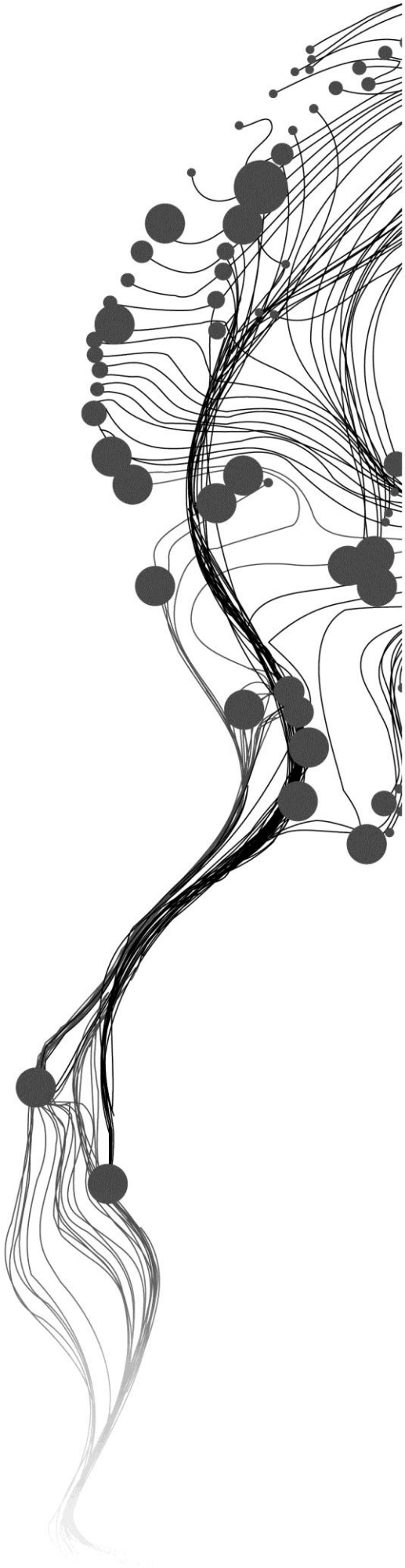

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Enschede, The Netherlands, February 2012

Thesis submitted to the Faculty of Geo-Information Science and Earth Observation of the University of Twente in partial fulfilment of the requirements for the degree of Master of Science in Geo-information Science and Earth Observation.

Specialization: Land Administration

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DISCLAIMER

This document describes work undertaken as part of a programme of study at the Faculty of Geo-Information Science and Earth Observation of the University of Twente. All views and opinions expressed therein remain the sole responsibility of the author, and do not necessarily represent those of the Faculty.

This thesis is dedicated to my dad Chief J.N. Ijomah for his inspiration and my husband for his trust in me.

ABSTRACT

Investment in public infrastructure has an impact on the land cover and land use particularly in the neighbourhood where they are provided. When there is a positive effect of public infrastructure provision, households/individuals and firms would desire to live near those facilities because it means low transportation cost to places of work, close to urban centre and general increase in their welfare etc. Therefore there is likely to be more demand for urban properties than the supply in the property market in the short run; thus the value of properties would rise. With the increase in value of properties various actors who are interested in benefiting from the value increase will be attracted to the areas while others might be forced to relocate from the area as a result of the market force (market eviction). All these activities cause change in land cover and land use. This can be in the form of changing the cover type as well as changing or intensifying the use of land in the improved areas which thus alters the land value. This study therefore aims at feeling the gap of knowledge about the underlying behaviour of the processes that are behind the change in land cover/land due to provision of public infrastructure. To understand this change, it became crucial to do a land cover classification using the spatial units created from the multi- temporal images of before and after the road rehabilitation. Land cover was classified in a hierarchical order of 3 classes and 8 sub classes while urban development were classified into 5 classes using the classification guideline since there is no universally accepted classification scheme. Further to this, change detection was done through a change matrix which assigned a code to each value of change in ArcGIS to analyse the various type of changes that took place in space from 2002 - 2011. The analysis of the changes processes (socio- economic) was afterwards linked to the type of cover changes that were seen on the images so as to achieve the overall aim of this study. To achieve this, field data were collected on the tenure system, the neighbourhood characteristics, actors, survey procedures, transactions, property values and urban development, which are some of the change processes in land cover and land use. Our results demonstrated that land cover changed in three ways- conversion, geometrical and modification. The change by conversion was from one cover type to another; modification was within the same cover category with changes in the physical or functional attributes of spatial units while geometrical change occurred by the decrease or increase of the outer boundaries of units. Also the result showed that high class urban development were carried out mostly in area under the statutory tenure system by the private developers activities caused most of the change both geometrically and by conversion, whereas modification was seen in the areas dominated by households/individual and village settlement who act under the customary tenure system and put up low and medium class type of development. The government' influenced the changes by providing most of the land that were utilised by the chief actor (the private developer) in the change process. We then concluded that that the analysis of the process behind urbanisation by the combination of these factors that were seen on ground with change in land cover has helped in understanding the types of change that were observed on images.

Keywords: urbanization, land cover, land use, land transaction, public infrastructure, urban development.

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Chiedozie – Udeh, Nneka
Enschede, The Netherlands, February 2012

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LIST OF ABBREVIATIONS AND ACRONYMS

CBD:	Central Business District
CICRED:	Committee for International Cooperation in National Research in Demography
C of O:	Certificate of Occupancy
CORINE	CO-ordination of Information on the Environment programme
EU	European Union
FAO	Food and Agricultural Organisation
GDP:	Gross Domestic Product
GIS:	Geographic Information System (Science)
Ha:	Hectares
INSPIRE	Infrastructure for Spatial Information in Europe
LCC	Land cover change
LCLUC	Land cover land use change
LUC	Land use change
LFTZ:	Lagos Free trade Zone.
MDGs:	Millennium Development Goals
NCF:	Nigerian Conservation Foundation
No.:	Number
OCF:	Ojomu Chieftaincy family
UNEP	United Nations Environmental Program
Vol.:	Volume

1. INTRODUCTION

1.1. Background

Public infrastructure is a capital intensive investment provided by the government for the benefit of the society. Benefits are defined as the net increase in the productivity of activities (firm or households) in the economic system resulting from a property – enhancing investment (Freeman, 1975b).One of the benefits of public infrastructure can be seen in the value increment of properties close to them. According to (Fisch, 1980), public investment that has a geographical impact alters the spatial pattern of land use and land rents, in the improved area, the intensity of use of the land tends to rise, increasing also the value of land and buildings (referred to as property throughout this research). However, the value of property does not only depend on its physical characteristics but also on the surrounding environment, its location, externalities (the relationship of the property and other established use) and accessibility (Topcu, 2009). Thus the overall changes in land value are generally considered by practitioners as a measure of the social benefits of the public programs under analysis (Johnson & Ragas, 1987). The benefits of the infrastructure can be evident in the amount of property transactions that go on in the form of trading in property rights which sometimes results to change in land cover and the use or in the improvement on the existing use.

However, the rates at which land transactions take place differ from one location of the infrastructure to another. This largely depends on the type, magnitude, quality and location or distance of the infrastructure within the region of study. The rate of property transactions on a highway road connecting the rural area to the nearest city centre is not the same as that of a road in the urban city. The introduction of a new or much improved highway lowers commuting [time and cost], and attracts new workers and or industry and generally converts land from a less – intensive use to a more intensive use (Lein & Day, 2008). For example, on the highway that connects the urban area and the outskirts, the driving forces of transaction are expected to be high as a result of the following; availability of large scale of land, increased rate of urbanization along this region, increased in demand for land and willingness of owners to sell. (Donnelly and Evans 2008) argued that the demand for real estate can motivate a landowner to sell their land holdings as is the case of the development of former farm fields into residential subdivisions. Also lower price of properties on this axis as compared to properties in the urban centres contributes to large scale of transaction. In the words of (El Araby, 2003) "with the devolvement of suburban (urban village), land prices is kept at the peaks in the city centre and leaves land prices in the suburban at lower values".

Though the aim of public infrastructure development is generally to promote economic growth and well being of the public (Lein & Day, 2008), it also leads to urbanization which bring about the (re)location of firms and households towards the developments. As put by (Yuhe & Zuoren, 2009), urbanization is the process accompanied by the structural changes of industry and population spatial distribution following the promotion of economic development and optimizing the distribution of resources. It is worthy to note that several authors have argued this point that urbanization is closely related to economic development since the economic developments creates opportunities for wealth generation that attracts the population movement, (Doytsher et al., 2010; Henderson, 2010). Though Henderson has further explained that while urbanization per se does not cause development, sustained economic development does not occur without urbanization. This is supported by the research (population-environment-development) carried out by CICRED in the developing countries where the researchers submitted that instead of bringing economic dynamism, improved health, tougher environmental standards, better education, and growing democratization, urbanization in many least developed countries is accompanied by economic stagnation,(deSherbinin & Sherbinin, 2007)

Development of public infrastructures and the urbanization process is not new in Nigeria, especially in Lagos State where infrastructure development is a major strategy of the present administration to position Lagos as a new megacity (A city with more than 10 million inhabitants(Doytsher, et al., 2010)). According to the state governor (Press, 2008) "a massive investment in the maintenance and expansion of infrastructure is therefore very critical to any meaningful bid to achieve the Millennium Development Goals (MDGs) of reducing poverty by half by Y[ear] 2015". In the state, many areas are impacted by road projects that have the potential to trigger urbanization processes capable of transforming their surroundings. The present administration of Lagos state has embarked on a massive public infrastructure development through the construction of new roads, expansion and improvement of existing roads throughout the state. This is because the government believes that there is a beneficial effect for the provision of public infrastructure as the state governor recently said in a forum and I quote. "Government must invest in infrastructure that will attract business to go on and prosperity to thrive. Government must continuously invest in building infrastructure like roads that renew the value of property. Everywhere that we have built a road, property values have appreciated and it is only fair to expect that people will pay taxes on the properties and allow business to grow" (Press, 2008).

It is established in literature that road infrastructure leads to developments which in turn causes change in land cover and land use, but the behaviour and strategy of the process that are behind these changes are seldom researched into. Therefore the various socio – economic factors that influence the change is assessed and analyzed during the course of this study to understand how they contribute to the changes we see in space. To carry out the study, a case of an improved highway road connecting an urbanization area to the urban centre in Lagos is used to analyse the process of change in the land cover and land use that is triggered by the development of public infrastructure.

The report is presented in chapters as follows; chapter 2 reviews literature on the key issues that form the body of this paper, chapter 3 is devoted to the methodology applied for this research and the study area. In chapter 4 and 5 the discussion on land cover and land cover change is presented, while the analysis of the processes that cause the spatial change in land cover and land use forms chapter 6. The link between the change and change process, with discussion concludes this thesis and is presented in chapter 7.

1.2. Research Problem

The main focus of previous studies on public infrastructure development has been on estimating its relationship with economic growth in general. (Lein & Day, 2008) argued that highway improvement describes a form of economic development where land improvement involving infrastructure represents a means of recruiting business operation to that region. Also the study on the impact of public infrastructure development on economic growth through property value increase abounds in literature (Rietveld, 1994), (Lein & Day, 2008; Topcu, 2009).

Often the development of public infrastructure triggers other developments alongside as a result of increase in accessibility such as intensive use and demand of land (Cervero & Kang, 2011) and firms and household strive to locate proximal to it in order to benefit from the public infrastructure development as well as increase their productivity and welfare (Nicholls & Crompton, 2005). Therefore there is always a pressure on the land, thus changing the land cover, intensifying or changing the land use and land ownership thus exposing the small land owners to market forces (Durand-Lasserve., 2005). Because the small land holders are vulnerable to pressures from investors they are in a weak position to negotiate and obtain fair market price for their properties thus they are voluntarily pushed away by the big investment. This results to the displacement of original small land holders by the market forces and the social composition of the area changes from low to medium and high income groups. This is supported by (Cross 2002) cited in (Durand-Lasserve., 2005) who has argued that, provision of services and

infrastructures in a settlement results to an increase in the market value of the land, making lower income families vulnerable to market pressure especially those without title to their ownership. This can also be described as gentrification which is defined as the displacement or replacement of a low ranking socioeconomic group by a higher status socioeconomic group in the inner city(Lyons, 1996).

However, urbanization which is brought about by the provision of the public infrastructure can be seen on imagery, but the processes behind the cover changes which can be different according to who the actors are, tenure regimes, and the government's influence are not well known. Therefore this study tries to assess the processes behind the cover/ use changes that can be observed on images which may lead to a deeper understanding of the types of development (and therefore the land values) behind what just seems to be a cover- use change classification.

1.3. Research objectives

1.3.1. Main objective

The main objective of this study is to assess how infrastructure development triggers land transaction and economic developments in space

1.3.2. Sub – objectives

1. To identify land cover change as a result of public infrastructure developments from images
2. To assess the process of land transactions and developments that brings about the land cover/use change by analysing developments on the ground.

1.4. Research questions

Questions for sub objective 1

1. Where does land cover change occur?
    a. In main cover class (conversion)
    b. Within the main cover class (modification)

Questions for sub objective 2

1. Who are the actors involved in the change?
2. How do they get access to land?
3. How do they develop?
4. What happened with the people on the land?

2. LITERATURE REVIEW

2.1. Introduction

In this section a quick review of relevant literatures on public infrastructures, their benefits as it relates to property transaction and land tenure systems are presented. The review also encompasses the main concepts that form the background of this research which include urbanization, land cover, land use, as well as land use change brought about by the urbanization which is triggered by the infrastructure development.

2.2. Public infrastructure (Definition, types)

Infrastructure is a broad term for capital projects that provide services used at a time by a large number of different firms and individuals to facilitate production, (G.Otto & Voss, 1995). That is projects that provide services used at any one time by a large number of different firms and individuals to facilitate production. Going through the literatures, there are no clear definitions of what public infrastructures is, but (G.Otto & Voss, 1995) went further to define public infrastructure as a class of public good which are non - excludable and does not preclude consumption of one firm or individual from another. Example of infrastructure capital include; transport system, communications networks, gas and electricity facilities, water supply facilities, drainage and sewer systems, education systems etc (G.Otto & Voss, 1995; Pinnoi, 1994).

Therefore, transport infrastructure enables the ease by which people can reach buildings, spaces, and places, (Jones & MacDonald, 2004). It provides a set of accessibility relationships within areas that can be seen in terms of the distances or travel costs. Accessibility costs are therefore the key to the underlying spatial economic forces at work that creates the pattern of land use within areas, (Jones & MacDonald, 2004). In terms of location, there is likely to be a higher demand for land/property that has good accessibility both to it, and to other infrastructure and services(Jones & MacDonald, 2004).According to (Damm, Lerman, Lam, & Young, 1980) the existence of highways, sewer services and other public facilities influences the behaviour of both suppliers and users of residential and commercial properties. Therefore the benefits of these facilities are partially or wholly capitalised into property value,

However, the concept of accessibility according to (Holl, 2007a) has a long tradition in urban and regional science and have the potential to disperse economic activity, particularly activities with lower transport costs but he concludes that the benefits of transport improvements tend to be concentrated near the infrastructure projects. Furthermore, a theory on location and urban land value was developed by Wingo in 1963 (Liu, Zheng, Turkstra, & Huang, 2010) who systematically analysed the relationship between the distance function of location and the urban land value by modelling the value of consumption in transportation. He developed his famous location equilibrium theory which declared that transportation costs can be substituted by land values. Then there is Alonso's profound trade off theory (Leahy, McKee, & Dean, 1970) which extended the von Thunen's model to urban land uses in which he pointed out that the price of land will decline with the increasing distance from the centre of the city. This theory reflects the bids of each household for various sites which yield equal utility or profit, (Damm, et al., 1980).

2.2.1. Public infrastructure (Effects/Benefits)

A number of studies have quite agreed that public investment in infrastructure is widely used to promote development of poorer regions (Aschauer, 1989; Calderon & Servén, 2004; G.Otto & Voss, 1995; Haughwout, 2002). Also (Rietveld, 1994) sees infrastructure development, especially transports infrastructure as a policy instrument that stimulates lagging regions economically. This was further proved

in a study by (European Commission, 1999) cited in (Holl, 2007a) which identified lack of access as a main impediment to the economic competitiveness of peripheral lagging regions in Europe. Thereby concluding that improvements in transport infrastructure are, therefore, seen as a key element in the economic development and in overcoming spatial imbalances(Holl, 2007b).

