

UNIVERSITY OF GHANA

DEPARTMENT OF GEOGRAPHY AND RESOURCE DEVELOPMENT



***UNDERSTANDING URBAN SPRAWL IN THE GREATER ACCRA METROPOLITAN
AREA: THE GIS PERSPECTIVE***

BY

BOATENG JOSEPH

(10550976)

**A MPHIL THESIS SUBMITTED TO THE DEPARTMENT OF GEOGRAPHY OF AND
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DEVELOPMENT**

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DECLARATION

I hereby declare that with the exception of works from different authors which have been duly referenced, this work was completed through my own effort. Neither part nor whole of this thesis has been presented elsewhere by me or any other person for the award of another degree.

STUDENT

BOATENG JOESPH

STUDENT ID NUMBER: 10550976

Signature

Date.....

SUPERVISORS

**DR. ALEX BARIMAH OWUSU
(PRINCIPAL SUPERVISOR)**

**MR. SOSTHENES KUFOGBE
(CO-SUPERISOR)**

Signature

Signature

Date

Date

DEDICATION

I dedicate this thesis to my wife Mrs. Rosemary Boateng for taking care of the family as a committed and industrious wife.

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ABSTRACT

There has been significant spatial expansion of urban areas in recent times, especially in developing countries. This process has posed a number of challenges for city managers as they seem to be unprepared to manage the urban process. In particular, there continue to be rapid development of fringe areas in urban centers, normally characterized by low density residential development, a process called urban sprawl. Accra, Ghana's capital city continues to witness significant growth, both demographically and spatially. This situation is leading to rapid urban sprawl in peri-urban areas. To enhance understanding on this process and add to existing knowledge about the problem, this study examines the extent of urban sprawl of Accra, the factors accounting for this sprawl and the challenges associated with it. The study was carried out using a mixed methods approach. The quantitative aspect of this method employed the use of remote sensing techniques, to analyze land-use and land-cover changes in Accra. Further on the quantitative approach, survey was conducted in three selected Municipalities which can be described as being within the peri-urban areas of Accra. Qualitative techniques using in-depth interviews were also used to gather further data for this study. The findings showed significant conversion of land surface from vegetative to unplanned built-up areas, thus a clear indication of the rapid sprawl of Accra. Among factors influencing driving urban sprawl include land affordability, search for work, pollution and environmental problems in inner cities and search for serene environment. Some challenges found include increasing living cost and problems with access to basic services. The study recommends the following; provision of and improvement in housing facilities in peri-urban areas, enhanced physical planning of peri-urban communities and speeding up land reforms for effective land management.

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LIST OF ACRONYMS

BMI	Body Mass Index
CBD	Central Business District
DC	District Capital
EEA	European Environment Agency
ETM	Enhanced Thematic Mapper
FDI	Foreign Direct Investment
GAMA	Greater Accra Metropolitan Area
GHC	Ghana Cedis
GIS	Geographic Information System
GoG	Government of Ghana
GSS	Ghana Statistical Service
JHS	Junior High School
JSS	Junior Secondary School
LULC	Land Use Land Cover
OLI	Operational Land Imager
TM	Thematic Mapper

NASA	National Aeronautic and Space Administration
SPSS	Statistical Package for Social Sciences
UN	United Nations
UNFPA	United Nations Fund for Population Activities
UNODC	United Nations Office on Drug and Crime
USGS	United States Geological Survey

CHAPTER ONE: GENERAL INTRODUCTION

1.1 Background

A shift in global demographic pattern from a predominantly rural to an urban dominated population, a process called urbanization, has been a major characteristic feature of the world, especially from the 20th century onwards. UNFPA (2007) has indicated that ‘between 2000 and 2030, the world’s urban population is expected to increase by about 72%, while the built-up areas of cities with populations of 100,000 or more could increase by 175%’. Existing evidence suggests that urbanization is now a process experienced globally with most developing countries undergoing the process at alarming rates (Bekele, 2015). Africa in the context of the developing world has experienced a minimum of 3.5 % annual population growth since the turn of the millennium and it is expected to continue for the next thirty years (African Development Bank Group, 2013). The rapidly increasing urban population has occasioned the need to ensure expansion of infrastructure and environmental services to accommodate the rising populations. This according to UNFPA (2007) and Owusu (2013) will lead to more spaces been taken up by urban localities at a rate faster than the urban population growth rates. Corroborating the above assertion, the UN-Habitat (2010) highlighted that the increased in the number of megacities in Africa and other developing countries will lead to the expansion of cities beyond their formal boundaries and the subsequent encroachment on neighbouring rural areas.

Documented results of such developmental patterns are the emergence of urban sprawl especially in peri-urban areas. Urban sprawl in the words of Siedentop and Fina (2008) refers to land-use changes and conversion of natural or semi-natural surfaces into urban uses with a high share of

artificial surfaces, usually affecting to the core areas of metropolitan regions and their surroundings (spatial dimension), thus ultimately, leading to a change of land-use patterns (pattern dimension). Due to high urbanization rates and the nature of existing weak governance structures in the developing world, the problem of urban sprawl will be a major problem that governments in developing countries will have to grapple with. This holds true for the African urban landscape because of the continent's high rates of urbanization and governance system.

Consequently, many explanations have been given for the sprawling nature of most cities especially in Africa and other developing world. Among the frequently cited precursors of urban sprawl include demographic change, urban biased developmental policies, and political factors among others has been identified as the major precursors of urban sprawl. While Grigorescu et al (2012) were emphatic that urban sprawl in the Romanian city of Bucharest has been occasioned by political decisions and demographic growth, Sudhira et al (2003) revealed that sprawling could be occasioned by economic reasons; proximity to essential resources and basic amenities. On the other hand, Owusu (2012) argued for the theory of 'flight from blight' and the 'effects of land speculation' as the driving forces behind urban sprawl. Wasserman (2008) explains that 'Flight from blight' refers to situations whereby people are repelled from city centres for reasons such as high tax regimes and the decaying nature of centres as manifested in reduction in the quality of education, high incidence of crime and crumbling infrastructure. Accounting for why land speculations trigger urban sprawl, Owusu (2012) indicated that in countries with weak land markets and governance system, prospective land owners and investors have had to find lands at a distance from the city centre due to the congested nature of the central business districts. In the process, the influence of the city centre over time grows beyond the existing boundaries.

Ghana's growth dynamics have not been immune from the concept of urban sprawl that have engulfed the developing world. In her profiling of cities in Ghana, Farvacque-Vitkovic et al (2008) indicated that the five major metropolitan areas in Ghana (Accra, Kumasi, Tema, Tamale and Sekondi-Takoradi) are undergoing the process of urban sprawl as manifested in the conversion of hitherto unoccupied and mainly agricultural lands into residential facilities. This situation is more pronounced in the Greater Accra Metropolitan Area (GAMA). The GAMA is a functional or metropolitan area that connects the city of Accra to other fringe or peri-urban settlement. There is a lot of intra and inter movement within GAMA owing to the concentration of job opportunities in Accra and other economic exchanges (Grant, 2009). It is estimated that the entire GAMA area has a population close to about 5 million and a daily movement of about 1 million people to and fro the area (Owusu & Oteng-Ababio, 2015). The growth dynamics and developmental trends suggest a steady extension of the urban boundaries to capture the nearby rural spaces owing to pressure from the city centre. This according to Farvacque-Vitkovic et al (2008) has led to reclassification of many urban fringes, traditionally deemed or captured under the rural landscape, as urban area. A point in case is the attainment of urban status in 2000 by areas such as Dome, Taifa, Gbawe, Santa Maria, Mallam, Agboba, Nii Boye Town and Amanfrom which in 1984 was considered rural (GSS, 2010).

The continuous annexation of previously classified rural areas into mainstream Accra are embedded with a number of economic opportunities despite the accompanying negative consequences which Adaku (2014) described as undesirable developmental patterns. This assertion makes it imperative for a careful examination and explanation of the phenomenon of urban sprawl.

1.2 Problem Statement

GAMA has over the past three decades experience an increased population growth owing to natural increase population growth and positive net migration. This has been in response to better economic opportunities as a result of past and present urbanization trends and experiences. GAMA's urban population growth is akin to the urbanization dynamics in other African countries as it is purely driven by the forces of rural- urban migration and natural increase rather than industrialization. This has led to the coining of the term demographic urbanization to describe Africa's peculiar situations (Gould 1998; Songsore, 2003). More importantly, Agyemang (2011) has added that the African urban experience which seems to be characterized by demographic increase rather than economic opportunities have had negative impact on the sustainability of urban areas. For instance, even in the wake of economic opportunities, albeit few, there are serious problems in regard to the provision of social and physical infrastructure.

Further the rapid urban population has been accompanied by a number of challenges, especially housing challenges which involves both quality and affordability. The housing deficit in developing countries seems to be a major challenge that authorities have had to grapple with in recent times. It is estimated that the housing deficit in Ghana is about 2 million with the situation far worse in urban areas (GoG, 2014). The solution has been for people to build in the fringe areas, a situation which is increasing the spatial extent of most cities like Accra. This phenomenon where there is a spatial extension of urban settlements is termed urban sprawl and has been defined in earlier part of this section. More importantly, the phenomenon in urban Ghana exhibits some unique features which have been highlighted in prior studies. For instance, Larbi (1996) and Rain et al (2011) argue that urban sprawl in Accra is basically low density

residential sprawl, marked by unicentric tendencies, rather than either a deconcentration of urban functions or a fusion of urban and rural functions'. This indicates that unlike regions in the developed world where urban sprawl have led to trickling down effects in the form of spread of urban functions or merging together of urban and region areas for developmental purposes, urban sprawl in Accra has mostly manifests in residential developments in its unplanned form.

The situation is also placing much burden on peri-urban and rural lands, thus increasing competition between settler farmers and prospective house owners mostly from the inner or elsewhere in the city, demanding for space for agricultural and residential purposes respectively which have further exacerbated the poor socioeconomic conditions of the people. The rippling effects have been the emergence of land guards, haphazard development, inadequate infrastructure and services, waste management issues and security and safety concerns.. Agyemang (2011) highlighting the increasing attention given to urban sprawl indicated that 'the urban sprawl phenomenon has been subjected to considerable analysis by social critics, academicians, policy makers and planners since the shift of people and economic activities beyond the core of the city have vast socioeconomic and environmental impacts'.

In the academic front, a plethora of works have been done to explore and understand the urbanization dynamics and its related management globally. In Ghana, mention can be made of the works of researchers such as Adarkwa (2012) Yeboah and Obeng-Odoom (2010), Songsore (2009), Boamah, (2013) and Yeboah et al (2013). While it is important to acknowledge the contributions of these studies to the urban problems facing Ghana, the continuous sprawl of the city of Accra and its surrounding smaller areas still points to the fact that more needs to be done in order to better understand the extent, drivers and pattern of urban sprawl. This is because a

cursory look at the problem of urban sprawl within the broad context of urbanization and from a citywide growth perspective. Little attention has been given to analysis of urban sprawl at the spatial areas or jurisdiction where the phenomenon is pronounced. In the context of Ghana, we will say at the Municipal or District level.

Accordingly, this study seeks to understand the urban sprawl phenomenon on a much smaller scale by using the Greater Accra Metropolitan Area (GAMA) as the study area. This will be done from a GIS perspective in the spirit that such micro analysis will enable policy makers appreciate the local dynamics for effective policy decision making.

1.3 Research Questions

To aid in achieving the objectives of the study, the study will seek to answer the following questions.

- 1 What is the spatial pattern of the sprawl in the GAMA?
- 2 What are the spatial and temporal changes that have occurred over the study period?
- 3 What are the primary drivers fuelling the sprawling situations in GAMA?

1.4 Research Objectives

The main objective of the study is to have an all-inclusive understanding of urban sprawl in GAMA between 1983 and 2013. Specifically, the study seeks to;

1. Investigate the spatial pattern of urban sprawl.
2. Assess the primary activities driving the urban sprawl phenomenon in GAMA.
3. Analyze the implications of the sprawl on living conditions of the people.

1.5 Propositions

1. One important factor driving urban sprawl in GAMA has been the increased supply of housing in peri-urban areas, making it more affordable for people who want to rental housing units
2. Urban sprawl has led to significant burden on city authorities to plan and provide infrastructure in peri-urban areas.

1.6 Significance of the Study

Urban sprawl and its management have become an issue of concern in contemporary developmental paradigm in Ghana. While efforts have been made to understand its causes, trends, and effects at the national and regional levels not much been done to ascertain and unpack urban sprawl on a localised scale. The study will therefore use GAMA as a region of interest with the application of Geographic Information System (GIS) to analyse urban sprawl. It is believed that the findings will be beneficial to a lot of agencies and institutions.

A better understanding of urban sprawl in Ga Municipality will help policy makers in formulation of policies that will seek to address problems facing the study area and likewise other areas surrounding Accra that depicts characteristics of sprawl. It will also help the emergency and security services in identifying areas of population concentration so that adequate measure will be put in place to curtail disasters and provision of adequate security respectively.

1.7 Organization of the Study

The first chapter of the thesis presents the background of the study. This includes the general introduction, the problem statement, the objectives and research questions, the study proposition and the significance of the study. The second chapter is the literature review. The review of the

literature focused on the general discussion of urbanization and urban sprawl. The impact of urbanization and urban sprawl were also discussed. The study then discussed neoclassical theories of location decision and land-use in urban settings. The last aspect of the review was discussion on GIS and its application on land-use and land-cover changes.

Chapter three presents the study area and methodology. In regard to the study area the study presented information about the demographic characteristics of the study Municipalities, the physical characteristics and the social and infrastructure in the communities. The methodology also provided details about data source, research approach adopted, the target population, the sampling technique and the data analysis. Chapter four presents findings on the land-use and land-cover changes in the GAMA using remote sensing and GIS approach.

Chapter five addresses objectives two and three. Basically, it provides results on the demographic background of respondents, the factors influencing individual decision making, the broader drivers of urban sprawl, locations where respondents migrated from into their present locations in peri-urban areas, occupational changes associated with relocation and the effect of urban sprawl in GAMA. The last chapter, which is chapter six, presents the summary, conclusion and recommendation of study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The present chapter presents literature vital to the understanding on urban sprawl, a contemporary challenge facing most urban communities. The central theme of the chapter is the discussion of the dynamics of urban sprawl, the underlying causes of the problem and ways to address the problem. Again the chapter also looks at the introduction and increase usage of Remote Sensing and GIS applications in social research and also for monitoring urban expansion. By way of structure, the chapter discusses issues of ‘urbanisation, urban growth and then urban sprawl’ and their impact. Subsequent to this is a discussion on Remote Sensing and GIS analysis of Urban Sprawl. The part of the chapter is a synthesis of urbanisation urban growth and sprawl with remote sensing and GIS.

2.2 Urbanization, Urban Growth and Sprawl

The world achieved a major milestone in the year 2008 as for the first time in history the population of urban areas had overtaken that of rural areas (UN-Habitat, 2010). Precisely, 51 percent of the world’s population was living in urban areas and this in nominal terms was about 3.3 billion individuals living in urban areas. The rapid increase in urban population is especially remarkable in Africa and Asia where it is expected that urban population will increase twofold by 2030 (UN-Habitat, 2008). By 2030, the towns and urban areas of developing nations will make up 81 percent of urban population (UN Habitat, 2010). In addition to the urban transition, there has been a remarkable increase in the number of towns and cities. For example Harris (1990) explained that, in 1950, there were 31 cities that were recorded with population of one (1) million or more in developing countries, but by 1985, the number increased to 146. It is estimated that the number will increase to 486 by 2025 (Harris, 1990).

While urban areas play an overwhelming part in the worldwide economy, particularly through both the production and utilization of processed goods, it is significant to also note that the rapid increase in urban areas is adversely impacting on the capacity of the resource pull of the earth to continuously provide the needed resource to engender growth and well-being of the human populace, particularly those living in urban areas (Satterthwaite, 1997; McGranahan and Satterthwaite, 2003). Additionally, the poor management of urban areas is also affecting the delivery of social services and infrastructural development needed in enhancing the viability of urban areas as potential centers of human well-being (Cohen, 2006). More important to the discussion of urban growth and trends, is the fact that, by the next 30 years, developing countries will witness significant increase in the number of towns with populations above 10,000 (Cohen, 2005). This development, expectedly, will have significant impact on land use pattern, energy and water utilization and socio-economic viewpoints in family unit consumption and imbalance (GEC, 2009)

The extension of urban areas into formerly unoccupied spaces beyond the precincts of the core built-up urban settlements is a major problem accompanying urbanization (Farvacque-Vitkovic et al, 2008; De Boeck et al., 2009). Urbanization can be seen as the process whereby societies grow and cities become more urban (Pacione, 2009). Potter and Lloyd-Evans (1998) argued that, urbanisation is one of the most significant processes that have affected human societies thus far. Additionally, urbanization has been accompanied by significant socio-spatial and structural changes in most part of the world (Lawrence, 2006). Most of these changes are manifested by the numerous social and economic problems bedeviling urban populace as well as city authorities, who apparently seem helpless on how to tackle the urban problems (Pacione, 2009). Some of

these challenges include overcrowding and congestion, pollution, waste management issues among others (Dutta et al, 2013; Owusu, 2012).

In an attempt to counter some of these problems that have been brought about as a result of urbanization, especially in the inner cities, many people move outwards from the inner cities and settle in the peripheries (Masakazu, 2003). This over a long period of time leads to extension of the urban space. In discussing Ghana's experience with regards to expansion of Accra, Boateng (2000) notes that, Accra has experienced rapid expansion over the years. He further notes that a range of factors have accounted for this phenomenon and include global and local forces. With regards to global the forces, he argues that FDI and demand from foreign expatriates for business opportunities has led to increase demand for land spurring land prices. Internally, increased residential development in response to increased local housing demands and expansion of business opportunities are among factors accounting for the rapid expansion of peri-urban areas (Boateng, 2000).

Indeed, the position of urban scholars is that most of the growth currently taking place in cities will be in the peripheral areas or what is commonly called peri-urban areas (Galster et al., 2010). The reason for this is that, there has been an increase in demand for land by urban residents for physical developments such as building projects (Boateng, 2000; Owusu and Oteng-Ababio, 2015). Additionally, the shortage of land for large scale businesses in inner cities has necessitated the use of peri-urban or suburban lands for these large scale businesses (Pacione, 2009). These demands have also occasioned the extension of vital services and infrastructure such as roads to peri-urban areas. These developments have led to the physical expansion of urban settlements, a phenomenon called urban sprawl (Fredua, 2011). While several attempts have been made by a number of scholars to define what urban sprawl is, it needs to be mentioned

that there has not been a unified definition among scholars thus far (Tamilenthi et al, 2015). This has been the result of the different perspectives held by researchers, sometimes based on the varying characteristics that urban sprawl normally assumes. Urban sprawl according to Grigorescu et al (2012) can be referred to as “land-use change and conversion of natural or semi-natural surfaces into urban uses with a high share of artificial surfaces”. Also, according to Owusu (2013), it refers to the physical outward expansion of cities characterized by low densities, separated land uses and car-dependent communities.