2.2.1.1. Value increase of properties and economic growth

There has been considerable interest in using changes in land values as empirical estimates of the benefits of land enhancement, such as highway transportation and urban renewal (Freeman, 1975a). Freeman went further to explain that given the assumption that the investment leaves all market prices other than land prices unchanged, these benefits accrue to landowners, firms, and households as increased land values, profits, and surpluses. There is also an extensive literature, on the broader economic consequences of transport capital as well as on the economic processes involved in the generation of these wider economic benefits. As put by (Lakshmanan, 2011) "Further, recent theoretical developments have enhanced our contemporary understanding of how transport infrastructure improvements open up markets, achieve gains from trade, promote inter-regional integration, and enhance the performance of factor markets". (Haughwout, 2002) Also agreeing with Lakshman's earlier submission, suggests that public capital may influence social welfare through income. That is if infrastructure contributes positively to private productivity, then more infrastructures will raise incomes and increase welfare.

Furthermore, the effect/benefit of public infrastructure can be linked to the property markets which are vital importance for the economic and social development and welfare in any country. These land markets are sought to directly contribute to the economy in the way of capital formation by providing a forum within which relationships among people, real property and finance are adjusted through market-based mechanisms.(Lisec, Ferlan, Lobnik, & Šumrada, 2008).

The benefits of these infrastructures are not only positive; there are also negative impacts of public infrastructure. One of the negative effects is gentrification which refers to the changes that result when wealthier people ("gentry") acquire or rent property in low income and working class communities (Wikipedia, 2011). Also gentrification put in a nutshell is the transformation of an urban neighbourhood through the gradual arrival of middle-class or well-to-do residents who eventually replace poorer or working-class residents(Guimond & Simard, 2010). However, the gentrification that these projects generally produce encourages the displacement of the existing, usually poor, inhabitants from the new project area (Lungo & Smolka, 2005). This takes us to the discussion on urban development brought about by the trigger of the economic benefits of the infrastructure development in the next section

2.3. Urban development (Urbanization)

The concept of urbanization is put differently by different writers. According to (Marc, 2004) urbanization is a complex process of change of rural lifestyles into urban ones, while (Weber & Puissant, 2003) defined it as a territorial and socio economic process that induce a general transformation of land cover/use categories. Further (Weber & Puissant, 2003) opined that urbanization causes land cover changes which can lead to deeper social, economic and environmental changes. In researching the landscape change and urban development process in Europe, Marc discovered that the process is intimately related to the introduction of new modes of transportation, in particular those that allowed mobility of the masses. This therefore aligns with the early location theories (cited in section 2.2) which largely believe that urban development are influenced by accessibility created by transportations.

2.3.1. Types of urban development

The form of urban development of a city is greatly affected by its land development process which is in turn influenced by its socio – economic structure (Yeh & Wu, 1996). However, according to (Zaremski,

2006) classification of urban development in satellite images is difficult because the structures and texture of land cover in urban areas does not allow automatic discrimination between types of land use. Though in his study of urban development classification in Warsaw, five classes; (high density, dense development, prefabricated high rise residential development, low density development and services, ware house and industrial development) were generated, he further explained that there is no distinct boundary between specific types of development hence the decision on the location of actual boundaries are frequently made arbitrarily. This therefore takes us to the discussion on land cover and land use change that is created by the urbanisation process.

2.4. Land cover and Land use

It is important to distinguish between the terms land cover and land use and also discuss them under separate headings for clarity reasons. Land use and land cover, though very different ways of looking at the land, are always defined with interchangeable expressions and frequently lumped together on a single map (Vermont, Centre, for, Geographic, & Information).

2.4.1. Land cover

As put by (Ramachandra & Kumar, 2004), land cover refers to the physical material covering the surface of the earth including vegetation, water, soil and artificial surfaces built by human activities. (Moser, 1996) notes that: "The term originally referred to the type of vegetation that covered the land surface, but has broadened subsequently to include human structures, such as buildings or pavement, and other aspects of the physical environment, such as soils, biodiversity, and surfaces and groundwater". However, (Gregorio & Jansen, 2000) advised that when considering land cover in a very pure and strict sense it should be confined to describe vegetation and man-made features.

2.4.2. Land use

Various definitions on land use abound in literatures and they vary according to the purpose of application and the context of their use (deAlmeida, 2005). Land use according to (Ellis, 2010) is a complicated term but in his views the natural scientists define land use in terms of syndromes of human activities such as agriculture, forestry and building construction that alter land surface processes. While social scientists and land managers define land use more broadly to include the social and economic purposes and contexts for and within which lands are managed (or left unmanaged), such as subsistence versus commercial agriculture, rented vs. owned, or private vs. public land. Furthermore, land use defines territory according to its current and future planned functional dimension, such as agricultural, residential or socio-economic purpose including industrial, commercial and recreational (Inspire., 2007). In other words, land use is characterized by the arrangement and activities people undertake in a certain land cover type (Gregorio & Jansen, 2000). Hence, two land parcels may have similar land cover types, but different land use types and vice versa. For example, two land parcels could be covered by grass as land cover, but one may be used as a sport area, while the other as farming area.

However, (Mucher et al. 1993) cited in (EuropeanCommission, 2001) presents land use in two ways - Land use in terms of "functional dimension": this describes area in terms of their socio-economic purpose (areas used for residential, industrial, commercial, farming, forestry, commercial, conservation purposes, etc). The second approach, termed "sequential": this define land use as a series of operations on land carried out by humans with the intension to obtain products and/or benefits through using land resources. This definition has been particularly developed for agricultural purposes. Also by (EuropeanEnvironmentAgency, 1999) land use describes the surface from a socio-economic viewpoint, its identifiable purpose or purposes which lead to a tangible or intangible benefit and finally, (FAO, 1995)states that "land use concerns the function or purpose for which the land is used by the local human population and can be defined as the human activities which are directly related to land, making use of its

resources or having an impact on them". Furthermore, land use is related to land tenure hence the discussion on their relationship below

2.4.2.1. Land use and land tenure

Several definitions of land tenure exist in the literature and the land tenure generally differs from country to country. Thorncroft (1974); Mehrwein (1983); Parsons (1951) cited in (Olima & Obala, 1998) and (P.Dale & McLaughlin, 1999), have all defined land tenure to mean the relationship between man and his right to own and use land. But (Olima & Obala, 1998) summarised these definitions by putting it in simple terms "Land tenure connotes a systematic land holding that embody legal, contractual and communal arrangements under which people gain access to and utilise land". Therefore, land tenure comprises of various laws, rules, procedures and obligations that govern the rights, interests in land, duties and liabilities of the people in their use and control of land resources. Some of the rules are formally defined through laws concerning property while others are determined by custom of which some establish the extent to which the rights in land and property may be transferred (P.Dale & McLaughlin, 1999). For example, freehold owners may dispose of their land in whole or in part at will though subject to any restrictions that may exist.

However, relating land tenure system to land use it is discovered that the prevalent forms of land tenure in any given area have profound effect on the use of land and the physical patterns of urban development (Olima & Obala, 1998), (Luning, 1984). It further determines the ease or difficulty of land acquisition and transfer of interest. As put by (Payne, 1997), land tenure and property rights can exert a significant influence over land use and land values. Most form of tenure involves some limitation as to the ways in which land or property may be used. Therefore, under any type of tenure arrangement, any change of use would require the permission of the community leaders or the authorities in charge of land.

2.4.3. Land use land cover classification system

Before we proceed to discuss the land use land cover classification system, it is important to first understand what classification means. Classification as defined by (Sokal, 1974) is the ordering or arrangement of objects into groups or sets on the basis of their relationships which can be observable or inferred properties. Therefore, land cover classification as an abstract representation of the land is defined as the ordering or arrangement of objects into groups or sets on the basis of their relationships (Sokal, 1974). It is worthy to note that there is no universally accepted system of LULC classification (FAO, 2011). As put by (Anderson, Hardy, Roach, & Witmer, 1976) there is no one ideal classification of land use and land cover therefore there are different perspectives in the classification process, and the process itself tends to be subjective. According to Wyatt (1997) cited in (EuropeanCommission, 2001), classification systems are presented in tree form, i.e. hierarchically. He further explained that a hierarchical system is an arrangement of objects into a series of groups, which are assigned to a succession of categories of ranks of different seniority. Groups of objects are defined by the selection of shared characteristics that make the members of each group similar to one another and unlike members of other groups.

However, different users may wish to partition their field of interest at a given level according to different criteria during classification (EuropeanCommission, 2001).This therefore creates serious difficulties, when comparing information, since a class which one system regards as unique may fall into two or more categories in a classification system that is set up on different principles. For example, the FAO classification system just grouped land lover into two classes, "vegetation and non- vegetation" and in their sub classes there was no distinct class as both were subdivided into "aquatic and terrestrial". While

the CORINE land cover classification proposed a case where in particular classes are overlapping through mixed classes (EuropeanCommission, 2001).

2.4.4. Land cover change (LCC)

(Hietel, Waldhardt, & Otte, 2004) in their study on environmental conditions of land-cover changes concluded that Land-cover changes are determined by complex interactions of environmental and socio-economic factors. And (Farley, Ojeda-Revah, Atkinson, & Eaton-Gonzalez, 2012) spotted those factors as population pressures, changes in markets and technology, and government policies, among others. In the case of land cover change, Turner et al. 1995 ; Skole 1994, cited in (Briassoulis, 2000); Stott, A. & Haines – Young. R. 1996; Alun, J. & Clark, J. 1997; Baulies, X.I. & Szejwach, G. 1997) cited in (EuropeanCommission, 2001) distinguishes between two types of change: conversion and modification. Land cover conversion involves a change from one cover type to another. While Land cover modification involves alterations of structure or function without a wholesale change from one type to another. Also, land cover changes are the results of natural processes such as climatic variations, volcanic eruptions, changes in river channels or the sea level, etc. However, most of present and the recent past land cover changes are due to human actions – i.e. the use of land for production or settlement. Turner et al. 1995, cited in (Briassoulis, 2000).

2.4.5. Land use change (LUC)

It is pertinent to mention that land use and land cover are not synonymous though they are often treated under the same heading, but the literature draws attention to their differences so that they are used properly in studies of land use and LCC (Briassoulis, 2000). As put by (Aspinall & Hill, 2007) changes in land use reflects socioeconomic processes that operate at a very wide range of spatial and temporal scales, including trade and markets, policy and land management decisions at the national, regional, local or households/individual level. For Jones and Clark 1997, cited in (deAlmeida, 2005), it may involve either a conversion of one type of use into another or modification of a certain type of land use, such as changes from high-income to low income residential areas (the buildings remaining physically and quantitatively unaltered).

In a similar vein, Jones and Clark (1997) cited in (Briassoulis, 2000) explained further that land use change may involve either (a) conversion from one type of use to another i.e. changes in the pattern of land uses in an area or (b) modification of a certain type of land use. Modification of a particular land use may involve changes in the intensity of this use as well as alterations of its characteristic and attributes – such as changes from low-income to high-income residential areas (in this case the buildings remains physically and quantitatively unaltered), changes of suburban forests from their natural state to recreation uses (the area of land staying unchanged), etc. (Meyer & Turner, 1994) added that land use change involves either a shift to a different use or an intensification of existing one. This takes us to the types of transaction that can be done on land in order to cause both change in cover and use.

2.5. Land transaction (definition, types and actors)

Literature states that public infrastructure triggers property transaction as a result of increased accessibility that drives demand (Wyatt, 2008); The geographical location of the public infrastructure plays a strong role in determining the scale of the property transactions and who the actors in the transactions are (Damm, et al., 1980).Therefore the location of a highway that connects the urban to the rural area makes that more actors in the property market are attacked as urban expansion drives demand for property along this axis (Cervero & Kang, 2011). Also the availability of land determines the size and the type of actors that participate in property transaction (Otsuka & Place, 2009). Low prices of land attract pressure

on the lands in the communities near the urban area due to congestion and high cost of properties in the city centres. Furthermore, the ownership type that is prevalent in an area plays a role in property market transaction. If the ownership system is customary it will be easier to acquire a large expanse of land at a time then in a statutory type of ownership.

To understand the scale of property transaction as a result of infrastructure development, it is important to know how the transactions are conducted – formal or informal. Land transaction is formal when its activities are serviced by authorised system provided by or at least organized through government (Williamson, Enemark, Wallace, & Rajabifard, 2009). There are other transactions that operate beyond the government under the local arrangement or sometimes even illegal (Williamson, et al., 2009).

Real property transactions are procedures that are necessary for owners to dispose legally of their ownership (or related property rights) and a new owner to acquire them, (Zevenbergen, Frank, & Stubkjaer, 2007). It is important to note that many economists, legal and property specialists have always pointed out that what is transacted and owned in the land market is the rights in land and not the bare land or the bricks and mortar (Maliti, 2009). However, land transaction is determined by cost involved in exchanging the rights, this cost further determines the type of market in which the land transaction will take place either in the formal or informal market, Furubotn and Richter (2002) cited in (Maliti, 2009). Whereas, (Benham and Benham, 1997) cited in (Maliti, 2009) argued that transaction costs determine property rights, ownership, the extent of trade, specialization, and production. If transaction costs decrease, property rights will be more clearly defined, more goods and services will be traded, the benefits of specialization will increase, and greater economic gains will be realized. Also, (Libecap,1986 cited in (Maliti, 2009) added that where transaction costs are high, as is often the case, the allocation of property rights is more critical, transfers are less fluid and this has profound and enduring effects on production and distribution. In simpler terms, the types of transaction that can be done on land include; buying/selling land, renting, leasing, division of the land between users and interchange of land between landowners(Swinnen, Vranken, & Stantey, 2006). However, for these property rights to be transacted, various actors are involved.

2.5.1. Actors

Actors as discussed in (Zevenbergen, et al., 2007) are seen in two extremes; in the engineering sciences and in economic sciences. In the first instance, they are seen only as fulfilling a technical sub – function in the system, like operators of machines, while in economic sciences, actors are viewed as highly rational and having intentionality, with the desires to maximise their own utility. Therefore in the context of land transactions, actors as those who are seen to have intentionality in the transfer and ownership of property rights so as to maximise their own utility. Typical actors involved in the land development process according to Austin-Cowe (1993) cited in (Williamson, et al., 2009) include the following; (a) land owners: they hold the legal rights for any development or change in land use to take place. (b) developers, also termed investors are the producers of housing commodity for the real estate market. (Tam, Tuladhar, & de Man, 2009). They serve as an intermediary between land owners willing to sell land and households willing to buy a house, (Parker & Filatova, 2008). In other words, they are the bridge to conduct "reallocation" of land to the people. The State in some cases allocates or leases land to the investors, or they buy undeveloped land from other sources then add up the value to the land as housings and improvements by converting it to residential land, and sell housing. (c). financial institutes: such as banks insurance companies, and investment funds, they lend capital for financing the developing projects. (d) professional advisers: these include a range of professionals to support and advice the land owner or developer on specific issues. These professionals include lawyers, architects, surveyors, engineers accountants, etc. At this point permit me to add another type of actor - the speculators – who play a very important role in the urban development process by buying land in places perceived to have future development potential for later sale at a higher value (Carey, 1976; Clawson, 1962).

(Lisec, et al., 2008) in the context of agricultural land transaction also identified two types of actors; active and passive actors. In his words, active actors include: vendor, buyer; while the Passive actors include: pre-emption beneficiaries, administration office, notary, Land Registry, Cadastral Authority. Whereas (Igbinoba, 2009) categorised the various actors involved in land development under the following groups; government and public sector agents, private sector, housing cooperatives and households.

2.6. Conclusion

In conclusion, from literature it is undoubtedly seen that accessibility and related transport costs remain - apart from other determinants - a significant factor in explaining land use patterns; Also the various way people own and manage land contribute to the level of land use change in that particular area. Through the review of some work done on land use and land cover, it has not been possible to discover land use/cover classes that have dealt clearly with the urban land cover change with regards to the processes that bring about the change in the cover classes. Therefore, when they talk about land use/land cover change they talk about the changes from one class to another leaving out the various factors/processes that are involved in the changes. Also most of the classifications are done with low resolution images which make it difficult to detect the process and the development that are involved in the change. More so the land cover classification reviewed have most of their interest on rural and agricultural lands and not much done on the urban land use/cover changes. For example the FAO and CORINE land cover classes which were done to establish an adopted universal cover classes and European standard respectively from the context of global and territorial levels

Furthermore, most of the definitions on land use and land cover found in literature refer mostly to the larger, territorial scales (i.e. global and regional). In the words of (Chapin and Kaiser 1979,) cited in (Briassoulis, 2000) "At territorial scales involving large land areas, 'land use' means 'resource use'. Whereas, at the urban scale, the emphasis is more on the use potential of the land's surface for the location of various activities" It is worthy to note that the term "land use" is employed at various levels of analysis and, most of the time, by different disciplines (e.g. the city planners and agricultural experts). Therefore the difference in perception inhibits more holistic and integrated approaches to the analysis of land use and its change in general (Briassoulis, 2000). This therefore takes us to the classification system.