While there seem not to be a single definition of urban sprawl, a general agreement is that urban sprawl is seen as unplanned and uneven pattern of growth, driven by a number of processes spanning social, economic and behavioural and in most cases acting together at different tempos and leading to low density physical development and sometimes inefficient resource utilization (Sudhira et al, 2007). The direct implication of such sprawl is change in land-use and land-cover of the area mostly characterized by the expansion of the built environment (Sudhira et al, 2007). As already indicated, sprawl can be defined in several perspectives, but then, sprawl can be carefully studied from many points of view and it may differ from case to case. For example, some researches have focused on studying sprawl from a social perspective (see Audirac et al, 1990; Ewing et al. 2002; Farley and Frey, 1994). Again, others have also focused on characterizing sprawl as a density phenomenon (Lang, 2003; Ledermann 1967; Pental, 1999; Burchell et al, 1998; Gordon and Richardson 1997). However, most scholars that have studied urban sprawl have been inclined to use density as the main characteristic feature (e.g., built-up density, population density, and housing density)

The problem of urban sprawl is even exacerbated by poor management, including waste, sanitation and flood management (UN, 2003). Additionally, there has always been the challenge

of extending infrastructure and services due to high cost in the provision of these infrastructures and service provision (UN, 2003). In most cases the challenge in managing urban sprawl has been more of a governance crisis due to both ineffective policies, for instance containment strategies and poor coordination among institutions, particularly those in charge of land management (Owusu and Oteng-Ababio, 2015).

2.3 The impacts of urbanisation, Urban Growth and Sprawl

Urban growth and sprawl consequently directly impacts on the environmental, social and economic facets of society (Balchin et al, 2000). For instance in Egypt, there has been a loss of more than 10% of the nation's productive agricultural land as a result of the sprawling of its major cities and towns (Minwuyelet, 2004). This implies that urbanisation in major areas of the country has impacted negatively on productive farmlands. Uncontrolled urban sprawl often results in the loss of livelihoods to those who depend on these lost lands for farming. Socially, this may also lead to displacement and dislocation of farmers. According to Tvedten (2001), Cities are likely to extend the same problem they are faced with in the inner cities to their peripheries if the expansion to the suburbs develops in an uncoordinated way. These include management of municipal solid waste, extension of social services like health and education as well as infrastructure. Thus effective urban governance is important in the face of peri-urban development (Kamete, Tostensen, & Tvedten, 2001).

Urban sprawl increases the commuting distance of residents living on the fringes of the sprawling cities and thus increases the usage of cars through longer and more continuous drives, which prompts an increment in air contamination and ground-level smog (White et al. 2007). Vehicles are the main source of air contamination in many urban centers with serious ramifications for public, untamed life and biological system wellbeing. As indicated by the

Union of Concerned Scientists, poor air quality increments respiratory afflictions like asthma and bronchitis, elevates the danger of dangerous conditions like cancer, and weights our health care system with substantial medical costs (White et al. 2007). As urban areas keep on sprawling, additional time is spent in cars usage and without proper planning of our cities, may increase traffic congestion and emission greenhouse gasses into the atmosphere.

Poor community outline, for example, poorly planned, car-dependent development, makes it more troublesome for individuals to get physical movement and keep up a healthy weight (White et al. 2007). Studies have found a relationship between urban sprawl and the increase occurrence in cardiovascular diseases (Ewing et al., 2006). This is largely because of the dependence on automobiles and increased inactivity of residents. A Smart Growth America study contrasted the county sprawl index with the wellbeing attributes of more than 200,000 people living in the 448 provinces and found that individuals living in sprawling communities walked less and dependent on car usage, thus they weighed more, drove more, had a higher body mass index (BMI) and experience the ill effects of hypertension (i.e. high blood pressure) than individuals who live in less sprawling regions.

Urban sprawl undermines productive farmland; changes open spaces into interstates and strip shopping centers and converts more than a million acres of land of parks, farms and open space every year into built-up areas (Berger, 2007). Loss of vegetation is a great damage caused by urban sprawl resulting in expansion and urban growth (Gour et al., 2014). As such it has resulted in severe loss of cropland, natural vegetation cover and water bodies (Gour et al., 2014). Rapid urbanisation and sprawl however needs a method to match it up. This is in terms of assessing how urbanisation is leading to extension of urban areas and also resulting in land-use, land cover change and other environmental, social and economic impacts that the extension has brought

about. Remote sensing and GIS is one of the most if not the most reliable and scientific methods used in determining and estimating the extent to which urban areas have expanded over a period of time and also assessing those changes that have occurred in land cover and land use.

2.4 Locational theories of urban land-use

Location of urban land-use is important for understanding the social and economic development of urban areas (Tewdwr-Jones and Hall 2011). Locational analysis in urban areas provide some background understanding of the relationship between different land-uses and also individual decisions that drives their locational interest. One important urban land-use of interest to any locational analysis is residential location (Stone 2005). Where people live or choose to live is underline by a number of factors and are mostly linked to their work places or other economic opportunities, rent and affordability of residential locations. Thus, understanding residential location patterns affords researchers the opportunity to be responsive in their planning arrangement in terms of providing the needed services and infrastructure to make residential developments in developing areas more sustainable (Bochnovic, 2014).

One locational theory which has been used quite extensively for understanding sub-urban development and in this case residential location is the bid-rent theory by Alonso in the 1960s. Even though technological change, transportation and changing population structure have had significant impact on the theory, it is still relevant for understanding contemporary distribution of land-use decisions within the city. According to Alonso (1960), consumers are rational and will opt for locations that will balance their commuting cost with any inconveniences associated with commuting. According to the theory, ordinarily, consumers will be willing to pay higher for land closer to the central business district (CBD) so that they can benefit from minimum transportation cost (O'Kelly and Brian, 1996). However, consumers are willing to pay for lower

rents even if transport cost will increase their commuting activities. Thus, in the spatial configuration of land values, there are higher land and rent charges close to the city center while there are lower rent charges and cheap land away from the CBD (Bochnovic, 2014). As shown in Figure 2.1, the most preferable land for commercial activities will be closer to the CBD, while those away will be residential.

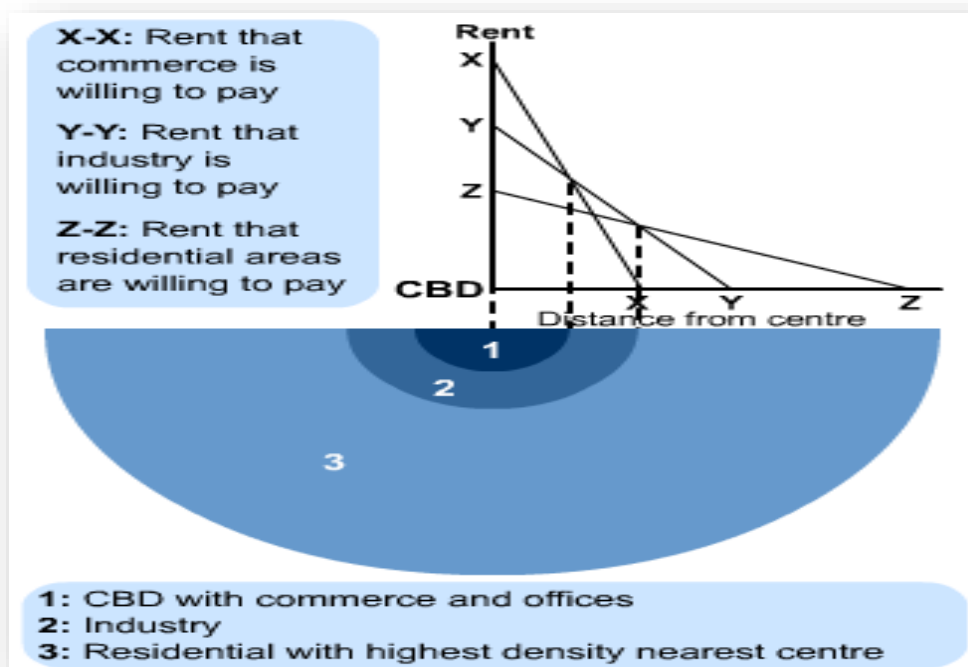


Figure 2. 1 Bid-rent curve

Source: Adapted from Narvaez et al., (2013)

Another significant development to the bid-rent theory and which happens to be a factor influencing residential location away from the CBD is the changing spatial structure of the urban areas away from a monocentric urban development with just one CBD to a polycentric urban spatial structure which is characterized by emerging commercial and industrial enclaves (Bohland and Levy, 1985). These patterns of urban development away from the traditional single

CBD, creates job opportunities in these areas. This, in addition to the comparatively lower rent and land values which is a precursor for the massive sub-urban development, sometimes in a haphazard manner which is also called urban sprawl.

In essence and as argued by Bochnovic (2014: 10) “people will successfully move further and further from the CBD, so long as the gains made through reduction in land cost out-weigh the disadvantages of increased commercial cost.” Know and McCarthy (2005) argues that the bid rent theory is also referred to as the trade-off model which suggest that people will be willing to trade off transportation cost for physical space if this is important to ensure that they maximize their individual satisfaction. This theory can be used as an important framework that can explain the current urban sprawl in GAMA area, especially whereby this sprawl is mainly characterized by residential development. Thus, the demand for housing is a major driving force for development in these areas. This is also accompanied by movement of industries and other businesses into the peri-urban areas of GAMA. It will be interesting therefore to ascertain how rent and land values as well as other environmental and economic factors are driving residential development of GAMA.

2.5 Remote Sensing and GIS for Analysis of Urban Sprawl

Remote sensing is defined as the science of getting information about the Earth’s surface without really being in contact with it (Jensen, 2007). As such, images of the surface of the earth are acquired by satellite sensors through reflected or emitted energy from surface objects which is processed and analyzed to get information. Geographic information systems (GIS), is a computer system which is used for capturing, storing, analyzing and displaying spatially referenced data. GIS therefore provides the tools to display and analyze various phenomena including, population characteristics and vegetation types. Remote sensing and GIS are very important due to their

ability to be used to monitor various changes that may have perhaps occurred on the surface of the earth, the trends of these changes as well as the extent and impacts of these changes (Lillesand and Kiefer, 1979). Remote sensing and GIS can be used to distinguish between various land cover and land uses and also determine the changes in land cover (Lambin et al., 2003.). For example, remote sensing is used in determining changes that have occurred in vegetation cover and also detect things that have occupied those areas formerly covered by a particular land-use type through a time series analysis of land-use change. Similarly, remote sensing and GIS can be used to monitor the extension of urban areas (Xiao et al., 2006). Remote sensing and GIS are therefore very important in most earth surface changes analysis.

Remote sensing has proved to be one of the reliable approaches to understanding spatio-temporal dynamics of urban settlements (Jensen and Cowen 1999; Herold et al. 2004), and as such it is by all accounts a proper method for understanding socio-spatial changes occurring within the urban environment (Donnay et al. 2001). It is unquestionable that the earth observation is an advanced science, which studies the world's evolving environment, through remote sensing devices, for example satellite imagery and aerial photographs (EEA 2002). A report distributed by National Aeronautics and Space Administration (NASA) featured the way that the advances in satellite-based land surface mapping are adding to the creation of significantly more detailed urban maps, offering planners considerably more profound comprehension of the elements of urban development and sprawl, and in addition related issues identifying with regional administration management (NASA 2001).

In terms of analyzing urban growth and urban spatial expansion, Batty and Howes (2001) indicated that remote sensing technology, particularly considering the current enhancements, can give a unique viewpoint on growth and land-use change processes. Data sets obtained from the

use of remote sensing applications are steadily increasing over the years, and can give information at an incredible assortment of geographic scales. The information derived from remote sensing can depict and show urban condition, prompting an enhanced understanding that benefits applied urban planning and management (Banister et al. 1997; Longley and Mesev 2000; Longley et al., 2001). Examination of urban growth from remote sensing information, as an example and process, encourages us to see how an urban scene is changing through time. This understanding incorporates: (a) the rate of urban growth, (b) the spatial configuration of development, (c) regardless of whether there is any discrepancy in the known and expected growth, (d) whether there is any spatial uniqueness in development, and (e) whether the development is sprawling or not. In the current years, remote sensing information and GIS methods are broadly being utilized for mapping (to comprehend the urban pattern), checking (to comprehend the urban procedure), measuring (to examine), and modelling (to reproduce) the urban growth, land use change, and sprawl.

The physical expressions and examples of urban growth and sprawl on scenes can be recognized, mapped, and investigated by using remote sensing data and GIS techniques. The decision support systems within the GIS can assess remote sensing and other geospatial datasets by utilizing multi-agent assessment (Axtell and Epstein 1994; Parker et al. 2003) which can likewise predict the conceivable outcomes in the subsequent years utilizing the current and historical data. Over the most recent couple of decades, these techniques have effectively been actualized to detect, analyze, and demonstrate the urban growth elements.

As a way of monitoring urban land-use and urban land-cover changes, Remote Sensing and GIS application has been adopted as an effective tool or technique for monitoring urban land use and land cover changes and also in different studies monitoring ecological changes (Attua, and Fisher

J., 2011; Awanyo, Attua, and McCarron, 2011; Kufogbe, 1999; Mensah & Nyamekye, 1999). For urban land-use changes using remote sensing application, most studies have used change detection as the main analytical procedure. This involves the comparison of satellite or air-borne images taken at different time scales at the same location after the images have been processed and features on the images duly classified (Sandarakumah et al, 2012; Huang et al, 2008).

There have been myriad of studies spanning various academic fields and across different countries that have employed the use of remote sensing techniques. For instance, studies by Masek et al (1999) on land-use and land-cover changes in Washington DC metropolitan area reveals that over a period of 23 years the built-up area had extended by 500 km² or a yearly average expansion of 22 km². The authors did this by way of examining Landsat images from 1973 to 1993. Similarly, a study by Yang et al (2003) using images from different Landsat sensor platforms i.e. Landsat 5 and Landsat 7 ETM+ also found an extension of about 20 percent of impervious surface from 1993 to 2001 in Western Georgia in the United States. More interesting about the study by Yang et al (2003) was the development of a sub-pixel imperviousness change detection (SICD) approach. According to the authors this approach increased accuracy in production and is a useful indicator for identifying spatial extent, intensity and type of urban land-use/land-cover changes. In addition to this, studies by Phinn et al (2000) and Yang et al (2003) reveal such changes in urban land-use and land-cover in the developed world.

Significant strides have been made especially in the developing countries regarding remote sensing application in urban land-use/land-cover change detection. However, most of these studies have been based in Asia. For instance, studies by Das et al (2012) using a combination of satellite images from 1989 to 2006 in Aurangabad in India revealed significant decrease of agricultural areas and significant gains in the built-up areas. Other works on urban land-use

changes within the same region include that of Manonmani and Suganya (2010), who used a multi temporal satellite data in studying the relationship between human pressure on land-use and land-cover change and its impact in vital habitats in Villivakkan, India. Similar conclusion was established i.e. the increase of the built area by 15.83 percent between 1990 and 2005. In Africa, studies by Lambin et al (1999) and Merton et al (2000) have also used satellite images in addition to survey data in analyzing the socio-economic drivers of land-use/land-cover changes, particularly in urban and peri-urban areas.

In Ghana, there have been a number of studies regarding the use of remote sensing application, particularly in determining the expansion of urban settlements through an analysis of land-use/land-cover changes. However, those that have focused directly on urban sprawl per se are relatively few, with most of the studies focusing on ecological areas such as vegetation changes (Braithmoh, 2004; Owusu, 2012; Kufogbe, 1999; Peprah et al, 2014). For instance Kufogbe (1999) looked at dominant land-cover changes in the wooded savanna and transition forest in the Afram plains region. Similarly, Braithmoh (2004) explored the linkages between population size, marketing of agricultural produce and technological evolution and how these factors influence land-cover/land-use changes. A similar study by Cudjoe (2007) also explored such changes in the Volta river basin using a combination of census data and geo-corrected Landsat satellite images for 1991 and 2000.

Regarding urban land-use and land-cover changes as a method for understanding the rate of sprawl of human settlements in Ghana, studies have either focused on large metropolitan areas or medium and small towns. For instance, Yankson et al (2005), assessed, using Landsat (TM) satellite images for the year 1985 to 2005 the urban spatial extension of Accra Metropolitan Area. The study sought to examine the implication of these changes on environmental planning

and the necessity of better land use planning and management, especially when such changes, affect peri-urban agricultural land-use and also the economic cost of low residential development on infrastructural extension and provision. Again similar study by Aduah and Baffoe (2013) explored the nexus between urban land-use/land-cover changes and temporal changes in the temperatures and rainfall in Takoradi. Using Landsat images spanning 1988 to 2011 and imbricating it with rainfall trends for similar years, the study revealed that large portion of the city and its surrounding areas had been converted from natural surfaces to impervious surface. Also a reduction in rainfall pattern was identified, suggesting that the reduction in the natural surface by the spatial extension of the impervious surface or the built up area might well be the most dominant factor contributing to the decline. Further, a study by Kumi-Boateng et al (2015) also identified significant changes in land-cover within Tarkwa and its environs.

Stemn and Agyapong (2014), studied urban expansion of Sekondi-Takoradi between 1991 and 2008 using supervised classification and found out that urban built up increases at a rate of 4.88% of their total area covered every year. This has altered the land cover in the metropolis. According to their research they also found out that, non-urban areas which include vegetation, grassland among others losses 5.88% of their total area covered to urban uses annually. In their method, remote sensing was used to classify land use into three, namely; non-urban, urban and water. Post-classification change detection was conducted to test the independence that existed between the land cover classes of different years which represent two land cover maps. This method proved that there were differences in the two land cover maps of the different years (1991 and 2008). As such the change detection method used showed that, there has been a decrease in non-urban land of 3437.06 hectares (ha) and an increase in urban land cover by 3166.24 ha and also land covered by water increased by 270.82 ha between 1991 and 2008

(Stemn and Agyapong, 2014). Post-classification change detection is a great method as it gives the ability to get the extent to which urban areas have expanded and also know the other land cover types have been that was taken over by built up areas. But, this technique is seen as the one with least accuracy when compared to others. However, Jensen et al (1995) use the post classification change detection method and found the resulting change product satisfactory and very useful as a display tool. Similarly, Augenstein et al. (1991) used the method and seen it acceptable in monitoring Kelp.

Also, Liu and Zhou (2005), used remote sensing and GIS to predict urban growth in Chaoyang district, Beijing in which they found out that the existence or presence of built up and major transportation lines are more likely to induce expansion in which areas surrounding them will be converted into built-up areas. They similarly employed post-classification comparison and cross tabulation which was the method to get the amount of a particular land cover that have converted to the other categories of land cover at a later date. All these researches show that the post classification change detection technique has a strength in monitoring phenomena that is increasing in places. Furthermore, Yiran et al (2012) assessed land degradation in the Bawku East district in Ghana using satellite images of 1989, 1999 and 2006 and found that woodlands and exposed soil reduced over the period while settlements and water bodies increased. They also established that urbanisation, and clearing of farmland are some of the major drivers contributing to vegetation cover degradation.

Their change detection method was image differencing However a major disadvantage of the image differencing method it does not reflect changes in categories of land use classes. Price et al (1992) used this method to find shrub dieback. In their analysis they found that there is a poor disagreement between their result and field verification. But other researches proved the method

to have accuracy. For example Muchoney and Haack (1994) found the method to offer the potential of for monitoring forest defoliation. These researches provide an insight to what remote sensing and GIS can do and as well as its importance in motoring Earth surface changes over periods of time. Also they helped in understanding and determining possible changes that may have occurred in areas due to expansion of other land uses of the area.