The discussions made it clear that land use and land cover is not equivalent although they may overlap, thus the distinction as put by Meyer and Turner 1994 cited in (Briassoulis, 2000) is that " land cover means the physical, chemical, or biological categorization of the terrestrial surface, e.g. grassland, forest, or concrete, whereas land use refers to the human purposes that are associated with that cover, e.g. raising cattle, recreation, or urban living". Therefore land use relates to land cover in various ways and affects it also in various ways (Briassoulis, 2000). A single land use may correspond fairly well to a single land cover; e.g. pastoralism to unimproved grassland). On the other hand, a single class of cover may support multiple uses (forest used for combinations of timbering, and agriculture, hunting/gathering, recreation, and wildlife preserve). However, the distinction between land use and land cover, although relatively easy to make at a conceptual level, is not so straightforward in practice as available data do not make this distinction clearly all the time, a fact that complicates the analysis of either one of them (Briassoulis, 2000).

The objective of this study is to bring to knowledge the change in urbanisation process that is brought about by the provision of a public infrastructure which triggers developments. We focus on land cover as the physical state of the earth's surface that is changed during the process of urbanisation by the human employment of land (land use).

3. RESEARCH METHODOLOGY AND STUDY AREA

3.1. Research approach

Considering the fact that case study is an approach to studying a social phenomenon through a thorough analysis of a single or multiple cases (Kumar, 2005) it is considered the most appropriate to be used in answering the research questions. Case study approach is proposed for this study so as to establish the relationship between the study with real life situation (Yin, 2003). To address the specific research questions, the case study is designed as a single – case and a mixed method of quantitative and qualitative used. The approach of the research design is presented in the form of a flow diagram shown in figure 3.1 F.om the diagram, the main focus is the rehabilitation of the expressway which triggers urban development in space and time. Therefore using a multi – temporal satellite images of the study area, land cover are classified and delineated into spatial units (polygons) and further change detection done in order to see the changes that have occurred in time. After, which data on the processes that drive the changes are collected and analysed. To do this analysis, the development processes are classified and finally combined with the spatial cover analysis to answer the specific research question and achieve the main objective of the study.

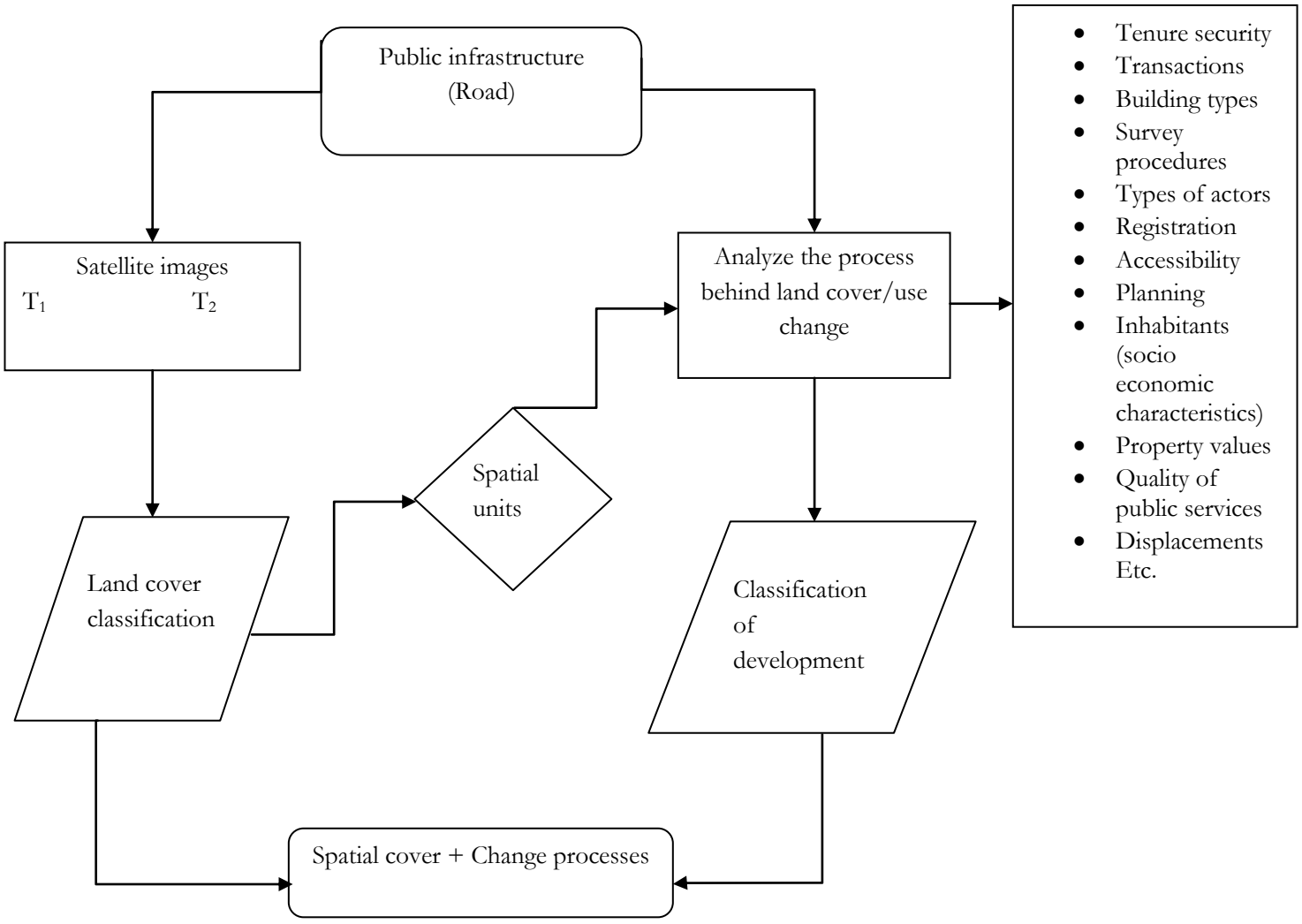

Figure 3-1: Research design

3.2. Data collection

3.2.1. Relevant data

Prior to data collection, the required data and the various approaches for collection were identified. The following data sets have been identified as relevant including and their sources as presented in table 3.1 Data are collected from both primary and secondary sources. Secondary data are data from existing sources while primary data is collected by the researcher (Kalkhan, 2011).

Data Type	Data required	Data source
Primary & Secondary	Road data	Field work &Map
Primary & Secondary	Land block	Field work &Map
Primary & Secondary	Building plot i.e. data about the individual parcel in the building block	Field work & Map
Primary	Buildings (building type, size, ownership data where applicable)	Field work
Primary & Secondary	Data on the actors of property transaction, transaction type, time series of transaction, ownership type and property values	Field work (interviews)
Secondary	Raster Image of 29/1/2002 and 10/1/ 2011 representing a stretch of the road (about 13.4km). The image processing was done using the image (RGB band 1-2-3) in ArcGIS software. Real estate transaction records General information on property market in Lagos.	Google earth Real estate surveyors/ managers/property companies Documents and publications on Lagos properties, literature etc.

Table 3-1: Relevant data and their sources

3.2.2. Classification system

Before doing the land cover classification, a review into the classification system was done as presented in chapter 2. And going by the fact there is no universal classification system, a hierarchical approach was used in selecting the mapping classes bearing in mind the rules/guidelines that have been observed in literatures. In a hierarchical approach, classes are grouped such that major classes are broken into sub-classes and these subclasses can further be broken into more detail (FAO, 2011). The advantage of this system is that it can be easily generalized and adapt to various scales.

3.2.3. Delineation of spatial units

Manual technique was used to delineate homogenous feature to create the spatial units. This method relies on the interpreter to employ visual cues such as tones, texture shape, pattern and relationship in order to identify the different land cover classes (EuropeanCommission, 2001). The technique was employed because it is fairly simple. To do this, the images were viewed on a computer screen and then polygons drawn around areas that are identified as a particular land cover type. Where mixed features existed, the least were ignored while the most populous features were used to define the classes on ground. This resulted in the land cover map.

3.2.4. Primary data source

The primary data were collected through a fieldwork carried out from the 4th – 25th October, 2011 in Lagos, Nigeria. On arrival to Lagos, a reconnaissance visit was made to be acquainted with the area. While in the area, it was observed many of the natives speak Yoruba language. Therefore there was a need to employ an assistant who speaks and understands the language very well.

3.2.4.1. Interviews

Interview is a commonly used method of collecting data from people (Kumar, 2005), it can be structured or unstructured. (It is structured when the interviewer keep strictly to questions decided before hand and it is unstructured if the interviewing is done with flexibility and complete freedom in terms of content and structure of the interview (Kumar, 2005)). Interview was the main source of primary data collection for this study and the unstructured method was used. The targeted resource persons were the local heads, residents of the area, land professionals/ agents, surveyors and officials of the lands department in the ministry of lands. For the interview extract see (appendix A).

3.2.5. Secondary data sources

The secondary data collection was done by tracing land transaction records at the lands services department of the Lagos State Lands Bureau, Alausa. Four (4) key officers in charge of lands in the study area were talked to. A printed map of the study area was given to them to identify the various actors and tenure systems on.

3.3. Limitation of data collection

During the period of data collection, some challenges were encountered in some areas. Some of the required data were not readily available,for example maps (they are sold at a very high price). People were sensitive to giving out information therefore data on the values of property were not readily available in some areas. Language was another challenge, most of the resource persons are native Yoruba speakers therefore it would have been easier to get more information if the researcher speaks the local language. Also the time for data collection was very short as the officers in the land ministry were very busy and did not have much time to spare for the researcher. Though English and the Pidgin English were the languages used during the interviews, it was observed that the use of the local language (Yoruba) would have made the respondents very much at home and easier for them to give out information than when speaking English.

3.4. Data processing

Processing of the data for this research involved, georeferencing, digitizing and inputting the fieldwork attribute data to the digitized polygons. Also the interviews were listened to and manually extracted.

3.4.1. Georeferencing

The raster data sets from the Google image contained unidentified spatial references. Therefore the spatial reference was defined by importing the coordinate system and projection of an existing Lagos road shape file. With the definition of the reference system, georeferencing was done by finding and matching the coordinates of the new images with the existing image. To do this, control points were established at known point such as road intersections and other identifiable features. This was afterwards overlaid on the original image to validate the georeferencing.

3.4.2. Digitizing

After georeferencing the images, on – screen digitizing was done in ArcGIS. Different classes of land cover were digitized as closed polygons. The digitized process tried as accurately as possible to avoid overlaps between polygons. This process resulted in various shape files as will be seen in subsequent section.

3.4.3. Creating and inputting the fieldwork attributes to spatial units in ArcGIS

In ArcGIS attributes about, land cover, actors urban and developments in the areas (polygons) were created. The values were added to the already created shape files through the add field function. Therefore each polygon contains the land cover, change classes and actors values.

3.5. Study area

3.5.1. Selection of study area

The study area for this research is Eti - Osa in Lagos, located between Victoria Island (CBD) and Ogun state. It is a suburban town that is undergoing rapid urbanisation hence that axis is termed to be the fastest growing area and the future of Lagos state. 13.4km stretch of the Lekki-Epe expressway that links the CBD and the suburban areas is the focus. Presently, there is a project going on to expand and toll the existing 49.5 km long road which is a principal road that is of economic importance to the state. The road leads to the new Lekki free trade zone (FTZ), the new sea port as well as the new Lagos international airport in Epe.

3.5.2. Location of the study area

The study area is located within the Eti – Osa local government of Lagos State. Its land size is 192.3 Km2 and according to the 2006 population census, the population of the area is 287,785. The area is surrounded by the lagoon on the left hand side and ocean on the right hand side see fig 3.2. Showing the location of the study area

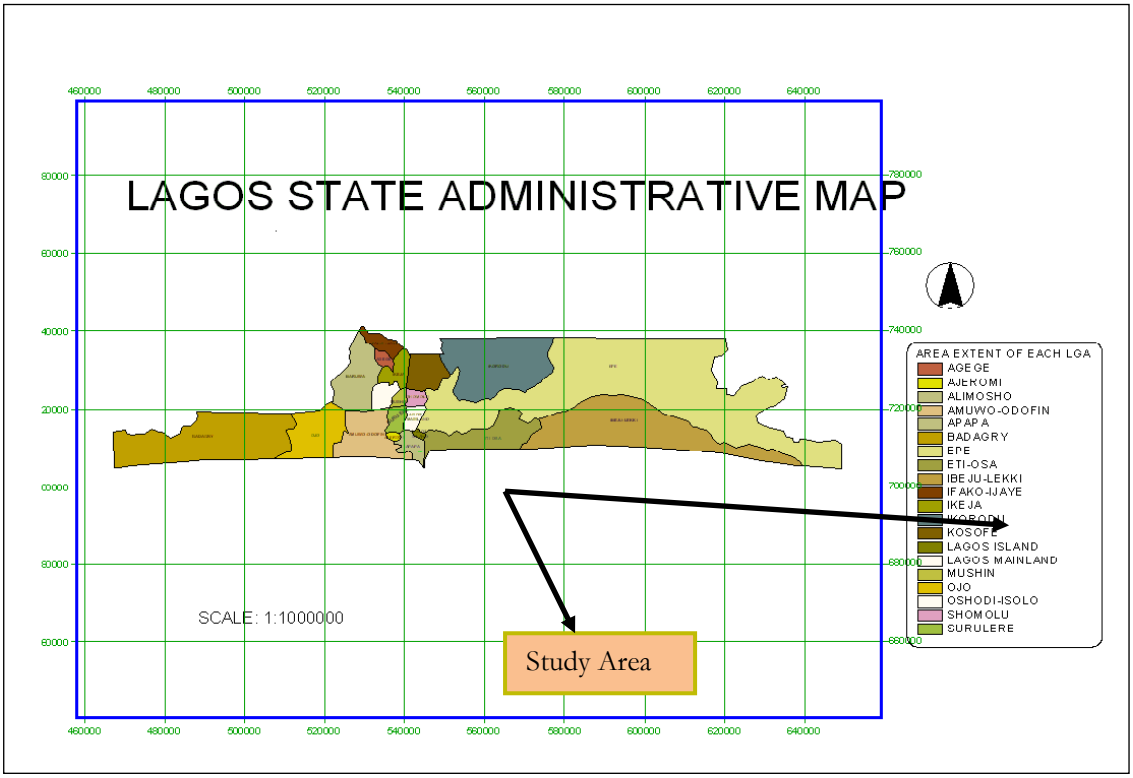

Table 3-2: Map of Lagos showing the study area

The state is located on the south-western part of Nigeria on the narrow coastal flood plain of Bight of Benin. It lies between latitudes 6°26' and 6°50'N and stretches between longitudes 3°09' and 3°46'E (Braimoh & Onishi, 2007). Lagos State is bounded in the North and East by Ogun State of Nigeria, in the West by the Republic of Benin, and in the South by the Atlantic Ocean. It has five administrative divisions

of Ikeja, Badagry, Ikorodu, Lagos Island where the study area is located and Epe. Territorially, Lagos State encompasses an area of 358,862 hectares or 3,577sq.km. The dominant vegetation of the State is the tropical swamp forest - the fresh water and mangrove swamp forests both of which are influenced by the double rainfall pattern of the State, that makes the environment a wetland region (LagosstateGovernment). Industrial and commercial activities are also concentrated in the Lagos metropolitan area.

3.5.3. Land tenure system in the study area

Prior to 1978, when a land use law was promulgated to provide a uniform mode of access to land in Nigeria, land tenure in Lagos state consisted mainly of two forms – customary law and the received colonial law(Tade Akin, 1992). Under the customary tenure system, control over the use of the land is vested in the traditional ruler who holds the land in trust for community members. He is also responsible for allocating unused land to members of the community and adjudicating in land disputes (Braimoh & Onishi, 2007). The right of usage of land is heritable through a patrilineal arrangement and there is a distinction between community members and strangers/migrants under this system (Braimoh & Onishi, 2007. However, to ensure that the rights of members of the community/family are protected, the system restrict the capacity to dispose of the land, except through the consent of the relevant authorities (Tade Akin, 1992).