2.6 Synthesis

Urbanisation and urban sprawl are major issues facing many cities due to the negative implication it has on the environment and economic activities (Boori, Netzband, Choudhary, and Voženílek, 2015). When more people are added to the total number living in an urban area, there is increased demand for land for residential development. This leads to the conversion of vegetation and ecological areas into built-up environment creating imbalances in the ecological system. Remote sensing and GIS is a favourable option in monitoring urbanisation and spatial expansion of urban areas such as urban sprwal. The loss of vegetation due to expansion of human settlement can be monitored through the post comparison change detection technique. As stated in the review of remote sensing and GIS, this technique provides the opportunity to identify various areas of each classified land use that have been converted to the other over some period of time. Land degradation due to loss of vegetation can similarly be monitored. In all these, various land cover which can help indicate urbanisation and thereby expansion of urban areas will be classified using remotely sensed images. Land cover types including, vegetation, settlement, bare land, water bodies among others can thereby be classified on the various images to help detect changes that have occurred to each group through change detection analysis.

CHAPTER THREE: STUDY AREA AND METHODOLOGY

3.1 Introduction

The previous chapters have provided important background and knowledge on urban sprawl from a global context and recent experiences of the phenomenon within the Ghanaian context as well. In particular, chapter two provided insight on urban sprawl, including the factors engendering the process, the social, economic and environmental effects of the problem and the application of new methods which include GIS in studying the problem. This chapter presents the study area and methodology of the study. In regard to the study area, the chapter begins with the physical characteristics of the three municipalities where the study was undertaken. These include the location, the vegetation and climatic condition of the municipalities. The socio-demographics and the situational analysis of social and economic activities as well as infrastructure are also presented. The methodology is also presented. Basically, it discusses the materials and methods of the study and the logic of justification for the choice of these methods. The chapter also presents details regarding the quantitative methods used including the GIS approach as well as household survey conducted. The methods in both the data collection and analysis of qualitative data are also presented in the chapter.

3.2 Study Area

3.2.1 Location and Size

Ga East is one of the sixteen administrative areas in the Greater Accra region. It is located in the northern part of the region and occupies a land area of about 85.7 km². The municipality shares boundaries with Ga West Municipal to the west, La-Nkwantanang Municipal to the east,

Akwapim South District to the north and Accra Metropolitan to the south. Ga South Municipal is among the recently created Metropolitan, Municipal and District Assemblies. It is located at the south western part of the Greater Accra region and occupies a land area of about 341.8 km². It is bounded by Accra Metropolitan to the south-east, West Akim to the north, Awutu-Senya to the west and Gomoa to the south and the Gulf of Guinea also to the south. The last among the three study areas is Ga West Municipal. It covers a land area of about 299.6 km². It is bounded Ga East and Accra Metropolitan Area to the east, Akwapim South to the North, Ga South to the south and Ga Central to the south.

3.2.2 Climate

In respect of climatic distribution there is little in terms of difference among the three municipalities. The first to be looked at is Ga East Municipality. The municipality is situated in the savannah ecological climatic zone. Figure 3.1 shows the map of Greater Accra Metropolitan Area (GAMA). The average temperature in the municipality ranges between 25.1°C within the month of August and 28.4°C in February (GSS, 2014a). The rainfall pattern is bi-modal, in other words, there are two major rainfall seasons in the year in the municipality. In regards to Ga South municipality, it lies in the dry equatorial zone and similar to Ga East it also has two major rainfall seasons (GSS, 2014b). The mean rainfall alternate between 790mm along the coast to about 1270mm at the northern part of the municipality. The average temperature recorded for the municipality is the same as that of the Ga East. Ga West municipality lies within the same climatic zone as Ga South municipality and thus shares the same climatic conditions with Ga South municipality (GSS, 2014c).

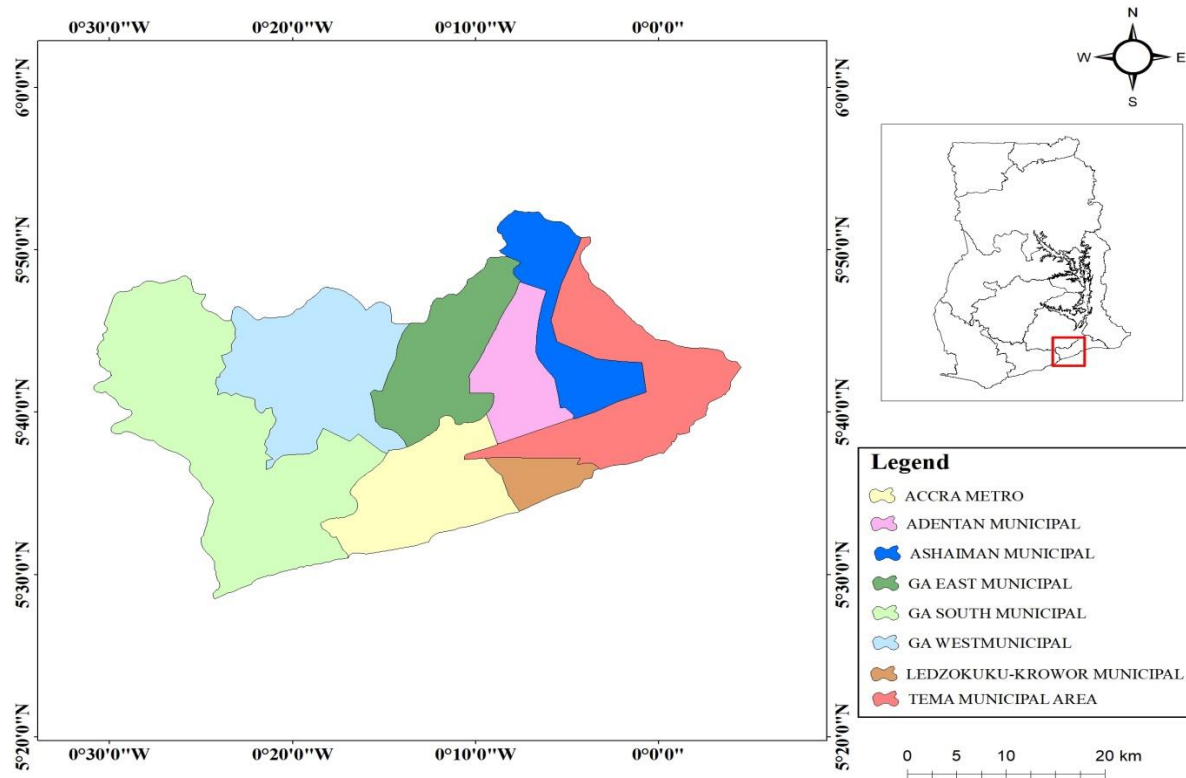


Figure 3. 1 Map of Greater Accra Metropolitan Area

Source: Author’s construct, 2018

3.2.3 Vegetation

With respect to vegetation and similar to that of the climatic condition, not much difference is found among the three municipalities. For Ga East municipality, the vegetation type is mainly shrub lands and grassland. The shrubs are mainly found at the western part and close to the Aburi Hill (GSS, 2014a). The grassland is however found in the southern portion of the municipality and currently being lost to encroachment as a result of intense residential development. For the Ga South municipality the vegetation mainly consist of grassland found mainly along the coastal belt. Another name given to the vegetation type in the Ga South is called the coastal savannah ecological zone (GSS, 2014b). The vegetation type found in the Ga West municipality is similar

to that of Ga South and therefore has the same characteristics. It must be noted that the vegetation invariably has impacted the intensity and nature of urban sprawl. This is because there are not many forests like that found in the Western and Ashanti regions of Ghana, thus there are not many natural reserves. This has made it easy for people to clear the lands for varied human activities and in this case residential development.

3.2.4 Demographic characteristics

The first municipality to be discussed is the Ga East Municipality. It has a population of about 147,742. Out of this figure 49 percent are males while 51 percent are females. About 43.8 percent of the population falls within the age bracket of 13-35 years (GSS, 2014a). This age distribution shows that a large proportion of the populace is youthful. Again, about 31.2 percent of the population is between 0-14 years age bracket. In addition to the above demographics, there are 37,415 households in the municipality with an average household size of 3.9 (GSS, 2014a). The fertility rate in the municipality is about 2.6 per a woman. Lastly, the density of the municipality stands at 1725 persons per Km² (GSS, 2014a).

In regard to Ga South, the total population of the municipality stands at 411, 377. Similarly, men constitute 49 percent of this population while that of women is 51 percent. A large section of the population is youthful with 45 percent of the population between the age group of 13-35, while that of 0-14 is about 36.8 percent (GSS, 2014b). The total fertility rate for municipality is 3.9 and is above the regional average which is 2.6. The municipality has about 100,701 households with an average size of 4.0 (GSS, 2014b).

For Ga West Municipality, the total population is about 219,788. In terms of the sex structure, women constitute 51 percent of the population while men constitute 49 percent of the population similar to the two municipalities described above. The age structure of the municipality bears the same semblance with that of the other two municipalities. For instance those who fall between the age group of 0-14 constitute 33.4 percent of the population, while that of 13-35 is about 50.5 percent of the population (GSS, 2014c). The number of households in the Municipality is about 55,913. The household size of the Municipality is about 3.9, while the fertility rate is 2.9 (GSS, 2014c).

3.2.5 Patterns of urbanization

In regards to patterns of urbanization, at present there is no data to guide an assessment of the temporal nature of urbanization within the Municipalities and this can be attributed to the fact that these Municipalities were created quite recently as they were hived off from other Districts. For instance, the three Municipalities were created from the existing Ga District at different periods ranging from 2004 to 2011. Nonetheless, it is important to note that the three municipalities are urbanized even though there are variations in regards to the share of urban population among the three Municipalities. For instance, the proportion of the population living in urban areas in Ga East in percentage terms is 90.2 while the rural population is about 9.8 (GSS, 2014a). In the case of Ga South, the urban share of the population is about 86.6 percent while the rural population is about 13.3 (GSS, 2014b). For Ga West, the urban share of the population is about 63.1 percent while the rural population is about 36.9 (GSS, 2014c). The data thus show that there are more rural areas in the Ga South compared to the other Municipalities. Another important issue in regard to the spatial manifestation of urbanization within the

Municipalities is the increasing sprawl of the communities which is largely accounted for by high demand for land for residential development. Urban sprawl in these municipalities is having significant implication for urban governance and management with the problem compounded by weak local government system.

3.2.6 Economic activities

The economic role of the three municipalities cannot be over-emphasized, especially when you look at their overall contribution to the economy of the Greater Accra region. Beginning with Ga East, the major economic activity in the municipality is farming and account for about 55 percent of the economically active labour force (GSS, 2014a). Most of the agricultural products are basically vegetables and include tomatoes, okro, pepper etc. Farmers in the municipality are also engaged in the cultivation of fruits. Additionally, the industry and service seems to be an emerging economic sector in most settlements in the municipality. For instance, there is a feed mill at Abokobi; there are also Pharmaceutical industries in the municipality located at Dome. In regard to the service sector, there are a number of market centers notable among them is the Dome market as well as a number of banking and commercial enclaves emerging in Areas like Dome, Kwabenya, Haatso etc. 70 percent of the population are economically active. It is also important to note that the number of people in the service sector has increased in recent times and it is estimated that close to 35 percent of the population are service and trade (GSS, 2014a).

In the case of Ga South municipality, a range of economic activities are found in the municipality. The local economy is largely agricultural followed by service and industry. With respect to industry, the sector is dominated by the construction industry which include block making, quarrying etc. (GSS, 2014b). The service sector is largely dominated by trade. There are

also emerging financial institutions and telecommunication services in the municipality, especially in the Gbawe area. Regarding the economic activity status of the municipality, it is revealed about 71 percent of the population is economically active (GSS, 2014b). Close to 91 percent of the economically active population are currently working in various occupations (GSS, 2014b). About 34 percent of the work force is engaged in service and sales work with agriculture and other craft related businesses also taking about 35 percent of the occupational work force. There is much potential for viability of business activities in the municipality due to its growing population and inflow of businesses. However, this can be enhanced with targeted investment in infrastructure and other social services.

Ga West has quite a diversified economy. While agriculture continues to occupy a large proportion of the economic sector of the municipality, this is gradually giving way to industry and the service sector. Again the fact that comparatively the municipality has a more rural population makes agriculture quite important. On the other hand, the increase in residential development in the municipality has also provided an impetus to the construction industry; especially block making industries and sand winning which are emerging economic activities in the municipality (GSS, 2014c). Again, important deposits such as sandstone and laterite minerals are giving a boost to the construction industry. There are also a number of manufacturing companies in the municipality and include Voltic mineral water company, Flush energy drink, Aqua fill mineral water etc. In regard to service, most people engaged in this sector are traders, trading in farm produce or merchandise. Regarding economic activity, about 71 percent of the population is economically active with 92 percent employed. As pointed out, a large proportion of those employed are engaged in service and sale related activities (GSS, 2014c).

3.2.7 Physical and social infrastructure

This section of the study area discusses the housing conditions and state of infrastructure and basic services in the three municipalities. In regard to the later attention is given to access to electricity, water, sanitation and waste management. First, regarding Ga East Municipality, records indicate that the total housing stock of the municipality is about 23,976 (GSS, 2014a). Out of this number, 29.9 percent are separate houses, 9.1 are semi-detached and 32.2 are compound housing units (GSS, 2014a). Again, about 39.1 percent are owner occupiers, while 44.0 percent are renting (GSS, 2014a). For access to utilities, the records show that about 78.4 percent of the populace has access to electricity supply. Recording water, official records show that 26 percent of people living in the municipality use bore hole and well for their domestic usage, 20.9 percent use pipe-borne water outside dwelling and 17.8 percent use pipe-borne water inside dwelling and just 8.4 percent use public tap (GSS, 2014a). However, the main source of drinking water is sachet water which is about 54.7 percent. Data further shows that about 42.6 percent use W.C mostly in-house, while 50.9 percent of the populace use the collection system of waste disposal and about 25 percent also burning their waste.

Moving to Ga-South municipality, there are about 76,536 houses in the municipality. 30 percent of this housing stock is separate houses, 9.4 percent are semi-detached houses and 37.8 percent are compound houses (GSS, 2014b). Regarding the occupancy status, 44.6 percent of residents in the municipality are owner occupiers. About 39 percent of the respondents are renting rooms in houses (GSS, 2014b). In the case of utilities, records from GSS show that about 77 percent of the populace in the municipality has access to electricity supply. Further, regarding source of water for drinking 38.3 percent of the populace use pipe-borne outside dwelling, 19.7 percent use pipe-

borne inside dwelling and 22.1 percent also use sachet water. In terms of water used for other domestic purposes, about 46.5 percent use pipe-borne outside dwelling and 26.1 use pipe-borne inside dwelling. For waste disposal, 21.3 percent use the collection system and 37.8 percent also burn the waste (GSS, 2014b).

The third municipality that forms part of the study areas is the Ga South municipality. According to GSS (2014c), the total number of houses in the municipality is 30,447. Out of this figure 29.7 percent are separate or detached houses, 7 percent are semi-detached houses and 46.3 percent of the housing units are compound houses. Regarding the ownership of dwelling, 39 percent of households own the houses while 43 percent of households are currently renting the housing unit. 85.5 percent of the populace are connected to the national electricity grid (GSS, 2014c). Further, the main source of drinking water in the municipality is sachet water which constitutes about 64.1 percent and followed by pipe-borne outside dwelling and pipe-borne inside dwelling which are also 9.9 and 9.5 percent respectively. Regarding water used for domestic purposes, the main sources are bore-hole (25.8%), pipe-borne outside dwelling (21.1%) and pipe-borne inside dwelling (16.2%). In the case of waste management, about 56.5 percent of waste is collected while 20.9 percent of waste is burned.

3.3 Methodology

3.3.1 Research Approach

The choice of a research approach is based on the philosophical underpinning of the study. A research philosophy refers to the belief about what constitute reality and how research should collect information or data about this reality. The research approach is usually based on two philosophical underpinnings. These include the positivist or interpretivist philosophical

underpinning. Positivistic approach believes in the fact that information about the world can be collected objectively without meanings attached to it by the researcher and is associated with quantitative research (Blaikie, 2000). On the other hand, interpretivists believe that reality or research facts are based on the meaning given to it by the researcher and this philosophy is associated with qualitative studies (Blaikie, 2000; Gorton, 2010). In realizing the shortcoming of these two research approaches, scholars in recent times have tended to combine both approaches in a single research, an approach called the mixed methods approach (Teye, 2012). This method or approach is also called method triangulation since it is useful in most cases in cross-validating and also corroborating findings emanating from either the quantitative or the qualitative approaches. This study adopted the mixed methods approach in both the collection and analysis of the data. The choice for this approach was also based on the recognition that the world is more complex and using just one approach in studying the problem of urban sprawl will not provide full understanding to the issue. It is important to also add that, mobility, which is one important factor occasioning urban sprawl is a decision making process, and therefore this process needs to be understood from the perspective of the individual (Neuman, 2003; Teye, 2012).

Further, the study adopted a sequential explanatory mixed-method approach. According to Creswell and Plano (2003), with the sequential explanatory mixed-method approach, the researcher first begins with the quantitative research strategy i.e. the quantitative data collection and analysis before following with the qualitative research strategy. According to Creswell and Plano (2003), a number of reasons account for the choice of this research approach. First, when there happens to be quite a lot of studies conducted in the area. This affords the researcher the opportunity to acquaint him or herself with the literature and also allow the researcher to know some of the known variables from which data is normally collected on in regard to urban sprawl.

Second, when there seem to be a lot of theories within the subject area that allows the researcher to operationalize the theory and generate variables out of it, then the researcher can begin with a quantitative approach. In the case of this study, the researcher admits that there have been quite a lot of studies of urban sprawl. In view of this, the current study proceeded on the premise that the extent and pattern of urban sprawl had to be established first. This then needed to be followed with the drivers and the effect on the study communities. It was important therefore that quantitative approaches had to be used to understand the growth these aspects of the study problems. The qualitative aspect of the study approach was then meant to provide insights on individual experiences and motivations behind this issue from the perspective of residents (Creswell and Plano, 2006)

3.3.2 Data Sources

Data used for this study were both primary and secondary data sources. The primary and secondary data were used to address the study objectives. In regard to the primary data sources, two data sources were used i.e. quantitative data sources and qualitative data sources. With respect to the quantitative data source, questionnaires were used to solicit respondents' opinion about the general factors accounting for urban sprawl within GAMA and more specifically on their motivation for moving to their present locations. Information about period of relocation, occupational changes and effects of urban sprawl in their local communities were also solicited through the distribution of the questionnaire. Further quantitative data sources included processed satellite images captured from Landsat TM ETM+ (Landsat 7) and Landsat Operational Land Imager (OLI-8).

Land use and land cover change statistics were also generated to assess urban sprawl in GAMA. For the qualitative data, the interviews sessions were conducted with planning officers of the Municipal Assemblies (i.e. Ga West, Ga East and Ga Central Municipalities) as well as some selected residents of the study community who were involved in the survey. In regard to the secondary data, satellite images were obtained and processed (details highlighted below) for the analysis. Other secondary data sources included census data i.e. summary reports for the three municipalities as well as other published studies on urban sprawl.

3.3.3 The GIS approach

3.3.3.1 Data acquisition

The spatio-temporal data used in determining the extent of urban sprawl were processed satellite images showing the land-use/land-cover changes in the selected communities. Specifically, these were Landsat images spanning a 15 year period. Four images were used in this analysis and include images captured in 2000, 2005, 2010 and 2015. The images were downloaded from the USGS Earth Explorer website. The images were carefully selected to avoid those inundated with cloud cover. In addition to this, field validation was also conducted to ensure accuracy of various training sites. Moreover images from Google earth and shapefile for the three municipalities were also used (i.e. Ga West, Ga East and Ga south municipalities).

Table 3. 1: Detail of Landsat data

No.	Date of acquisition	Satellite specification	path/row	Spatial Resolution	% Cloud cover
1	04/02/1985	Landsat 4 TM	193/056	30	0
2	01/10/1991	Landsat 7 ETM	193/056	30	0

3	01/17/2006	Landsat 7 ETM	193/056	30	0
4	03/10/2017	Landsat 7 ETM	193/056	30	0

3.3.3.2 Image preprocessing

A number of preprocessing procedures were carried out in the study. The first was radiometric calibration. The essence of calibration was to remove distortion in the process of data capturing through factors such as sun's angle and instrument effect. Atmospheric calibration was also done to enhance the reflectance of the satellite images. The images were then stacked to generate composite images. Three composite images were generated representing images for 2000, 2005, 2010 and 2015. Using a polygon shapefile of GAMA, a subset via ROI (Region of Interest) was performed to delineate the study area from the images. Lastly the images were enhanced through contrast stretching to enhance the appearance of the images.

3.3.3.3 Image classification

Classification involves the process of sorting pixels into a number of individual classes or categories of data, based on their data file values. The preprocessed images were classified using supervised maximum likelihood classification. The maximum likelihood algorithm in ArcGIS software was used for the supervised classification. The maximum likelihood "uses the training data by means of estimating means and variances of the classes, which are used to estimate probabilities and also consider the variability of brightness values in each class" (Perumal and Baskakaran, 2010: 126). Supervised maximum likelihood classification was performed to derive different feature classes of land use and land cover identified in the study area. In performing the classification, each pixel is taken as an individual unit composed of values that exist in several bands. The pixel is assigned to each class of a feature identified in the study area to generate

different feature classes. For the purpose of this study, five feature classes were derived from the maximum likelihood classification. They were built environment (including all other forms of urban features such as residential, commercial, administrative, parking space, road, transportation and industry), dense vegetation (including forest, savanna woodland and mangroves), sparse vegetation (farmlands, crop fields, and vegetable lands), water body (including wetlands, lakes, streams and rivers) and bare land/ plains (untarred road and footpath). Site specific accuracy assessment was also performed. In order to measure the accuracy of the results from the ArcGIS software 10.4.1, accuracy assessment was performed. This evaluation procedure measures the correlation between satellite image classification and ground reference samples collected to indicate the overall agreement between processed classification and ground-truthing data (Pullanikkatil et al., 2016). To achieve this assessment, a field based data collection exercise was conducted with the aid of a hand held Global Positioning System (GPS). In all, ten (10) localities were selected to pick the data on vegetation cover. They localities are Abokobi, Oyarifa (located in Ga East), Medie, Amasaman (located in Ga West) and Gbawe, Weija (located in Ga South). The basis of selection was to confirm that features appearing in the satellite images truly reflect what was on the ground. This explains why specific communities in GAMA were selected for the ground truthing exercise. Data from the field exercise was used to validate the results from the ArcGIS software 10.4.1.

3.3.3.4 Change detection

Change detection involves an array of methods or technics used in identifying, describing and quantifying changes in land-use and land-cover of the same location but at different time scales (Manonmani and Suganya, 2010). While there are a number of techniques for change detection analysis, Masek et al (1999) asserts that they may be broadly categorized into two approaches (1)

change through radiometry and (2) changes through independently produced classification. The first involves the comparison of the radiometry of images or variations in the grey tone of images (Masek et al; Belaid, 2003). Specific techniques involved in this include image differencing, image rationing, change vector analysis and vegetation index. While it is suggested that this approach has a much higher accuracy, Masek et al (1999) are of the view that unless it is combined with filtering procedures at the preprocessing stage, there is likely to be an over-estimation of changes in land-use and land-cover. This is particularly the case for normalized difference vegetation index analysis for agricultural change and real urban growth (see Griffith, 1988).

The second method, which is the change detection through independently-produced classification, is the most widely used. According Masek et al (1999), this technique easily avoids difficulty in identifying the different classes of land use land cover (LULC) changes. However, it is also noted to be associated with high errors, especially where the amount of changes are small relative to the total area being studied. Nonetheless, based on the fact that it is easy to execute, coupled with the fact that it is the most commonly used approach, the study therefore this approach and subsequently used a post classification comparison. In this regard statistics were generated to offer detail on changes that have occurred during the period under investigation.

3.4 Target population and sample size

The target population and the procedure that is adopted in sampling respondents from the target population group is an important aspect in the research process, especially in the case of quantitative research. The target population can be defined as the complete set of units that is

going to be studied (United Nations Office on Drug and Crime (UNODC), 2010). The choice of a target population is dependent on the study goal and objectives. It is also important because it is from the target population that the sample is drawn, since it is virtually impossible to involve the whole population in one single study. However, survey exercises in most cases do well to achieve a representative sample of the actual target population as a way of enhancing the external validity of the study.

In this study, the target population was the household head. A household involves one or more people living in the same dwelling and share meals and accommodation (UNODC, 2010). The household head was identified after preliminary engagement with members of the household during the survey exercise. The duration of stay of the household in the study location was not part of element needed in the sampling process, however on these variables were collected in the course of the survey exercise. The choice of the head of a household as the target for the interview (in the case of the survey) was because they are in the position to provide information about the development of the locality. The decision to move the family is informed by certain consideration by the head. Again, even if the household is moving to reside in a peri-urban area, it is likely that this project is also undertaken by the head of the household. Further, the study did not intend to target specific occupant ownership forms. Even though the survey instrument solicited information about occupancy status, the inclination of the researcher to focus on households residing in peri-urban areas was also to provide some background information on the diversity of people residing in peri-urban areas and what informed their location decisions. For instance, some household heads may be owners of houses while some may be renters. All these category of people and the reason driving their location decisions have significant impact on residential development in peri-urban areas.

In regard to the sample size, a total of 200 respondents were sampled from the three study municipalities. In determining the sample size, the researchers relied on published tables which were also based on the level of precision and the confidence interval. This approach was reliable compared to other criteria which included the use of census population (especially if the area is small) and the use of sample sizes of a similar study (Israel, 2009). “The level of precision, sometimes called sampling error, is the range in which the true value of the population is estimated to be” (Israel, 2009: 1). Furthermore, the confidence interval assumes that the “average value of the attribute obtained by those samples is equal to the true population value” (Israel, 2009 pg.1 Referring to Yamane (1967) published table on determination of sample sizes, a sample size of 200 was arrived at based on a household size of about 194, 029 for the three Municipalities, and a ± 7 level of precision and a confidence interval of 95%. The use of on a ± 7 level of precision was in recognition that a smaller level of precision will increase the sample size which may also influence both time and resources that might have to be devoted in the data gathering process.

After deciding on the sample to be used, the next stage was how to distribute the sample across the respective Municipalities. A proportional representation method was used to calculate the sample size for each of the municipalities. This was done by dividing the respective household size of the municipalities by the total household size for the three municipalities and then multiplied it by 200. In the end the sample size for Ga East municipality was 38 ($37,415/194,029*200$), Ga West municipality was 58 ($55,913/194,029*200$) and lastly, Ga South municipality was ($100,701/194,029*200$). Regarding the qualitative data, a total of sixteen informants were selected for in-depth interviews. In all, 10 household heads who participated in

the survey exercise were selected. Three Assembly members, one each from the three municipalities and lastly three planning officers, one each from the three municipalities.

3.5 Sampling technique

The sampling technique involves the procedures used in arriving at the ultimate sampling unit before the interview is finally undertaken. In this study a multi-stage sampling procedure was adopted in carrying out the sampling exercise. A multi-stage sampling involves the use of more than two sampling techniques for arriving at the final unit of analysis. The first stage of the sampling process involved a simple random sampling of the three municipalities known to have peri-urban settlements. Following this was a simple random sampling of two communities within the three municipalities randomly sampled. These towns have quite a number of features that make them peri-urban localities. These features that qualifies them as peri-urban localities include (1) their location, which is further from the main urban center, (2) they are characterized by high residential development and (3) the areas are characterized by inadequate physical infrastructure because extension of infrastructure has not kept pace residential development. The final stage involved a simple random sampling of a head of a head of a house hold for the structured interview.

In addition to the above stage, it is important that reasons and some details are provided for the choice or use of the various sampling procedures at each stage. First, reasons for randomly sampling two communities was that, the municipalities were quite large and it would have been virtually impossible to cover the length and breadth of the municipalities. Again, the fact that towns selected were peri-urban settlement meant that information needed to address the research questions could still be obtained from residents living in any part of the municipality. Also,

similar conditions prevail within the Municipality i.e. land ownership, legal and institutional frameworks set by the

Assembly and rent regimes which are determined by type of building and amenities instead of location. The first stage led to the sampling of Abokobi and Oyarifa in the Ga East Municipality, Medie and Amasaman in the Ga West Municipality and Gbawe and Weija in the Ga South Municipality. In addition to the first stage, a listing exercise of houses was also conducted in the sampled settlements. The listing exercise involves moving within the study community and numbering houses from which the target population reside. The relevance of this approach is that at the end of the exercise, a list of houses numbered will be generated from which further probability sampling can be undertaken to arrive at the final sampled houses. Thus the houses constituted the secondary sampling unit while the household heads constituted the final or ultimate sampling unit. In each house that was sampled, a household head was selected for the structured interview. In houses where there were more than one household, one household was randomly sampled.

In addition to the sampling of respondents for the quantitative data, some respondents who were involved in the survey exercise were selected for in-depth interviews which were carried out subsequent to the survey. A total of ten household heads were selected. The interviews were scheduled to appropriate times they could be available. Among issues discussed with participants included their decision to reside in peri-urban areas and the effect of this decision on other economic and social well-being of the household. It was also meant to provide insights on the challenges households face in the wake of peri-urban development. For the other key informants, similar questions were asked of them. For the planners in particular, additional questions asked

included the effect of peri-urban growth on governance challenges and infrastructural development.

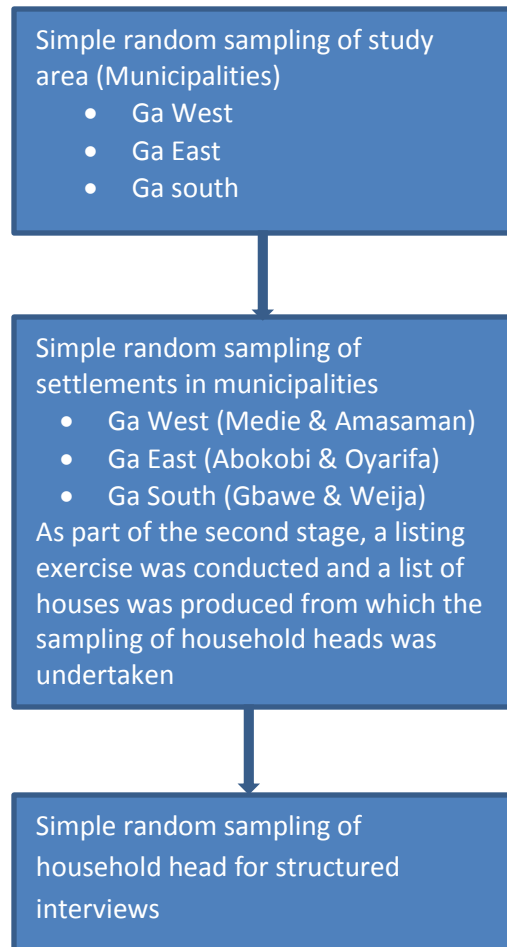


Figure 3. 2: A flow chart showing the stages in the sampling process

3.6. Data Analysis

The quantitative analysis involved two parts. The first was a change detection analysis of land-cover of images spanning the 30 year period. Percentage changes of the various land-use and land-cover types were generated and analyzed to provide insight on the extent of land-use/land cover change, precisely the extent of expansion of the built environment. The second aspect involved the use of descriptive statistics embedded in the Statistical Package for Social Sciences (SPSS) software version 21.0. The SPSS software was used to summarize and describe a number

of variables that answers or responds to the objectives of the study. The variables included socio-demographic characteristics of respondents, reasons for relocating into peri-urban centers, general factors accounting for urban sprawl, time of relocation, the link between relocation and occupational changes and the effects of urban sprawl on local communities. These results were presented with tables, graphs and pie charts. With respect to the qualitative data analysis, the transcriptions were carefully analyzed and integrated with the quantitative data in the form of quotes.

CHAPTER FOUR: RESULTS AND ANALYSIS

4.1 Introduction

This section of the study addresses research objective one; to examine the percentage of land cover land use change in Greater Accra Metropolitan Assembly (GAMA) from 1985 to 2017. The study also assessed how much of the change occurred within the 32-year study period (i.e. 1985 – 1991; 1991 – 2006; 2006 - 2017; 1985 - 2017). This was made possible through an algorithm known as maximum likelihood classification (Acheampong et al., 2018). This algorithm is often used to monitor human-induced changes in the environment. The study employed multi-temporal satellite images and GIS to assess the magnitude of vegetation depletion caused by urbanisation. The satellite images which were selected to perform the Land Use Land Cover (LULC) analysis had a spatial resolution of 30 metres. The research used imagery from Landsat Thematic Mapper (TM), Landsat Enhanced Thematic Mapper (ETM+) and Landsat Operational Land Imager (OLI-8).

4.2 Land Cover Land Use Change Analysis

Table 4.1 presents the land use changes that took place in GAMA from 1985 to 2017 in km². The results were obtained using ArcGIS 10.4.1 software. Each digit represents the total area of land space it covers on the ground in square kilometres. The five classes appear vertically at the left side of the table and the corresponding years are depicted horizontally. The classes include built environment, dense vegetation, sparse vegetation, water body and plains/ bare land. The built environment (see Table 4.1) in GAMA recorded a steady rise from 1991 to 2017. This can be attributed to the expansion of the urban centre which has created a spillover effect for the formation of urban periphery in dormitory towns like Adenta, Dodowa, Amasaman and Pokuase.

On the contrary, the sparse vegetation cover has recorded a decrease relatively faster than the sparse vegetation cover in the study area. A more detailed LCLUC analysis of the respective years is given in the subsequent sub-sections.

Table 4. 1: Land Use and Land Cover in km² in GAMA

Classes	1985	1991	2006	2017
Built Environment	435.18	423.26	480.06	557.39
Dense Vegetation	163.52	156.80	538.69	609.45
Sparse Vegetation	2298.39	1015.32	1083.06	1643.08
Water	132.63	1181.93	126.98	158.25
Bare land/ Plains	640.07	892.49	1441.00	701.62

Source: Secondary Data from Landsat satellite images.

For the purpose of this study, a Supervised Maximum Classification was performed because the researcher had background information on the study area. Landsat Thematic Mapper (TM) and Landsat Operational Land Imager satellite images were used for this analysis because there was no significant cloud cover and scan lines to mar the accuracy of the results. In the following sections the LULC pattern are discussed by the years as follows; LULC pattern of 2000, 2005, 2010 and 2015.

4.2.1 Land Cover Land Use Change (LCLUC) analysis of GAMA in 1985

Figure 4.1 shows the result of the supervised maximum likelihood classification of GAMA in The study calculated the percentage changes in each of the classes with respect to the selected year. Figure 4.2 shows the LCLUC percentage change in 1985. Sparse vegetation dominated

the total land cover with 62.6%. This was followed by plains/ bare lands (17.4%). Dense vegetation recorded 4.4%. Built environment accounted for 11.8% of total land space in the region. The remaining 3.6% was covered by water bodies (wetlands, lakes, streams and rivers). A graphical presentation of the result is shown in Figure 6.2. From the map, the urban areas in GAMA during 1985 were concentrated along the coastal belt and extended 10 km into the hinterland. The built environment comprised mostly of indigenous communities like Jamestown, Chorkor, Osu, La, Labone, Teshie, Nungua, Sakumono, Tema, Ningo and Prampram. The inner communities include Ridge, Adabraka, Tesano, Dansoman and Kaneshie. These localities house most of the urban population and represent the densest areas in GAMA (GSS, 2010). These residential areas are categorised into high-income, middle-income and low-income communities. Vegetation cover is denser in the high-income communities but relatively sparse in middle-income and low-income communities.

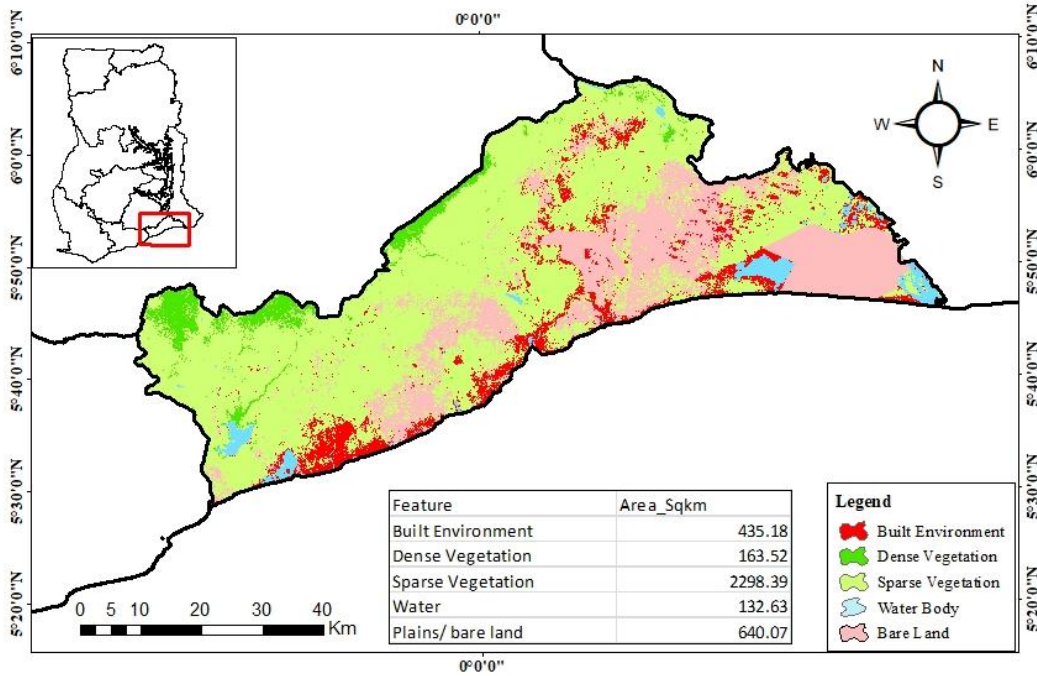


Figure 4. 1: Land Cover Land Use Change (LCLUC) Map of GAMA in 1985.