In 1978 the Federal Government of Nigeria promulgated the Land Use Act. Going by the act, part 1 section 2 (1) (a) all land in urban areas shall be under the control and management of the Governor of each State and (b) all other land shall, subject to this Act, be under the control and management of the Local Government, within the area of jurisdiction of which the land is situated in (FederalRepublicofNigeria). Statutory rights of occupancy are granted by the State for a specific period subject to rental payments to the State.

The distribution and use of land in the study area is generally governed by both the customary and statutory laws in Lagos. Some of the land tenure in the area are governed by the statutory system through government allocation, while government in some areas has excised some portion of land for the villagers who were there before the act by revoking the existing customary rights held and gazette the excision in the government papers.

4. LAND COVER CLASSIFICATION

4.1. Introduction

In order to analyse the process of change over time, the land cover classes (LCC) were created to generate the spatial units/areas that form the basis of analysis. Before creating these classes we brief introduce what the term classification mean. According to (Sokal, 1974) classification is defined as the ordering or arrangement of objects into groups or sets on the basis of their relationships which can be observable or inferred properties. Therefore, land cover classification as an abstract representation of the land is defined as the ordering or arrangement of objects into groups or sets on the basis of their relationships (Sokal, 1974). It involves definition of land class boundaries clearly and is precisely based upon objective criteria. However, it is worthy to note that there is no universally accepted system of classification (Anderson, et al., 1976; FAO, 2011)

4.2. Land cover classes

A classification system is the result of a structure and an order, coming from a system of values, revealing an intention (EuropeanCommission, 2001). The purpose for which the classification is designed necessarily shapes its structure and content. This is why each user, in general, builds an individual classification adapted to his specific needs (EuropeanCommission, 2001). (Anderson, et al., 1976) explained that each classification though made to suit the needs of the user should follow certain guidelines. These guidelines include; (a) compatibility with existing classification systems - a proposed classification system should be as compatible as possible with major existing systems to allow meaningful conclusions to be drawn by reference to data from different relevant sources. (b)absence of overlap; classes must be mutually exhaustive, without overlap for a consistency; (c) principles of coding: codes are attached to images in general; codes are structured if the nomenclature is hierarchical. The code of the lower level has to repeat the code of the higher level, it is possible to use any symbols for coding (numbers, characters, and other signs. At the urban scale which is our interest we have classified land cover from the satellite images under a hierarchical class of vegetation, non vegetation and water and sub classes using the guideline suggested by (Anderson, et al., 1976). This is presented as figure 4.1 and the description presented as table 4.1

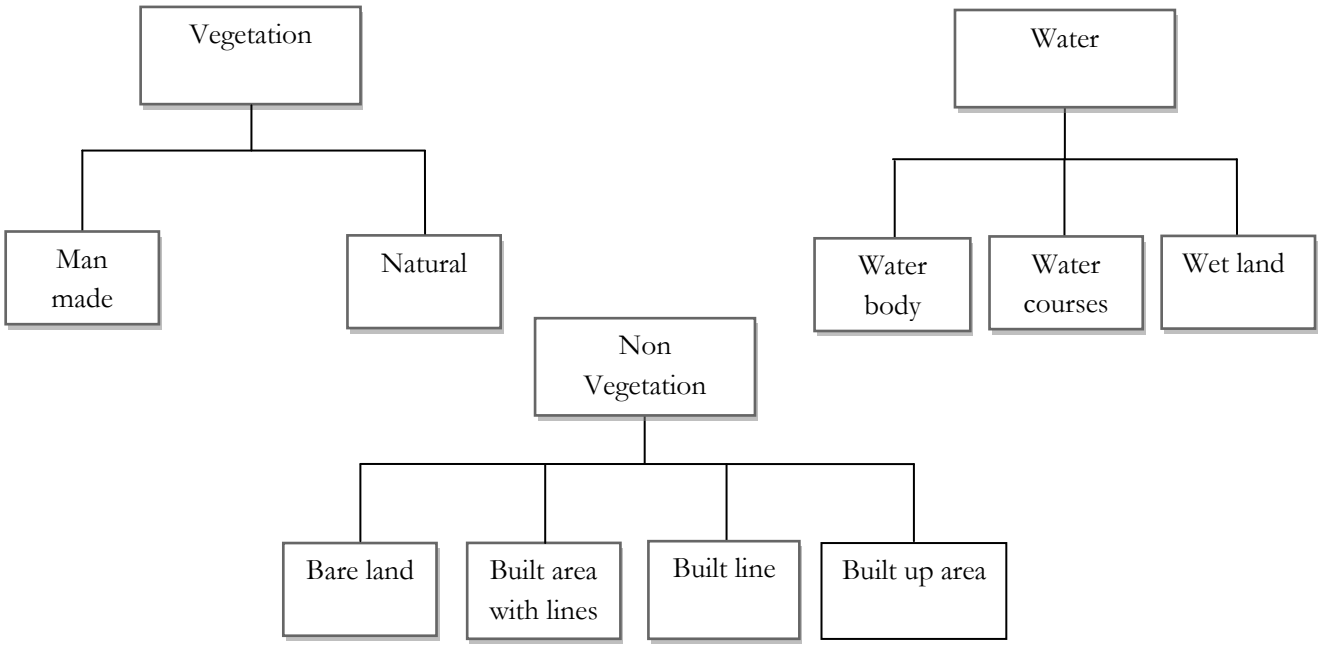

Figure 4-1: Land cover classes

S/N	Class	Codes /Sub class	Description
1	Vegetation	1.1. Man made	These are cultivated lands.
		1.2. Natural cover	These are areas that are seen to be predominantly green and still have natural vegetation cover.
2	Non vegetation	2.1. Bare land	Land areas of exposed soil surface as influenced by human impacts and/or natural causes. (areas prepared for construction)
		2.2. Built area. with lines	These are areas that are prepare for construction that have the basic service – i.e. road network.(the site and service schemes)
		2.3. Built line	These are road networks and includes; primary road, secondary roads and path ways. High - way, railroad and energy lines.
		2.4. Built up area	Comprised of areas of intensive use with much of the land covered by structures
3	Water bodies	3.1. Water bodies (area)	These are areas covered by water. (Ocean, sea, lakes, dams).
		3.2. Water course	Areas with flowing body of water, these include rivers, canal, ditch streams e.t.c.
		3.3. Wetland	These are areas of wetland that have some grass, forest and shrub on them. (swamps, marsh)

Table 4-1: The descriptions of the land cover classes and sub classes

5. SPATIAL ANALYSIS OF LAND COVER CHANGE

5.1. Introduction

(According to (Lu, Mauselb, Brondízioc, & Moranac, 2004) change detection generally involves the application of multi – temporal data sets to quantitatively analyse the temporal effects of the phenomenon). This chapter presents the analysis of land cover changes as identified on the change map presented as Fig 5.3. To produce the change map, the cover class maps of 2002 and 2011 which is presented as Fig 1 and Figure 5.2 respectively were overlaid and a change matrix was generated to show the various changes from one class to another or within the same classes and digitized in ArcGIS. Each of the class changes were assigned a code ranging from 1- 72 according to the type of change in that class. The analysis is done on the 102 polygons (units) covering an area of 6878.4 ha under the caption - conversion, geometry modification and no change which are the types of change observed from the images. The details of the data used for this analysis is presented as Appendix B.

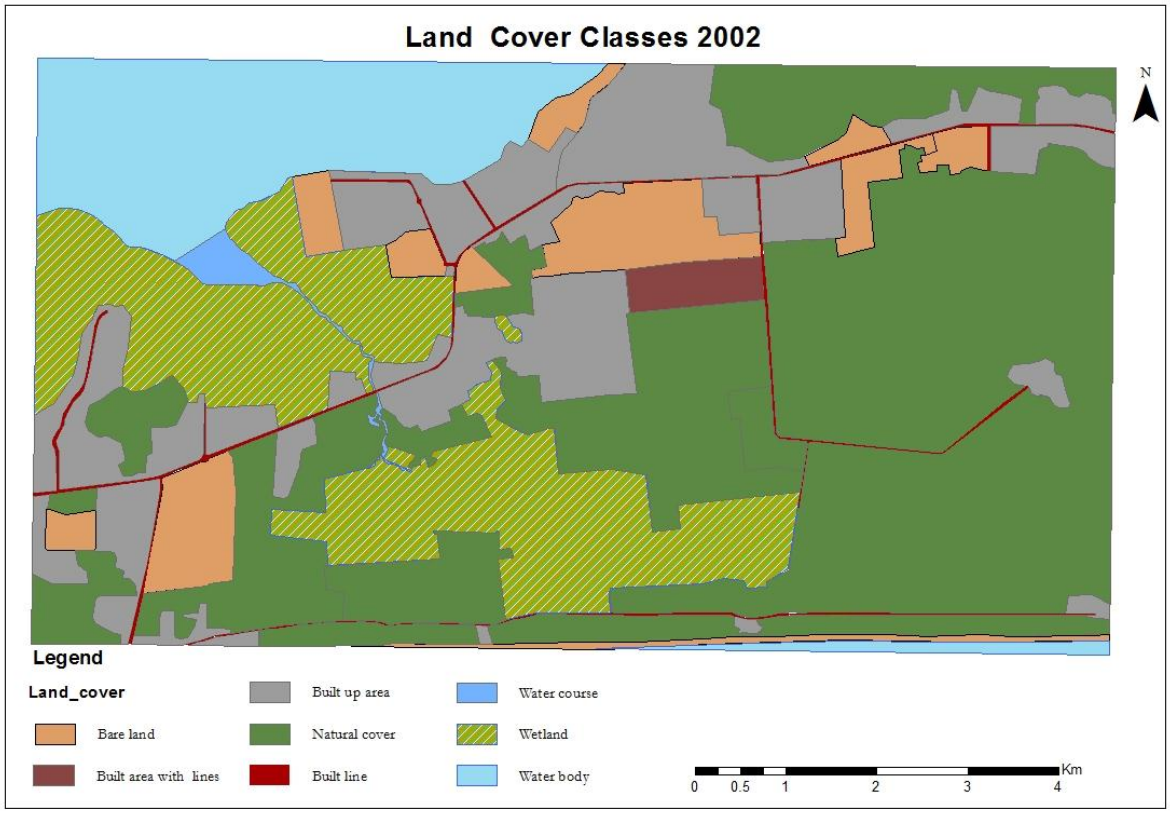

Figure 5-1: Map showing the land cover classes 2002

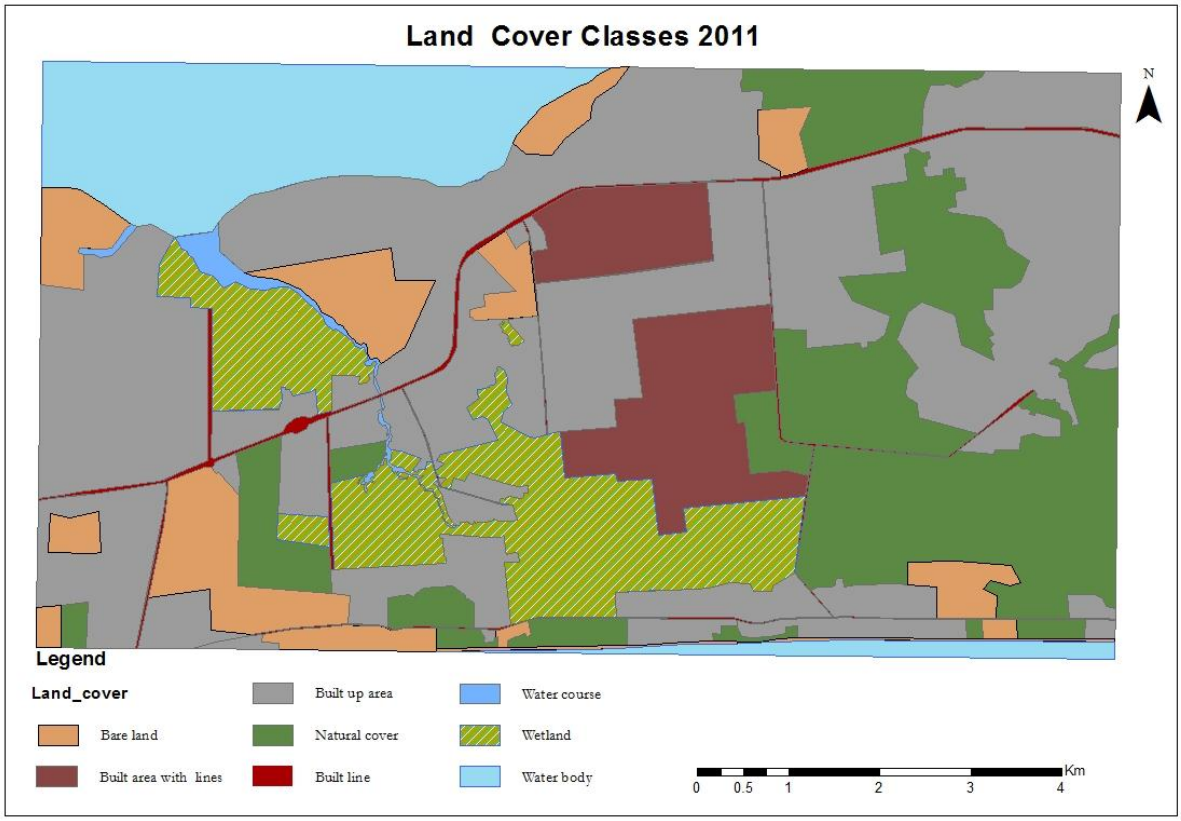

Figure 5-2: Map showing the land cover classes 2011

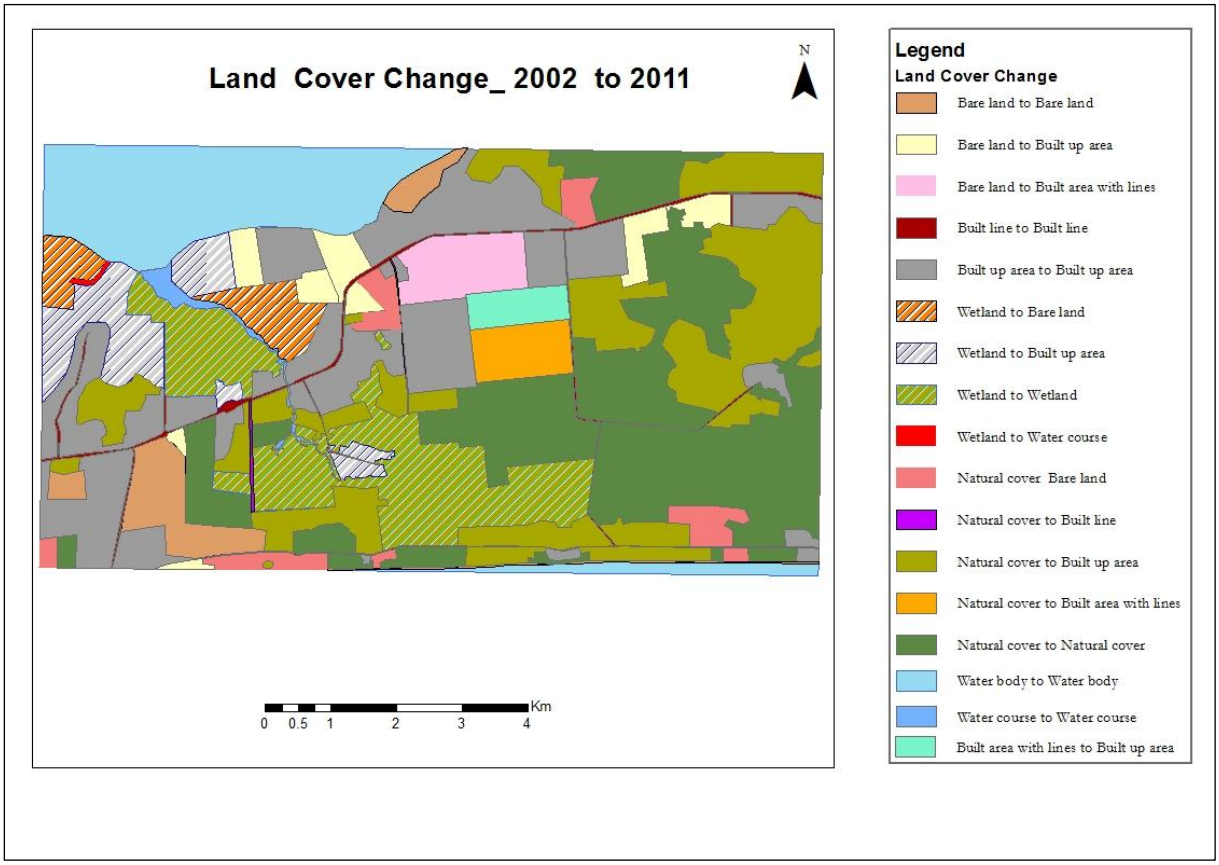

Figure 5-3: Map showing the land cover change 2002 to 2011

5.2. Analysis of land cover change due to conversion

This involves changes from one cover class to another cover class and changes from one sub class to another sub class within the same class. From the change map 50 unit totalling 2598.1ha converted (borne) this is presented as fig. 5.4. The classes that changed from one class to another includes; from vegetation to non vegetation; in this group 21 units measuring 1268.8 ha were converted from natural cover to built up area, from natural cover to bare land prepared for construction, 199.2 ha of 8 units, 9.2 ha of 2 units were converted from natural cover to built line, these are areas where roads were constructed and 2 units of 354.4 changed from natural cover to built area with lines (e.g. The site and service schemes). Another category of change from class to class is from water to non vegetation. In this category, 6 units of 324.4 ha changed from wetland to built up area and 2 units measuring 187.1ha were converted from wetland to bare land (eg. areas that were sand filled).