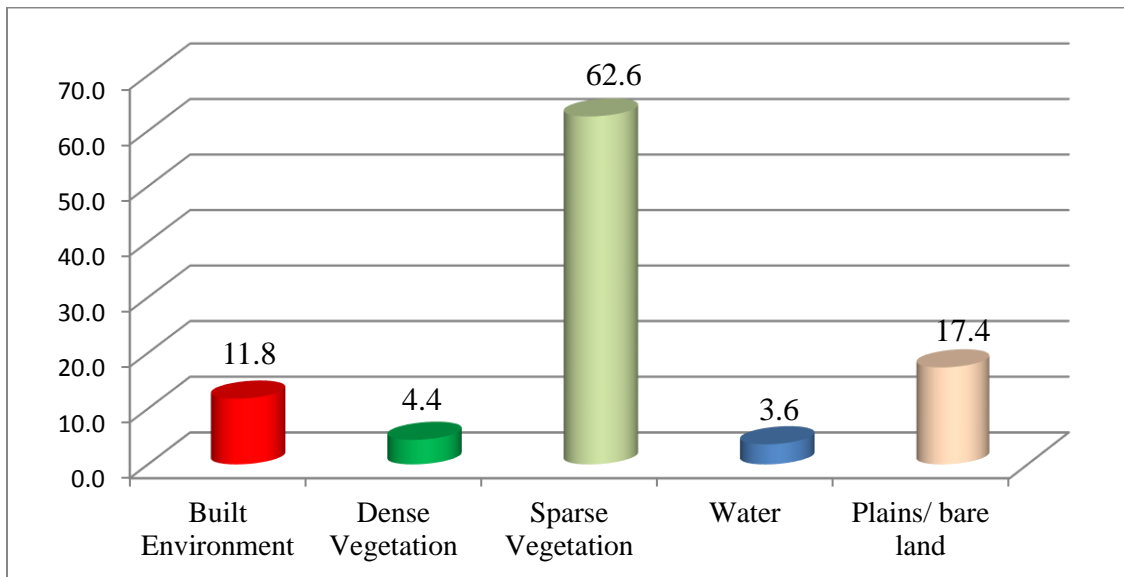


Figure 4. 2: Percentage (%) Change of Land Cover in GAMA during 1985

Source: Secondary Data from ArcMap 10.4.1.

4.2.2 Land Cover Land Use Change (LCLUC) analysis of GAMA in 1991

LULC in 1991 is captured in Figure 4.4. Dense vegetation recorded 27.6 % of total land space in GAMA. Sparse vegetation also covered the highest land space with 32.2%. The total space covered by water (wetlands, rivers, lakes and streams) recorded an increase of 0.6 % in GAMA. Built environment on the other hand recorded 11.5% which is .3 % less of the figure in 1985. Figure 4.3 is a LULC map of GAMA. It can be noted that the built environment is now extending to the north eastern section of GAMA. This area is part of the large expanse of Accra plains. The size of bare land in this area can be attributed to the large scale rearing of cattle which has virtually depleted the vegetation cover in the area (Adjorlolo et al., 2014). Thus, plain/ bare land covered 24.3% of total land space in GAMA during 1991. The built environment in 1991 extended from areas like Adabraka to new urban areas like Lapaz, Achimota, Mallam and Kwashieman. These areas used to be pockets of communities but the ever expanding urban core has merged with these isolated communities to form a conurbation. The vegetation cover between Accra and Tema also experienced urban features springing between them. This can be largely attributed to the expansion of coastal communities like Sakumono, Nungua and Teshie. The industrial enclave in Tema has also contributed to the expansion of built environment in GAMA.

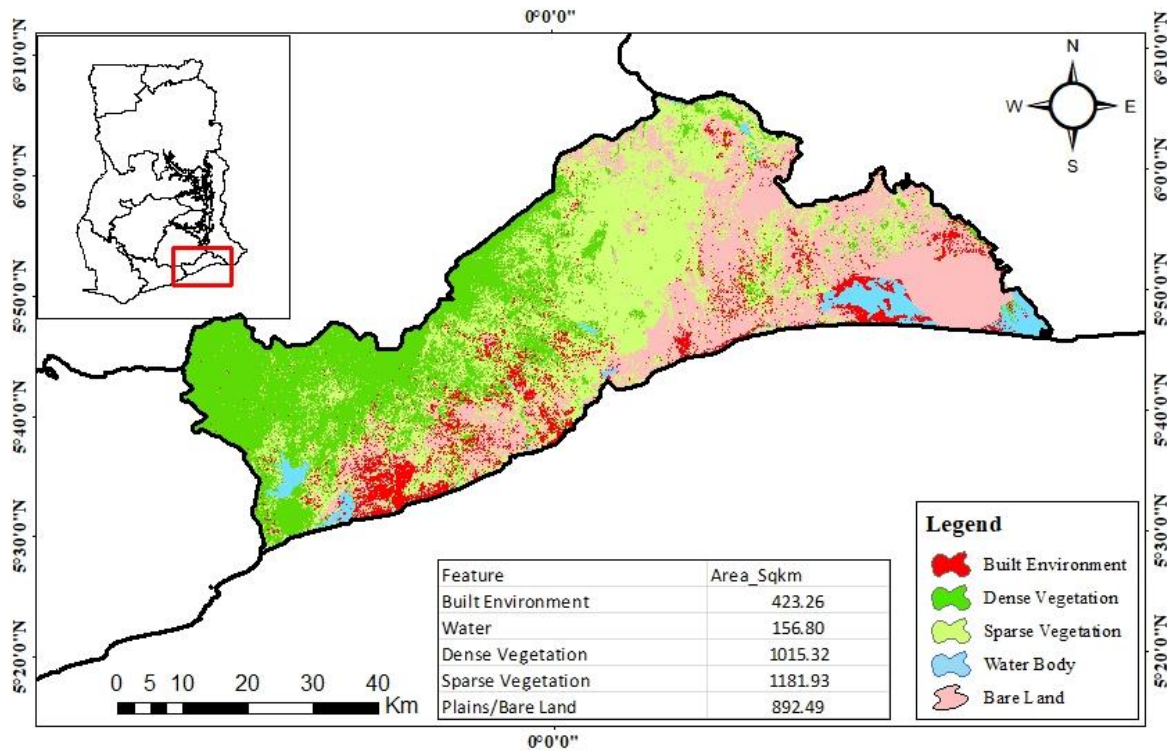


Figure 4. 3: Land Cover Land Use Change (LCLUC) Map of GAMA in 1991.

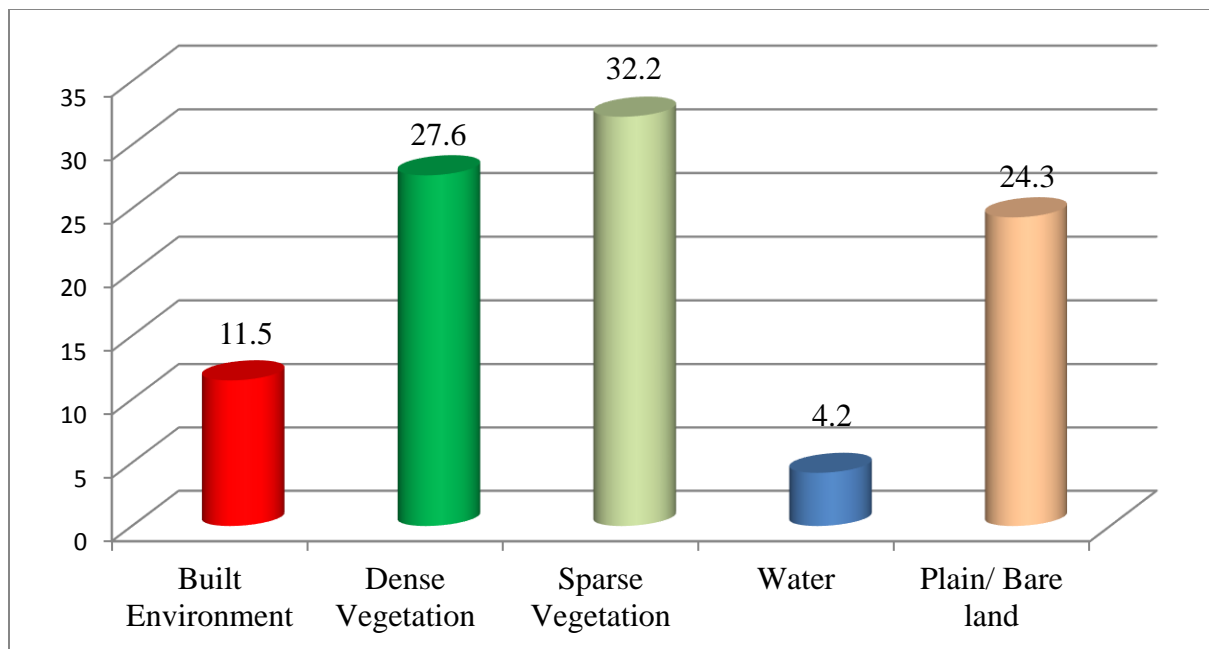


Figure 4. 4: Percentage Change of Land Cover in GAMA during 1991

Source: Secondary Data from ArcMap 10.4.1

4.2.3 Land Cover Land Use Change (LCLUC) analysis of GAMA in 2006

Result from the supervised maximum likelihood classification is displayed in Figure 4.6. Plains/ Bare land dominated total land cover in GAMA. This can be attributed to expansion of the Accra plains covering the north eastern section of the region (Adjorlolo et al., 2014). The built environment gained additional 1.5% of land cover increasing its total coverage to 13% in 2006. The expansion of communities due to their proximity to the capital city which is made possible through the transportation routes has contributed to the expansion of the built environment. In the map (Figure 4.5), towns like Amasaman and Pokuase can be spotted linking up with the nearby communities such as Tantra Hill and Achimota. In terms of green cover, sparse vegetation covered 29.5% while dense vegetation recorded 14.6% of total land space. The results indicate that dense vegetation is depleting faster than sparse vegetation in this urban

agglomeration (Coulter et al., 2016). Water reduced drastically and covered 3.4% of total land space in the study area.

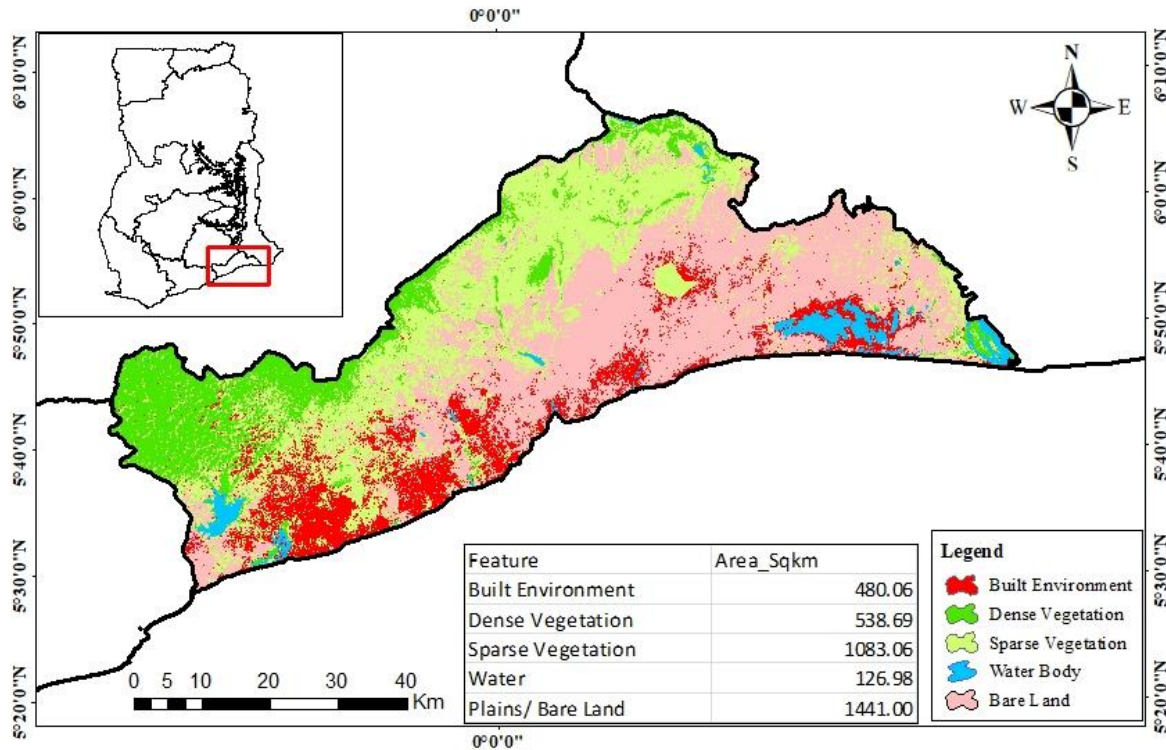


Figure 4. 5: Land Cover Land Use Change (LCLUC) Map of GAMA in 2006.

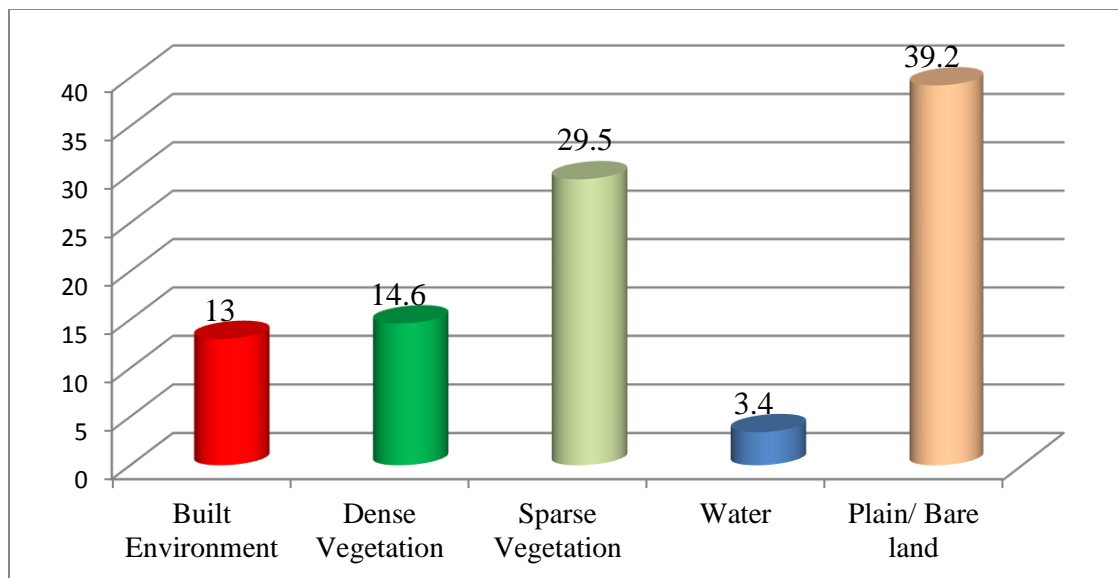


Figure 4. 6: Percentage (%) Change of Land Cover in GAMA during 2006

Source: Secondary Data from ArcMap 10.4.1

4.2.4 Land Cover Land Use Change (LCLUC) analysis of GAMA in 2017

This year experienced a hallmark in GAMA’s urban population because official statistics showed an increase from 2 million in 2000 to 4 million in 2010 (GSS, 2010). The expected result was that, areas which hitherto were covered by vegetation would have been converted for urban purposes (Kusimi, 2008).

After performing the maximum likelihood classification (see Figure 4.8), the result showed an increase in the total coverage of built environment (15.1%). This can be attributed to the expansion of the periphery zones due to the spillover effect of Accra and Tema Metropolitan areas (Yankson et al., 2004). The total area covered by plains/ bare land recorded 19.11%. The reduction in the total coverage of plains/ bare lands can be attributed to the growth of housing facilities such as Appolonia estates in Pampram (Owusu & Oteng-Ababio, 2015). It could be

inferred that, the expansion of the built environment is not only causing depletion of vegetation cover but it is minimising the total size of plains/ bare land in GAMA. Dense vegetation and sparse vegetation recorded 16.6% and 44.7% respectively. The remaining total land space was covered by water (4.3%). It can be seen in Figure 6.8 that Ga District (SHOW ON A MAP; DEPENDS ON LULC IMAGE RESULTS), Accra metropolis and Tema Metropolis have virtually merged together to form an urban agglomeration of what we know as Greater Accra Metropolitan Area (Songsore, 2017). Residential areas like Ashaiman, Afenya, Dawenya and Pampram have all merged together in Tema Metropolis.

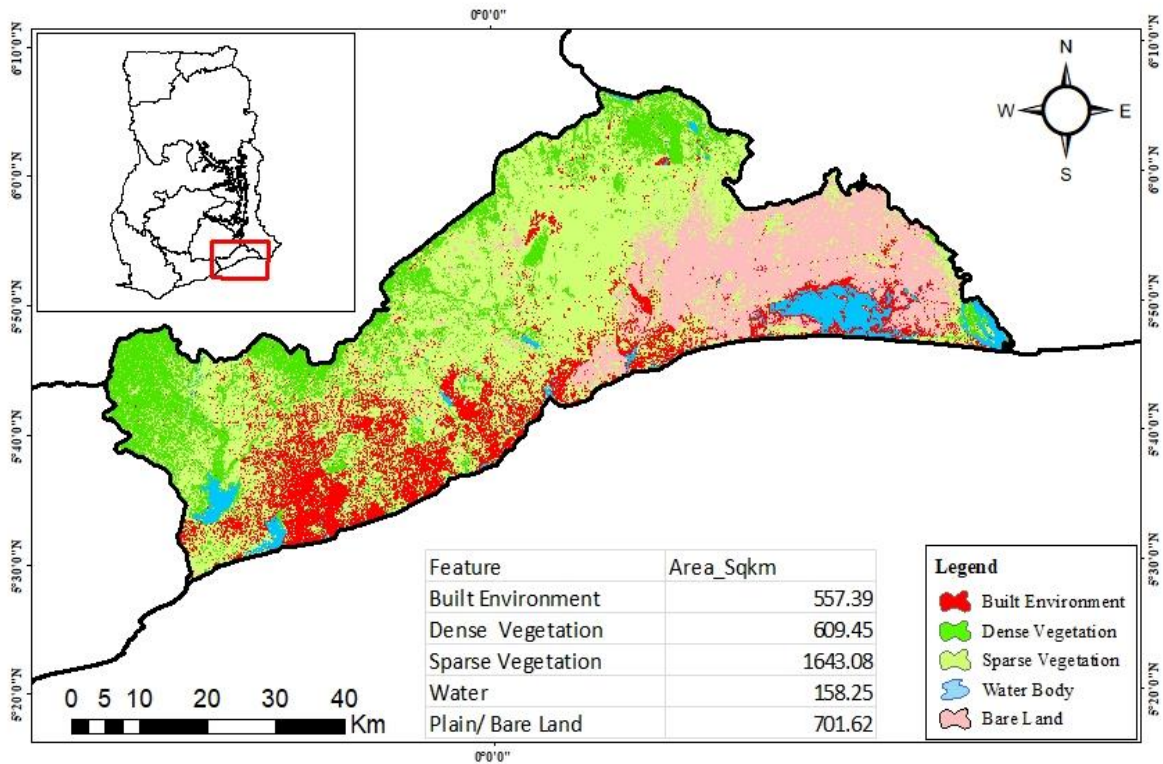


Figure 4. 7: Land Cover Land Use Change (LCLUC) Map of GAMA in 2017.