The second group of change is from sub class to sub class (i.e. change within sub classes that belong to the same class). This change took place in the non vegetation and water classes. In the non vegetation class, 10 units of 482.9 ha changed as a result of this type of change and this includes (i) from bare land to built up area 8 unit measuring 228.0 ha (ii) 1 unit of 171.9 ha changed from bare land to built area with lines and (iii) 1 unit with a shape area of 83 ha changed from built area with lines to built up area. In the water class, the only conversion was in wetland that changed to water course which measures 5.5 ha.

5.3. Land cover change due to geometrical change

This type of change though not reviewed in literature is a type of change that either increases or reduces the size and shape of areas (polygons). They include areas that have remained in the same cover classes but as result of changes by conversion or modification of adjoining units, their sizes have reduced or increased thereby altering their shapes. The units that reduced in size include; (i)13 units of natural cover with an area of 1446.0 ha in 2011 that decreased from 3313.66 ha, (ii) 4 units of wetland measuring 1322 ha in 2002 which became 5 units as a result of a road that divided one of the units but decreased in size to 359.4 ha, (iii)2 units of water course that decreased from 47.1 ha to 44.1 ha (iv) a unit of water body that was 855.8ha in 2002 but decreased to778.9 in 2011. While the group that increase in size and shape are (i) 2 units of bare land were increased from 152.6 ha in 2002 to 220.3 ha in 2011 and (ii)1 unit built line which expanded from 29.2 ha in 2002 to 77.9 ha. A typical example is the resettlement scheme which changed both in geometry and modification, geometrically as result of a road that reduced the size and made the boundaries sharp while the housing density in the scheme equally grew.

5.4. Land cover change due to Modification

Modification represents a change within the same land cover class due to changes in its physical or functional attributes. This type of change was largely in the non vegetation cover classes (urban areas) that have remained built up but have increased in the number of structures (housing density) that were there in the year 2002. From the image, 21 spatial units with a total shape area of 1262.4 ha were modified. In the modified areas, some building were brought down and replaced by another type of structure while some other buildings were added to the existing one to increase the density of the area. (e.g. a particular unit measuring 98.5 ha was modified as a result of road construction that caused the demolition of structures but afterwards was replaced by houses of different types).

5.5. No change

Despite the three types of change presented above, there were 7 units totalling 158.5 ha that behaved differently since they remained the same class over the period. These are 3 units of road network covering an area of 18.9 ha, 2 units of bare land measuring 42.6 ha, 1 unit of water body measuring 91.3 and 1 unit of built up area with a shape area of 5.7 ha.

5.6. Conclusion

With the summary of the land cover changes presented as table 5.1 we therefore conclude as thus;

That geometry presents the major type of change within the period under analysis with 42%, followed by the conversion 38% and then the change by modification 18%. Within the conversion change, the class to class change was higher than the sub class changes and happened more in the units that changed from vegetation (rural) to non vegetation (urban). This explained that in the urbanization process areas change geometrically and also was borne (created) more than they were modified from the existing ones. We also can conclude that the type of boundary determines the type of change that take place in an area hence the conversion change took place in areas that have sharp and defined boundaries. Whereas the boundary behaviour of the areas that showed geometric change depict that of an unclear boundary and that explained why it was the highest type of change as units more in areas with unstable boundaries than in the areas with clear boundaries.

	Type of change				
Cover change	**Conversion ha**	**Geometry ha**	**Modification ha**	**No change ha**	**Grand Total ha**
Bare land to Bare land		153.1		42.6	195.7
Bare land to Built area with lines	171.9				171.9
Bare land to Built up area	228.0				228.0
Built area with lines to Built up area	83.0				83.0
Built line to Built line		77.9		18.9	96.8
Built up area to Built up area			1262.4	5.7	1,268.1
Natural cover Bare land	199.2				199.2
Natural cover to Built area with lines	121.0				121.0
Natural cover to Built line	9.2				9.2
Natural cover to Built up area	1,268.8				1,268.8
Natural cover to Natural cover		1446.0			1,446.0
Water body to Water body		778.9		91.3	870.2
Water course to Water course		44.1			44.1
Wetland to Bare land	187.1				187.1
Wetland to Built up area	324.4				324.4
Wetland to Water course	5.5				5.5
Wetland to Wetland		359.4			359.4
Grand Total	**2,598.1**	**2,859.4**	**1,262.4**	**158.5**	**6,878.4**

Table 5-1: Summary of the types of land cover change

6. ANALYSIS OF THE PROCESS BEHIND THE LAND COVER CHANGE

6.1. Introduction

In this chapter, an analysis of the urbanization process is presented in the case study area over the period of 2002 – 2011. From the year 2002 to 2011, there have been quite a number of processes that have caused the type of land cover change identified and analysed in chapter 5. In order to understand and carry out the analysis of the socio – economic process that drive changes in land cover as a result of public infrastructure development., field data were collected on tenure regime, actors that are involved in land transaction, development types, survey procedures, property values, displacements and socio - economic characteristics of the neighbourhoods. Analysis of the process is done on 66 units that is (64%) covering a shape area of 4225.3 ha out of the total 102 units that were digitized. These were the units covered that covered the different types of land cover change that was identified and where complete field data were available. The area is presents as figure 6.1 and detail of the data used for this analysis is presented as Appendix C and appendix D

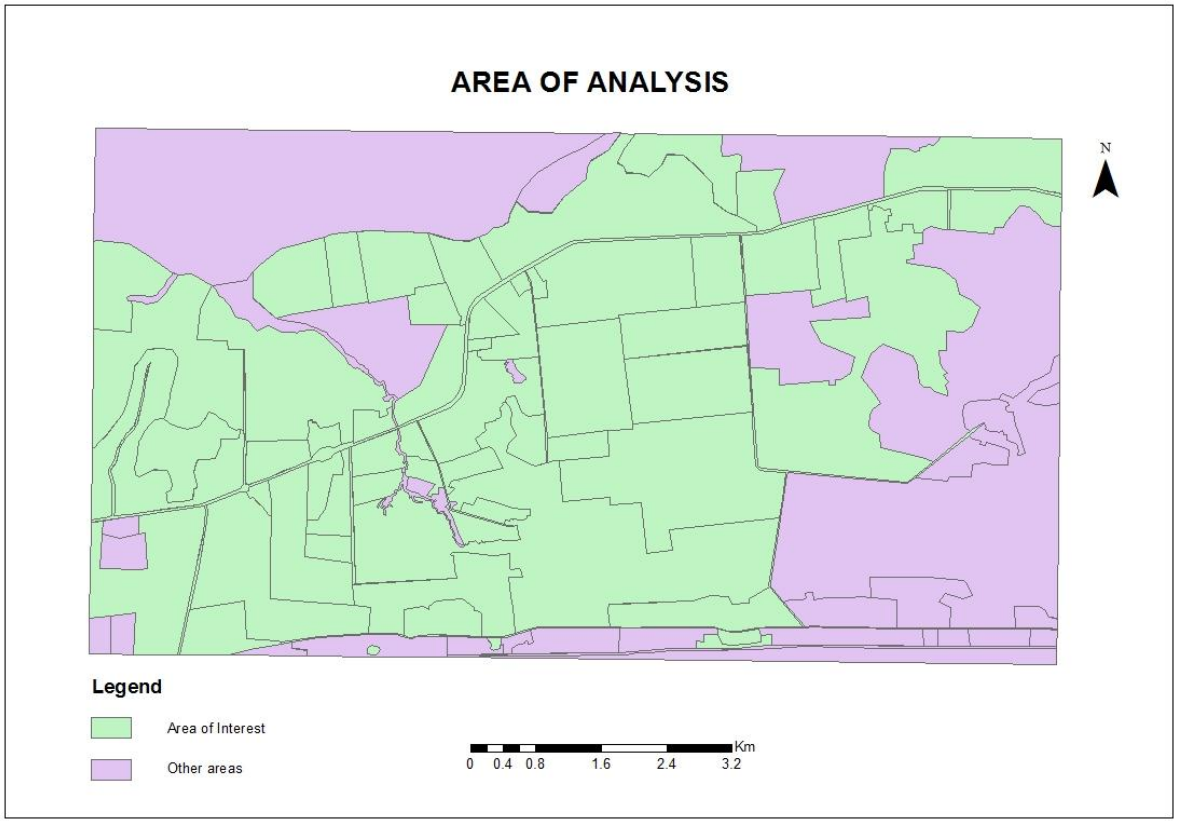

Figure 6-1: Map showing the analysed area

6.2. Tenure systems and transactions

From the analysis, it was discovered that a total unit of 34 units covering an area of 2355.9 ha are governed by the statutory system while 32 units of 1869.4.ha was under the customary system. 3 units in the statutory area were resettlement schemes for the villagers and land owners of Maroko that was demolished while 6 units were road networks. The customary system existed in the village lands that were excised and gazetted by the government. Property transactions were between multiple actors that is

between village and individuals, village and corporate body (organisation or institutions), individuals and individuals, corporate body and individual. Where land was held under the customary system and utilised by the village, registration was not required but where there was a transaction between the village and another party, it required that the transaction be registered with the government to make such a transfer of interest formal. Data collected on registered property transaction showed that in the areas under customary system, a total number of 4081 transactions were registered in 12 units out of the 66 units under analysis. The transactions were; 1974 units by the villages and royals, 1089 between individuals and individuals, 658 between corporate body and individuals and 170 from individuals to corporate body. Ownership of land in the areas under the statutory system was through the government allocation or through other parties who had got same from the government. Though further transactions by parties with government allocation were supposed to be registered with the government, no record on this was made available during the field exercise.

6.3. Type of actors and land acquisition

The various actors who were involved in the development process with their brief description and analysis is as follows and presented as figure 6.2 ; government, village, corporate body, households (individuals), the royal family and private developer. These actors also acquire their lands in different ways; some get their land through government allocation and others by buying from other actors.

6.3.1. Government

All lands in the state according to the land use act of 1978 are owned by the government and the governor holds the land in trust for the citizens. The government acquired lands in some areas and pay compensation on improvements but not on bare lands. If government wants to open up an area for development it puts up a public notice inviting the public to apply for allocation of large portion of land for development. Upon application, the following criteria are used to determine the eligibility of the applicant; the profile of the applicant, size of land applied for (which should not be less than 2 hectares, the use to which the area will be put to and the financial capability of the applicant (commitment from the bank). Also government allocate lands to individuals under the site and service schemes in these areas, the estates are subdivided into layouts and given to individuals with certificate of occupancy. In some areas government have excised some portion of land for the local communities (villages) and these are entered in the government gazette. Some lands are for government projects and are called "committed areas" example the general hospitals, airports, schools, housing estates etc. From the analysis, a total number of 1738 ha have been allocated by the government to the other actors, 920.3 ha were to the private developer, 99.4 ha to corporate bodies, 34.7 ha to households and 683.4 to government. They also did excision of 44.5 ha to the villages. There was no record on government acquisition.

6.3.1.1. Villages

The villages have communal ownership of land with a collective title (a global Certificate of occupancy) which they got through government excision on application, with the following criteria; brief history of the family, how they came about the land, population of the village, size of the area, number of houses in the area and the name of the Oba (chief). The land is then excised for them for excision future expansion of the villages, to preserve cultural heritage and to get the villagers' cooperation towards government developments. A total number of 22 main villages existed in the study area where data were collected from. The analysis shows the villages' presence in 20 units of 1348.4 ha out of which 905.9 ha of12 are

village and household mixed together and 442.5 ha 8 units purely village setting. All the village land is under the customary tenure system and was acquired through government excision.

6.3.1.2. Corporate body

These are corporate entities, institutions and organizations that as a body buy and develop large expanse of land for their organizations. The analysis showed that there were 6 units in an area of 134.8 ha and that 99.4 ha of their lands are under the statutory system while 35.4 ha are under the customary tenure regime including an area of 109.5 ha where they occupied together with the village. From the analysis of acquisition procedures, the corporate bodies have acquired 74% of their land from the government in an area of 99.4ha and the other 26% covering 35.3 ha from the villages.

6.3.1.3. Private developers

These are individuals or housing corporations who either get allocation from to government or purchase large expanse of land from the villagers to develop housing estates or commercial centres for sale or lease. When they get allocation from the government, they are issued with a global Certificate of Occupancy (C of O) and when they sell, they issue the buyer with the governor's consent. From the analysis, 18 units of 1133.6 ha were for private developers whose 920.4 ha are under the statutory system whereas 213. 3ha are under the customary system including 279.2 ha that they are occupied together with village. The acquisition procedure showed that 920.3 ha (81%) of land owned by the private developers were from government allocation, and 213.3 (19%) from the villages. In the areas where they existed together with the villages the land was 100% from the villages.

6.3.1.4. Individuals

The individual actors (termed households in this study) in these areas include the low, middle and high class groups of the society who either get government allocation, buy from the villagers, or from the private developers. Also individuals buy from other individuals. In this analysis, household are found operating separately on 10 units of 513.8 ha and mixed with the villages on 12 units of 905.5 making a total of 1419.3 ha. Their 267.9 ha are under the customary system while 250.3 ha are under the statutory system. Households has acquired 267.8 ha (52%) of their land from the villages, 98.5 ha (19%) through the resettlement scheme, 66.6 ha (13%) from individuals, squats on 50.5 ha (10%) and 34.7 (7%) from the government.

6.3.1.5. Royal family

Apart from the transactions carried out by the villages as a community, the royal families also have their own lands that they manage directly and independent of the village lands. In the analysis, the royal was found in 1 unit of 17.6 ha which is under the customary tenure regime.

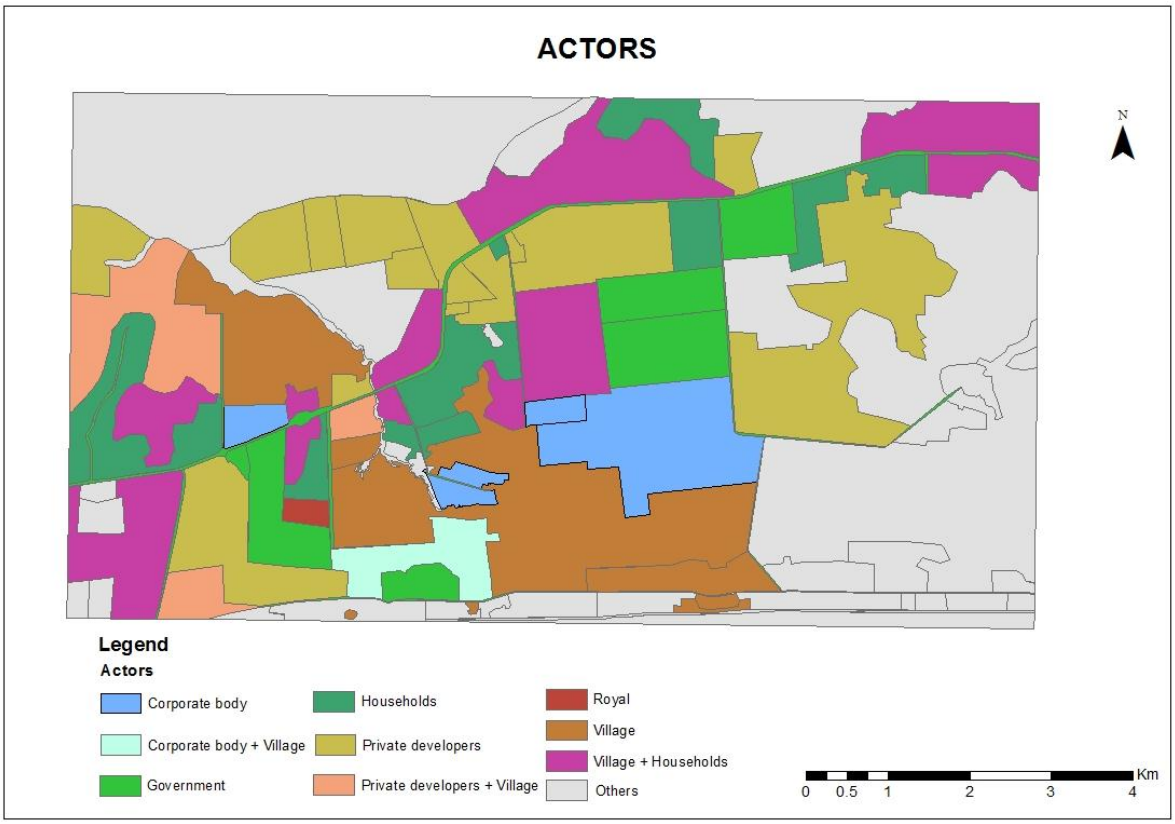

Figure 6-2: Map showing the actors in urbanisation process

6.3.2. Survey procedures

Survey procedures which define the boundary of a parcel were analysed by taking into consideration the type of boundaries that exist in the units. Where the boundaries are well defined and sharp, they were taken to be surveyed and coded yes in the analysis while areas that have fuzzy and irregular boundaries are taken to be without survey and are assigned the code no. However, it was observed that the boundaries existing in some areas were created by the roads and were not taken to be surveyed. From the analysis, areas with surveyed boundaries were 38 units in an area of 2334.1ha (55%). In these areas, the high class development has 17 units, low class 7 units, road network 6 units, 4 units of future development, 4 units for medium class, 3 units for no development and 1 unit for medium + low class. The unsurveyed units covers an area of 1891.2 ha (45%) with 28 units which include17 units of low class development, 5 units of no development, high class with 3 units, high +low of 2 units and 1 unit of medium class.

6.3.3. Property values

Data on property values were available for 4 units, out of which 2 units were high class development - 1 government property selling between ₦12 ,000,000 – ₦16,000,000 ($ 80,000 - $106,666) and 1 private developer estate selling a detached house for ₦72, 000,000 ($453,000). 2 units were in the low class development areas where a plot of land is sold between ₦8,000,000 – ₦10,000,000 ($53,333 – $66,666) and a detached house between ₦25,000,000 - ₦30,000,000– ($ 166,666 - $200,000). ₦

6.3.4. Types of urban development

The type of building structures and neighbourhood of an area can further explain the type of changes that are prevails there. According to (Zaremski, 2006) classification of urban development in satellite images is difficult because the structures and texture of land cover in urban areas does not allow automatic discrimination between types of land use. Therefore the urban development classes for this study was done and presented as figure 6.2 in relation to the classes of Zamreski but with particular reference to the type of structures in the study area and using the following criteria; (i) type and quality of buildings – high rise, low rise, temporal structures (ii) existence of basic services such as road networks and (iii) type of neighbourhood - planned or unplanned. The classification includes;

(a) High class development: these are planned with large prototype buildings which possess all the above mentioned characteristics including the site and services schemes (which do not have buildings but are well laid out with good road network) are classified as high class urban development. From the analysis, the high class urban development were found in 20 units with a shape area of 1109.5 ha out of which 11 units are developed by private developers,5 units by corporate bodies and 3 units by the government. Where the high and low classes are found together they were grouped as high class + low class and from the analysis they were found in 2 units of 157.9 ha. It also showed that this type of development is carried out by the following actors; private developers in an area of 468.6 ha (42%), government 275.1ha (25%), corporate body + village 109.6 ha (25), private developer + village 231ha (21%) and corporate body 134.8 ha (12%).

(b)Medium class urban development: areas that have good building quality in a semi - planned layout but do not have road networks are under this category; in these areas building owners provide road networks by themselves. There were found in 5 units of 331.3 ha. Some area have the mixture of medium and low qualities therefore they were grouped as medium + low class and they were found in 1 unit with the size of 98.6 ha. The actors involved in the medium class development include; Households in an area of 261.4 ha (79%) and village +households 69.9 ha (21%).

(c) Low class development are classified as areas with low building quality, no planned neighbourhood, poor road network and clustered buildings. In the study area, low class development is carried out by the villages and household on an area of 1090.3 ha in 19 units. The main actors in this class of development are the village + households 836.1 ha (77%), households 158.3 ha (15%), village 87.7 ha (8%), and the government in an area of 7.2 ha (1%).

(d) Future development: bare land prepared for construction is classified under this category and was in 4 units of 255.8 ha.

(e) No development: these are areas without structures and not bare land prepared for construction; the green and water areas are under this group and cover an area of 915.9 ha with 8 units.

(f) the road network and the power station did not fall under any of the above described groups but were found in 6 units of 258.9 ha and 1 unit of 7.2 ha respectively.

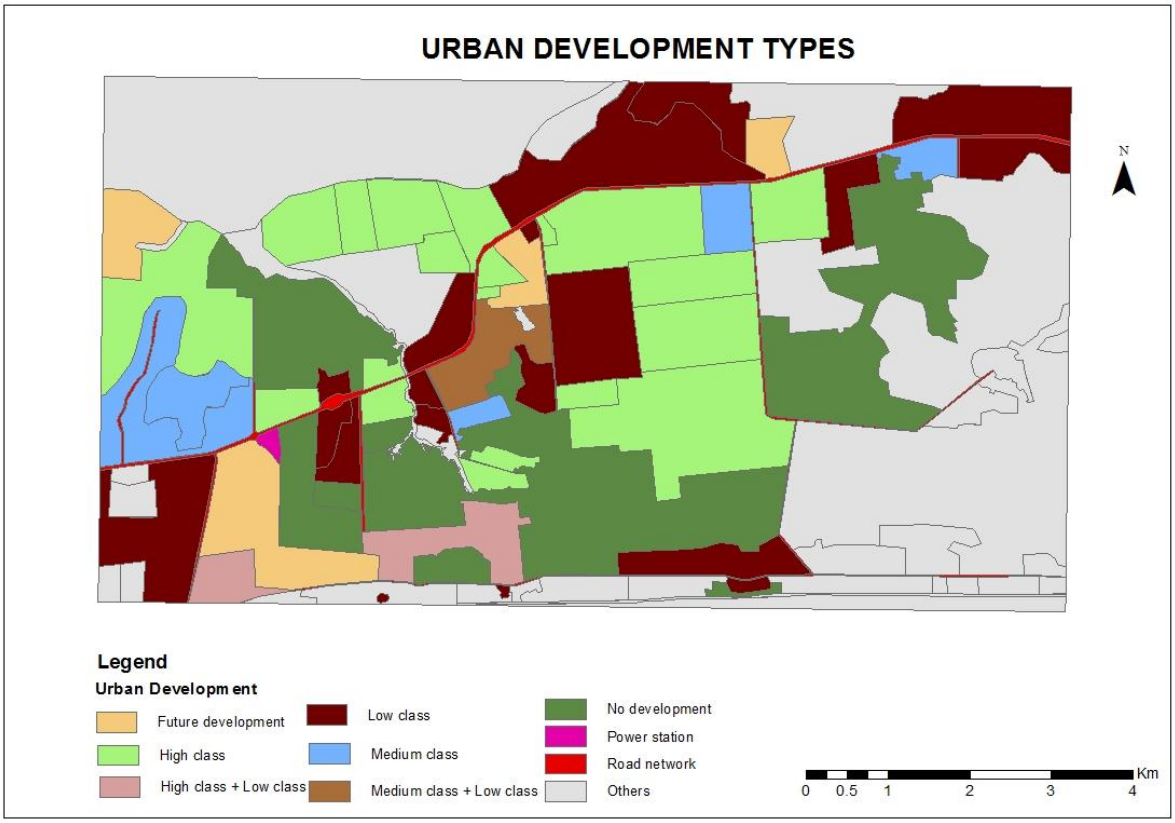

Figure 6-3: Map showing the urban development types

Type of devt / Actors	Future devt ha	High class ha	High class + Low class ha	Low class ha	Medium class ha	Medium class + Low class ha	No devt ha	Power station ha	Road network ha	Grand Total ha
Corporate body		134.8								134.8
Corporate body + Village			109.6							109.6
Government		275.1		7.2			135.1	7.2	258.9	683.5
Households				158.3	261.4	98.6				518.3
Private developers	255.8	468.6					409.4			1133.7
Private developers + Village		231.0	48.3							279.3
Royal							17.6			17.6
Village				88.7			353.9			442.5
Village + Households				836.1	69.9					906.0
Grand Total	**255.8**	**1109.5**	**157.9**	**1090.3**	**331.3**	**98.6**	**915.9**	7.2	**258.9**	**4225.3**

Table 6-1: Showing the summary of the actors and type of developments

6.4. Conclusion

From the analysis of the process behind the change we can conclude that 44% of the land in the area is under statutory tenure and 56% under the customary tenure systems. That the major actors involved in land transaction were the private developers who operates in 27% of the area followed by the village+ household with 21%, the government 16%, households and village with 12% and 10% respectively. In terms of urban development, we can conclude that the high class development dominates the other types of development and is carried out by the private developers who acquired 81% of their land from the government. Whereas the low class development carried out the villages and household whose land acquisition was through the government excision and village transactions respectively. On the boundaries which was another important factor that was analysed we conclude that the most surveyed areas fell in the high class development (38%) while the areas with fuzzy boundaries were in the areas occupied by the village and household (29%).

7. FINDINGS, DISCUSSION AND CONCLUSION

7.1. Introduction Findings and discussion on the spatial cover change and the change process

From the period under analysis, there have been quite a number of dynamic processes that have caused the land cover in the study area to change in space. These factors though hidden play various roles to determine the type of change that can be observed in space. Therefore, in this chapter the relationship between the process and the land cover change is presented as the findings of this study. This is presented in sections according to the type of change that have been observed and analysed in chapter 4. This is followed by the discussion and conclusion of this thesis. The Details of the data used for this analysis is presented as appendix E.

7.2. Conversion and its change processes

7.2.1. Conversion and tenure system

The analysis result showed that 50% of the areas that were converted are governed by the statutory system while 50% are by the customary tenure system.

7.2.2. Conversion and type of actors

From the results of the analysis, it revealed that this type of change that created new areas by converting the natural cover to the built up area was carried out by the following actors; (i) the private developers with a total of 31% in an area covering 526.1 ha, (b) Village + households 235.4 ha (14%), (iii) private developers + village 231.0 ha (14%), (iv) government 224.4 ha (13%), (v) households 208.7 ha (12%), corporate body + village 58.1 ha and (iv) corporate body 58.1 ha (3%).

7.2.3. Conversion and acquisition procedures

In the converted areas 750.1 ha (45%), were acquired from the villages, 702.9 ha (42%) from government allocation, 78.8 ha (5%) were excised lands, 66 ha (4%) individual transactions, 46.2 ha (3%) were squatting and 27.4 ha resettlement scheme.

7.2.4. Conversion and survey procedures

The nature of the boundaries in the converted areas showed that 1116.5 ha (67%) were surveyed and 555.6 ha (33%) were not surveyed.

7.2.5. Conversion and type of development

In terms of the type of urban development that were analysed, the high class development covered an area of 871.8 ha (52%), low class 405 ha (24%), future development 147.5 ha (9%), medium class 124.7 ha (7%) high class + Low class 109.6 ha (7%).

7.3. Geometry and its change processes

7.3.1. Geometry and land tenure system

The results showed that 689 ha (59%) of the areas that changed in geometry are under the Statutory tenure system while 479.8 ha (41%) are under the customary tenure systems.

7.3.2. Geometry and type of actors

The type of actors that were observed to be in these areas were the private developers in an area of 526.1 ha (44%), village 353.9 Ha (30%), government 234.0 (20%), corporate body 45.6 ha (4%) and royal (2%).

7.3.3. Geometry and acquisition procedures

Land acquisition in the geometry area were as follows; government allocation 689.0 ha (59%), from excision 371.5 ha (32%), and 108.3 ha (9%%) were acquired through villages transactions.

7.3.4. Geometry and survey procedures

In terms of the boundary formation, 652.1 ha (56%) of the areas were not surveyed therefore do not have sharp boundaries while (44%) 516.6 ha of the area have fixed boundaries.

7.3.5. Geometry and type of development

The types of development that changed in geometry include; no development with an area of 915.9 ha (78%), future development 108.3 ha (9%), road network 98.9 ha ((8%) and high class development 45.6 ha (4%).

7.3.6. Modification and land tenure system

In the modified areas 659.1 ha (54%) were under the statutory while 560.7 ha (46%) existed in the customary tenure system.

7.3.7. Modification and actors

The modification change which happened majorly in the built up areas were carried out by the following actors; village + households 665.7 ha (55%), households 309 ha (25%), and the rest by private developers 7%, government 6%, private developers + village 4%,Corporate body 3% and the village %.

7.3.8. Modification and acquisition procedures

The modified areas witnessed village transaction 550.8ha (45%), resettlement scheme 468.4 ha (38%), government allocation 186.4 ha (15%), excision 9.9 ha (1%) , and squatting 4.4 ha (0%)

7.3.9. Modification and survey procedures

The boundary formation of the area under this type of change were 629.9 (52%) ha fixed and 589.9 (48%) ha not surveyed.

7.3.10. Modification and type of development

Modification change was as a result of the following urban development activities; high class186.4 ha (15%) high class + low class 48.3 ha (4%), low class 680.0 ha (56%) medium class + low class 98.6 ha (8%)

7.3.11. No change areas

In these all the lands were in the statutory tenure regime, 57 % of it was not surveyed, 43% surveyed. The type of development there was 94% road network and 3% high class development with the major actor as the government 94% and 97% of the land acquisition from government allocation.

7.4. Conclusion

We can conclude this chapter on the relationship between the land cover change and the resultant processes as thus; That the converted areas were half (50%) under statutory and half customary tenure systems carried out majorly by the private developers (31%) in areas with 67% sharp boundaries dominated by the high class urban development. Secondly that the geometry change with 42% presented the largest type of change that was observed and occurred in the areas of 59% statutory system covered by 78% no development. Private developers (44%) were the major actors in these areas of whose boundaries (56%) sharp. Also that the modification change which occurred 100% in the built up areas were carried out in the units which were 54% under the state with the village + household (55%) playing the most significant role of low class urban development in an area with 52% fixed boundaries. Finally that the

government allocation (41%) and village transaction (59%) respectively were the most acquisition mode for all the types of change the changed areas.

7.5. Discussion

To discuss the findings of this study, the research questions raised to achieve the objectives were re visited to ascertain if they were met.

Where does land cover change occur?

In main cover class (conversion)

Within the main cover class (modification

From this research we have been able to identify land cover change as a result public infrastructure development from images. Three types of change were identified; conversion, modification which was in conformity with reviewed literatures and geometry which though was not found in literatures that were reviewed but was identified in the course of this study. The geometry type of change presented a very important change as it occurred in the greater part (42%) of the area that was studied. This type of change resulted in the reduction or increase of the outer boundaries of the same cover classes as a result of the changes caused by the other types of change. For example the change that converted a natural cover to a bare land in an area has reduced the geometry of the unit that was natural cover. Geometry change was equally determined by the nature of the boundary (established or fuzzy boundaries); the areas with fuzzy boundaries (56%) witnessed more change than the areas with stable and defined boundaries. Conversion was another important type of change that was identified and analysed, it involved the change from one cover class to another and also from one sub class to another sub class within the same class. From this study it was discovered that the areas that resulted out of this type of change were mainly from vegetation (rural) to non vegetation (urban) representing 61% of the total conversion change. Another type of change was modification which occurred within the cover of the same classes – the built up area and resulted to the change in the characteristics of the built up area by the increasing the housing density. Apart from the changes that were identified 2% of the areas did not change.

Who are the actors involved in the change?

How do they get access to land?

How do they develop?

What happened with the people on the land?

To answer the above research questions, data were collected from the case study area and analysed and this revealed that the various actors as reviewed in literatures were also involved in the development process in the study area. These actors included; the private developers, government, village, households and corporate body. The study revealed that the tenure regime in the area were 56% customary and 44% statutory. In terms of acquisition procedures, 41% of the land acquisition by the various actors excluding the villages was from the government and 33% from the villages while the villages themselves got their lands from government excision The boundaries of the areas were also analysed and were found to be 55% surveyed and 45% unsurveyed while the most surveyed areas were in the high class development (38%) while the areas with fuzzy boundaries fell in the areas occupied by the village and household (29%).

From the study, it has been revealed that the private developers were the most prominent actor and operated in the high class urban development areas (42%) with most of their lands in the areas governed by the statutory tenure system. Also the corporate body though not very influential in the process also were involved in high class developments, the village + household (77%) concentrating in the low class area. The type of structures that were observed in these areas was the self financed kind of structures the

activity of the government was seen largely in the form of facilitation of the change process through allocation of lands to other actors.

As regards the 5th research question, displacement was another issue that was observed in this study particular incidents were the road construction that caused the demolition of a neighbourhood and the resettlement schemes used to resettle households who resided in an area demolished by government for further development. From the study it is was also discovered that only the land owners in the demolished areas where resettled leaving out the tenants which explained why there was modification in the neighbourhood around the demolished area which suggested that the displaced people tried to find shelter for themselves by squatting on available lands.

7.6. General conclusion

From the analysis and the result of this research it was found out that there were three types of change that were observed in urbanisation process – conversion, geometry and modification. Of these three, geometry change which was determined by the stability or otherwise of a boundary was the most prominent, therefore the fuzzier the boundary formation, the more the changes in the geometry of the units. While conversion created most of the new urban areas by changing the non urban lands to urban lands and carried out mainly by the private developers in the high class areas, it can then be concluded that this would definitely push the property values of these areas and create more exclusive areas for the upper class. Aside the activities of the private developers who had the financial backings to cause major changes in land cover by altering the geometry of the spatial units and converting the rural lands to urban area (built up area), the government was seen as a strong force behind urbanisation through the allocation of developable lands to the private developers and the excision of the village lands which made it easier for the villagers to transact in their lands which was seen in the huge village transactions as captured in this study. Also With this, I therefore conclude that the analysis of the process behind urbanisation by the combination of these factors that were seen on ground with change in land cover has helped in understanding the types of change that were observed on images.

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APPENDICES

Appendix A: Interview extract

In the field work area, the following resource persons were interviewed; Baale of Olugborogan, Baale Morekete and Baale Ajiwe, land agents and two residents of Ikota resettlement scheme (1 house owner and a squatter), villager from the "21" village resettlement, 2 residents of Olugborogan village, a developer and a resident at Ajiwe village, Ojomu family land administrator and a professional Estate Surveyor/Town planner in the area. The key concept of the interview was extracted however an extract of the interview carried out with the surveyor to identify areas on the images and the ownership /tenure system in the study area is presented here.

Transcription of field Data collected from the surveyor general's office, with Messrs Fetuga, Emmanuel and Fatai trying to identify Specific questions were asked on the following; acquisition, demolition, changes in ownership, Survey procedures, changes in land use
Question on Demolition and the development seen on the image in 2006 as against no development in 2002.

Respondent: On expansion of the Lekki- Epe- expressway by the LCC, there is what we call overriding public interest, enumeration was done and those that have their title documents, they valued their properties and government compensate them. The presence of the road brings more value to more properties along that area. For years, the LCC will be the ones that will collect tolls.. Good road will make property more appreciative and development will be more rapid.

Change on ownership

Question: *In 2006 the area was not really developed but now it is, is it the villagers that develop the areas.*

Answer: In property, once there is infrastructure in place and they have everything in place, people will like to buy. This is as a result of many factors. Along this stretch, government gave land allocation to private developers and private estates. In that kind of situation, private developers buy from government and get a certificate of occupancy. They now will be selling to the public at their own valued rate (the title they will give have is the governor's consent. Some of the developed area is that we have the private developers' estate, private estate, Royal people estate the Oniru, the Elegushi. They are the real indigene of that place. So government release to them as a gazette as a freehold Government also release land to the royal families and the indigene of the place as a freehold and gazette them they no sell the land to whoever they like but the title document on it is going to be governor's consent.

Question: *Okay, which means that areas that the government allocated to the private developers, they have acquired it from the original owners?*

Answer: No, like Lekki Scheme II, it is in form of allocation, it is has a rate, they buy and Government issues C of O to them directly in their name

Question: *Before government carved out this estate, did they acquire it from the villagers*

Answer: No, because every land belong to the government. I have told you that once the government earmarked a particular place a project they call it committee. The government have designated the area as

a scheme to provide land and accommodation form you pay your tax clearance then after payment of all the charges, you will now be given block and plot no that is that for the scheme Lekki I and Lekki II.

Question: *But I think some people also buy from the villagers around?*

Answer: Yes they buy, once they buy they give them deed of assignment and this refer to the royal families and omoniles, (those that own the land)

Question: *Are they sometimes clash of interest between the royal families and the government over land ownership?*

Answer: No, government owns the land that is the more reason why government release some portion of the land so that they can make use of it. But there might be clash in between the royal families (you cannot rule that out (land dispute) over who own what side.

Question: *Do they stay clear of government land or do they sell government land?*

Answer: They do out of ignorance, people do buy out of ignorance, more reason why the permanent secretary and the surveyor general do announce on air that anybody who wants to buy land should come and do

This resettlement was as a result of what?
Answer: Government made use of their land to some estate. So the government resettled them.

DEMOLITION

On the expansion by the LCC, enumeration was done and those that have their title documents, their properties were valued and the government compensated them. The presence of the road brought more value to the property along that area. For years, they LCC will be the ones that will be collecting tolls.
Good roads will make the property more appreciative and developments will more rapid.

Change of ownership

Chevron: Government allocation
So are the village people the once that developed the area?
Answer: In property once that is in areas where they have infrastructures in place and have everything in place people were more willing like to buy. This is as a result of the so many factors; In 2006, it was not really developed before now but now, it is has been developed. The Chevron, the road and those that marketed the place

Information on the area opposite Eleganza and Ikota resettlement scheme
Government resettled about 21 villages

Can you tell me about land ownership along the road Stretch
Answer: Along this stretch, government gave lands to private developers and the private developers buy from the government and get a certificate of occupancy. They now will be selling to the public at their own valued rates (The title they will have will based on that is the governor's consent). Government will give the private developers Certificate of Occupancy and they will now do governor's consent to have the title on their land. Government also release land to the royal families to the indigenes of the place as a freehold and gazette them. Some of this developed area is that we have the private developer's estate, private estate, royal people estate, the Oniru, the Elegushi-they are the real indigenes of the place. So, government release to them on a gazette as a freehold.

They now sell the lands to whomever they like but the title document on it is going to be governor's consent.

Which means that areas that the government has allocated to people, they acquired from the initial owners?

Answer: No,

Before Government carved out this estate, did they acquire it from the villagers?

Answer: No, because every land belongs to the state. I have told you that once the government earmark a particular place for a project, they call it committed. The government have designed the area as a scheme to provide land and accommodation to the people. So, the scheme is going to be in the form of allocation where people purchase the allocation form. You pay your tax clearance, then, after payment of all charges, you will now be given block plot number. That is that for the scheme. We have Lekki I and Lekki II

But do you think that some people bought from the villagers' around?

Answer: Yes, They buy, once they buy they give them deed of assignment and this refer to the loyal families and the Omoniles those that own the land.

Are there sometimes clash of interest between the Royal family and the government over land?

Answer: No, Government owns the land that is the more reason why government release some portion of the land so that they can make use of it. But there might be clashed in between the Royal families. You can rule that out (land dispute) over who owns what side.

Do they stay clear government lands, they don't sell government land?

Answer: They do out ignorance more reason why the permanent secretary and the surveyor general do announce on air that anybody who want to buy land should come and do some findings, some preliminary findings. If you come here, you will meet somebody and they will chat and advice you whether the land is free from government acquisition, is it within the committed area, is it within government project or is it within the gazette of area.

You have mentioned something to me now, I have heard Committed, Gazette, Project can you explain?

Answer: Committed project is still the same thing. Let me analyse it for you. We start with the Gazette areas. What I meant by Gazette are is this like I told you, Government owns the land and because of the project and the presence of the people in that area, government decides to release some portion of the land to them and release the gazette. That means it is titled that they can use it for their own consumption. In such a situation, government will not take the land from them to use. So, in that kind of situation, they will have gazette number, volume so-so and have their documents being documented in the land registry. So, anybody who wants to buy can make reference to that gazette number.

Ok. But individual do not have documents, they just gazette the whole area as one?

Answer: Yes, individuals that want to buy from the gazette are will governor's consent.

Alright, let us go to the committed area?

Answer: Committed area is a government project. Let me give an example of a committed project like this scheme mentioned. The government scheme government general hospital, government school, power station, housing estate, infrastructures and any government project is a committed area.

So, Committed and project are together?

Answer: Yes, there are together.

Is there acquisition?

Acquisition means government have acquired area i.e. the whole area. So any land owned and acquired by Lagos state government. Of course from what you have been saying, government owns the land. *So they are acquired from the people?*

Answer: No, Government don't acquire from the people. Acquisition means government has acquired the whole area for a purpose. So they now use their discretion to release some portion of the land for the villagers that is why they say it is gazetted.

During this acquisition, do they pay something to some people?

Answer: Let me sight an example with the airport right now. We are working on the airport right now. These lands have been acquired long ago. It is a committed project. Now some indigenes do some crop plantation. Now the government want to start the project, they do compensation. The compensate people that planted on the land. So, before they are evacuated from the land, they are compensated on the crop and not the land.

Ok, Only for the crops, they don't pay for the land?

Answer: No because government owns the land.

Then if you now have houses on those areas, what will the government do?

Answer: They are demolished without compensation because they built in ignorance. That is the more reason why before you build, you must have approval, you must have title. So anybody that builds wrongly on the government land, may be you build on drainage, on roads, it is subjected to demolition.

Does it mean that these small-small developments are on government Land?

Answer: : For us to make comment on that, we must identify it and place it on our information. Then we know if it is within or outside. Some people out of ignorant some build on acquisition land some build on the government land.

On government allocation, government have rates, you buy a form. *What are the survey procedures for the acquired areas and gazetted areas?*

Answer: (I made a note on the above). In the survey procedure, we have government survey plan and private survey plan.

The government survey plan is done by government survey on only land or government allocation, counter signed by the surveyor general. While on pilot, it is not by registered land surveyor with beacon number issued by Nigerian Institution of surveyors (NIS) and Survey Registration council of Nigerian (SURCON). They monitor the issue of beacon numbers and red copy submitted to the office of the surveyor general. So when an area is to be excised, then government will do the survey and description.

When you say description what do U mean?

Answer: In survey, we have the bearing and distance from one pillar to another. The survey description will describe the bearing and the distance. So the survey description is would come out as a gazette.

Overriding public interest project attracts demolition. Overriding public interest is subjected to compensation for example, the coastal road that is coming up and people that have land or the right of way are subject to demolition but with compensation.

This entire estates do you think all these are demolition or they could still buy from the villages?

Answer: Government estates are being subdivided into layout and sell to people per plot and will be given certificate of occupancy. You can now sell or subdivided and sell a portion of it. This transaction will be between you and the buyer and the person processes governor's consent on it

What I want to get is if the private developer buys also from the individual?

Answer: No. You can be a private developer, assuming you private developer ask for a portion of land for let's say whatever, you write a proposal that you want to provide a housing on provide land for people, government will give al the necessary , the title document will be in your name, you now sell to people and the root of little is going to be from you.

KEY CONCEPT FROM INTERVIEWS—BAALE OLUGBORDAN

- Non complete of the road (result to non appreciation of property)
- When there is no good network (road) the property value appreciates
- Since the roads of adjoining the communities are bad, it is not appreciating.
- Almost 4 years now, people are coming for properties

- Ownership: All land under Ojumu chieftaincy is free from government acquisition. They have a global certificate of Occupancy.
- Olugboragan under Ojomu; we are under royal family.
- Sell property to attract the buyer
- Real village settlement
- Collective land sale by the community
- All lands belong to the Royal majesty-the Ojomu of Ajiran and Ojumu have an umbrella (Global Cof O) have so many families
- Olugboragan was a thick forest before
- Villagers were farming around
- The properties along the road are gated, they are not enjoying

❖ **Negative effect of the road:**

- Properties facing the road depreciated because they are gated.
- No freedom in the gated areas

❖ **Conservation land is part of Olugboragan**

- The royal majesty owned behind the village.

Appendix B: Codes for land cover change and detail of the date used for land cover analysis

From 2002 To 2011	**Bare land**	**Built line**	**Built area with lines**	**Built up area**	**Natural cover**	**Water body**	**Water course**	**Wetland**
Bare	1	2	4	3	6	7	8	5
Built line	9	10	12	11	14	15	16	13
Built area with lines	65	67	66	68	69	70	71	72
Built up area	17	18	20	19	22	23	24	21
Natural cover	41	42	44	43	46	47	48	45
Water body	49	50	52	51	54	55	56	53
Water course	57	58	60	52	62	63	64	61
Wetland	33	34	36	35	38	39	40	37

Cover_change class	**Type_of_change**	**Area_ha**
Water body to Water body	Geometry	778.9
Water body to Water body	No change	91.3
Built up area to Built up area	Modification	6.9
Natural cover to Natural cover	Geometry	16.1
Bare land to Bare land	No change	19.4
Natural cover Bare land	Conversion	8.1
Natural cover to Natural cover	Geometry	3.7
Natural cover to Built up area	Conversion	40.6
Built up area to Built up area	Modification	8.0
Natural cover to Natural cover	Geometry	8.5
Natural cover to Natural cover	Geometry	35.9
Natural cover Bare land	Conversion	5.9

Built up area to Built up area	Modification	1.8
Natural cover Bare land	Conversion	44.1
Natural cover to Built up area	Conversion	1.4
Bare land to Built up area	Conversion	9.0
Natural cover Bare land	Conversion	12.1
Natural cover to Natural cover	Geometry	14.2
Bare land to Bare land	No change	23.2
Natural cover to Built up area	Conversion	9.7
Built up area to Built up area	Modification	156.4
Bare land to Bare land	Geometry	108.3
Bare land to Built up area	Conversion	7.2
Wetland to Wetland	Geometry	116.5
Built up area to Built up area	Modification	21.6
Natural cover to Built up area	Conversion	25.8
Natural cover to Natural cover	Geometry	19.0
Wetland to Wetland	Geometry	11.9
Natural cover to Built up area	Conversion	109.6
Natural cover to Natural cover	Geometry	36.2
Natural cover to Built up area	Conversion	77.4
Natural cover Bare land	Conversion	52.5
Built up area to Built up area	Modification	11.8
Natural cover to Natural cover	Geometry	590.1
Natural cover to Natural cover	Geometry	45.6
Wetland to Wetland	Geometry	3.5
Wetland to Built up area	Conversion	20.4
Wetland to Built up area	Conversion	0.5
Wetland to Built up area	Conversion	14.9
Natural cover to Built up area	Conversion	12.4
Built up area to Built up area	Modification	12.9
Built up area to Built up area	Modification	98.6
Natural cover to Built up area	Conversion	20.1
Bare land to Built area with lines	Conversion	171.9
Bare land to Built up area	Conversion	18.3
Natural cover to Built up area	Conversion	4.0
Natural cover Bare land	Conversion	42.4
Built up area to Built up area	Modification	4.4
Built up area to Built up area	No change	5.7
Built up area to Built up area	Modification	71.1
Natural cover to Natural cover	Geometry	409.4
Bare land to Built up area	Conversion	34.7
Bare land to Built up area	Conversion	46.2
Natural cover to Built up area	Conversion	116.3
Built up area to Built up area	Modification	53.7
Natural cover to Built up area	Conversion	399.0
Built up area to Built up area	Modification	23.8

Natural cover to Built up area	Conversion	6.8
Natural cover to Built up area	Conversion	30.5
Built line to Built line	Geometry	77.9
Built up area to Built up area	Modification	156.5
Wetland to Bare land	Conversion	71.1
Wetland to Water course	Conversion	5.5
Wetland to Built up area	Conversion	205.1
Water course to Water course	Geometry	36.1
Built up area to Built up area	Modification	31.1
Natural cover to Built up area	Conversion	69.9
Wetland to Built up area	Conversion	11.6
Wetland to Wetland	Geometry	209.9
Built up area to Built up area	Modification	14.4
Wetland to Bare land	Conversion	116.1
Bare land to Built up area	Conversion	36.8
Bare land to Built up area	Conversion	27.0
Built up area to Built up area	Modification	229.5
Built up area to Built up area	Modification	51.4
Bare land to Bare land	Geometry	44.8
Natural cover Bare land	Conversion	34.0
Natural cover to Built up area	Conversion	66.6
Natural cover to Natural cover	Geometry	155.8
Natural cover to Built up area	Conversion	126.5
Natural cover to Built line	Conversion	3.3
Wetland to Built up area	Conversion	71.8
Built up area to Built up area	Modification	69.8
Bare land to Built up area	Conversion	48.8
Natural cover to Natural cover	Geometry	12.6
Natural cover to Built up area	Conversion	28.0
Natural cover to Built up area	Conversion	45.3
Built line to Built line	No change	12.5
Built line to Built line	No change	1.5
Built area with lines to Built up area	Conversion	83.0
Built up area to Built up area	Modification	50.2
Natural cover to Built area with lines	Conversion	121.0
Built up area to Built up area	Modification	140.3
Natural cover to Built up area	Conversion	27.4
Natural cover to Built up area	Conversion	22.8
Natural cover to Natural cover	Geometry	98.9
Natural cover to Built up area	Conversion	28.8
Wetland to Wetland	Geometry	17.6
Natural cover to Built line	Conversion	5.9
Built line to Built line	No change	4.9
Built up area to Built up area	Modification	48.3
Water course to Water course	Geometry	8.0

	Grand total	**6,878.4**

Appendix C: Details of data used for the process analysis

Actors / **Survey procedures**	**Corporate body ha**	**Corporate body + Village ha**	**Govt ha**	**Hholds ha**	**Private dev ha**	**Private dev + Village ha**	**Royal ha**	**Village ha**	**Village + Hholds**	**Grand Total ha**
NO		109.6	202.2	130.2	429.4	253.4		224.5	541.9	1891.2
YES	134.8		481.3	388.2	704.3	25.8	17.6	218.0	364.1	2334.1
Grand Total	**134.8**	**109.6**	**683.5**	**518.3**	**1133.7**	**279.3**	**17.6**	**442.5**	**906.0**	**4225.3**

Actors and survey procedures

Tenure systems	**Area_ ha**	**% Area**
Customary	1869.4	44
Statutory	2355.9	56
Grand Total	**4225.3**	**100**

Tenure systems

Row Labels	**Corporate body ha**	**Corporate body + Village ha**	**Govt ha**	**Hholds ha**	**Private Dev ha**	**Private dev + village**	**Royal ha**	**Village ha**	**Village + Hholds ha**	**Grand total**
Excision							17.6	442.5		
Government allocation + individual transaction				66.6						
Government allocation	99.5		683.5	34.7	920.4					
Resettlement scheme				98.6					397.2	
Squatting				50.5						
Village transaction	35.4	109.6		267.9	213.3	279.3			508.8	
Grand Total	**134.8**	**109.6**	**683.5**	**518.3**	**1133.7**	**279.3**	**17.6**	**442.5**	**906.0**	

Actors and acquisition procedure

Appendix D: FIELD DATA COLLECTED

Object_ ID	**Actors**	**Brief description**	**Remarks**
7	Government	This land measuring 78 hectares (ha) is a forest reserve owned by the government (**NCF)**..  ***Lekki conservation centre***	No change in cover but there was a change in ownership through government acquisition
2	Village+ Households	**Olugborogan** This is a village land that has witnessed quite a number of transactions from households (individuals). The land measuring 75 ha was in 1993 revoked alongside other lands under Ojomu Chieftaincy family (OCF) land by the Lagos State government. Olugborogan is located near the NCF by the right hand side of the road as you come from the CBD. The village setting is further away from the road while the parcels adjoining the road are sold to attract buyers. Also within the village, there are some developments by individuals who have bought from the village hence there are very few local houses in the area. My source revealed that some of the villagers relocate with share of the money they get from the collective land sale to buy land in cheaper places. Presently the amount of property reselling is on the increase. Property values: Around 2001 a parcel of land was sold for about ₦4million ($26,666) – ₦5 million ($33,333) and presently it is between ₦8 ($53,333) million to ₦10 million ($66,666). A2 bedroom flat is sold for ₦17million (£78,200, $107,100) Despite the large presence of strangers in the community which suggests large amount of property transactions, the villagers are not developing the areas where they occupy and there seem to be no farmland around the village while the only available natural land is said to belong to His Royal Majesty.	Change from partly natural vegetation cover in 2002 to fully built up in 2011. The area cover by natural vegetation in 2011 land is a royal land. Some of the land transaction this area are registered in the land registry

		 ***Olugborogan Village***  ***Individual's building in Olugborogan village***	
19	Households	This is an excised village land that has been leased or sold to households. The type of development is medium class.	It was built up in 2002 Some of the land transaction are registered in the land registry
24	Corporate body	This is a bare land that is for construction. Part of it is used as a power station in 2011.	Did not change though part of it change from bare to built up
46	Corporate body	This is a government allocation to a corporate body (Mobil staff housing estate).	Was natural vegetation cover in 2002 but is built up 2011
30	Village + Households	This is a marsh land that has some structures and is owned by a village **(Porokun village)**. The whole village land 26.18 ha was excised for the village. Directly in front of this land is the construction of the second toll gate on the expressway which has resulted from the expansion of the road. Part of this land is also taken for the construction.	Was complete marsh in 2002. No trace of transaction in **this area**
38	Private developer	This is a private developer estate (**Eleganza shopping mall)** allocated by the government. The land adjoins the road directly and contains a prototype shopping mall.	It was a bare land that was prepared for construction in year 2002 and in 2011 it changed to a high class development. It maintained a sharp

			boundary over time. Also beside the mall in the same ID is a residential housing estate by another private developer who got allocation from the government.
44	Individuals	23 village resettlement scheme. The 23 villages were indigenes of Maroko that was demolished in 1983 and were resettled in 2004 without compensation. The area was acquired by the Lagos State government from the Ikota village. Each of the 23 villages has a global C of O. Some of the villages shared their land amongst their members who now sell to individuals.	Was completely natural vegetation in 2002 but changed to built up in 2011. No trace of transaction records.
49	Households	**Ajiwe Ajah** The whole village land is about 15 ha land owned by the Ajiwe Ajah family. It has government excision and was gazetted.. The villagers parcel and sold all their land and left except for the Baale who retained half a plot of land for his household. They sold as families and not collectively as a village. When sold they share the proceeds among the family members through their representatives. The types of buildings found in these areas are mainly of medium class development which seemed to be done on incremental basis. Property values: The properties in this area have so much appreciated and the villagers that sold are regretting. In 1995 a plot was sold for ₦200,000.00 ($1,333), while in 2010 half a plot was sold for ₦13, 000,000.00 ($86,666) and presently (2011) a plot goes for as much as between ₦25,000,000 and ₦30,000,000 ($166,666 - $200,000). 	The area was covered by natural vegetation cover in 2002 but has changed to built up estate. 847 transactions were done on assignment.

		 ***Individuals' development at Ajiwe village***	
20	Private developer	This is a private estate from, government's allocation (ọluwani Sọla private estate). This area did not change from its built up cover in 2002.	
97	Individuals	This area is a resettlement scheme that was used to resettle house owners from Maroko which was demolished in 1983. The land was acquired from the Ikota village and government paid compensation to them. It comprises of 1 bedroom bungalow on a very small space. The area grew housing density from 2002 to 2011 partly because some of the evictees from Maroko who were not house owners did not get allocation therefore needed to provide shelter for themselves, so the squat on any available space. Each time a new structure is to be erected, the sum of ₦7,000.00 is demanded by the boys (ọmọnile) of the local community.  *A temporary structure at the Ikota resettlement scheme*	
50	Government	This estate was built by the Lagos State Government **(Abraham Adesanya Housing Estate)** and sold to individuals. It comprises of 2 & 3 Bedroom Bungalows. **Properly values:** Outright sale value of Properties in this area is in the region of 3 bedrooms for ₦16 and ₦12million for 2 bedroom bungalow.	This are did not change from built up in 2002

1	Government	This is the Lagos lagoon	
6	Government	This is a power substation that.	was bare in 2002 but built up in 2011
18	Private developer	The area is part of the 28.06ha of land excised for the Ajiran village under the Ojomu chieftaincy family and gazetted as No. 24 Vol. 27 of 1994. The land has been sold to private developers (Carlton gate estate) for the development of high value residential properties. Property values: A detached house (duplex) is sold at ₦72,000,000 (seventy two million) (£3331,200,$453,600).  Carlton gate estate	The area was partly natural vegetation and partly swamp in 2002 but in 2011 has changed to built up (high class development). 9 transactions were registered to have been done from the village to corporate body.
40	Private developer	This is a site and service scheme developed by a private developer **(Royal garden estate).** The site is clearly laid out in parcels with few buildings. There is also a road network within the estate and also connecting to the expressway	The area in 2002 had natural vegetation cover but in 2011, change to built line.
5	Corporate body	Government allocation to a corporate body (Chevron). This is a high class office and residential building.  Chevron estate	The area did not change from its original cover in 2002
29	Government	This is the Lagos sea	

Village name	Assignment	Sublease	Lease	Gift	Transfer of assignment	Conveyance
Ajiran	209	3	0	2	0	0
Ologolo	33	1	0	0	0	0
Olokonla	117	0	0	0	1	0
Aiyedere	56	1	0	0	0	0
Igbo- efon	129	0	0	0	0	0
Ikota	147	8	0	1	0	0
Sangotedo	647	56	1	0	0	1
Lafiaji	72	2	0	0	0	0
Olugborogan	82	1	0	0	0	0
Ikota resettlement	68	1	0	0	0	0
Olumegbon	0	0	0	0	0	0
Ajah	847	79	1	2	0	0
Ojomu	941	2	0	0	0	0

Property transaction as at 17/10/11, Source: Land bureau, Alausa, Lagos, October 2011

Village name	Individual-individual	Company - Individual	Individual to company	Family	Royal
Ajiran	28	83	9	83	0
Ologolo	3	2	0	24	9
Olokonla	75	9	7	51	0
Aiyedere	11	1	1	26	20
Igbo- efon	44	4	13	44	31
Ikota	24	18	14	25	22
Sangotedo	260	375	39	62	5
Lafiaji	9	8	7	52	0
Olugborogan	20	1	2	54	0
Ikota resettlement	47	3	9	16	0
Olumegbon	26	1	1	152	0
Ajah	542	147	24	542	11
Ojomu	0	6	44	822	113

Property transaction as at 17/10/11, Source: Land bureau, Alausa, Lagos, October 2011

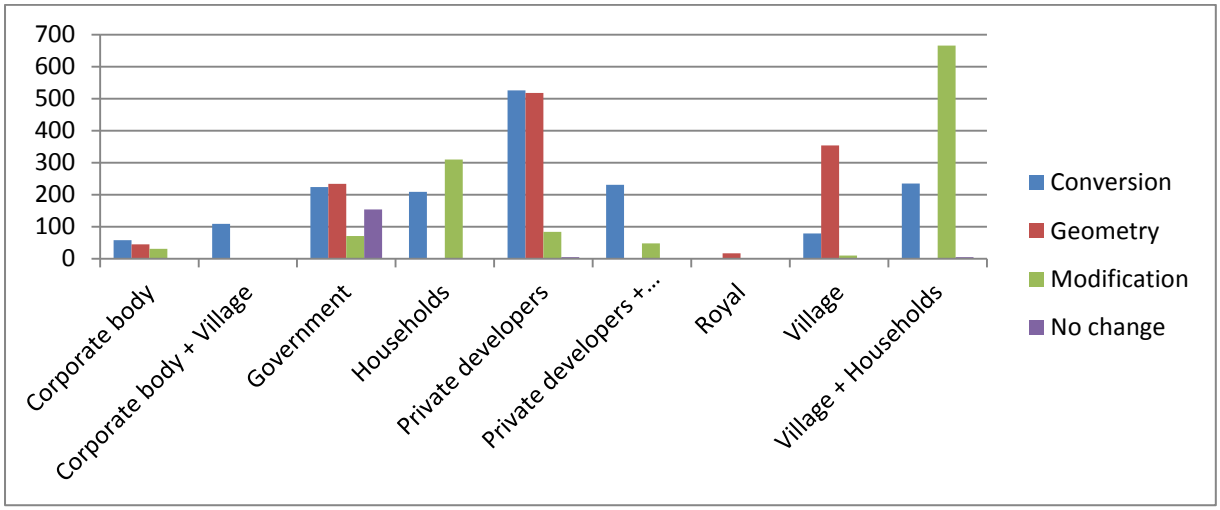
Appendix D: Details of the data for the analysis on the spatial cover and change process

Tenure system	Conversion	Geometry	Modification	No change	Grand Total	% C	%G	%M	%N
Customary	828.9	479.8	560.7		1869.4	50	41	46	0
Statutory	843.1	689.0	659.1	164.7	2355.9	50	59	54	100
Grand Total	**1672.1**	**1168.7**	**1219.8**	**164.7**	**4225.3**	100	100	100	100

Tenure system and types of change

Actors	Con	Geom	Mod	No change	Grand Total	% _Conv	% _Mod	% Area_Geom	% No change
Corporate body	58.1	45.6	31.1		**134.8**	3	3	4	0
Corporate body + Village	109.6				**109.6**	7	0	0	0
Government	224.4	234.0	71.1	154.1	**683.5**	13	6	20	94
Households	208.7		309.6		**518.3**	12	25	0	0
Private developers	526.1	517.7	84.2	5.7	**1,133.7**	31	7	44	3
Private developers + Village	231.0		48.3		**279.3**	14	4	0	0
Royal		17.6			**17.6**	0	0	2	0
Village	78.8	353.9	9.9		**442.5**	5	1	30	0
Village + Households	235.4		665.7	4.9	**906.0**	14	55	0	3
Grand Total	**1,672.1**	**1,168.7**	**1,219.8**	**164.7**	**4,225.3**	**100**	100	**100**	**100**

Actors and types of change



Actors and types of change

Types of change Acquisition procedures	Conversion ha	Geometry ha	Modification ha	No change ha	Grand Total ha	Con %	Geom %	Mod %	No ch.%
Excision	78.8	371.5	9.9		460.1	5	32	1	
Government allocation + individual transaction	66.6				66.6	4			
Government allocation	702.9	689.0	186.4	159.8	1738.0	42	59	15	97
Resettlement scheme	27.4		468.4		495.8	1		38	
Squatting	46.2		4.4		50.5	3		0	
Village transaction	750.1	108.3	550.8	4.9	1414.1	45	9	45	3
Grand Total	**1672.1**	**1168.7**	**1219.8**	**164.7**	**4225.3**		100	100	100

Acquisition procedures and types of change

Survey procedures	Conv	Geom	Mod	No change	Grand Total	% Con	% Geom	% Mod	% No change
NO	555.6	652.1	589.9	93.6	1891.2	33	56	48	57
YES	1116.5	516.6	629.9	71.1	2334.1	67	44	52	43
Grand Total	**1672.1**	**1168.7**	**1219.8**	**164.7**	**4225.3**	100	100	100	100

Survey procedures and types of change

Type of change Type of Dev	Con	Geo	Mod	No change	Grand Total	% Conv	% Geom	% Mod	% No change
Future development	147.5	108.3			**255.8**	9	9	0	0
High class	871.8	45.6	186.4	5.7	**1109.5**	52	4	15	3
High class + Low class	109.6		48.3		**157.9**	7	0	4	0
Low class	405.4		680.0	4.9	**1090.3**	24	0	56	3
Medium class	124.7		206.6		**331.3**	7	0	17	0
Medium class + Low class			98.6		**98.6**	0	0	8	0
No development		915.9			**915.9**	0	78	0	0
Power station	7.2				**7.2**	0	0	0	0
Road network	5.9	98.9		154.1	**258.9**	0	8	0	94
Grand Total	**1672.1**	**1168.7**	**1219.8**	**164.7**	**4225.3**	**100**	**100**	**100**	**100**

Development and types of change