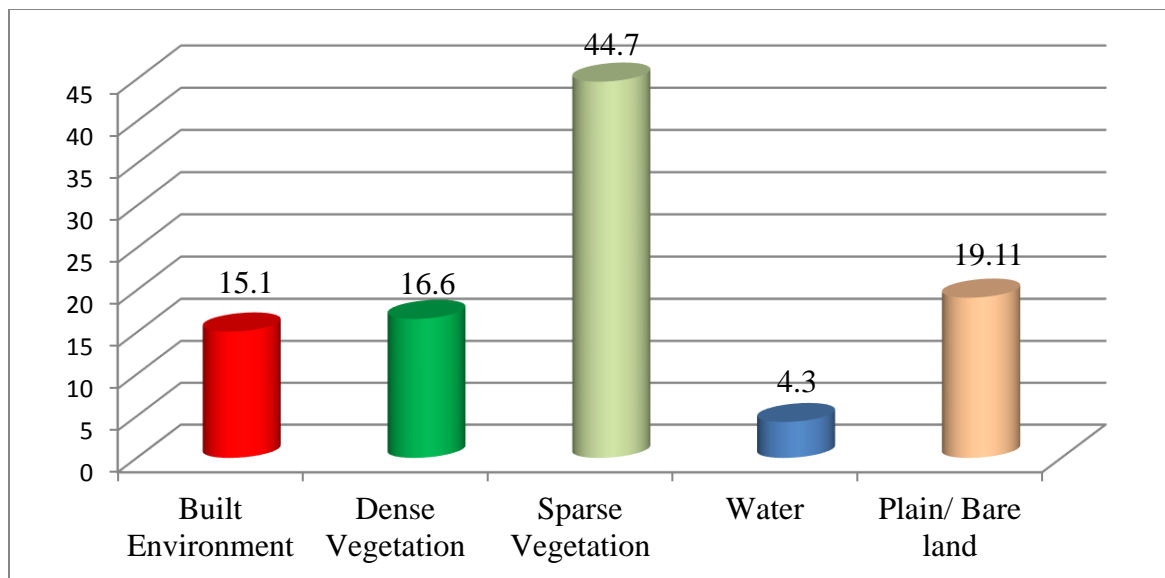


Figure 4. 8: Percentage (%) Change of Land Cover in GAMA during 2017.

Source: Secondary Data from ArcMap 10.4.1

Table 4.2 shows the percentage changes between the selected years for the study. The calculation was done by subtracting the percentage change of the substantial year from the percentage change in the previous year. A graphical presentation of the results is displayed in Figure 4.9. Between 1985 – 1991, built environment decreased by -0.3%. The figure rose to 1.5 % between 1991-2006. Based on the 32 year period (1985- 2017), the built environment in GAMA has increased by 3.3%. The plains/ bare lands in GAMA recorded a decrease of 20% between 1991-2006. Within the 32 year periods, the total coverage of plains/ bare land in GAMA has recorded only 1.71%. In terms of green cover, sparse vegetation between 1991- 2017 has reduced by -17.9%. Dense vegetation on the other hand has increased by 12.2% between the 32 year periods. The volume of water in GAMA between 1985 – 2017 recorded an increase of 0.7%.

Table 4. 2: Land Use Land Cover (LULC) analysis in GAMA in %

Classes	1985-1991	1991-2006	2006-2017	1985- 2017
Built Environment	-0.3	1.5	2.1	3.3
Dense Vegetation	23.2	-13	2	12.2
Sparse Vegetation	-30.4	-2.7	15.2	-17.9
Water Body	0.6	-0.8	0.9	0.7
Plains/ Bare Land	6.9	14.9	-20.09	1.71

Source: Author's construct based on results from Maximum Likelihood Classification.

CHAPTER FIVE: ANALYSIS OF DRIVERS AND THE EFFECTS OF URBAN SPRAWL

5.1 Introduction

The previous chapter has illuminated our understanding regarding land-use and land-cover (LULC) change in GAMA with the use of remote sensing and GIS application. This chapter builds on the previous chapter by assessing the drivers and effects of LULC changes in GAMA. The chapter begins by discussing the demographic characteristics of respondents. Further, the chapter analysis decisions behind individuals' relocation into communities within the Ga municipalities, general factors driving urban sprawl, link between relocation and occupational changes and the effect of urban sprawl on residents in study localities.

5.2 Demographic characteristics of respondents

This first section of the analysis presents statistics on demographic background of respondents. Basically, the frequency and the percentages are used in describing the demographic data. The first variable to be discussed is the locational characteristics of respondents which are found in Table 5.1. The result indicates that out of the 200 respondents, 39.0 percent were from the Ga Central municipality, 46.5 percent were from the Ga East municipality and 15.5 percent were also from the Ga South municipality. Indeed, these municipalities are found in the peri-urban zones of the Greater Accra Metropolitan Area. As noted by Owusu (2015), between 1988 and 2003, the three municipalities existed as one local District, known as the Ga District. However, over the years it has experienced significant growth, mostly due to housing development, which has also necessitated the extension of vital services to these Municipalities. According to Owusu (2015), due to Ghana's decentralization policy and the need to improve local participation in government, coupled with other political considerations, in 2007, the then Ga District was

broken up into Ga East and Ga West Municipalities. In 2011, it was further divided into three, this time Ga South was added to the existing two Municipalities. In 2012, two more Municipalities were added to the existing three Municipalities, and these include Ga Central and La Nkwantanan Madina Municipalities.

Table 5. 1: Distribution of respondents in study locations

Variable	Categories	Frequency	Percentage
Location	Ga Central	76	39.0
	Ga East	93	46.5
	Ga South	31	15.5
	Total	200	100.0

Source: Fieldwork, 2017.

Table 5.2 shows a cross-tabulation of gender and age categories of the study respondents. Overall, the results indicate that out of the 200 respondents surveyed, 39 percent of the respondents were males whiles, 61 percent were females. A number of factors may account for the skewed distribution of the sex. Notable among them is the fact that most females are engaged in home based enterprises and likely to be closer to their homes during the working hours. This is mostly the case in such peri-urban areas which in most cases do not have large market centers that concentrate a lot of women traders compared to communities in the inner cities. Again, being closer to work afforded them the opportunity to engage in their reproductive roles. Thus with this, most women were available in their homes at the time of the survey exercise and as such were interviewed.

Table 5. 2: Cross-tabulation of gender and age groups of respondents

Gender	Age of respondents					Total
	20-30	31-40	41-40	51-60	61 and above	
Male	10 (21.3)	22 (33.8)	22 (52.4)	11 (33.3)	13 (100.0)	78 (39.0)
Female	37 (78.7)	43 (66.2)	20 (47.6)	22 (66.7)	0 (0.0)	122 (61.0)
Total	41 (100.0)	65 (100.0)	42 (100.0)	33 (100.0)	13 (100.0)	200 (100.0)

Source: Fieldwork, 2017.

In terms of the age distribution across the gender groups, the result indicates that about 21 percent of respondents within the 30-40 years age group were males while 79 percent were females. Regarding the 31-40 year age group, 34 percent were males while 66 percent were females. About 52 percent of respondents within the age categories 41-40 were males while 48 percent were females. In all, more than half of the respondents were within the age categories of 20-40. It can be inferred from this result that household in the study locations are young households.

Table 5.3 shows a cross-tabulation between location of respondents and duration of stay in these study locations. The result indicates that out of the 97 respondents who indicated that they have resided in their present locations for the past 10 years, 45 percent of them were respondents from Ga East, 39 percent were from Ga central and 15 percent were from Ga South. Again out of the 47 respondents who indicated that they have resided in their present location between the past 11-20 years, 40 percent were respondents from Ga Central, 43 percent were residents from Ga East and 17 percent were from Ga south. Again, the results show that comparatively, residents more than half of residents at Ga East have stayed in their present location for more than 20 years. One interesting fact about the finding is that, a large proportion of respondents began staying in the municipalities within the last ten years, thus giving an idea of how fast these

municipalities and their peri-urban settlement are developing. This is attributed to the increase demand for lands in these areas for building projects (Owusu, 2008; Owusu, 2012; Boateng, 2000) and the increase decentralization of businesses and industries into peri-urban areas (Owusu, 2012). The latter is even quite notable, especially in recent times as economic zones are been created in these areas to encourage Foreign Direct investment (FDI) into the country. For instance there is free trade zones enclave around the Medie-Nsawam region which has factories such as Africola, Voltic mineral water and Blue Skies.

Table 5. 3: Cross-tabulation of residential location and duration stay of respondents

Location	Duration of stay in community				Total
	1-10	11-20	21-30	31-40	
Ga Central	38 (39.2)	19 (40.4)	15 (33.3)	4 (36.4)	76 (38.0)
Ga East	44 (45.4)	20 (42.6)	23 (51.1)	6 (54.5)	93 (46.5)
Ga South	15 (15.5)	8 (17.0)	7 (15.6)	1 (9.1)	31 (15.5)
Total	97 (100.0)	47 (100.0)	45 (100.0)	11 (100.0)	200 (100.0)

Source: Fieldwork, 2017

Table 5.5 shows a cross tabulation between occupation and level of education of respondents. This table seeks to provide insight as to whether ones level of education has any link with the kind of occupation that a person is engaged in. The table shows that all 11 of respondents who have not had any formal education were currently working in the informal sector. Out of the 89 respondents who have had basic level education, 86.5 percent were within the informal sector and just 13.5 percent were within the private formal sector. In regard to those who have had senior level secondary education, 43 percent were in the informal sector, 26.3 percent were unemployed and

15.8 percent were within the private formal sector and 14.5 percent were currently in the public sector or engaged in government work. Result of tertiary is quite perplexing as it can be observed that none from the educational category is the formal government sector, with few represented also represented in the private formal sector. A number of insight is provided from this result. First, the possibility or likelihood of having an opportunity to work in the formal sector, both private and public is less for those who have had no formal education, especially when some amount of literacy is required. Further, even with high level of education, it is not also easy to enter into the private formal or the government sector. The latter point can be attributed to factors such as freeze in government work as part of IMF conditionalities and high level of graduate unemployment as a result of fewer jobs provided in the private and government sector. It is not surprising therefore that that the informal sector has a large proportion of respondents from all the levels of education.

Table 5. 4: Link between level of education and type of occupation

Occupation	Level of income				Total
	No formal education	Basic education	Secondary education	Tertiary education	
Formal government	0 (0.0)	0 (0.0)	11 (14.5)	0 (0.0)	11 (5.5)
Private Formal	0 (0.0)	12 (13.5)	12 (15.8)	4 (16.7)	28 (14.0)
Informal	11 (100.0)	77 (86.5)	33 (43.4)	10 (41.7)	131 (65.5)
Unemployed	0 (0.0)	0 (0.0)	20 (26.3)	10 (41.7)	30 (15.0)
Total	11 (100.0)	89 (100.0)	76 (100.0)	24 (100.0)	200 (100.0)

Source: Fieldwork, 2017

Further, the study examined whether there was a link between income earned by respondents and their level of education. This was important as it sought to provide insight as to whether

education influenced how much a person earned. The result as shown in Table 5.5 suggests that as respondents' level of education increases, their income earned also increases. For instance, it can be observed that for those who earned between GHC 0-200, about 57.4 percent have had basic education, 32.7 percent have had secondary education and 9.9 percent have had tertiary level education. For those who earned between GHC 200-500, 22 percent, 38 percent and 40 percent have had no formal education, basic education and secondary education respectively. Interestingly, for those within the high income brackets such as GHC 801-1000, and above GHC 1000, it can be observed that none of the respondents have no formal education. For those who earned above GHC 1000, out of the 14 respondents, about 73 percent have secondary education, with 26 percent having tertiary education.

Table 5. 5 : The link between level of education and income earned

Occupation	Level of income					Total
	GHC 0-200	GHC 201-500	GHC 501-800	GHC 801-1000	Above GHC 1000	
No formal education	0 (0.0)	11 (22.0)	0 (0.0)	0 (0.0)	0 (0.0)	11 (5.50)
Basic education	58 (57.4)	19 (38.0)	0 (0.0)	12 (54.5)	0 (0.0)	89 (44.5)
Secondary education	33 (32.7)	20 (40.0)	12 (100)	0 (0.0)	11 (73.3)	76 (38.0)
Tertiary education	10 (9.9)	0 (0.0)	0 (0.0)	10 (45.5)	4 (26.7)	24 (12.0)
Total	101 (100.0)	50 (100.0)	12 (100.0)	22 (100.0)	15 (100.0)	200 (100.0)

Source: Fieldwork, 2017

Table 5.6 further explores the linkage between respondents' occupation and income earned. The result shows that out of the 101 respondents who earned between GHC 0-200, 70 percent were within the informal work category, while 30 percent were unemployed. This finding thus provides insight regarding the precarious nature of some of the informal work activities, which

are basically used as a survival strategy to live in the urban setting. Similarly, out of the 50 respondents who earned between GHC 201-500, all (100%) were within the informal work category. For those who earned between GHC 501-800, all 12 respondents were in the private formal work category. For those who earned between GHC 801-1000, about 54.5 percent were in the private formal sector, while 45.5 were in the informal sector. Interesting for those who earned above GHC 1000, about 73.3 percent were in the formal government sector. A number of important insights can be generated from this finding. Apart from the fact that it shows the diverse background of respondents residing in peri-urban areas of Accra, the findings show that government workers have better living conditions, in terms of income when compared with other work categories. Again, the result shows that the informal sector is much diverse as some workers may be engaged in more profitable ventures and may be earning much higher incomes.

Table 5. 6: Link between respondents’ occupation and income earned

Occupation	Level of income					Total
	GHC 0-200	GHC 201-500	GHC 501-800	GHC 801-1000	Above GHC 1000	
Formal government	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	11 (73.3)	11 (5.5)
Private Formal	0 (0.0)	0 (0.0)	12 (100.0)	12 (54.5)	4 (26.7)	28 (14.0)
Informal	71 (70.3)	50 (100.0)	0 (0.0)	10 (45.5)	0 (0.0)	131 (65.5)
Unemployed	30 (29.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	30 (15.0)
Total	101 (100.0)	50 (100.0)	12 (100.0)	22 (100.0)	15 (100.0)	200 (100.0)

Source: Fieldwork, 2017

Figure 5.1 shows the distribution of household size of respondents in the Municipalities. The result indicates that about 43.5 percent of respondents had a household size of about 3-5. 10 percent of the respondents had household sizes of less than three. About 22.5 percent of

respondents had household sizes above 10. The result is in synch with the official average household size in the country which is about 4.1 (GSS, 2010). With regards to marital status, Figure 5.2 shows that about 46 percent of respondents are single, while about 43 percent of respondents are married. The result is not surprising given the fact that the substantial proportion of respondents are within the 20-30 age cohort. Indeed, the results is similar to the national figures which indicate that about 42.0 percent of population 12 years and older are not married, while about 42.9 percent of this same age cohort are married.

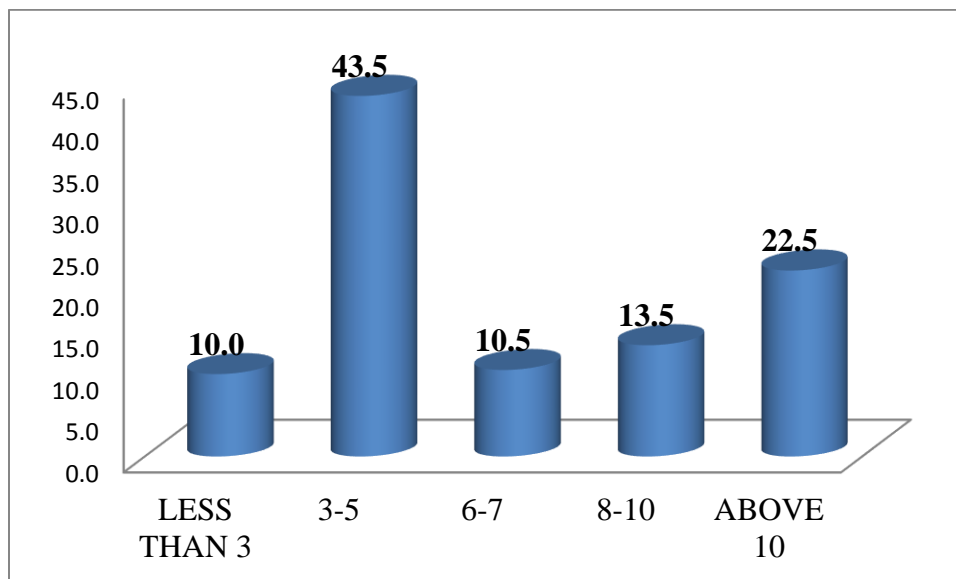


Figure 5. 1: Household size of respondents

Source: fieldwork, 2017.

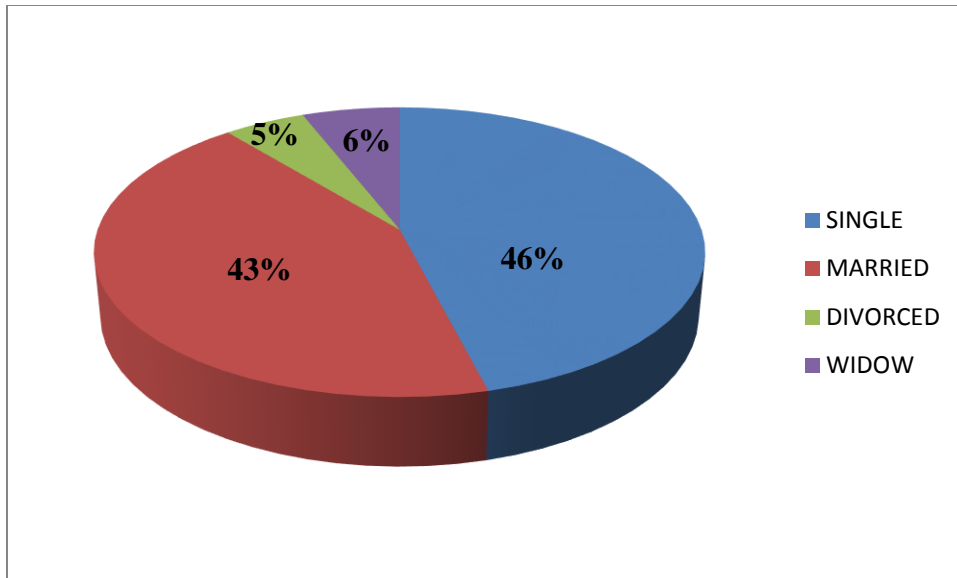


Figure 5.2: Marital status of respondents

Source: fieldwork, 2017.

5.3 Where are people moving from?

Table 5.7 shows responses of respondents regarding their previous location. A careful observation shows that significant proportion of respondents relocated from communities in and around the peri-urban areas. Surprisingly, just 30.5 percent of respondents moved from Accra central. Even though this percentage is quite high when compared to those coming from the other settlements, the result complicates the general view that most people residing in peri-urban communities were previously residing in the inner cities, and that they are moving because of the problems in the inner cities. Generally, it can be suggested that the movement patterns of households is more of an intra-city movement characterized since it is from one peri-urban locality to the other. Can this movement patterns be attributed to the general factors that influences movement into peri-urban areas or could there be peculiar conditions in previous location that may be informing their decision to move contrary to what we know from the existing literature? We interrogate some of these issues in subsequent discussion.

Table 5. 7: Previous place of residents of respondents

Place of origin	Frequency	Percentages
Abetifi	10	2.0
Accra	25	30.5
Amasaman	12	6.0
Dansoman	13	6.5
Darkuman	10	5.0
Kaneshie Zongo	11	5.5
Mallam	10	5.0
Obmeng	10	5.0
Odorkor	21	10.5
Ofankor	10	5.0
Santa Maria	20	10.0
Sowutoum	12	6.0
Total	200	100

Source: Fieldwork, 2017

5.4.1 Period of relocation of respondents

As indicated earlier, urban sprawl is a key feature of the urbanization process and is inextricably linked with the movement of people either from the inner city or other settlement into suburban or peri-urban areas. Before discussing the factors that informed respondents to move from their previous to their present location, it is important that we interrogate some issues about the movement of residents and here the period of movement and whether there have been changes in livelihood activities will be interrogated. Figure 5.3 shows that most of these movements took place within the last ten years. For instance the figure shows that 26.5 percent of respondents migrated between 2006 and 2010. 22.0 percent of respondents moved into these Municipalities since 2011. If you look at these two period highlighted above, which numbers up to the last ten years, it corresponds to about half of the entire respondents. This suggests that the Municipalities are expanding spatially or put differently rapidly sprawling. Indeed, according to Owusu (2012), the urban sprawl in the Ga municipalities particularly over the last three decades has resulted in a

situation where about 50 percent of the entire population of the Greater Accra Metropolitan Area is currently within these three sprawling municipalities.

Further, the result in Figure 5.3 indicates that about 23.0 percent of respondents indicated that they moved into these three municipalities prior to 1996. Thus, it can be inferred that movement into these municipalities have been taking place for some time now. Indeed, it is estimated that since 1984 to 2000, the Ga Municipalities, have had the highest rate of increase, which is about 8.9 people, which is even higher compared to Accra Metropolis, which has experienced growth of 3.3 percent within the same period (Owusu, 2012). If past and present trend is something to go by, then it is suggested that these area (the Ga Municipalities) will continue to experience growth unabated. This is because the area still have large expanse of unoccupied lands, even though I must admit that increasing land prices due to speculation and land conflict is a characteristic feature of the municipalities.

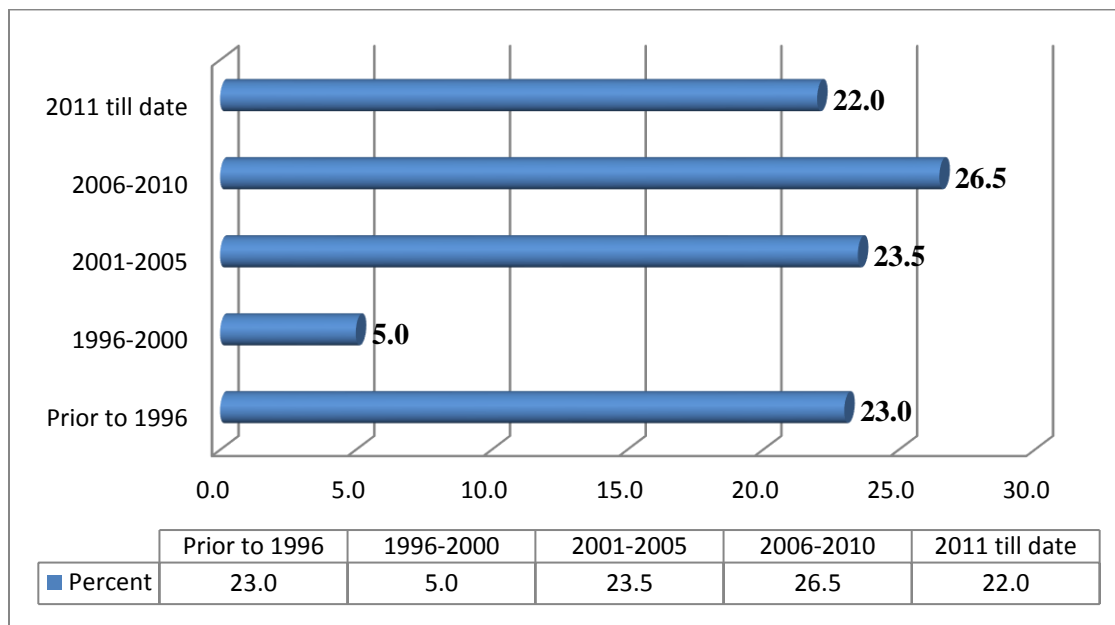


Figure 5. 3: Time of relocation of respondents

Source: fieldwork, 2017.

5.4.2 The link between occupational changes and time of relocation

Table 5.8 shows a cross-tabulation between the period of relocation and the question about whether there has been any change in respondents' occupation. This relationship is very important as it provides insight about whether relocation to suburban or peri-urban areas necessarily results in changes in job or livelihood activities. The result indicates that for those who moved prior to 1996, all of them have not changed their occupation since. Similarly, for those who moved between 1996 and 2000, as well as those who moved between 2001 and 2005, none of the respondents have changed their occupation following relocation. A number of factors may account for this. One of these factors is the construction of arterial road corridors which enables people living in peri-urban areas to be linked up to the core urban centers which apparently are the economic hub of the country (Farvacque-Vitkovic et al, 2008). This point resonates with Boateng (2000) argument of the uncentric nature of Accra development, where even though the city is expanding; it is linked functionally with the core city. In this regard, development in the peri-urban areas is largely residential. In a simple term, what is being argued here is that, people will be unwilling to change their occupation because they can still get to their work places in the core city, or the commercial hub because of easy access to road networks. Another reason could be that, people with certain skills e.g. artisan may be unwilling to change their career outright for another profession. In circumstances where it is viable to continue with this profession even though they might have been relocated to a peri-urban area, there is still the possibility of continuing with their career.

Table 5. 8: Time of relocation and change in occupational status

Time of relocation	Change in occupation		Total
	Yes	No	
Prior to 1996	0 (0.0)	46 (100.0)	46 (100.0)
1996-2000	0 (0.0)	10 (100.0)	10 (100.0)
2001-2005	0 (0.0)	47 (100.0)	47 (100.0)
2006-2010	11 (20.8)	42 (79.2)	53 (100.0)
2011 till date	14 (31.8)	30 (68.2)	44 (100.0)
Total	25 (12.5)	175 (87.5)	200 (100.0)

Source: fieldwork, 2017.

Table 5.9 shows a cross tabulation between time of relocation and the occupation of respondents. The table shows that out of the 46 respondents who indicated that they relocated to the Municipalities prior to 1996, 76.1 percent were within the private informal sector, while 23.9 were from the formal public sector or were government workers. Out of the 53 respondents who migrated between 2006 and 2010, 22.6 percent were within the private formal sector, 39.6 percent were within the private informal sector and 37.7 were unemployed. In the case of those who relocated to the municipalities, 77.3 percent were from the private informal sector. This result seems to tie in with argument by Boateng (2000) regarding the issue that people who are engaged in residential development in peri-urban areas in Accra are from different socio-economic classes. Whiles there are residential enclaves exclusively made of high income people, normally built by real estate developers, in some areas or communities in peri-urban settlement, it is common to find low and middle income earners, as well as people in various occupation engaged in housing development. A number of factors may account for this and include (1) the fact that socially and culturally, owning a house is an important aspiration of every Ghanaian worker and therefore will prefer to save and build a house (2) the second point is that people

normally build incrementally, and so it may take quite some time for a person to complete a house, and the pace of completion will depend on changes in occupation and thus in income.

Table 5. 9: Time of relocation and type of occupational

Time of relocation	Type of occupation				Total
	Formal Gov't	Private Formal	Informal Private	Unemployed	
Prior to 1996	11 (23.9)	0 (0.0)	35 (76.1)	0 (0.0)	46 (100.0)
1996-2000	0 (0.0)	0 (0.0)	10 (100.0)	0 (0.0)	10 (100.0)
2001-2005	0 (0.0)	16 (34.0)	31 (66.0)	0 (0.0)	47 (100.0)
2006-2010	0 (0.0)	12 (22.6)	21 (39.6)	20 (37.7)	53 (100.0)
2011 till date	0 (0.0)	0 (0.0)	34 (77.3)	10 (22.7)	44 (100.0)
Total	11 (5.5)	28 (14.0)	131 (65.5)	30 (15.0)	200 (100.0)

Source: fieldwork, 2017.

5.5: Why are people moving: Drivers of LULC?

The main feature that has characterized LULC is the expansion of residential development. Admittedly, sprawling Municipalities in Ghana, like the Ga East, West and South Municipalities are increasingly been characterized by commercial developments, making them more of a mixed land-use, even though residential land-use dominates. An important issue that requires interrogation is the occupancy status of residents in the peri-urban areas. The result in Figure 5.4 shows that 54.5 percent of respondents indicated that they were renters, while 45.5 percent of respondents indicated that they were owner occupiers. The result is perplexing for quite a number of reasons. First, it departs from existing knowledge from the western context about occupancy status, which seems to suggest that most residents in suburban settlements are mainly made up of high and middle income earners who own houses and have moved to these areas because of inner city negative externalities (Pacione, 2009). The result also corroborates official

records of GSS which indicates quite a proportion of the population in these areas rent accommodation (GSS 2014a; 2014b; 2014c).

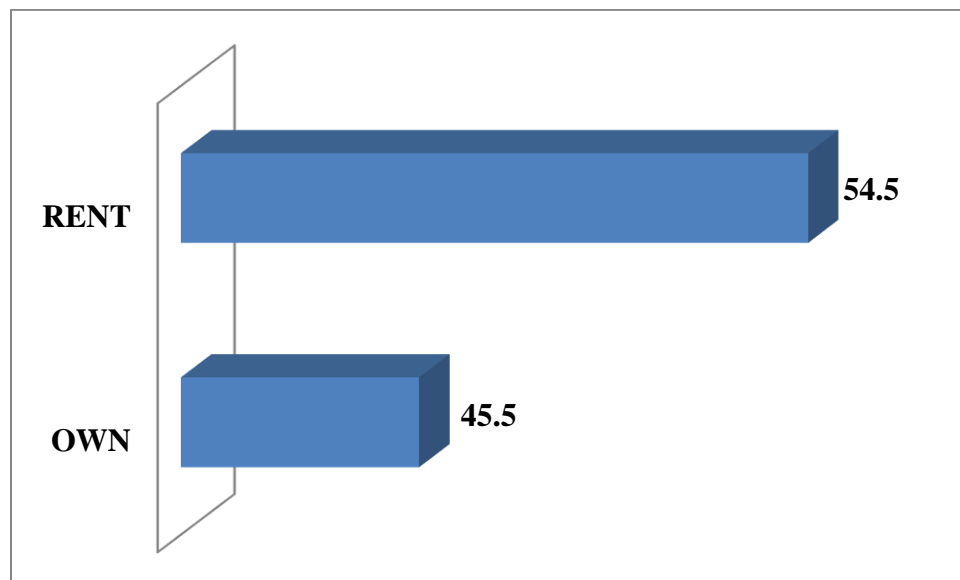


Figure 5. 4: Occupancy status of respondents (%)

Source: fieldwork, 2017.

An important takeaway from this result is that, the issue is more nuanced than just a flight of high income people from the city center to the fringes or peri-urban or suburban areas. More importantly, we can argue that there is a mix of housing type and tenurial arrangement in peri-urban areas in response to changing social and economic complexes in this part of the city. This I must admit requires interrogation through further studies. Indeed, this finding corroborates earlier discussions about the socio-demographic background of respondents, which suggest a mixed of people from different income brackets. The point about the diversity of different socio-economic groups may also warrant different reasons why people may want to move to peri-urban areas and here the three Ga municipalities. This point is discussed in the next section below.

What are the factors influencing residents to relocate? Table 5.11 shows respondents' views regarding why they relocated to their current residential areas. The result shows that 41.0 percent of respondents indicated that they moved to their present location because of affordability of rents in the peri-urban areas. Further, 20.0 percent indicated that they moved to their present locations because of the quest to find a job. 15.5 percent of the respondents indicated that they moved into their present location because of pollution and environmental problems in the towns or parts of the city where they moved from. Again, about 12 percent of respondents indicated that they moved into their present location because of the serene environment. Other responses, albeit constituted a small fraction of the responses include access to public services and expansion of the settlement.

Table 5. 10: Individual reasons for relocation

Reasons for relocation	Frequency	Percentages
Access to public facilities	12	6.0
Affordability of rents in peri-urban areas	82	41.0
Expansion of the settlement	11	5.5
Pollution and environmental problem	31	15.5
In search of work	40	20.0
Serene environment	24	12.0
Total	200	100.0

Source: fieldwork, 2017.

Important insight can be drawn from this finding. The issue of affordability of rents in peri-urban is not a surprising result as it argument of the bid rent theory which emphasizes that affordability of rent and lower land values increases consumers' willingness stay further away from the city center (O'Kelly and Brian, 1996; Bochnovic, 2014). Studies have shown that increased density of communities closer to the city center has led to rising demand for residential accomodation

thus placing serious strain on prices in Accra (Owusu, 2012). Moreover, the supply of housing continuous to fall short of the existing demands. This has led to a situation where people are moving into peri-urban communities where demand comparatively is low and also supply is on the increase. More important also, the emerging commercial activity is an important issue that has also driven people into the peri-urban areas. Further, the quest for change of an environment to more peaceful vicinity is a primary factor attracting people to the outskirts areas of urban centers. These therefore encourage people, particularly people from higher income brackets to build at places considered calm from the city centre “noise” as it were, resulting in leap frog settlement as a cause of sprawling (see Owusu, 2012). This factor has perhaps been the most important that has caused the sprawl situation of the Greater Accra Metropolitan Area.

The quotations below elaborate on some of the issues highlighted above

I was staying at Osu and working at North Legon. Even though my place of residence was quite close to where I work the rent was quite exorbitant. I was paying GHC 250 for a chamber and hall. However, when the rent elapsed, the Landlord wanted to increase this by 50%. I couldn't afford so I had to relocate to Pokuasi, which I think is not also very far from my work place and the rent is also affordable, Here I pay GHC 120 and month. (One informant staying at Pokuasi)

I was staying at Teshie with my family. However, I got a job here at Medie in one of the new industries they have established here so I moved in with my family. But I think this was a good decision. Apart from the job, the place is not noisy and I think this is the best environment I need for my children's growth. (One informant staying at Medie)

The issue of environmental problems as a precursor for the movement of people from the core parts of the city to the peri-urban or suburban areas is a notable issue. Indeed, congestion and high density in inner cities and other commercial areas of the city has led to a situation where

dealing with environmental problems, especially waste management has become intractable. This has reduced significantly the quality of the urban environment in these parts of the city. Again, air pollution and noise making is also another problem affecting the urban environment in these areas. It is therefore not surprising why people are leaving because of these environmental problems and are opting for a more serene environment, which happens to be the situation in most parts of the peri-urban centers. This is not to say that there are no challenges in peri-urban communities. Indeed in Figure 5.5 some issues relating to problems of environmental management has been highlighted as effects of urban sprawl. The point here is that the situation is far worse in the inner cities compared to the suburbs or peri-urban centers.

In addition to Table 5.10 which provides insight regarding individual relocation decision, in other words personal factors that influenced respondents to move to their present location, the study further sought to find out from respondents what they think are the general or broader factors driving urban sprawl in Accra. Table 5.11 shows that 28 percent of respondents strongly agreed that this is due to rising income, 45.5 percent agreed to this assertion, while 20.5 were neutral on this point. Indeed, there is much truth in this point because as income levels of people in the country is currently rising, the middle income Ghanaians who can afford to build for themselves a house or rent a moderate house are on the lookout for places out for the city center. However, these various building projects by people do not conform to the planning authorities, resulting in unplanned development of these areas. Most of these are as a result of the difficulties people go through in getting a building permit that will enable them to put up structures at designated areas. These have also contributed to the expansion of the city boundaries in unorganized manner.

The quote below throws light in issues raised above

I was staying in a rented house at Kaneshie. So I asked myself if I will stay in this house or be renting for the rest of my. I decided then to buy a plot of land at Gbawe and I started developing it. Even though things were difficult, I have been able to put up my own house after six years. I worked hard, got some money and with determination I have my own house now.

Secondly, respondents were also of the opinion that the relatively low commuting cost also facilitated the drive towards the settling on the country sides. About 18.0 percent of respondents strongly agreed to this point, 51.5 agreed to this point and 25.5 percent had a moderate view on this point. In explicating this point, it is noted that many people who search for low cost accommodation end up settling in areas which are linked to the city center by good roads. However, the effect of this has been heavy traffic congestions along major arterial roads that link the city center to peri-urban areas, especially in the morning and late evenings when people are moving to and from their work places located at the city center. Typical examples of roads which experience major traffic as a result of large amount of vehicles plying these roads in GAMA include Kwame Nkrumah Circle-Nsawam corridor (linking east of Accra); CBD-Mallam-Kasoa corridor (linking the west of the city) and; CBD-Madina-Aburi Corridor (linking the north-east of Accra). According to Doan and Oduro (2011), improved roads make peri-urban development attractive to middle-class residents while at the same time allowing peri-urban residents to commute to the central city and other locations within the metropolitan area where their livelihoods are located. But then, these settlements along the roads happen in unorganized and similarly uncontrolled manner resulting in sprawling conditions.

The quotes below throw light in issues raised above

My decision to relocate to Gbawe has not affected my commuting to Accra every day to work. The construction of the dual carriage road has even helped a lot. All you need to do is to get up very early so that you can beat the early traffic.

Another important point that was raised by respondents was the inability of local authorities to regulate land-use and residential development. About 63 percent of respondents agreed to the assertion that the local authority is weak in the control of residential development. Even though the existing set of laws establishes local governments as the main agents of city based development in Ghana, these institutions are very weak. This is because the current system of (without having one central area of command) planning still operates in a top-down fashion, and local governments lack both the ability (to hold or do something) and the political will to plan, design, put into use and monitor programmes and policies at the local level. As Doan and Oduro (2011) notes, planning functions in GAMA and in other urban settlements, are very badly interfered with or slowed down by the inability of local governments to direct physical development in a neat, well-organized and well-behaved manner, and thus accounting for the uncontrolled and out of control sprawl of the area. As a result of the variety of factors and conditions driving the sprawl of GAMA, the area shows the many different forms of sprawl. These include leapfrog, ribbon, low-density and uncontrolled outwards developments exist to point to or show that at all places within GAMA, developments have broken into greenbelts and natural edges/borders resulting in leapfrog sprawl. Also, there are strong developments along the main roads travel paths in and out of Accra reflecting ribbon development. However, leapfrog and ribbon sprawl exist along with a general pattern of low-density and uncontrolled outwards developments.

Table 5. 11: Broader issues accounting for urban sprawl in Accra

Reasons for urban sprawl	Options					Total
	Strong agree	Agree	Neutral	Disagree	Strongly disagree	
Rising income	28.0	45.5	20.5	6.0	-	100
Lower commuting cost	18.0	51.5	25.5	5.0	-	100
Government zoning policies	42.5	26.5	16.0	15.0	-	100
Avoidance of crime	14.5	75.0	5.5	5.0	-	100
District Assembly inability to regulate land-use	16.5	63.0	10.5	10.5	-	100
Land prices	7	67.0	10.5	11.0	4.5	100
Construction of access roads	19.5	53.5	15.5	5.0	6.5	100

Source: fieldwork, 2017.

5.6 Effects of urban sprawl

A lot of challenges have accompanied urban sprawl. This has led to serious governance and management crises for local governments to deal with. The problem is even very difficult to handle, especially in developing countries like Ghana where institutions are either ill-equipped or bedeviled with latent structural constraints to handle the transition of these settlements. Figure 5.5 shows that 59 percent of respondents indicated that the major challenge accompanying urban sprawl is environmental pollution. Even though the study did not categorize specific pollution, it refers to problems such as air pollution, poor sanitation and poor waste management. About 24.5 percent of respondents indicated that there is rising living cost in the peri-urban areas. Again, about 10 percent of respondents indicated that there have been rising incidences of crime, while 6.5 percent also indicated congestion problems as one of the emerging challenges in peri-urban centers.

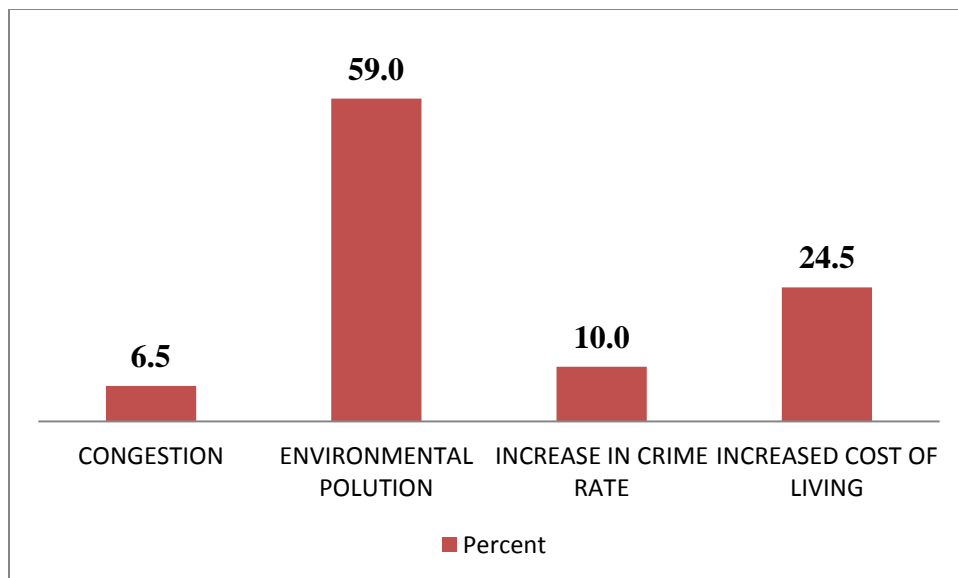


Figure 5. 5: Problems associated with urban sprawl (%)

Source: fieldwork, 2017.

Indeed, the issue of pollution and poor environmental management in peri-urban areas have received significant academic for some time now (White et al. 2007). These problems have arisen out of poor and adequate provision of infrastructure and social services in peri-urban communities (Owusu, 2008). Even though most peri-urban communities fall within specific administrative units, the growth of these areas have not proceeded with adequate planning and provision of vital services. For instance, the drainage infrastructure of these areas (Ga municipalities) has been very dismal, resulting in incessant flooding incidences. Again the inadequate and poor waste management practices has resulted in a situation where solid waste is indiscriminately dumped anywhere, particularly in abandoned quarry and sand winning sites (Oteng-Ababio, 2014). The rising cost of living is not surprising, indeed, urban sprawl has not only changed livelihoods of indigenes, who have to grapple with the changes to their livelihoods, but the increase in population has increased demand for goods and services, pushing prices up and seriously affecting residents who are at the lower end of the social ladder. The rise in crime

is not also surprising. The increasing land guardism (see Oteng-Ababio, 2016) and inadequate provision of security services and infrastructure in peri-urban areas is something negatively impacting crime and residents sense of security in peri-urban areas (Frimpong et al, 2018).

The quote below highlight concerns about the environmental challenges in peri-urban areas

We have huge environmental challenges in this area. There are no proper drains and so flooding is a perennial problem. Whenever the rain season is approaching people become very worried about their property being lost to rain. There is also the issue of waste management. The Assembly hardly comes by to collect the waste, and so the skips are always full and people will be disposing of the ground close to these skips. People also put their waste into any created whole they find and within a short period it becomes a waste dump. This is a serious problem we face here. (Informant from Abokobi)

Urban sprawl has had significant impact on the lives of dwellers living in sprawling communities. Table 5.12 shows responses of respondents regarding the effects of urban sprawl on residents. It can be observed that about 38 percent of respondents indicated that urban sprawl has resulted in increasing cost of living, 16.5 percent indicated it has resulted in high demands for goods and services, 11.5 percent indicated that it has resulted reduced standard of living and 17 percent are of the view that they have challenges regarding proximity to their work places. The responses indicate that there have been structural changes of both social and economic in nature as a result of urban sprawl. The issue of increased cost of living requires attention. Indeed, the expansion of settlement, especially at the fringe areas results in a certain kind of social mix. For instance you may have both rich and poor coexisting (which happens to be the case in our context). There is demand for goods and services such as land, food etc. In some cases where demand is very high, the poor may be priced out resulting in high living cost for this section of

the populace. This situation can be true in the study communities, especially when it can be observed that population are rapidly increasing, without the vital services and infrastructure to make peri-urban areas economically viable.

Nonetheless, living in peri-urban areas can also reduce living cost when looked at from another direction. This because inner communities compared to peri-urban communities, like the Ga municipalities, continuously face urban challenges such as high rents, poor housing conditions and congestion. The low density of peri-urban areas and the low pressure on housing in terms of demand may not spur housing prices. Again, the possibility of accessing food and agricultural produce in nearby rural areas may also significantly reduce prices which may account for the reason why 11.5 percent of respondents were of the view that, urban sprawl led to lower living cost. More so, urban sprawl or expansion has taken place among major road corridors (Owusu, 2012). The relevance of this is that, it has afforded most people to have easy access to Accra central, the main business hub of the county. This is because even though the city continuous to expand, the main economic function continuous to be concentrated in the city center.

Table 5. 12: challenges associated with urban sprawl

Variable	Frequency	Percentage
Problems with access to social amenities	23	11.5
Increasing cost of living	76	38.0
Inability to get large market	11	5.5
Reduced living standard	23	11.5
Challenges to proximity to work	34	17
High demand for goods and services	33	16.5
Total	200	100.0

Source: fieldwork, 2017.

5.8 Conclusion

The chapter presented results regarding the factors that accounted for urban sprawl and the effects of urban sprawl. In summarizing the main findings presented in the chapter, the results showed that factors that influenced residents' desire to relocate included affordability of rents, search for business opportunities and desire to move into salubrious environments. Additionally, respondents also indicated that general factors accounting for urban sprawl again include rising incomes, easy accessibility to main urban centers due to available roads and poor regulation of land by local authorities. It was also shown that a majority of respondents relocated within the last ten years, with most of the respondents, about 55.5 percent, renting. Some problems associated with urban sprawl include congestion, environmental problems, increase in crime and safety concerns and rising cost of living.

CHAPTER SIX: SUMMARY, CONCLUSION AND RECOMMENDATION

6.1 Introduction

This chapter presents the summary of the main findings, which has been thoroughly presented and discussed in chapter four and five. The presentation of the key findings of the study is done in accordance with the objectives of the study. The chapter also presents conclusions on the key findings of the study. The last section of the chapter is the recommendations of the study. The recommendations are presented in the form of study implications. These include implications on both theory and policy.

6.2 Key findings of the study

This study examined the growth of Greater Accra Metropolitan Area (GAMA) between pre-colonial and post-colonial period. The study region represented the most dense urban agglomeration in Ghana. It came to the fore that the key drivers behind GAMA's spatial expansion were population growth, natural increase and rural urban migration. These findings were confirmed by the results obtained after performing a supervised maximum likelihood classification. The change detection analysis was done for a 30 year periods (i.e. 1985, 1991, 2006 and 2017). The 30 year period enabled the researcher to analyse and monitor changes to land cover and land use for the study area. In 1985, dense vegetation and sparse vegetation covered 163.52 km² (4.4%) and 2298.39 km² (62.6%) respectively. Built environment and bare lands covered 435.18 km² (11.8%) and 640.07 km² (17.4%). Water body occupied 132.63 km² (3.6%) of total land size in GAMA. These results indicated that sparse vegetation dominated the total land cover of GAMA during 1985.

Supervised classification results obtained in GAMA during 1991 showed a high coverage of sparse vegetation (32.2%). This was followed by dense vegetation (27.6%). Comparing results in 1985 and 1991 showed that dense vegetation gained an increase of 23.2%. Built environment (11.5%) recorded a reduction of 0.3% in 1991. Water body on the other hand recorded an increase of 0.6% in 1991. Bare lands also increased by 6.9% in 1991. Results in 1991 showed a decline in sparse vegetation but an increase in the other feature classes.

In 2006, bare lands dominated the total land cover (39.2%) in GAMA. It was followed by sparse vegetation (29.5%) as the second dominant feature class in the study area. Dense vegetation which previously gained an increase in 1991 depleted rapidly (14.6%). Built environment gained an increase of 1.5% which was an evidence of increasing urban population in GAMA during the late 2000's. Increase in built environment was inversely related to water body because it reduced by -0.8% in 2006.

The last Supervised Maximum Classification was analysed on 2017 Landsat satellite image. Five feature classes were obtained in the study area. Sparse vegetation (44.7%) regained its position to represent the dominant feature class in GAMA. It covered 1643.08 km² of total land size in 2017. Dense vegetation on the other hand gained just 2% of land size from the previous year. This meant that, sparse vegetation coverage exceeded dense vegetation in GAMA in present time. The situation raises concerns regarding GAMA's capacity to absorb carbon emissions which is a prime contributor of global climate change.

In regard to the drivers of urban sprawl, a number of factors were found to be associated or accounted for this phenomenon. Before highlighting on the drivers of urban sprawl, the study found that most respondents were renters and this was about 54.5 percent of the respondents. The

remaining 45.5 percent were owner occupiers. This finding complicates the assertion that people moving into peri-urban areas were from high and middle income groups. In regard to the individual relocation decisions, the study found that the major factor accounting for relocation into peri-urban areas was because of affordability rents. This finding thus support the hypothesis of the study which suggest that rent charges in peri-urban areas could be more affordable, especially when there have been an increase supply of housing in this area. The other factors that influenced individual relocation decision include job opportunities and environmental problems in inner cities. Another interesting finding from the study was the fact that, contrary to current knowledge that seems to suggest that relocation to peri-urban areas are from the inner cities, in the case of this study, quite a number of respondents moved from one peri-urban center to the other. This point was clearly shown in both Table 5.6 and Figure 5.4.

Further, the study sought to find out other broader factors that influenced urban sprawl in the GAMA. The results showed that factors such as rising level of income, lower commuting cost, construction of arterial roads and land prices were critical in the rising spate of urban sprawl in the Metropolis, and more importantly in the three study Municipalities. The study further sought to find out the period within which respondents moved to their present locations. The result indicates that close to 50 percent of respondents moved into their present peri-urban location in the last 10 years. However, it was also found that 23.0 percent of respondents had moved into the study communities prior to 1996. Thus, it can be suggested that while settlement in peri-urban communities is not a recent phenomenon, the pace it is assuming in recent times has been quite phenomenal, especially when one juxtaposed this with the current housing backlog. Further, another important issue that the study investigated was whether there have been occupational changes that have accompanied residents' relocation into peri-urban communities. The result on

this showed that there have not been much occupational changes associated with relocation into peri-urban areas.

The last objective sought to understand the effect of urban sprawl on residents. The result showed that among the major issues that residents have to grapple with include environmental problems such as poor waste management practices, problems with access to environmental services such as good and adequate sanitation services. These problems relate largely to management and governance of peri-urban communities and which falls within the purview of the local government structure. Thus we can argue therefor that the pace of urban sprawl have overwhelmed the capacity of the local government system to deal with the problem. This point therefore ties in with the second proposition of the study which stated that the provision of infrastructure and services in peri-urban settlements have not kept pace with the speed of urban sprawl. Other issues that were mentioned by respondents include increased cost of living, increased crime rates and high levels of congestion.

6.3 Conclusion

The study has demonstrated that the built environment of GAMA has seen a significant increase over the years. The rapid increase of GAMA's built up area raises important question in regard to management of vegetative cover and water bodies important in providing ecosystem services. The change in land-cover from vegetative to built-up environment has been the result of rapid residential development and to a lesser extent commercial development of peri-urban areas. The result from the remote sensing analysis indicated that the pace of land-cover change from vegetative to built-up environment seems to be rapid in recent times especially in the past 10 years.

Further, the study has provided much insight in respect of the demographics of peri-urban settlers. It was shown that residents in peri-urban areas are from diverse socio-economic background. It was also revealed that people are motivated to relocate to peri-urban communities due to a number of reasons and this include affordability of housing, increasing job opportunities in peri-urban areas and environmental challenges in most part of the inner cities. Other broader factors driving urban sprawl include rising income levels, construction and improvement of arterial roads which facilitate linkages between peri-urban communities and Accra central and lastly lower land prices in peri-urban areas which tend to facilitate housing supply in peri-urban areas. There were a number of challenges facing peri-urban respondents and this includes environmental pollution, increase crime and increased living cost.

6.4 Recommendation

Based on the research finding the following policy objectives are recommended

- From the remote sensing analysis, it can be observed that the spatial growth of Accra will continue unabated into the near future. In view of this, it is important that policy makers provide and improve infrastructure and services needed to improve the daily lives of peri-urban residents. This will include improvement in road infrastructure, good drainage facilities, extension of utility services such as water and electricity and sustainable waste management practices
- There is also the need to improve physical planning in peri-urban communities. When communities are planned well before their development, it will reduce haphazard physical development and ensure that communities have good layout and well zoned. This will maximize the use of land and facilitate the provision of infrastructure services such as street light drainage facilities etc.

- The study also brings to the fore the need to improve land management in the country. The current reforms been undertaken through the Land Administrative project is meant to address this challenge, however, delays over the years and the snail pace of its implementation continue to hamper efforts to address the land challenge. It is suggested that efforts should be fast-tracked to ensure its implementation.

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APPENDIXES

APPENDIX 1

QUESTIONNAIRE GUIDE

This research is being carried out as part of the requirement for the award of an MPhil Degree in the Department of Geography and Resource Development, University of Ghana. The study seeks to examine people's opinion about the reasons why they have relocated to their present locations and the challenges associated with leaving in this part of the city. The information is collected purely for academic research purpose as stated herein and confidentiality will be strictly observed.

SECTION I: DEMOGRAPHIC CHARACTERISTICS (Circle/tick option or write where applicable)

1. Sex of Respondent: a) Male b) Female

2. Age of Respondent:
a) 0 – 15 years b) 16 – 30 years c) 31 – 45 years d) 46 – 60 years e) Above 60 years.

3. How long have you lived in this community?
a) Less than 5 years b) 5 – 10 years c) 11 – 15 years d) 16 – 20 years e) above 20 years

4. Highest educational level of respondents a) No Formal Education b) Basic Education
c) Secondary level d) Tertiary Education e) Other (Specify)

5. What is the size of your household?

- a) Less than 3 b) 3 – 5 c) 6 – 7 d) 8 – 10 e) above 10

6. What is your average monthly household income?

- a) Ghc 0 – 200 b) Ghc 201 – 500 c) Ghc 501 – 800 d) Ghc 801 – 1000 e) Above Ghc1000

7. Marital status a) Single b) Married c) Divorced d) Widow e) Never Married

SECTION II: TREND OF URBAN SPRAWL

8. Kindly describe the boundaries of this community since you moved in?

.....
.....
.....
.....

9. How has the boundaries changed since you have lived in here?

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.....
.....
.....

10. What are some of the major cities (in terms of size and population) within Ga South?

.....
.....
.....

11. Has there been a change in the boundaries of Ga South?

- a) Yes b) No c) No Idea

12. If yes, what has been the direction of change?

- a) To the South b) To the north c) To the East d) To the West e) All directions

13. Does the increasing sprawl comes with any change to the physical environment?

- a) Yes b) No c) No idea.

14. Has there been any change in land use pattern since you have lived in this community?

- a) Yes b) No c) No idea.

15. If yes to Q13 kindly explain.

.....
.....
.....

16. What is the trend of population growth in this community?

.....
.....

17. How is the urban sprawl process linked to increasing urbanization in Ga East?

.....
.....

SECTION III: FACTORS CAUSING URBAN SPRAWL

18. Do you own or rent this property?

- a) Own b) Rent

19. Where did you live/work before relocating here?

.....

20. What were the factors that caused you to move from your previous location?

i.

ii.

iii.

21. What factors influenced your choice of housing in this community?

- a) Financial b) Proximity to work c) Access to public facilities d) other, Please explain.....

22. To what extent do you agree that the following accounts for increasing urban sprawl?

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Rising Income					
Lower Commuting cost					
Gov't Zoning Policies					
Avoidance of Crime					

SECTION IV: EFFECTS OF URBAN SPRAWL ON LIVELIHOOD STRATEGIES

23. What has is your occupation?

.....

24. Have you had a change in occupation since you lived here?

a) Yes b) No

25. If yes indicate your formal work?

.....

26. If you have had a change in occupation, do you agree that the change was caused by urban sprawl?

27. Do you have any source of income apart from the work you do?

.....

28. What are some of the challenges posed by urban sprawl in your locality?

a) Congestion b) Pollution c) Increased in crime rates d) Increased cost of living

e) Other (please specify)

29. In what ways does urban sprawl influences your livelihood strategies?

.....

.....

30. Any other comments?

.....

.....

Thanks for your cooperation.

APPENDIX 2

INTERVIEW GUIDE

This study forms part of my MPhil studies currently being undertaken at the University of Ghana, Legon. The study seeks to understand the factors that account to the development of peri-urban centers and the challenges which are associated with this phenomenon. Other issues that will also be interrogated are occupational changes associated with relocation. Please you are not obliged to complete the interview and can opt out anytime you want to do so. Information given will also be treated as confidential.

1. Please where were you residing previously?
2. Why did you decide to come and stay in your present place of residence
3. Are you currently renting or you own a house
4. What benefits have you gotten moving into this area
5. Has movement to this area changed your occupation
6. Has movement to this area changed your livelihood
7. What challenges are you currently facing as a result of moving to this place

Background of interviewer

Name:

Age:

Occupation: