SOCIAL ECOLOGY AND GREEN SPACES OF THE IBADAN METROPOLIS, NIGERIA

BY

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A THESIS in the Department of Geography, submitted to the Faculty of the Social Sciences in partial fulfillment of the requirements for the award of the degree of

DOCTOR OF PHILOSOPHY

of the

UNIVERSITY OF IBADAN

ABSTRACT

Green spaces (GS) are vegetation areas in urban landscapes, including forests, parks, gardens, wetlands and street trees. Their loss has great consequences for the aesthetic, recreational, economic and human health value and sustainability of urban environments. The literature on urban GS hasfocused on locations and effects on human well-being with limited attention to the impact of the existing social ecology (SE) on GS patterns. SE considers spatio-temporal patterns, socio-cultural variables, and underlying environmental patterns. Ibadan is Africa's largest traditional city with a long history of GS which has reduced over the years, thus providing a suitable environment for examining SE. This study was, therefore, designed to analyse the spatio-temporal patterns of GS,relationship between SE and GS, the perception on greening culture and government greening interventions in the Ibadan metropolis.

The concept of Social Ecology guided the study, while a survey research method was adopted. Cloud free Landsat Imageries (LI) of 1972, 1984, 2000 and 2015 were obtained from www.Glovis.com. Normalised Difference Vegetation Index threshold of 0.2-0.8 was used in identifying GS from the processed LI. The Oyo State map sourced from the State Valuation Department was superimposed on the LI to identify a total of 104 localities. The stratified proportional sampling technique was used to categorise the localities into four population range groups using sample percentages – A: 0.1%, B: 0.2%, C: 0.4% and D: 0.8%. The systematic technique was used to draw a total sample of 3,410 from the localities. Area of GS in each locality was thereafter computed for all the years. The change detection method was used to map the changes in GS, while Global Moran's-I was used to analyse its temporal pattern. Geographically Weighted Regression (GWR) was used to identify the SE predictors of GS in different localities. Analyses were done at $p<0.05$.

The age of residents was 33±6.01 years, and the estimated monthly income was ₦42,055±13, 934. About 46.1% had secondary education. The GS declined by -62.0%, -37.8% and -38.4% between 1972-1984, 1984-2000, and 2000-2015, respectively. In 1972 (*I*: 0.348091), the GS were principally clustered in Bodija, Elewura and Academy. In 1984 (*I:* 0.452642), 2000 (*I*: 0.313010) and 2015 (*I*: 0.229712) the GS were principally clustered around UCH, Jericho GRA, Alalubosa, Iyaganku and along Ogunpa river channels indicating unequal spatial distribution**.** Occupation, income and housing were the SE determinants of GS distribution (*Bandwidth:* 0.02: *AICc:* 3043.3; R^2*:* 0.52) while SE effects were very strong in some localities in group A (Sango, Jericho, University of Ibadan) and group B (Ring road, Molete, Apata), which are the non-traditional areas of Ibadan.The major perceived cause of GS depletion in groups A, B and C is building construction and poor development control in group D. More than 64% favoured government greening intervention, but doubted their implementation competence.

The social ecology in Ibadan has resulted in uneven spatial distribution of green spaces in the city. There is a need for policy intervention to reduce the adverse loss of green spaces and consequent effect on the environment.

Keywords: Green spaces, Social ecology, Ibadan, Nigeria
Word Count: 500

ACKNOWLEDGEMENT

I give all glory to God because without Him I am nothing. I am grateful to my supervisor, Prof. C.O. Ikporukpo, for providing necessary instructions and guidelines, and for making time to patiently read through the drafts at every stage of this research.

I am equally grateful to Dr D.D. Ajayi, Prof. J. O. Ayoade and Dr (Mrs) Ibidun O. Adelekan, for giving me the needed advice, Prof. Gbadegesin Dr. O. J. Taiwo and Dr. T.O. Osayomi for making valuable suggestions, Prof. A. Aweto, Dr. G.O. Ikwuyatum, Dr. F. A Olaniyan as well as all other staff of the Department of Geography for their support and advice. Many thanks also to the staff at the Cartography Lab and the GIS lab., especially Mr Joseph Olumoyegun, Mr Adigun and Mr Adeleye, for their prompt response to every request on data matters. I appreciate my fieldwork team members, Segun Oyegbade, Bukky Ojo, Omolara Popoola, Akin Akinade, Yinka Adesina, Taiwo Adetola, Pelumi Adekunle, Ossai, Nada, Pelumi, Dike Ozonze, Victor Oyewusi, Tunji Keyede, Victor Murana, Obafemi Michael and others for their hard work and selfless assistance.

To my fellow postgraduate students and friends at the Department of Geography, Shola Adediran, Nnamdi Chibo, Mr Alo, Moses Atteh that helped with their advice, support and prayers. I am very grateful.

I am also grateful to my parents, Prof and Dr (Mrs) Olusegun Areola and in-laws for their love, care and support during the course of this programme. My heartfelt appreciation goes to my wife Jenneh, who remained steadfastly loving, caring and understanding all through the period of this study. My Joy, I will always love you. To my children, Oluwakorede and Mofeoluwa, I say thank you for being lovely divine gifts to me.

My special gratitude goes to Pastor Akande, Pastor Adesipe, Pastor and Pastor (Mrs) Toyin Lawal, Pastor and Pastor (Mrs) Tayo Elujoba, Bro. Peter Edward, Bro. Peter Amao, Dr Victor, Emmanuel Maduforo for their ceaseless prayers and encouragement.

Lastly, to all my friends, colleagues, families, in-laws, brethren and loved ones, whose names I have not mentioned here, please accept my gratitude for your love. Thank you very much and may God bless you all.

CERTIFICATION

I certify that this research was carried out by **Abiodun Ayooluwa AREOLA (SI 140633)** in the Department of Geography, Faculty of the Social Sciences, University of Ibadan, Nigeria, in partial fulfillment of the requirements for the award of a Ph.D. degree.

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DEDICATION

This work is dedicated to the glory of the Lord, the giver of wisdom and strength.

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CHAPTER ONE

1.0 INTRODUCTION

This chapter gives the background to the study. The research problem and relevance of the study are discussed. The major research questions, the aim and objectives as well as the hypotheses are stated. The study area is presented in relation to the research study and, lastly, the scope of the study ishighlighted.

1.1 Background to Study

Greenspace is a vital part of the complex urban ecosystems. It benefits urban communities environmentally, aesthetically, recreationally and economically (Swanwick and Woolley 2003; Alberti 2008;Dadvand, Nieuwenhuijsen, Esnaola, Forns, Basagaña, Alvarez-Pedrerol and Jerrett 2015). The loss of urban green space as a result of urbanization threatens the general biodiversity of urban areas, prompting the consideration of existing urban nature more carefully (Bastian, Haase and Grunewald 2012;Crouse, Pinault, Balram, Hystad, Peters, Chen, Villeneuve 2017). The growing demand for land for residential development will increase the pressure to develop un-built urban areas like urban green spaces(Boone-Heinonen, Casanova, Richardson, Gordon-Larsen 2010). This development has serious consequences for urban nature itself, and also for residents of urban or suburban areas who might face increasing development and decreasing quantity of green areas in their neighborhoods (Ament, Moore, Herbst, Cumming 2017 ;Ehnert, Kern, Borgström, Gorissen, Maschmeyer and Egermann 2018).

There is no single definition of green space. Several studies failed to offer a definition of green space but, rather, provided examples of what was meant by greenspace. The foremost common definition delineated greenspace as vegetated areas (Carbo-Ramirez and Zuria 2011;Taylor and Hochuli 2017). The second commonest definition considered explicit examples of what is considered ‘greenspace’ for example “urban green spaces include forests, trees, parks, allotments or cemeteries” (Bastian, Haase and Grunewald 2012). Land uses, like recreational areas or undeveloped land, are the next most common definitions provided (Carbo-Ramirez and Zuria 2011;Bastian, Haase and Grunewald 2012). Some literature acknowledged that there is a range of different kinds of vegetative complexity (Tavernia and Reed 2009; Chong,Lobb,Khan,Abu-Rayya, Byun, Jalaludin 2013 ; Almanza, Jerrett, Dunton, Seto, Pentz 2012 ; Aydin and Cukur 2012;Taylor and Hochuli 2017). Furthermore, green space is defined as

'natural' environments, together with parks, woods, gardens and coastal areas (Chong, Lobb, Khan, Abu-Rayya, Byun and Jalaludin 2013).

In a study regarding the physical activity and design of communities, Almanza*et al., (*2012) referred to green space as 'greenness exposure' that is measured via normalized difference vegetation index (NDVI), focusing on all live vegetation. Furthermore, green space is sometimes, but not always, defined as comprised of vegetation and associated with natural components (Alberti 2008;Swanwick and Woolley 2003). Other associated terms of green spaces include open space, urban vegetation, parks, remnant patches, residential gardens or yards, and road verges or streetscapes. These terms all assume human interaction or an urban context.Taylor and Hochuli (2017) observed two main broad definitions of green spaces: first, greenspace as nature and, second, green space as urban vegetated space. Most existing literature fail to provide a precise definition of green space; thus, recent studies prompt that researchers ought to provide a meaningful definition and that they qualify and quantify what they mean by the term (Almanza*et al.,* 2012;White *et al.,* 2013;Chong *et al*., 2013; Taylor and Hochuli 2017).

Social ecology is also perceived in different ways by different scholars. Social ecology comes from its position that nearly all of the world's ecological problems stem from social problems (Bookchin 1964; 1995; 2005; 2007). Some authors perceived social ecology as the interactions within the socio-cultural, economic and governance contexts of people-environment relationships(Bookchin 1964, 2007; Andersson, Barthel and Ahrné 2007; Duncan, 1964; Light, 1998). Another perspective views social ecology as focusing on those drivers that may precipitate environmental changes and conversely provide a means of adapting to environmental changes (Young, 1974;Young, Berkhout, Gallopin, Janssen, Ostrom and Van der Leeuw 2006; Rosa, 2004; Goldstein 2018). These drivers have been identified as socio-political (governance), legal, economic and socio-cultural drivers (Redman, Grove and Kuby 2004; Folke 2007; Dietz, Thomas, Eugene, York 2007). Some authors also believed that social ecology does not only address the social, economic, ethnic or cultural aspects but also the psychological aspects of people-environment relations as suggested by earlier versions of human ecology (Stokols 1996; Scott 1998; Whitehead, Jones and Jones 2007; Mugica-Valdés, Acosta-Cruz, Anadón-Irizarry 2011; Liu, Vogt, Luo, He, Frank and Liu 2012). Interestingly, the study by Berkes, Colding and Folke (2003) emphasized that the social and ecological relationships depend among other things on power and gender relations, institutional arrangements, cultural practices, andpolitical-economic regimes.Stokols (1992) identified the underlying principles of social ecology. They

include:identifying a phenomenon as a social problem; viewing the problem from multiple levels and methods of analysis; utilizing and applying diverse theoretical perspectives; recognizing human-environment interactions as dynamic and active processes and considering the spatio-temporal patterns, socio-cultural,economic and governance contexts of people-environment relations.

The intense interaction between urban ecological and human-social systems has therefore led to a scenario where researchers have understood that it is necessary to take human-social systems into consideration when studying urban ecological problems (Groffman and Likens 1994; Grimm *et al*. 2000; Zipperer *et al.* 2000; Kinzig and Grove 2001; Berkowitz *et al.* 2003; Dijst *et al.* 2003; Alcock 2015; Addison and Greiner. 2016). Studies have been conducted on the integration of both ecological and social systems for investigating potential land use changes in urban areas (Dijst *et al.* 2003: Bennett and Gosnell 2015; Ban, Evans, Nenadovic and Schoon 2015; Banay, Bezold, James, Hart, Laden 2017). The integration of ecological and social systems has been known to be a useful framework in explaining landuse change, which incorporates the planning system as a central block; however it still lacks the preciseness of those drivers, interactions and feedbacks that are useful.

Some authors are of the opinion that social patterns and processes are the direct drivers of land use change (Grimm *et al* 2000; Ament, Moore, Herbst, Cumming G 2017). Furthermore, some are of the opinion that changes in ecological conditions might have an effect on humans and lead to changes in their attitudes (Andersson Tengö, McPherson, Kremer 2015; Anguelovski, Connolly, Masip, Pearsall 2018). In addition, others believe that changes in human perceptions and attitudes might feedback to politics, decision-making and other societal patterns (Basurto, Blanco, Nenadovic, Vollan 2016; Baró, Gómez-Baggethun, Haase 2017). Urban dwellers might choose their community based on several factors. Studies have shown that the existence of green areas and easy access are some of the potential factors (Grahn and Stigsdotter 2003; Guerry *et al.* 2015;Farahani *et al.,* 2018). As an example, a study in Chicago, USA, revealed that rich urban regions had higher tree cover than poor regions (Iverson and Cook 2000). However, the causative relationships are not continuously clear in such situations: is the neighbourhood poor because there are no trees, or are there no trees because the neighbourhood is poor? Equally, studies have shown that lower building efficiency of residential areas or the quantity of parks and forests increases house costs indicating that households are willing to pay

for the existence, quantity and quality of green areas (Laakso 1997; Tyrva¨inen 1997; Laakso *et al.* 2001; McEachan *et al.,* 2016;Cusack *et al.,* 2017).

Apparently, social ecology is within the sustainability discourse, primarily, targeted on the question of how complex relations between nature and society can be conceptualized, analyzed and formed (Young, 1974; Young *et al*., 2006; Folke *et al*., 2007; Dietz *et al*., 2007; Rosa, 2004). Sustainability is a direction rather than a destination (City of Vancouver, 2002). A sustainable city, therefore, is one that seeks improved public health and a higher quality of life for all its residents by limiting waste, preventing pollution, increasing conservation, promoting efficiency, and developing native resources to revitalize the local economy. Therefore, this study relies on the premise that economic growth can and should occur without damaging the social fabric of the community and without harming the environment.

The above explanations show that there is a need to contextualize the social-ecological relationship of urbangreen spaces. There are also different perspectives to the definition of green spaces and social ecology hence there is a need to establish a working definition for this study.Therefore, in this study green space is seen as areas of vegetation in a landscape, such as forests street trees and parks, gardens and backyards, farmland and waterlogged areas (Taylor and Hochuli 2017). Green space is also seen as 'greenness exposure' which is measured via normalized difference vegetation index (NDVI), focusing on all live vegetation (Almanza *et al.,* 2012). Social ecology in this study contextbelieves that ecological problems stems from social problems which emanate from the existing social organization or arrangement of a city ((Bookchin 1964, 2007).Social ecology therefore refers to people- environment interaction which considersthe spatio-temporal processes and the socio-culturalprocesses influencing the distribution of ecological resources(Bookchin 1964, 2007; Duncan, 1964; Light, 1998; Andersson *et al*., 2007).

1.2 **The Research Problem**

In the literature, urban green spaces have already been worked out in various ways covering the environmental, economic and social perspectives of urban green spaces (e.g., Burgess *et al.,* 1988; Morgenstern, 1999, Stephen *et al.* 1995; Taylor *et al.* 2,001;Jim 2004; Boone *et al.* 2009; Chiesura, 2004; Swanwick *et al.* 2003; Tzoulas *et al.* 2007; Alberti, 2005, Wendel *et al.* 2011; Ekkel and de Vries 2017). Studies have also been carried out on the perception of the urban residents of trees in low, medium and high density residential areas (Ekanade 2006). Other

studies have been carried out on factors and processes behind the destruction of urban green spaces both at local and regional scales (Chiesura 2004; Ali and Malik 2010; Mensah-Bonsu and Owusu-Ansah, 2011; Feng and Astell-Burt T 2017; Bell, Hamilton, Montarzino, Rothnie, Travlou, Alves, 2008; Maller, Mardie, Brown and Lawrence 2002; Guerry *et al.* 2015; Kuehler, Hathaway, Tirpak 2017). More importantly,Literature on green spaces in urban areas have focused more on their location and effects on human well-being with limited attention to the socio-ecological processes (socio-cultural; social, economic and governance) influencing their distribution in urban areas. This study argued that the social patterns and processes of a city (as perceived by social ecology concept) are the direct drivers of the changing spatial distribution of green spaces.

Undoubtedly, the urbanization factor is still the major driver of studies on urban green spaces. Urbanization is experienced in all countries of the world and is expected to continue in the coming decades, especially in the developing world where the United Nations Population Fund (UNPF-2007) anticipates that 80% of urban communities in the world will be recorded by 2030 (Beardsley *et al.,* 2009). Cities are confronted with a mix of growing challenges from population growth that outpaces infrastructure development, growing slums and informal settlements, changing demographic characteristics, social inequality, economic fluctuations, pollution, local changes in climate and water systems, ageing infrastructure in need of replacement, and other stressors.Studies in several African countries revealed that there is intense pressure on green spaces for different human activities resulting in persistent deterioration of these spaces especially in urban areas where the pressure is more profound (Chiesura, 2004; Dai, 2011; Cilliers, 2012; Djibril, 2012; Abbasi *et al.,* 2016; Gren and Andersson 2018). At the moment, the rapid depletion of urban green spaces in Africa has resulted in green spaces occupying only a very small proportion of the total land space of many urban areas. For example, several towns in the Republic of South Africa have less than 10 percent of their total lands occupied by green spaces (MaConnachie, 2008). In Kumasi city (Ghana), once the Garden city of West Africa, several of the green spaces in the city have been depleted leaving only a small fraction, which together with other open spaces constitute only about 10.7 percent of the total land area (Amoako, 2011). The situation in Lagos city (Nigeria) is worse as green spaces now occupy less than 3 percent of the city's landmass (Oduwaye, 2013).

The degradation of green spaces in cities is one of the ecological threats with attendant consequences on human health and environmental safety. Urban areas have to maintain an

internal equilibrium or balance between socioeconomic and environmental conditions in such a way that the urban system and its dynamics evolve in harmony, internally limiting, and as much as possible,ensuring low impacts on the natural environment (Barredo and Demicheli, 2003; Guariguata, Cronkleton, Duchelle and Zuidema 2017).The urgency of this highlights the gap in knowledge as recent studies are yet to systematically integrate the social and ecological components in explaining the processes behind variation in urban landscape. One suitable approach is through the social ecology conceptas earlier mentioned. Social ecology is a concept that emphasizes the interactions of the social, economic, ethnic or cultural contexts of people with the natural environment (Goldstein, 2018; Young, 1974). Commonly used variables are socioeconomic and policy related variables (Gunderson and Holling, 2002;Chapin, *et al.,* 2006; Tzoulas, 2007; Bennett *et al.,* 2009).

In summary, an increasing number of investigations have focused on racial and income disparities in understanding access to green spaces (Bell, Hamilton, Montarzino, Rothnie, Travlou, Alves, 2008; Maller, Mardie, Brown and Lawrence 2002; Guerry *et al.* 2015; Kuehler, Hathaway, Tirpak 2017). However, these investigations did not consider the pattern and socio-ecological processes (socio-cultural i.e. socio-eonomic dimensionsand governance system) influencing green space distribution in urban areas.

1.3 **Significance of the Study**

Urbanization remains one predominant issue that is continuously connected to the destruction of urban green spaces. This has created a knowledge gap of limited attention to other internalized factors in understanding the processes behind the distribution of urban green spaces. This thesis sought to fill this gap by exploring conceptual ideology aside urbanization (Heynen *et al*. 2006; Boone *et al*. 2009; Pham *et al*. 2012; Goldstein 2018). The concept of social ecology is a more realistic approach in understanding the processes behind the distibution of green spaces since it sees ecological problems as a function of social problems (i.e. social, economic,cultural and governace system) (Bookchin 1964; Andersson *et al*., 2007; Duncan, 1964; Light, 1998; Hertz and Schlüter 2015). Many of the underlying drivers that lead to inequitable distribution of green spaces mirror the factors that result in unequal exposure to environmental burdens in cities. For instance, historical policies related to urban planning can vary by location and influence the availability of green spaces based on the existing social ecology of a geographical area (Astell-Burtetal, 2014). Also, following the Hastings *et al.* (2006) discussion, limited access to and

availability of green space become an injustice when public policies fail to address underlying historical discrimination, exclusionary policies, and management practices.

The interaction between social processes such as residential segregation, neigbourhood stressors (e.g., income inequality), and structural factors (e.g., zoning policies and governance structure) can affect the presence of amenities and hazards in the physical environment (Payne-Sturges and Gee 2006). As an illustration, Jesdale *et al.* (2013) explored the extent of canopy cover with degrees of residential segregation across the USA and found that the lack of canopy cover was associated with segregation, especially for locations dominated by racial and ethnic minorities. Specifically, Blacks, Asians, and Hispanics were significantly more likely to live in areas with no tree canopy and more impervious surface (Jesdale *et al.* 2013). Others note how financial constraints on local governments and low awareness of the benefits from green space can restrict their development (Kabisch 2015). Similar financial constraints on low-income residents can limit their purchasing power to live in desirable communities that are often characterized by quality green spaces (Landry and Chakraborty 2009; Astell-Burt *et al.* 2014; Houlden, Weich, de Albuquerque, Jarvis, Rees, 2018).

In summary,greater attention should be given to understanding barriers to the decision-making processes experienced by disadvantaged communities (Heynen *et al.* 2006; Jennings and Johnson Gaither 2015). The concept of social ecology will help in understanding how the social–political arena works together to influence variations in urban green space. Furthermore, research has shown that the attitude of city dwellers cannot be overlooked regarding urban greening (Dai, 2011; Davoudi, 2012; Fanan, 2011; Jennings, Larson and Yun 2016). This is because human attitude, in the long run, will translate into either positive or negative environmental effects (especially government attitude to greening). In this thesis, the political arena and attitude will be addressed as perceived by the residents of Ibadan metropolis.The inclusion of the social ecology concept in urban greening will, therefore, help people in the academic and policy circles better understand the spatial and the temporal variations in urban green spaces.

1.4 **Research Questions**

The pertinent research questions arising from the foregoing discussion and the focus of this study include the following:

i. Have green spaces decreased significantly with time in Ibadan?

ii. Is there a relationship between the distribution of urban green spaces and social ecology of Ibadan?
iii. What are the socio-ecological determinants of green space distribution in Ibadan?
iv. AreIbadan residents willing to accept government greening intervention?

1.5 Aim and Objectives

The aim of this study is to investigate the role of social ecology in the distribution of urban green spaces in Ibadan Metropolis.

The rationale behind the specific objectives and hypotheses is based on the conceptualization of social ecology which may involve the consideration of the spatio-temporal, socio-cultural processes (i.e., socio-economic dimensions, governance)of an underlying observed pattern.

The specific objectives are to:

i. analyze the spatio-temporaldistribution of green spaces in Ibadan;
ii. examine the relationship between the distribution of urban green spaces and social ecology;
iii. analyze theperceived causesof green space depletionin Ibadan;
iv. examine the acceptability and non-acceptability of governmentgreening intervention.

1.6 Hypotheses

i. The spatial pattern of green spaces in Ibadan is random.
ii. Green spaces significantly decrease with time.
iii. There is a significant relationship between the distribution of urban green spaces and the social ecology of the Ibadan metropolis.

1.7 Study Area

1.7.1 *Location*

Ibadan metropolis, covering an area of 129.65km^2, is located in south-western Nigeria, 128 km inland northeast of Lagos and 530 km southwest of Abuja, the federal capital. It lies between latitudes $7^0$3'N and 7^0 10'N and longitudes 3^0 2'E and $4^0$40'E.The study area map (see Figure

1.1) for this research consists of 104 neigbourhoods which were identified by the Valuation Department of Oyo state in the 1990s. The data used for identifying these localities were based on housing properties such as types, structure and location. The digital map wasproduced by Ayeni and Fabiyi in 2006based on the identification done by the Valuation Department of Oyo state (Figure 1.1).

1.7.2 *Growth of the city*

Ibadan was established in 1829 as a war camp for warriors coming backfrom Oyo, Ife, and Ijebu. A forest site and several ranges of hills, varying in elevation from 160 to 275 meters, offered strategic defense opportunities (Mabogunje, 1968). Moreover, its location at the fringe of the forest promoted its emergence as a marketing center for traders and goods from both the forest and grassland areas. Ibadan therefore began as a military state and remained so till the last decade of the nineteenth century. The city-state succeeded in building a great empire from the 1860s to the 1890s that extended overmuch of northern and eastern Yoruba land. It was appropriately nicknamed Idi Ibon, “butt of a gun”, because of its unique military character. The warriors made up most of the rulers of the town and also the most vital economic group.

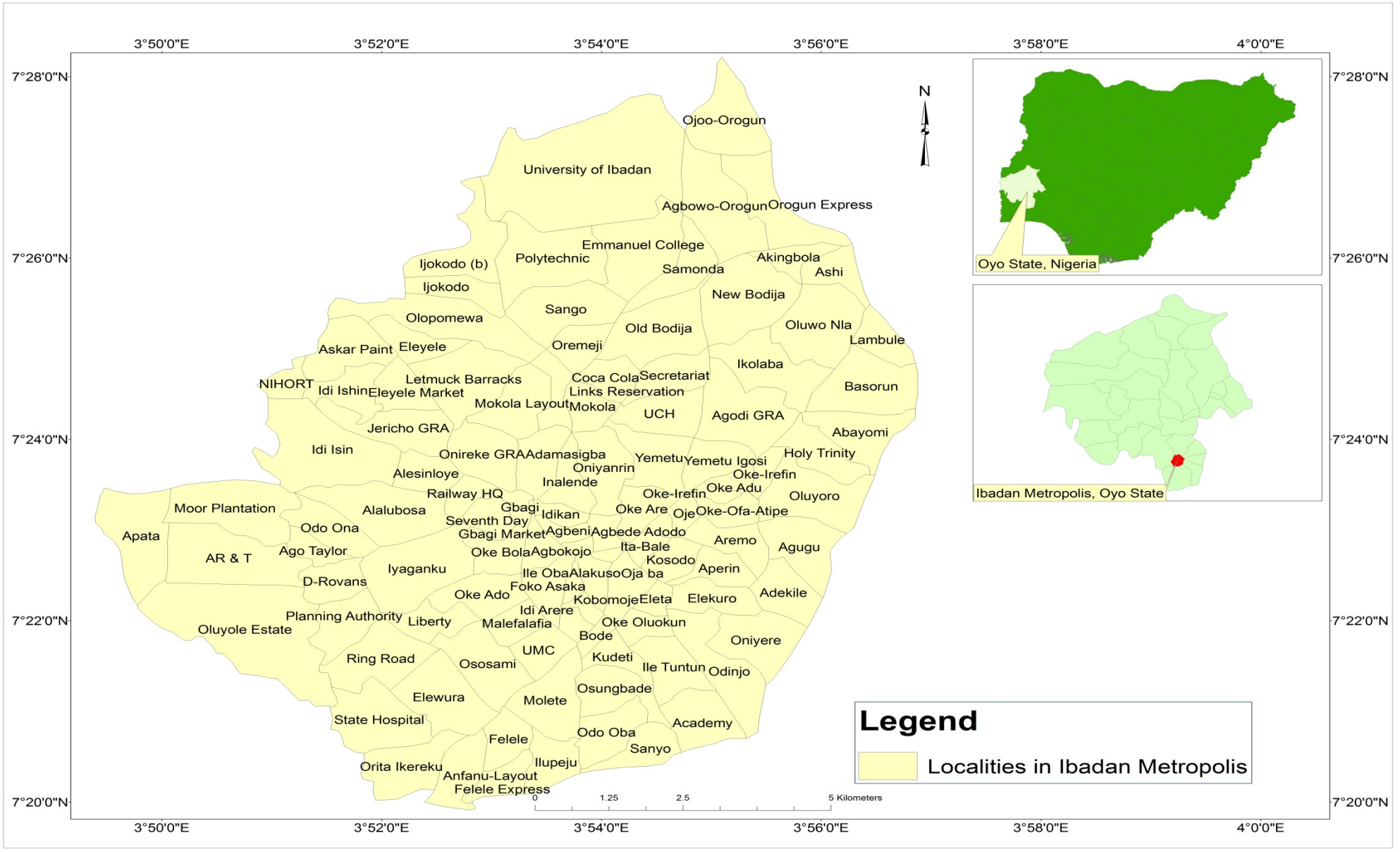


Figure 1.1: The Ibadan Metropolis showing localities.
Source of data: Valuation Department of Oyo state

Digital map by: Ayeni and Fabiyi (2006)

The economy of Ibadan primarily rested on agriculture (yam, maize, vegetable etc.), manufacture (mainly weapons, blacksmith, cloth and ceramics industries) and trade (slaves, palm oil, yam, kola for export, shea butter, salt, horses, weapons from outside) (Falola, 1984: 192).

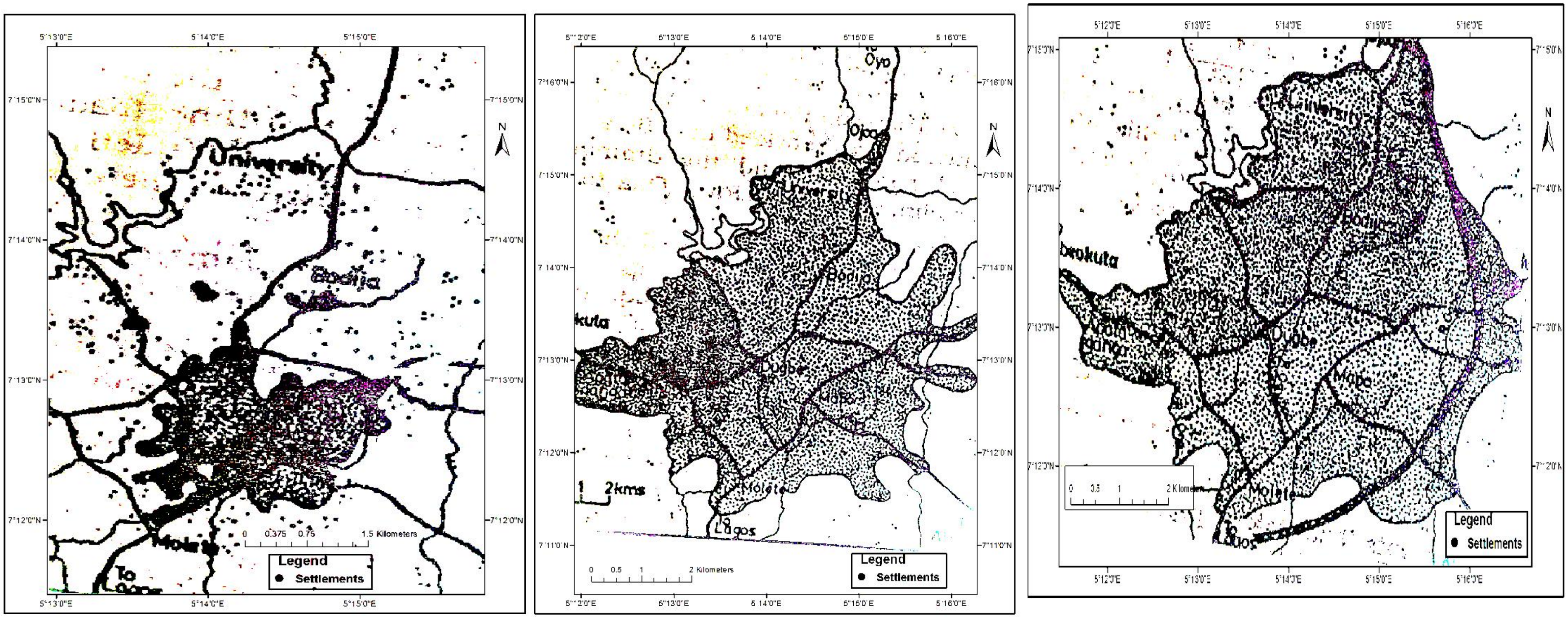
The colonial period strengthened the position of Ibadan town within the Yoruba urban network. After a small boom in rubber business (1901-1913), cocoa became the main produce of the region and attracted European and Levantine firms, as well as southern and northern traders from Lagos, Ijebu-Ode, and Kano among others. Their activities covered both the import of manufactured articles and the export of native agriculture produce, notably cocoa, palm oil, palm kernels, rubber, hides, and skins (Mabogunje, 1968). The railway to the North reached Ibadan in 1901 and all road traffic from Lagos to the North converged in Ibadan. The city became a significant zone of bulk trade. Its central location from the capital city of Lagos was major concern in the selection of Ibadan as the headquarters of the Western Provinces (1939) that became the Western Region of Nigeria in 1952. This change required a considerable transfer of political power from the British Colonial Office to the nationals of the country and commenced the process of ministerial appointments and the rapid growth in the number of government workers and buildings in the city (Mabogunje, 1968).

The importance of Ibadan was additionally increased in 1948 by the founding of the University College that later became the University of Ibadan. Ibadan also had a well-equipped teaching hospital, at that time the only one within the country. The concentration of qualified individuals inflated the purchasing power within the city and stimulated rapid growth in commerce and working opportunities. However, Ibadan failed to attract many large scale industries: by 1963 there were only forty-seven industrial institutions employing over ten individuals and 2,000 small-scale industries employing fewer than ten individuals (Mabogunje, 1968).

By 1979, the economic landscape was still dominated by small-scale industrial activities (Oketoki, 1998: 294) though a few large scale firms had been established in the newly developed industrial estates. The Structural Adjustment Programme (SAP) introduced in 1986 was supposed to motivate both Nigerian and foreign investments; limit the amount of foreign imports; and promote export-oriented industries. Thousands of small-scale and home industries have appeared since then in the metropolis. Consequently, there was a rise in employment within the informal economic sector in the 1980s and 1990s. The crisis in the economic sector and the

decrease of public funds radically modified the landscape of the city: a general decay of urban facilities and of social services affected the metropolis like other Nigerian cities. Whereas urban poverty became a national drawback in the 1980s, corruption and poor government administration increased dramatically throughout the military era notably throughout Babangida and Abacha regimes (1984-1998).

The exact population of Ibadan is unknown as a result of national census of 1991 beyond any doubt underestimated the numberof inhabitants (Ayeni, 1994; Olaniran, 1998). Moreover, it is acknowledgedthat population counts throughout the colonial period were a lot like estimates than real counts, and explaining the percentage rate of growth is quite difficult. Until 1970, Ibadan metropolis was the largest city in sub-Saharan Africa. In 1952, it was estimated that the entire area of the city was around 103.8 km^2 (Areola, 1994). However, only 36.2 km^2(or approximately, 35%) was built up (see Figure 1.2 a-c). This meant that the remaining 67 km^2(or 65%) were dedicated to non-urban uses, like farmlands, river floodplains, forest reserves, and water bodies. These "non-urban land uses" disappeared during the 1960s: an aerial photograph in 1973 revealed that the urban land use had utterly spread over a 100 km^2. The land area of the metropolis increasedfrom 136 km^2 in 1981 to 240 km^2 in 1988-89 (Areola, 1994). By the year 2000, it was calculated that Ibadan covered 400 km^2 (Onibokun 1995). In the nineteen eighties, the Ibadan-Lagos expressway generated the largest urban sprawl (east and north of the city), followed by the Eleiyele expressway (west of the city). Since then, the city has expanded further into the neighboring Akinyele and Egbeda Local Government Areas in particular.



(a) 1963 **(b) 1973** **(c) 1981**

Figure 1.2a-c: *Growth of Ibadan (1963-1981)*
Source: Areola 1994

1.7.3 *Socio-economic composition of the city*

Information on social trends and composition of Ibadan appear with the 1952 and 1991 national censuses. The information provided on the socio-economic composition of the city was based on the available documented report of the Population census of Nigeria for 1991. The unequal distribution by sex in 1952 (more male than female) had disappeared in 1991. The 1952 census has probably overemphasized the percentage of children under 14 in Ibadan. The most important figure of the change in the active population is the drop of the proportion of males between 1952 and 1991 (from almost 62 percent to less than 49 percent). This drop can be explained in relation to the radical change which occurred in the occupational structure of Ibadan, between 1952 and 1991 (Fourchard 2013).

By 1952, agricultural activities remained vital in the city, like several other African towns, with 37 percent of the population engaged in agriculture. Trading is, however, the primary activity of the city (almost 40 percent), especially among women. Craft still employs additional individuals than government administration, despite the promotion of Ibadan to the status of headquarters of the Western Province in 1939. In the middle of the twentieth century, Ibadan kept part of its qualities inherited from the mid-19th century, based mainly on agriculture, trade, and craft. The major modification within the last half of the twentieth century was the disappearance of agricultural activities within Ibadan, that is, within the area of the five local governments making up the metropolis. It went with the disappearance of the farmlands and forest reserves within the city throughout the 1960s (see above). If there was a real diversification in the labor market, notably because of the development of services (others), the major change in the occupation structure would be the development of craft and trading activities. Over 70 percent of active women were into trading activities, whereas the craft and industry sectors became the major sectors of employment for men. This cannot be understood by the establishment of a few large industrial units in Ibadan. Rather, it was the aftermath of the development of small-scale trade since the putting in place of SAP in 1986. In fact, these two activities are related to the development of the informal sector. Thus, there has been a rise in employment within the informal economic sector of Ibadan since the 1980s: the annual growth rate rose from 25.8 percent (1984-1986) to 32.5 percent (1986-1990) before dropping to 11.1 percent (1990-1993) (Akerele, 1997).

This growth of the informal sector in trading and petty craft activities was the primary consequence of the existing economic crisis and the advancement of urban poverty in Nigeria. Since 1983, crisis in the economic sector has had strong impacts on the development of slums because of the conjunction of 2 major factors: a great increase in poverty on the one hand and an increase in the property market and rental housing on the other hand. According to the Federal Office of Statistics, poverty levels increased from 28.1 percent in 1980 (representing 17.7 million people) to 65.6 percent in 1996 (representing 67.1 million Nigerians) (FOS, 1999: 24). If the core poor (extremely poor people) group was not important in 1980 in urban areas (around 3 percent), in 1996 it affected a quarter of the urban population (ibid: 26). Also, there has been a very significant rise in personal income inequalities.

In 1997, 10 per cent of Nigerians accounted for 40.8 per cent of the national income whereas in other rich West African countries the top 10 per cent accounted for only about a quarter of national income (26.1 per cent in Ivory Coast, 28.8 per cent in Ghana) (Poverty and Nigeria, Nigerian Tribune, 7 December 2000). Habituallyhigher costs of building materials hadaugmented the property market in the 1990s. The building of the Ibadan-Lagos expressway has encouraged many Lagosian workers to live in Ibadan where accommodation is cheaper. This new influx has had an important influence on Ibadan's property market as demand rises, giving estate agents and landlords opportunity to push up the rent. The rise of the property market in the Ibadan metropolis at that time resulted in the urban poor moving in search of the cheapest areas of Ibadan, the inner city and peripheral slums.

1.7.4 *Governance systems*

Urban governance in Ibadan and in Nigeria as a whole cannot be fully understood without reference to the three principal levels of power created since the 1950s: the local government, the state government, and the federal government. Each of those levels intervenes moreor less directly in urban management. The federal government participates in issues relating to urban planning through the Federal Ministry of Works and Housing. Between 1952 and 1976, the states otherwise known as regions, rapidly reinforced their hold on the local governments. The local governments never had urban autonomy throughout the first half of the twentieth century. The native authority could not apply enough measures without referring to the British District Officer. At the commencement of the process of decolonization (beginning of the 1950s), there

was a short period of urban autonomy. This was, however, followed by 20 years (1960-1980) of a decrease in the powers of local governments. During this period, localgovernments were treated much like extensions of the state government (Aliyu and Kohen, 1982; Bello-Imam 1996). Local governments gave the party in control at the regional level the opportunity to remove from power political opponents who controlled cities like Ibadan between 1952 and 1964 (Vaughan, 2000).

Furthermore, the budget of the Ibadan Municipal Government was relegated and possessed by the Western Region Ministry of Local Government and from 1976, by the Oyo State Government. In 1976, a reform targeted towards attributing a measure of local autonomy was initiated (universal adult suffrage for three-quarters of local government members, right to implement by-laws) but the states still maintained supremacy. From the 1980s, ten percent of the federal budget was transferred directly to the local governments. Nevertheless, the flexibility of the local government to come up with internal revenue folded at the same time, increasing their dependence on financial gains from federal sources (Bello-Imam, 1990). The difficulties in the financial status of the country had some negative consequences at the level of states and municipalities. Under these circumstances, most of the governments could not face the challenge of galloping urbanization. From the start of the 1990s, public services administered by the local governments (health centres, primary and secondary schools, water distribution, road repairs) and also the management of public spaces were to a level passed on to the private sector (Agbola, 1994). An increase in the number of local governments in Nigeria (from 301 in 1976 to 776 in 1996) tallied with the strong demands of the urban population. Ibadan had five new local governments within the city and eleven within the metropolitan area by 1991. The lack of timely coordination among these local governments has increased the difficulties of urban management.

1.8 **Scope of the Study**

Thisstudy adopted specific lines of thought for the research investigations. These include:-

1) ***Working definitions of Green spaces and Social Ecology***

GreenSpaces*: These are areas of vegetation* in a landscape, such as forests and street trees and parks,gardens, farmland, and waterlogged areas' (Taylor and Hochuli 2017).And also green spaces is used in this study as greenness exposure which is measured via normalized difference

vegetation index (NDVI)focusingon all live vegetation (Theshold: 02-0.8) (Almanza *et al*., 2012).

Social Ecology:Foremost, social ecology argues that most ecological problems stems from social problems and these social problems emanate from the social organization or arrangement of a city (Bookchin 1964, 2007). Social ecology in this study context refers to people-environment interaction which consider the spatio-temporal patterns and socio-cultural processes (socio-econmic, governance e.t.c) influencing the distribution of ecological resources (Bookchin 1964, 2007; Duncan, 1964; Light, 1998; Andersson *et al*., 2007).

2. ***Social ecology model for the study***

Therefore, the social ecological model for this study included the consideration of the:

i. Spatio-temporal processes (i.e. green space pattern analysis)
ii. Socio- cultural processes;
    **Individual Variables:*age,gender, income,education, occupation, ethnicity, religion, housing types and structure.
    **Perceived Variables:*greening culture and government involvement.

3. ***Geographic Scope for the study***

The geographic scope isat the locality level. The study area map (Figure 1.1) for this research consists of 104 localities which were identified/ delineated by the Valuation Department of Oyo state in 1990. The data used for identifying these localities were based on housing properties such as types, structure and location. The digital map was produced by Ayeni and Fabiyi in 2006 based on the identification done by the valuation department of Oyo state (Figure 1.1).

CHAPTER TWO

CONCEPTUAL/THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.0 Introduction

This chapter focuses on relevant concepts and theory underlying this study. Relevant literature covering the specific objectives of the study isreviewed. Thegaps in researcharealso identified and undertaken.

2.1 Concepts

The concepts guiding this study are those of urban green spaces, green infrastructure, greening and social ecology.

2.1.1 *Urban greenspaces*

There are differentterms used forurban green spaces (Table 2.1).Urban green areas consist of open spaces, generally covered with natural or planted vegetation (Enger 2005; Panduro and Veie 2013). Urban green spaces (UGS) can be of many shapes, forms, functions,and purposes.They can vary from asimple playing field to a natural landscape or highly maintained environment to which the public are mostly granted open access, although some may be privately owned. The most famous UGS are the amenity green spaces, having a high quality of landscape design and maintenance, but no single open green space example typifies what this term is(Nicol and Blake, 2000; Neil Stuart, Robert, Mohd Johari Mohd Yusof, 2013). It is important to arrive at some consensus regarding what the different terms for urban green space mean and how they are popularly understood. The term open space and green space have been applied interchangeably by urban planners and other professionals. As shown in figure 2.1, the most usual of these termsare urban environment, urban space, public space, open space, open space reserve, urban landscape, urban greening, green space and greeninfrastructure (Rakhshandehroo, Yusof, Johari and Deghati, 2015).

Table 2.1: Common definitions of green space from literature

Definition type	*Description*	*Example*
Acknowledged range	A definition that acknowledged the range of what can be considered 'green space'	"greenness describes the level of vegetation, ranging from sparsely-landscaped streets to tree-lined walk-ways to playfields and forested parks." (Almanza *et al.,* 2012)
Definition by examples	Examples were provided to illustrate what is meant by green space	"combined areas of open land, cropland, urban open land, pasture, forest, and woody perennial" (Tavernia and Reed 2009)
Ecosystem services	Examples that embody ecosystem services, such as urban agriculture, and/or a reference to serving human needs	"a type of land use which has notable contributions to urban environments in terms of ecology, aesthetics or public health, but which basically serves human needs and uses" (Aydin and Cukur 2012)
Green areas	A reference to 'green' and/or 'natural' areas without further explanation	"the area investigated included substantial green elements"(Gentin 2011)
Land uses	Generic land uses described as green space	"recreational or undeveloped land" (Boone-Heinonen, Casanova, Richardson, & Gordon-Larsen 2010)
Vegetated areas	Areas that feature vegetation	"green in the sense of being predominantly covered with vegetation" (Heckert 2013)
Two broad Definitions of Green Spaces		
Green space as nature		*Green space as urban vegetated space*
"Green spaces broadly encompass publicly accessible areas with natural vegetation, such as grass, plants or trees [and may include] built environment features, such as urban parks, as well as less managed areas, including woodland and nature reserves." (Lachowycz and Jones 2013)		"Green space is defined as any vegetated land adjoining an urban area …and includes bushland, nature reserves, national parks, outdoor sports fields, school playgrounds and rural or semi-rural areas immediately adjoining an urban area." (Chong *et al*., 2013)
"Green space includes both urban and nonurban green, from natural and semi-natural landscapes to the countryside and urban parks." (Kloek, Buijs, Boersema, & Schouten, 2013)		"urban green spaces − that are forests, trees, parks, allotments or cemeteries − provide a whole range of ecosystem services for the residents of a city" (Bastian *et al*., 2012)

Source: Taylor and Hochuli (2017)

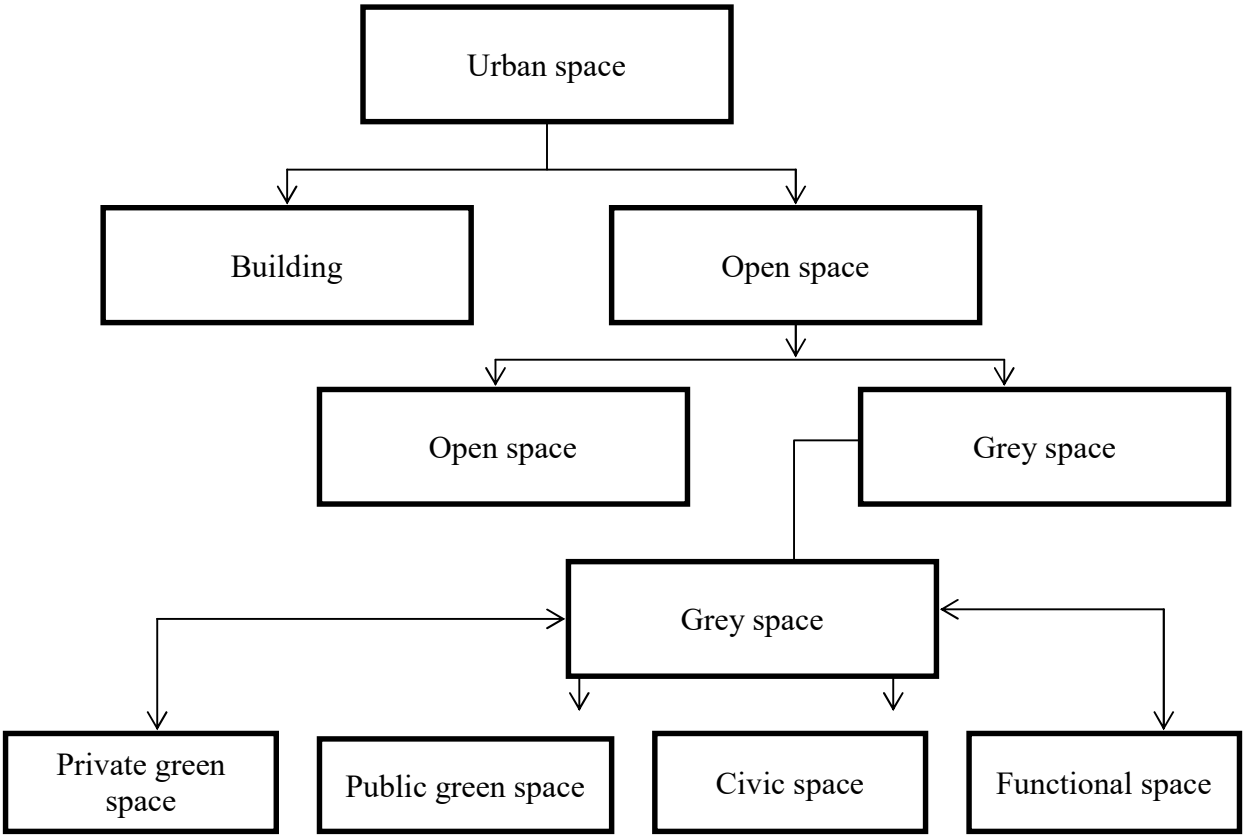


Figure 2.1: Spaces in Urban Landscape

Source: Rakhshandehroo et al., 2015

Futhermore, green space as a term can alsobe linked to the urban nature conservation movement andthe European thinking about green space planning that started in the United Kingdom (Swanwick, Dunnett and Woolley, 2003). Green space comprises all public and private open space in urban areas, mostly covered by plants (naturally or artificially) including trees, shrubs, and grasses (Fam *et al.,* 2008),which are directly or indirectly available for use (Mensah, 2014) and mainly found in semi-natural areas (Chi Yung Jim and Chen, 2003). Campbell (2001) explained that green spaces consist of any vegetated land or structure, water or geological features found in a given area. It has alsobeen definedto coverall greeninfrastructure suchas a networkof the natural, semi-natural and artificial ecological system within a given area(Tzoulas *et al.,* 2007; Mensah, 2014). Green space is used to representany vegetated land such as parkland, greenways, open space, naturalheritage, vacant lands, green infrastructure (Nicol and Blake, 2000; Enger, 2005; Tzoulas*et al.,* 2007; Springgate, 2008; Mensah, 2014).

2.1.2 *Green infrastructure*

Green infrastructure is a network of connected, high-quality, multi-functional open spaces, corridors and the links in between that provides environmental services and multiple benefits for people and wildlife (CABE, 2008). It is a network providing the ingredients in each rural and urban area for addressing urban and climatic issuesby building withnature that underpinsthe sustainabilityand increasesthe qualityof lifewith its natural and ecological processes(Olsson, 2012). Green infrastructure plays an important role in maintaining the integrity of the built space (Tiwary and Kumar, 2014). It is an inter-connected network of green space that preserves natural ecosystem values and provides associated benefits to human populations" (Comas, Carr, and Alig, 2010). The major elements of this network are climate adaptation, stormwater management, less heat stress, sustainable energy production, clean water and healthy soils etc. The anthropocentricfunctions includeincreased quality of life through recreation and provision of shade and shelter in and around cities. This is typically divided into areas (parks, gardens, squares, etc.) and paths (streets, walkways, canals, etc.), which may surround the built environment. In other wordsgreen infrastructure is a network of multi-functional green space, provided across asub-region. Green infrastructure is set within and contributes to ahigh-quality

natural and built environment that is required to deliver livabilityfor new communities (Lockhart, 2009; Mukherjee, 2013).

2.1.3 *Greening*

There are different perspectives to the term greening.Greening could mean making or keeping cities greener by designing, establishing, maintaining and managing green areas (Wright Wendel, Zarger; Mihelcic, 2012; Jim, 2013). This concept emphasizes that we look at greenery not as luxury goods for making cities more pleasant, but as a basic part of urban infrastructure. It contributes notably to the quality of life and ecosystem services in cities. Similarly, greening is also a common term for the process of selecting and planting plants next to buildings and in public parks. The goal of greening is typically a combination of environmental benefits and improving the visual design of surfaces, for instance, a green wall or green roof, as well as the creation of green spaces. This sometime needs technical measures like earthworks. Furthermore, permanent care and irrigation are usually necessary to maintain a greener environment. In some areas, there are normative requirements for the planning and execution of the greening, for example, roadsides greening (Baycan-Levent and Nijkamp, 2004; Cilliers *et al*., 2012 Djibril *et al*., 2012; Ozonoff 2014; Fuwape and Onyekwelu, 2011; Fanan *et al*., 2011; Maller, 2002; Mpofu, 2013).

Greening environment is often used as a catchall term referring to resource protection and practices which emphasize certain core concepts, such as resource efficiency and, therefore, the need to ensure that the natural systems upon which humans and all other species depend are protected (Carley *et al.* 2011).Similarly, greening can also be viewed as the process of transforming living environments, and also artifacts such as a space, a lifestyle or a brand image, into a more environmentally friendly versionInternational Energy Agency, 2009; Blaxekjaer, 2012; Boyd, 2011; Bibbee, 2011; Dercon, 2012).

Green is also used to refer generically to certain policy topics or business sectors, including activities and technology associated with the movement of people and goods; waste management and recycling, energy that is efficiently produced and consumed; the design, construction and dismantling of buildings; resource extraction; agriculture; resource management (e.g. air, water, land/open space, forests/other ecosystems, fisheries) and other environmental services (Andrade and Scarpati, 2007). Greening the environment emphasizes the interrelatedness of economic and environmental concerns. Thus, green environment policies aim

to identify the complementarities between economic and environmental challenges in a way that highlights the opportunities for new sources of economic growth (Hammer *et al.* 2011).

2.1.4 ***Social ecology***

Social ecology, as a separate field of ecology, addresses the socio-cultural, economic and gender conflicts, among many others, that lie at the core of the most serious ecological imbalances oftoday's society (Bookchin 1964; 1995; 2007). Social ecology, by definition, takes on the responsibility of evoking, elaborating, and giving an ethical content to the natural core of society and humanity (McGinnis and Ostrom 2014;McPherson 2016). The philosophical base of social ecology lies in the idea that the real background on which the ecological future of the planet will be decided is clearly a social one. Social ecology rests on the awareness of the interdependence of the biophysical and socio-cultural domains. The basic categories of social ecology are social-cultural structure, economy, polity and ecological infrastructure ((Bookchin 1995; McGinnis and Ostrom 2014;McPherson 2016; Olander *et al.,* 2018). Figure 2.2shows the general conceptual framework of social ecology. The power of social ecology lies within the association it establishes between society and ecology (Bookschin 1967;2005; Nagendra and Ostrom 2014; Olander *et al.,*2018).

Social ecology focuses on the multidimensional structure of human environments (Stokols 1996; Stokols *et al.* 2006). Environmental settings may be classified based on their physical and social components, that is, natural and built features and their immediacy to people and teams. Moreover, the participants in environment are made up of individuals, small groups, and organizations that also comprise larger communities and populations (Stokols 1996; Stokols *et al.* 2006). Therefore, social-ecological analyses incorporate multiple levels of research and numerous methodologies for assessing the resilience and wholesomeness of settings and therefore the well-being of people and teams. This discourse, multi-level perspective construes human environments as complex systems within which local settings and organizations are nested within more complex and remote regions. Therefore, attempts to understand and enhance the resilience of explicit human-environment systems should take into consideration the interdependencies that exist among immediate and better distant environments (Stokols et al. 2009). Social ecology is based upon key ideas and assumptions derived from systems theory like interdependence, homeostasis, negative feedback, and deviation amplification, to understand the

interrelationships among people and their surroundings (Maruyama 1963, Katz and Kahn 1966, Emery 1969). Social-ecological analyses of human-environment systems focuses on the transdisciplinary action research orientation such that diverse knowledge cultures, for instance, academic-disciplinary, professional practitioners and lay citizen perspectives are brought together for purposes of better understanding and ultimately improving the resilience and sustainability of people-environment systems (Stokols 2006, Brown 2010).

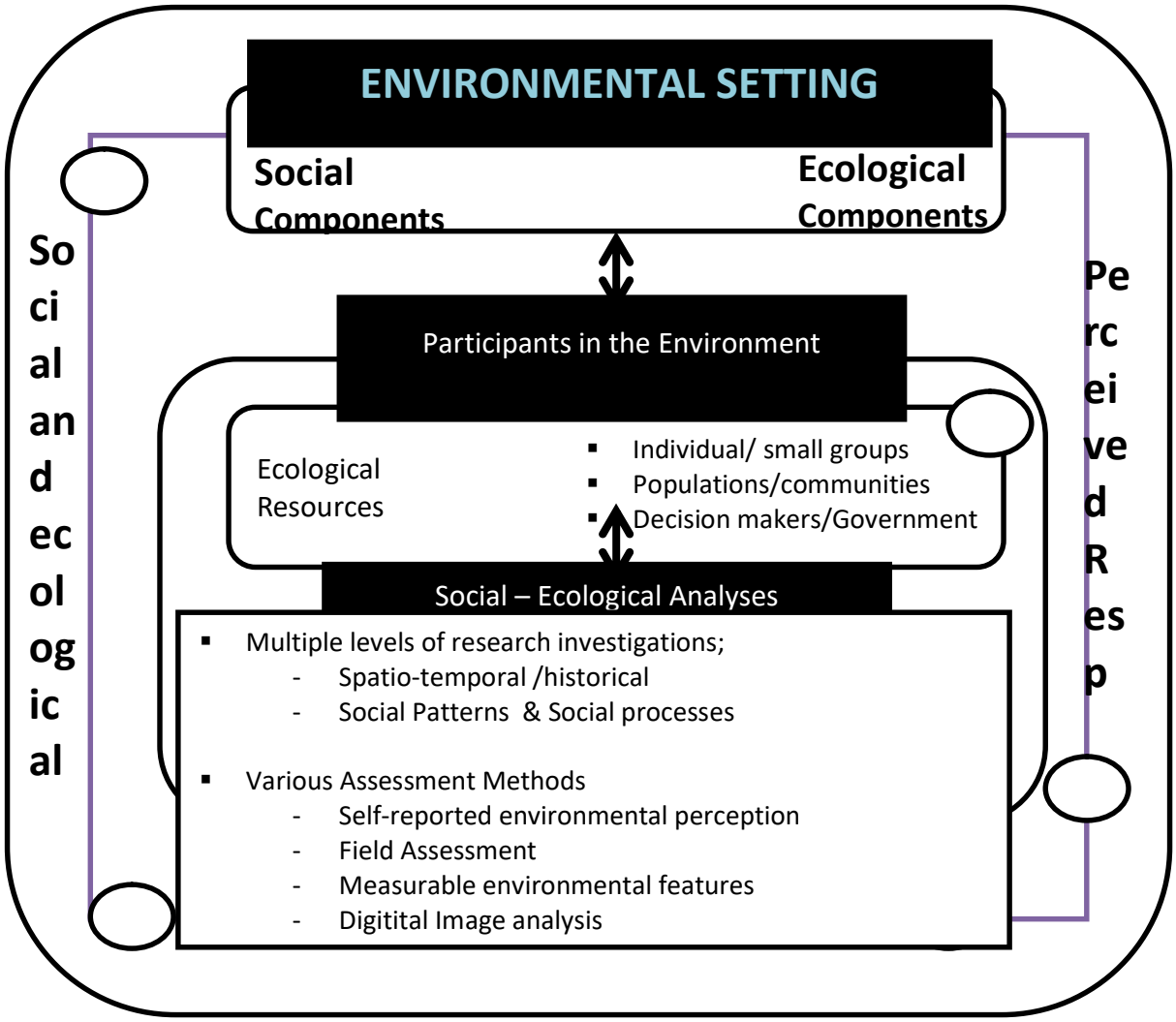


Figure 2.2: General Conceptual Model of Social Ecology
Source :(Bookchin 1967;2005; Chapin et al., 2006, Stokols 1996; *Nagendra and Ostrom 2014; Olander et al., 2018)*

2.2**Theoretical Background**

The relevant theoretical background for this study is the socio-ecological model.

2.2.1 ***Socio-Ecological Model***

The socio-ecologicalmodel is widely used as a theoretical framework to structure and understand factors influencing human behavior (Sharma *et al.,* 2016; Torralba, Fagerholm, Hartel, Moreno, Plieninger 2018). The idea behind the socio-ecological model is that the environment humans live in should be seen and studied in the same way as the environment for plants and animals, which basically comes down to the idea that one cannot understand a person's behavior without understanding the 'system' or 'environment' he or she lives in (Bronfenbrenner, 1979;Schlüter, Hinkel, Bots, and Arlinghaus 2014; Yandle, Noonan, and Gazley 2016). In a socio-ecological model, various levels of influence on a person's behavior are distinguished that, according to Giles-Corti (2006), can be divided into individual factors (i.e. socio-cultural e.g. age, gender, income ethnicity, religionetc.) and environmental factors (e.g. physical environment, perceivedenvironment (behavior, policy; government involvement). The model in figure 2.3 shows that the behavior, that is, useof urban green spaces (UGS) can be seen as the result of individual factors, the perceived environment, the physical environment,and various interactions (Giles- Corti *et al., 2005;* Sallis *et al. 2006)*

Individual factors: The individual factors such as age, education, gender and ethnicity e.t.ccan influence the use of urban green spaces (De Vries and De Bruin 1998; Payne *et al.,* 2002; Roovers *et al.,* 2002; Giles-Corti *et al.,* 2005; Galloway, 2002; Gobster, 2002;Neuvonen *et al.* 2007; Guerry *et al.* 2015;McEachan *et al.*,2016;Cusack *et al.,*2017; Farahani *et al.,* 2018).

Physical Environmental factors: size , pattern (spatio-temporal) and nature of activities are all thought to affect the use of UGS (e.g. Coles and Busey, 2000; Kaczynski *et al.,* 2008; Van Herzele and Wiedemann, 2003; Bedimo-Rung *et al.,* 2005; Giles-Corti *et al.,* 2005).

Millington *et al.* (2009) distinguish three main types of environmental assessment: self-reported environmental perception by residents; standardized field assessment by experts; assessment of measurable environmental features using a Geographic Information System. Each method has its own benefits and drawbacks, and researchers therefore increasingly use multiple methods (Millington *et al.,* 2009).

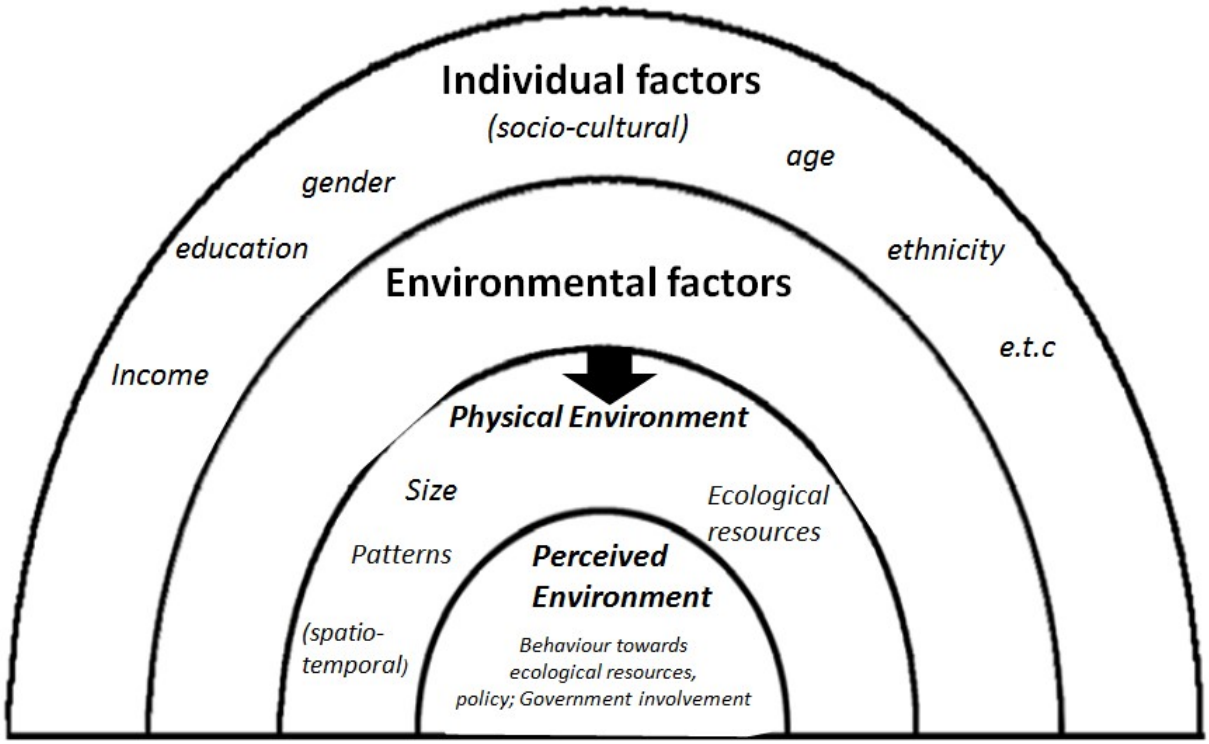


Figure 2.3: A socio-ecological model for the use of green space
Source: Giles- Corti et al., (2005) and Sallis et al. (2006)

Perceived environmental factors: Scott *et al.,*(2007) report that perceived environmental factors are a better predictor for behavior than objectively measured environmental factors. Van den Berg (2007) explains the poor correspondence between objective and perceived environmental factors by dividing space into three separate, but closely related parts: inner space, experienced space,and outer space.McCormack *et al.* (2004) argue for more studies that combine various assessment methods to determine the respective association of subjective as well as objective environmental features.

2.3 Literature Review

This section reviews literature relevant to the study. They includeliterature on urbanization and environmental change, benefits of urban green spaces, use of urban green space, policies on green space management, role of social ecology in urban ecosystem analyses, people's attitude/behaviour towards urban green spaces and greening strategies in developed countries.

2.3.1 *Urbanizationand environmental change*

Environmental change and urbanization are major issues of the international political agenda and are highly interlinked. As of today, 54% of the world's population resides in urban areas, and more than two-thirds of the world's population is projected to be urbanized by 2050 (United Nations, Department of Economic and Social Affairs, 2014). One of the major challenges for future urban planning is, thus, to prepare urban spaces for an increasing number of people while developing and maintaining cities as sustainable and livable places (Larondelle, Haase, and Kabisch, 2014). The predominant challenge found to be behind the deterioration of urban green spaces around the world is that of rapid urbanization (Tibaijuka 2007). Cairo (Egypt) and Lagos (Nigeria) which are among the most populous cities in the world are good examples. The 2010 State of African Cities Report by UN-Habitat indicated that out of the over one billion people living in Africa, close to 50 percent are dwelling in urban areas (UN Habitat, 2010). The statistics shown by the report on the intensity of urbanization and its adverse effects in Africa are frightening. For example, in West Africa where countries such as Nigeria, Ghana, Togo, Cote D'Ivoire and Liberia are located, the total urban population in 2010 was 137.2 million compared to a mere 6.6 million in 1950 while that of East Africa (Kenya, Ethiopia, Tanzania etc.) increased from 6 million in 1960 to about 77 million in 2010. The forecast shows that by 2050 the total urban population in West Africa would reach 427.7 million. The situation

in northern Africa and southern Africa is no different. Southern Africawhich includes countries such as Republic of South Africa, Zimbabwe, Zambia,remains the most urbanized region in Africa with close to 60 percent of the human population living in urban areas. Similarly, the entirepopulations in northern Africa (Egypt, Tunisia, Libya, Morocco etc.) also live in urban areas (Mensah, 2014).

Therefore, the rapid urbanisation has resulted in many cities in West Africa like Lagos, Ibadan, Kano, Kaduna, Sokoto (Nigeria), Dakar (Senegal), Freetown (Sierra Leone), Abidjan (Cote D'Ivoire), Accra, Kumasi and Tema (Ghana)losing substantial amounts of urban green spaces to urban sprawl and infrastructural developments. In a related development, a study on urban sprawl and its effect on the natural vegetation cover in Abuja (the capital city of Nigeria) showed a considerable loss of the natural vegetation to the expansion of settlements. Specifically, the study revealed that in 2001 built-up areas covered 30.51 percent of the total land area of Abuja whilst that of the natural vegetation was 21 percent. However, in 2006 the coverage of the built-up areas had increased to 42.6 per cent whilst in contrast that of the natural vegetation (green spaces) had decreased to 12.19 per cent as a result of increase in urban sprawl to contain the high population growth of the city **(**Fuwape and Onyekwelu, 2011; Mensah, 2014**)**.

Studies have also shown that rapid urbanization leads to conversion of manyurban lands into built-up structures and the massive destruction of the natural ecosystem including green spaces (Berry, 1990; Barredo and Demicheli, 2003; Honu *et al*., 2009; Akerlund *et al.*, 2006). A study of several European cities observed a reduction in the coverage of green spaces and attributed urbanization as a major cause of this problem with many of the cities increasing in size (population and land area) to cover lands reserved for green spaces (Fuller and Gaston, 2009). In the USA, McDonald *et al*. (2010) observed a loss of about 1.4 million hectares of green spaces due substantially to rapid urbanization taking place in most cities. Similar is the story in most developing countries and Africa in particular where the rate of urbanization has been identified to be high and expected to continue into the future (United Nations, 1992; Mensah-Bonsu and Owusu-Ansah, 2011, Ali and Malik, 2010; Chiesura 2004). Fanan *et al*., (2011) observed that urbanization and urban sprawl have caused Abuja (the capital city of Nigeria) to increase the loss of its green spacefrom about 21 per cent in 2001 to 61 per cent in 2006. The total land mass of Kumasi (the second city of Ghana) in 1950 was 25km^2 but due to urbanization it increased to 182km^2 in 1963 and as at 2011, it was 254km^2 (Poku-Boansi and Inkoom, 2011). Such

expansions have caused massive destruction to Kumasi's green belt and other essential green spaces. A study on some selected African cities such as Abidjan (Cote D'Ivoire), Lagos (Nigeria), Dakar (Senegal), Accra (Ghana) and Freetown (Sierra Leone) found rapid urbanization causing the conversion of many reserved green space lands to infrastructural development to meet the needs of the soaring urban population (Fuwape and Onyekwelu, 2011).

Planning of towns in most countries of the world is underlined by regulations which are made by the legislature and approved by the central government. Although several land planning regulations on green spaces are available in various African countries, the operation of such regulations has been problematic. Certain factors hinder the effective operation of urban planning regulations on green spaces in Africa such as the dysfunctional nature of urban planning regulations; the bureaucratic processes involved in issuing development permits; and lastly, the weakness of the planning institutions as a result of insufficient resources to work with (Kironde, 2006; Mensah, 2014). The dysfunctional nature of the urban planning regulations in most countries of the world especially in Africa can be linked to the outdated nature of some of these regulations meant to resolve the current development trends in urban areas. Majority of the urban planning regulations operating in some countries in Sub-Saharan Africa were made about 60 years ago along the lines of the planning regulations of their colonial masters at that time like the British, French and Germans. For instance, the Town Planning Ordinance of Nigeria of 1948, the Town Planning Act of Malawi of 1948, the Town Planning Ordinance of Tanzania and the Country Planning Ordinance of Ghana are still in operation (UN Habitat, 2009; Mensah, 2014).

Furthermore, lengthy bureaucratic processes have been found to give rise to corrupt practices such as collection of bribes by planning authorities from private developers to speed up the process. For instance, a study on Festac Town in Lagos associated the poor physical development of the town to corruption as bribes were collected by the city planning authorities (Ogundele, 2011; Mensah, 2014). The findings of that study showed that some officials of the Federal Housing Unit in charge of Festac Town area collected bribes before granting development permits to developers. This was discovered to be a major cause of the high occurrence of unauthorized building structures in Festac Town, which have destroyed much of the green vegetation in the town. This is because developers can pay bribes to get documents that enable them to encroach on lands reserved as green spaces.

The uncooperative attitude of urban dwellers towards the management of green spaces also emerged as a predominant challenge. This was found to be the result of a lack of involvement of the local people in decision making on green spaces and poor awareness of the benefits of green spaces on the part of the local people. For example, decisions on green spaces in many southern African countries (Malawi, Lesotho, Mozambique) were found to be undertaken mostly by city planning authorities without the active involvement of the local people (Southern African Development Community, 2006; Mensah, 2014). The high rate of urban poverty in the developing countries of the world has been linked to the depletion of thegreen environment as many of the poor tend to over-rely on these resources for their survival (Cilliers, 2012). Also in a study in South Africa,it was found that many poor communities relied much on the green environment for additional income or to improve their livelihood (UN Habitat 2010). The resultant effect has been excessive destruction of green spaces in many urban areas in Africa by the poor to satisfy their needs.

However, there are other factors equally as important as urbanizationbeing responsible for the destruction of green spacesbutthese have received much less attention.

2.3.2 *Benefits of urban green spaces*

Gill *et al.* (2007) emphasized that urban green spaces can play a central role in both climate-proofing cities and reducing the impacts of cities on climate. Since urbanization is resulting in increasing losses of urban green space across the globe, this may have serious implications on future changes in the Earth's climate. As a result urban green areas need to be preserved and promoted for future generation as they provide key ecological services. There are three main benefits of urban green spaces: social, economic and environmental. Green space can provide places where people can meet and develop as socialites (Coley *et al.,* 1997; Kuo *et al.,* 1998, Sullivan *et al.,* 2004). A study by Sullivan *et al*. (2004) in Chicago found that the use of outdoor spaces was related to presence of trees and grass, which also influenced the amount of social activity that took place within the green spaces and the proportion of social activities to nonsocial activities they supported. Coley *et al.* (1997) found that the presence of trees consistently predicted greater use of outdoor spaces by all people, young and older, as well as groupings of people consisting of both youth and adults together. Kuo *et al.* (1998) found that levels of vegetation were positively associated with both the use of common spaces and the

strength of neighborhood societies. Maas *et al.* (2009) found that after adjustment for socio-economic and demographic characteristics, less green space in people's living environment coincided with feelings of loneliness and with a perceived shortage of social support. Maas *et al.,* (2009) also studied the effect of green space on the feeling of social safety and their analyses suggested that more green space in people's living environment was linked with enhanced feelings of social safety;it was only in strongly urban areas that enclosed green spaces were linked with reduced feelings of social safety. Besides offering meeting places, green space can also promote a sense of community (Kim and Kaplan, 2004) by increasing feelings of emotional attachment to a neighborhood (Prezza *et al*., 2001). Urban green space can also play an important role in providing a suitable setting for outdoor education and outdoor learning (Bell *et al.,* 2007; Bentsen *et al.,* 2009).

Urban green space can have long-term positive effects on the economy but can also give more direct economic benefits and values using increased property value, willingness-to-pay for goods, urban agriculture,and city branding. The rise in thepropertyvalues withtheclosenessofurban green spaces reveals the attractiveness ofthose locations. Studies in the USA show a 20% increase in property values close to parks (Crompton, 2005). Apartment prices in Finland are higher close to water and forested recreation areas and increase with increasing size of the total forested area within a residential district (Tyrväinen, 1997). In Guangzhou, China, apartment prices are higher if they have views of green spaces and proximity to water (Jim and Chen, 2006), and in Hong Kong, the scarcity of neighborhood parks has pushed the value of housing close to few available onesto a 17% increase (Jim and Chen, 2010). In a study of three Dutch cities, houses in direct proximity to parks were found to be 6−8% more expensive and those close to water 7−11% higher in price (Luttik, 2000). Propertiesof high value located near urban green space carry a paradoxical risk that those spaces would be built on due to their attractiveness, leading to a lack of green spaces and increased socio-economic injustice in housing. Urban forests in some parts of America are more common in rich areas, where people can afford the property prices (Zhu and Zhang, 2008).

Urban green spaces provide many direct environmental benefits. Urban vegetation contributes to the reduction of atmospheric CO_2 by direct sequestration (McPherson, 1998; Nowak and Crane, 2002), and, when placed strategically, by reducing energy consumption for heating and cooling (Simpson, 1998). Urban green space helps to reduce the urban heat island

effect. A study measuring air temperature over a 12 hour period at 10 sites on a transect across Primrose Hill, a London park, found temperatures to be on an average 0.6ºC cooler in the park compared to neighboring streets. The main shopping street, which offered no shading, was up to 3ºC warmer than the center of the park (Graves *et al*., 2001). Urban green space can also help to improve urban hydrology by intercepting rainfall (Xiao *et al.,* 2000), increasing rainwater infiltration and increasing the water storage capacity (Tyrväinen *et al.,* 2005). Also the presence of UGS, and especially urban woodland, can reduce surface runoff and, consequently, the risk of soil erosion and flooding (Pauleit and Duhme, 2000).

Urban green spaces provide several human health benefits like longevity, physical and mental well-being, brain power and child development, all important for sustainable social and economic development. Proximity to attractive, public areas with many functions, such as parks, increases physical activity in the form of walking (Jackson, 2003; Giles-Corti, *et al.,* 2005; Fastenrath Braun 2018). Access to gardens and other green spaces promote the functioning of outdoor activities and healthy transport, reducing stress and overweight (Nielsen and Hansen, 2007). People are healthier when living in urban areas with access to much green space as compared to rural areas (de Vries, *et al.,* 2003), and with less sick-leave (Maas, *et al.,* 2009). People consider themselves healthier when they are closer to green space from their home (Maas, *et al.,* 2006).The possibility of living a long and healthy life is affected by access to outdoor activities in all facets of life, not least in childhood (Ward Thompson, Aspinall,and Montarzino, 2008). Longevity inurban areas for the aged increases with access to parks and tree-lined streets (Takano, Nakamura and Watanabe, 2002), but green spaces must be well-kept to promote walking by the elderly (Sugiyama and Ward Thompson, 2008). The risk of dying from severe diseases like a number of cancer formswill be significantly reduced by having green spaces close to home (Zoeller, 2009; Orsini, *et al.,* 2009). For example, a study shows thatpeople whose age are 62 and above live a healthier life if they have allotment gardens (van den Berg, *et al.,* 2010).

Access to green spaces plays a major role in the child-friendliness of cities and children's physical and mental development. Among children in highly urbanized areas, the risk of overweight can be reduced by proximity to much vegetation (Liu, *et al.,* 2007). Accessibility to e.g. parks with shadowing vegetation and playgrounds increases everyday physical activity among children (Timpiero, *et al.,* 2008). Studies have shown that public playgrounds close

tovegetation are frequently used compared to other playgrounds (Jansson, 2010; Refshauge, Stigsdotter and Cosco, 2012). A park playground within 1km of the home is linked with a five-fold reduced risk of a child having an unhealthy weight (Potwarka, Kaczynski and Flack, 2008). Closeness to schools, parks and recreation facilities is vital for physical activity among teenagers, but they consider it a major problem if parks are too small, badly kept or not welcoming to them (Tucker, *et al.,* 2008). Also, preschool grounds that have slopes, trees and shrubs make children to be physically active and better protected from unhealthy effects from solar radiation than traditional, flat open yards (Boldemann, *et al.,* 2006).

Green areas in cities havedevelopmental and educational values that can beadopted in school teaching (Dyment and Reid, 2005). School groundgardeninghas manypositive effects on children and their behavior, including educational results (Blair, 2009). Research has shown that schools with large windows surrounded by trees and shrubs have a higher proportion of pupils with good study results and plans for highereducation than other schools (Matsuoka, 2010). Viewing vegetation from the home is linked withincreased cognitive abilities among children in low-income families (Wells, 2000). Children often use natural vegetation close to housing, since children's mobility is limited unless in organized groups or similar (Florgård and Forsberg, 2006). Access to green areas makes children more creative (Taylor, *et al.,* 1998) and also support children with difficulties in concentrating (Kuo and Taylor, 2004).Spending time in green environmentsfacilitates the recovery and power of the human brain. Engaging in walks in parks offers shelter from stressful city life thereby improving concentration and mental control (Berman, Jonides and Kaplan, 2008). Green environments have special benefits in helping the brain recover from mental fatigue or after crises (Ottosson 2001; Hartig, *et al.,* 2003). Among the aged, the ability to concentrate is higher after resting in a garden than in a pleasant indoor environment (Ottosson and Grahn, 2005). The natural shrinkage of brain grey matter is slower among the aged who walk a lot (Erickson, *et al.,* 2010), especially with access to green areas (Giles-Corti, *et al.,* 2005).

*2.3.3 **Use of urban green space***

Looking at studies on the use of urban green space published over the years, it becomes clear that in most studies data were collected on-site by means of surveys or observations using selected urban green spaces as case studies (Arnberger, 2006; Arnberger and Eder, 2007;

Chiesura, 2004; Gobster, 2002; Guldager and Jensen, 2005; Janowsky and Becker, 2003; Randrup *et al.,* 2008; Roovers *et al.,* 2002; Tinsley *et al.,* 2002; Yilmaz *et al.,* 2007). This type of studies provides a good picture of the people actually using an urban green space and their preferences, but it does not include the views of potential users that are currently not using the urban green space. A few studies have a setup that provides data on both current users and potential users by randomly selecting residents that live in the vicinity of a selected green space and including them in a postal or telephone survey (Coles and Bussey, 2000; Payne *et al.,* 2002; Randrup *et al.,* 2008). This second type of studies has the advantage that it can reveal possible barriers or constraints for not using a certain urban green space. A third group of studies looked at the use of all urban green space close to respondents' homes in one or more cities or neighbourhoods by conducting a postal or telephone survey targeting randomly selected citizens (Giles-Corti *et al.,* 2005a; Grahn and Stigsdotter, 2003; Hillsdon *et al.,* 2006; Holm, 2000; Sasidharan *et al.,* 2005; Sanesi and Chiarello, 2006; Sasidharan *et al.,* 2005; Tyrväinen *et al.,* 2007; Kaczynski *et al.,* 2009; Neuvonen *et al.,* 2007). This type of studies provides good information on the total use of urban green space, as respondents tend to use more than one area, but most of these studies lack knowledge on exactly which urban green space is used for what.

According to the found literature, distance to green space is the most important factor related to its use. The closer a green space is to each individual home, the more it is used (Björk *et al.,* 2008; Coles and Bussey, 2000; Giles-Corti*et al.,* 2005; Grahn and Stigsdotter, 2003; Jensen and Koch, 2004; Nielsen and Hansen, 2007; Roovers e*t al.,* 2002). A distance of 300-400 meters is often mentioned as threshold beyond which use starts to decline (Coles and Bussey, 2000; Giles-Corti *et al.,* 2005; Grahn and Stigsdotter, 2003; Nielsen and Hansen, 2007). None the less, only a few of thesestudies found actually looked at the distance city residents have to travel to their nearest green space (Oh and Jeong, 2007; Van Herzele and Wiedemann, 2003; Barbosa *et al.,* 2007; Comber *et al.,* 2008; Kessel *et al.* 2009;). Several studies report significant differences in the use of green space for different population segments (Coles and Bussey, 2000; Galloway, 2002; Holm, 2000; Payne *et al.,* 2002; Sanesi and Chiarello, 2006; Tinsley *et al.,* 2002; Sasidharan *et al.,* 2005; Yilmaz *et al.,* 2007).

Finally, some studies report that different characteristics of green space, such as size and the presence of facilities, have an effect on its use (Coles and Bussey, 2000; Giles-Corti *et al.,* 2005; Kaczynski *et al.,* 2009). When looking at the available literature, it is unclear whether or

not the availability of urban green spaces (UGS) is equally distributed among the different socioeconomic classes in society. Some North American studies (e.g. Heynen *et al.,* 2006; Wolch *et al.,* 2005) conclude that deprived areas have less green space whereas Barbosa *et al.* (2007) and Kessel *et al.* (2009) found that areas with a lower socio-economic status have better access to green space in two UK cities, and the same was found in Perth, Australia, by Giles-Corti and Donovan (2002).

2.3.4 Policies on green space management

There is also interest in green spaces in poor and minority communities, which has stimulated a second wave (Taylor *et al.* 2007; Yandle *et al.,* 2016) and an expansion of the urban environmental justice agenda (Anguelovski 2015; Jennings *et al.*2012). The first wave of environmental justice studies focused on environmental hazards and locally unwanted land uses (LULU), particularly in racial/ethnic minority and low-income communities (Bullard 2000). However, in order to practice sustainable development principles, it is essential to incorporate considerations of nature's benefits (i.e., ecosystem services) and natural capital in decision-making processes (Guerry *et al.* 2015). Practices that can be helpful from a planning perspective include empirically evaluating growth management policies and streamlining multiple policy strategies to improve effectiveness (Bengston *et al.* 2004; Kwon, Joo, Han and Park 2017; Liang *et al*2017).

Some policies to manage green space often focus on both real and perceived disservices that natural spaces can provide for people. For example, these risks can be related to transmission of insect-borne diseases such as malaria (Quiroga *et al.* 2013), falling branches or trees, and a negative perception of safety in some neighbourhoods (Lachowycz and Jones 2013). For instance, some qualitative studiesnotethatcrimeand poorlymaintainedrecreational areas orfeworganizedactivities can limit physical activity in low-income areas (Jarrett *et al.* 2013; Jarrett *et al.* 2012).Through better practices, the structure and configuration of vegetation can be managed in the urban environment in order to sustain and account for ecosystem services in multiple settings. Some recommend that affirmative actions to increase green space availability in low-income communities are a strategy to redress such inequalities (Astell-Burtetal.2014).Watkins *et al.* (2016) analyzed four non-profittree-planting programs in the USA and found that they are less likely to happen in areas with more racial/ethnics minorities in

general and low-income levels in particular. With this in mind, tree planting initiatives should not only expand in disadvantaged communities (Watkins *et al.* 2016) but also incorporate strategies to support long-term maintenance in such initiatives.

Other factors influence the effectiveness and longevity of green space initiatives in minority and low-income communities. For example, scholars are careful to note that increasingaccesstogreen spacedoesnotnecessarilyguaranteethattheywillbeutilized in a way that is conducive to public health (Astell-Burt *et al.* 2014; Floyd *et al*. 2008;Markevych *et al.,* 2017; Lin *et al.* 2018), especially for individuals who are not physically active or who have other concerns related to the outdoor activity (e.g., severe allergies) (Jennings and Johnson Gaither 2015). Although green space initiatives can enhance neighborhoods and increase local property values (Wolch *et al.* 2014), many low-income residents are concerned about gentrification which can cause them to be displaced to other locations (Watkins *et al.* 2016; Wolch *et al.* 2014; Watkins *et al.* 2016).Acknowledging that all green spaces are not created equally (Jennings and Johnson Gaither 2015; Kondo *et al*. 2015; Tanner *et al*. 2014) is important since green spaces present trade-offs that should be considered in the context of ecosystem management (Escobedo*et al.*2011;Patak*iet al.*2011) aswellashealthandwell-being(Jenningsand Johnson Gaither 2015; Lovasi *et al*.2013).

Political instability also has contributed to the poor management and rapid deterioration of urban green spaces in Africa. Over the last two decades, several civil wars have taken place in many African countries such as Sudan, Somalia, Liberia, Chad, Mali, Cote D'Ivoire, Sierra Leone, Democratic Republic of Congo, Rwanda, Angola,and Libya. The devastating effects of these civil wars on urban development as well as green spaces cannot be overstated. For example, in Liberia, the over 10 years' civil war in the country destroyed substantial areas of the urban natural environment in Monrovia (capital city), Buchanan and other areas (United Nations 2004). The Somalia civil war destroyed many urban trees. During the war, some major urban areas such as Hargeisa, Borama, Berbera,and Erigavo were the hot spots of the war and in view of that, both indigenous and foreign trees in these areas were destroyed through cross bombardments (Mensah, 2014).

*2.3.5 **Role of social ecology in urban ecosystem analyses***

Conceptual and methodological tools introduced byecologists in the 19th Century (longitudinal observations of plant and animal habitats especially homeostatic processes of adaptation) were

later used for the study of human communities by a group of sociologists at the University of Chicago around 1920 and 1930. This group was popularly known as the Chicago School of Human Ecology (Park *et al.* 1925) and was broadened to cover like-minded sociologists based at other universities (e.g., Hawley 1950). The Chicago School incorporated the ecologists'emphasis on adaptation processes with macroeconomic theories of urban development. For example,Haig's (1926) theory of highest and best use of land and Christaller's(1933) central place theory were applied to explain the spatial distribution of financial resources, behavioral disorders, and health problems observed among sub-groups of Chicago's population residing in different zones of the metropolitan region. However, the relationships between material and social dimensions of urban communities, as construed by the Chicago School of human ecologists, emphasized the unidirectional influence of material conditions on social phenomena, rather than the reciprocal transactions among them.

Another limitation of the Chicago school's "concentric zone" theory of human ecology is that it was extreme in explaining the biological and economic facets of human ecosystems while neglecting the sociopolitical, symbolic, legal, philosophical, ethical, and environmental design facets of human communities (Michelson 1970). Firey (1945) argued that environmental elements of human ecosystems specialize in the symbolic and also in the material meanings that usually exist in contrast to their economic and locational values. Also, Alihan (1938) had published an earlier assessment of the Chicago School calling for the establishment of a more integrative interdisciplinary conceptualization of human communities that link the concerns of bio ecology and economics together with ethics, anthropology, urban planning, psychology, sociology, and other fields. Alihan and systems theorists like Emery and Trist (1972) called this broader conceptualization and study of human-environment relationships as social ecology.

In contemporary scholarship, social ecology generally refers to the study of communities from a broad, interdisciplinary perspective that encompasses bio ecological and macro-economic concerns, but gives greater attention to the social, cultural, institutional, and psychological contexts of people-environmentinteractions as compared to earlier human ecology research (Michelson 1970, Moos 1979, Stokols 1996, Redman 1999, Stokols et al. 2003, Ostrom 2009, Peterson 2010). In studying the reciprocal interactions of the biophysical world and the human social world, social ecology draws upon sociological theories of power, ideology, social organization, etc.as well as the concepts and findings of scientific ecology (Binder 1972; Stokols

1996; Redman 1999; Ostrom 2009; Stokols *et al.* 2003). The power of social ecology lies in the relationship association it establishes between society and ecology, the social conceived as fulfillment of the latest dimension of freedom in nature, and the ecological came into being as the organizing principle of social development, in other words, the guidelines for an ecological society (Bookchin 1995; 2005).

There is greater relevance in applying the theory of social ecology to understand the modern development pattern. Most of the development interventions ideally aim at ensuring a good quality of life for human beings. In this process, the technology-driven development pattern tends to impact on the relationship dimensions of the human beings to the ecology and also generates a different relationship pattern between those who own the technology and those who use or consume the technology (Peterson 2010). Urban green spaces are by their very nature highly patchy and also dynamic, influenced by the biophysical and ecological drivers on the one hand and social and economic drivers on the other hand (Tinsley *et al*., 2002; Yilmaz *et al*., 2007). Factors such as climate change, species extinction and invasion, constitute potential biophysical and ecological drivers, whereas human population change, urban sprawl, real estate, and banking practices act as primary social and economic drivers.Urban green spaces produce several ecosystem services, providing recreational and educational values as well as ecological processes such as pollination and seed dispersal and other services such as air filtration, microclimate regulation, noise reduction, rainwater drainage, and sewage treatment. In the face of increasing and rapid environmental change in urban areas, a continuous generation of ecosystem services cannot be taken for granted and a challenge is how to sustain the flow of services delivered in growing urban areas (Sasidharan *et al*., 2005; Sanesi and Chiarello, 2006).

Studies on urban biodiversities have shown that variation in socioeconomic factors, thathave been used to refer to social, demographic, and economic criteria, are important factors of variation in residential green infrastructure in cities generally (Pickett *et al.* 2011; Cook *et al.* 2012; Marco *et al.* 2010; Cook *et al.* 2012; Cilliers *et al.* 2012). These studies have produced a variety of competing theories and generalizations about which socioeconomic factors are most important at generating urban vegetation variation and under what circumstances (Kendal *et al.* 2012). Several studies have found significant relationship between plant diversity and abundance and household wealth, a relationship that has been termed “the luxury effect” (Hope *et al.* 2003, Melles 2005). Such trends suggest an unequal distribution in the quality of green infrastructure

throughout many cities that are unsure with most accepted sustainability definitions (Hope *et al.* 2003, Martin *et al.* 2004, Lubbe *et al.* 2010; Drexhage and Murphy 2010). Some of the mechanistic explanations incorporate the migration of rich house owners to areas of high biodiversity to plant vegetation by higher income groups (Hope *et al.* 2003; Mennis 2006). Moreover, not all yard house owner interactions have had a purely economic basis and instead may reflect social, demographic, or cultural factors that may vary from place to place (Marco *et al.* 2010, Cilliers *et al.* 2012, and Kendal*et al.* 2012).

In some cities, for instance, education level rather than income is a better predictor of vegetation characteristics in urban neighborhoods (Heynen and Lindsey 2003, Luck *et al.* 2009). This relationship has been attributed to a higher knowledge of the benefits of vegetation (Luck *et al.* 2009) or a higher valuing of vegetation by the more educated (Lohr *et al.* 2004). Others factors, such as demographic stage, family size, and household ownership, can also be important contributors to vegetation variation in urban neighborhoods in addition to economic ones. Vegetation cover may show positive association to home ownership and resident's age, which may stem from a higher degree of attachment to or time to spend on planting activities (Luck *et al.* 2009). Biophysical, yard area and historical, age of house factors can interact with socioeconomic factors to influence biodiversity at the residential scale in urban areas (Grove *et al.* 2006, Mennis 2006, Kendal *et al.* 2012). From the point of view of residential green spaces, the general consensus of urban studies is that "bottom-up" factors, i.e., household socioeconomic and demographic factors, dominate the variation generated across urban households. On the other hand, vegetation traits of public green spaces tend to be driven by "top-down" ones, i.e., top-down planning and management processes related to governance structures, institutions, and political factors (Kinzig *et al.* 2005, Heynen *et al.* 2006, Landry and Chakraborty 2009, Cook *et al.* 2012).

The intense interaction between urban ecological and human-social systems has led to a situation where researchers have understood that it is necessary to take human-social systems into account when studying urban ecological issues (Groffman and Likens 1994; Grimm *et al.* 2000; Zipperer *et al.* 2000; Kinzig andGrove 2001; Berkowitz *et al.* 2003; Dijst *et al.* 2003). Socioeconomic and cultural factors drive many aspects of green space management (Wheeler *et al.* 2015; Wood*et al.,* 2018). Demonstrating a positive correlation between wealth (or indices of wealth) and biodiversity, the well-known "luxury effect" (Grove *et al.* 2014) has been found in

an increasing number of cities around the world. For example, in some towns in the Eastern Cape of South Africa, street trees are of various kinds in affluent areas (Kuruneri-Chitepo and Shackleton 2011) and in Phoenix, Arizona, higherincome neighborhoods support the greatest number of native lizard species (Ackley *et al*. 2015). The luxury effect is motivated to an extent by the combination of positive associations among house prices, access to green space (Brander and Koetse 2011), and the ability of individual householders to buy plants and landscape their yards. In other words, in several cities of the world, people have varying degrees of ability to directly affect the green space on or near their homes via habitat modification. In Tlokwe City Municipality, South Africa, plant diversity across the municipality increased with increasing socioeconomic status, driven by the planting of non-native horticultural species in yards and gardens of landowners of higher socioeconomic status (Lubbe *et al*. 2010). Although such patterns have been demonstrated across several cities, contrasting patterns do exist, making generalizations difficult.

Negative relationships among biodiversity, access to green space, and occurrence of racial minorities have been documented in both northern and southern hemisphere cities, primarily driven by socioeconomics and segregation legacies (Perkins *et al.* 2004; Lubbe *et al.* 2010). Lifestyles and life stages, irrespective of income, are also important determinants of UGS management (Grove *et al*. 2014). The household decision making as it concerns garden and yard management is complex. In many regions, cultural traditions drive garden management, such as the Tswana tshimo (home gardens) of the Batswana people in the North West province of South Africa; there, the area around the house is kept devoid of vegetation but other areas of the yard incorporate both native and non-native plants in medicinal and food gardens, in addition to a separate natural area garden (Lubbe e*t al.* 2010).

Human perceptions of nature also have a strong influence on behaviors associated with maintaining UGS (Clayton 2007). Aesthetics, safety, property values, and social pressures often drive management goals for both public and private UGS (Nassauer 1995). As a result, a mix of individual preferences and neighbor perceptions influences yard management (Goddard *et al.* 2013). These social pressures can lead to negative outcomes for biodiversity where harmful management practices are reinforced (e.g. use of lawn chemicals; Fraser *et al.* 2013) or positive outcomes where neighborhood mimicry results in diffusion of wildlife-friendly management practices (Goddard *et al.* 2013). Sustainable yard management practices that spread through

social diffusion have the potential to foster ecological connections between private yards and gardens across landscape scales, maximizing biodiversity management at ecologically relevant scales. Local stewardship and other social organizations, such as homeowner and neighborhood associations, have the opportunity to influence and coordinate biodiversity-friendly management across yards (Lerman *et al.* 2012).

2.3.6 ***Peoplesattitude and behavior towards urban green spaces***

Attitude is a complex construct with cognitive (knowledge), affective (feelings) and conative (behavioral) components (Walmsley and Lewis, 1984). As such an attitude is formed and affected by socio-economic, cultural and biophysical interactions. Attitude is also a powerful predictor of behavior and thus an important tool in determining human response to policies and planning decisions (Kaiser *et al.,* 1999; Tuan, 1990). Also, attitudes at the local scale can impact aggregated level observations as individuals are behaviorally and psychologically distinct because of genetic and environmental influences.

Measuring individual attitudes towards urban green spaces has received sparse coverage in the environment and planning literature (Gerd and Wänke, 2002; Wan and Shen 2015; Kondo, Hohl, Han, Branas 2016). One reason may be due to the greater importance that natural forests have occupied in global environmental concerns with the result that local land use types such as urban green spaces have not been comprehensively studied. Another reason is that local environments have complex social characteristics and it has been technically easier and more cost-effective to generalize research results using coarser scales of analysis. However, this approach risks incurring ecological and exception fallacy problems (Trochim, 1999). In the ecological fallacy, inferences from aggregate to individual measures are unreliable and not able to capture the intricate local attitude dynamics. In the exception fallacy, outlier measurements distort the degree to which aggregated data can represent reality. Accurately characterizing the complexity of individual attitudes can better support the integration of all interest groups, optimize local benefits, and increase success in community planning efforts by using cooperative management strategies (Gerd and Wänke, 2002; Wan and Shen 2015; Kondo, Hohl, Han, Branas 2016).

Attitude is not directly observable and therefore strategies such as inferred cues and interrogation using questionnaire surveys have been the methods of choice in attitude

measurements (Dawes, 1972). Therefore, effective attitude measurement depends on its systematic behavior and the reliability of the system used to measure it. In measuring attitude, local scale analysis and multivariate statistical analysis approaches are needed to simultaneously explore the dimensions of the attitude construct in order to produce more accurate and robust local scale representations. The evidence in environmental psychology indicates that attitude towards the environment is a multi-dimensional construct with the common components being value orientations, demographics, knowledge, and context (Blake, 2001; Lakhan and Lavalle, 2002; Schultz and Zelezny, 1999). Measuring citizens' attitudes towards urban green spaces has been achieved largely through structured questionnaire surveys. The dominant use of questionnaire surveys to characterize environmental attitudes is described in several studies that explore, for example, attitudes toward urban growth (Henwood and Pidgeon, 2001), quality of life (Bonaiuto *et al.,* 2003), community conservation (Mehta and Heinen, 2001), forestry (McFarlane and Boxall, 2000), rural woodlots (Erickson *et al.,* 2002), and energy use (Knight, 1990). These studies are valuable as they act at a local level and address fine scale social complexities and attitude dynamics. The research literature has explored attitude either alone or as value–attitude or attitude-behavior linkages (Kondo, Han, Donovan, and MacDonald 2017).

McFarlane and Boxall (2000) explored forest attitude using a bottom-up approach in which the cognitive hierarchy model of value–attitude relationships was used to examine forest values and attitudes between forest user groups. Values are consistent knowledge and belief about the worth or importance of an object. A survey questionnaire with socio-economic, values, attitude, and knowledge items was used to explore the different dimensions associated with values and attitudes. In their study, the authors found that socio-economic factors, social influences, and knowledge had little influence on attitude (McFarlane and Boxall, 2000). However, it was established that forest values (what people believe to be true about forests) were strongly related to attitude. This confirmed research evidencesthat the measurement of attitudes must consider individual characteristics that influence personal values. Other published studies have supported the value - attitude link in different contexts (Gotmark *et al.,* 2000; Schultz and Zelezny, 1999; Tarrant and Cordell, 1997; Vaske and Donnelly, 1999). The consensus seems to be that many factors affect

attitude and that environmental attitude research serves to provide lists of possible factors that can be tested in new contexts to explore the effects of these factors on attitude.

` Lakhan and Lavalle (2002) attempted to isolate significant factors influencing environmental concern by using a semi-structured survey. Categorical data analysis showed that age and education formed significant factors (Lakhan and Lavalle, 2002). But there was no support for gender and residential location. Another study on attitude found age and education to be significant, but not gender and marital status (Kasapoglu and Ecevit, 2002). The role of demography (Hartup, 1994), access and equity (Lindsey *et al.,* 2001), perceptions (Trakolis, 2001), utility and amenity value (Henwood and Pidgeon, 2001; Solecki and Welch, 1995), and community conservation (Mehta and Heinen, 2001) in environmental attitude studies are documented. These studies suggest that attitude is context dependent and local analysis is needed for its accurate measurement. Much of the complexity and articulation of people's perceptions of urban green areas are well-established. It was for example highlighted by a series of qualitative and quantitative studies carried out by Bonnes and his colleagues in various Italian cities (Bonnes, Aiello, & Ardone, 1995; Bonnes, Carrus, Bonaiuto, Fornara, and Passafaro, 2004; Bonnes *et al.,* 1999; Carrus, Passafaro and Bonnes, 2004; Lafortezza *et al.,* 2009). One aim of these early studies was to identify the various factors that form the basis of residents' perception of urban green spaces. The results of one of these studies show for example how positive and negative attitudes toward urban green areas could coexist in people's mind (Bonnes *et al.,* 1999).

Collaborative geographical information systems (GIS) provide a foundation to integrate the spatial component into attitude measurements. A collaborative GIS is a networked collection of computer hardware, geographical software, and interest groups within a traditional workshop type setting (Armstrong, 1994). The purpose is to capture, store, manage and visualize spatial data and knowledge to guide unstructured problems towards solutions and new learning opportunities. During the collaborative GIS process, participants combine knowledge and share, explain, analyze, and visualize map-based data to elaborate on issues and challenges (Faber *et al.,* 1996). The foundation of the collaborative GIS approach is rooted in the theory of communicative action where discourse or language-based communication and argumentation are used as formal procedures to elaborate ideas and agree on decisions (Habermas, 1984). Digital maps are used to support and document knowledge and provide an environment for oral and visual stimulation of attitudes. The collaborative GIS

provide benefits such as real-time interactions, inclusiveness, social learning, and awareness about the shared challenges that need common solutions (Balram *et al.,* 2003; Godschalk *et al.,* 1992; Roche and Humeau, 1999). But focus group workshops and interviews applied separately can reveal different valuation information (Kaplowitz and Hoehn, 2001). By integrating these in a spatial context using the collaborative GIS, a broad range of spatial and non-spatial issues associated with attitude is addressed. The integration creates opportunities to improve content validity by making all the issues associated with urban green spaces attitude clearer.

2.3.7 ***Greening strategies in developed countries***

The European Commission has introduced legislation and several strategies for developing and enhancing urban green and blue spaces, such as the Green Infrastructure Strategy (EC, 2013), the Biodiversity Strategy (EC, 2011), the Habitats Directive (CEC, 1992) and the Water Framework Directive (CEC, 2000). These initiatives (more indirectly) and the current EU research programme, Horizon 2020 (EC, 2016) emphasize two concepts, in particular, Green Infrastructure (GI) and Nature-based Solutions (NBS) as important concepts in the discussion about sustainable cities and as ways to address the UN Sustainable Development Goal No. 11: *Make cities and human settlements inclusive, safe, resilient and sustainable* (*https://sustainabledevelopment.un.org*). Both GI and NBS are concepts based on the different contributions of green spaces to the urban environment. GI refers to an interconnected network of green spaces that helps stop the loss of biodiversity and enables ecosystems to deliver their many services to people and nature (Benedict and McMahon, 2002). NBS are instruments inspired by nature and using the properties and functions of ecosystems to enhance ecosystem services (EC 2013) and multiple health benefits (Kabisch *et al.,* 2016; Mathey, Roßler, Banse, Lehmann and Brauer, 2015). They claim to provide solutions for a broadly contextualized 'environmental and health challenge' in cities mainly referring to air pollution, extreme heat and flood events and increasing numbers of cardiovascular diseases, asthma or obesity on the one hand, and losses of life and disproportional property values on the other (UN Habitat, 2012). These arguments build upon the 'healthy city debate' (e.g. World Health Organization, 2012), and the discussion around climate change adaptation (Cohen-Shacham, Walters, Janzen and McGinnis, 2016) where urban green spaces play an important role in mediating climate change-related impacts. At the same time, GI and NBS often claim to address social issues such as social

cohesion, socio-spatial inequalities and an unequal distribution of goods and burdens in and across cities. EU documents on GI and NBS (2015) argue that the multiple benefits of their installation include 'fostering social cohesion', and contributing to the solution of 'various societal challenges'. However, in reality, little is known about how the implementation of green strategies or policies could affect health and wellbeing, livelihood and the living conditions of the urban poor in the medium and longer-term (Anguelovski *et al.,* 2015).

To green cities GI and NBS constitute an active intervention to enlarge and to maintain the quantity, enhance the quality and improve the network of green spaces in a city. Green Infrastructure (GI) is a strategically planned and designed network of natural and semi-natural areas, integrated with other environmental features and managed to conserve biodiversity and to deliver a wide range of ecosystem services (Benedict and McMahon, 2002). In cities, it may include any kind of vegetation cover such as parks, forest, public green spaces, private gardens, and roof gardens. Furthermore, blue spaces and other physical features in terrestrial (including coastal) and marine areas are also considered as GI. Green Infrastructure (GI) embodies the principles of multi-functionality and connectivity and offers a strategic planning approach to make use of ecosystem properties to support human health and wellbeing (Landscape Institute, 2013; Rouse and Bunster-Offa, 2013). GI relies on the principle that conscious integration of measures to protect and enhance nature and ecosystem processes into spatial planning and territorial development support and safeguard many essential benefits for human society in cities (EC, 2013). GI is assumed to have general and largely positive effects on people's quality of life, health,and wellbeing. However, whether these effects are fairly distributed over a city's population or to what extent they directly contribute to a decrease in inequalities is much less clear and awaits further more in-depth analyses including qualitative studies (e.g. as discussed by Botzat, Fischer, and Kowarik, 2016; De la Barrera, Reyes-Paecke, and Banzhaf, 2016).

Nature-based Solutions (NBS) are living solutions inspired by, continuously supported by and using nature. They are designed to address various environmental challenges in a resource efficient and adaptable manner and to provide simultaneously economic, social and environmental benefits (European Commission, 2015; Kabisch *et al.,* 2016). NBS might include anything from genetically modified organisms, bio mimicry developments, to small-scale land management, ecosystem restoration, and the greening of artificial surfaces such as rooftops or walls in cities. At a larger scale, NBC can include integrated climate change mitigation and

adaptation measures such as afforestation, natural flood control and, potentially, geo-engineering. NBS is supposed to contribute positively to social inclusiveness even beyond the functions to increase social wellbeing, health and quality of life for urban residents. This should happen through urban gardening, ecologically well-adapted forms of housing and transport, quality of life support through activities in green and clean environments as well as the reduction of environmental burdens through nature-based technologies (European Commission, 2015). All of this is expected to have (generally) positive socially inclusive effects; however, empirical evidence for this relationshiphas not been gathered yet.

Greening strategies carry a paradoxical risk of fostering greater inequality among social groups rather than fostering social cohesion and inclusiveness (Wachsmuth and Cohen, 2016). Undoubtedly, greening cities, installing new parks and using the space along the streets for diverse greenery, for example, contribute to an increase in wellbeing and enhance the attractiveness of open spaces in cities despite potential disservices like pollen allergies (Dohren andHaase, 2015). At the same time, there areincreasing uses of greening strategies that are officially adopted as ingredients of urban renewal, upgrading and revitalization projects but are in reality first and foremost market-driven endeavors primarily catering for higher income residents (Anguelovski, 2015; Sham, 2012). Less affluent, low income and homeless people, in contrast, are threatened by displacement (see Cucca, 2012 for examples from different cities).

There is a documented trend of growing inequality in many cities across Europe, as evidenced by, among other things, increasing socio-spatial segregation, even polarization (Cucca, 2012). This is reflected in an increasingly uneven distribution of environmental goods and burdens among urban residents, e.g. access to urban green, recreational areas or the possibility to live in a healthy place (Kabisch and Haase, 2014), as well as the uneven exposure to risks. Unequal socio-spatial distribution is reflected by differences in the quantity and size of green spaces, the structure of vegetation, and their quality (De la Barrera et *al.,* 2016). Poorer areas often have less vegetation, especially fewer trees, in contrast to more affluent urban areas with plenty of private gardens and shady green spaces, providing a larger amount and diversity of ecosystem services (De la Barrera, Rubio and Banzhaf, 2016). In this context, greening projects may be seen as "ways that entrepreneurial urban regimes have sought to incorporate the green agenda" into a neoliberal development, something White, Jonas, and Gibbs (2004) articulated as a 'sustainability fix'. One effect (intended or not) is that existing social inequalities

in access to public resources and the possibilities for urban dwellers to benefit from environmental goods are, in some cases, not improved by urban renewal activities, and might be even exacerbated (Curran and Hamilton, 2012; Gould and Lewis, 2009; Wolch *et al.,* 2014).

In conclusion, the literature reviewedhas shown that there are underlying conceptual facts that can explain better the spatial pattern of green spaces over time. The literature has also identified empirical facts and research gaps which need to be expanded upon or addressed. Hence, the focus and scope of this research as presented in Chapter one and expanded upon subsequently in Chapter Three of this thesis.

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CHAPTER THREE
RESEARCH METHODOLOGY

3.0 Introduction

This chapter is divided into three sections describing respectively data sources, data collection,and data analysis. There are however conceptual principles guiding the methodology of this study(see *section 1.8; scope of study*).

3.1 Types of Data Sources

Data for this study were obtained from two sources namely primary and secondary sources.

3.1.1 *Primary sources*

Primary data were collected through a structured questionnaire survey and focus group discussion (FGD).The structured questionnaire was divided into three sections. Section A is concerned with information to characterize Ibadan metropolis using the social ecology indicators. The social ecology indicators selected for this study included gender, age, ethnicity, religion, occupation, education, income, housing type, housing structure; wall material,and housing structure; roof material*(details on how the dataset was transformed is explained in section 3.3-Data Analysis)*. Section B is about the distributional pattern of green spaces while section C is about the perceived causes and role of government in greening the environment.

An investigation of green space situation from pre – independence (around 1955) was essential using focus group discussion (FGD) to improve on the subsequent geospatial assessment of green space situation in Ibadan metropolis. The FGD was obtainedfrom the locality elders in Ibadan metropolis.(*choice of year is explained in the preceeding section*)

3.1.2. Secondary Sources

Secondary data for this study were obtained mainly from remotely sensed data and GIS-based sources for extracting the green areas.The data collection commenced fully in 2015. The initial intention was to use a ten year- interval; however, since the data were not available at that interval, a 15-year interval was applied. A backward count from 2015 resulted in the following years:-2015, 2000, 1985 and 1970. Hence the choice of 1955 for investigating green space situation from pre-independence. There were however one main exception on the satellite imagery selection for 1970 and 1985. The earliest satellite imagery for the study area was

captured in1972 while the closest for 1985 is the 1984 Landsat imagery;the study therefore obtained the closest available Landsat satellite imagery which was 1972 as a proxy for1970 while the Landsat satellite imagery for 1984 was a proxy for 1985.The specifications are as follows:

- Landsat- 4 Thematic Mapper of 8 Nov 1972 with 7 spectral bands, where the bands 1 -7 have a spatial resolution of 60 meters obtained from United States Geological Survey (USGS). EarthExplorer https://earthexplorer.usgs.gov/order
- Landsat 5 Thematic Mapper (TM) of 18 Dec 1984 with a spatial resolution of 30m and 7 bands obtained from USGS. EarthExplorer https://earthexplorer.usgs.gov/order
- Landsat Enhanced Thematic Mapper plus (ETM+) of 28th May 2000 with 8 spectral bands where bands 1-7 havethe spatial resolution of 30 meters and band 8 (panchromatic band) hasa higher spatial resolution of 15 meters were obtained from USGS. EarthExplorer https://earthexplorer.usgs.gov/order
- Landsat Enhanced Thematic Mapper plus (ETM+) of 15th June 2015 with 8 spectral bands were obtained from USGS. EarthExplorer https://earthexplorer.usgs.gov/order

3.2 **Data Collection**

Three main sets of data were collected for this study bearing in mind the social ecology concept. The data collection approach included: (i) Land use land cover classification; (ii) Focus Group Discussion (FGD);and (iii) structured questionnaire survey.

Before embarking on the data collection, the researcher took a tour round Ibadan city to ascertain the suitability of using Ibadan metropolis as a study site.In addition to the tour, a *virtual earth approach* was employed using Google Earth software which enabled a "bird's-eye" or “fly through” viewing of the city. The outcome of these activities showed some localities having significant green spaces while some had little or no green spaces. On these bases, the locality map of Ibadan metropolis which is made up of 104localities (see Figure 1.1 p.7) constituted the spatial units of measurement. As earlier mentioned in the study area section, the 104 localitieswere identified by the Valuation Department of Oyo State. The data used for identifying these localities were based on housing properties such as types, structure and location. The digital map as shown in figure 1.1 was produced by Ayeni and Fabiyi (2006).

3.2.1 ***Land use/land cover classification (LULC) approach***

The first step in the collection of the Landsat images involved the ordering for the images from USGS EarthExplorer, *https://earthexplorer.usgs.gov/order.* The other steps included (i) Image Processing; (ii) Computation of the Normalized Difference Vegetation Index (NDVI)to derivea threshold for identifying green areas; (iii) Image classification – Green space extraction;and (iv) Green space are calculation in square meters per neigbourhood. To achieve accurate change detection mapping, multispectral images must be pre-processed both geometrically and radiometrically to correct errors arising from imaging sensors, atmospheric effect, and earth's curvature. Pre-processing operations sometimes referred to as image restoration and rectification, are intended to correct for sensor and platform-specific radiometric and geometric distortions of data. However, since the images (Landsat - 4 (1972), Landsat 5 (1984), Landsat ETM+ (2000), Landsat ETM+ (2015) had been ortho-rectified by USGS EarthExplorer, there was no need for radiometric and geometric corrections. The false color composite of these images were obtained by the combination of bands 4, 3, 2 (Infrared, red, Green) using Idrisi Selva 17.0 software.

3.2.1.1 Normalized Difference Vegetation Index (NDVI)

The Landsat images of 1972, 1984, 2000 and 2015 were subjected to NDVI analysis to derive a threshold for identifying green areas in each neigbourhood using the Image Analysis tool of ArcGIS (See figure 3.1). The Normalized Difference Vegetation Index was introduced by Rouse *et al* (1974) in order to produce a spectral Vegetation Index (VI) that separates green vegetation from its background soil brightness using Landsat multispectral digital data. It is expressed as the difference between the near Infrared and red bands normalized by the sum of those bands i.e. NDVI = NIR – RED/NIR+RED. NDVI is the most commonly used VI as it retains the ability to minimize topographic effects while producing a linear measurement scale. In addition, division by zero errors is significantly reduced. Furthermore, the measurement scale has the desirable property of range of -1 to +1 with 0 representing the approximate value of no vegetation. Very low values of NDVI (0.1 and below) correspond to barren areas of rock, sand, or snow. Moderate values (0.2 to 0.3) represent shrub and grassland, while high values (0.6 to 0.8) indicate temperate and tropical rainforests. For the purpose of this study, the greenness brightness

threshold is from 0.2 to 0.8 (Almanza *et al*., 2012). The NDVI for each periodic year is shown in figure 3.1.

3.2.1.2 Green space extraction/mapping

The mapping covers the greenness brightness between 0.2 - 0.8 measured via normalized difference vegetation index (NDVI) (Rouse et al 1974; Almanza et al., 2012), focusing on all live vegetation cover.The process of extraction is called *digitization*. Digitization is the process of converting information into a digital format for further analysis. For the extraction, two major land use/ land cover classes were of interest; green areas and built up areas. The green areas included forests, grasses, street trees and parks, gardens and backyards, farmland and waterlogged areas. The builtup areas, on the other hand, included buidings and bare ground. To achieve this, the shapefile of Ibadan metropolis was superimposedon the Landsat NDVI Images (1972 (proxy for 1970), 1984 (proxy for 1985), 2000, and 2015 respectively) using ArcGIS 10.4.1 (see figure 3.1). The green areas were therefore mapped using the vegetation brightness threshold of 0.2 – 0.8 as specified in the literature.

3.2.1.3 Green space calculation in square meter

After the process of digitization, the green spaces were saved as *shapefiles* and thereafter subjected to measurement. The goal here was to measure the area extent of the green spaces for each locality for the respective years. Using the measure tool of ArcGIS the green spaces were calculated in square meter (sqm) (see Appendix D for results of the green space measurements in square meter for the respective years.

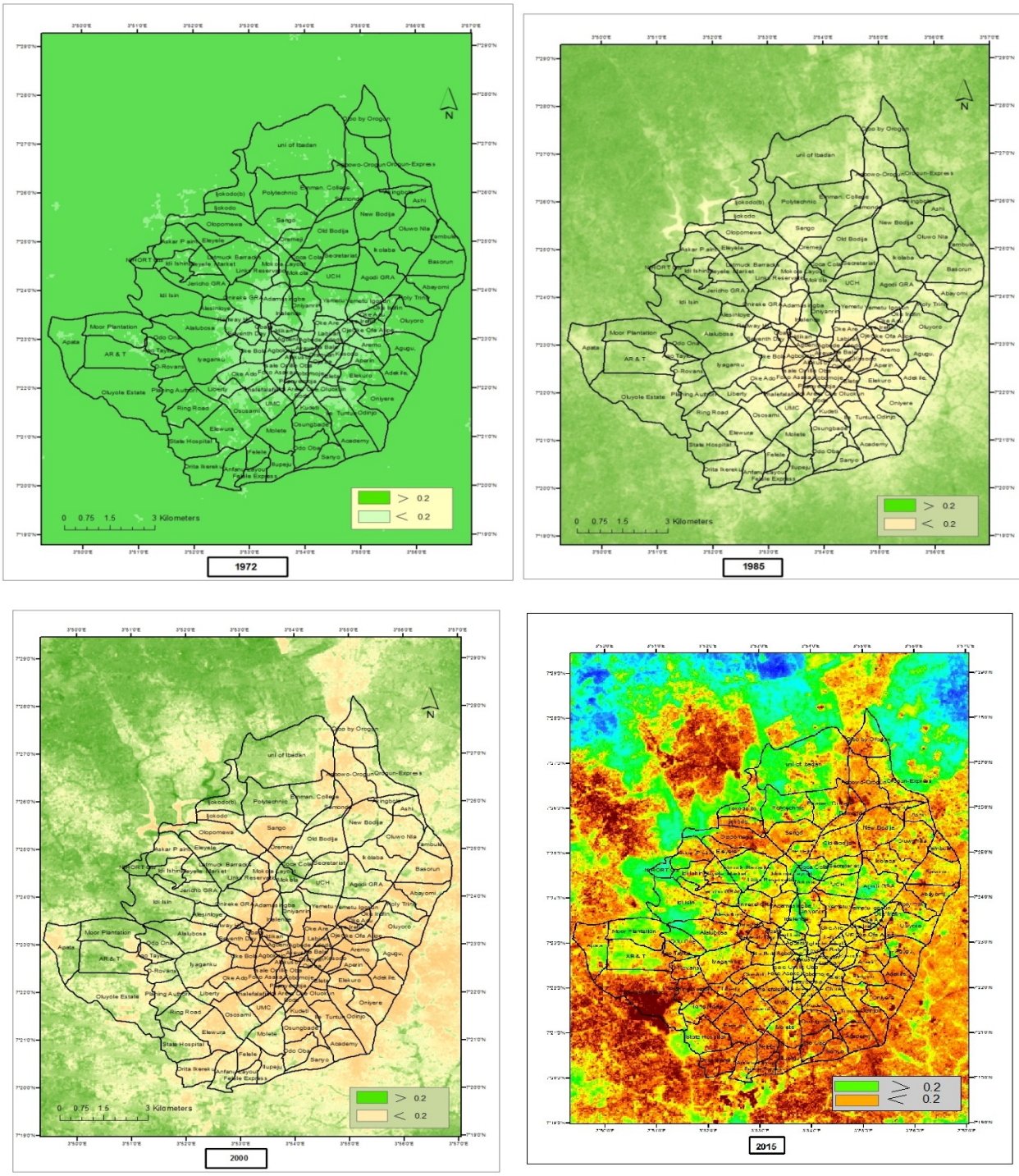


Figure 3.1: Normalized Difference Vegetation Index of Landsat Imagery 1972 (proxy:1970), 1984 (proxy:1985), 2000 and 2015

3.2.2 ***Focus group discussion (FGD)***

The focus group discussion (FGD) was carried out to give explanations to green space depletion from pre- independence to 2015. The target respondentswere the elders of each neigbourhood mainly becausethe elders were well informed about developments and the disappearance of green spaces as farback as pre-independence days. The elders also have information passed on to them by their fathers or forefathers through *oral history*. They are therefore not neccessarily those that were bornbefore pre-independence.

The age limit for an elder for this researchstudy is 65 years old as adopted from United Nations report on ageing (2015 till date).A typical FGD consistedof representatives from each locality and total numbers of participants rangedfrom4 to 8. The participants includedaged men and women that were between 65 and 75 years old. The leaders of the landlords' associations and locality heads were present at the discussion.Appendix E-2 shows plates of typical FGDsin session during the field data collection exercise.

The process of conducting a focus group discussion was tedious and time consuming. The starting point was to regroup the 104 localities into smaller number for the purpose of detailed focus group interviews. Twenty – one groups emergedby considering the proximity/distance of localities from one another (the groups are listed in Table 3.1). More importantly their similarity / homogeneity in terms of their physical/ spatial characteristics also informed the groupings. The next step was to visit the local government secretariats based on each locality constituency. The council members assisted in identifying some elders who were actively involved in their local areas. The elders were contacted and further arrangements were made ahead of the focus group discussions. The leaders of landlords' associationsas well as locality heads in each locality were also identified and they served as medium of reaching and assembling the elders for the FGDs.The primary challenges were the language barrier and difficulty in assembling the target participants. The language barrier was therebecause the researcher did not understand the local dialect but was particularly interested in getting the elders to give specific answers on issues raised rather than general or vague responses. Most of the interviews started off in the mornings around 11am and a single session could last for as long as 2 hours. Sometimes, it could just be one focus group interview that would be conducted in a day due to the challenge of assembling the targetparticipants and the technical language barrier. In all, it took 32 weeks to complete the focus group discussions.

Table 3.1: Locality Groupings for the Focus Group Discussions

No	Locality Groupings
1)	Oranyan, Kosodo, Ita bale, Adodo, Oje
2)	Popoyemoja, Foko Asaka, Koboomoje, Isale Osile Oba
3)	Kudeti, Bode, Oke Oluokun, Eleta, Oja Oba
4)	Felele, Ilupeju, Molete, Odo Oba, Osungabde
5)	Oke Bola, Seven Day Adventist Area, Alegunloye, Railway headquarters, Agbokoju
6)	Apata, Moor plantation, IAR & T, Ago Taylor, Odo Ona
7)	Adekile, Agugu, Oluyoro, Abayomi, Basorun, Yanbule, Akobo
8)	Oke Ofa, Atipe, Oke Irefin, Oke Adu, Holy Trinity
9)	Sanyo, Academy, Odinjo, Ile Tuntun, Elekuro
10)	Oke Are, Yemetu, Yemetu Igosu, Oniyanrin, Mokola
11)	Coco cola Layout, Oremeji, Sango, Polytechnic, Samonda,
12)	Emmanuel College layout, Agbowo, Orogun,
13)	Bodija, Ashi, Akingbola, Oluwonla,
14)	Ikolaba, UCH, Agodi GRA
15)	Oluyole, D- Rovans area, Ring road, Orita Ikereku, Elewura
16)	Anfani, Ososami, UMC, Imalefalafia, Arere
17)	Liberty, Iyaganku, Alalubosa, Alesinlonye
18)	Idi sin, Jericho GRA, Eleiyele, NIHORT Area
19)	Askar Paint, Olopomewa, Ijokodo, Barracks, Letmuck Barracks
20)	Onireke, Adamasingba, Inalende, Gbagi
21)	Idikan, Agbeni, Agbede, Ayeye

**For the Transcribed response from recording (see Appendix E)*
*Groupings based on similarity/homogeneity and proximity of localities
Source: Fieldwork 2017

3.2.3 S*tructured questionnaire survey*

The total population of Ibadan based on the 2006 National Population Census is 1,338,659. With an annual growth rate of 2.8 percent, the total population of Ibadan for the year 2015 was estimated at 1, 783,367. Also, the project locality populations for 2015 were determined using this formula:

$P1 = P0 (1 + r)^t / 100$

Where P_1 is projected population

P_0 is the base population

r is the rate of population growth, and

t is the time difference

Since the 104 identified localitiesdiffered significantly in population, a*stratified proportional sampling technique* was used to determine the sample size.The 104localitiesweredivided into 4 population subgroups using a population range in order of magnitude:

Group A: Localities in Population Range 20,001 – 70,000	38
Group B: Localities in Population Range 10,001 – 20,0000	31
Group C: Localities in Population Range 5001 – 10,000	20
Group D: Localities in Population Range 1001– 5000	15
Total:	**104**

Sampling ratios of 0.1%, 0.2%, 0.4% and 0.8 % were thereafter used respectivelyto determine the sample size for each locality. This was necessary to give a realistic sample representation for each locality(Neumann 1991) (See Table 3.2). The computation of the sample size for each localitywas as follows:

Group A: Population Range 20,001 – 70,000	=	0.1/100* Locality projected_pop
Group B: Population Range 10,001 – 20,0000	=	0.2/100 * Locality projected_pop
Group C: Population Range 5001 – 10,000	=	0.4/100 * Locality projected_pop
Group D: Population Range 1001 – 5000	=	0.8/100 * Locality projected_pop

In administering the questionnaire in each locality, a systematic random sampling technique was adopted. This involved taking samples from each locality using the k value approach in which individual selection of respondents was at a regular interval of 5 buildings after randomly selecting a starting point from *1 to k (across each locality)*. The *interval of 5 houses* was chosen to increase the chances of administering the questionnaire to respondents with distinct demographic characteristics.The questionnaire administration was carried out by field assistants who were graduate students of the University of Ibadan. The exercise took 12 weeks to complete.

Table 3.2: Distribution of LocalitySamplesfor questionnaire survey on social ecoloy indicators only(projected_ 2015_population)

No	Locality_name	Projected_2015	Sample Size
Group A			
1.	Mokola	34376	34
2.	Jericho GRA	20768	21
3.	Gbagi	26822	27
4.	Odo Ona	23768	24
5.	Oja'ba	22073	22
6.	Liberty	20044	20
7.	Sanyo	23655	24
8.	Felele	24332	24
9.	Apata	41672	42
10.	Yemetu	39967	40
11.	Adamasingba	26139	26
12.	Oniyanrin	28578	29
13.	Oje	27055	27
14.	Agbeni	23873	24
15.	Agugu	26876	27
16.	Oke Bola	23921	24
17.	Aperin	23903	24
18.	Eleta	29053	29
19.	Molete	32793	33
20.	Elewura	24307	24
21.	Agbowo	25354	25
22.	Ashi	49273	49
23.	Orogun-Express	25546	26
24.	Ijokodo	20949	21
25.	Samonda	21125	21
26.	Old Bodija	24523	25
27.	New Bodija	34124	34
28.	Abayomi	21707	22
29.	Onireke GRA	21616	22
30.	Inalende	31371	31
31.	Elekuro	21304	21
32.	University of Ibadan	29425	29
33.	Oniyere	25223	25
34.	Academy	34651	35

35.	Sango	36277	36
36.	Oremeji	45977	46
No	**locality_name**	**Projected_2015**	**Sample Size**
37.	Ikolaba	22955	23
38.	Eleiyele	37756	38
Group B			
39.	UCH	17965	36
40.	Idi Isin	10112	20
41.	Alesinloye	14773	30
42.	Oke Irefin	13214	26
43.	Alalubosa	13883	28
44.	UMC	14597	29
45.	Kudeti	19775	40
46.	Odo Oba	13209	26
47.	Orita Ikereku	11103	22
48.	Labiran	11774	24
49.	Iyaganku	16349	33
50.	Alekuso	16168	32
51.	Oke Ado	13614	27
52.	Ring Road	19664	39
53.	The Polytechnic	19451	39
54.	Akingbola	14177	28
55.	Basorun	17672	35
56.	Holy Trinity	14963	30
57.	Akobo	14,269	29
58.	Aremo	18446	37
59.	Foko Asaka	18955	38
60.	Adekile,	14291	29
61.	Kobomoje	16185	32
62.	Oluyoro	14389	29
63.	Odinjo	17248	35
64.	Oluwo Nla	12169	24
65.	Adeoyo	17349	35
66.	Agodi GRA	10937	22
67.	Olopomewa	16532	33
68.	Yambule,	12877	26
69.	Ososami	19843	40
Group C			
70.	Askar Paint	6788	27
71.	Ago Taylor	8603	34

72.	Coca Cola	5956	24
73.	Letmuck Barracks	5964	24
No	**Locality_name**	**Projected_2015**	**Sample Size**
74.	Secretariat	5882	24
75.	Eleiyele Market	7961	32
76.	Anfani Layout	7139	29
77.	Moor Plantation	7217	29
78.	Ile Tuntun	7645	31
79.	Popoyemoja	5736	23
80.	Idi Arere	9067	36
81.	Oke Oluokun	9216	37
82.	Bode	6937	28
83.	Ile Oba	5459	22
84.	Ayeye	9355	37
85.	Kosodo	7784	31
86.	Oranyan	6649	27
87.	Agbede Adodo	5353	21
88.	Idikan	6839	27
89.	Ilupeju	9026	36
Group D			
90.	Railway HQ	1809	14
91.	IAR & T	2081	17
92.	Seventh day	3009	24
93.	Links Reservation	1756	14
94.	NIHORT Qtrs.	3572	29
95.	Osungbade	4046	32
96.	Planning Authority	3218	26
97.	Imalefalafia	3453	28
98.	D-Rovans	3528	28
99.	Isale Osi	4007	32
100.	Agbokojo	4867	39
101.	Ita Bale	2762	22
102.	Oke Ofa Atipe	4541	36
103.	Oke Adu	4045	32
104.	Oke Are	4398	35
	Total	**1, 783,367**	**3,410**

3.3 **Data Analysis**

The data analysis involved the use of both descriptive and inferential statistics. The specific descriptive and inferential statistics applied to the different types of datawere as follows:-

1) ***Descriptive Statistics:*** (i.e. frequency, percentages, average, Chi-square).

2) ***Change Detection Analysis***of land use/land cover data

3) ***Inferential Statistics:****The* Inferential statistics carried out included
   - Global Moran's Ianalysis of spatial pattern of green spaces
   - Trend Analysis (Slope of trend)
   - Principal Components Analysis (PCA)
   - Ordinary Least Square Analysis (OLS) and Geographically Weighted Regression Analysis (GWR)

A typical social ecology model consist of Individual component (i.e socio-economic) such as age gender occupation, ethnicity e.t.cand theperceived environment component such as peoples greening culture; Government involvement e.t.c. Section A of the structured questionnaire addressed the ten individual variables (social ecology indicator) analyzed using **inferential statistics.** The individual variables were selected based on what is applicable and available in the Nigeria context.The ten indicators included gender, age, education, occupation, income, ethnicity, religion, housing type, housing structure; wall materials and roofing materials. Each indicator consist of more than two variables x_1,x_2,x_3…e.tc). On the other hand, section B and C of the structured questionnaire addressed the perceived component and were analysed using **descriptive method of explanation** (percentages).

For the purpose of the statistical analysis, the X and**Y** variables were expressed as follows:

Y = *Green spaces in square meters_2015 (sqm)*

X = s***ocial ecology indicators (SEI):*** *income, gender, age, ethnicity, religion, Occupation, education, housing type, housing structure; wall materials, housing structure roofMaterials.*

The raw datasets from the field were transformed into average values and percentages as applicable. *Age and income*datasets were transformed into *average values* while the *nominal*

datasets were transformed into percentages (%) for each locality.Gender, ethnicity, religion, occupation, education, housing type, housing structure; wall materials and housing structure roof materials are all *nominal or categorical variables* because they each have two or more categories and there is no intrinsic ordering to their categories. Thus, *mean* is not logical to be associated with them.A final transformation was carried out before the test of significance using principal components analysis (PCA) on the demorgraphic variables (see *section on PCA, Page 74 -76*).

Mean of Grouped data

$$\bar{x} = \frac{\sum fx}{n}$$

where: $\bar{x}$ = mean
f = frequency of each class
x = mid-interval value of each class
n = total frequency
$\sum fx$ = sum of the producst of mid – interval values and their corresponding frequency

Percentages (%)

$$\% = \frac{f}{N} \times 100$$

Where: % = Percent
f = Frequency
N = Number of cases

Analyzing Spatio-Temporal Patterns of Green Spaces: -The ***first objective*** seeks to analyze the spatio-temporal patterns of green spaces in Ibadan metropolis. The area extent of green spaces in the 104 localitiesfor 1972, 1984, 2000 and 2015 respectively were mapped and measuredusingthe ArcGIS 10.4.1 software (*the measure tool*). The maps were put in their final stage of map production (i.e. inserting the map element; scale, grid legend etc.). The spatial trend of green spaces from 1972 to 2015 was carried out to show the changes over time. This method of analysis is a GIS technique known as *change detection analysis*. Change detection refers to the process of identifying changes in the state of land features by observing them at different times. Using the GIS symbology tool, the green space variation in sqm for the study period (1972-2015)was superimposed as bar graphson each locality respectively.

Testing Spatial Patterns of Green Spaces: -Furthermore, global Moran's I analysis was used to test if the spatial pattern of green spaces in Ibadan metropolis was random. Global Moran's I statistic determines the degree of spatial autocorrelation of a given phenomenon. It measures the degree to which a given phenomenon is clustered in space. The global Moran's I value generates a single summary value (*I*) and a z score with its associated probability value (p-value) indicating

the presence or absence of concentration or dispersion. The Moran's I ranges approximately from +1 (positive) to -1 (negative) and any value close to zero does not show where the clusters or outliers are located. The global Moran's I is expressed as:

$$I = \frac{N}{W} \frac{\sum_i \sum_j w_{ij}(x_i - \bar{x})(x_j - \bar{x})}{\sum_i (x_i - \bar{x})^2}$$

Where *N* is the number of spatial units (104 localities) indexed by *i* and *j;*

X is the variable of interest (Green space in sqm per year)

$\bar{X}$ isthe mean value (Green space in sqmper year)

W_{ij} is an element of a matrix of spatial weights which expresses the degree of proximity between locality*i* and *j.* Localities that share boundaries with others were considered to be contiguous and therefore assigned a value of 1 whereas non –contiguous localities have zero value assigned to them. The result of the Global Moran's I included the following values: Moran's Index, Variance, Z- score, P-Value (significancelevel).

Testing temporal trend of green spaces: -Lastly on objective one, the hypothesis which was to test if green spaces significantly decreased with time was achieved by plottingthe temporal trend of green spaces between 1972 and 2015 using the trend line tool of Microsoft Excel. Here, the overall temporal trend of green spaces (sqm) for Ibadan metropolis as a whole and the temporal trend of green spaces (sqm) at the locality level from 1972 – 2015, were plotted.

Analyzing Relationship Between Spatial Distribution Of Green Spaces And Social Ecology: -The ***secondobjective*** seeks to examine the relationship between the distribution of urban green spaces and social ecology. The goal here is to determine the social ecology of each locality in relation to green spaces. The study year for this objective was 2015. Two main methods of analysis wereapplied to achieve this goal, namely, (i) Principal Component analysis (PCA) and (ii) Ordinary Least Square and Geographically Weighted regression analysis.

Principal Components Analysis (PCA): - PCA is a dimension reduction tool. It yields principal components linear relationship between a dependent variable and one or more independent variables. It yields a formula describing that relationship and measures of its strength. Principal

componentsanalysis(PCA) was used on the social ecology indicatorsfor three main purposes. First, it was used to identify the effective dimensions of the social ecology datasets. Second, it was used to create new and fewer variables that could be used in the Geographically regression analysis. Third, it was used for index construction that is to show the social ecology indicators in a spatial dimension across the 104 localities. The ultimate objective of the PCA is to create a set of new variables from an original dataset. The researcher went through the following stages to generate the principal components:-

- Constructed a data matrix
- Computed a zero-order correlation matrix
- Computed the eigenvalues and eigenvectors of the correlation matrix. Eigenvalues are the characteristic values representing important attributes of this matrix while eigenvectors are the column vectors associated with each eigenvalue.
- Generated the component scores (given principal components/ factors) which represented the performance of each and every observation on the new variates and their interpretation.
- Component scores (the new given principal components/factors) were mapped so as to show the spatial variations in the phenomena they represent.

Each variable has a component loading for each environment. The component loading represents the amount of correlation of that particular variable with the corresponding component. The factor loadings are coefficients which indicate the extent of the relationship between a variable and a factor. Thus, factors with high loadings are closely related to such variables. The search for simple structures, the varimax rotation procedure was used.Kaiser's criterion (Kaiser, 1959) was used to determine the statistically significant PCs. This is the most widely used criterion.

Ordinary Least Square and Geographically Weighted Regression for Hypothesis Testing: - After the principal components (PC) were determined and mapped, Ordinary Least Square and Geographically Weighted regression analysis package of ARCGIS software were carried out totest the hypothesis (H1: there is a relationship between green spaces (sqm) and social ecology).

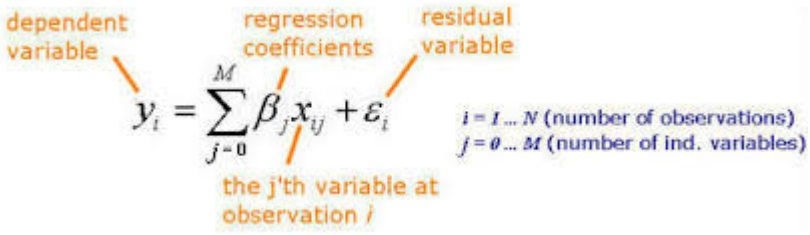
Ordinary Least Squares regression (**OLS**) is more commonly named linear regression (simple or multiple depending on the number of explanatory variables).

In the case of a model with p explanatory variables, the OLS regression model writes:

$Y = \beta_0 + \Sigma_{j=1..p} \beta_j X_j + \varepsilon$

where Y is the dependent variable, β_0, is the intercept of the model, X_j corresponds to the j^{th} explanatory variable of the model (j= 1 to p), and e is the random error with expectation 0 and variance σ^2.

The **Geographically Weighted regression equation** is as follows:



Geographically weighted regression (GWR) analysis package of ArcGIS software was used to visually identify the socio-economic predictors of green space. The input variables for the GWR includes therefore included " green space in sqm^2 for 2015; and the socio- economic parameters.

The ***third and fourth objectives*** seek to analyze the variation in the perceived causes of green space depletion as well as examine the variation in the acceptability and unacceptability of government intervention in greening among the localities and the socio-economic groups.In order to achieve these, the *multiple response analysis* was performed on the dataset. The SPSSMultiple Response Sets function version 17 was used for this purpose.

Multiple response analysis is a frequency analysis where there can be more than one response per participant to a survey question. Rather than treat the 1st, 2nd, 3rd etcetera responses as separate variables, multiple response analysis allows the set of responses to be combined and collectively analyzed. The process involves three main activities:

- *The set of responses were defined:*
    - Analyze - Multiple Responses - Define Sets.
    - Multiple response variables were added to the "Variables in Set" box.
    - Using the *Categories function* the category range was indicated

- The new set was labeled and created.

- *The multiple response frequencies (or cross-tabs) of the set created were generated*
  - That is, the frequencies and percentages of each response option by the total number of responses and by variables.
- *Spatial mapping of the perceived variables was carried out to show the variation of each perception across the localities.*

Lastly, Chi-square was also run for each socio-economic groups to assess the significance variation of perception of respondents.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Introduction

This chapter presents the result of analyses and discussion based on the objectives of this study. The chapter is therefore divided into four main section; (1) Spatio-temporal patterns of green spaces; (2) Social ecology and the distribution of green spaces; (3) Perceived causes of green space depletion in the Ibadan metropolis and lastly (4) the acceptability and non-acceptability of government greening intervention in in Ibadan.

4.1. Spatio- Temporal Pattern of Green Spaces

Result of analysis and discussion are provided for the following: (1) Temporal trend of green spaces from 1972- 2015; and (2) Spatial pattern of green spacesaround pre-dependence to 2015.

4.1.1 *Temporal trend of green spaces from 1972- 2015*

The total area of green spaces in square meters for each periodic year was plotted on a graph to derive a trend line. The result showed the total green spaces as follows:

1972: 68, 610,542sqm.(6,861.05ha.)

1984: 26,086,573sqm(2,608.66ha.)

2000: 16,219,748sqm (1,621.97ha.)

2015: 9,985,743sqm. (998.57ha.)

As shown in Figure 4.1, the slope of the trend for Ibadan metropolis is negativeindicating a decreasing trend in the extent of green spaces from 1972 to 2015(i.e. y = -2E+07x + 8E+07 in which E is a scientific notation that stands for 10^{x}). Remarkably the years 2000 and 2015 marked critical turning points in the fortunes of greening. Information gathered from the FGD showed that the late 90s and early 2000s were characterized by controlled urban development in Ibadan metropolis. As construction works and other human activities increased, there was a greater awareness of the importance of green spaceshence; green spaces were deliberately accommodated in the physical development process. The resurgence of the greening process

was, however, not universal as many localities, particularly in the traditional core of the city continued to suffer rapid de-greening (Fieldwork, 2017).

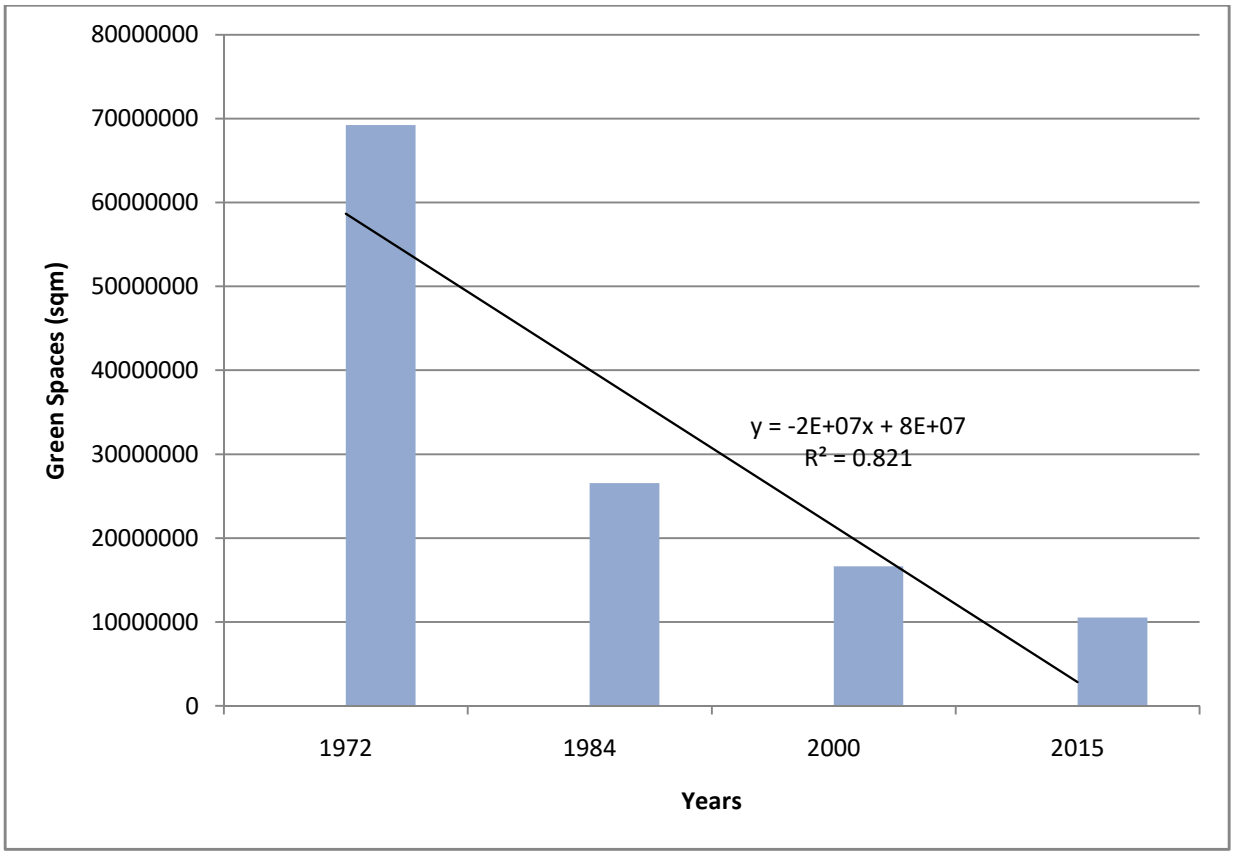


Figure 4. 1: Total Temporal Trend of Green Spaces in Ibadan Metropolis (1972 -2015)
Source: Author Analysis, 2017

4.1.1.1 *Temporal trend in green spaces for selected localities (1972- 2015)*

The localities selected had some uniquecharacteristics. In addition, the selected localities reflect the differences between the traditional core/ semi modern areas (Adekile, Ago Taylor, Mokola); institutional/Government Reserved Areas (University of Ibadan, Jericho GRA);and the more recent and suburban areas of the city (Molete/Challenge, D'Rovans housing unit, Apata)

The green spaces in square meters for each locality were plotted for the study period to derive a trend line. The slope of the trend for Adekile is negative indicating a decreasing trend in the spatial coverage of green spaces from 1972 to 2015(y = -348520x + 1E+06; R^2=0.9617 in which E is a scientific notation that stands for 10^x). Green spaces in Adekile locality, for instance, started to decrease from about 450, 000 m^2 (45ha.) in 1972 and then to about 120,000m^2(12ha.) in 1984(Figure 4.2). Then, a drastic decline occurred in 2000 when the coveragedropped toonly about 50,000m^2 (5ha.). Thereafter, there was a drastic decline to less than 20,000m^2(2ha.) in 2015. Findings from the FGD 2017 support this trend in that it was reported that in the 1980s there was significant physical development which brought about reduction in green spaces. Furthermore, findings from the FGD 2017 also confirm the trend depicted in the graph (Figure 4.2) showing the drastic reduction between 2000 and 2015. According to the FGD report, the yearssince 2000 are characterized by rapid physical development such as road construction, siting of petrol filling stations etc.

The graph for Ago Taylor locality(Figure 4.3)is also negative (y = -98300x + 359250; R^2 = 0.7185). The green space coverage declined from about 45,000 m^2(4.5ha.) in 1972, about 25,000 m^2 (2.5ha.) in 1984 and about 20,000 m^2.(2ha.) in 2000.

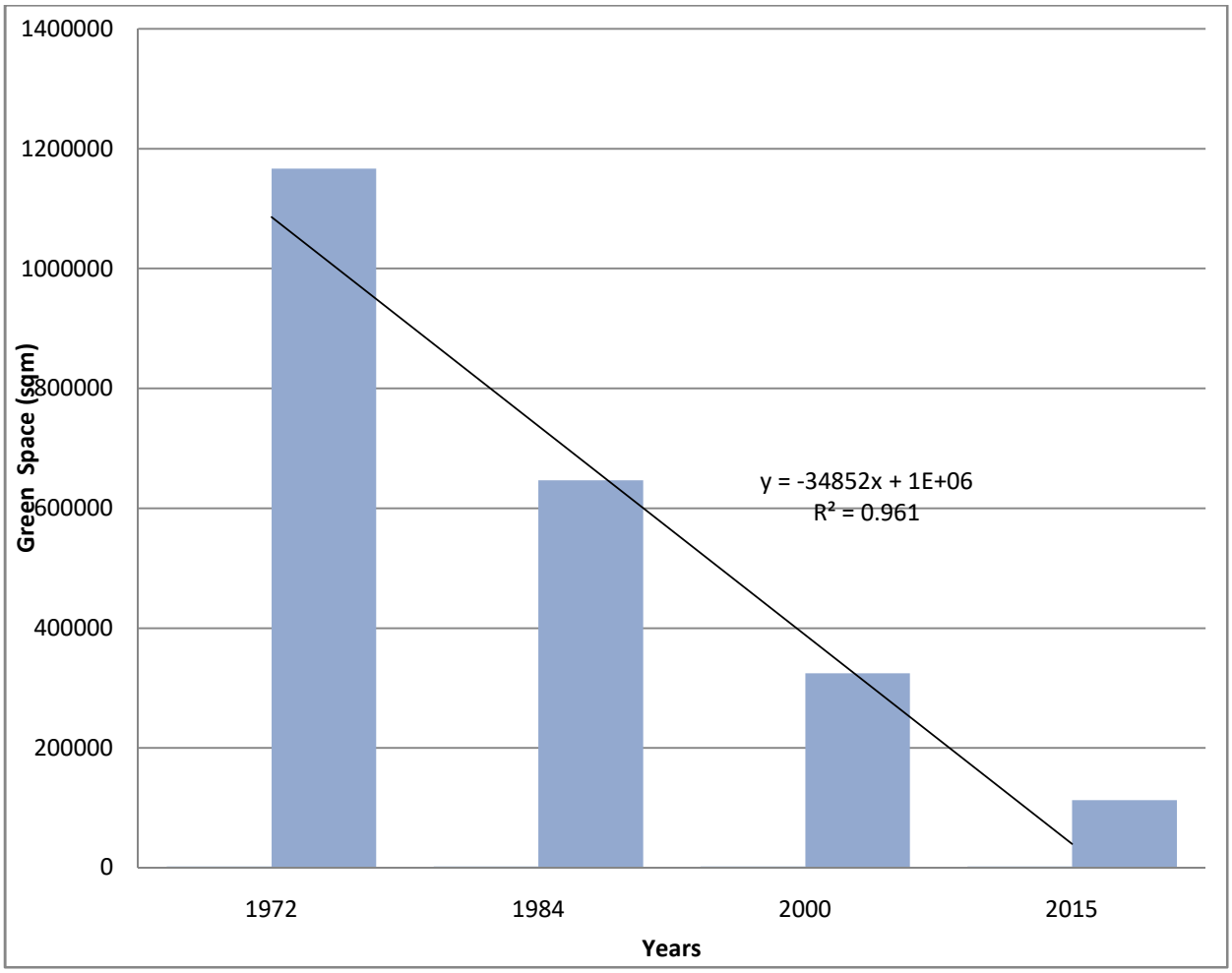


Figure 4.2: Temporal Trend of Green Spaces in Adekile locality (1972 -2015)
Source: Author Analysis, 2017

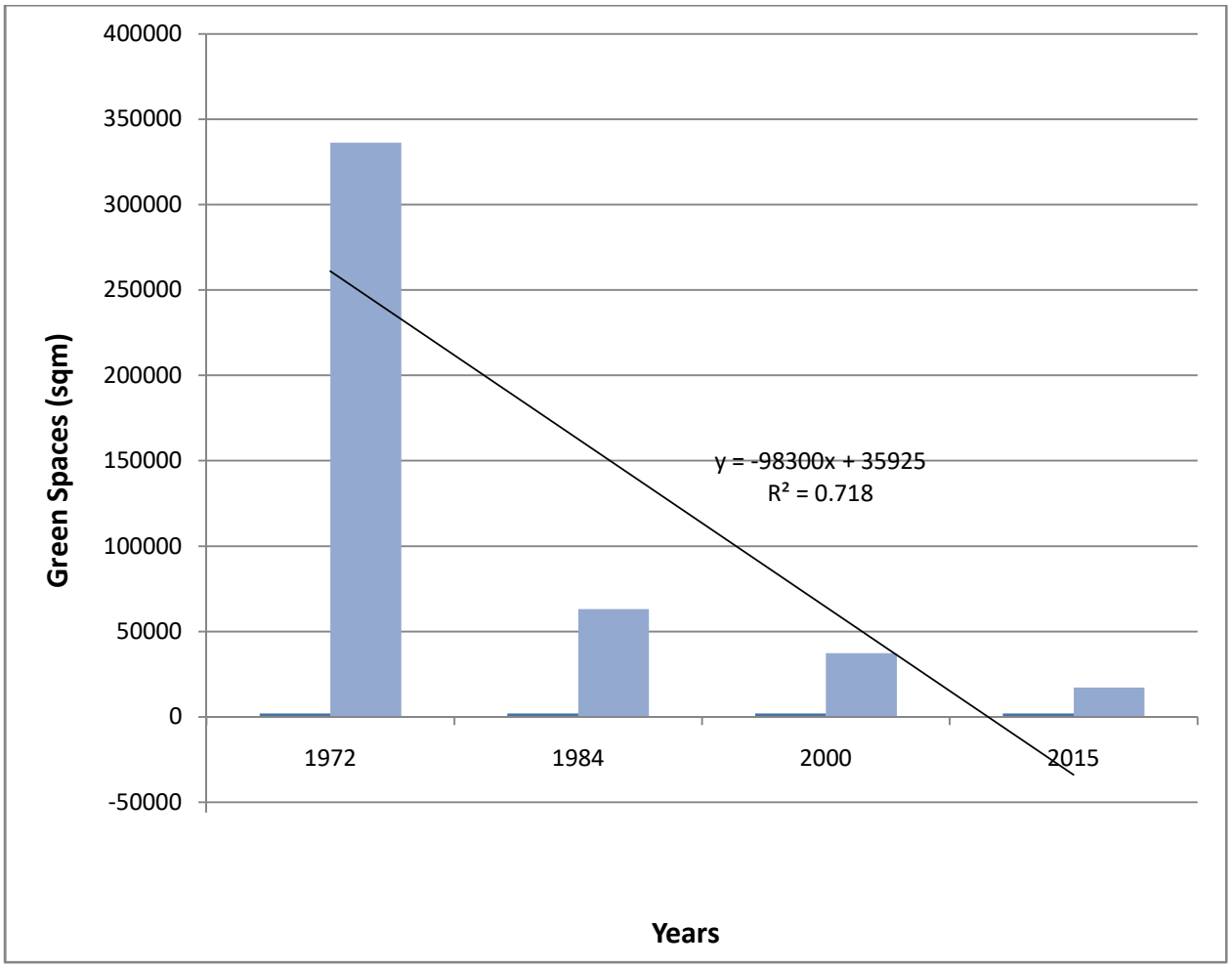


Figure 4.3: Temporal Trend of Green Spaces in Ago Taylor locality (1972 -2015)
Source: Author Analysis, 2017

Another distinct pattern was observed in some neigbourhoods where the size of green spaces started to decline gradually and then there was a sharp decline which later readjusted to a slower rate of decline. For example, Mokola area today is known as a mixed land use area comprising residential and commercial land uses. It is one of the major transition zones in Ibadan. Therefore, it is not surprising that the green space had reduced from600,000m^2(60ha.) in 1972 to 520,000 m^2 or (52ha.) in 1984 though the decline was gradual. The rate of decline became very rapid between 1984and 2000 in which Mokola was left with a green land mass of less than 200,000m^2 (20ha.). Thereafter, the decline gathered speed and has continued until the present. The transition years can be observed in the graph in Figure 4.4. The slope of the trend for Mokola is negative ($y = -172880x + 789050$; $R^2 = 0.904$)indicating a decreasing trend in the size of green spaces from 1972 to 2015. Findings during the FGD analysis showed that green spaces gave way to urban development such as filling stations, parks, shops, houses etc.

One of the characteristics of an institutional land use is green spaces made up of a variety of lawns, sports fields, hedges, parks, and gardens. The University of Ibadan is characterized by trees, wetlands, gardens, farmlands and grass lawns in large numbers. However, the graph in figure 4.5 shows that between 1972 and 1984, the University had minimal loss of green spaces. This was a period marked by a lot of physical development and expansion of farming activities by students in the Faculty of Agriculture (FGD 2017). The decline continued but less steeply after 1985. Indeed, there was only a comparatively slight decline of about 100,000m^2(10ha.) between 2000 and 2015. The gradual decline could be explained in terms of the abandonment of University farmlands which reverted to bush, and poor maintenance of open spaces which became overgrown with bush. But, the University also planted exotic tree species in some areas, which increased the green spaces. However, there are physical developments today such as research centers, institutes, and the international conference center among others, which have encroached further into the existing green spaces. The slope of the trend for the University of Ibadan is negative ($y=-1E+06x+4E+06$;$R^2 = 0.6646$) in which E is a scientific notation that stands for 10^x (Fig 4.5).

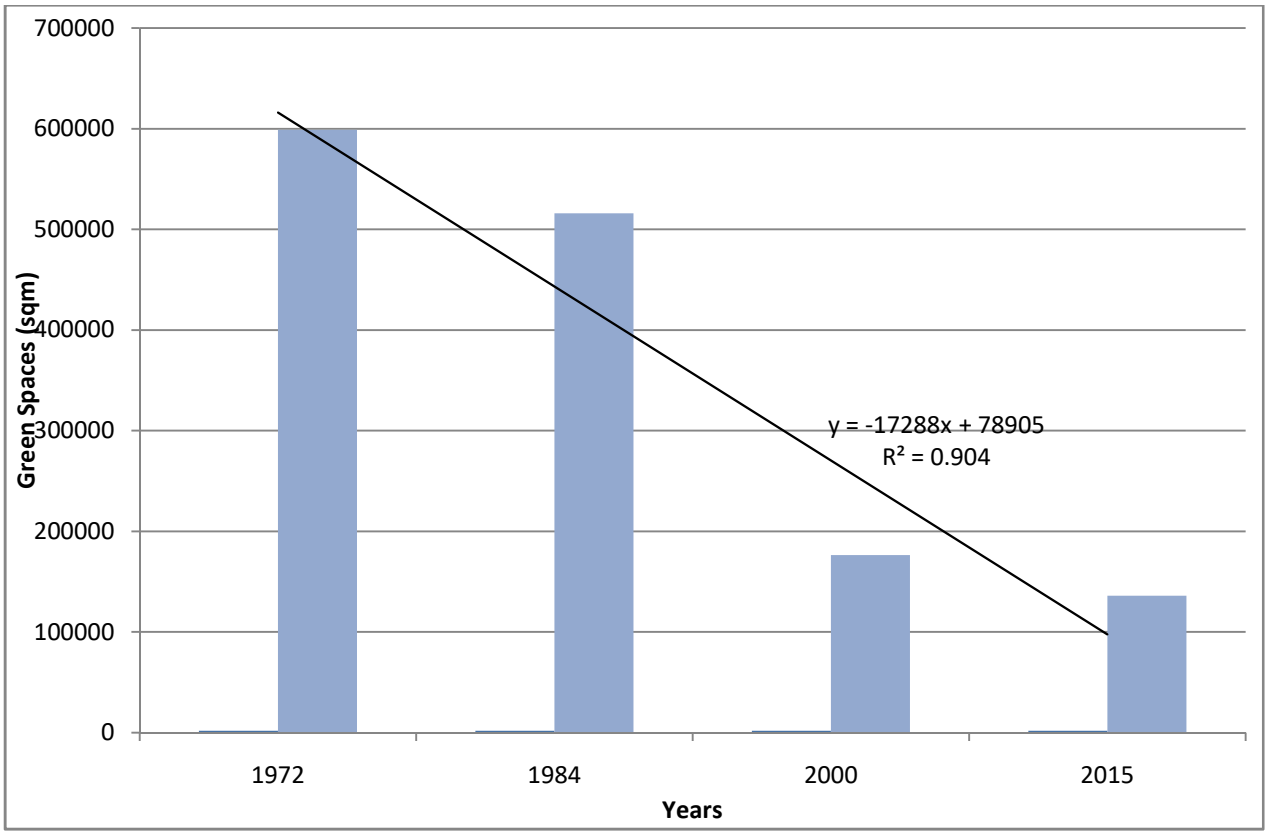


Figure 4.4: Temporal Trend of Green Spaces in Mokola Locality (1972 -2015)
Source: Author Analysis, 2017

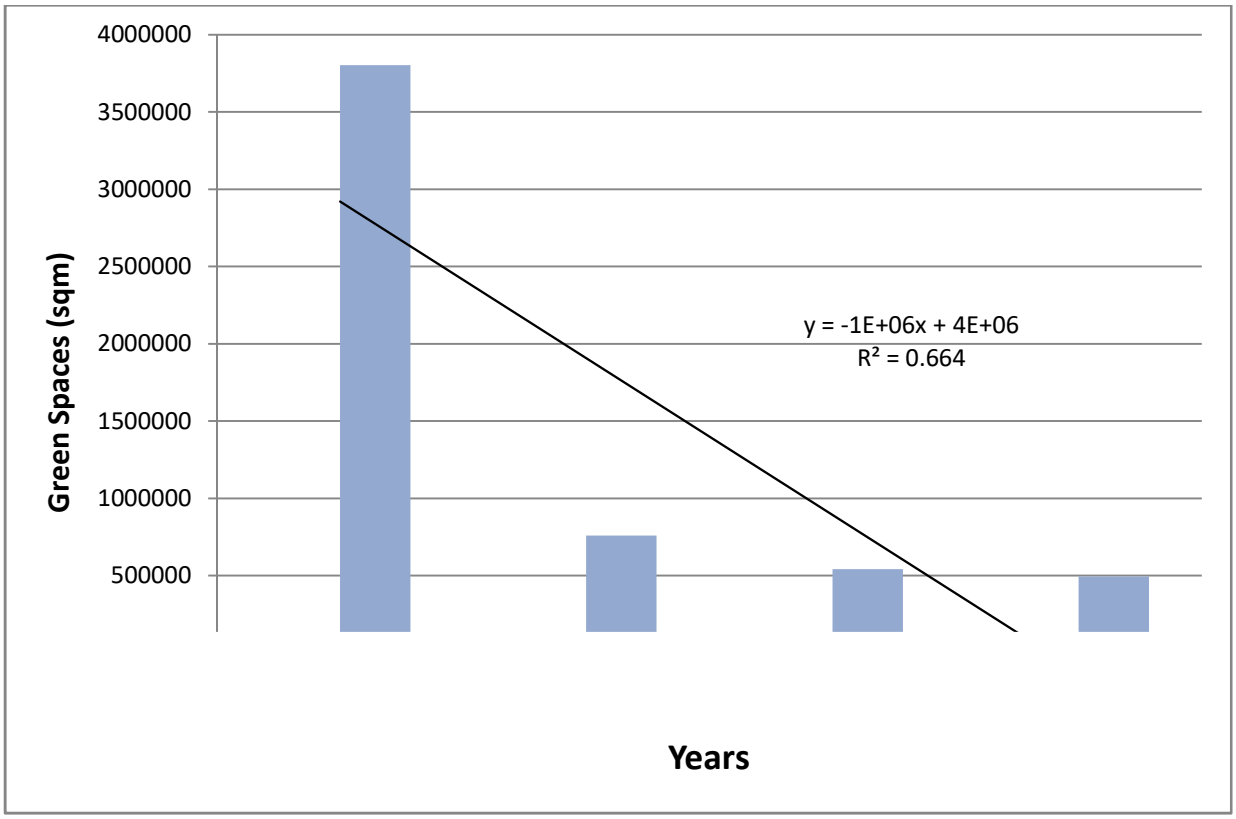


Figure 4.5: Temporal Trend of Occurrence of Green Spaces, University of Ibadan (1972 -2015)

Source: Author Analysis, 2017

Another unique pattern is that of the green spaces in Jericholocality. Jericho is a Government Reserved Area and naturally one would expect a controlled removal of green spaces. From the graph in Figure 4.6, this was actually the case. Still, the slope of the trend for Jericho is negative indicating a decreasing trend in the coverage of green spaces from 1972 to 2015 (i.e. y = -348520x +1E+06; R^2= 0.9617 in which E is a scientific notation that stands for 10^x). Between 1972 and 1984 the green space land mass was about 650,000m^2(65ha.) and about 300,000m^2(30ha.) in 2000. There was a further decrease between 2000 and 2015.. Reports from the FGD analysis show that Governments right from the military era were responsive for the massive encroachment on green spaces in Government Reserved Areas. Green spaces have been giving way to more offices, residential houses and light business concerns from 1980 until now.

Also, a unique temporal pattern of green spaces observed is clearly depicted by the graph for Apata locality shown in Figure 4.7. Apata is located at the urban fringe of the city, that is, at the outskirts of the city. Therefore, development in most cases is driven by population pressure from the city center. Pressure came from the desire of the average Nigerian, particularly, the Yoruba, to build their own houses (FGD 2017). Therefore, Apata is one of the areas in Ibadan that have attracted the influx of people in search of land for residential buildings. But, in spite of this influx of people, de-greening was very slow for a long time. The area is surrounded by hills and this might have been responsible for the minimal reduction in green spaces as some areas are not suitable for development. Green space reduction was observed to be 1,200,000 m^2 (120ha.)between 1972 and 1984. The green land mass declined only slightly to about 1,000,000m^2(100ha.) in 2000. However, there was a drastic decline between 2000 and 2015. This sharp decline could be as a result of increasing demand for land for commercial and residential purposes (FGD 2017). Therefore, the slope of the trend for Apata is negative (y = -229160x+2E+06; R^2; 0.8032 in which E is a scientific notation that stands for 10^x) (Fig 4.7).

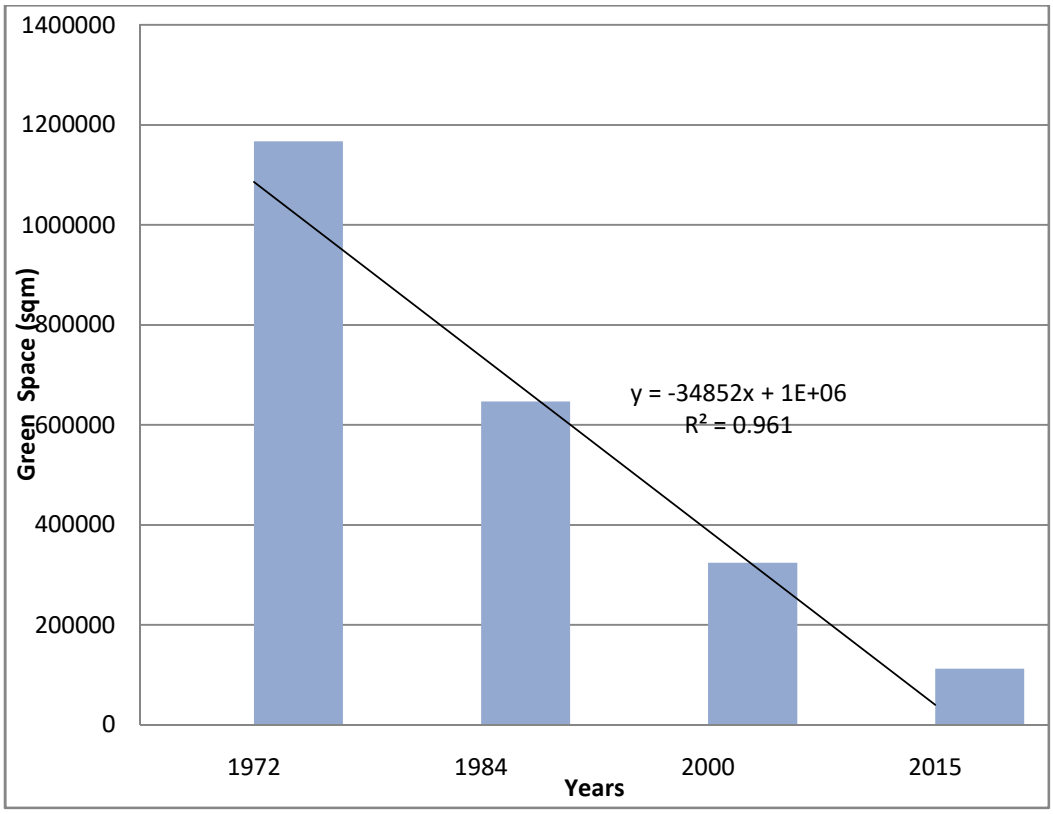


Figure 4.6: Temporal Trend of Green Spaces in Jericho GRA locality (1972 -2015)

Source: Author Analysis2017

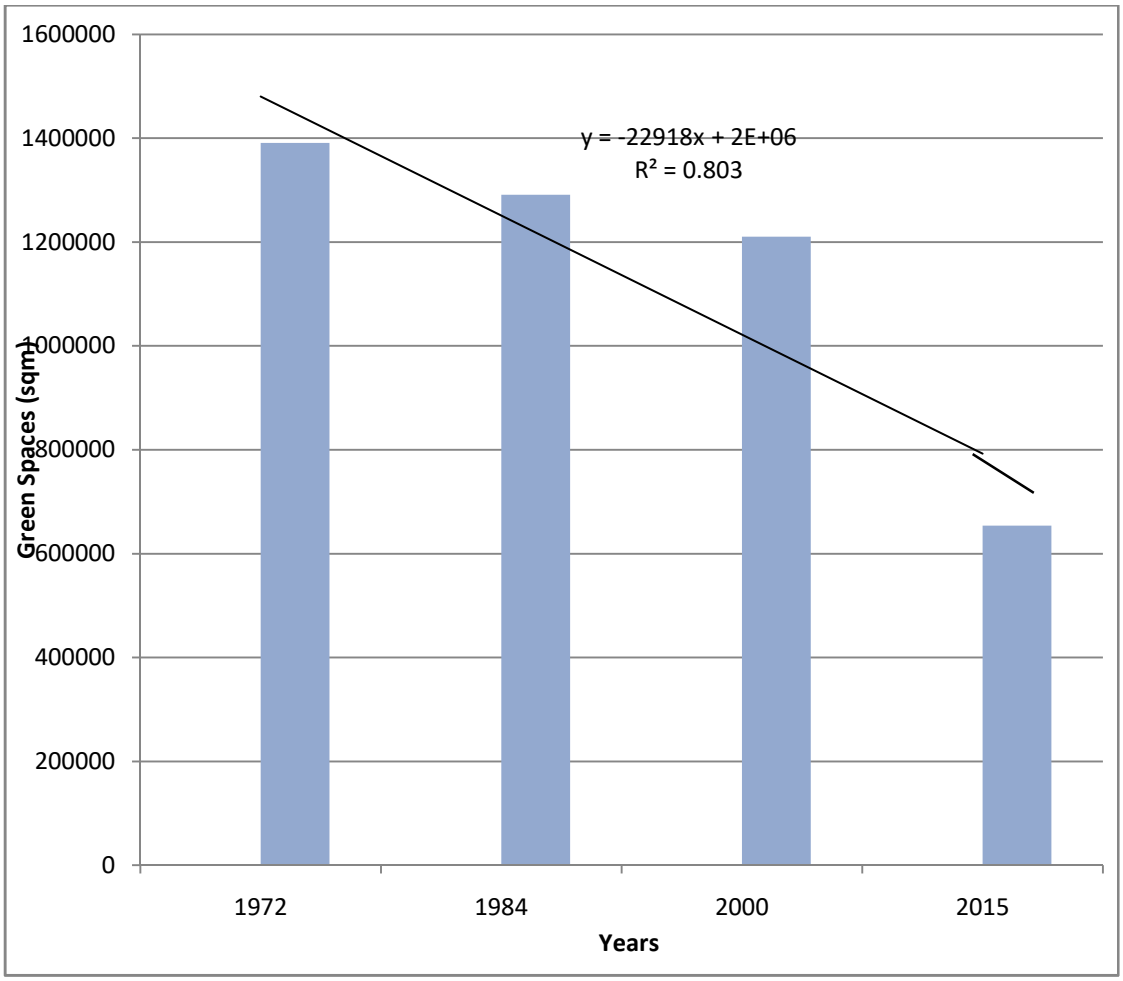


Figure 4.7: Temporal Trend of Green Spaces in Apata Locality (1972 -2015)

Source: Author Analysis, 2017

Interestingly, there were also temporal patterns of green space occurrence that displayed a rather slow decline for a long period and suddenly the rate of decline picked up and there was a long period characterized by a steep drastic decline before there was a turnaround. Moleteneigbourhood is known as a residential area but with light commercial activities. Between 1972 and 1984, farmlands were noticeable in Molete area as people were still concentrated in the core parts of Ibadan. But then, people began to relocate to Molete for two main reasons: (i) to be close to their farms; and (ii) to escape the increasing housing congestion in the traditional core of the city (FDG 2017). Between 2000 and 2015, the pressure from the core areas of the city allowed physical development in the form of schools, residential houses, shops, markets etc. and this led to an alternating fall and rise of green spaces of about 300,000m^2 (30ha.). Reports from FGD showed that people's ties with the core areas of Ibadan were very strong due to commercial reasons and social engagements, hence the alternating rise and fall of green spaces. However, the slope of the trend for Molete is negative ($y = -133180x + 820650$; $R^2 = 0.7375$) from 1972 to 2015 (Fig 4.8).

Lastly, the trend exhibited by some localities typified by the D'Rovans locality was observed where drastic de-greening took place initially between 1972 and 1984. Thereafter, the rate of decline slowed down between 1984 and 2000 and then between 2000 and 2015, there was another sharp decline in green spaces. However, the slope of the trend for D'rovan area is negative ($y = -177814x + 881858$; R^2; 0.9451) from 1984 to 2015 (Figure 4.9). D'Rovans locality is a mixture of light commercial and residential zones and this accounted for the initial reduction between 1984 and 2000 when physical development began in earnest in the area. During this period there was much construction activity going on. The years between 2000 and 2015 witnessed more construction but this was accompanied by a beautification initiative by government, which helped the greening process (FGD 2017). Inability to sustain the beautification initiative of government probably led to the drastic de-greening process that had set in by 2015.

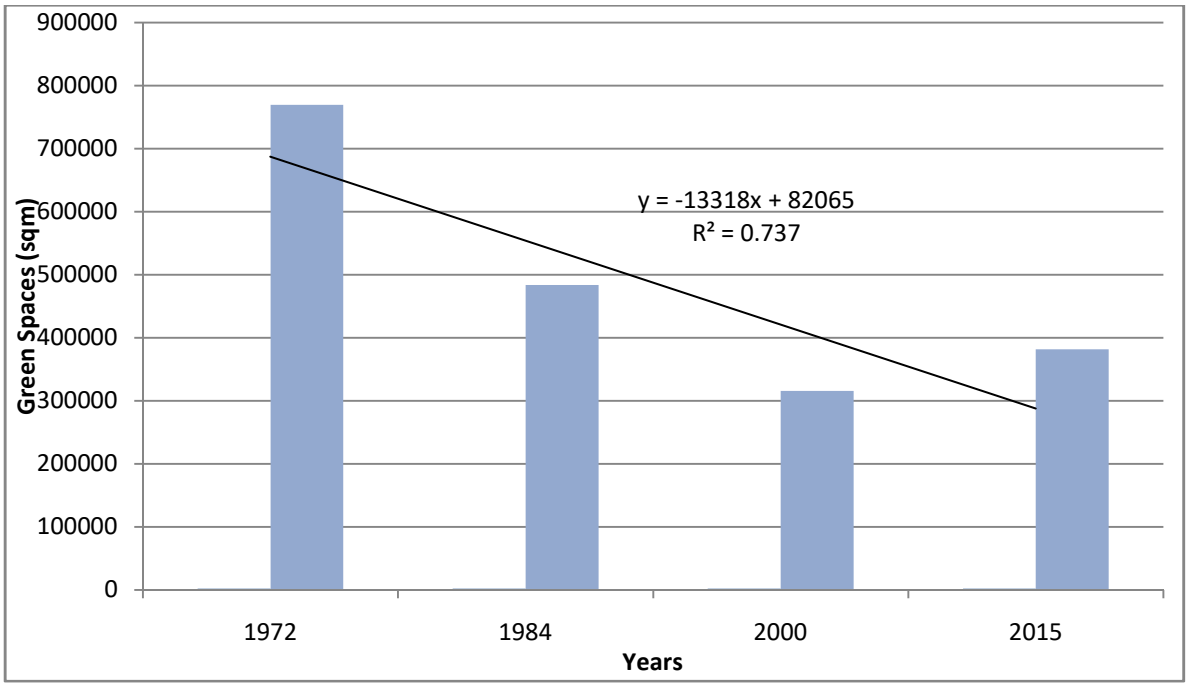


Figure 4.8: Temporal Trend of Occurrence of Green Spaces, MoleteLocality (1972 -2015)
Source: Author Analysis, 2017

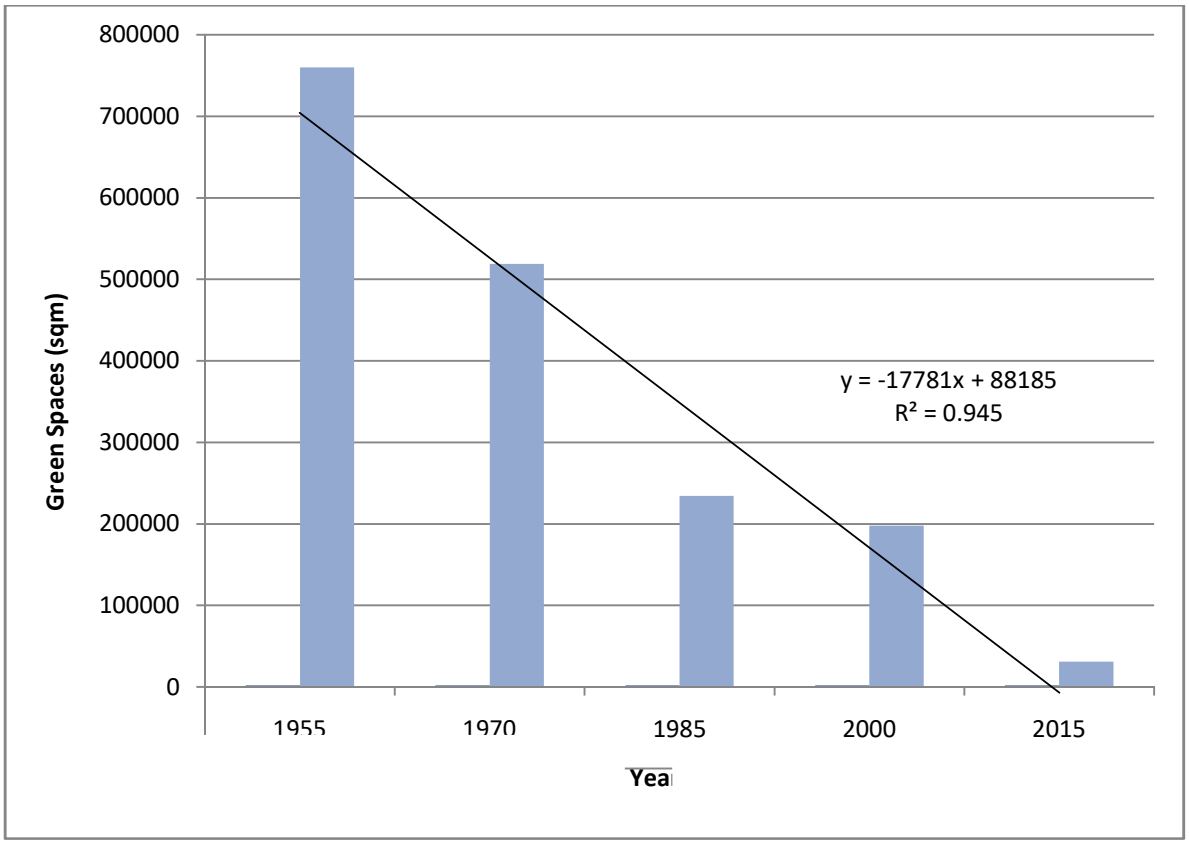


Figure 4.9: Temporal Trend of Green Spaces in D'Rovans Locality (1972-2015)
Source: Author Analysis, 2017

4.1.2 *Spatial Patterns of Green Spaces*

Table 4.1 presents a summary of Global Moran's I analysis carried out for 1972, 1984, 2000 and 2015 respectively. There was a significant clustering of green spaces in 1972 (*I*: 0.348091; *z*: 6.365863; *p:*0.000000), 1984 (*I:* 0.452642; z: 8.099308; *p:*0.000000), 2000 (*I*: 0.313010; *z*: 5.781242; *p:*0.000000) and 2015 (*I*: 0.229712; *z* score; 4.355389; *p:*0.000013).The implicationis that given the Moran's Index value and the z- score of 6.365863 for 1972, there was a less than 1% likelihood that a clustered pattern could have occurred by a random chance. In other words, localities with more green spaces were found together and localities with little or no green spaces also occurred together. However, from the cartographic mapping, clustering patterns were obvious for 1984, 2000 and 2015 only. This justifies Tobler's first law of geography which states 'everything is related to everything else but near things are more related than distant things (Tobler, 1970; p236).

Table 4.1: Summary of Global Moran's I Analysis

Year	Moran's Index	z-score	p-value	Remark
1972	0.348091	6.365863	0.000000	Clustered
1984	0.452642	8.099308	0.000000	Clustered
2000	0.313010	5.781242	0.000000	Clustered
2015	0.229717	4.355389	0.000013	Clustered

Source: Author 2017

4.1.2.1 *Pattern of green spaces around pre-independence (around 1955)*

An investigation of green space situation from pre – independence (around 1955) was carried out using focus group discussion to improve on the subsequent geospatial assessment of green space situation between (1972-2015) in Ibadan metropolis. By 1955, most of the areas now built up were thick forests, woodland and grass vegetation. Some of the neigbourhoods in Ibadan metropolis were isolated and almost inaccessible from each other because they were separated by either thick forests or bush. Also, some of the localitiesin the core areas of the metropolis were not in existence then (Figure 4.10).

The focus group discussion in Adamasingba, Gbagi, Inalende, Onireke GRA revealed that there was a significant quantity of green spacesby 1955. For instance, *Adamasingba* had been popular as an open playground since the period of the Western Province. By 1955 there were still green spaces distributed across the locality. They started disappearing gradually as physical development came. For instance, areas along Lemomu, Akinsanmi, Akintola, and Skyline Hospital were all green by 1955. It was also obvious that between 1955 and 1969, there was a drastic reduction in green spaces in *Adamasingbalocality*. For instance, the FGD report revealed that much of the area now covered by Sabo (Fulani) sect was green up until the 60s. The Old Gbagi locality was located at Lebanon Street which has now been relocated to Alakia and called New Gbagi.*Inalende locality*, also, had a considerable expanse of green spaces at the heart of the locality by 1955 and human activities were concentrated at the periphery of the locality and the houses there were not as ancient as those in the core of Ibadan. Physical development that has replaced the green spaces at that time as show from an extract from the FGD Interview: -

> *"The vine branches church, the mechanic workshop, vine private hospital, conoil and the P.D.P secretariat were all dense green spaces until the 90's."*
>
> *– FGD respodent*

Reports from the FGD revealed that the Old Gbagi area had relatively small expanse of green areasby 1955. For instance, the popular Methodist Church has been there since 1955 as well as the John Holts venture (UAC). The warehouse also has been there since 1955. Also, areas along New Court road and Jimoh Odutola Street were green spaces at that time. *Onirekelocality*was

reported to have wide expanse of green areas by 1955 except some parts of Oba Akenzua and Fajuyi areas. Also, areas along NEPA lane, parts of Oba Akenzua and Opeagbe remained green until the early 60s.

Another significant observation was noticed in the Focus Group Discussion carried out in Agbokojo, Aleshinloye, Oke Bola, Railway Station and Seventh Day Adventist areas. These localities had considerable amount of green space around 1930, however, by 1955, there had been a significant reduction across these localities. For instance, by 1930, *Oke-Bola neigbourhood* had few urban footprints towards the east side, in areas such as Victory School, Obafemi Awolowo Residence, and Sawmill areas. But by 1955, these areas were becoming heavily built up. The green spaces extended from Oke Irorun down to Mighty Miracle College and further extended to the Ibadan Tennis Club. *Agbokojo* is among the traditional core areas. By 1955, there was very small expanse of green spaces. *Alesinloye* had wide expanse of green spaces by 1955. Alesinloye is currently a market place and significant green space depletion was noticed in the 1990s as shown in an extract from the FGD interview: -

> *"Alesinloye was fully green up until the early 90's, Alesinloye is a market place. However, green spaces can be found at the back of the market. Alesinloye road was dualized in the early 2000, so areas that were green then have been replaced with road network extension."*
>
> - *FGD respondent.*

Areas around *Seventh Day Adventist* had moderate green spaces as well as moderate settlements. Reports revealed that green spaces continued to decrease gradually over the years and by 1955, only patches of green spaces could be seen and some were confined to residential compounds. The r*ailway headquarters side* had minimal green spaces by 1955.

The focus group discussion in Eleiyele, Idishin, Jericho GRA, and NIHORT locality areas revealed that there was minimal depletion of green spaces by 1955. *Eleiyele locality*, for example, had a large expanse of green areas except for areas along Odubiyi, Surulere mosque and Animashahun along the eastern boundary of the locality. Significant depletion was evident in Eleiyeleafter Independence in 1960. *NIHORTS area*was fully green in 1955 while Jericho, being a Government Reserved Area, had a considerable amount of green spaces with minimal building spread across the locality.

Furthermore, reports from the FGD carried out in Alalubosa, Iyaganku and Liberty localities revealed that while Alalubosa was almost totally green by 1955, localities such as Liberty and Iyagangu had experienced a relatively significant de-greening. For instance, there was more concentration of built up areas towards the eastern side of the locality. Today, Liberty area is experiencing compact development and green spaces have disappeared except in houses with compounds. Iyagangu also experienced minimal development which was concentrated in the east side of the locality by 1955. Iyaganku is a Government Reserve Area (GRA); therefore, there are still quantifiable areas of green spaces till date. Places such as Oyo State Women and Children Welfare Development office, NUJ, CGNetc.experienced de-greening in the 90s. Alalubosa as earlier mentioned witnessed little or no development by 1955. Reports showed that the dense vegetation started to reduce after 1955. Today, a railway line passes through Alalubosa, and although green spaces can be found on both sides of the rail line, it is also the case that large sections have been built up right up to the rail line.

Notably, the focus group discussion in D 'Rovans, Elewura, Oluyole Estate, Orita Ikereku, and Ring road informed that these localities experienced little or no de-greening by 1955. The only forms of de-greening were in scattered farm plots. Reports from the FGD showed that significant de-greening started in the 1970s. For instance, Oluyole is now an industrial zone today. Industries such as P&G, Pepsi, and Sumal developed in the 1980s. In D 'Rovans area, development was significant in the 1980s and 1990s such that nowadays green s/paces can only be found in confined areas and in front of people's houses. It was gathered from the FGD that pressure from the core areas forced people to look for space in Ring road and Oluyole areas as shown from an extract from a respodents from Oluyole locality: -

"Pressure from the core areas forced people to look for houses in the interior areas, so Ring-Road has been green up until the mid-70's, development can be found along major roads as well in the interior part of Ring-Road. Areas such as Palms Mall are recent development in the late 90's/2000. Today green spaces can be found in confined areas"

-FGD Respodent

InOrita Ikereku rapid development took place in the late 1970s; today there is little or no green spaces left. The road at the Orita was dualized in early 2000s.

Reports from the FGD in Anfani Layout, Idi Arere, Imalefalafia, Ososami and UMC showed that by 1955 only Idi Arere had experienced de-greening. Actually by 1930, the green spaces had almost all disappeared in *Idi Arere* and the situation even got worse in the mid-50s. The Ogunpa canal passes through *Arere locality*; as such green spaces can still be found along the canal today. By 1960, development had speed over the other localities. For instance, *Anfani area* was primarily a residential area, the *College Crescent*was constructed in the 1960s. Today, *Anfani* area has little or no green spaces but many compact buildings.*UMC* area started experiencing significant development after independence, and because physical development was gradual in the area, a few green spaces can still be found scattered around UMC. *Ososami locality* was green up until the 1960s, but it has developed as a compact residential-cum-commercial area and today, there is little or no green space left in the area.*Imalefalafia locality*is situated around the Liberty area and the area had a large expanse of grass fields until the early 1960s as well. The popular Tribune Newspaper office is located in the area. Today the green spaces are only found in confined areas and residential compounds.

Report from the focus group discussion in Akingbola area, Ashi, New Bodija, Old Bodija, and Oluwo Nla revealed that these localities had dense vegetation and grasses by 1955 except for Old Bodija which had started to experience de-greeningactivities. The developed areas were concentrated along major roads. Old Bodija later developed as a planned residential area in the 1960s and 1970s. Today, the building density is high and green spaces are confined to residential compounds. Ashi, Oluwo nla and Akingbola areas started to experience significant de-greening by 1980 with a rapid increase in physical development. Today, green spaces are very scanty in these areas.

Furthermore,from figure 4.10, other localities that had started to experience de-greening by 1955 were University of Ibadan, Agbowo-Orogun area, Ijokodo, Mokola, and Secretariat. Localities such as Yemetu, Idikan, Kosodo, Ile oba were the traditional core areas and had experienced intense de-greening by 1955. Findings from FGD show that by 1955 there were more grasslands and bushes in the core localities as compared to the outer areas of Ibadan, which had more of thick forests and farmlands.

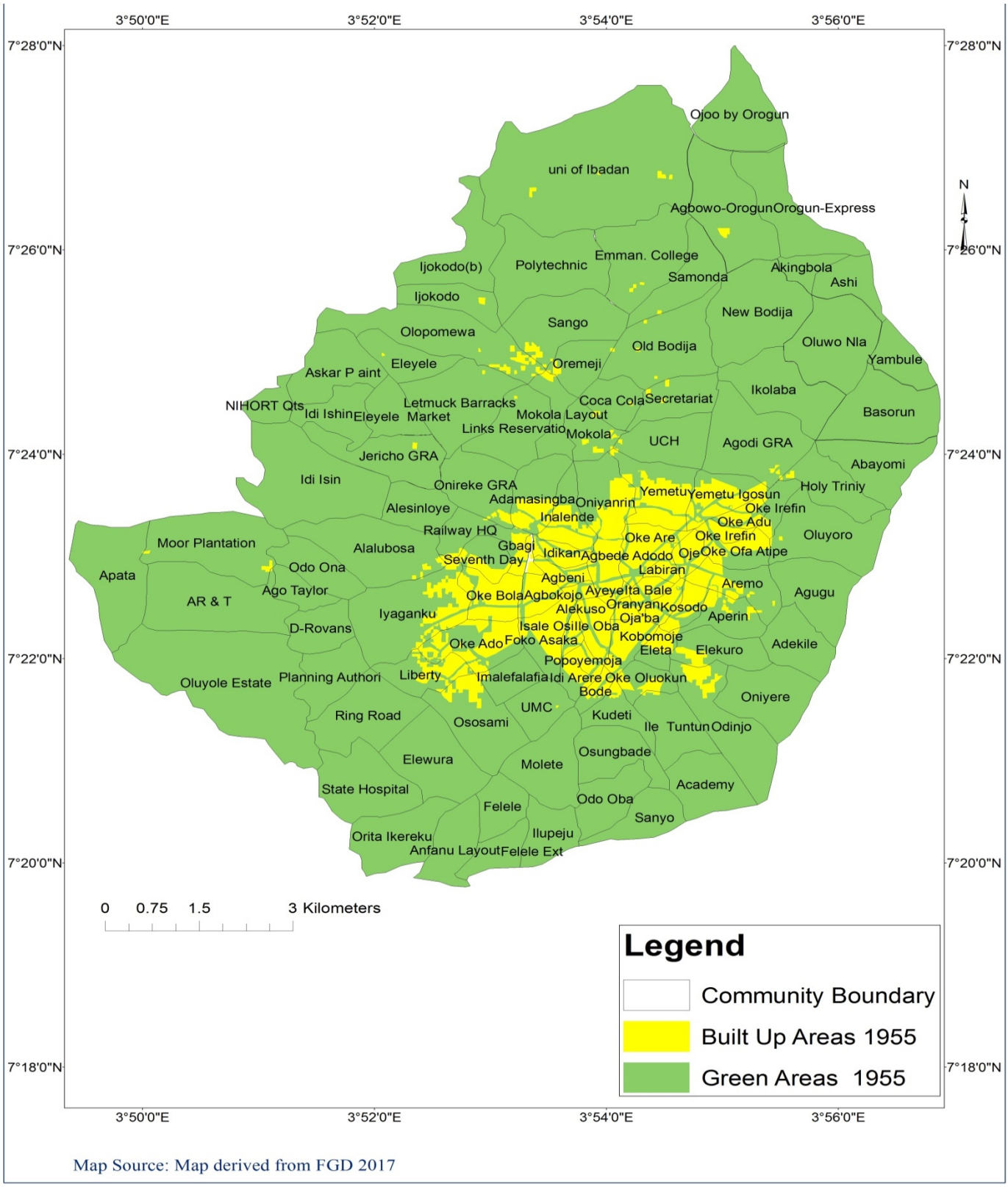


Figure 4.10: Generalized pattern of green spaces around pre-independence (1955)
Sketch map from focus group Discussion
Source: Author, 2017

4.1.2.2 Pattern of green spaces in1972 (proxy for 1970)

The spatial pattern of green spaces for 1972is presented in Figure 4.11. From the image analysis, there had been a significant decline in green spaces by 1972. The decrease was spreading outwardly from the traditional core areas of Ibadan. Physical development experienced in this period was characterized by modern structures.From the area measurements (Appendix D-1), twenty (20) localitieseach had less than 10,000m^2(1ha.) of green spaces in 1972. Examples include Idi Arere, Ile Oba, Oranyan, Imalefalafia, Isale Osi, Popo Yemoja, Kosodo, Agbede, and Adodo. Some localities are in the core areas of the metropolis. Twelve (12) localities had green spaces between 10,000m^2(1ha.) and 100,000m^2 (10ha.) in size as of 1972. Examples are Bode, Aperin, Kudeti, Oke Bola, Elekuro, Aremo, and Kobomoje, etc. Furthermore, Fifty-three (53) localities were in the category 100,000m^2 - 1,000,000m^2(i.e. 10 -100ha.) while nineteen (19) localities were in the category 1,000,000m^2 - 3, 900,000m^2(i.e. 100 – 390ha.). Some of these localities included Old Bodija, Onireke GRA, Ikolaba, Jericho, etc. The major changes to green spaces were noticed in the core areas and their surroundings except for areas that have landmark like institutions and offices. Furthermore, by 1972, it was observed from the map analysis that the city center was getting congested which meant that people would have to migrate to other areas for shelter and work.

4.1.2.3 Pattern of green spaces in 1984

By 1984, there had been a significant reduction in green spaces. Figure 4.12 shows the spatial distribution of green spaces in 1984. From the green space area measurements, the number of localities with less than 10,000 m^2(1ha.) of green spaces had increased from twenty (20) as in 1972to twenty-three (23) localities by 1984. The additional three (3) localitieswere Agbokojo, UMC and Aperin. Twelve (12) localities had their green spaces between 10,000 m^2 and 100,000 m^2 (i.e. between 1ha. And 10ha.) as of 1984. For instance, Bode which was estimated at 31,400 m^2(3.1ha.) in 1972had reduced to 12000 m^2(1.2ha.) by 1984; Kudeti which was estimated at 54,800 m^2(5.48ha.) had reduced to 20,200m^2(2.02ha.) and Osungbade which was estimated at 93,800 m^2(9.38ha.) had reduced to 23,400m^2(2.34ha.). Also, fifty-nine (59) localities were in the category 100,000 m^2 - 1,000,000 m^2(10 -100ha.) in 1984 as compared to the 53 localities counted for 1972. This shows a reduction in green spaces in some localities between 1972 and 1984.

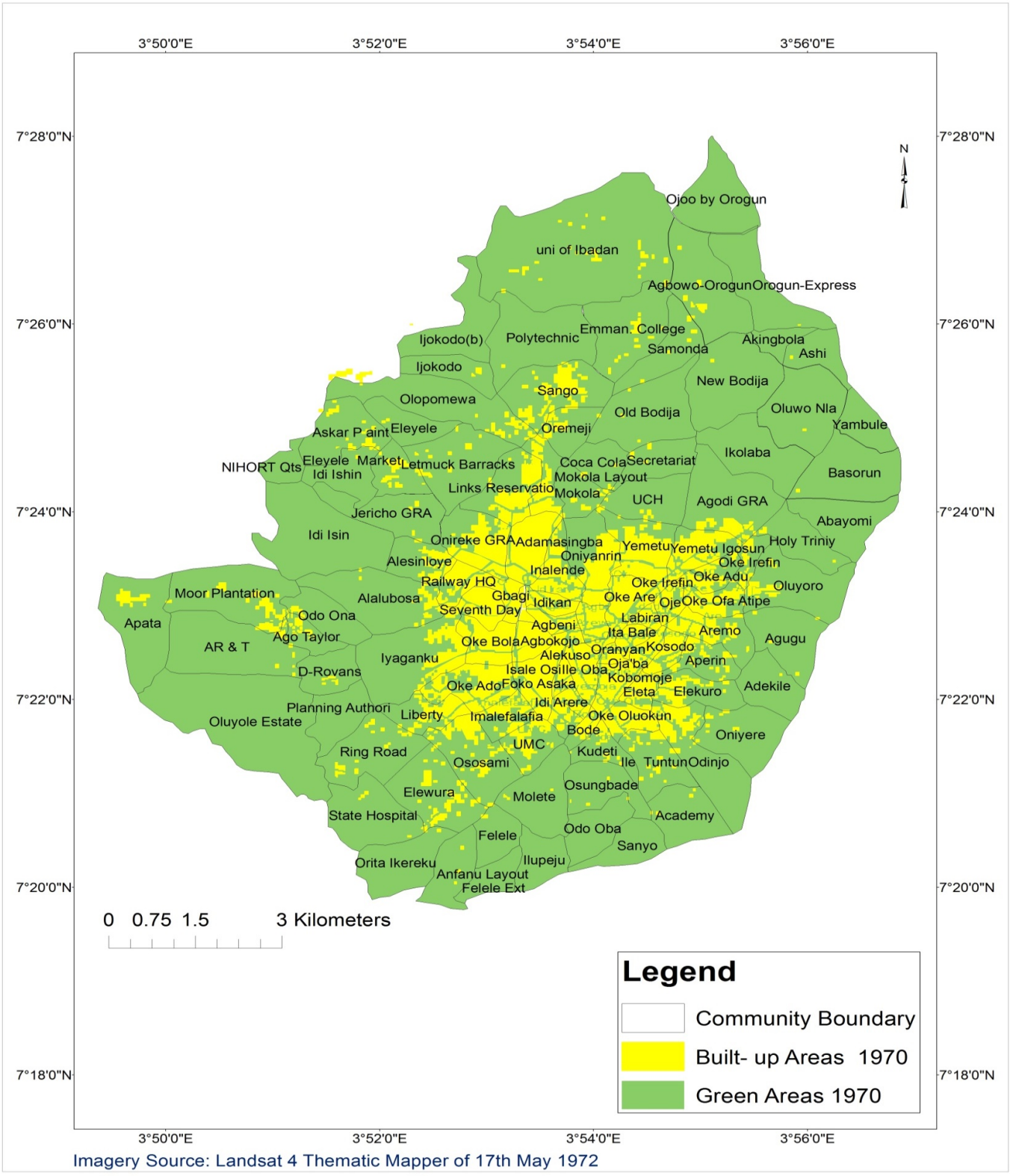


Figure 4.11: SpatialDistribution of Green Spaces in Ibadan Metropolis for 1972 (proxy for 1970
S*ource: Author Analysis,2017*

Some of these localities included Ashi, Odo- oba, and Orogun-Ojoo. Furthermore, only four (4) localities were in the 1,000,000m^2- 3,900,000 m^2(100-390ha.) category as compared to the 19 localities recorded in 1972.Findings from the FGD revealed that the period between mid-1970s and mid-1980s was a period of economic boom for the country as well as for the people of the metropolis then in terms of trade and commerce. As such accelerated physical developments were experiencedin this period which led to a significant reduction in green spaces (FGD 2017).However, some areas still maintained their green spaces or experienced insignificant depletion of their green spaces between 1984 and 2000. According to findings from the FGD thiswas partly due to (i) the presence of the Ogunpa water canal along certain localities contributed to the greenness of those areas still date for example, Arere, Oniyanrin, Foko, Asaka, Onireke etc.;(ii) some localitieswere government reserved areas, for instance, Letmuck Barracks, Iyaganku GRA, Jericho GRA; and (iii)low-density areas like housing estates, institutions,and government offices still experiencedvery slow pace of green space depletion.

4.1.2.4 Pattern of green spaces in 2000

One expected a drastic reduction in green spaces between 2000 and 2015 in the metropolis and from the map in Figure 4.13, this was the case in some areas. For instance, there was an increase of localities that had less than 10,000 m^2 (1ha.) from twenty-three (23) in 1984to thirty (30) by 2000. By 2000 there were two other localitiesadded to those in the range between 10,000m^2 and 100,000m^2(1ha. and 10ha.). It is, however, important to note here that while some localities continued to decline in green space area, some increased over the years particularly those along the wet Ogunpa canal. Findings from the FGD showed that increase in the upgrading of residential areas into estates brought about controlled pressure in some areas. Furthermore, there was a drastic decrease in the number of localitiesin the green space range 100,000m^2 and 1,000,000m^2(10 -100ha.) from fifty-nine (59) in 1984 to thirty-nine (39) in 2000. It was observed from the image analysis that open spaces in some localities reduced significantly even though they were still within this category. As can be seen in Figure 4.12 institutional land use accounted for localities with the largest expanse of green spaces, for example, IAR& T, Moor Plantation etc.

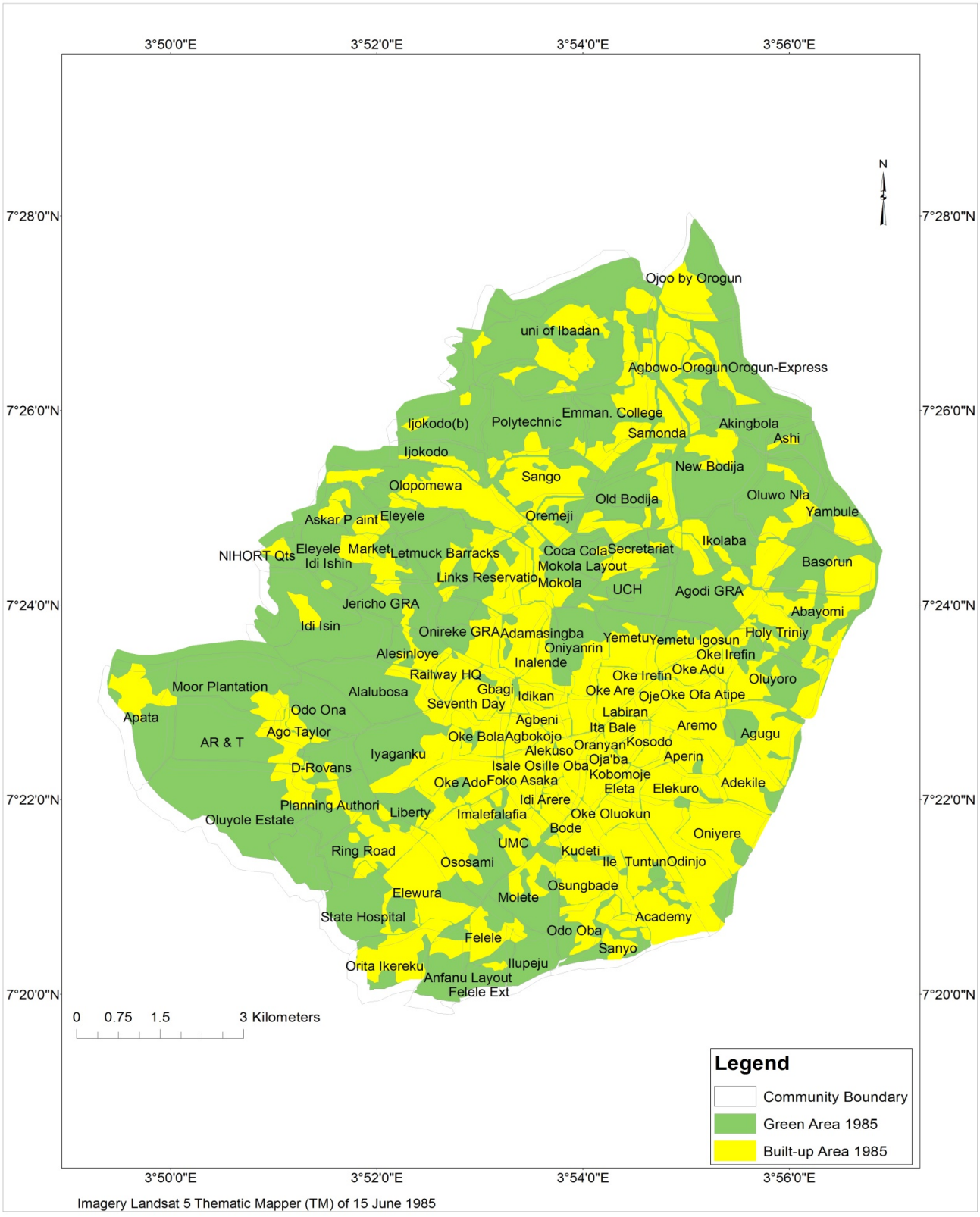


Figure 4.12: Spatial distribution of Green Spaces in 1984
Source: Author Analysis, 2017

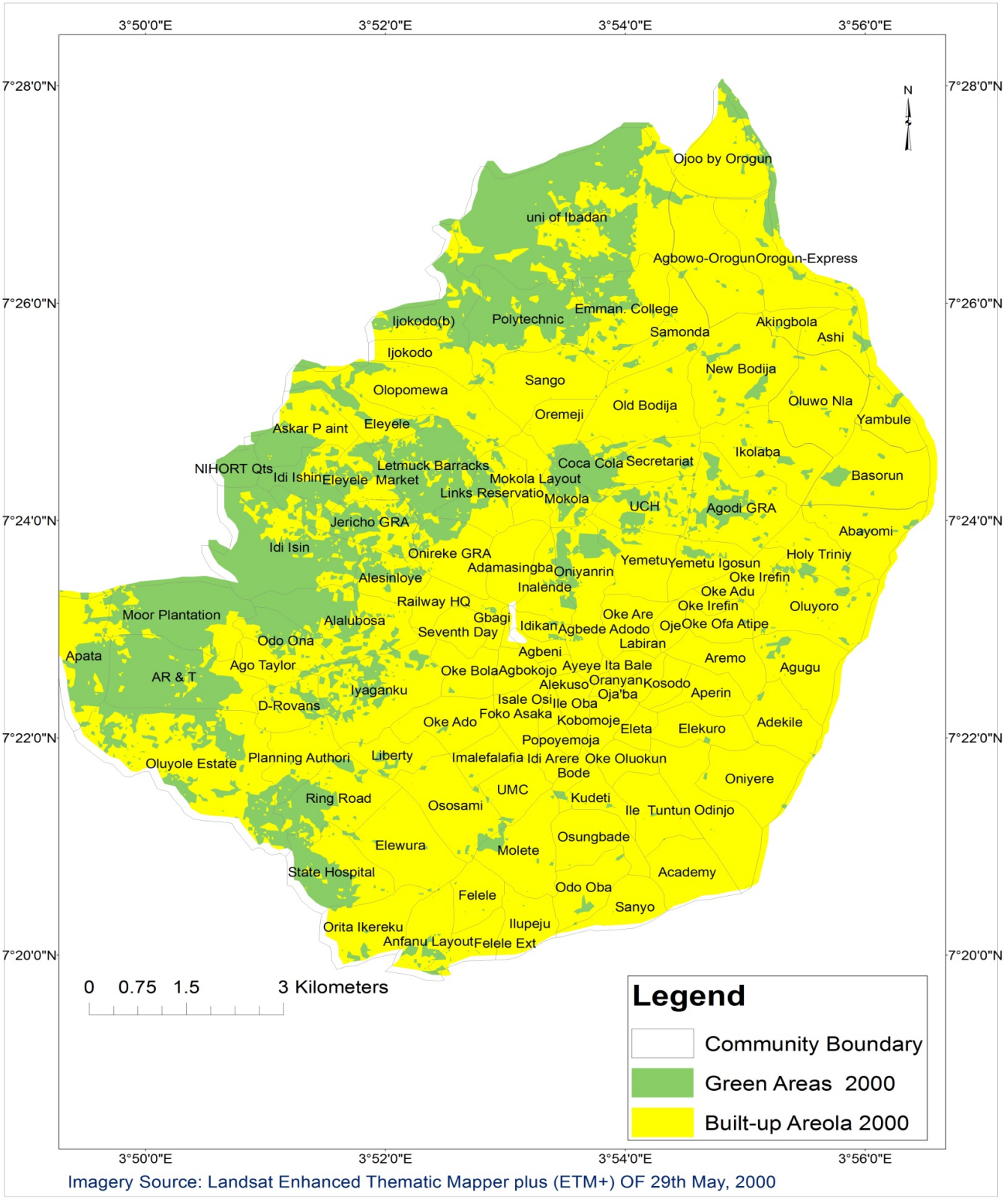


Figure 4.13: Spatial distribution of Green Spacesin 2000
Source: Author Analysis, 2017

But, such green spaces occupied a small portion of the city landscape in 2000 as compared to the situation in 1985 (Figure 4.13). The city traditional core center continued to experience de-greening in the year 2000.

4.1.2.5 Pattern of green spaces in2015

Figure 4.14shows that green spaces remained sparsely distributed as of 2015 while areas with large volumes of green spaces were still linked with government reserved areas (GRA). But, significantly, some new areas emerged with small pockets of green space that were not there before. Could it be that the green movement had started by 2015? Or could it be that residents had become more aware of the benefits and importance of green spaces? From the FGD conducted in these localities, it is clear that the metropolis is now congested and green spaces are found in fenced areas, in compounds and in the interior parts of the localities which are not suitable for construction. However, findings also showed that a number of single lane and dual carriage roads were constructed between2000 and 2015 during the Alao-Akala and Ajimobi administrations. The road construction cleared some erstwhile green spaces. From the green spacemeasurement carried out (Appendix D-1) the majority of the localitiesnow have green spaceswithin the range 10,0000m^2 to 100,000m^2 (1ha. – 10ha.). In other words, small sized green spaces now predominate in the metropolis.

Interestingly, the spatial pattern of green spaces clearly portrayed a declining trend in coverage from 1972 to 2015. The main factor responsible was urbanization characterized by the construction of residential, commercial and industrial buildings, roads and other social infrastructures. There were, however, exceptions in certain areas. For example, areas close to the river channels (e.g. Ogunpa canal, Ona River etc.) and Government Reserved Areas remained green over the years. The GRAs suffered repeated deregulation especially under the military governments but, they still have a relatively higher proportion of green spaces compared to other sections of the city up till today. Another crucial observation was the impact of the establishment of an institution, the University of Ibadan, and the Government Secretariat in shaping the green space distribution. For instance, as early as pre-independence, areas around Agbowo, Orogun, Ojoo, and Samonda were already under significant pressure for expansion. Areas along Old Bodija began to spring up fast in the 60s which could be attributed to the presence of major landmarks such as the Secretariat and the University institution.

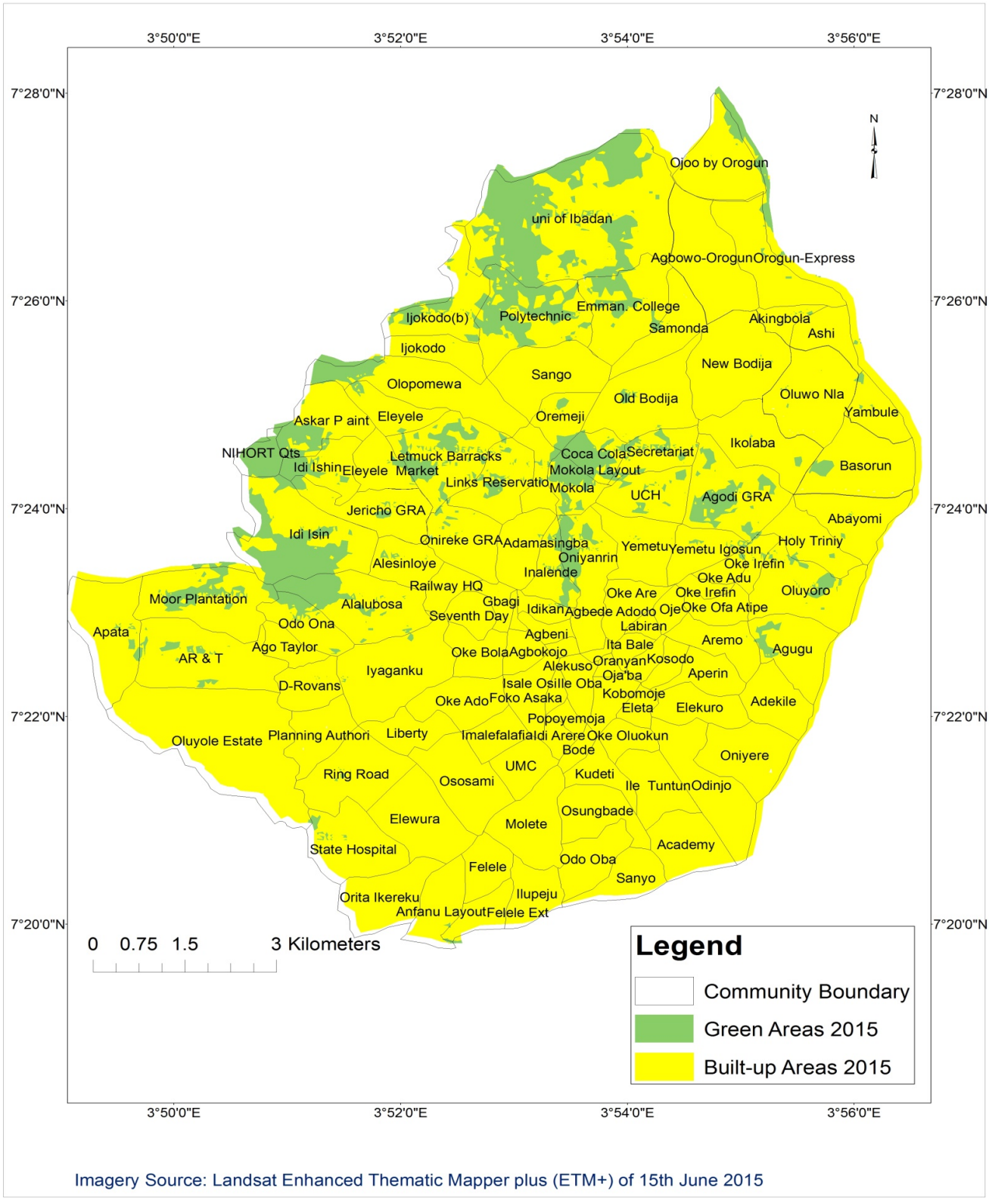


Figure 4.14: Spatial distribution of Green Spaces in 2015
Source: Author Analysis,2017

Today, the unplanned traditional core areas of Ibadan show more scanty distribution of green spaces as compared to the outer areas because of the densification of buildings. Localities such as Moor Plantation, IAR & T, Iyaganku, Oluyole estate still have open spaces with dense green vegetation. These areas were once either Government Reserved Areas or parts of the modern core city fringesthat could still accommodate settlers at that time and so reduced the number of people migrating far to therural fringes of the metropolis. The presence of Ogunpa River channel contributed immensely to the preservation of green spaces in such areas as Oranyan, Foko, Asaka and Inalende.

Furthermore, it could be inferred from the FGD reports that the green space distribution pattern was more a function of the pattern of physical developments than a deliberate effort by the people to maintain the green spaces. When asked if they understood the negative impact of green space removal, the people's responses were limited to immediate negative impacts rather than the long term effects like climate change. Also, there was a clear distinction between what was happening in the various concentric zones of the city structure. The core areas witnessed more physical development and human activities and thatwas why by 1955, there had considerable removal of green spaces in these areas. By the mid-50s also, the core areas were battling with a shortage of land for development and green spaces were either restricted to fenced areas and family compounds. The question remains whether there were other unknown factors responsible for the spatial pattern of green spaces in Ibadan metropolis till date.

Lastly, green spaces declined by -62.0%, -37.8% and -38.4%between 1972-1984, 1984-2000, and 2000-2015, respectively. The overall percentage change from 1972 to 2015 is -85.4%. Figure 4.15 shows a graphicaldepiction of variations in localitygreen space losses between 1972-2015.

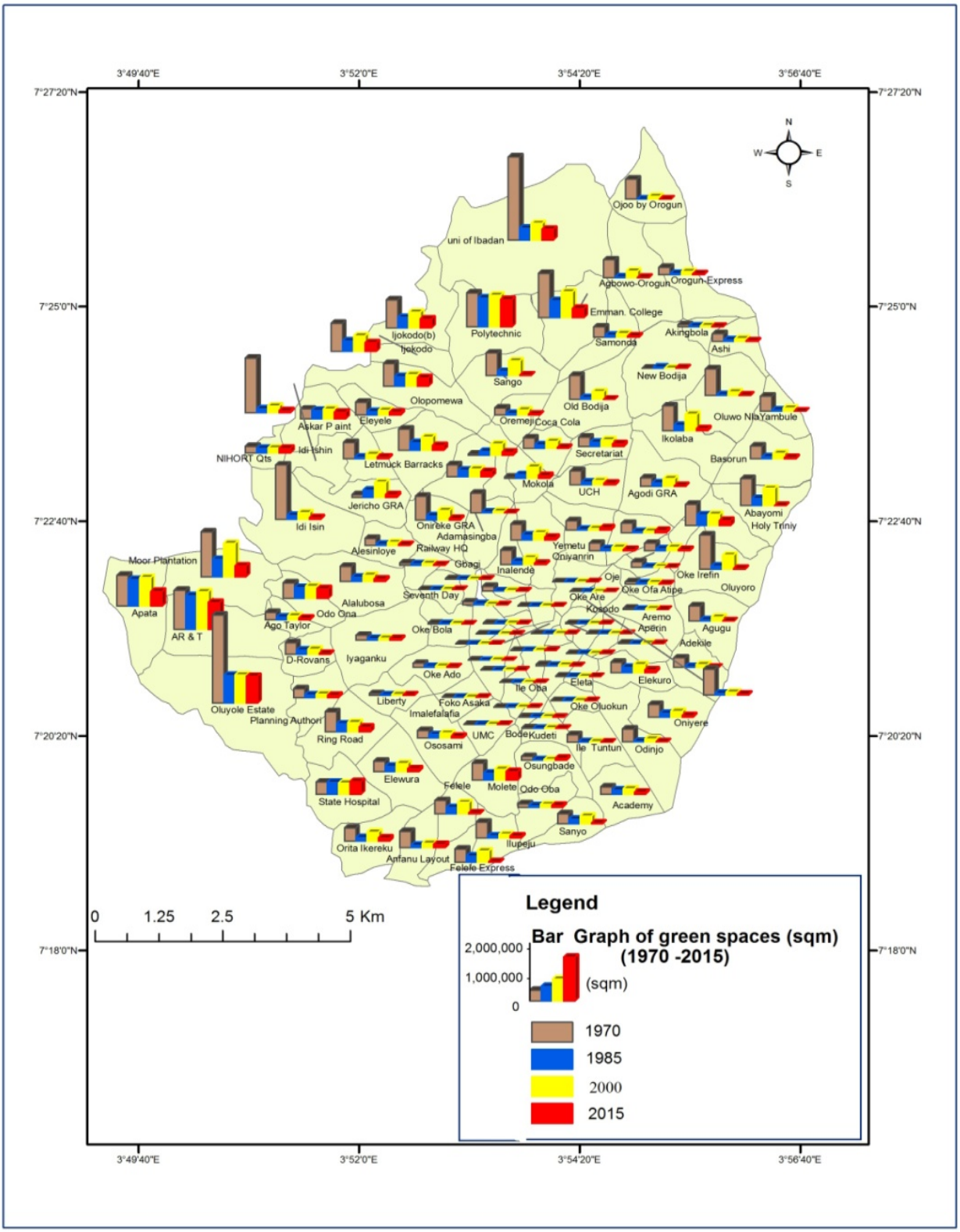


Figure 4.15: Changes in Green Space, 1972 – 2015
Source: Author Analysis, 2017

4.2 Social Ecology and the Distribution of Green Spaces

Results of analysis and discussion are provided for the relationship between the distribution of green spaces and the social ecology of localities. This section is divided into two main sub sections. The first sub section presents the descriptive statistics by characterizing Ibadan metropolis based onten (10) social ecology indicators (i.e. the transformed dataset; average and percentages as applicable). The second section focuses on the inferential statistics with the goal of examining the relationship between green spaces in square meters and the social dimensions of the city. Lastly, attempt is made to compare findingswith those in existing literature.

4.2.1 *Characterization of Ibadan Metropolis using Social Ecology Indicators*

The male gender (54.9%) outweighs the female gender (45.1%) among the respondents in the metropolis and there is more concentration of the male gender in both high and medium density residential localities(Figure 4.16; Appendix B-1). In terms of age, the average ageof respondents for Ibadan metropolis is 33 years old. The spatial distribution of the average age groupsis presented in figure 4.17. Localities at the city center dominate at every age bracket, except the oldest group of 59years and above.With respect to ethnicityof respondents,the Yoruba group constituted the highest proportionat 70.8%, followed by the Ibo at 18.7%. The Hausa group was the lowest at 10.5% (Figure 4.18; Appendix B-2). Christians constituted the largest group at 74.8%, followed by Muslims at 24.3% and, lastly, the traditional religionists at about 0.9%. (Figure 4.19; Appendix B-2).

In terms of the occupation indicator students are more concentrated in the high and middle income localities such as Bodija, Agbowo (Figure 4.20; Appendix B-2). The artisans, trading/business people, and the civil/public servants are moderately evenly distributed across the city. Farmers are widely dispersed but with a discernible concentration in the outer parts of the city. In total, the self-employed accounted for 1.7%; farming 6.4%; students 13.7%; Artisan 19.2%; civil/public servants 28.4%; and trading/business 30.6%.

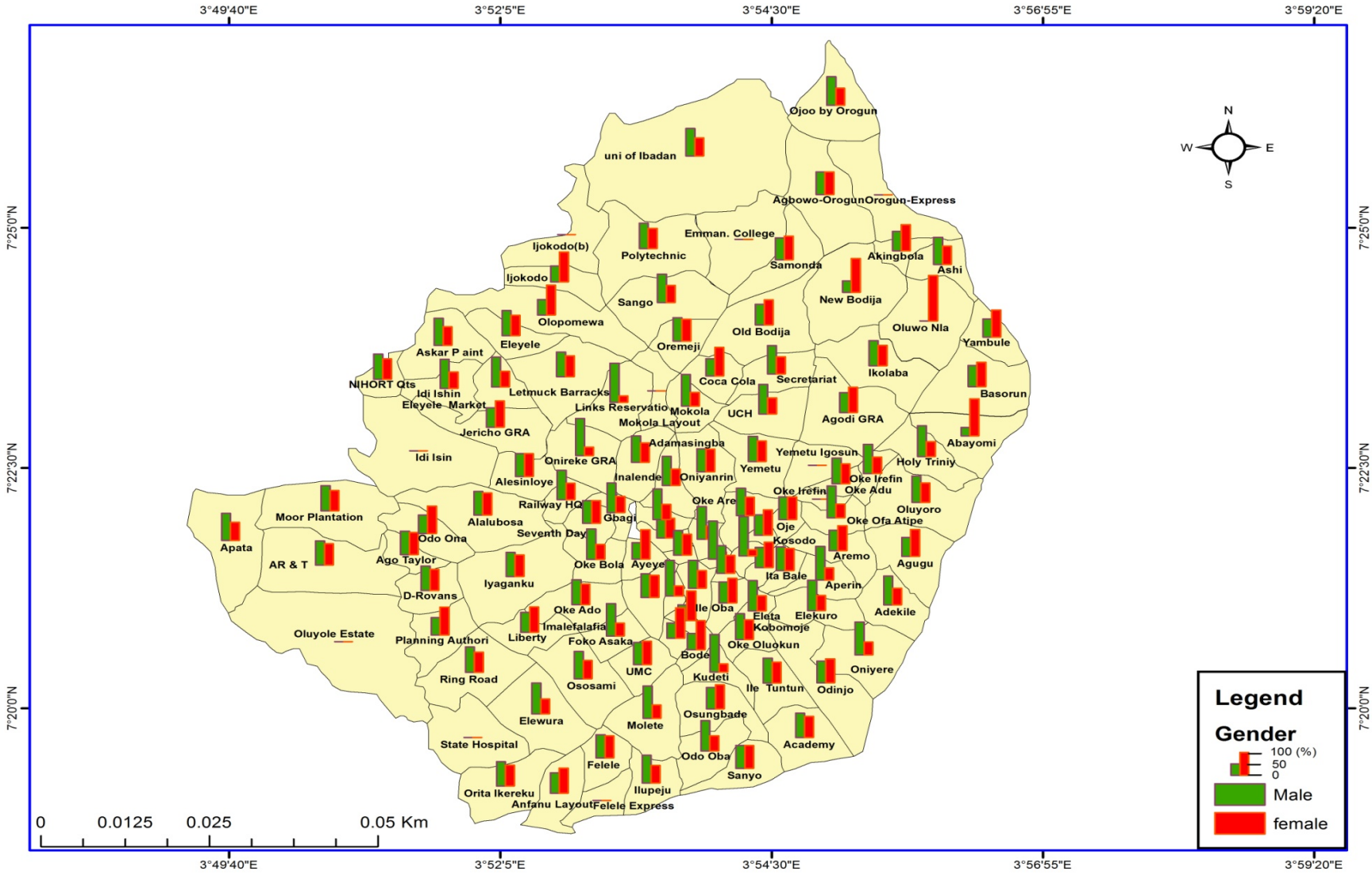


Figure 4.16: Spatial Distribution ofthe Gender Groups in Ibadan Metropolis
Source: Author Analysis, 2017

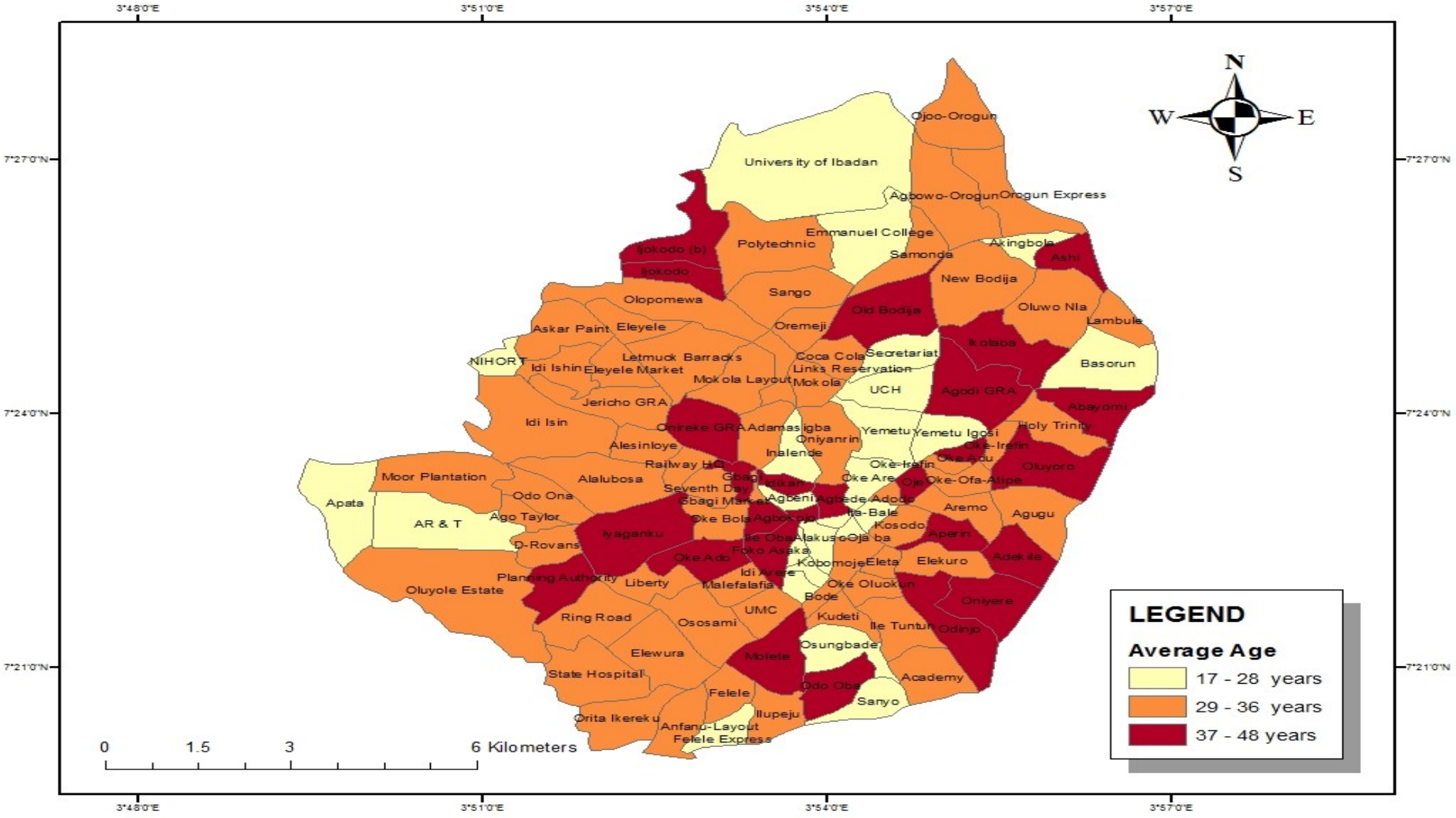


Figure 4.17: Spatial Distribution of the Average Age of Dwellers across Ibadan Metropolis
Source: Author Analysis, 2017

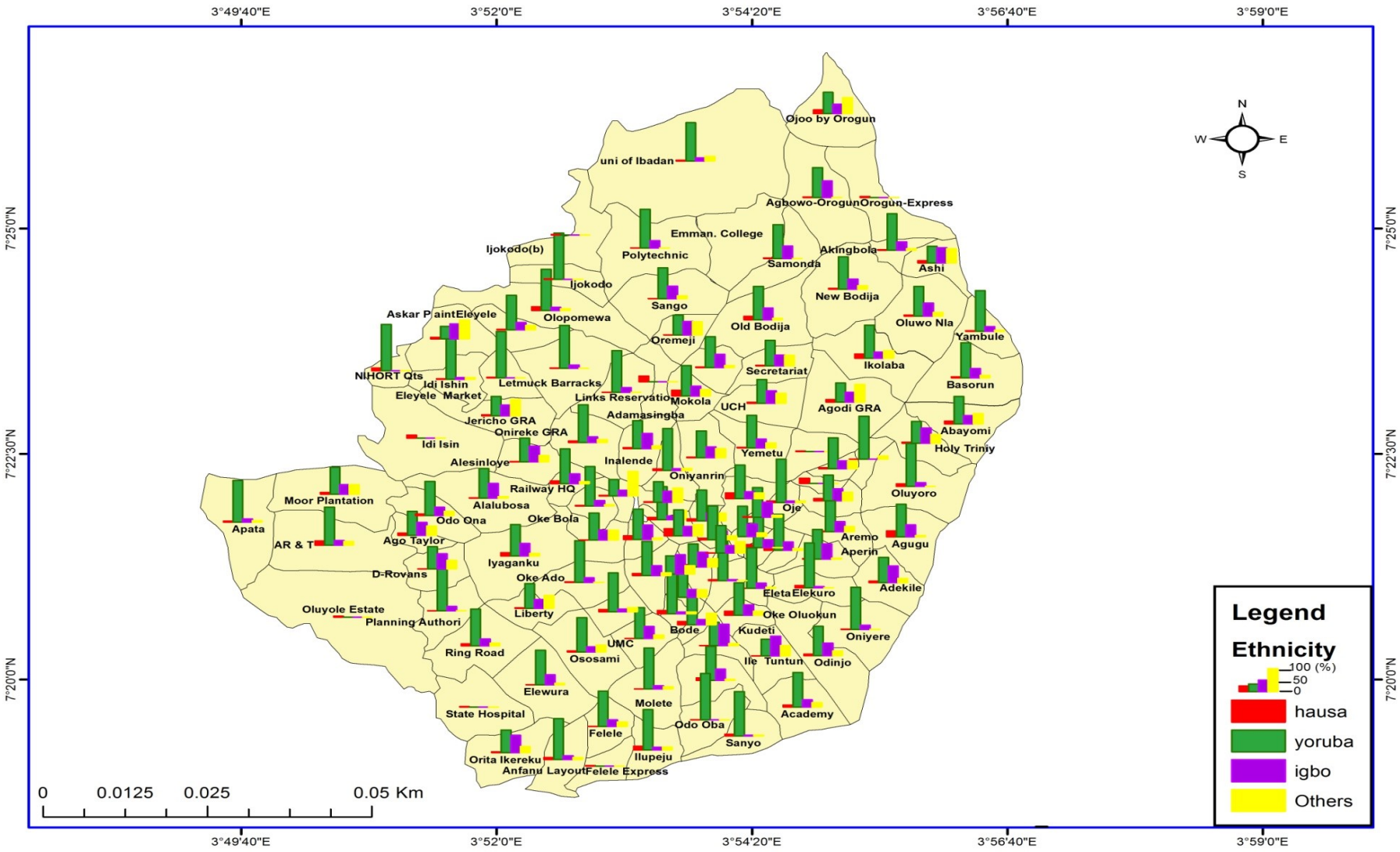


Figure 4.18: Spatial Distribution of the Ethnic Groups in Ibadan Metropolis
Source: Author Analysis, 2017

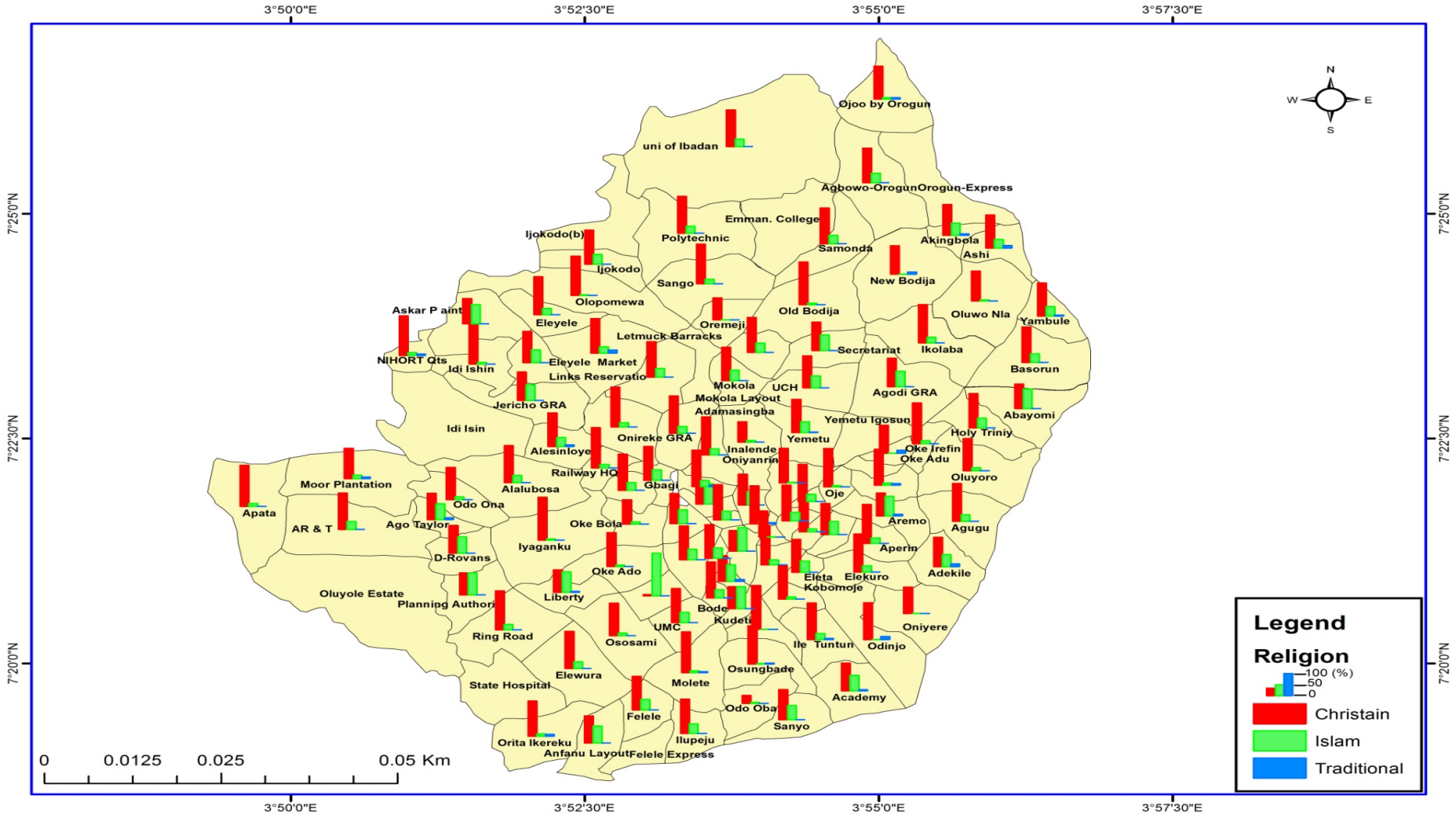


Figure 4.19: Spatial Distribution of the Religious Groups in Ibadan Metropolis
Source: Author Analysis, 2017

With regard to the educational level of respondents,the medium density residential localities had the highest concentration of those with secondary school certificate, primary school certificate, and tertiary level education while those with no formal education at the bottom of the chart are well represented in the middle and high-incomelocalities (Figure 4.21; Appendix B-2). In total, those with 'No formal education' were about 4.6% of total respondents; those with primary school certificate as their highest level of education, 7.2%; secondary education, 45.4%; and tertiary level education, 42.8%. About 0.1% had only Quranic education.

The average income of respondents for Ibadan metropolis as a whole is 42,055 naira. The spatial distribution of average income of respondents across Ibadan metropolisis presented in figure 4.22.

In the metropolis as a whole(Figure 4.23), bungalow housing types dominate at 40.8%, followed by flats, 28.7%; single apartment, 28.1%; duplex, 1.1%; storey building (0.8), hostel 0.4%; boys' quarters, 0.1%. Hut housing type recorded 0.0% (Appendix B-2). Also, housing wall materials in Ibadan metropolis include mud, concrete, mud bricks, cement blocks, wood, and tiles. Concrete walls predominate in all localities. There is virtually no other type of wall material in the low residentiallocalities while the medium and high residentiallocalitiesaccommodate small proportions of mud and wood walls (Figure 4.24). Bricks and tiles are the least common across localities. Overall, concrete material made up 89.7%; mud, 8.1%; while wood, bricks, blocks and tiles recorded 1.7%, 0.2%, 0.1% and 0.1% respectively (Appendix B-2). Several roofing materials are in use in Ibadan metropolis but asbestos roofing sheets far outstrip all others even in the high density residential localities(slum areas) (Figure 4.25). Indeed, asbestos (78.6%), zinc (8.9%) and thatch (6.7%) are the leading roofing materials across localities. Other roofing materials found in the metropolis are aluminum material (2,4%), PVC (about 1.5%), corrugated iron roofing sheets (0.7%), while concrete (0.7%), POP (0.7%), metro tile (0.3%) and hay/palm (0.3%) also featured (Appendix B-2).

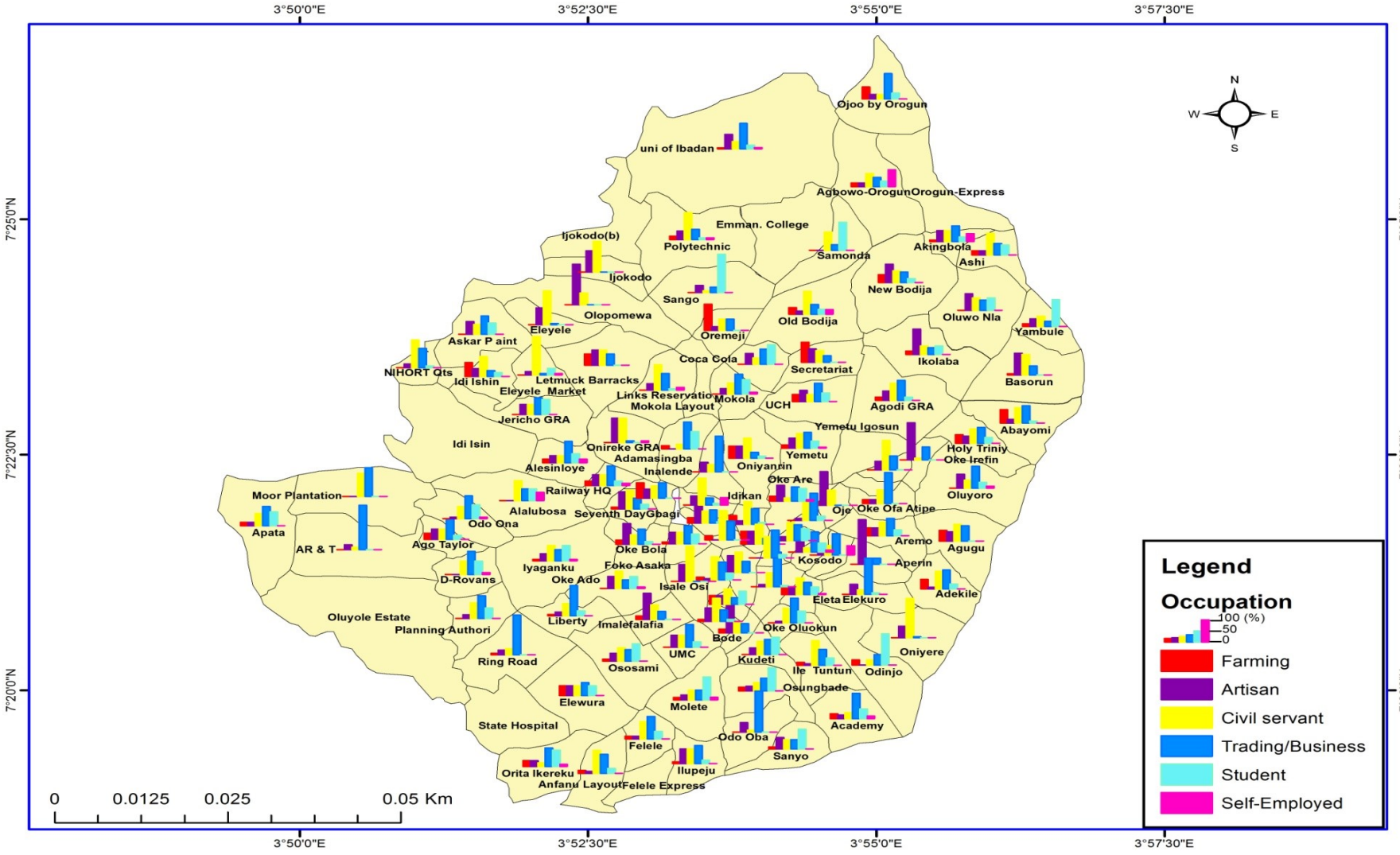


Figure 4.20: Spatial Distribution of the Occupation Groups in Ibadan Metropolis
Source: Author Analysis, 2017

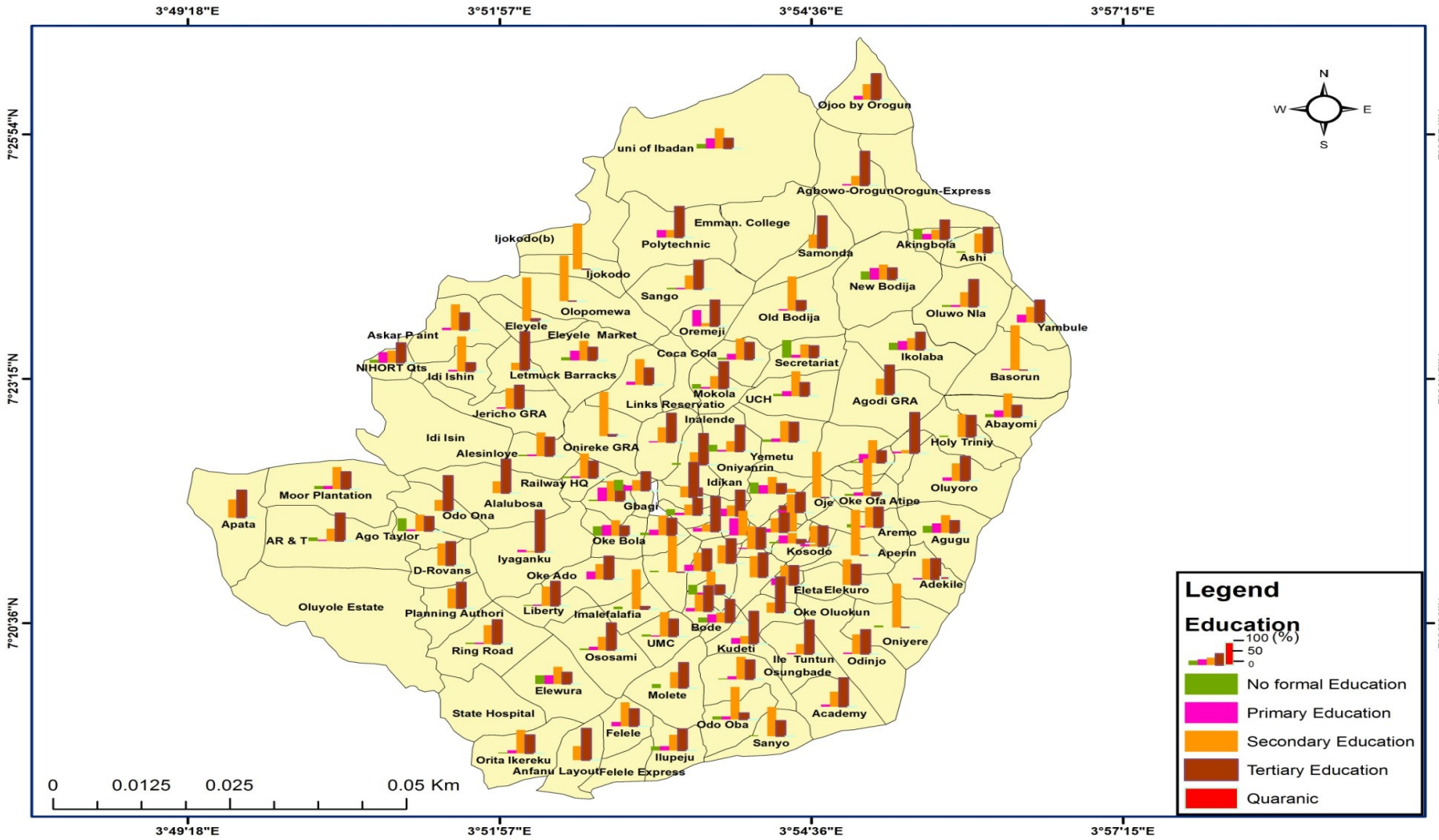


Figure 4.21: Spatial Distribution of the Highest Level of Education Attained in Ibadan Metropolis
Source: Author Analysis, 2017

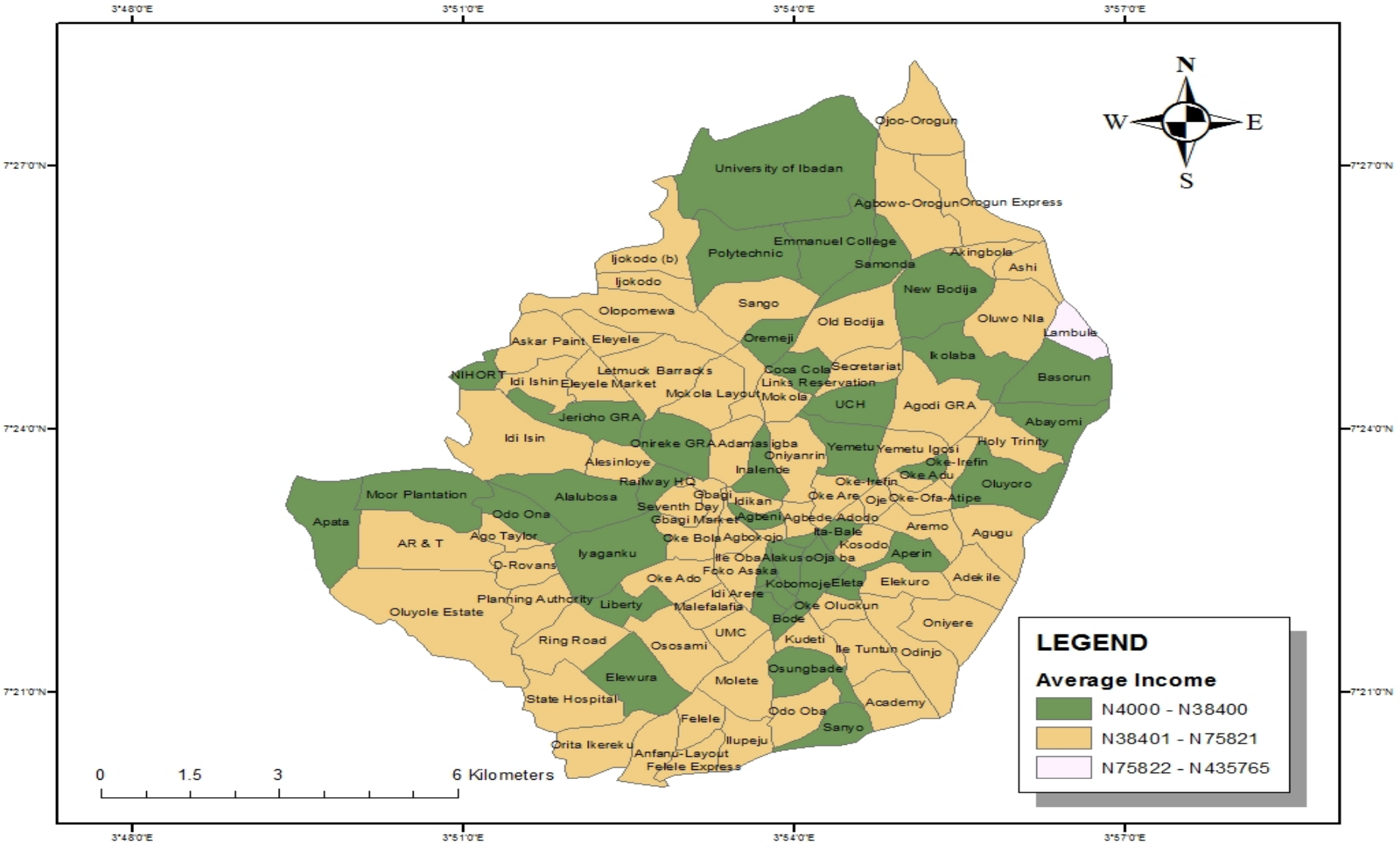


Figure 4.22: The Spatial Distribution of the Average Income of Respondentsacross Ibadan Metropolis
Source: Author Analysis, 2017

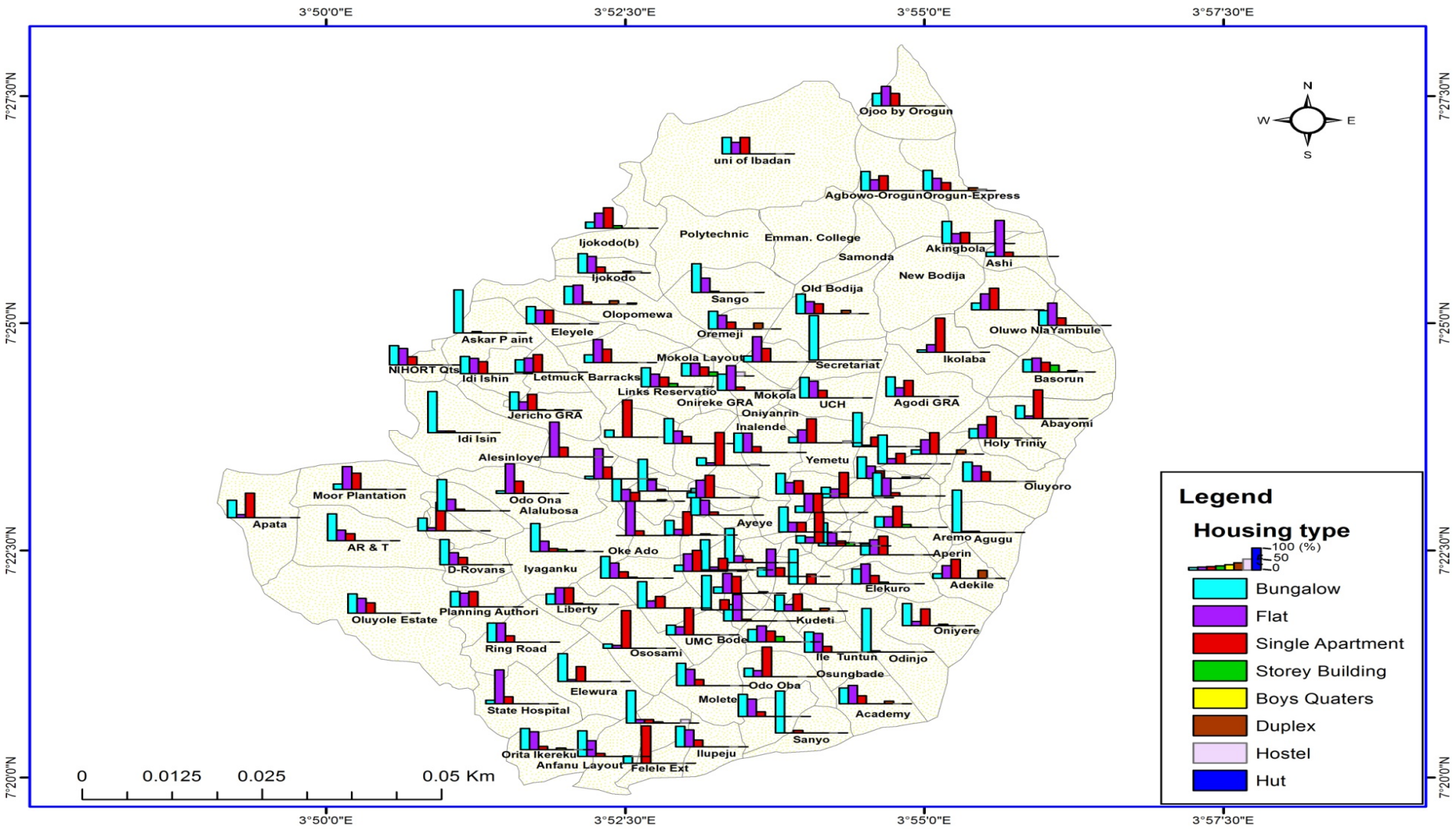


Figure 4.23 Spatial Distribution of Housing Types in Ibadan Metropolis
Source: Author Analysis, 2017

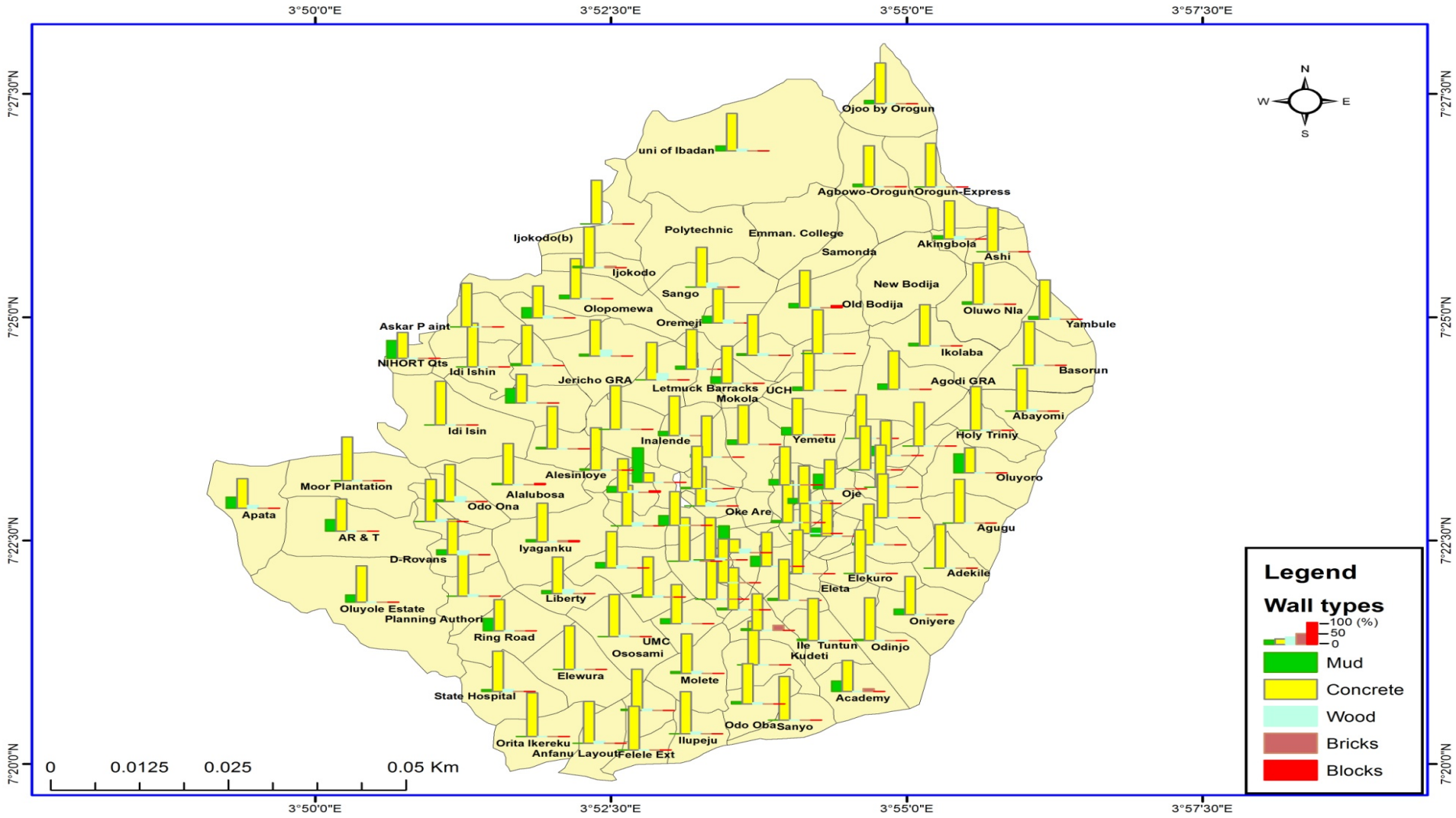


Figure 4.24 Spatial Distributionof Housing Wall Materials in Ibadan Metropolis
Source: Author Analysis, 2017

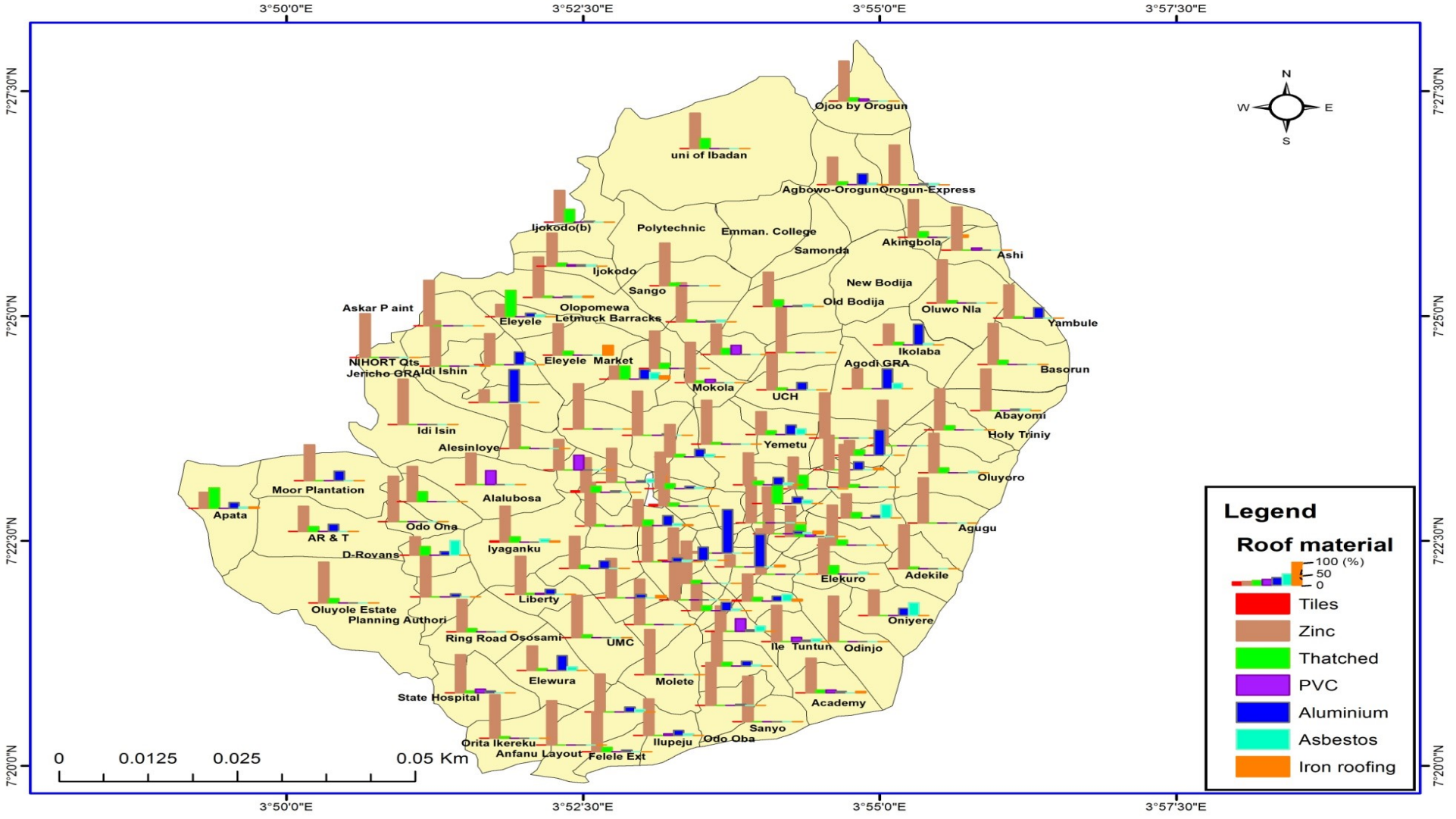


Figure 4.25 Spatial Distribution of Housing Roofing Materials of Ibadan Metropolis
Source: Author Analysis, 2017

According to existing literature, factors that influence attitudes towards the environment include among others income status and housing characteristics (De Vries and De Bruin 1998; Payne *et al.,* 2002; Galloway, 2002; Gobster, 2002; Roovers *et al.,* 2002; Giles-Corti *et al.,* 2005; Guerry *et al.* 2015). From the findings localities with predominantly bungalow type housing can be largely associated with owner-occupierswho may have more positive attitudes towards greening and have more green spaces as compared tolocalitieswithpredominantly rented apartments. Also, localities with more expensive but affordable building (wall) and roofing materials are likely to have more green spaces as compared to the other types of neigbourhoods with less expensive building materials.

4.2.2 ***Relationship between Social Ecology and Green Spaces in Ibadan Metropolis***

4.2.2.1 *Principal component analysis*

Principal component analysis (PCA) was employed to identify the underlying dimensions in the datasetsin which the 10 indicators (*transformed values*)were collapsed tofewer uncorrelated components. The results of the analysis showthe total variance explained by each component (Table 4.2 – table 4.2b; Figure 4.26). The first column of the table shows the factors (PCs). The second column shows the initial total. The third column displays the eigenvalues % of variance while the fourth column shows the cumulative percentage of the total variance attributed to each PC.

Based on the Kaiser criterion, only factors with an eigenvalue of 1 and above were extracted for interpretation and further analysis. Therefore, the first five PCs were extracted for further examination and analysis (Table 4.2). The five (5) factors (PCs) together account for (1.552 +1.418+1.204+1.027+1.009) /10 = 62.1% of the total variance in the data set. The corollary of this is that these five components best describe the nature of the original dataset and therefore constitute the main dimensions of the social ecology in Ibadan metropolis. There is a sharp drop in eigenvalue between factor five and factor six. Factors six to ten are scree (figure 4.27).

Table 4.2a: Total Variance Explained

	Initial Eigenvalues		
PC	Total	% of Variance	Cumulative %
1	**1.552**	**15.524**	**15.524**
2	**1.418**	**14.184**	**29.709**
3	**1.204**	**12.037**	**41.745**
4	**1.027**	**10.268**	**52.014**
5	**1.009**	**10.091**	**62.104**
6	.919	9.190	71.294
7	.856	8.565	79.859
8	.797	7.970	87.829
9	.635	6.352	94.181
10	.582	5.819	100.000

Source: Analysis. Note: the major PCs in bold print

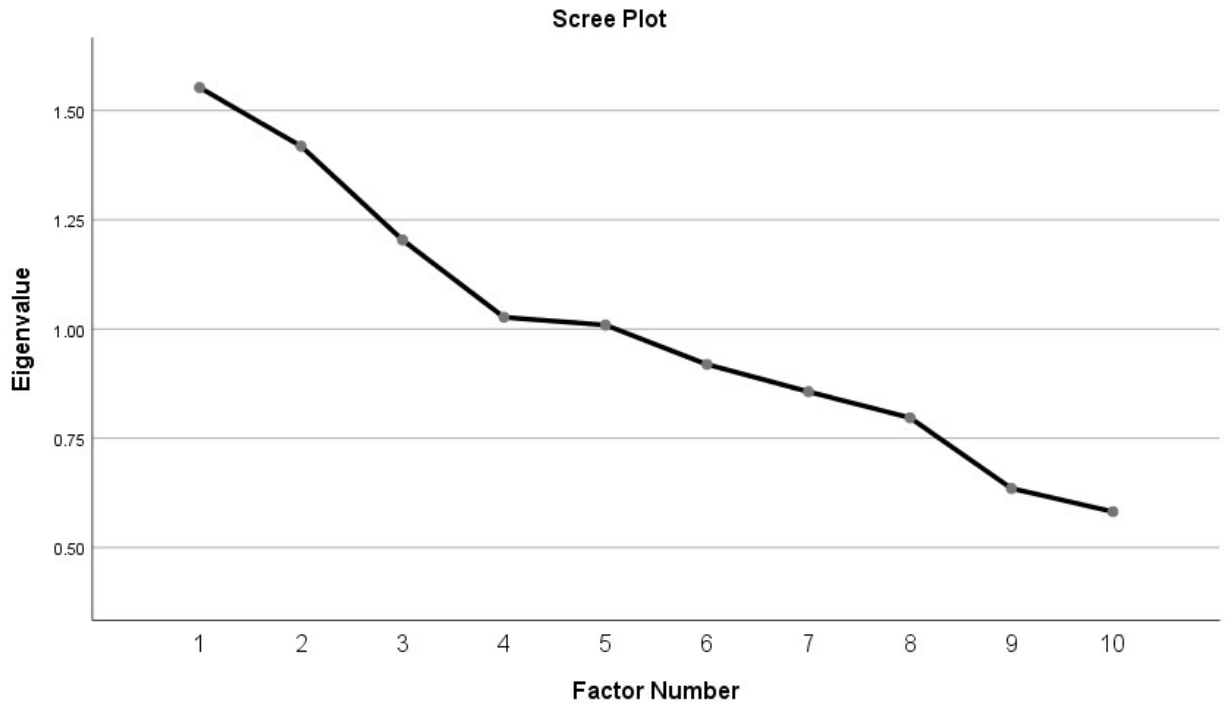


Figure 4.26: Scree Plot for the Eigenvalues of the Ten Indicators

Source: Author 2018

Each of the five PCs accounted for a certain percentage of the total variance. The first PC, with an eigenvalue of 1.552, accounted for the largest amount of variance (15.524%). The second PC, with an en eigenvalue of 1.418, explained 14.184 of percentage variance. The third PC has an eigenvalue of 1.204 and accounted for 12.037 % of the variance, the fourth PC, with an eigenvalue of 1.027 accounted for 10.268% of variance while the fifth PC, with an eigenvalue of 1.009, contributed the least amount of the total variance (10.091%). A summary of the component loadings is displayed in Table 4.2.

Based on the largest loadings within the respective PCs, each has been labeled or characterized. The factors with the highest loadings on PC1 are monthly income (0.647) and age (0.595), while PC2 highest loadings are by occupation (0.542), highest level of education (0.419) and gender (0.153). Ethnicity (0.452) and religion (0.413) load highly on the PC 3; housing wall materials (0.333) and housing types (0.331) load highly on PC4, while the highest loading on PC5 isby housing roofing material (0.267). Given the nature of the component loadings, the first PC was referred to as income/age; the second as occupation/education/gender;the third as ethnicity/religion;the fourth as housing wall material/housing type; and the fifth as housing roofing material(Table 4.2b).

Table 4.2b: Rotated Components Matrix

Factors					
	PC 1 monthly income/age	PC 2 (occupation/ edu/gender)	PC 3 Ethnicity/ religion	PC 4 Housing wall/type	PC 5 Housing roof
Monthly Income	**.647**	.082	-.010	.083	.044
Age	**.595**	-.129	.154	-.081	.020
Occupation	.036	**.524**	-.038	.137	-.082
Highest level of Education	.281	**.419**	-.258	.270	-.275
Gender	-.034	**.153**	.024	-.016	.047
Ethnicity	.045	.069	**.452**	.067	.128
Religion	.044	-.054	**.413**	-.051	-.017
Housing structure Wall Materials	.036	.009	-.055	**.333**	-.106
Housing types	-.056	.105	.112	**.331**	.172
Housing structure roofing	.030	.002	.029	-.014	**.267**
Extraction Method: *Principal Axis Factoring*. Rotation Method: *Varimax with Kaiser Normalization*.					

Finally, the component scores were mapped to show their spatial variation across the 104 localities(Figures 4.27 to 4.31). Figure 4.27 displays the spatial pattern of monthly income/age (PC1). High (0.695-0.953) and moderate (0.139–0.695) income/age localitiesoccur in patches in a sea of low income/age localities. The high income/age localities are mostly at the outer areas of the city and the more modern areas adjoining the traditional core of the city.They include Ojoo-Orogun, Ijokodo, Jericho, Idi Ishin, New Bodija, Agodi GRA, Abayomi, Oje, Oke Ofa, Aperin, Molete and Apata. The medium income/age localities are almost everywhere adjacent or close to the high income/age localities. They include Ring road, Onireke, Academy, Agugu, Old Bodija, Odo Ona, and Eleiyele.

Figure 4.28 shows the spatial pattern of PC2, occupation/education/gender. The spatial patterns of distribution oflocalities with high, medium and low scores on this PC2 are largely similar to those of PC1 (income/age). This is not surprising as there is a high correlation between the factors with high loadings on both principal components.

Figure 4.29 shows the spatial pattern of the factors of ethnicity/religion (PC3). The areas with high (0.534 – 0.961) to medium (0.184 – 0.534) scores seem to coincide with localities that probably house a lot of migrants from other states and towns and so are probably more diverse in ethnic composition and religious affiliation. The sea of low scores (-0.560 – 0.184) covers the traditional core and outlying localities where the indigenous Ibadan and Yoruba from other parts of Nigeria are likely to be concentrated.

Figure 4.30 displays the spatial pattern of housing wall material/housing type (PC4).Again localities with low scores (-0.230 – 0.230) dominate the urban landscape while the patches of localities with high (0.587 – 0.930) and medium (0.230 – 0.587) scores probably highlight areas where housing types are markedly different than in other areas. The areas with modern housing estates and more recent building structures feature much among the high and medium score areas.

Finally, Figure 4.31 displays the spatial pattern of housing roofing (PC5) in the metropolis. Perhaps, as to be expected, there is close similarity between the spatial distribution of localities on the basis of housing roofing materials (PC5) and that of housing wall/housing type (PC4). There is close match between the areas of low, medium and high scores between the two PCs.

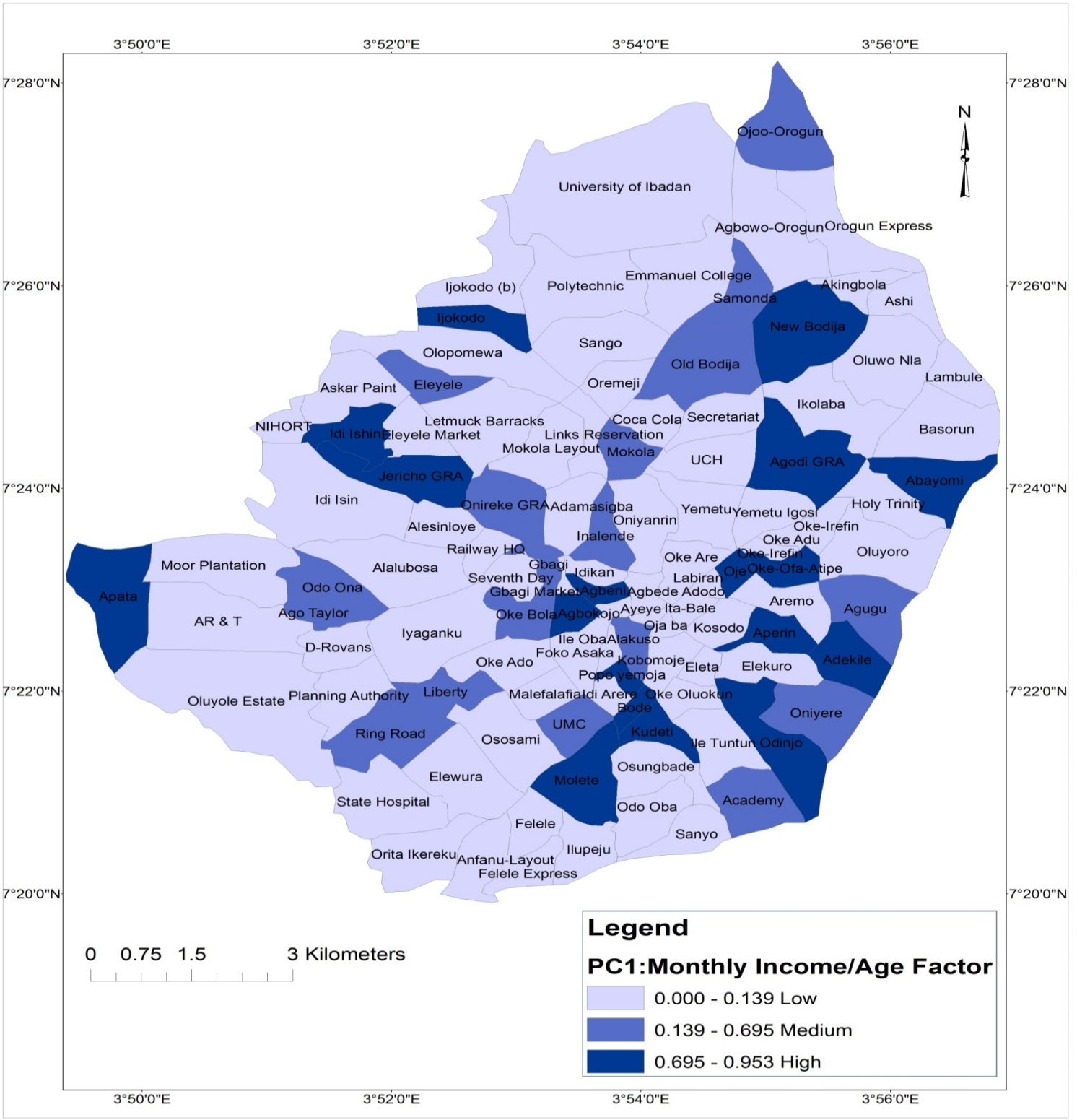


Figure 4.27: Spatial variation of Monthly Income/ age (PC1)
Source: Author 2018

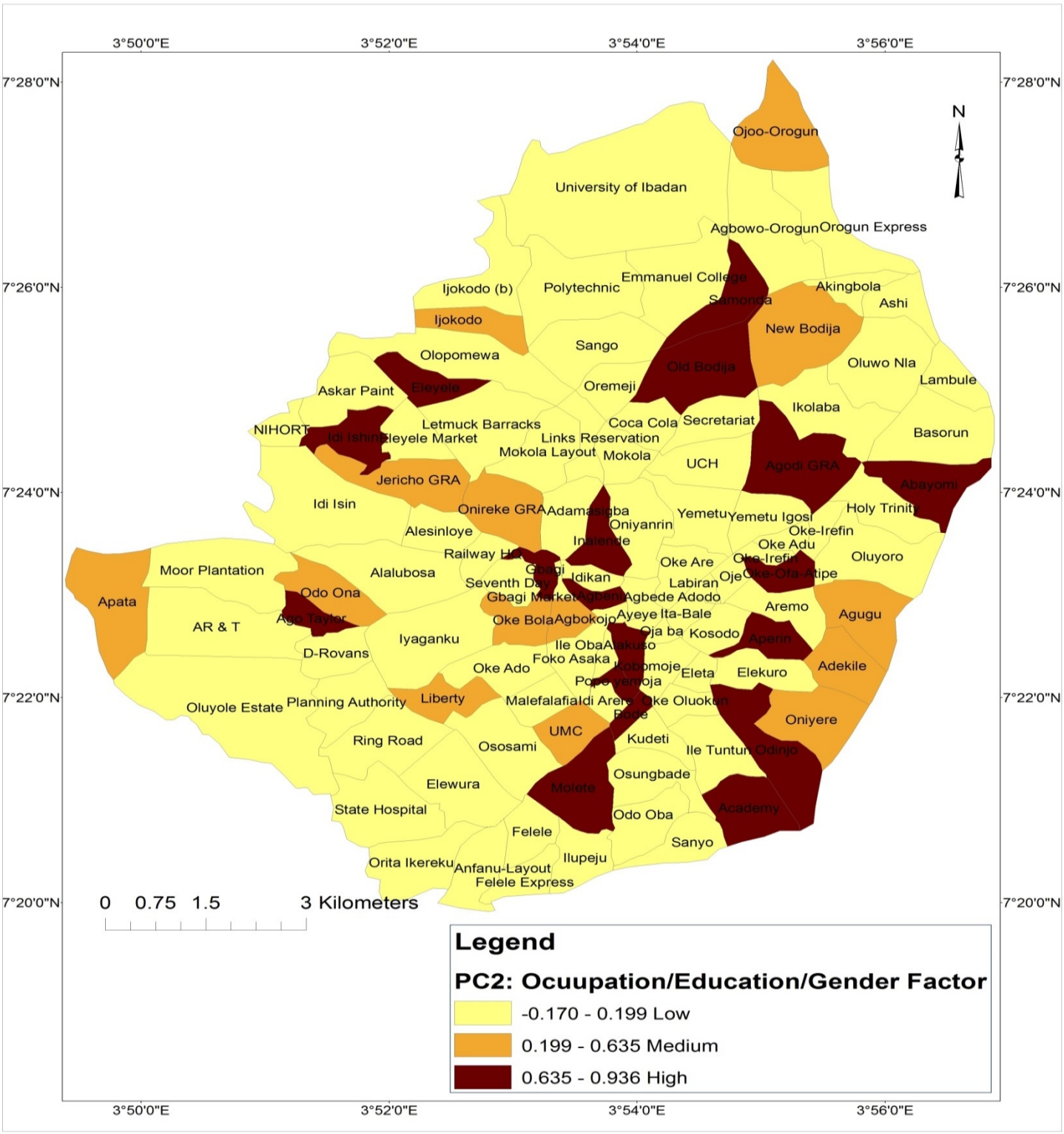


Figure 4.28: Spatial variation of occupation/edu/gender (PC2)
Source: Author 2018

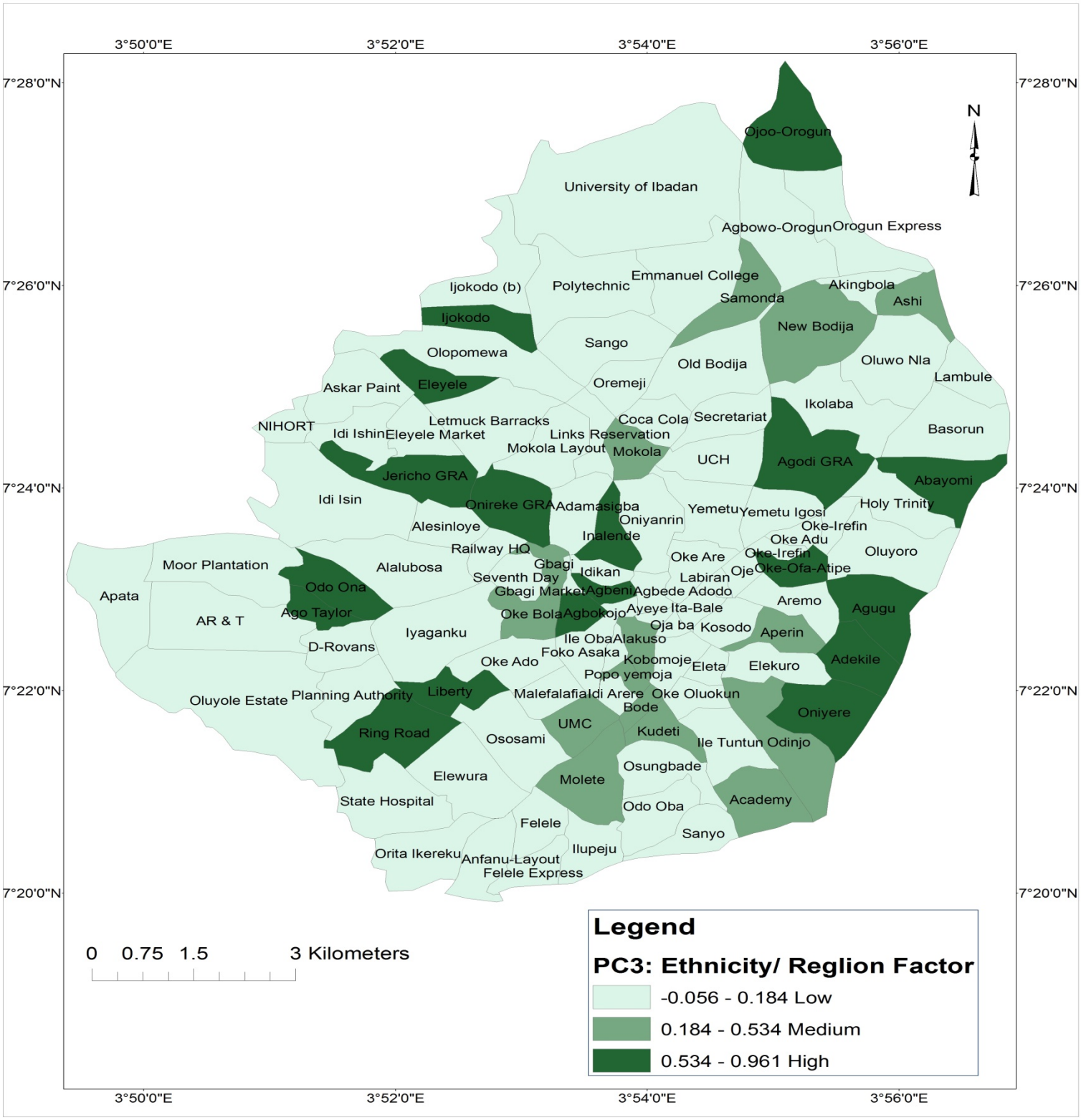


Figure 4.29: Spatial variation of ethnicity/religion (PC3)
Source: Author 2018

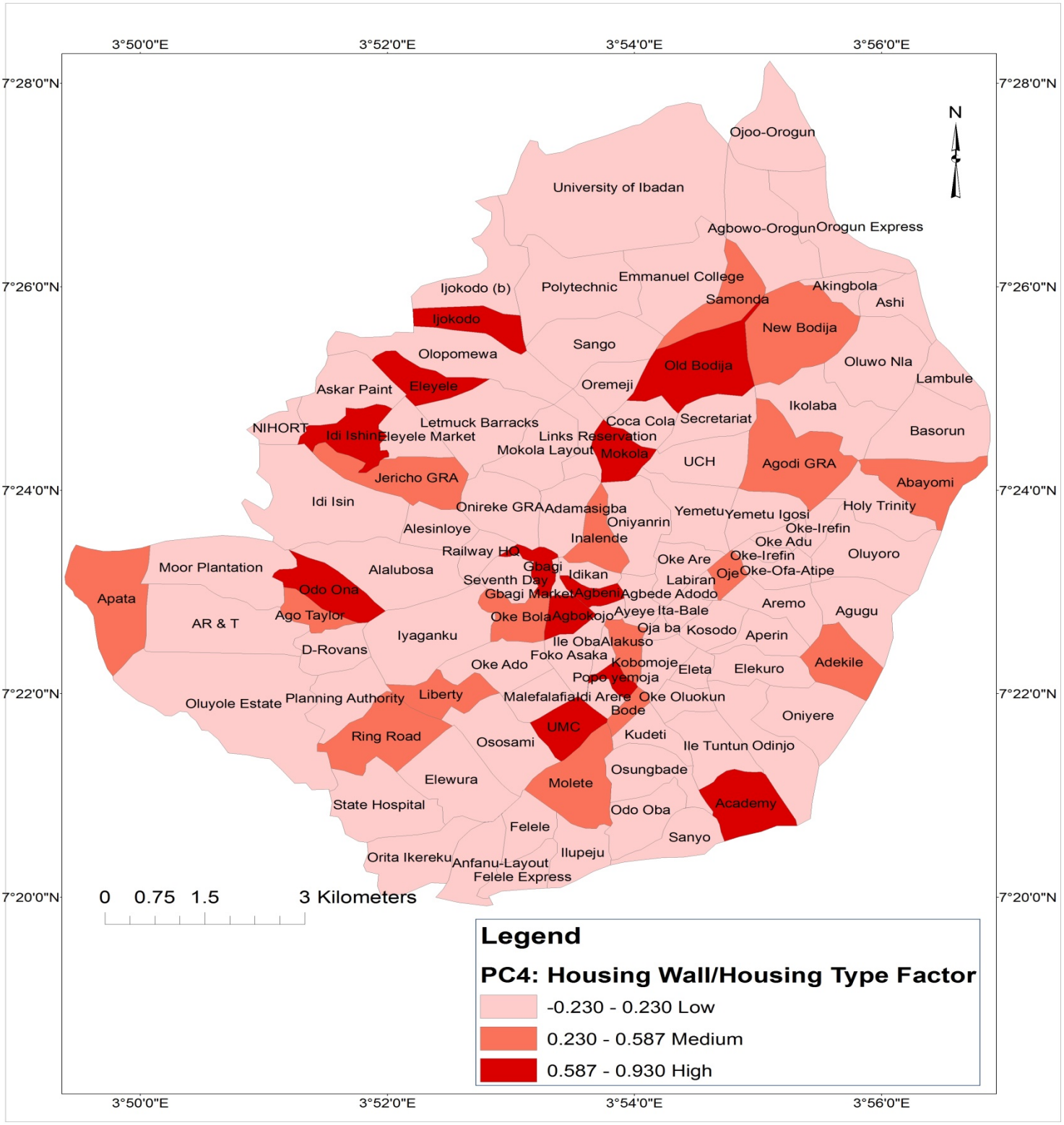


Figure 4.30: Spatial variation of Housing wall/type (PC4)
Source: Author 2018

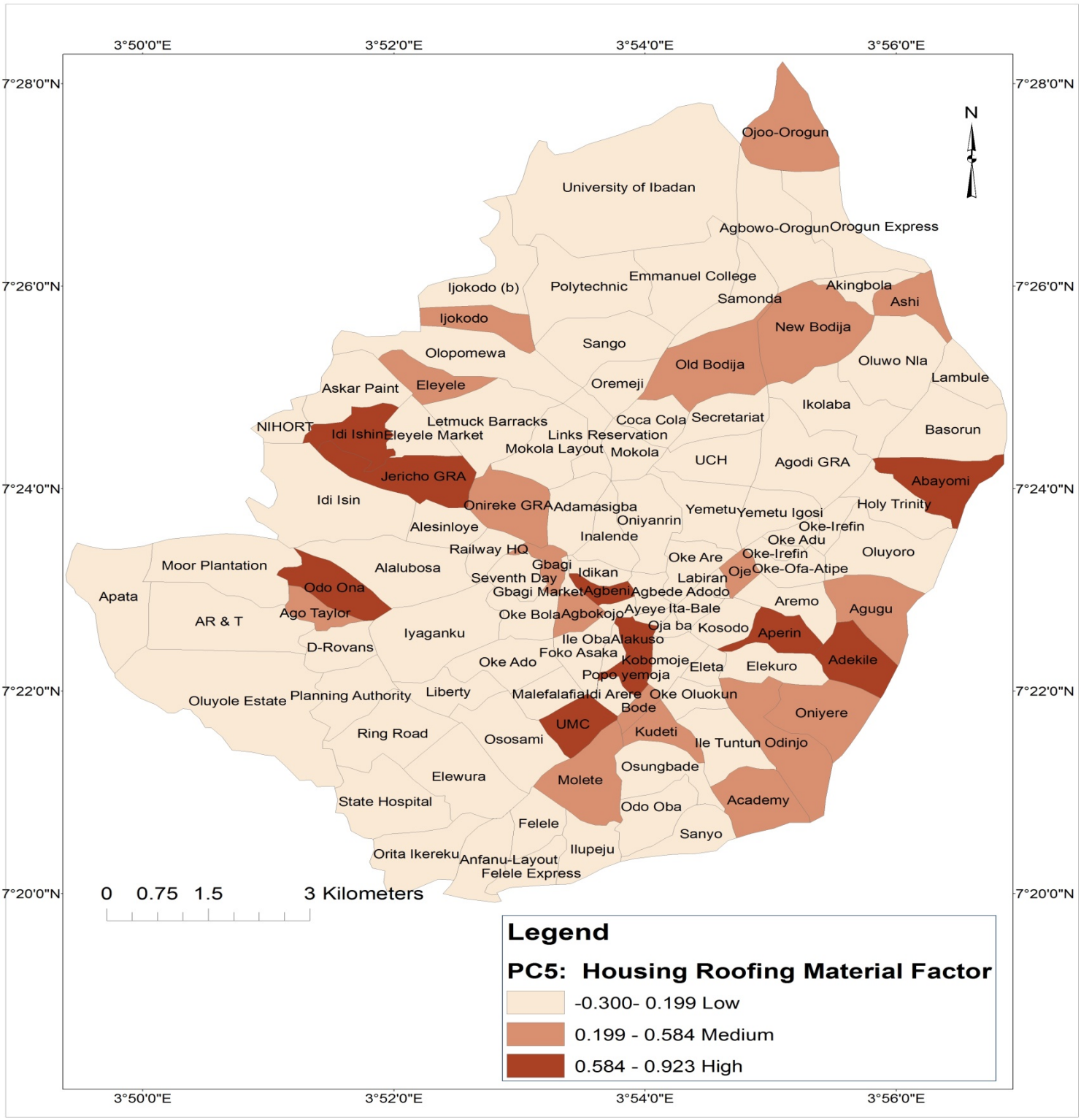


Figure 4.31: Spatial variation of Housing roofing (PC 5)
Source: Author 2018

4.2.2.2 ***Ordinary Least Square and Geographically Weighted Regression (GWR)***

The next stage was to perform an Ordinary Least Square regression and a Geographically Weighted Regression in order to identify which of the factors assisted in predicting green space patterns for Ibadan metropolis.The summary of the OLS using ARCGIS 10.4.1 (Statistically significant p-value ($p < 0.01$) (Appendix H-1)are:

Income	0.004*
Occupation	0.010*
Housing type	0.001*

The input variables for the GWR OF ArcgIS 10.4.1 therefore included"green space in sqm^2 for 2015; Income; Occupation; and Housing type. The output results are as follows (Appendix H-2):

Bandwidth: 0.02;

Residual Squares: 1672717481970.27;

Effective Number: 44.36;

Sigma: 157262.17;

AICc: 3043.3;

R2: 0.39;

R2Adjusted: 0.52.

Dependent Variables: Green Spaces_2015sqm;

*Explanatory variables:*Income, Occupation and housing type.

Figure 4.32 therefore identifies areas where the social ecology indicators have the greatest effect on greening using Local R^2 Appendix H-2). The Local R^2 shows how the social ecology indicators (i.e. income, occupation and housing type) work together to explain the spatial distribution of green spaces. Therefore, it is not only income that is responsible for the variation in green spaces in Ibadan metropolis; occupationand housing types as well contributed to the spatial variation in green spaces in Ibadan metropolis. From the map, examples of localities that exhibited very strong effects of the interplay of social indicators in explaining green space variation include Sanyo, Odo Oba, Ijokodo, Apata, Oluyole Estate etc.The core or central parts of the metropolis exhibit only moderate impact of social ecology on green space distributional pattern. They include localities such as Felele, Agugu, Oluyoro, Idi shin, Aremo etc.

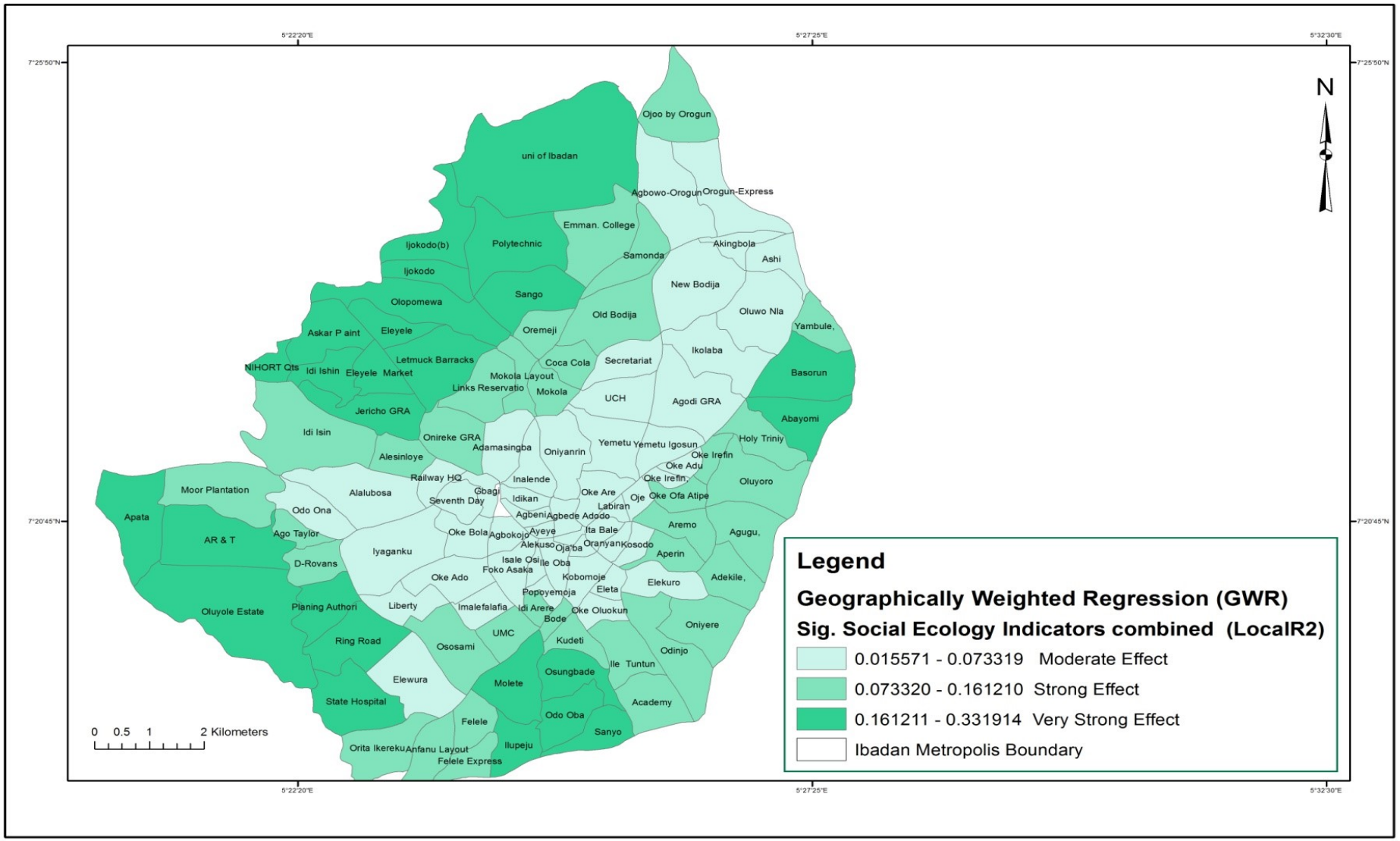


Figure 4.32: Spatial Effect of the Social Ecology Indicators
Source: Author's GIS Analysis 2017

The maps in Figure 4.33 to figure 4.35 show the spatial pattern of effects of each social ecology indicator. Figure 4.33 shows that occupation has "very strong effect" in explaining green space distrinution in majority of localities in Ibadan metropolis; some of these localities include Agbowo, Oke Are, Odo Oba, Molete, Agodi GRA etc. Some localities belong to the "strong effect" category, for example, Apata, Jericho, Oremeji, Old Bodija etc. Those localities with "moderate effect" include, for example, Ijokodo, Olopomewa, and University of Ibadan etc. In summary the effect of occupation in Ibadan metropolis is very strong in majority of the localities.

Figure 4.34 shows the individual effects of income in explaining the variation in green spaces in Ibadan Metropolis. Income has "very strong effects" in explaining the variation in green space variation in majority of the localities in Ibadan Metropolis. However, the effect is categorized as only "strong" in a few localities such as Odo Ona, Ago Taylor, D'Rovans, Ring RoadApata, Oluyole, IAR& T, etc.

Figure 4.35 shows the individual effect of housing type in explaining the variations in green spaces in Ibadan Metropolis. Housing type has a "strong effect" in the majority of the localities in Ibadan Metropolis. Examples include Molete, Agodi, Basorun, Kudeti, Liberty, Iyaganku, Oremeji etc. However, it had "very strong" effects in a few localities including Apata, Oluyole, Ago Taylor, Idisin, NIHORT etc. Localities with "moderate effects" included Ijokodo, The Polytechnic, University of Ibadan, Samonda, Emmanuel College, and Agbowo. In summary the effect of housing type on green space pattern in Ibadan metropolis is *strong or very strong* in majority of the communities.

Overall, therefore, the hypothesis which states there is a significant relationship between social ecology and green space pattern can be accepted. It is important to note that only three social indicators were significant among the 10 major social indicators considered. In the literature, the commonly used indicators of social ecology for geographical studies are income, race and education. This study has been able to identify additional possible indicators such as occupation, and housing type.

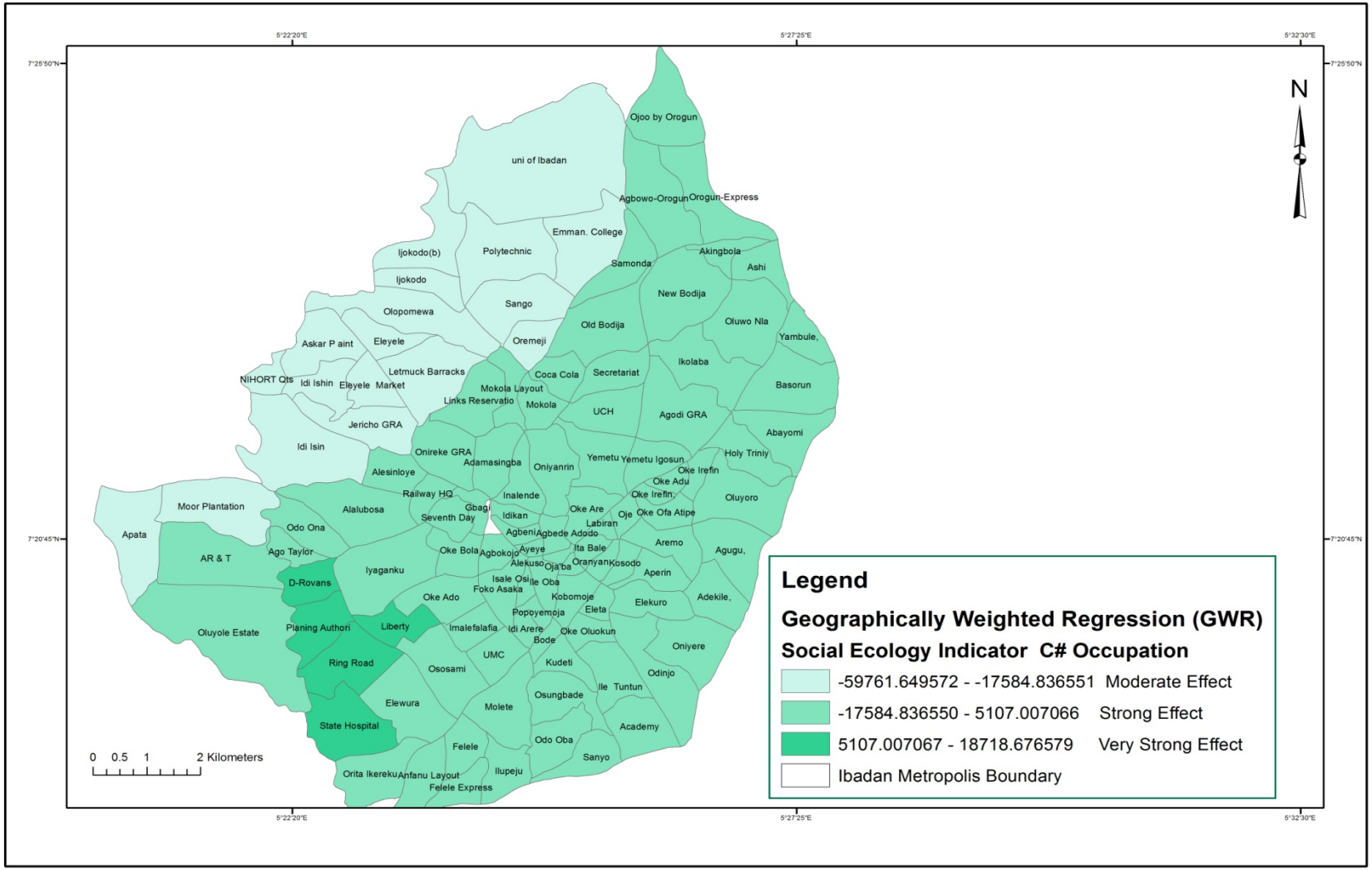


Figure 4.33: Spatial Effect of Occupation Types
Source: Author's GIS Analysis 2017

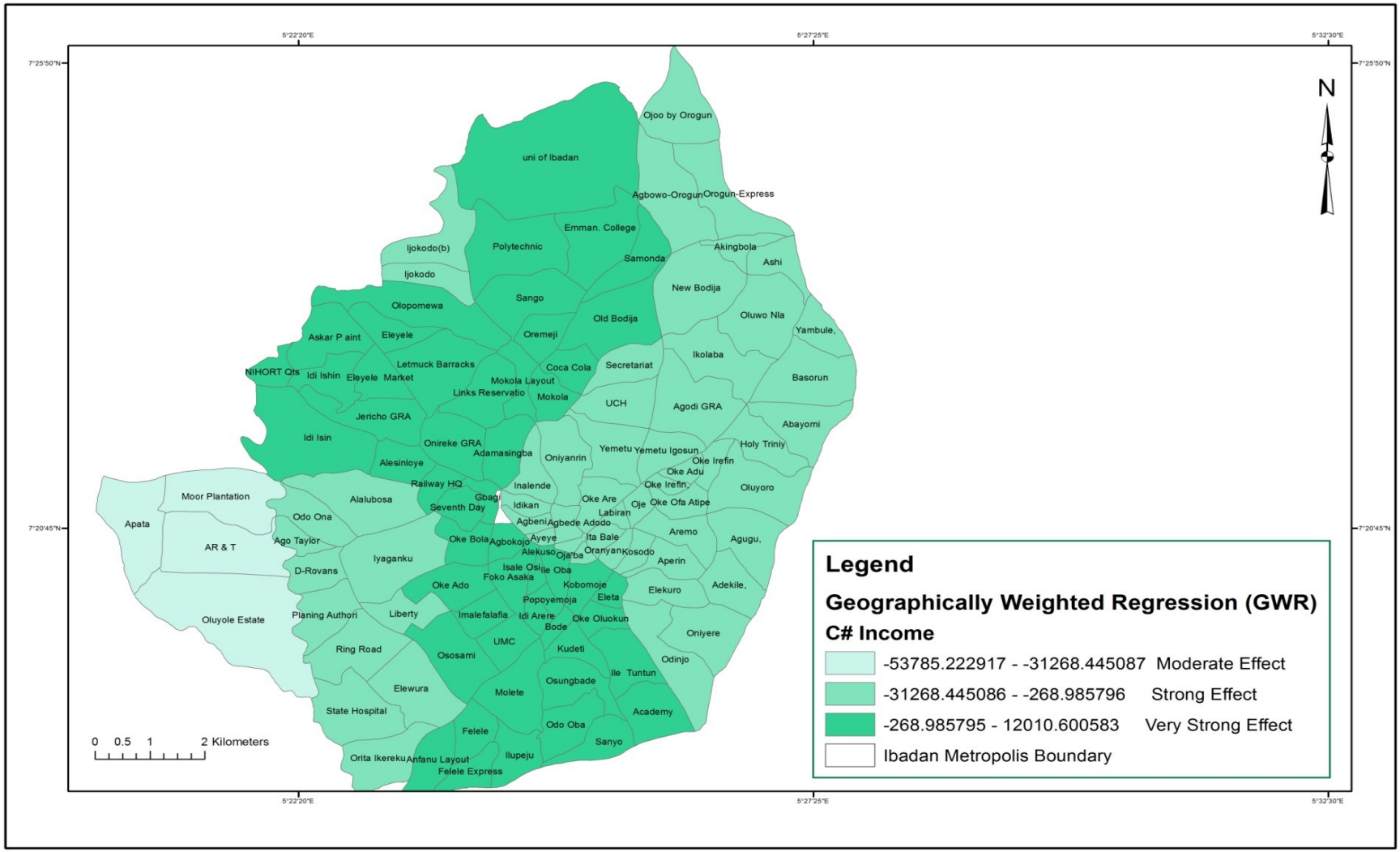


Figure 4.34: Spatial Effect of the Income Group
Source: Author's GIS Analysis 2017

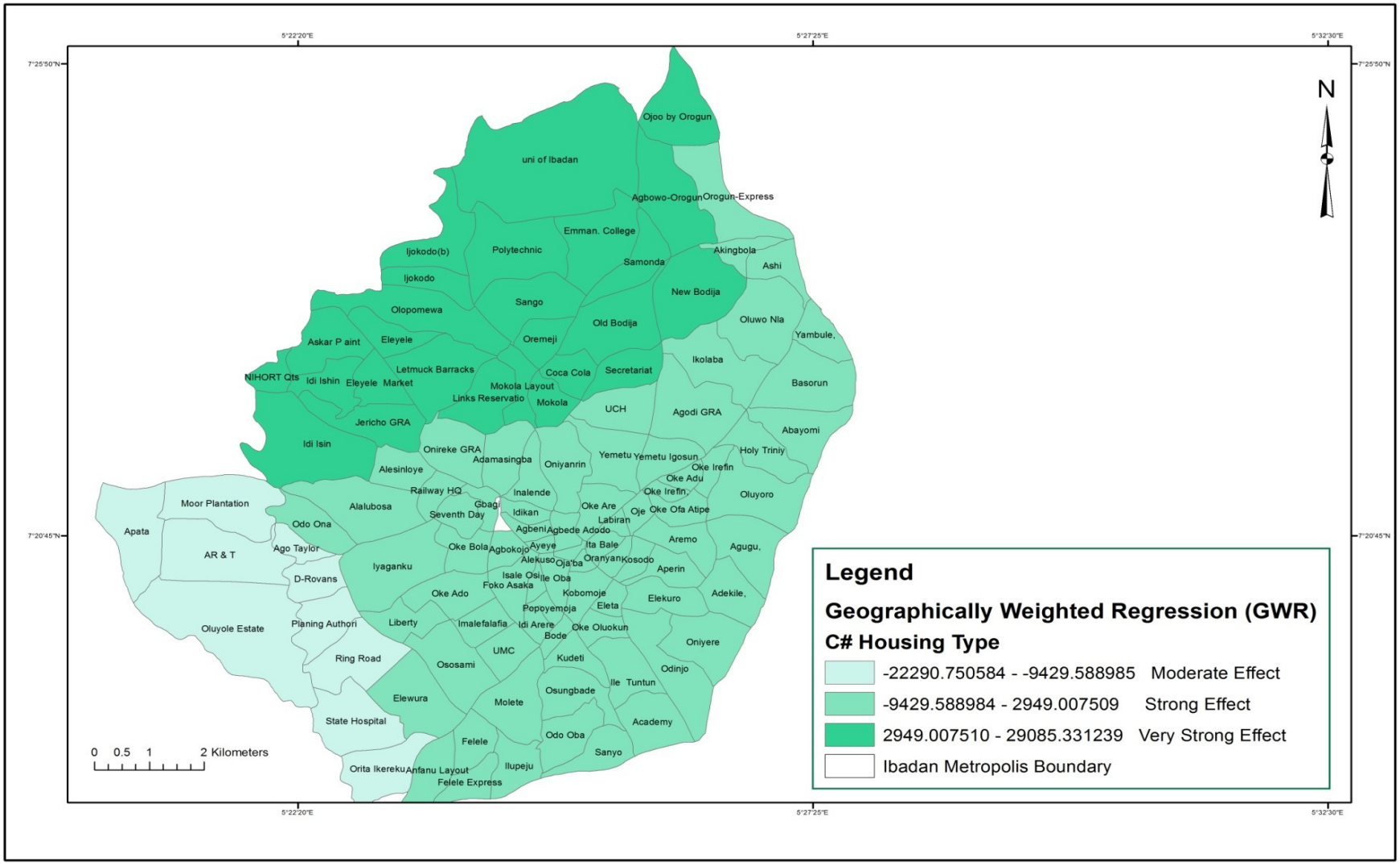


Figure 4.35: Spatial Effect of the Type of Housing
#Source: Author's GIS Analysis 2017

4.3 Perceived Causes of Green Space Depletion in Ibadan

This sectionanalyzes the variations in the perceived causes of green space depletion among the localities and the socio-economic groups. This perception section employed the multiple response analysis of SPSS Software and spatial mapping to explain the variations as perceived by Ibadan residents.

4.3.1. *Causes of Declining Green Spaces*

Figure 4.36 shows the spatial distribution of the perceived causes of declining green spaces across the localities. Seven major perceived causes of declining green spaces were observed. They included: i) Houses for residential purpose;

ii) Houses for commercial purpose;

iii) High population pressure;

iv) farming activities;

v) Lack of proper policies from government;

vi) Prolonged dry season/climate change;and

vii) Belief that green spaces are possessed.

It was observed that most localities (e.g. Sango, Adamasingba, Eleiyele, UCH,Oke Ado, Ososami, Oniyere, Agbowo, Orogun, Iyaganku, Apata, Ring road, Mokola, Oremeji, Yemetu, Gbagi, Liberty, Kobomoje, Ikereku, Samonda etc.) attributed the decline of green spaces to demand for housing for residential and commercial purposes while residents in a minority of the localities (e.g. Liberty, Ring road, Agbowo, Holy Trinity area etc.) were of the opinion that the green space depletion were as a result of high population pressure, farming activities, lack of proper policies from government, prolonged dry season/climate change and belief that green spaces are possessed, that is, infested by demons. Only very few of thelocalitieswere indifferent about the major causes ofdeclining green spaces (University of Ibadan, Oluyole Estate, Idi Ishin, Oke Irefin etc.)

Furthermore,Table 4.3 shows the percentage responses of the male and female groups on their opinions about the major causes of declining green spaces. The male gender exhibited greater conviction than the female counterpart about the perceived causes of declining green spaces. On each of the seven perceived causes of declining green spaces, the proportion of the male respondents was higher than that of the female respondents. For instance 52.6% of the male respondents were of the opinion that house construction for residential purposes was responsible for the decline in green spaces while the percentage for a female was 47.4%.

Furthermore, out of the socio-economic groups, the occupation group was not significant as shown in table 4.4

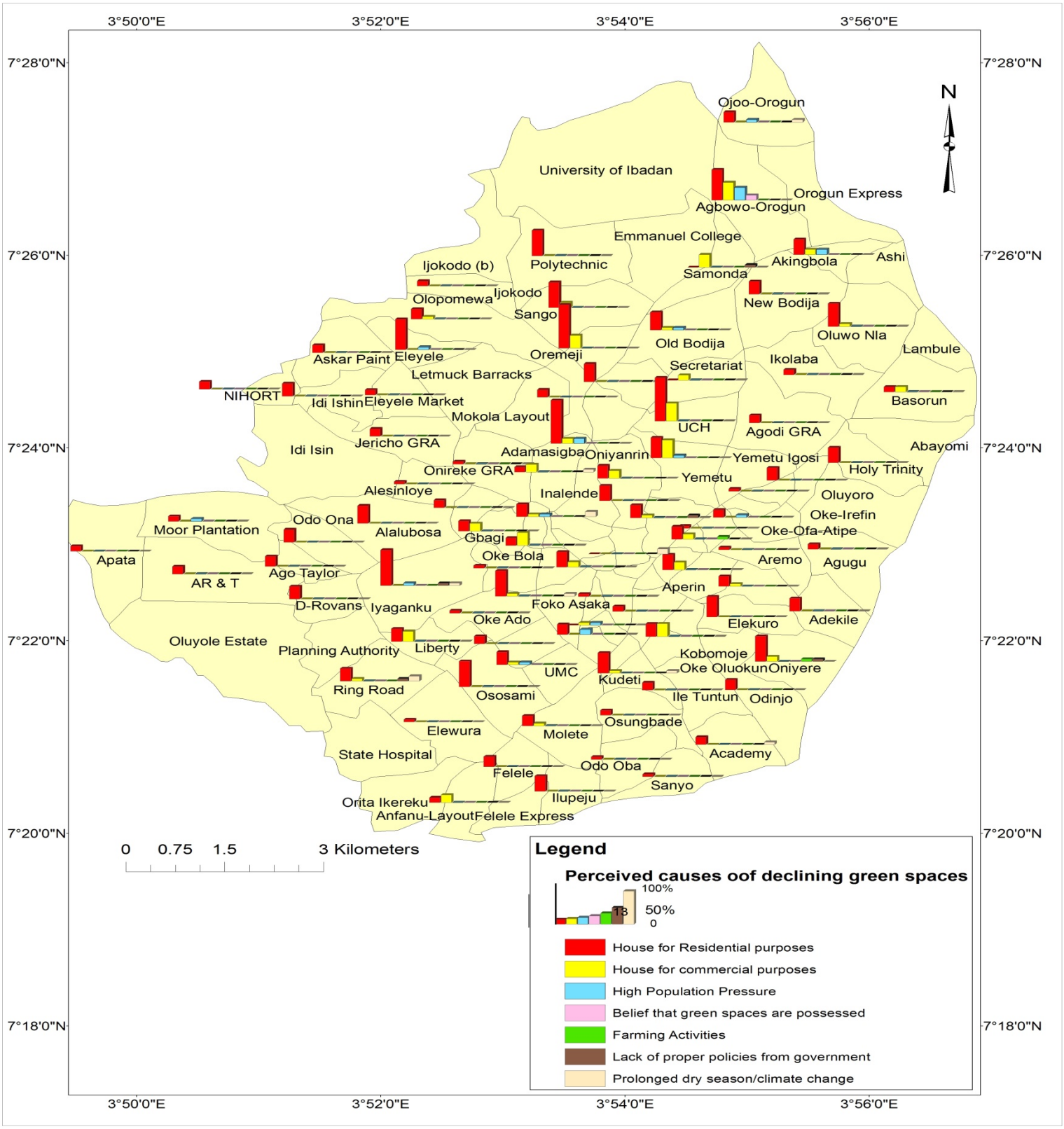


Figure 4.36: Spatial Distribution of the Major Perceived Causes of Declining Green Spaces
Source: Author 2018

Table 4.3: Causes of Declining Green Spaces by GenderGroup

Perceived Causes*	Male Group	Female Group	Total
1. Houses for Residential Purpose	262(52.6%)	236(47.4%)	498(100%)
2. Houses for Commercial Purposes	62(56.9%)	47(43.1%)	109(100%)
3. High Population pressure	17(51.5%)	16(48.5%)	33(100%)
4. Belief that green spaces are possessed	2(100.0%)	0(0.0%)	2(100%)
5. Farming activities	2(100.0%)	0(0.0%)	2(100%)
6. Lack of proper policies from government	5(83.3%)	1(16.7%)	6(100%)
7. Prolonged dry season/climate change	15(60.0%)	10(40.0%)	25(100%)

Chi-Square = 42.163; df = 25; p = 0.024 (sig)

******NOTE: Multiple responses* *Source*: Author Analysis, 2017

For the age group, as to be expected the adolescents (below 18 years) did not have much to say about the issue given their level of experience. Still, the few respondents saw the major causes of declining green spaces as houses for residential purpose (8.7%), houses for commercial purpose (6.6 %) and lack of proper policies from government (4.5%). At the other extreme, the age bracket 49-58 years and above, perceived the causes as farming activities (40%), lack of proper policies from government (10%) and prolonged dry season/climate change (9.1%).

On the perception by ethnic groupings, three major causes for the Yoruba group were, in order of importance, houses for residential purposes (68.2%), houses for commercial purposes (66.7%) and high population pressure (63.6%). In the case of the Ibo group, the major causes in order of importance were lack of proper policies from government (50%), high population pressure (33.3%) and houses for commercial purposes (25.9%). Lastly, in order of importance the three major causes observed by the Hausa group included lack of proper policies from government (16.7%), houses for residential purpose and houses for commercial purpose (7.4%).

Results from the analysis show that adherents of Christianity (75.7%), Islam (22.9%) and traditional religion (1.4%) alike perceived houses for residential purposes as the major cause of declining green spaces. Other causes of declining green spaces included high population pressure, the belief that green spaces are possessed, farming activities, lack of proper policies from the government and prolonged dry season/climate change. Remarkably, respondents of traditional religion were of the opinion that major causes of declining green spaces included lack of proper policies from government which suggest lack of proper orientation on the importance of green spaces and poor town planning

Table 4.4 shows perception of declining green space by occupational groupings. Respondents who are farmers, artisans, traders, civil/public servants, and students were all of the opinion that houses for residential purposes were the major causes of the declining green spaces. The self-employed had no opinion probably because they were preoccupied with their livelihood and how to cater for their day-to-day needs. It was observed in general that, occupation actually informed the perceptions of the different groups. For instance, majority of the civil/public servants, complained about priority given to residential and commercial land use at the expense of space for industrial development and productivity.

Table 4.4 : Causes of Declining Green Spaces by Occupation

Perceived causes*	Farming	Artisan	Civil servant	Trading	Student	Self-employed	Total
1. Houses for Residential Purpose	35(7.1%)	96(19.6%)	145(29.5%)	145(29.5%)	70(14.3%)	0(0.0%)	491(100%)
2. Houses for Commercial Purposes	9(8.3%)	22(20.4%)	19(17.6%)	38(35.2%)	20(18.5%)	0(0.0%)	108(100%)
3. High Population pressure	3(9.1%)	2(6.1%)	8(24.2%)	7(21.2%)	13(39.4%)	0(0.0%)	33(100%)
4. green spaces are possessed	0(0.0%)	0(0.0%)	2(100.0%)	0(0.0%)	0(0.0%)	0(0.0%)	2(100%)
5. Farming activities	0(0.0%)	0(0.0%)	0(0.0%)	1(50.0%)	1(50.0%)	0(0.0%)	2(100%)
6. Lack of proper policies	0(0.0%)	1(16.7%)	2(33.3%)	2(33.3%)	1(16.7%)	0(0.0%)	6(100%)
7. Prolonged dry season/ climate change	0(0.0%)	4(36.4%)	5(45.5%)	2(18.2%)	0(0.0%)	0(0.0%)	11(100%)

Chi-Square = 211.892; df = 275; p = 0.998 (Not Sig)

Source: Author Analysis, 2017

Figure 4.5 shows results according to highest educational levels attained by respondents. Respondents of all educational levels considered demand for houses for residential purposes and houses for commercial purposes as most responsible for declining green spaces. Respondents with only primary school education and those with no formal education had little or nothing to say about the subject matter. However, of significance was the fact that those whose highest level of education was either secondary or tertiary level also considered high population pressure, farming activities and lack of proper policies from the government and the vagaries of the weather and climate as possible causes of declining green spaces.

Respondents of all income levels respondents were more or less equally agreed on houses for residential purposes and houses for commercial purposes as the major perceived causes of declining green spaces (Table 4.6). High population pressure and weather and climate change is a distant third to the two highest perceived causes. Not much credence was given by any income group to any of the other possible causes.

Table 4.5: Causes of Declining Green Spaces by Level of Education

Perceived causes*	No Formal Education	Primary	Secondary	Tertiary	Total
1. Houses for Residential Purpose	21(4.2%)	29(5.8%)	236(47.4%)	212(42.6%)	498(100%)
2. Houses for Commercial Purposes	3(2.8%)	7(6.4%)	57(52.3%)	42(38.5%)	109(100%)
3. High Population pressure	2(6.1%)	1(3.0%)	12(36.4%)	18(54.5%)	33(100%)
4. Belief that green spaces are possessed	0(0.0%)	1(50.0%)	0(0.0%)	1(50.0%)	2(100%)
5. Farming activities	0(0.0%)	0(0.0%)	1(50.0%)	1(50.0%)	2(100%)
6. Lack of proper policies	1(16.7%)	0(0.0%)	2(33.3%)	3(50.0%)	6(100%)
7. Prolonged dry season/ climate change	0(0.0%)	1(9.1%)	7(63.6%)	3(27.3%)	11(100%)

Chi-Square = 83.235; df = 75; p = 0.037 (Sig)

Source: Author Analysis, 2017

Table 4.6: Causes of Declining Green Spaces by Level of Income

Perceived causes*	< 18,000	39,000-58,999	59,000-78,999	79,000-98,999	99,000 +	Total
1. Houses for Residential Purpose	126(25.3%)	104(20.9%)	41(8.2%)	44(8.8%)	32(6.4%)	498(100%)
2. Houses for Commercial Purposes	24(22.0%)	28(25.7%)	7(6.4%)	11(10.1%)	1(0.9%	109(100%)
3. High Population pressure	14(42.4%)	7(21.2%)	2(6.1%)	2(6.1%)	1(3.0%)	33(100%)
4. Belief that green spaces are possessed	1(50.0%)	0(0.0%)	0(0.0%)	1(50.0%)	0(0.0%)	2(100%)
5. Farming activities	0(0.0%)	1(50.0%)	0(0.0%)	0(0.0%)	0(0.0%)	2(100%)
6. Lack of proper policies	0(0.0%)	0(0.0%)	0(0.0%)	1(16.7%)	1(16.7%)	6(100%)
7. Prolonged dry season/ climate change	2(18.2%)	0(0.0%)	3(27.3%)	3(27.3%)	0(0.0%)	11(100%)

Chi-Square = 94.235; df = 75; p = 0.036 (Sig)

Source: Author Analysis, 2017

4.4 Acceptability and Non-acceptability of GovernmentGreening Intervention in Ibadan.

This section provides findings and discussion onthe reasons for accepting or not accepting government intervention in greening among the localities and socio-economic groups. Thisassessmentemployed multiple response analysis and spatial mapping toexplorevariationsamong localities and socio-economic groups.

4.4.1 Acceptability of Government Greening Intervention

Figure 4.37 shows the spatial patternof localities'readiness to accept government greening interventions.The maximum number of persons interviewed in each locality is 35. Three main classes of acceptance of government intervention were differentiated and mapped: low (0-5 persons accepting); medium(6-16persons accepting);and high (17-35 persons accepting). Forty-five localities(43%) were least in favour of accepting government intervention; thirty five (33.7%) were in the moderate category while fifty-four localities(51.9%) were in the high category of those in favour of government intervention.It is perhaps a very positive thing that (i) more than half of the localities are highly in favour of government intervention; and (ii) several localities in the traditional core of the metropolis are highly or moderately in favour of government intervention to address thede-greening phenomenon.

About 68.1 % of the female gender accepted government's intervention while the male gender recorded 66.9% acceptance level.Those in the age group between 29 years and 38 years recorded acceptance level of not less than 60% (Table 4.7), while those in the age groups less than 18 years, 19-28years and 59 years and above, recorded acceptance levels of 70% and above.Furthermore, the acceptance level among the Christian group was 68.4%; 64.6% among Muslims and 67.6% among the Traditionalists. This closeness of acceptance level is remarkable because religion is one of the major factors that affect people's attitudes. Therefore the findings show the people's willingness to embrace greening if the necessary infrastructures or resources were in place.

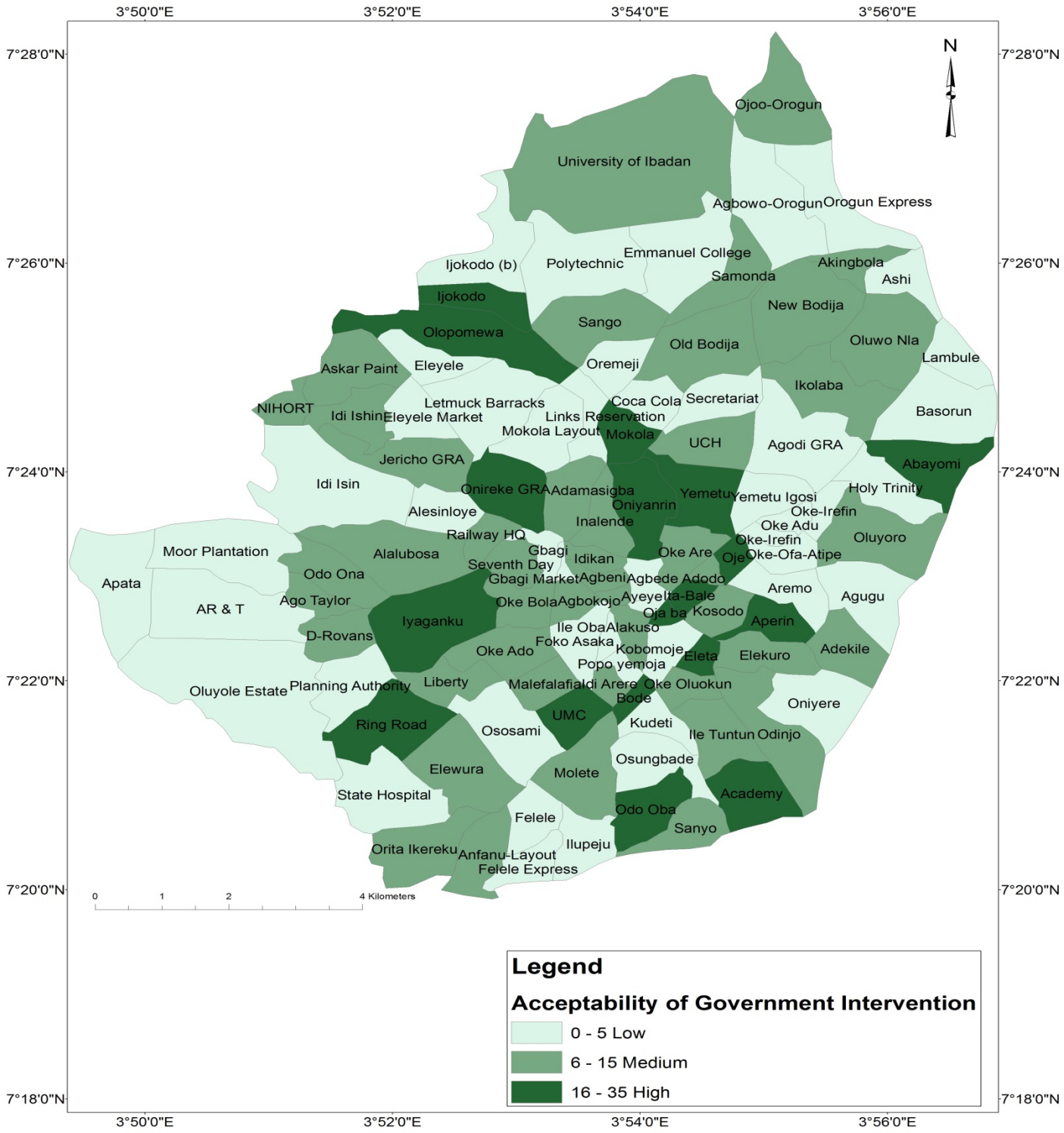


Figure 4.37: Spatial Distribution of localities' Readiness to Accept Government Intervention
Source: Author 2018

Table 4.7: Acceptability of Government Greening Intervention based on the Socio-economic groups

Socio-Economic Groups		Accept (Yes)	
Gender	Male	1194(66.9%)	$X^2 = 485$; p = 0.486 (Not Sig)
	Female	996(68.1%)	
Age	< 18 years	206(70.5%)	$X^2 = 54.349$; p=0.000 (Sig)
	18-28 years	804(74.7%)	
	29-38 years	552(60.0%)	
	39-48 years	421(66.0%)	
	49-58 years	146(62.1%)	
	59 and above	61(71.8%)	
Religion	Christianity	1661(68.4%)	$X^2 = 3.750$; p=0.153 (Not Sig)
	Islam	508(64.6%)	
	Traditional	21(67.7%)	
Ethnicity	Yoruba	1540(66.3%)	$X^2 = 17.596$; p=0.000 (Sig)
	Ibo	444(74.4%)	
	Hausa	206(62.8%)	
Education	No Formal Education	76(54.3%)	$X^2 = 27.540$; p=0.000 (Sig)
	Primary	147(64.5%)	
	Secondary	1057(71.1%)	
	Tertiary	910(65.5%)	
	Quranic education	0(0.0%)	
Occupation	Farming	131(68.2%)	$X^2 = 76.396$; p=0.000 (Sig)
	Artisan	448(71.7%)	
	Civil servant	687(73.6%)	
	Trading/Business	576(57.0%)	
	Student	306(71.0%)	
	Self employed	42(76.4%)	
Income	Less than 18,000	580(75.6%)	$X^2 = 57.254$; p=0.000 (Sig)
	18,000-38,999	640(61.1%)	
	39,000-58,999	396(62.7%)	
	59,000-78,999	185(73.4%)	
	79,000-98,999	223(72.9%)	
	99,000 and above	166(68.3%)	

Source: Author Analysis, 2017

The levels of acceptance by ethnic groups are as follows: Ibo, 74.4%; Yoruba, 66.3%; and Hausa, 62.8%. Northern towns are noted for the abundance of trees along the streets to provide shade and ameliorate local climate; therefore it was expected that the Hausa would appreciate more the need for green spaces but this was not so. In terms of educational level, the secondary group had the highest level of acceptance of 71.1% followed by respondents in the tertiary group which recorded a 65.5% acceptance level (Table 4.7).Interestingly, those with no formal education at all also embraced the intervention of the government (54.3%).

Acceptance level was relatively high among the farmers (68.2%), artisans (71.7%), civil servants (73.6%), students (71%) and the self-employed (76.4%). However, among those in the trading and business line, the level of acceptance was only 57% (Table 7.1). Finally, in terms of income grades, the acceptance levels were highest among those whose income were under 18,000naira (75.6%); 59,000-78,000 (73.4%); and 79,000-98,999 naira brackets (72.9%). The acceptance levels for all other income brackets ranged from 61- 68 percent (Table 4.7)

There is no doubt that the people of Ibadan metropolis are eager for government intervention in promoting greening. Interestingly, the reasons vary across localities and the socioeconomic groups.Six major perceived reasons for accepting Government intervention were observed. They included (i) green spaces prevent global warming/climate change; (ii) green spaces add nutrients to the soil and enhance farming; (iii) green spaces serve as recreational centres; (iv) green spaces bring us closer to nature; (v) green spaces are sources of ventilation; (vi) green spaces promote free movement and proper planning.

In figure 4.38, it is clear that many localities such as Sango, Iyaganku, Oniyere, Kudeti, Inalende, Old Bodija, liberty, ring road, Agbowo, Holy trinity area etc. attributed acceptance of Government intervention to the fact that green spaces bring people closer to nature while some other localities such as Mokola, Ikolaba, Gbagi, Oniyere, Oluwo nla etc. will accept government intervention because green spaces prevent global warming/climate change and because green spaces add nutrients to the soil and enhance farming. Localities such as Orogun, Odo ona, Oluwo nla, were more of the opinion that green spaces are sources of ventilation. Others such as Ring road,Felele, Yemetu, Eleiyele, Odo Ona, Ring Road, Oluwo Nla, Bode strongly agreed that green spaces serves as recreational centres.

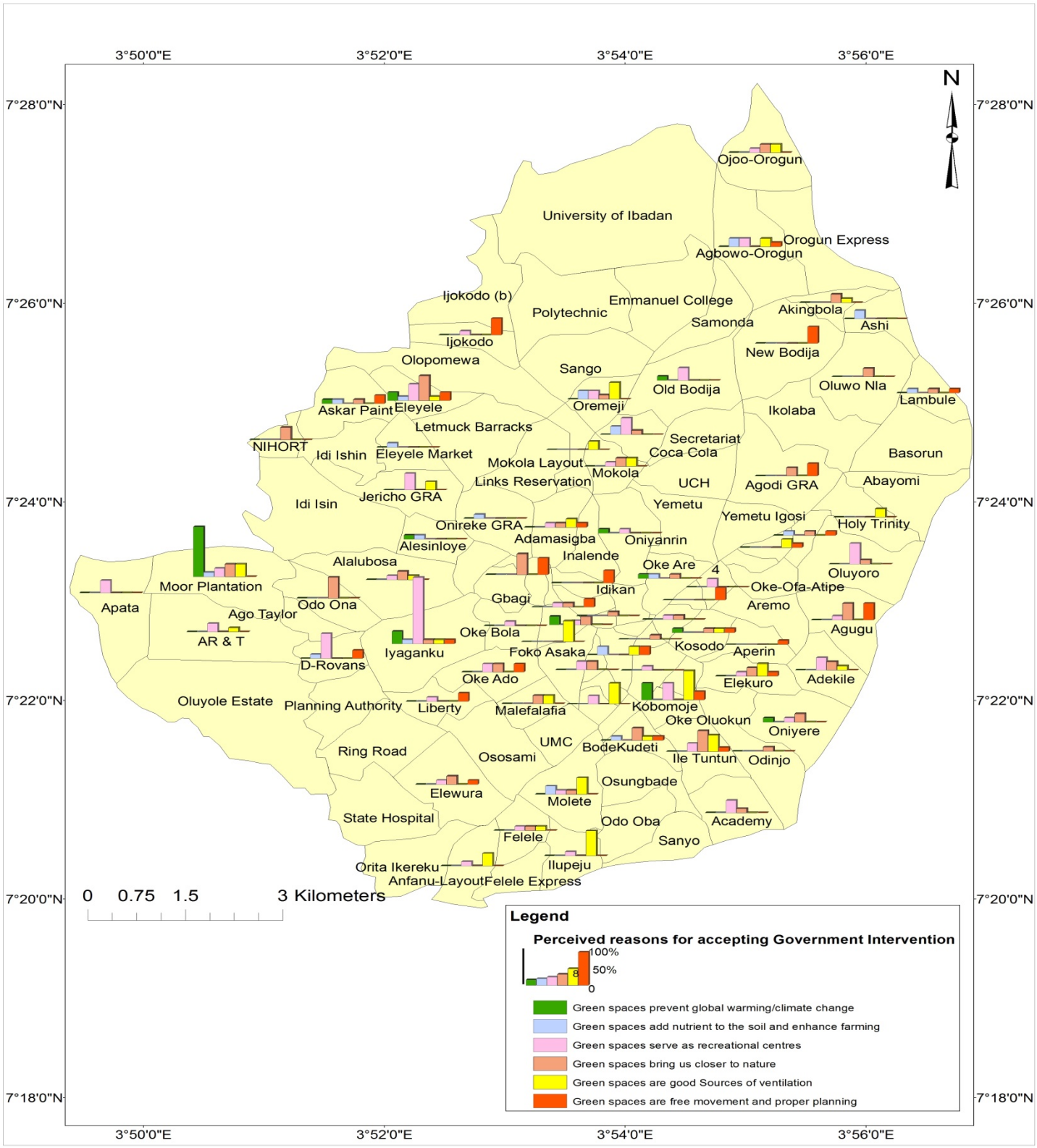


Figure 4.38: Spatial Distribution of Perceived Reasons for Acceptability of Government Interventions

Source: Author 2018

Based on the socio-economic parameters, 75% of the male gender see government intervention as an awareness drive to promote tree planting and discourage their felling. On the other hand, 64.3% of the female gender thinks that the green spaces sustained by the government will control winds and prevent the risk of houses collapsing. In terms of age groups, those in the age bracket *less than 18* years old embraced government intervention because it will promote tree planting, supply nutrients to the soil and enhance farming activities. On the other hand, the age bracket between 18 – 28 years old respondents believe that government intervention will also help beautify the environment and help bring people closer to nature. Uniquely, those in the age bracket (29 -28) years old think that government intervention will assist in controlling global warming and climate change. Other age brackets 39 – 48 and 49 -58 years old attributed acceptability to the provision of habitat for wildlife and bringing nature closer to people.

In the case of ethnicity, majority of the Yoruba think green spaces beautify the environment, add nutrients to the soil and enhance farming activities (Table 7.4). The Ibo attributed the reasons for accepting government intervention primarily to the fact that green spaces serve as recreational centres and that green spaces bring us closer to nature. The Hausa will rather accept government intervention primarily because green spaces will help prevent global warming/ climate change by controlling erosion thereby minimizing environmental degradation. They also think that government intervention will add nutrients to the soil thereby increasing productivity in terms of foods/fruits/vegetable supply in general .

Table 4.8 shows the reasons for accepting government intervention according to religious affiliation.Majority of the Christians think that government intervention will promote recreational centers, prevent global warming and bring us closer to nature. The few Muslim respondents think green spaces provide habitat for wildlife and also promote recreational activities etc.

Furthermore, each occupational group seems to have their own unique reasons for supporting government intervention (Table 4.9). For instance, the farmers think the Government should intervene because green spaces bring us closer to nature and because they provide space for social events. The artisans will rather accept government intervention primarily because green spaces promote environmental serenity and supply nutrients to soils. Interestingly, the civil servants, students, and traders will rather have the government intervene because green spaces

are sources of income and promote environmental serenity. Furthermore, out of the socio-economic groups, level of education was not significant as shown in table 4.16

Table 4.8: Reasons for Accepting Government by Religion

Perceived reasons *	Christianity	Islam	Traditional	Total
1. They bring us closer to nature	73(71.6%)	28(27.5%)	1(1.0%)	102(100%)
2. Add nutrients to the soil/enhance farming.	20(69.0%)	8(27.6%)	1(3.4%)	29(100%)
3. Promote free movement and proper planning	53(72.6%)	20(27.4%)	0(0.0%)	73(100%)
4. They serve as recreational centres	94(83.9%)	17(15.2%)	1(0.9%)	112(100%)
5. They prevent global warming/climate change	12(85.7%)	2(14.3%)	0(0.0%)	14(100%)
6. Source of ventilation	98(71.5%)	37(27.0%)	2(1.5%)	137(100%)

Chi-Square = 11.659; Df = 16; p = 0.767 (Not Sig.)

Source: Author Analysis, 2017

Table 4.9: Reasons for Accepting Government by Occupation

Perceived reasons *	Farming	Artisan	Civil	Trading	Student	Self-employed	Total
1. They bring us closer to nature	11(10.9%)	17(16.8%)	34(33.7%)	22(21.8%)	17(6.8%)	0(0.0%)	101(100%)
2. Add nutrients to the soil/enhance farming.	1(3.6%)	4(14.3%)	5(17.9%)	16(57.1%)	2(7.1%)	0(0.0%)	28(100%)
3. Promote free movement and proper planning	5(6.9%)	15(20.8%)	27(37.5%)	16(22.2%)	8(11.1%)	1(1.4%)	72(100%)
4. They serve as recreational centres	7(6.5%)	17(15.9%)	32(29.9%)	28(26.2%)	22(20.6%)	1(0.9%)	107(100%)
5. They prevent global warming/climate change	0(0.0%)	2(14.3%)	4(28.6%)	7(50.0%)	1(7.1%)	0(0.0%)	14(100%)
6. Source of ventilation	4(2.9%)	21(15.3%)	51(37.2%)	36(26.3%)	25(18.2%)	0(0.0%)	137(100%)
Chi-Square = 380.234; df = 224; p = 0.000 (Sig)							

Source: Author Analysis, 2017

For levels of education (Table 4.10), the “no formal education” category are of the opinion that the major reasons for accepting are (i) green spaces will beautify the environment (i.e. recreational centre) (3.4%); and (ii) raise awareness about tree planting and warn against felling of trees (9.4%). Respondents in the primary education category are more in favor of beautification of the environment and wind control. The secondary and tertiary education categories had strong opinion ranging from beautification of the environment to prevention of global warming/climate change; bringing people closer to nature to the provision of habitat for wildlife. Lastly, aside from the earlier reasons mentioned (Table 4.11), notably is the income group 18,000 – 38,999 that strongly believes that acceptance of government intervention is because it will bring about serenity in the environment and also facilitate proper developmental planning.

Table 4.10: Reasons for Accepting Government by Level of Education

Perceived reasons *	No Formal Education	Primary	Secondary	Tertiary	Total
1. They bring us closer to nature	5(4.9%)	9(8.8%)	46(45.1%)	42(41.2%)	102(100%)
2. Add nutrients to the soil/enhance farming.	1(3.4%)	2(6.9%)	10(34.5%)	16(55.2%)	29(100%)
3. Promote free movement and proper planning	4(5.5%)	6(8.2%)	32(43.8%)	31(42.5%)	73(100%)
4. They serve as recreational centres	3(2.7%)	3(2.7%)	42(37.5%)	64(57.1%)	112(100%)
5. They prevent global warming/climate change	1(7.1%)	2(14.3%)	6(42.9%)	5(35.7%)	14(100%)
6. Source of ventilation	7(5.1%)	12(8.8%)	62(45.3%)	56(40.9%)	137(100%)

Chi- Square = 165.003; Df = 48; p = 0.000 (Sig.)

Source: Author Analysis, 2017

Table 4.11: Reasons for Accepting Government by Level of Income

Perceived reasons *	18,000	18,000-38,999	39,000-58,999	59,000-78,999	79,000-98,999	99,000 +	Total
1. They bring us closer to nature	28(27.5%)	32(31.4%)	16(15.7%)	8(7.8%)	12(11.8%)	6(5.9%)	102(100%)
2. Add nutrients to the soil/enhance farming.	7(24.1%)	7(24.1%)	10(34.5%)	1(3.4%)	2(6.9%)	2(6.9%)	29(100%)
3. Promote free movement and proper planning	10(13.7%)	39(53.4%)	10(13.7%)	2(2.7%)	6(8.2%0	6(8.2%)	73(100%)
4. They serve as recreational centres	33(29.5%)	28(25.0%)	21(18.8%)	9(8.0%)	7(6.2%)	14(12.5%)	112(100%)
5. They prevent global warming/climate change	3(21.4%)	5(35.7%)	2(14.3%)	2(14.3%)	2(14.3%)	0(0.0%)	14(100%)
6. Source of ventilation	42(30.7%)	47(34.3%)	23(16.8%)	8(5.8%)	11(8.0%)	6(4.4%)	137(100%)
Chi-Square = 277.900; df = 80; p = 0.000 (Sig.)							

Source: Author Analysis, 2017

4.4.2 *Non-Acceptance of Government Greening Intervention*

The spatial pattern of localitiesin terms of thenon-acceptability of government intervention in greening is as shown on Figure 4.39. Three main classes: low (0-10 persons); medium (11-27 persons); and high (28-54 persons) were mapped. Twenty-nine localitiesdisplayedthe least resistanceto accepting government intervention;fifty fivelocalitiesexhibited moderate resistance toaccepting government intervention;whiletwenty localities mostly on the outer fringes of the metropolis were strongly opposed toaccepting government intervention. Thus, overall, 80.8 per cent of localities are low – moderately resistant to government intervention in greening. This tallies with the finding earlier that manylocalities accepted the idea of government intervention.

About 31.1 % of the female gender would not accept government's intervention while the male gender recorded 33.1% non-acceptance level.Those in the age group between 29 years and 38 years recorded a non-acceptance level of not less than 34% (Table 4.12), while those less than 18 years, 19-28years group and 59 years and above recorded non-acceptance levels between 30% and 40 %.Furthermore, the non-acceptance level among the Christian group was 31.6%; 35.4% among Muslims; and 32.2% among the Traditionalists. The levels of non-acceptance among the ethnic groups were: Ibo, 22.6%; Yoruba, 33.7%; and Hausa, 37.2%. In terms of educational level, the *'no formal education group'* had the highest level of non-acceptance of 45.7% followed by respondents in the primary group, 35.5% (Table 4.12). The percentages of non-acceptance were relatively low among the farmers, artisans, civil servants, students and the self-employed (Table 7.9).The percentages of non-acceptance were also generally relatively low across the income groups .Furthermore, out of the socio-economic groups, the gender group was not significant as shown in table 4.12

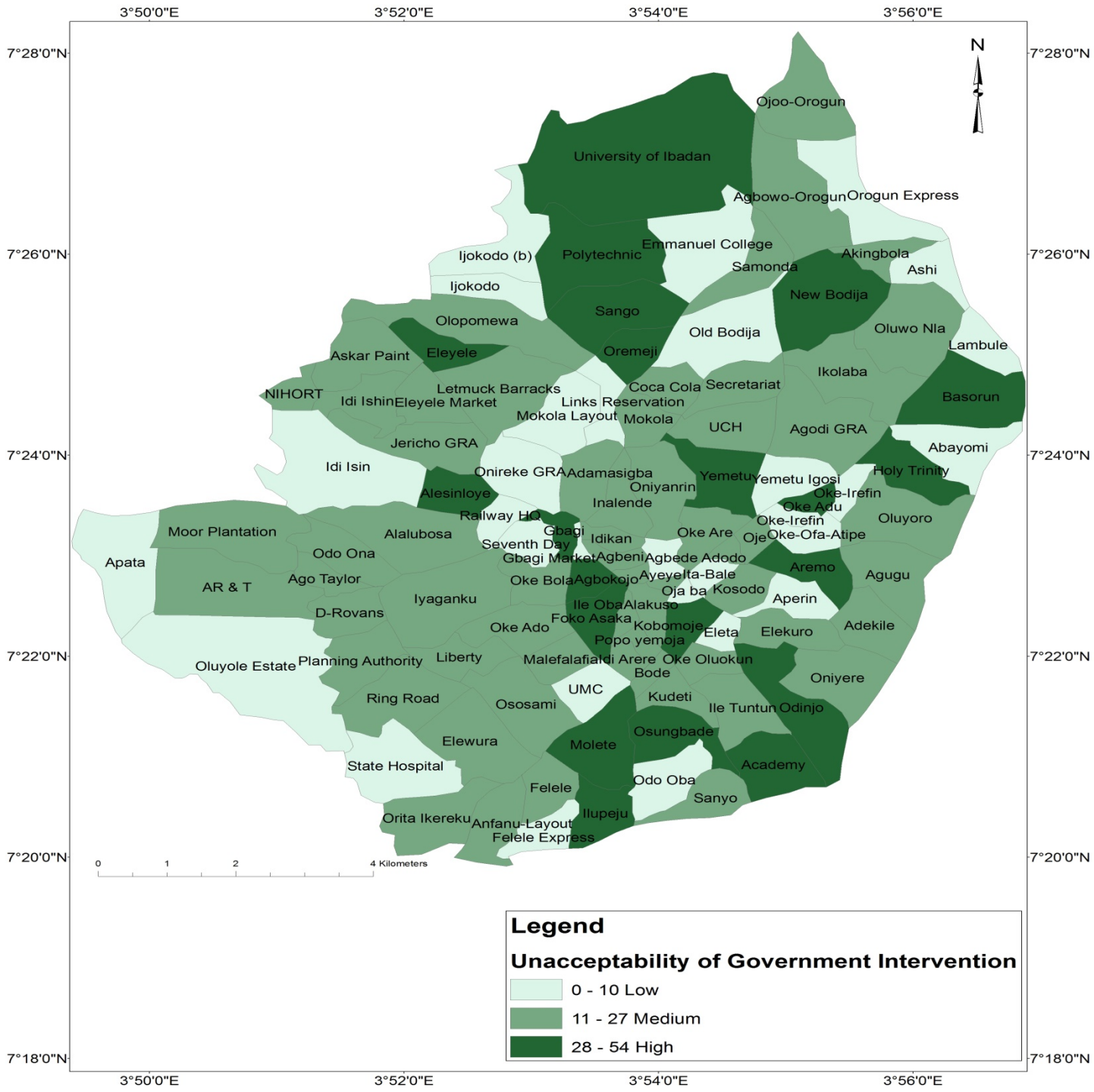


Figure 4.39: Spatial Distribution of localities' Unwillingness to Accept Government Intervention
Source: Author 2018

Table 4.12: Non-acceptability of Government Greening Intervention based on the Socio-economic groups

Socio-Economic Groups		Do Not Accept (NO)	
Gender	Male	590(33.1%)	Chi-Square = 11.659; Df = 16; p = 0.767 (Not Sig)
	Female	467(31.9%)	
Age	< 18 years	86(29.5%)	Chi-Square = 202.460; Df = 80; p = 0.000 (Sig)
	18-28 years	273(25.3%)	
	29-38 years	368(40.0%)	
	39-48 years	217(34.0%)	
	49-58 years	89(37.9%)	
	59 and above	24(28.2%)	
Religion	Christianity	769(31.6%)	Chi-Square = 266.867; Df = 16; p = 0.000 (Sig)
	Islam	278(35.4%)	
	Traditional	10(32.3%)	
Ethnicity	Yoruba	782(33.7%)	Chi-Square = 51.054; Df = 32; p = 0.018 (Sig)
	Ibo	153(25.6%)	
	Hausa	122(37.2%)	
Education	No Formal Education	64(45.7%)	Chi-Square = 165.003; Df = 48; p = 0.000 (Sig)
	Primary	81(35.5%)	
	Secondary	430(28.9%)	
	Tertiary	480(34.5%)	
	Quranic education	2(100.0%)	
Occupation	Farming	61(31.8%)	Chi-Square = 380.234; Df = 224; p = 0.000 (Sig)
	Artisan	177(28.3%)	
	Civil servant	246(26.4%)	
	Trading/Business	435(43.0%)	
	Student	125(29.0%)	
	Self employed	13(23.6%)	
Income	Less than 18,000	187(24.4%)	Chi-Square = 277.900; Df = 80; p = 0.000 (Sig)
	18,000-38,999	407(38.9%)	
	39,000-58,999	236(37.3%)	
	59,000-78,999	67(26.6%)	
	79,000-98,999	83(27.1%)	
	99,000 and above	77(31.7%)	

Five major reasons were givenforthe non-acceptability of government intervention, namely: (i) acceptance will lead to demolition of houses; (ii) green spaces are dangerous to human health; (3) green spaces add no value; (4) Government will not take proper care of them; and (5) green spaces reduce space for building. AsFigure 4.40 shows, there were observations mostly. Majority of respondents in the localities at the outer part of the city centre (e.g. Odo ona, Oke Are, Adekile, Idi Ishin, Ring road, Sanyo etc.) were of the opinion that government greening intervention is not necessary because they would add no value to their neigbourhood. Some localities (Elekuro, Apata, Iyaganku, and Abayomi) attributed the non-acceptability of government intervention to the fact that green spaces encourage the breeding of animals and insects. Localities such as Orogun, Ijokodo, Academy, University of Ibadan etc.rejected government intervention because they believe green spaces are dangerous to human health. Other reasons included demolition of houses and scarcity of land for building construction, but these were adduced by an insignificant number of respondents in just a few localities.

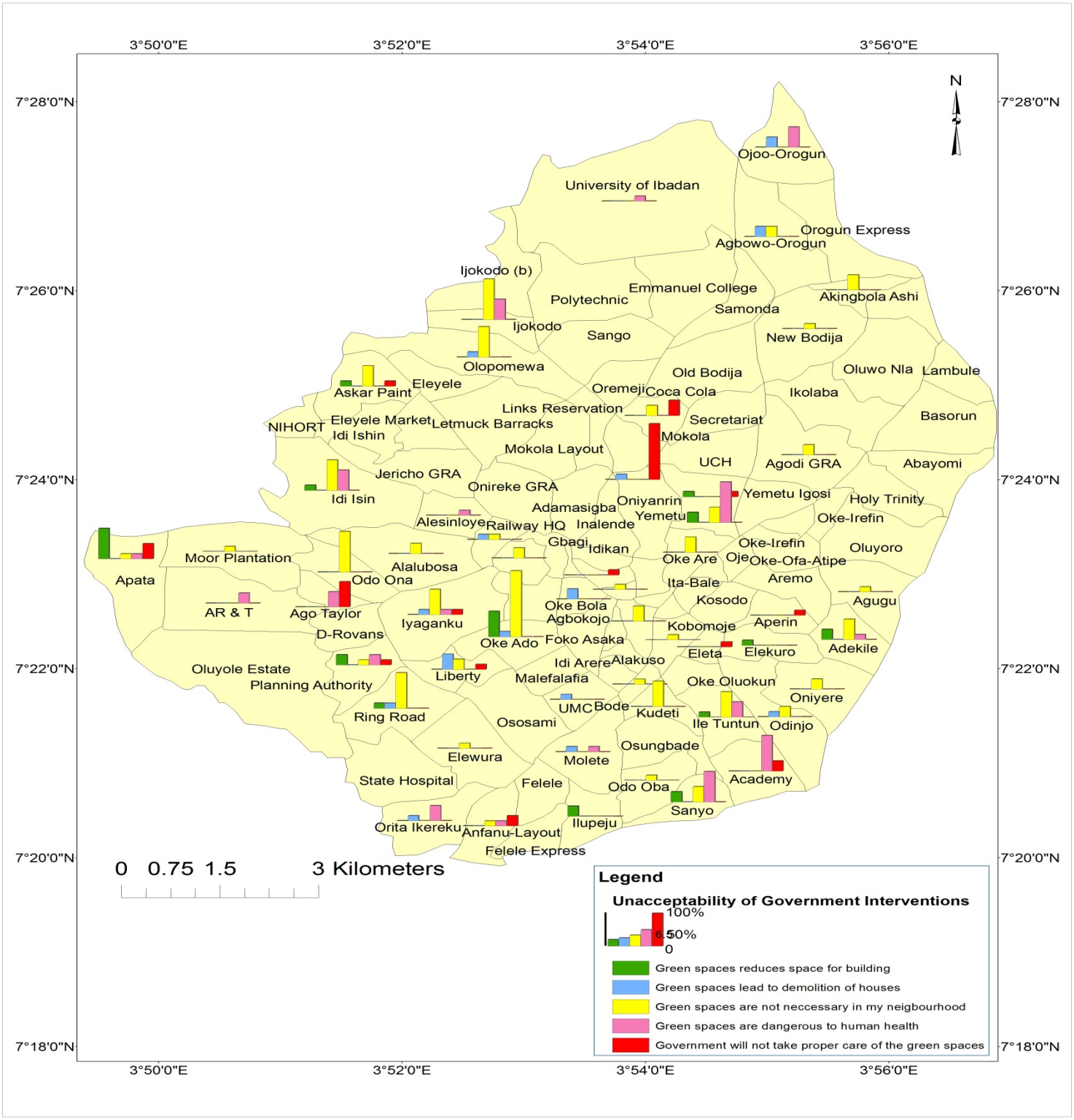


Figure 4.40 Spatial Distribution of Perceived Reasons for Non- acceptability of Government Interventions

Source: Author 2018

Using gender as a basis of analysis, about 57% of the male gender thinks intervention by the government will bring about the demolition of houses while 49.3% thinks green spaces are dangerous (hazardous) to human health because they create avenues for breeding of dangerous animals and insects. For the age groups (Table 4.13), the majority of the *less than 18 years old* do not care about the intervention from the government because they feel green spaces are not important and that if at all government intervenes, they will not take proper care of the green spaces. Those between *18 and 48 years* feel strongly that government intervention will reduce spaces for building and also lead to demolition of houses, while those *49 years old and above* will not accept government intervention because green spaces are dangerous to human health, and the project will be abandoned along the line by the government anyway .

About 67.2% of the Yoruba ethnic group respondents think green spaces are not necessary for their localities, while 17.6% of the Ibo respondents will rather not support government intervention because green spaces encourage the breeding of dangerous animals and insects. The Hausa claim that they have no interest in the project.

Moving on to the religions groups, the majority of the Christians and Muslims share the same strong opinions that green spaces will reduce space for building and lead to the demolition of houses; and that government will not take good care of the green spaces which would tend to become hideouts for criminals. The different religious groups seem to care less about creation of green spaces which could result in the displacement of people. The traditional religionists, however, seem to have little to say on all the perceived reasons (Table.

For the occupational groups (table 4.14), the farmers and the self-employed were indifferent about reasons for non-acceptance of government intervention as compared to those in the trading profession, artisans and civil servants. The major complaint of note made by the farmers is that green spaces dirty the environment. Artisans agree that green spaces dirty the environment and will also lead to displacement of people, reduce space for building and, in any case, the government will not complete the project or take proper care of it. The self-employed had nothing to contribute to this issue. Majority of the traders said they had no interest or had no reasons to give for non-acceptance but others felt strongly that green spaces would lead to loss of properties, displacement of people and that they do not think green spaces are necessary. It is quite remarkable and revealing that the most important objection of the civil servants is that government will not complete the project while the single most serious objection of the students is that government will not take good care of the green

spaces .Furthermore, out of the socio-economic groups, the gender group was not significant as shown in table 4.12

Table 4.13: Reasons for not Accepting Government Efforts at Creating Green Spaces by Age

Perceived reasons *	<18 years	18-28 years	29-38 years	39-48 years	49-58 years	59 and above	Total
1. Green spaces reduce space for building	0(0.0%)	8(24.2%)	8(24.2%)	9(27.3%)	7(21.2%)	1(3.0%)	33(100.0%)
2. They will lead to demolition of houses	4(7.7%)	19(36.5%)	15(28.8%)	12(23.1%)	2(3.8%)	0(0.0%)	52(100.0%)
3. Green spaces are not necessary in my community	16(7.9%)	64(31.5%)	46(22.7%)	51(25.1%)	19(9.4%)	7(3.4%)	203(100.0%)
4. Green spaces are dangerous to human health	6(8.5%)	17(23.9%)	20(28.2%)	21(29.6%)	6(8.5%)	1(1.4%)	71(100.0%)
5. The government will not take proper care of them	16(22.5%)	30(42.3%)	15(21.1%)	7(9.9%)	2(2.8%)	1(1.4%)	71(100.0%)

Chi-Square = 202.533; Df = 65; p = 0.000 (Sig)

Source: Author Analysis, 2017

Table 4.14: Reasons for not Accepting Government Efforts at Creating Green Spaces by Occupation

Perceived reasons *	Farming	Artisan	Civil servant	Trading	Student	Self-employed	Total
1. Green spaces reduce space for building	2(6.1%)	5(15.2%)	13(39.4%)	11(33.3%)	2(6.1%)	0(0.0%)	33(100.0%)
2. They will lead to demolition of houses	4(7.7%)	6(11.5%)	10(19.2%)	23(44.2%)	9(17.3%)	0(0.0%)	52(100.0%)
3. Green spaces are not necessary in my community	18(8.9%)	36(17.7%)	40(19.7%)	79(38.9%)	26(12.8%)	4(2.0%)	203(100.0%)
4. Green spaces are dangerous to human health	4(11.3%)	8(11.3%)	17(23.9%)	33(46.5%)	9(12.7%)	0(0.0%)	71(100.0%)
5. The government will not take proper care of them	0(0.0%)	17(23.9%)	12(16.9%)	17(23.9%)	25(35.2%)	0(0.0%)	71(100.0%)
Chi-Square = 228.887; Df = 117; p = 0.000 (Sig)							

Source: Author Analysis, 2017

Furthermore, there is a sharp distinction between those at the higher levels of education (secondary and tertiary) and those at the primary level or with no formal education at all (Table 4.15). The latter group has nothing much to say about the issue under discussion as not many responded to the questions. They do not think that green spaces are necessary rather they will reduce space available for building. With regard to the more educated levels, over 40% said they had no reasons to proffer for non-acceptance of government intervention (Table 4.15).

The general observation that can be made is that no income group really has any strong opinions about any of the reasons given (Table 4.16). In fact, the level of response was generally low across all income brackets. The strongest objections were expressed by those in the lower income brackets (<18000 to 58999). The objections mostly given include loss of properties, demolition of houses, the government will not complete the project; green spaces are not necessary; and will breed bad animals and insects. Furthermore, out of the socio-economic groups, level of education was not significant as shown in table 4.15

Table 4.15: Reasons for not Accepting Government Efforts at Creating Green Spaces by Level of Education

Perceived reasons *	No Formal Education	Primary	Secondary	Tertiary	Total
1. Green spaces reduce space for building	1(3.0%)	3(9.1%)	10(30.3%)	19(57.6%)	33(100.0%)
2. They will lead to demolition of houses	1(1.9%)	6(11.5%)	19(36.5%)	26(50.0%)	52(100.0%)
3. Green spaces are not necessary in my community	23(11.3%)	18(8.9%)	73(36.0%)	89(43.8%)	203(100.0%)
4. Green spaces are dangerous to human health	4(5.6%)	4(5.6%)	35(49.3%)	28(39.4%)	71(100.0%)
5. The government will not take proper care of them	1(1.4%)	1(1.4%)	36(50.7%)	33(46.5%)	71(100.0%)
Chi-Square = 66.026; Df = 52; p = 0.091 (Not Sig)					

Source: Author Analysis, 2017

Table 4.16: Reasons for not Accepting Government Efforts at Creating Green Spaces by Level of Income

Perceived reasons *	< 18,000	18,000-38,999	39,000-58,999	59,000-78,999	79,000-98,999	99,000 +	Total
1. Green spaces reduce space for building	2(6.1%)	11(33.3%)	12(36.4%)	2(6.1%)	2(6.1%)	4(12.1%)	33(100.0%)
2. They will lead to demolition of houses	7(13.5%)	27(51.9%)	8(15.4%)	4(7.7%)	2(3.8%)	4(7.7%)	52(100.0%)
3. Green spaces are not necessary in my community	42(20.7%)	72(35.5%)	29(14.3%)	10(4.9%)	25(12.3%)	25(12.3%)	203(100.0%)
4. Green spaces are dangerous to human health	16(22.5%)	18(25.4%)	18(25.4%)	9(12.7%)	6(8.5%)	4(5.6%)	71(100.0%)
5. The government will not take proper care of them	26(36.6%)	23(32.4%)	15(21.1%)	3(4.2%)	2(2.8%)	2(2.8%)	71(100.0%)
Chi-Square = 153.543; Df = 65; p = 0.000 (Sig)							

Source: Author Analysis, 2017

From the above analyses and discussion, the study has shown that de-greening process began in earnest and accelerated after World War II (1950) due to the introduction of the western government and institutions including government offices, government reserved areas for expatriates and government workers and educational institutions and hospitals. As of 1955, some of the localities in Ibadan were isolated from each other by wide expanses of green space. Also, some of the present day localities were not even in existence then.

The result of the change analyses can translate to how decisions or policies can have longterm effects on the environment. For instance, findings from the multiple response analysis revealed that significant green spaces are concentrated in certain parts of the metropolis. The Town Planning Authority has been accused of nepotism and partiality in the allocation of land and in development control without much consideration for environmental protection (FDG 2017).

General studies have also found correlations between individual factors such as age, education, gender and ethnicity and the use of urban green spaces The result of the above analyses have shown additional factors such as occupation and housing properties as crucial indicators especially in the context of social ecology. For instance, house owners living in bungalows with high quality housing materials will have the resources to maintain the green spaces (through gardening) in their immediate environments as compared to those living in rented apartments who will rather spend time in making ends meet than in engaging in greening activities.

Authors in recent times have cautioned that existing research on the distribution of urban vegetation and its link to socioeconomic factors had been limited in its geographic scope. The study has improved on the geographic scope by looking at the linkage between urban vegetation and socio-economic factors in a metropolis using the neigbourhood/locality level as the spatial unit of measurement. This spatial unit of analysis revealed the existence of clear distinctions between the three main types of residential locality (high, low, medium density) in green space occurrence. For instance, the traditional core areas which are the high density residentiallocalities of Ibadan metropolis have been virtually denuded of all green space except along the rivers. In addition, the investigation at this spatial unit of analysis revealed that the green space distribution

pattern is more a function of the pattern of unplanned and uncontrolled physical developments than of a deliberate effort by the people or government to maintain green spaces.

Some authors have emphasized that the social and ecological relationships depend among other things on power and gender relations, social arrangements and political - economic regimes. This is corroborated in the findings from the multiple response analysis which revealed that the spatial disparities in the distribution of green areas and areas that are not green clearly suggest an absence of fair-play as certain areas are advantaged over other areas due to their prestige or status. For instance, the government in recent times has invested in parks and recreational centers, a typical example being the Agodi Garden Park. However, from all indications, it would seem as if the established parks and recreational green centres are meant for the medium and high-income earners, not only in terms of their location, but also, in terms of the transport links and cost of entry tickets.

Other studies have observed the negative attitudes of government in the development of green spaces. The findings of this study corroborate this viewpoint. For instance, during the field survey it was reported that there is very little confidence among the people in the ability of the government to implement and accomplish a greening programme. Most respondents do not believe the government will be able to complete whatever it starts and that, if it does, it will be able to maintain and sustain it. The government has not involved the people in the greening process at all. Reports from the field survey show that decisions on the environment are totally left in the hands of the people through the Landlords Associations or community heads. Conversely, the situation in some southern African countries (Malawi, Lesotho, Mozambique) is that decisions on green spaces were undertaken mostly by city planning authorities without the active involvement of the local people.

Human perceptions of nature also have a strong influence on behaviors associated with maintaining urban green spaces. Researches have shown that the attitude of city dwellers cannot be overlooked regarding urban greening. Findings from this research project show that Ibadan residents are very rational in their decisions to accept or not accept any government intervention initiatives to sustain green spaces in their communities. Economic considerations loom large in their decision making. There are concerns about the costs of any greening programme in terms of the demolition of houses, loss of properties, reductions in the land for building and other developments and compensation for properties lost to greening projects. There is very little

confidence among the people in the ability of the government to implement and accomplish a greening programme.

Lastly, there have been on-going discussions on whether subjective or objective environmental assessments are to be preferred in studies of this nature. Some authors argued for more studies that combine various assessment methods to determine the respective associations of subjective and objective environmental features. From the above analyses and result, this study explored the integration of both the subjective and objective forms of assessment, such as, self-reported environmental perception by residents; field assessment; assessment of measurable environmental features using digital image analysis and Geographic Information System. The multiple methods of geographical investigation helped to strengthen the research findings. For instance, the integration of oral history from FGD, statistical analysis, GIS analysis, and questionnaire survey improved on the quality of the research.

CHAPTER FIVE

SUMMARY AND CONCLUSION

5.0 Introduction

This chapter presents the summary, findings, conclusion, contribution to knowledge recommendation and areas of further research.

5.1 Summary

The study analyzed thespatio-temporal patterns of green spaces in Ibadan metropolis from pre-independence to 2015. Furthermore, the study examined the relationship between the distribution of urban green spaces and social ecology. Finally, the study assessed the variation in the perceived causes of green space depletion andthe role of government in greening. The concept of social ecology guided the study, while a survey research method was adopted. Cloud free Landsat Imageries (LI) of 1972, 1984, 2000 and 2015 were obtained from www.Glovis.com.Normalised Difference Vegetation Index threshold of 0.2-0.8 was used in identifying GS from the processed LI. The study map comprised of 104 localities delinated by the State Valuation Department and was superimposed on the Landsat Imageries. The stratified proportional sampling technique was used to categorise the localities into four population range groups using sample percentages – A: 0.1%, B: 0.2%, C: 0.4% and D: 0.8%. The systematic technique was used to draw a total sample of 3,410 from the localities. Area of green spaces in each locality was thereafter computed for all the years. The change detection method was used to map the changes in green spaces, while Global Moran's-I was used to analyse its temporal pattern. Ordinary Least Square (OLS) and Geographically Weighted Regression (GWR) were used to identify the Social Ecology predictors of green spaces in different localities. Analyses were done at $p \leq 0.5$.

5.2 Findings

From the characteraction of Ibadan metropolis, findings showed that the age of residents was 33±6.01 years, and the estimated monthly income was ₦42,055±13, 934. In addition, about 46.1% had secondary education. Green spaces declined by -62.0%, -37.8% and -38.4%between 1972-1984, 1984-2000, and 2000-2015, respectively.The percentage change for the entire period (i.e. 1972-2015) is estimated at -85.4%. Intensification of de-greening characterized the period

from 1972 to 2015. The traditional core areas of Ibadan metropolis were virtually denuded of all green spaces except along Ogunpa and other rivers. Uncontrolled physical development, road construction, high rates of population migration into the metropolis and spread of urban land useput pressure on the remaining green spaces. The economic boom experienced in the country between 1985 and 2015 fuelled physical development. Presently, green spaces are preserved primarily in government reservation areas, institutions of higher learning, research centers and farms and along rivers. However, the green space distribution pattern is more a function of the pattern of unplanned and uncontrolled physical developments than of a deliberate effort by the people or government to maintain the remaining green spaces.

With respect to the temporal distribution of green space between 1972 and 2015, the slope of the trend for Ibadan metropolis was negative (i.e. y = -2E+07x + 8E+07; R^2=0.8214 in which E is a scientific notation that stands for 10^x) indicating a decreasing trend in the extent of green spaces from 1972 to 2015.The years 1984 and 2000 marked critical turning points for the worse in the fortunes of greening in the metropolis because of significantly higher rates of green space loss. In 1972 (*I*: 0.348091), the green spaces were principally clustered in Bodija, Elewura, Apata, Oluyole and Academy. In 1984 (*I:*0.452642), green spaces were clustered aroundUCH, Jericho GRA, Alalubosa, Iyaganku and Polytechnic. By 2000 (*I*: 0.313010), the green spaces were principally clustered aroundUCH, Polytechnic, IAR&T, University of Ibadan,Nihort, Jericho and Ringroad and lastly by and 2015 (*I*: 0.229712), the green spaces were principally clustered Agodi, Moor Plantation, Nihort, Mokola, University of Ibadan and along Ogunpa river channels indicating unequal spatial distribution**.**

Occupation, income and housing were the Social Ecology determinants of green space distribution (*Bandwidth:* 0.02: *AICc:* 3043.3; R^2*:* 0.52) while social ecology effects were very strong in some localities in group A (Sango, Jericho, University of Ibadan) and group B (Ring road, Molete, Apata), which are the non-traditional areas of Ibadan.The major perceived cause of GS depletion in groups A, B and C is building construction and poor development control in group D. More than 64% favoured government greening intervention, but doubted their implementation competence.

In examining the relationship between green spaces and social ecology, ten social ecology indicators were considered as guided by existing literature and were subjected to principal components analysis (PCA). The result of the Ordinary Least Square and Geographically

weighted regression analysis showed that occupation, income and housing were the predictors of green space distribution are concentrated more outside the traditional core areas of the city.

5.3 **Conclusion**

Political instability has contributed to the poor management and rapid deterioration of urban green spaces in Africa. Lack of continuity of government regime has been the bane of the implementation and enforcement of set laws and policies. During the Ladoja regime Oyo State, Nigeria, efforts were made to green the metropolis but the Alao-Akala administration that succeeded it drastically curtailed the greening culture and process. The Ajimobi administration that followed made some effort to promote the greening culture by creating parks and by demolishing houses to give room for an urban beautification scheme. Nevertheless, most green schemes made by the government were for political reasons without bearing in mind the issue of environmental justice. The people they are to protect have little or no say in environmental issues and management.

5.4 **Contribution to Knowledge**

This study is a new contribution to studies on urban green spaces since previous studies did not consider the concept of social ecology to explain the processes behind the distribution of green spaces in a city. Investigating the existing social ecology of a city or a geographical space will help policy makers and government officials in understanding how the social–political arena works together to influence variations in urban green space. Furthermore, research has shown that the attitude of city dwellers cannot be overlooked regarding urban greening.This is because human attitude, in the long run, will translate into either positive or negative environmental effects. Governmental officials such as the town planning authorities; Ministry of Lands, Housing and Development; Waste Management Authority; and the Agency on urban beautification have not been carrying out their duties effectively. This is evident in the allocation of land without proper layout and consideration for green spaces.

From this research study, it is evident that Ibadan is not properly planned, resulting in uncontrolled physical development. Understanding the social ecological dimensions of a city as shown in this study can reveal a situation where people's behavior towards green spaces is poor

since the government that is to motivate them is engaged in unhealthy practices such as arbitrary allocation of lands and construction works. This study research has shown that people do not have much confidence in the ability of Government to implement, manage and sustain such a development project as greening of Ibadan metropolis.

5.5 **Recommendation**

Ibadan needs to be declared a planning zone because the existing landscape master plan cannot give room for an effective greening culture or intervention.There is therefore a need to restructure Ibadan Metropolis through urban revitalization and environmental planning by means of appropriate policy formulation.Government involvement cannot be overlooked as observed in the previous sections but the people at the locality/neighbourhood level must be involved in decision making at every stage of the project. Revitalizing and restructuring of Ibadan metropolis will not go without a cost in terms of the demolition of houses to accommodate green landscapes, displacement of people and their compensation by the government. A systematic approach to proper urban planning and environmental planning is required bearing in mind the concepts of social ecology.

5.6 **Areas for Further Research**

This research project is a new area of investigation inthe geography of urban green spaces. It has been applied at the relatively detailed locality level in a metropolitan area. Further applications of theconcept can be tested at the local government, state and national levels. The findingscan then be compared to the investigation done at the locality/neigbourhood level to discover if thereare exceptions in using the concept of social ecology in explaining the processes behind the depletion of green spaces in a city. Even at the locality level, more research can still bedone to increase the level of explanation. For instance, further research can analyze the role of social ecology using specific types of green space such as parks.

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APPENDIX A

UNIVERSITY OF IBADAN
FACULTY OF THE SOCIAL SCIENCES
DEPARTMENT OF GEOGRAPHY

SURVEY ON GREENING AND SOCIAL ECOLOGY IN IBADAN METROPOLIS

Dear Respondent,

This survey is on the distributional pattern of green spaces in Ibadan Metropolis. Please kindly fill in the appropriate answer to each question. The information is strictly for academic purpose and will therefore be treated confidentially.

Neighbourhood…… Housing Density (Low, Medium, High).....

SECTION A: SOCIO-ECONOMIC CHARACTERISTICS

1) Gender: Male ( ) Female ( )
2) Age: a. Less than 18 ( ) b. 18 – 28 ( ) c. 28 -38 ( ) d. . 48 - 58 ( ) E. 58 and above ( )
3) Ethnicity: a. Yoruba ( ) b. Ibo ( ) c. Hausa ( ) d. Others (Specify).....
4) State of Origin…… …….....…
5) Religion: a. Christianity ( ) b. Islam ( ) c. Others (specify) …….....….
6) Occupation: a. Farming ( ) b. Artisan ( ) c. Civil/Public servant ( ) d. Trading/Business ( ) e. others (specify) …….....
7) Highest level of Education: a. No Formal Education b. Primary ( ) c. Secondary ( ) d. tertiary ( ) e. others (specify)…….
8) Monthly Income (Naira): a. Less than 18, 000 ( ) b. 18,000 – 38 0000 ( ) c. 38,000 – 58,000 ( ) d. 58,000 – 78,000 ( ) e. 78,000 – 98,000 ( ) f. 98,000 and above ( )
9) Housing Type: a. Bungalow b. Flat c. Single apartment d. others (specify)…….....……..
10) Housing Wall Materials: a. Mud ( ) b. Concrete ( ) c. Wood ( ) d. others (specify)…….
11) Housing Roof Materials: a. Asbestos ( ) b. Thatched ( ) c. Others (specify).....

SECTION B: SPATIAL DISTRIBUTION OF GREEN SPACES

12) Which of the following types of green spaces do you have in your neighbourhood?
    a. No green spaces ( ) b. Trees ( ) c. Compound Grasses ( ) d. gardens and lawns ( ) e. roadside grasses ( ) f. grass fields ( ) g .Others (specify) ……
13) Do you think green spaces are declining in your neigbourhood? Yes ( ) No ( )
14) Are there areas in your neigbourhood which were former green and not? Yes ( ) No ( )
15) If yes, which areas and what year? :-

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16) If yes, what was responsible for the decline of green spaces in your neigbourhood?

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SECTION C: PERCEPTION ON GREENING CULTURE

17) Do you think green spaces are necessary in your neigbourhood? Yes ( ) No ( )

18) If yes, why:-

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19) If No, why:-

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20) If government wants to create green spaces in your neigbourhood, will you accept? Yes ( ) No ( )

21) If yes, why:-

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22) If No, why:-

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23) If government wants to establish green spaces that will involve demolition of houses, will you accept? Yes ( ) No ( )

24) If yes, why:-

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25) If No, why:-

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APPENDIX B-1 : Housing Density (Low,Medium High)

No	Low housing	Medium housing	High housing	Sample Size
1.		Abayomi		27
2.		Academy		43
3.		Adamasingba		33
4.			Adekile	33
5.		Adeoyo		40
6.			Agbeni	30
7.			Agbokojo	39
8.			Agbowo	32
9.	D-Rovans			28

10.			Agodi	25
11.		Agugu		34
12.		Gbagi		34
13.		Akingbola		33
14.		Akobo		33
15.	Alalubosa			31
16.			Alekuso	37
17.	Anfani Layout			29
18.		Apata		52
19.			Aperin	30
20.			Aremo	42
21.		Ashi		62
22.	Askar Paint			27
23.			Atipe	36
24.			Ayeye	37
25.		Idi-Ishin		25
26.		Bashorun		41
27.			Bode	28
28.		Coca-cola		24
29.			Elekuro	27
30.			Eleta	36
31.		Eleyele		47
32.		Eleyele market		32
33.	Fako Asaka			43
34.		Felele		31
35.		Gbade Adebo		21
36.		Holy Trinity		34
No	**Low housing**	**Medium housing**	**High housing**	**Sample Size**
37.	IAR&T			17
38.		Idi Arere		36
39.			Idikan	27
40.		Ijokodo		26
41.	Ikolaba			29
42.			Ile Oba	22
43.			Iletuntun	31
44.			Ilupeju	36
45.			Imale Falafia	28
46.			Oke Adu	32
47.			Isale Osi	32
48.			Ita Bale	22

49.	Iyaganku			38
50.	Jericho			26
51.			Kobomoje	37
52.			Kosodo	31
53.			Kudeti	45
54.			Labiran	27
55.	Letmuck			24
56.		Liberty Road		25
57.	Links reservation			14
58.		Mokola		43
59.		Molete		41
60.	Moor Plantation			29
61.		New Bodija		43
62.	NIHORT			29
63.		Odinjo		40
64.			Odo Oba	30
65.		Odo Ona		30
66.			Oja-oba	28
67.			Oje	34
68.			Ojoo-Orogun	32
69.		Oke Ado		31
70.			Oke Are	35
71.			Oke Irefin	30
72.		Oke-Bola		30
73.			Oloyoro	33
74.			Olopamewa	38
75.			Oluwa Nla	28
No	**Low housing**	**Medium housing**	**High housing**	**Sample Size**
76.		Onireke		27
77.			Oniyanrin	36
78.			Oniyere	32
79.			Oranyan	27
80.			Orita Ikeredu	26
81.			Ososami	25
82.			Osungbale	32
83.	Planning Authority			26
84.	Poly			45
85.			Popoyemoja	23
86.		Railway		14
87.	Ring Road			45

88.		Samonda		27
89.		Sango		45
90.		Sanyo		30
91.	Secretariat			24
92.		Seventh Day		24
93.	UMC			34
94.	University of Ibadan			37
95.			Yanbile	30
96.			Yemetu	50
97.		Old Bodija		31
98.		Alesinloye		34
99.		Alesinloye		31
100.		Ago Taylor		35
101.			Oku-Lokun	37
102.			Inalende	39
103.			Oremeji	58
104.	UCH			41
			Total	**3410**

APPENDIX B -2

SOCIO-ECONOMIC CHARACTERISTICS

GREEN SPACES AND SOCIO-ECONOMIC GROUPS (%)

Localities	% Green (2015)	Gender		Age									Ethnicity		
		Male	Female	< 18years	18-28 years	29-38 years	< 18 years	18-28 years	29-38 years	39-48 years	49-58 years	59 +	Yoruba	Ibo	Hausa
Abayomi	0.113687	18.5	81.5	3.7	3.7	51.9	3.7	3.7	51.9	25.9	14.8		59.3	18.5	22.2
Academy	0.853158	53.5	46.5	2.3	32.6	30.2	2.3	32.6	30.2	18.6	7.0	9.3	74.4	16.3	9.3
Adamasingba	0.009055	57.6	42.4	6.1	42.4	27.3	6.1	42.4	27.3	21.2		3.0	60.6	33.3	6.1
Adekile	0.105639	63.6	36.4	3.0	9.1	30.3	3.0	9.1	30.3	42.4	6.1	9.1	54.5	36.4	9.1
Adeoyo	0.056341	60	40	7.5	70.0	7.5	7.5	70.0	7.5	5.0	5.0	5.0	47.5	42.5	10.0
Agbede Adodo	0.003018	71.4	28.6		20.0	10.0		20.0	10.0	30.0	33.3	6.7	66.7	16.7	16.7
Agbeni	0.001006	56.7	43.3	35.9	35.9	17.9	35.9	35.9	17.9	5.1	2.6	2.6	71.8	7.7	20.5
Agbokojo	0.002012	35.9	64.1	9.4	31.3	6.3	9.4	31.3	6.3	31.3	12.5	9.4	65.6	31.3	3.1
Agbowo	0.104633	50	50	3.6	21.4	42.9	3.6	21.4	42.9	21.4	3.6	7.1	64.3	35.7	
Ago Taylor	0.173046	51.4	48.6		24.0	40.0		24.0	40.0	20.0	16.0		52.0	28.0	20.0
Agodi	0.239448	44	56	2.9	17.6	38.2	2.9	17.6	38.2	29.4	8.8	2.9	41.2	20.6	38.2
Agugu	0.001006	41.2	58.8	11.8	26.5	23.5	11.8	26.5	23.5	20.6	11.8	5.9	70.6	26.5	2.9
Akingbola	0.106645	42.4	57.6	6.1	39.4	36.4	6.1	39.4	36.4	18.2			78.8	18.2	3.0
Akobo	1.145928	60.6	39.4	9.1	51.5	21.2	9.1	51.5	21.2	18.2			81.8	6.1	12.1
Alalubosa	1.129831	51.6	48.4	9.7	25.8	22.6	9.7	25.8	22.6	38.7	3.2		64.5	32.3	3.2
Alekuso	0.031189	83.8	16.2	2.7	43.2	48.6	2.7	43.2	48.6	5.4			73.0	18.9	8.1
Alesinloye	0.322952	50	50	6.9	24.1	34.5	6.9	24.1	34.5	20.7	10.3	3.4	51.7	34.5	13.8
Anfani Layout	1.482966	44.8	55.2	13.5	23.1	17.3	13.5	23.1	17.3	34.6	11.5		88.5	7.7	3.8
Apata	6.578773	59.6	40.4	13.3	40.0	23.3	13.3	40.0	23.3	23.3			90.0	6.7	3.3

Localities	% Green (2015)	Male	Female	< 18years	18-28 years	29-38 years	< 18 years	18-28 years	29-38 years	39-48 years	49-58 years	59 +	Yoruba	Ibo	Hausa
Aperin	0.024146	73.3	26.7	23.8	38.1	31.0	23.8	38.1	31.0	7.1			64.3	33.3	2.4
IAR&T	12.38588	52.9	47.1		14.5	72.6		14.5	72.6	9.7	3.2		82.3	9.7	8.1
Aremo	0.002012	45.2	54.8		11.1	25.9		11.1	25.9	25.9	7.4	29.6	66.7	22.2	11.1
Ashi	0.353135	59.7	40.3		25.0	38.9		25.0	38.9	25.0	11.1		36.1	33.3	30.6
Askar Paint	2.971968	59.3	40.7	5.4	16.2	24.3	5.4	16.2	24.3	37.8	16.2		27.0	32.4	40.5
Ayeye	0.021128	54.1	45.9		4.0	40.0		4.0	40.0	40.0	12.0	4.0	56.0	20.0	24.0
Bashorun	0.453743	46.3	53.7	26.8	34.1	19.5	26.8	34.1	19.5	17.1	2.4		75.6	19.5	4.9
Bode	0.006036	35.7	64.3	17.9	32.1	10.7	17.9	32.1	10.7	17.9	17.9	3.6	64.3	10.7	25.0
Coca-cola	0.373257	37.5	62.5	12.5	50.0	4.2	12.5	50.0	4.2	20.8	8.3	4.2	66.7	29.2	4.2
D-Rovans	0.313898	53.6	46.4		44.4	29.6		44.4	29.6	18.5	3.7	3.7	48.1	33.3	18.5
Elekuro	0.02314	66.7	33.3		11.1	72.2		11.1	72.2	13.9	2.8		97.2	2.8	
Eleta	0.001006	66.7	33.3		46.8	34.0		46.8	34.0	10.6	4.3	4.3	87.2	10.6	2.1
Elewure	1.350163	67.7	32.3	18.8	37.5	21.9	18.8	37.5	21.9	9.4	9.4	3.1	75.0	21.9	3.1
Eleyele	1.138885	55.3	44.7	4.7	53.5	25.6	4.7	53.5	25.6	14.0	2.3		74.4	16.3	9.3
Eleyele market	0.703252	65.6	34.4	6.5	6.5	25.8	6.5	6.5	25.8	32.3	29.0		100.0		
Fako Asaka	0.001006	51.2	48.8	9.5	4.8	23.8	9.5	4.8	23.8	42.9	19.0		76.2	14.3	9.5
Felele	0.289752	51.6	48.4	11.8	44.1	44.1	11.8	44.1	44.1				73.5	20.6	5.9
Gbagi	0.003018	64.7	35.3	11.8	17.6	5.9	11.8	17.6	5.9	35.3	23.5	5.9	35.3	11.8	52.9
Holy Trinity	2.224448	67.6	32.4	2.8	11.1	55.6	2.8	11.1	55.6	25.0	5.6		47.2	33.3	19.4
Idi Arere	0.002012	33.3	66.7		11.1	7.4		11.1	7.4	40.7	33.3	7.4	92.6	3.7	3.7
Idi-Ishin	0.848128	64	36	30.8	53.8	3.8	30.8	53.8	3.8	11.5			92.3	3.8	3.8
Idikan	0.140852	66.7	33.3		34.5	37.9		34.5	37.9	27.6			44.8	24.1	31.0
Ijokodo	0.03965	34.6	65.4		95.5	4.5		95.5	4.5				100.0		
Ikolaba	0.959803	55.2	44.8	9.7	38.7	25.8	9.7	38.7	25.8	16.1	3.2	6.5	71.0	12.9	16.1
Ile Oba	0.001006	54.5	45.5		33.3	27.8		33.3	27.8	25.0	13.9		36.1	41.7	22.2
Iletuntun	0.066401	61.3	38.7	42.9	28.6	7.1	42.9	28.6	7.1	3.6	10.7	7.1	50.0	32.1	17.9
Ilupeju	0.880322	61.1	38.9		28.1	31.3		28.1	31.3	21.9	12.5	6.3	87.5	6.3	6.3

Localities	% Green (2015)	Male	Female	< 18years	18-28 years	29-38 years	< 18 years	18-28 years	29-38 years	39-48 years	49-58 years	59 +	Yoruba	Ibo	Hausa
Imale Falafia	0.001006	71.4	28.6	53.1	34.4	9.4	53.1	34.4	9.4	3.1			84.4	6.3	9.4
Inalende	0.657978	64.1	35.9		4.5	31.8		4.5	31.8	63.6			90.9	4.5	4.5
Isale Osi	0.002012	78.1	21.9	10.5	18.4	34.2	10.5	18.4	34.2	31.6	2.6	2.6	39.5	42.1	18.4
Ita Bale	0.001006	86.4	13.6	19.2	38.5	11.5	19.2	38.5	11.5	23.1		7.7	65.4	26.9	7.7
Iyaganku	0.749531	52.6	47.4		32.4	59.5		32.4	59.5	2.7	5.4		67.6	27.0	5.4
Jericho	1.133855	42.3	57.7		32.3	29.0		32.3	29.0	32.3	6.5		41.9	22.6	35.5
Kobomoje	0.033201	45.9	54.1	2.2	28.9	42.2	2.2	28.9	42.2	26.7			97.8	2.2	
Kosodo	0.003018	51.6	48.4		33.3	37.0		33.3	37.0	22.2	3.7	3.7	77.8	18.5	3.7
Kudeti	0.089541	82.2	17.8	16.7	45.8	20.8	16.7	45.8	20.8		8.3	8.3	50.0	45.8	4.2
L abiran	0.322952	44.4	55.6	4.0	28.0	44.0	4.0	28.0	44.0	8.0	12.0	4.0	64.0	32.0	4.0
Letmuck	2.24457	54.2	45.8		28.6	57.1		28.6	57.1	7.1		7.1	92.9	7.1	
Liberty Road	0.210271	44	56	4.7	20.9	25.6	4.7	20.9	25.6	30.2	16.3	2.3	53.5	18.6	27.9
Links reservation	2.24457	85.7	14.3	7.3	36.6	41.5	7.3	36.6	41.5	7.3	4.9	2.4	90.2	9.8	
Mokola	1.367266	69.8	30.2		48.3	24.1		48.3	24.1	20.7		6.9	65.5	20.7	13.8
Molete	3.839211	70.7	29.3	30.2	34.9	16.3	30.2	34.9	16.3	9.3	9.3		88.4	7.0	4.7
Moor Plantation	4.987151	55.2	44.8			24.1			24.1	69.0	6.9		58.6	20.7	20.7
New Bodija	0.302831	25.6	74.4	7.5	20.0	22.5	7.5	20.0	22.5	25.0	17.5	7.5	70.0	22.5	7.5
NIHORT	2.142956	55.2	44.8			96.7			96.7	3.3			100.0		
Odinjo	0.1489	47.5	52.5	10.0	66.7	13.3	10.0	66.7	13.3	10.0			63.3	26.7	10.0
Odo Oba	0.927608	66.7	33.3		3.6	17.9		3.6	17.9	28.6	39.3	10.7	100.0		
Odo Ona	4.441854	40	60	2.9	32.4	17.6	2.9	32.4	17.6	41.2	5.9		73.5	17.6	8.8
Oja-oba	0.001006	60.7	39.3		9.4	53.1		9.4	53.1	34.4	3.1		59.4	15.6	25.0
Oje	0.004024	50	50	9.7	87.1	3.2	9.7	87.1	3.2				93.5	3.2	3.2
Ojoo-Orogun	0.025152	62.5	37.5	5.7	8.6	51.4	5.7	8.6	51.4	22.9	8.6	2.9	45.7	20.0	34.3
Oke Ado	0.207253	54.8	45.2	3.3	43.3	16.7	3.3	43.3	16.7	20.0	13.3	3.3	90.0	10.0	
Oke Adu	0.033201	56.3	43.8	10.0	16.7	40.0	10.0	16.7	40.0	30.0	3.3		66.7	16.7	16.7

Localities	% Green (2015)	Male	Female	< 18years	18-28 years	29-38 years	< 18 years	18-28 years	29-38 years	39-48 years	49-58 years	59 +	Yoruba	Ibo	Hausa
Oke Are	0.002012	60	40	6.1	33.3	18.2	6.1	33.3	18.2	9.1	27.3	6.1	72.7	15.2	12.1
Oke Irefin	0.567431	66.7	33.3	2.6	31.6	28.9	2.6	31.6	28.9	26.3	10.5		57.9	21.1	21.1
Oke Ofa Atipe	0.000022	63.9	36.1		42.9	35.7		42.9	35.7	21.4			92.9		7.1
Oke-Bola	0.05131	70	30	3.7	3.7	25.9	3.7	3.7	25.9	37.0	29.6		55.6	25.9	18.5
Oku-Lokun	0.002012	56.8	43.2	2.8	25.0	25.0	2.8	25.0	25.0	41.7	5.6		69.4	22.2	8.3
Old Bodija	0.011067	45.2	54.8		9.4	46.9		9.4	46.9	34.4	6.3	3.1	71.9	25.0	3.1
Olopamewa	3.938813	34.2	65.8	22.2	66.7	7.4	22.2	66.7	7.4	3.7			88.9	7.4	3.7
Oloyoro	0.347098	57.6	42.4		42.3	23.1		42.3	23.1	23.1	11.5		92.3	7.7	
Oluwa Nla	0.087529		100	8.0	44.0	16.0	8.0	44.0	16.0	16.0	12.0	4.0	64.0	28.0	8.0
Onireke	0.70627	81.5	18.5	3.1	65.6	9.4	3.1	65.6	9.4	21.9			81.3	12.5	6.3
Oniyanrin	1.264646	50	50	19.2	11.5	7.7	19.2	11.5	7.7	26.9	23.1	11.5	57.7	23.1	19.2
Oniyere	0.675081	71.9	28.1	11.1	66.7	22.2	11.1	66.7	22.2				91.1	8.9	
Oranyan	0.002012	44.4	55.6		30.4	43.5		30.4	43.5	21.7	4.3		82.6	17.4	
Oremeji	0.451731	51.7	48.3	14.3	28.6	28.6	14.3	28.6	28.6	21.4	7.1		42.9	28.6	28.6
Orita Ikeredu	1.431655	53.8	46.2	8.9	60.0	8.9	8.9	60.0	8.9	8.9	11.1	2.2	48.9	37.8	13.3
Ososami	0.736452	60	40	7.4	37.0	37.0	7.4	37.0	37.0	7.4	11.1		74.1	11.1	14.8
Osungbale	0.880322	46.9	53.1	35.6	40.0	20.0	35.6	40.0	20.0	4.4			73.3	24.4	2.2
Planning Authority	1.008095	38.5	61.5	13.3	56.7	20.0	13.3	56.7	20.0	10.0			90.0	10.0	
Popoyemoja	0.002012	34.8	65.2	12.5	29.2	20.8	12.5	29.2	20.8	12.5	16.7	8.3	66.7	16.7	16.7
Railway	0.208259	64.3	35.7		37.5	37.5		37.5	37.5	16.7	4.2	4.2	75.0	20.8	4.2
Ring Road	2.225454	55.6	44.4		17.6	52.9		17.6	52.9	20.6	8.8		79.4	14.7	5.9
Samonda	0.45978	48.1	51.9		78.4	8.1		78.4	8.1	5.4	5.4	2.7	73.0	27.0	
Sango	0.212283	62.2	37.8	6.7	86.7	3.3	6.7	86.7	3.3	3.3			66.7	26.7	6.7
Sanyo	0.450725	50	50	36.0	50.0	12.0	36.0	50.0	12.0		2.0		96.0	2.0	2.0
Secretariat	1.241506	62.5	37.5	6.5	22.6	32.3	6.5	22.6	32.3	9.7	6.5	22.6	54.8	22.6	22.6
Seventh Day	0.003018	50	50	26.5	29.4	29.4	26.5	29.4	29.4	14.7			85.3	11.8	2.9

Localities	% Green (2015)	Male	Female	< 18years	18-28 years	29-38 years	< 18 years	18-28 years	29-38 years	39-48 years	49-58 years	59 +	Yoruba	Ibo	Hausa
The Polytechnic	12.51265	55.6	44.4	12.9	25.8	16.1	12.9	25.8	16.1	38.7	6.5		83.9	16.1	
UCH	0.747519	51.2	48.8	8.6	22.9	31.4	8.6	22.9	31.4	25.7	5.7	5.7	57.1	28.6	14.3
UMC	0.029176	64.7	35.3	2.7	29.7	32.4	2.7	29.7	32.4	24.3	10.8		51.4	27.0	21.6
University of Ibadan	4.980108	48.6	51.4	2.6	33.3	35.9	2.6	33.3	35.9	17.9	5.1	5.1	66.7	25.6	7.7
Yanbile	0.096584	60	40	17.2	27.6	31.0	17.2	27.6	31.0	19.0	3.4	1.7	82.8	6.9	10.3
Yemetu	0.507066	40	60	17.1	48.8	14.6	17.1	48.8	14.6	9.8	4.9	4.9	87.8	9.8	2.4
Total	100	54.9	45.1	8.9	33.0	28.4	8.9	33.0	28.4	19.6	7.4	2.7	70.8	18.7	10.5

Localities	% Green (2015)	Religion			Occupation						Level of Education				
		Christianity	Islam	Traditional	Farming	Artisan	Civil/Public servant	Trading/Business	Student	Self employed	No Formal Education	Primary	Secondary	Tertiary	Quranic education
Abayomi	0.113687	55.6	44.4		25.9	7.4	29.6	33.3	3.7		7.4	14.8	51.9	25.9	
Academy	0.853158	62.8	34.9	2.3	9.3	7.0	11.6	48.8	18.6	4.7		4.7	32.6	62.8	
Adamasingba	0.009055	84.8	15.2		6.1		9.1	51.5	33.3			3.0	33.3	63.6	
Adekile	0.105639	66.7	27.3	6.1	18.2	3.0	33.3	36.4	9.1			3.0	45.5	45.5	6.1
Adeoyo	0.056341	95.0	2.5	2.5	12.5	10.0	15.0	22.5	35.0	5.0	2.5		35.0	62.5	
Agbede Adodo	0.003018	70.0	30.0		16.7	6.7	43.3	30.0	3.3		3.3	16.7	23.3	56.7	
Agbeni	0.001006	53.8	46.2		10.3	38.5	23.1	25.6	2.6		12.8	5.1	23.1	59.0	
Agbokojo	0.002012	68.8	31.3		3.1	21.9	21.9	34.4	18.8		6.3	12.5	43.8	37.5	
Agbowo	0.104633	78.6	21.4		7.1	7.1	25.0	17.9	10.7	32.1		3.6	21.4	75.0	
Ago Taylor	0.173046	60.0	36.0	4.0	12.0	20.0	20.0	40.0	8.0		28.0	4.0	36.0	32.0	
Agodi	0.239448	64.7	35.3		5.9	17.6	32.4	38.2	5.9				35.3	64.7	
Agugu	0.001006	85.3	14.7		20.6	17.6	32.4	29.4			14.7	20.6	38.2	26.5	
Akingbola	0.106645	69.7	27.3	3.0	3.0	21.2	21.2	30.3	9.1	15.2	24.2	12.1	21.2	42.4	
Akobo	1.145928	78.8	21.2		3.0	12.1	66.7	18.2			3.0		81.8	15.2	
Alalubosa	1.129831	83.9	16.1				38.7	22.6	22.6	16.1			25.8	74.2	
Alekuso	0.031189	86.5	10.8	2.7	24.3	24.3	37.8	10.8	2.7			37.8	54.1	8.1	
Alesinloye	0.322952	75.9	20.7	3.4	6.9	13.8	13.8	41.4	17.2	6.9	3.4	3.4	51.7	41.4	
Anfani Layout	1.482966	61.5	38.5		5.8	3.8	44.2	36.5	9.6				30.8	69.2	

Localities	% Green (2015)	Christianity	Islam	Traditional	Farming	Artisan	Civil/Public servant	Trading/Business	Student	Self employed	No Formal Education	Primary	Secondary	Tertiary	Quranic education
Apata	6.578773	93.3	6.7		6.7	6.7	23.3	36.7	26.7				40.0	60.0	
Aperin	0.024146	88.1	11.9			85.7	2.4	11.9					100.0		
IAR&T	12.38588	82.3	17.7			9.7	4.8	85.5			8.1	3.2	27.4	61.3	
Aremo	0.002012	51.9	44.4	3.7	14.8	14.8	25.9	33.3	11.1		7.4	3.7	44.4	44.4	
Ashi	0.353135	75.0	19.4	5.6	8.3	8.3	41.7	22.2	19.4		2.8		41.7	55.6	
Askar Paint	2.971968	56.8	43.2			24.3	18.9	35.1	21.6			5.4	56.8	37.8	
Ayeye	0.021128	80.0	20.0		8.0		56.0	36.0				8.0	16.0	76.0	
Bashorun	0.453743	80.5	19.5		2.4	41.5	39.0	17.1				2.4	97.6		
Bode	0.006036	50.0	50.0		7.1	53.6	21.4	17.9			10.7	17.9	21.4	50.0	
Coca-cola	0.373257	79.2	20.8			20.8	12.5	29.2	37.5		4.2	12.5	45.8	37.5	
D-Rovans	0.313898	63.0	37.0				25.9	44.4	25.9	3.7			48.1	51.9	
Elekuro	0.02314	86.1	13.9			19.4	8.3	69.4	2.8				55.6	44.4	
Eleta	0.001006	74.5	25.5		12.8	14.9	31.9	23.4	14.9	2.1		14.9	42.6	42.6	
Elewure	1.350163	84.4	15.6		18.8	18.8	18.8	25.0	18.8		18.8	18.8	37.5	25.0	
Eleyele	1.138885	86.0	14.0			32.6	65.1	2.3					95.3	4.7	
Eleyele market	0.703252	71.0	29.0			6.5	74.2	3.2	12.9	3.2			16.1	83.9	
Fako Asaka	0.001006	76.2	23.8		4.8	4.8	33.3	42.9	14.3			9.5	52.4	38.1	
Felele	0.289752	76.5	23.5			32.4	67.6				2.9		97.1		
Gbagi	0.003018	76.5	23.5		29.4	17.6	23.5	29.4			23.5	11.8	23.5	41.2	
Holy Trinity	2.224448	77.8	22.2		16.7	13.9	27.8	30.6	11.1		2.8		50.0	47.2	
Idi Arere	0.002012	81.5	18.5		3.7	25.9	44.4	22.2	3.7			7.4	37.0	55.6	
Idi-Ishin	0.848128	96.2	3.8		26.9	15.4	38.5	11.5	7.7			3.8	76.9	19.2	

Localities	% Green (2015)	Christianity	Islam	Traditional	Farming	Artisan	Civil/Public servant	Trading/Business	Student	Self employed	No Formal Education	Primary	Secondary	Tertiary	Quranic education
Idikan	0.140852	82.8	13.8	3.4		17.2	51.7	13.8	3.4	13.8			24.1	75.9	
Ijokodo	0.03965	77.3	22.7			40.9	59.1						100.0		
Ikolaba	0.959803	87.1	12.9		6.5	48.4	16.1	12.9	16.1		16.1	19.4	25.8	38.7	
Ile Oba	0.001006	83.3	13.9	2.8	5.6	2.8	47.2	30.6	13.9			2.8	22.2	75.0	
Iletuntun	0.066401	46.4	53.6		7.1	32.1	39.3	21.4			7.1		39.3	53.6	
Ilupeju	0.880322	78.1	21.9		3.1	28.1	28.1	34.4	6.3		9.4	9.4	34.4	46.9	
Imale Falafia	0.001006	3.1	96.9		6.3	50.0	28.1	15.6			6.3		87.5	6.3	
Inalende	0.657978	86.4	13.6			18.2	13.6	68.2			4.5		27.3	68.2	
Isale Osi	0.002012	76.3	23.7		5.3	2.6	44.7	34.2	13.2			13.2	39.5	47.4	
Ita Bale	0.001006	80.8	19.2		3.8	7.7	34.6	30.8	23.1		3.8	7.7	30.8	57.7	
Iyaganku	0.749531	97.3	2.7		2.7	13.5	29.7	21.6	29.7	2.7		5.4	2.7	91.9	
Jericho	1.133855	64.5	35.5			19.4	19.4	32.3	29.0			3.2	45.2	51.6	
Kobomoje	0.033201	88.9	11.1			4.4	26.7	66.7	2.2				46.7	53.3	
Kosodo	0.003018	70.4	29.6			22.2	18.5	40.7		18.5		11.1	44.4	44.4	
Kudeti	0.089541	100.0				12.5	25.0	29.2	33.3			12.5	16.7	70.8	
Labiran	0.322952	84.0	16.0			4.0	36.0	52.0	8.0			4.0	52.0	44.0	
Letmuck	2.24457	78.6	14.3	7.1	21.4	28.6	28.6	21.4			7.1	21.4	42.9	28.6	
Liberty Road	0.210271	51.2	46.5	2.3	2.3	7.0	23.3	58.1	9.3		2.3	2.3	41.9	53.5	
Links reservation	2.24457	80.5	19.5			12.2	48.8	31.7	2.4	4.9		7.3	56.1	36.6	
Mokola	1.367266	75.9	24.1			10.3	20.7	37.9	27.6	3.4	10.3	3.4	27.6	58.6	
Molete	3.839211	93.0	4.7	2.3	4.7	9.3	18.6	18.6	44.2	4.7	9.3		34.9	55.8	
Moor Plantation	4.987151	69.0	7.6	3.4			44.8	55.2			6.9	6.9	48.3	37.9	

Localities	% Green (2015)	Christianity	Islam	Traditional	Farming	Artisan	Civil/Public servant	Trading/Business	Student	Self employed	No Formal Education	Primary	Secondary	Tertiary	Quranic education
New Bodija	0.302831	65.0	0.0	5.0	15.0	35.0	22.5	20.0	7.5		17.5	25.0	32.5	25.0	
NIHORT	2.142956	90.0	6.7	3.3		6.7	53.3	36.7	3.3		6.7	23.3	26.7	43.3	
Odinjo	0.1489	83.3	0.0	6.7	10.0		10.0	20.0	60.0			3.3	43.3	53.3	
Odo Oba	0.927608	17.9	2.1			17.9	3.6	78.6			7.1	7.1	71.4	14.3	
Odo Ona	4.441854	73.5	6.5			2.9	23.5	44.1	26.5	2.9			23.5	76.5	
Oja-oba	0.001006	59.4	0.6				40.6	53.1	6.3			3.1	50.0	46.9	
Oje	0.004024	87.1	2.9		6.5	64.5	29.0						100.0		
Ojoo-Orogun	0.025152	74.3	2.9	2.9	22.9	8.6	8.6	48.6	11.4			8.6	34.3	57.1	
Oke Ado	0.207253	76.7	3.3			23.3	33.3	16.7	23.3	3.3		16.7	33.3	50.0	
Oke Adu	0.033201	63.3	0.0	6.7		16.7	56.7	26.7			3.3	20.0	50.0	26.7	
Oke Are	0.002012	78.8	1.2		9.1	30.3	6.1	27.3	24.2	3.0	24.2	18.2	36.4	21.2	
Oke Irefin	0.567431	55.3	4.7		7.9	39.5	18.4	28.9	5.3		21.1	23.7	34.2	21.1	
Oke Ofa Atipe	0.000022	92.9	7.1			71.4	3.6	25.0				3.6	7.1	89.3	
Oke-Bola	0.05131	81.5	4.8	3.7	7.4	7.4	25.9	59.3			3.7	7.4	81.5	7.4	
Oku-Lokun	0.002012	75.0	5.0			2.8	27.8	47.2	22.2				22.2	77.8	
Old Bodija	0.011067	96.9	3.1		12.5	6.3	43.8	18.8	9.4	9.4		3.1	75.0	21.9	
Olopamewa	3.938813	88.9	1.1			77.8	22.2						100.0		
Oloyoro	0.347098	73.1	6.9			26.9	15.4	42.3	11.5	3.8		7.7	38.5	53.8	
Oluwa Nla	0.087529	68.0	2.0			32.0	24.0	20.0	24.0		4.0	4.0	32.0	60.0	
Onireke	0.70627	90.6	9.4			46.9	46.9	3.1		3.1			96.9	3.1	
Oniyanrin	1.264646	46.2	3.8		23.1	23.1	38.5	11.5	3.8		15.4	3.8	23.1	57.7	
Oniyere	0.675081	60.0	0.0			22.2	75.6	2.2			4.4		95.6		

Localities	% Green (2015)	Christianity	Islam	Traditional	Farming	Artisan	Civil/Public servant	Trading/Business	Student	Self employed	No Formal Education	Primary	Secondary	Tertiary	Quranic education
Oranyan	0.002012	73.9	6.1			30.4	8.7	39.1	17.4	4.3	4.3	17.4	69.6	8.7	
Oremeji	0.451731	50.0	0.0		50.0	7.1	21.4	21.4				35.7	7.1	57.1	
Orita Ikeredu	1.431655	80.0	5.6	4.4	11.1	11.1	6.7	35.6	31.1	4.4	2.2	6.7	51.1	40.0	
Ososami	0.736452	74.1	5.9		3.7	14.8	25.9	22.2	33.3		3.7	7.4	29.6	59.3	
Osungbale	0.880322	86.7	1.1	2.2	6.7	8.9	15.6	24.4	44.4		2.2	6.7	48.9	42.2	
Planning Authority	1.008095	50.0	50.0			6.7	30.0	43.3	20.0				43.3	56.7	
Popoyemoja	0.002012	58.3	37.5	4.2	16.7	16.7	29.2	12.5	25.0		20.8	4.2	54.2	20.8	
Railway	0.208259	91.7	8.3		8.3	20.8	20.8	37.5	8.3	4.2	4.2	4.2	54.2	37.5	
Ring Road	2.225454	88.2	11.8		2.9	8.8	11.8	76.5			2.9	2.9	41.2	52.9	
Samonda	0.45978	81.1	18.9				35.1	10.8	54.1				29.7	70.3	
Sango	0.212283	90.0	10.0			13.3	3.3	10.0	73.3		3.3	3.3	30.0	63.3	
Sanyo	0.450725	68.0	32.0		4.0	22.0	18.0	18.0	38.0		2.0		64.0	34.0	
Secretariat	1.241506	64.5	35.5		38.7	25.8	22.6	12.9			38.7	6.5	29.0	25.8	
Seventh Day	0.003018	82.4	17.6		2.9	32.4	35.3	20.6	8.8		2.9	29.4	44.1	23.5	
The Polytechnic	12.51265	83.9	16.1		6.5	16.1	51.6	19.4	3.2	3.2		16.1	16.1	67.7	
UCH	0.747519	71.4	25.7	2.9	8.6	34.3	20.0	28.6	5.7	2.9	5.7	14.3	54.3	25.7	
UMC	0.029176	73.0	27.0		13.5	21.6	13.5	35.1	16.2		5.4	10.8	54.1	29.7	
University of Ibadan	4.980108	76.9	23.1			23.1	23.1	43.6	10.3		5.1	2.6	53.8	38.5	
Yanbile	0.096584	82.8	17.2		1.7	27.6	13.8	48.3	6.9	1.7	10.3	22.4	44.8	22.4	
Yemetu	0.507066	75.6	22.0	2.4	4.9	14.6	19.5	9.8	51.2			17.1	34.1	48.8	
Total	100	74.8	24.3	0.9	6.4	19.2	28.4	30.6	13.7	1.7	4.6	7.2	45.4	42.8	0.1

Localities	% Green (2015)	Monthly income					
		Less than 18,000	18,000-38,999	39,000-58,999	59,000-78,999	79,000-98,999	99,000 and above
Abayomi	0.113687	11.1	48.1	37.0	3.7		
Academy	0.853158	14.0	18.6	14.0	20.9	16.3	16.3
Adamasingba	0.009055	21.2	21.2	6.1	9.1	24.2	18.2
Adekile	0.105639	21.2	18.2	27.3	9.1	15.2	9.1
Adeoyo	0.056341	50.0	15.0	10.0	2.5	7.5	15.0
Agbede Adodo	0.003018	6.7	16.7	40.0	20.0	10.0	6.7
Agbeni	0.001006	38.5	33.3	12.8	15.4		
Agbokojo	0.002012	21.9	21.9	37.5	9.4	6.3	3.1
Agbowo	0.104633	7.1	14.3	10.7		17.9	50.0
Ago Taylor	0.173046	8.0	24.0	32.0	20.0	16.0	
Agodi	0.239448	2.9	44.1	35.3	14.7	2.9	
Agugu	0.001006	32.4	23.5	17.6	2.9	17.6	5.9
Akingbola	0.106645	6.1	33.3	12.1	3.0	27.3	18.2
Akobo	1.145928	33.3	18.2	3.0	3.0	36.4	6.1
Alalubosa	1.129831	12.9	9.7	32.3	6.5	19.4	19.4
Alekuso	0.031189	56.8	32.4	2.7	2.7	5.4	
Alesinloye	0.322952	27.6	27.6	13.8	3.4	10.3	17.2
Anfani Layout	1.482966	21.2	25.0	36.5	11.5	3.8	1.9
Apata	6.578773	40.0	26.7	30.0	3.3		
Aperin	0.024146	11.9	47.6	7.1	16.7	16.7	
IAR&T	12.38588	3.2	24.2	35.5	9.7	14.5	12.9
Aremo	0.002012	14.8	37.0	7.4	11.1		29.6
Ashi	0.353135	11.1	30.6	30.6	11.1	11.1	5.6

Localities	% Green (2015)	Less than 18,000	18,000-38,999	39,000-58,999	59,000-78,999	79,000-98,999	99,000 and above
Askar Paint	2.971968	10.8	37.8	29.7	8.1	10.8	2.7
Ayeye	0.021128		36.0	20.0	12.0	8.0	24.0
Bashorun	0.453743	26.8	41.5	17.1	9.8	2.4	2.4
Bode	0.006036	21.4	39.3	21.4	7.1	10.7	
Coca-cola	0.373257	41.7	20.8	25.0	8.3	4.2	
D-Rovans	0.313898	14.8	7.4	14.8	22.2	18.5	22.2
Elekuro	0.02314	8.3	88.9	2.8			
Eleta	0.001006	8.5	40.4	21.3	8.5	8.5	12.8
Elewure	1.350163	28.1	28.1	12.5	6.3	12.5	12.5
Eleyele	1.138885	27.	30.2	2.3	11.6	25.6	2.3
Eleyele market	0.703252	9.7	12.9	32.3	22.6	16.1	6.5
Fako Asaka	0.001006	14.3	38.1	38.1			9.5
Felele	0.289752	67.6	11.8		11.8	8.8	
Gbagi	0.003018	47.1	17.6	29.4	5.9		
Holy Trinity	2.224448		50.0	30.6	2.8	8.3	8.3
Idi Arere	0.002012	3.7	29.6	33.3	18.5	7.4	7.4
Idi-Ishin	0.848128	57.7	30.8	7.7		3.8	
Idikan	0.140852		34.5	7.2	10.3	17.2	20.7
Ijokodo	0.03965	100.0					
Ikolaba	0.959803	25.8	38.7	9.7	3.2	3.2	19.4
Ile Oba	0.001006	8.3	19.4	55.6	8.3	5.6	2.8
Iletuntun	0.066401	25.0	46.4	17.9	3.6	3.6	3.6
Ilupeju	0.880322	9.4	18.8	25.0	15.6	21.9	9.4

Localities	% Green (2015)	Less than 18,000	18,000-38,999	39,000-58,999	59,000-78,999	79,000-98,999	99,000 and above
Imale Falafia	0.001006	68.8	15.6	15.6			
Inalende	0.657978	4.5	72.7	22.7			
Isale Osi	0.002012	39.5	23.7	13.2	5.3	2.6	15.8
Ita Bale	0.001006	26.9	42.3	19.2	3.8	3.8	3.8
Iyaganku	0.749531	16.2	18.9			2.7	62.2
Jericho	1.133855	6.5	25.8	48.4	12.9	3.2	3.2
Kobomoje	0.033201		55.6	26.7	2.2	13.3	2.2
Kosodo	0.003018		33.3	18.5	25.9	14.8	7.4
Kudeti	0.089541	45.8	25.0	12.5		12.5	4.2
Labiran	0.322952	8.0	52.0	16.0	20.0		4.0
Letmuck	2.24457	14.3	57.1	7.1		21.4	
Liberty Road	0.210271	2.3	25.6	20.9	2.3	34.9	14.0
Links reservation	2.24457	22.0	61.0	4.9	4.9	7.3	
Mokola	1.367266	27.6	34.5	17.2	10.3	6.9	3.4
Molete	3.839211	39.5	44.2	7.0		4.7	4.7%
Moor Plantation	4.987151		37.9	48.3	6.9	6.9	
New Bodija	0.302831	12.5	27.5	20.0	30.0	5.0	5.0
NIHORT	2.142956	6.7	66.7	23.3	3.3		
Odinjo	0.1489	33.3	26.7	16.7	6.7	13.3	3.3
Odo Oba	0.927608		14.3	21.4		28.6	35.7
Odo Ona	4.441854	5.9	20.6	14.7	11.8	23.5	23.5
Oja-oba	0.001006		56.3	34.4	3.1	6.3	
Oje	0.004024	90.3			6.5	3.2	

Localities	% Green (2015)	Less than 18,000	18,000-38,999	39,000-58,999	59,000-78,999	79,000-98,999	99,000 and above
Ojoo-Orogun	0.025152	11.4	45.7	25.7	8.6	8.6	
Oke Ado	0.207253	20.0	33.3	13.3	23.3	10.0	
Oke Adu	0.033201	23.3	26.7	13.3	20.0	13.3	3.3
Oke Are	0.002012	48.5	33.3	6.1		9.1	3.0
Oke Irefin	0.567431	21.1	39.5	5.8	15.8	2.6	5.3
Oke Ofa Atipe	0.000022		42.9	7.1	25.0	25.0	
Oke-Bola	0.05131	14.8	55.6	5.9	3.7		
Oku-Lokun	0.002012	5.6	16.7	3.9	11.1	30.6	22.2
Old Bodija	0.011067	6.3	31.3	0.0	3.1	9.4	
Olopamewa	3.938813	92.6	7.4				
Oloyoro	0.347098	7.7	0.8	15.4	23.1	15.4	7.7
Oluwa Nla	0.087529	24.0	8.0	16.0	20.0	8.0	4.0
Onireke	0.70627	78.1				18.8	3.1
Oniyanrin	1.264646	3.8	34.6	57.7		3.8	
Oniyere	0.675081	68.9	22.2			6.7	2.2
Oranyan	0.002012	13.0	60.9	17.4	4.3	4.3	
Oremeji	0.451731	7.1	21.4		42.9	14.3	14.3
Orita Ikeredu	1.431655	26.7	51.1	17.8		2.2	2.2
Ososami	0.736452	18.5	33.3	33.3	3.7	7.4	3.7
Osungbale	0.880322	37.8	33.3	13.3	2.2	8.9	4.4
Planning Authority	1.008095	23.3	26.7	30.0	6.7		13.3
Popoyemoja	0.002012	25.0	20.8	33.3	8.3	4.2	8.3
Railway	0.208259	12.5	45.8	20.8	16.7		4.2

Localities	% Green (2015)	Less than 18,000	18,000-38,999	39,000-58,999	59,000-78,999	79,000-98,999	99,000 and above
Ring Road	2.225454		14.7	70.6	5.9	5.9	2.9
Samonda	0.45978	59.5	24.3	8.1		5.4	2.7
Sango	0.212283	43.3	30.0	13.3	3.3	3.3	6.7
Sanyo	0.450725	76.0	20.0	4.0			
Secretariat	1.241506	19.4	32.3	9.7		6.5	32.3
Seventh Day	0.003018	23.5	52.9	14.7		8.8	
The Polytechnic	12.51265	19.4	61.3	9.7		6.5	3.2
UCH	0.747519	5.7	28.6	22.9	8.6	5.7	28.6
UMC	0.029176	13.5	43.2	21.6	8.1	13.5	
University of Ibadan	4.980108	10.3	38.5	33.3	10.3	2.6	5.1
Yanbile	0.096584	20.7	51.7	22.4	3.4		1.7
Yemetu	0.507066	48.8	34.1	12.2	2.4	2.4	
Total	100	23.6	32.3	19.6	7.8	9.2	7.4

Housing types

Localities	Bungalow	Flat	Single apartment	Story building	Boys quarters	Duplex	Hostel	Hut	Total
Abayomi	37.0	25.9	37.0						100
Academy	27.9	44.2	27.9						100
Adamasingba	45.5	27.3	18.2			6.1	3.0		100
Adekile	42.4	24.2	33.3						100
Adeoyo	50.0	22.5	25.0				2.5		100
Agbede Adodo	9.5	81.0	9.5						100
Agbeni	33.3	50.0	16.7						100
Agbokojo	15.4	35.9	48.7						100
Agbowo	28.1	31.3	21.9	15.6		3.1			100
Ago Taylor	5.7	17.1	77.1						100
Agodi	44.0	20.0	36.0						100
Agugu	29.4	5.9	64.7						100
Akingbola	21.2	30.3	48.5						100
Akobo	75.8	3.0	21.2						100
Alalubosa	9.7	32.3	48.4			9.7			100
Alekuso	43.2	35.1	21.6						100
Alesinloye	64.7	11.8	23.5						100
Anfani Layout	48.3	27.6	17.2			3.4	3.4		100
Apata	51.9	40.4	7.7						100
Aperin	23.3	20.0	56.7						100
AR&T	23.5	23.5	47.1	5.9					100

Localities	Bungalow	Flat	Single apartment	Story building	Boys quarters	Duplex	Hostel	Hut	Total
Aremo	95.2	2.4	2.4						100
Ashi	24.2	33.9	41.9						100
Askar Paint	51.9	29.6	11.1	7.4					100
Ayeye	16.2	13.5	70.3						100
Bashorun	56.1	22.0	22.0						100
Bode	14.3	42.9	42.9						100
Coca-cola	45.8	25.0	29.2						100
D-Rovans	10.7	28.6	42.9			17.9			100
Elekuro	33.3	44.4	18.5	3.7					100
Eleta	77.8		22.2						100
Elewure	19.4	61.3	19.4						100
Eleyele	36.2	14.9	38.3	4.3		6.4			100
Eleyele market	50.0	9.4	37.5		3.1				100
Fako Asaka	97.7	2.3							100
Felele	45.2	41.9	12.9						100
Gbagi	35.3	41.2	17.6			5.9			100
Holy Trinity	94.1		5.9						100
Idi Arere	19.4	13.9	66.7						100
Idi-Ishin	28.0	36.0	24.0	12.0					100
Idikan	37.0	59.3	3.7						100
Ijokodo	76.9	15.4	7.7						100
Ikolaba	13.8	44.8	37.9			3.4			100
Ile Oba	77.3		22.7						100
Iletuntun	67.7	6.5	25.8						100
Ilupeju	13.9	38.9	47.2						100
Imale Falafia	21.4	17.9	60.7						100

Localities	Bungalow	Flat	Single apartment	Story building	Boys quarters	Duplex	Hostel	Hut	Total
Inalende	59.0	15.4	25.6						100
Isale Osi	9.4	6.3	84.4						100
Ita Bale	50.0	36.4	13.6						100
Iyaganku	50.0	39.5	10.5						100
Jericho	46.2	38.5	15.4						100
Kobomoje	73.0	8.1	8.1	2.7			8.1		100
Kosodo	16.1		83.9						100
Kudeti	57.8	35.6	6.7						100
Labiran	48.1	40.7	7.4		3.7				100
Letmuck	62.5	4.2	33.3						100
Liberty Road	8.0	76.0	16.0						100
Links reservation	42.9	42.9	14.3						100
Mokola	23.3	37.2	37.2	2.3					100
Molete	48.8	34.1	14.6	2.4					100
Moor Plantation	34.5	31.0	34.5						100
New Bodija	62.8	23.3	7.0	4.7		2.3			100
NIHORT		89.7	10.3						100
Odinjo	32.5	12.5	52.5		2.5				100
Odo Oba	60.0	33.3	6.7						100
Odo Ona	50.0	26.7	20.0			3.3			100
Oja-oba	71.4	25.0	3.6						100
Oje	5.9	67.6	26.5						100
Ojoo-Orogun		78.1	21.9						100
Oke Ado	16.1		83.9						100
Oke Adu	56.3	28.1	15.6						100
Oke Are	17.1	5.7	74.3				2.9		100

Localities	Bungalow	Flat	Single apartment	Story building	Boys quarters	Duplex	Hostel	Hut	Total
Oke Irefin	43.3	43.3	13.3						100
Oke Ofa Atipe	11.1	38.9	50.0						100
Oke-Bola	43.3	33.3	23.3						100
Oku-Lokun	56.8	27.0	16.2						100
Old Bodija	38.7	6.5	54.8						100
Olopamewa	60.5	23.7	15.8						100
Oloyoro	12.1	51.5	36.4						100
Oluwa Nla	28.6	7.1	64.3						100
Onireke	70.4	25.9	3.7						100
Oniyanrin	5.6	66.7	27.8						100
Oniyere	43.8	37.5	18.8						100
Oranyan	92.6	3.7	3.7						100
Oremeji	41.4	19.0	36.2	1.7		1.7			100
Orita Ikeredu	38.5	34.6	26.9						100
Ososami	28.0	32.0	40.0						100
Osungbale	96.9		3.1						100
Planning Authority	38.5	30.8	30.8						100
Popoyemoja	17.4	52.2	30.4						100
Railway	42.9	28.6	21.4	7.1					100
Ring Road	28.9	28.9	20.0	8.9		4.4	8.9		100
Samonda	37.0	55.6	7.4						100
Sango	40.0	31.1	15.6			13.3			100
Sanyo	13.3	56.7	30.0						100
Secretariat	12.5	29.2	54.2				4.2		100
Seventh Day	45.8	37.5	16.7						100
The Polytec	100.0								100

Localities	Bungalow	Flat	Single apartment	Story building	Boys quarters	Duplex	Hostel	Hut	Total
UCH	43.9	26.8	22.0			7.3			100
UMC	64.7	32.4	2.9						100
University of Ibadan	40.5	43.2	5.4			8.1		2.7	100
Yanbile	43.3	36.7	13.3			3.3	3.3		100
Yemetu	14.0	34.0	46.0	6.0					100
Total	40.8	28.7	28.1	0.8	0.1	1.1	0.4	0.0	100

Housing Wall Materials

Localities	Bungalow	Flat	Single apartment	Story building	Boys quarters	Duplex	Total
Abayomi	11.1	85.2	3.7				100
Academy	7	93					100
Adamasingba		100					100
Adekile	6.1	93.9					100
Adeoyo	7.5	87.5	5				100
Agbede Adodo		100.0					100
Agbeni	6.7	90	3.3				100
Agbokojo	5.1	94.9					100
Agbowo		100					100
Ago Taylor	5.7	94.3					100
Agodi	12	88					100
Agugu		97.1	2.9				100
Akingbola		100					100
Akobo		100					100
Alalubosa		100					100
Alekuso	43	56.8					100
Alesinloye	20.6	79.4					100
Anfani Layout		100					100
Apata		96.2	3.8				100
Aperin	33.3	66.7					100
AR&T		100					100
Aremo		100					100
Ashi	3.2	93.5	3.2				100
Askar Paint	18.5	81.5					100
Ayeye		100					100
Bashorun	4.9	95.1					100
Bode	10.7	85.7	3.6				100
Coca-cola	12.5	87.5					100
D-Rovans		100					100
Elekuro		100					100

Localities	Bungalow	Flat	Single apartment	Story building	Boys quarters	Duplex	Total
Eleta		100					100
Elewure	22.6	77.4					100
Eleyele	4.3	93.6				2.1	100
Eleyele market	12.5	87.5					100
Fako Asaka	2.3	97.7					100
Felele	3.2	96.8					100
Gbagi	23.5	70.6		5.9			100
Holy Trinity		100					100
Idi Arere		100					100
Idi-Ishin	4	84		12			100
Idikan	3.7	96.3					100
Ijokodo	61.5	30.8	7.7				100
Ikolaba		100					100
Ile Oba		100					100
Iletuntun		96.8	3.2				100
Ilupeju		100					100
Imale Falafia	10.7	89.3					100
Inalende	5.1	92.3	2.6				100
Isale Osi		96.9	3.1				100
Ita Bale	4.5	90.9	4.5				100
Iyaganku	5.3	92.1	2.6				100
Jericho		96.2	3.8				100
Kobomoje	2.7	94.6	2.7				100
Kosodo		100					100
Kudeti		95.6	4.4				100
Labiran		100					100
Letmuck		100					100
Liberty Road	4	92	4				100
Links reservation	28.6	71.4					100
Mokola	7	83.7	9.3				100
Molete	12.2	82.9	4.9				100

Localities	Bungalow	Flat	Single apartment	Story building	Boys quarters	Duplex	Total
Moor Plantation		96.6	3.4				100
New Bodija	4.7	88.4		2.3	2.3	2.3	100
NIHORT		93.1	6.9				100
Odinjo	22.5	77.5					100
Odo Oba		90	6.7			3.3	100
Odo Ona	13.3	76.7	3.3		3.3	3.3	100
Oja-oba	78.6	21.4					100
Oje	2.9	97.1					100
Ojoo-Orogun	3.1	96.9					100
Oke Ado		100					100
Oke Adu	9.4	90.6					100
Oke Are	5.7	94.3					100
Oke Irefin	10	90					100
Oke Ofa Atipe	2.8	97.2					100
Oke-Bola	16.7	83.3					100
Oku-Lokun	10.8	81.1	8.1				100
Old Bodija	25.8	67.7	6.5				100
Olopamewa	26.3	73.7					100
Oloyoro		100					100
Oluwa Nla		96.4	3.6				100
Onireke	3.7	85.2	11.1				100
Oniyanrin	2.8	94.4			2.8		100
Oniyere	40.6	59.4					100
Oranyan		100					100
Oremeji	32.8	65.5	1.7				100
Orita Ikeredu		100					100
Ososami	4	92	4				100
Osungbale		100					100
Planning Authority	23.1	73.1	3.8				100
Popoyemoja	4.3	82.6	13				100
Railway		85.7	14.3				100

Localities	Bungalow	Flat	Single apartment	Story building	Boys quarters	Duplex	Total
Ring Road	6.7	91.1	2.2				100
Samonda	14.8	85.2					100
Sango	15.6	77.8	6.7				100
Sanyo	3.3	93.3	3.3				100
Secretariat	16.7	83.3					100
Seventh Day	8.3	91.7					100
The Polytechnic		100					100
UCH	9.8	85.4			4.9		100
UMC		91.2	8.8				100
University of Ibadan	8.1	91.9					100
Yanbile	3.3	93.3		3.3			100
Yemetu		100					100
Total	8.1	89.7	1.7	0.2	0.1	0.1	100

Localities	Asbestos	Thatched	PVC	Zinc	Aluminum	Iron roofing sheet	Concrete roof	Hay/Palm leaf	Metro tiles	POP	Total
Abayomi	77.8	22.2									100
Academy	88.4	7	4.7								100
Adamasingba	87.9			3	3					6.1	100
Adekile	60.6	6.1		24.2	3		6.1				100
Adeoyo	82.5	12.5				5					100
Agbede Adodo	95.2		4.8								100
Agbeni	73.3	3.3		23.3							100
Agbokojo	94.9	5.1									100
Agbowo	90.6	9.4									100
Ago Taylor	45.7	5.7		45.7	2.9						100
Agodi	44			44	12						100
Agugu	91.2			2.9	2.9		2.9				100
Akingbola	90.9	9.1									100
Akobo	100										100
Alalubosa	100										100
Alekuso	86.5	10.8			2.7						100
Alesinloye	32.4	11.8		55.9							100
Anfani Layout	75.9			17.2		3.4	3.4				100
Apata	94.2	5.8									100
Aperin	70	3									100
AR&T	52.9	11.8		5.9	29.4						100

Localities	Asbestos	Thatched	PVC	Zinc	Aluminum	Iron roofing sheet	Concrete roof	Hay/Palm leaf	Metro tiles	POP	Total
Aremo	100										100
Ashi	88.7	11.3									100
Askar Paint	66.7	25.9	7.4								100
Ayeye	86.5			5.4	2.7	5.4					100
Bashorun	100										100
Bode	35.7	42.9		14.3	7.1						100
Coca-cola	70.8	8.3		16.7	4.2						100
D-Rovans	96.4	3.6									100
Elekuro	77.8	18.5			3.7						100
Eleta	100										100
Elewure	25.8			71		3.2					100
Eleyele	59.6	8.5		10.6	14.9	4.3				2.1	100
Eleyele market	56.3			15.6	28.1						100
Fako Asaka	100										100
Felele	80.6		9.7	3.2	6.5						100
Gbagi	76.5	5.9	5.9	2.9		2.9				5.9	100
Holy Trinity	100										100
Idi Arere	77.8	8.3		11.1	2.8						100
Idi-Ishin	56		28	4	12						100
Idikan	66.7	11.1		18.5	3.7						100

Localities	Asbestos	Thatched	PVC	Zinc	Aluminum	Iron roofing sheet	Concrete roof	Hay/Palm leaf	Metro tiles	POP	Total
Ijokodo	3.8			96.2							100
Ikolaba	93.1	6.9									100
Ile Oba	100										100
Iletuntun	71			29							100
Ilupeju	86.1			8.3	2.8		2.8				100
Imale Falafia	100										100
Inalende	87.2			7.7		5.1					100
Isale Osi	93.8	6.3									100
Ita Bale	100										100
Iyaganku	94.7			2.6			2.6				100
Jericho	80.8		3.8	11.5	3.8						100
Kobomoje	83.8			10.8	5.4						100
Kosodo	87.1	9.7		3.2							100
Kudeti	97.8									2.2	100
Labiran	96.3	3.7									100
Letmuck	54.2	4.2		33.3	8.3						100
Liberty Road	84	4	8	4							100
Links reservation	71.4	7.1								21.4	100
Mokola	83.7	2.3	2.3	11.6							100
Molete	70.7	7.3		17.1			2.4			2.4	100

Localities	Asbestos	Thatched	PVC	Zinc	Aluminum	Iron roofing sheet	Concrete roof	Hay/Palm leaf	Metro tiles	POP	Total
Moor Plantation	93.1			6.9							100
New Bodija	79.1	11.6			7	2.3					100
NIHORT	96.6	3.4									100
Odinjo	57.5	12.5		22.5	5	2.5					100
Odo Oba	93.3	6.7									100
Odo Ona	76.7	13.3		3.3						6.7	100
Oja-oba	75			3.6	7.1	14.3					100
Oje	67.6		32.4								100
Ojoo-Orogun	96.9	3.1									100
Oke Ado	100										100
Oke Adu	96.9			3.1							100
Oke Are	71.4	5.7		17.1	5.7						100
Oke Irefin	96.7	3.3									100
Oke Ofa Atipe	80.6	11.1		5.6	2.8						100
Oke-Bola	90	10									100
Oku-Lokun	40.5	18.9		8.1	32.4						100
Old Bodija	35.5	45.2		12.9	3.2	3.2					100
Olopamewa	55.3	10.5		15.8				18.4			100
Oloyoro	78.8			21.2							100
Oluwa Nla	100										100

Localities	Asbestos	Thatched	PVC	Zinc	Aluminum	Iron roofing sheet	Concrete roof	Hay/Palm leaf	Metro tiles	POP	Total
Onireke	77.8	22.2									100
Oniyanrin	69.4		30.6								100
Oniyere	96.9									3.1	100
Oranyan	100										100
Oremeji	27.6			72.4							100
Orita Ikeredu	100										100
Ososami	68			28	4						100
Osungbale	100										100
Planning Authority	26.9	57.7		7.7	3.8			3.8			100
Popoyemoja	69.6	8.7				21.7					100
Railway	28.6	28.6		21.4	14.3	7.1					100
Ring Road	82.2	11.1						2.2		4.4	100
Samonda	88.9	3.7	7.4								100
Sango	86.7	4.4		2.2	4.4					2.2	100
Sanyo	66.7	13.3	20								100
Secretariat	50	8.3		20.8	12.5		8.3				100
Seventh Day	79.2	4.2		16.7							100
The Polytechnic	100										100
UCH	75.6	14.6		2.4	4.9		2.4				100
UMC	94.1	5.9									100

Neigborhood	Asbestos	Thatched	PVC	Zinc	Aluminum	Iron roofing sheet	Concrete roof	Hay/Palm leaf	Metro tiles	POP	Total
University of Ibadan	89.2	2.7		2.7	2.7	2.7					100
Yanbile	73.3	6.7	3.3	3.3	3.3		3.3	3.3	3.3		100
Yemetu	70	28		2							100
Total	78.6	6.7	1.5	8.9	2.4	0.7	0.3	0.3	0	0.5	100

Appendix D

Green Space Measurement in sqm and Hectares

No	Locality	GS_sqm_1972	GS_Ha._1972	GS_sqm_1984	GS_Ha._1984	GS_sqm_2000	GS_Ha._2000	GS_sqm_2015	GS_Ha._2015
1.	Mokola	599000	59.9	516000	51.6	176500	17.65	135900	13.59
2.	Jericho GRA	1167000	11.67	646800	64.68	324500	32.45	112700	11.27
3.	Gbagi	6100	0.61	900	0.09	700	0.07	300	0.03
4.	Odo Ona	707800	70.78	550100	55.01	498900	49.89	441500	44.15
5.	Oja'ba	6600	6600	400	0.04	200	0.02	100	0.01
6.	Agbowo	812300	81.23	290500	29.05	36100	3.61	10400	1.04
7.	Liberty	87700	8.77	50600	5.06	34800	3.48	20900	2.09
8.	Sanyo	468700	46.87	360600	36.06	213100	21.31	44800	4.48
9.	Felele	600300	60.03	514700	51.47	285400	28.54	28800	2.88
10.	Apata	1390900	139.09	1291100	129.11	1210300	121.03	653900	65.39
11.	Yemetu	116600	11.66	85900	8.59	63200	6.32	50400	5.04
12.	Adamasingba	887100	88.71	65400	6.54	31200	3.12	900	0.09
13.	Oniyanrin	716300	71.63	325300	32.53	223300	22.33	125700	12.57
14.	Oje	700	0.07	500	0.05	500	0.05	400	0.04
15.	Agbeni	127100	12.71	10700	1.07	49100	4.91	100	0.01
16.	Agugu,	689500	68.95	167600	16.76	5.3900	5.39	100	0.01
17.	Oke Bola	31400	3.14	1400	0.14	8900	0.89	5100	0.51

No	Locality	GS_sqm_1972	GS_Ha._1972	GS_sqm_1984	GS_Ha._1984	GS_sqm_2000	GS_Ha._2000	GS_sqm_2015	GS_Ha._2015
18.	Aperin	18800	1.88	9400	0.94	3700	0.37	2400	0.24
19.	Eleta	11400	1.14	400	0.04	400	0.04	100	0.01
20.	Molete	769600	76.96	483700	48.37	315900	31.59	381600	38.16
21.									
22.	Elewura	476800	47.68	376900	37.69	247800	24.78	134200	13.42
23.	Ojoo-Orogun	920800	92.08	126000	12.60	6600	0.66	2500	0.25
24.	Ashi	366300	36.63	135100	13.51	75100	7.51	35100	3.51
25.	Ijokodo	1274900	127.49	705000	70.50	4743	0.47	3941	0.39
26.	Samonda	456500	45.65	154700	15.47	82600	8.26	45700	4.57
27.	Old Bodija	1076200	107.62	339500	33.95	74400	7.44	1100	0.11
28.	New Bodija	322400	32.24	268400	26.84	54200	5.42	30100	3.01
29.	Abayomi	1238600	123.86	788100	78.81	331200	33.12	11300	1.13
30.	Onireke GRA	1091500	109.15	436500	43.65	197900	19.79	70200	7.02
31.	Inalende	650400	65.04	315200	31.52	143100	14.31	65400	6.54
32.	Elekuro	43300	4.33	18900	1.89	7400	0.74	2300	0.23
33.	University of Ibadan	3802800	380.28	760100	76.01	541200	54.12	495000	49.50
34.	Oniyere	579300	57.93	259500	25.95	177300	17.73	67100	6.71

No	Locality	GS_sqm_1972	GS_Ha._1972	GS_sqm_1984	GS_Ha._1984	GS_sqm_2000	GS_Ha._2000	GS_sqm_2015	GS_Ha._2015
35.	Academy	332600	33.26	248400	24.84	191100	19.11	84800	8.48
36.	Sango	1021200	102.12	660600	66.06	179600	17.96	21100	2.11
37.	Oremeji	323500	32.35	223500	22.35	74300	7.43	44900	4.49
38.	Ikolaba	1130000	113.00	753800	75.38	252100	25.21	95400	9.54
39.	Eleyele	574400	57.44	212200	21.22	158100	15.81	113200	11.32
40.	UCH	622400	62.24	180400	18.04	117200	11.72	74300	7.43
41.	Idi Isin	2486300	248.63	306400	30.64	177300	17.73	84300	8.43
42.	Alesinloye	318200	31.82	130400	13.04	51100	5.11	32100	3.21
43.	Oke Irefin	347800	34.78	170800	17.08	97300	9.73	56400	5.64
44.	Alalubosa	682300	68.23	282100	28.21	191100	19.11	112300	11.23
45.	UMC	6600	0.66	6600	0.66	3700	0.37	2900	0.29
46.	Kudeti	20500	2.05	20200	2.02	10300	1.03	8900	0.89
47.	Odo Oba	154100	15.41	131200	13.12	73500	7.35	92200	9.22
48.	Orita Ikereku	593900	59.39	394100	39.41	158100	15.81	142300	14.23
49.	Ago Taylor	336300	33.63	63100	6.31	37400	3.74	17200	1.72
50.	Labiran	1177400	117.74	114500	11.45	67800	6.78	32100	3.21
51.	Iyaganku	225900	22.59	100600	10.06	78100	7.81	74500	7.45
52.	Alekuso	8100	0.81	5100	0.51	3900	0.39	3100	0.31

No	Locality	GS_sqm_1972	GS_Ha._1972	GS_sqm_1984	GS_Ha._1984	GS_sqm_2000	GS_Ha._2000	GS_sqm_2015	GS_Ha._2015
53.	Oke Ado	177100	17.71	40500	4.05	36500	3.65	20600	2.06
54.	Ring Road	922800	92.28	428500	42.85	369100	36.91	221200	22.12
55.	The Polytechnic	155.23	155.23	1463900	146.39	1313400	131.34	1243700	124.37
56.	Akingbola	93800	9.38	46700	4.67	27700	2.77	10600	1.06
57.	State hospital	555500	55.55	516700	51.67	546500	54.65	582300	58.23
58.	Holy Triniy	962800	96.28	502800	50.28	479600	47.96	221100	22.11
59.	Akobo	1965000	196.50	195000	19.50	612200	61.22	113900	11.39
60.	Aremo	54800	5.48	38000	3.80	8900	0.89	200	0.02
61.	Foko Asaka	10400	1.04	4300	0.43	100	0.01	100	0.01
62.	Adekile,	434600	43.46	123600	12.36	44700	4.47	10500	1.05
63.	Kobomoje	56000	5.60	43400	4.34	18300	1.83	3300	0.33
64.	Oloyoro	1567500	156.75	644800	64.48	139500	13.95	34500	3.45
65.	Odinjo	586500	58.65	124900	12.49	24900	2.49	14800	1.48
66.	Oluwo Nla	1203900	120.39	152000	15.20	31600	3.16	8700	0.87

No	Locality	GS_sqm_1972	GS_Ha._1972	GS_sqm_1984	GS_Ha._1984	GS_sqm_2000	GS_Ha._2000	GS_sqm_2015	GS_Ha._2015
67.	Agodi GRA	383900	38.39	339900	33.99	157600	15.76	23800	2.38
68.	Olopomewa	1034200	103.42	528200	52.82	441800	44.18	391500	39.15
69.	Yambule,	683000	6830	140100	14.01	48200	4.82	9600	0.96
70.	Ososami	339000	33.90	228600	22.86	157600	15.76	73200	7.32
71.	Askar Paint	452600	45.26	439600	43.96	389100	38.91	295400	29.54
72.	Coca Cola	462700	46.27	313800	31.38	148600	14.86	37100	3.71
73.	Letmuck Barracks	966800	96.68	606500	60.65	349100	34.91	223100	22.31
74.	Secretariat	417600	41.76	288500	28.85	193200	19.32	123400	12.34
75.	Eleyele Market	735800	7358	201100	20.11	72100	7.21	69900	6.99
76.	Anfanu Layout	742300	74.23	196700	19.67	119800	11.98	147400	14.74
77.	Moor Plantation	2042000	204.20	1521100	152.11	794300	79.43	495700	49.57
78.	Ile Tuntun	330600	33.06	18800	1.88	18800	1.88	6600	0.66

No	Locality	GS_sqm_1972	GS_Ha._1972	GS_sqm_1984	GS_Ha._1984	GS_sqm_2000	GS_Ha._2000	GS_sqm_2015	GS_Ha._2015
79.	Popoyemoja	400	0.04	400	0.04	400	0.04	200	0.02
80.	Idi Arere	200	0.02	200	0.02	200	0.02	200	0.02
81.	Oke Oluokun	14474400	1447.44	1400	0.14	1400	0.14	200	0.02
82.	Bode	12000	1.20	12000	1.20	12000	1.20	600	0.06
83.	Ile Oba	300	0.03	300	0.03	300	0.03	100	0.01
84.	Ayeye	5100	0.51	5100	0.51	5100	0.51	2100	0.21
85.	Kosodo	400	0.04	400	0.04	400	0.04	300	0.03
86.	Oranyan	300	0.03	300	0.03	300	0.03	200	0.02
87.	Agbede Adodo	400	0.04	400	0.04	400	0.04	300	0.03
88.	Idikan	214100	21.41	22300	2.23	17100	1.71	14000	1.40
89.	Ilupeju	727000	72.70	169400	16.94	99400	9.94	87500	8.75
90.	Railway HQ	97500	9.75	81100	8.11	61400	6.14	20700	2.07
91.	AR & T	1787000	178.70	1714200	171.42	1547100	154.71	1231100	123.11
92.	Seventh day	400	0.04	400	0.04	400	0.04	300	0.03
93.	Links Reservation	545700	54.57	345400	34.54	293100	29.31	223100	22.31
94.	NIHORT	302400	30.24	230800	23.08	213400	21.34	213000	21.30

No	Locality	GS_sqm_1972	GS_Ha._1972	GS_sqm_1984	GS_Ha._1984	GS_sqm_2000	GS_Ha._2000	GS_sqm_2015	GS_Ha._2015
95.	Osungbade	163900	16.39	23400	2.34	7500	0.75	87500	8.75
96.	Planning Authority	402700	40.27	157200	15.72	116500	11.65	100200	10.02
97.	Imalefalafia	300	0.03	300	0.03	300	0.03	100	0.01
98.	D-Rovans	518800	51.88	234500	23.45	197800	19.78	31200	3.12
99.	Isale Osi	300	0.03	300	0.03	300	0.03	200	0.02
100	Agbokojo	7100	0.71	6300	0.63	3200	0.32	200	0.02
101	Ita Bale	7600	0.76	5400	0.54	3900	0.39	100	0.01
102	Oke Ofa Atipe	98100	9.81	70500	7.05	57400	5.74	2.1700	2.17
103	Oke Adu	245400	24.54	23400	2.34	8800	0.88	3300	0.33
104	Oke Are	700	0.07	700	0.07	400	0.04	200	0.02
105	Basorun	566300	56.63	235100	23.51	85100	8.51	45100	4.51

Appendix D-2 Averages (Income and Age)

Locality	Average Age	Average Income (Naira)
Abayomi	38	35370
Academy	36	58535
Adamasingba	31	56848
Adekile	41	49197
Adeoyo	28	36825
Agbede Adodo	44	54283
Agbeni	23	29666
Agbokojo	37	41625
Agbowo	35	59400
Ago Taylor	36	51240
Agodi GRA	37	42882
Agugu	30	60500
Akingbola	28	50015
Akobo	33	60693
Alalubosa	29	22067
Alekuso	25	32147
Alesinloye	35	45793
Anfanu Layout	34	40134
Apata	28	28000
Aperin	39	27500
AR & T	24	44416
Aremo	34	57056
Ashi	48	52740
Askar Paint	36	47736
Ayeye	37	44189
Basorun	25	33805
Bode	32	37982
Coca Cola	31	31187
D-Rovans	36	75821
Elekuro	33	64666
Eleta	34	27402
Elewura	33	32822
Eleyele	32	48883
Eleyele Market	29	44468
Felele	29	45244
Foko Asaka	40	56693
Gbagi	39	40262
Holy Triniy	35	41720
Idi Arere	26	25073

Locality	Average Age	Average Income (Naira)
Idi Isin	35	46888
Idikan	41	59460
Ijokodo	46	51870
Ikolaba	21	20865
Ile Tuntun	33	61448
Ile Oba	24	8500
Ilupeju	32	42419
Imalefalafia	35	46944
Inalende	25	33321
Isale Osi	34	42653
Ita Bale	17	17953
Iyaganku	39	32250
Jericho GRA	34	38316
Kobomoje	30	33692
Kosodo	31	71338
Kudeti	35	46612
Labiran	33	44522
Letmuck Barracks	34	57055
Liberty	30	32437
Links Reservation	34	41140
Mokola	34	40071
Molete	37	64348
Moor Plantation	31	31512
New Bodija	33	37344
NIHORT Qts	25	28162
Odinjo	42	45362
Odo Oba	39	48850
Odo Ona	34	33300
Oja'ba	25	38400
Oje	48	75714
Ojoo-Orogun	35	66161
Oke Ado	37	40593
Oke Adu	38	15000
Oke Are	22	58015
Oke Bola	36	40142
Oke Irefin	34	42733
Oke Ofa Atipe	33	45116
Oke Oluokun	34	41689
Old Bodija	41	53580

Locality	Average Age	Average Income (Naira)
Olopomewa	34	39276
Oloyoro	37	27712
Oluwo Nla	31	55214
Onireke GRA	42	32351
Oniyanrin	35	69111
Oniyere	38	44437
Oranyan	21	9981
Oremeji	30	31586
Orita Ikereku	34	54269
Ososami	32	42780
Osungbade	28	26453
Planning Authority	39	41884
Popoyemoja	24	20344
Railway HQ	33	33847
Ring Road	30	63285
Samonda	29	29744
Sango	31	40259
Sanyo	21	33133
Secretariat	25	42216
Seventh day	35	42187
The Polytechnic	34	40000
UCH	28	23707
UMC	35	51014
University of Ibadan	28	23473
Yambule	23	30700
Yemetu	20	14120

Appendix E-1

FOCUS GROUP DISCUSSION -Contd

Good morning sirs and ma, can you kindly please describe the situation of green spaces in your community from pre-independnece to date.

1. *Oke Ofa, Atipe, Oke Irefin, Oke Adu, Holy Trinity*

1st*res*: Oke ofa is a small neighbourhood and also an ancient one. By 1955, the area have been occupied by settlements and also being used for farming.

2nd*res*: Atipe, oke Irefin and Oke Adu have the same characteristics. They are the interior part of Ibadan.

3rd*res*: These three neighbourhoods have their own markets and primary schools. In the 70's it could be said that the green spaces have almost lost all their green areas except those in inaccessible areas that is confined areas.

4th *res*: Holy trinity is not as rough as the others mentioned. The area was full of grasses and bushes until the early 60's with minimal settlements mostly farmers.

5th*res:* The settlers are more refined in terms of education and the area has modern structures.

6th res. The ogunpa carnal also passes through this area and as such grasses can be found along the carnal till date.

2. *Sanyo, Academy, Odinjo, Ile tuntun, Elekuro*

1st*res:* Sanyo neighbourhood is close to the Lagos – Ibadan express settlement. in Sanyo neighbourhood started to grow significantly in the 70's. Between 1930- 1955, there were dense green spaces in Sanyo with few human activities. Any form of activies will be farming.

2nd*res*: Areas where you find fountain secondary school and Sanyo primary school were all green spaces until the late 70's and mid 80's. Sanyo. The green spaces around Sanyo markets were replaced with more shops in the early 90's.

3rd*res:* Academy also started to develop extensively in the 70's. By 1955, the neighbourhoods were bushes and forest. The academy secondary school and Olomi grammer school have been there since the 80's. Today there are barely green spaces in the neighbourhood.

4th res: By 1955, Odinjo neighbourhood was full of bushes. Odinjo is close to the Lagos- Ibadan express road. The overhead bridge has been there since the 60's.

5th*res*: To the left of the bridge from Aperin, we have the Odinjo grammar school and to the right we have Aperin Anglican secondary school. We also have Odinjo markets. Green spaces have disappeared from all these areas since the late 80's/ early 90s.

Appendix E-1

FOCUS GROUP DISCUSSION -Contd

Good morning sirs and ma, can you kindly please describe the situation of green spaces in your community from pre-independnece to date.

6th res: Ile tuntun have been in existence since the 70's. By 1955, the area was bushy. Now there are no green spaces except those preserved. A carnal passes through Ile tuntun and as such there are green spaces along the carnal until data. There is also Ile tuntun market which has no green spaces due to human activities in the area. More, shops have replaced the green spaces since the late 80s.

8th res: Elekuro neighbourhood was green in the 50's up to the late 60's. By 1970, there were mud houses and a market where they sell tubers and vegetables. Today there are no green spaces in Elekuro except those found in individual compounds.

3. *Oke Are, Yemetu, Yemetu igosu, Oniyanrin, Mokola*

1st*res:* Oke Are was very bushy in the 40's and 50's. By 1960, settlements had started to spring up significantly. Areas along Bishop Akinyele secondary school were all bushes until the early 70's. There is also a community market in oke Are. Today there are no green spaces in Oke Are except those preserved by individual houses.

2nd*res:* Yemetu and Yemetu Igosu in 1955 were bushy. Between 1955 and 1960 the area was used for farming. There was significant removal of grasses in the 70's due to settlements. The school of mid-wifrey in yemetu was established in the mid-80s. The market in Yemetu has been there since the mid80s and as such areas around the market have little or no grasses.

3rd*res:* By 1955, Oniyanrin community was just grasses. By 1960, there were significant human activities. For instance, places like the customary court, police post, oniyanrin community high school have all been there between 1960 and 1970. Today there are barely green spaces in this community.

4th res: The popular Ogunpa canal also passed through this community. Green areas can be noticeable along this carnal till date.

4th*res*: Mokola is one of the areas that first developed in Ibadan. By 1955, there were considerable amount of settlement and other human activities. Areas around sabo market however, were still green until the late 90's. Initially, settlement development were along the major roads in the maid 60's to mid-80's.but by the 90's the interiors areas which were green spaces have been taken over by settlements as well as commercial activities.

Appendix E-1

FOCUS GROUP DISCUSSION -Contd

Good morning sirs and ma, can you kindly please describe the situation of green spaces in your community from pre-independnece to date.

4. Idi kan, Agbeni, Agbede, Ayeye

1st res: Considerable number of settlements can be found in Idikan in the 1955's. Idikan community is an ancient community. Majority of the houses here are mud houses. Scattered green spaces can be found in Idikan until the 90's areas. The central mosque has been there since the 30's however over the years. It was demolished and replaced with modern structure (early 90's). Areas where the Methodist church is were formally green up until early 20's as well as the customary court.

2nd res: You see all these banks and shops along this road were all mud houses which were demolished to erect these modern structures. Idikan markets were all grasses until the 1930's. The market goes straight up but over time they expand inside.

3rd res: Agbeni is an extension of Idikan and the whole area was dense with grasses up until the 50's where significant disappearance of grasses was noticeable. There is a big carnal from ogunpa that passes through Agbeni. Area where Methodist church is was grasses not until the 50's. Agbeni market was grasses not until early 60's. There is a wide refuse dump in Agbeni for a very longtime people have been dumping refuse there since the 50's.

4th res: Agbede area is one of the core areas of Ibadan and as sure the community is ancient with majority of the houses are mud houses. Grasses started disappearing significantly from the 30's up until the 80's. Residential development in the areas was slow. So grasses were found in patch across the community over time. The dualise road are recent and before the extension there grasses along the road. Areas such as Magistrate office, CAC Agbede, mechanic shop sprang up in the 90's. There is a green field in Agbede where people come to play football.

5th res: Ayeye has existed since ancient time. By 1955 the community had settlements and a meeting place for market. Ayeye has green spaces up to date but they are scanty all over. There is also the ogunpa canal which passes through Ayeye. Ayeye primary and secondary school were green areas until the 40's. The CAC church was green until the early 90's. The mosque area too sprang in early 2000.

Appendix E-1

FOCUS GROUP DISCUSSION -Contd

Good morning sirs and ma, can you kindly please describe the situation of green spaces in your community from pre-independnece to date.

5. Onireke, Adamasingba, Inalende, Old Gbagi

1st res: Onireke neigbourhood could be said to have been bushy and full of green spaces until the early 60's. The green spaces seen now are does in fenced residential compounds. There is a carnal that passes through onireke (ogunpa carnal). The head quarter of Ibadan North West, Onireke primary and secondary, Seed of life secondary school, onireke high school were all green spaces until the 80's and early 90's. The licencing office in onireke for instance was green until the late 80's.

2nd res: Inalende neigbourhood was full green not until the early 70's. The houses there have not as ancient like the core of Ibadan. There is a very big carnal that passes through Inalende. The interior parts of Inalende have modern buildings. The vine branch church, the mechanic workshop, vine private hospital, conoil and the P.D.P secretariat were all dense green spaces until the 90's.

3rd res: Adamasingba have been popular since the period of the western region . The place we call Adamasingba now started from the interior. By 1955's there were still green spaces sparely distributed across the neigbourhood. The grasses started disappearing gradually has development came. The Fulani house settlements that you know was until early 60's. There was rapid development between the 70's and the 80's. Salvation Army, schools and churches sprang up during this period. The building in Adamasingba along the road were demolished and reconstructed up till the late 90's. The golf course around Admasingba area is still green still date.

4th res: The gbagi you know now is not the gbagi of thoses day. Which one are you talking about? We have the old gbagi and the new gbagi. The old gbagi is the one within Ibadan metropolis. I am sure that is the one you are talking about. The old gbagi was located at Lebanon Street which has now been relocated to Alakia called new gbagi. The old gbagi was fully green until the 30's and early 40's. The ogunpa carnal passed through the araea. The popular Methodist church have been there since the 40's as well as the John holds venture (UAC). The ware houses have been there since the 40's.

6. *Olopomewa, Ijokodo, Askar Paint, Letmauck Barrack.*

1st res: Olopomewa was fully green until the early 70's. The kind of buildings there were mud houses. Today, the development you see today were initially mud buildings which have been demolished. The formerly single road was dualized in the 90's. The abattoir area, market, garage was green until the mid-70's till the mid-85. The churches and the schools you see now in Olopomewa have been there since the 80's.

2nd res: Ijokodo neigbourhood was green until the early 50's. Over the years there has been a gradual development in the neigbourhood. Green Spaces can be found sparely distributed to date. Building construction along the road experienced rapid development. For instance, the WAEC office was green

area was green until the early 80's including Ijokodo High School. The green spaces disappeared significantly in the 80's such has the Ijokodo police post, central mosque Ijokodo.

3rd res: Askar paint area and Barrack area close to Eleyele were fully green areas until development started in the 80's. Over the years, developments were concentrated along major roads in these areas and as such green spaces are more in the interior. Green spaces can still be noted in these areas today though they are sparely distributed.

7. Idi sin, Jericho GRA, Eleyele, Nihort Area

1st res: Green spaces have reduced drastically as compared to the olden days in Idi sin. It can be said that green spaces significantly that disappear around the early 80's. The police post head quarter in Idisin in the 80's attracted more settlement to the area such as churches, mosque and shops. There is also a Government Reserved Area GRA. This area have plenty green.

2nd res: Human activities such as offices and residential building started to spring up in the 80's. The areas are green still, this is because the areas are Government Reserve Areas. There are plenty of forests. The mechanic village there was green until the 80's. There is New Development going on now. This mean green spaces is moderately distributed in Jericho and densely around NIHORT.

3rd res: Eleyele was green until after Independence. There are still grasses around the dam. Thick vegetation. We have Acasia tree, elephant grasses, and mango. There are also plantation farming along the road in some areas. Rapid development can be found along major roads and over time it expanded inward causing the green spaces to disappear. There are still green areas but can be founf in swampy and water logged areas.

4th res: The road from Eleyele to Dugbe were dualize in the 2004. The road from Eleyele to Ibarapa was dualised in the 90's. The one going to Ologuneru is just being dualized. This means they were green areas along these path before the road expansion.

8. Popoyemoja, Foko Asaka, Koboomoje, Isale Osile Oba

1st res: Popoyemoja is one of the core areas of Ibadan. Right before the 1955's the area was noted for farmlands. By 1955, settlements began to spring up significantly. In those days there were migrate and market. Green spaces can still be found today but are scanty.

2nd res: Foko Asaka had dense green spaces up until the50's. The area is a slum. Development has not been rapid. The ogunpa carnal passes through the area. The areas close to the carnal have green spaces. There are few modern structures compared to the mud buildings. The grasses there have disappeared except those in compound houses.

3rd res: Koboomoje had plenty green expanse of land until the early 60's. The green spaces now are confined. Areas around the carnal were reserved by the government. These areas are green until now. Koboomoje was recently dualized. There are also recent modern structures such as schools and Nursery school. There is also Government secondary school in Koboomoje.

4th res: Isale Osile Oba has been green up until the 70's where there was significant development. In the past the area were used as farmlands. Today green spaces has disappeared expect in confined area.

Appendix E-1

FOCUS GROUP DISCUSSION -Contd

Good morning sirs and ma, can you kindly please describe the situation of green spaces in your community from pre-independnece to date.

9. Liberty, Iyaganku, Alalubosa, Alesinlonye

1st res: Liberty areas had plenty green spaces up until the 60's that is after independence. There was slow development in the area over the years and that meant that the green spaces were disappearing gradually. Between mid-80s and 90's there was rapid development in the area and at that time the green spaces had drastically reduced. The popular stadium and Jorgor center attract settlement along the area. Today liberty is experiencing compact development and green spaces have disappear except in compound areas.

2nd res: Significant development in Iyagnaku began significantly in the mid-70s. The area is a Government Reserve Area GRA. Therefore there are still quantifiable amount of green spaces must till date. Places such as Olubadan station, Oyo sate women and children welfare development office, NUJ, CGN e.t.c were all green spaces until the 90's.

3rd res: Alalubosa has the same characteristics with Iyaganku, significant development with Iyaganku, the area had dense vegetation until the mid s70's. Since the area is a government reserved area, there is still a considerable amount of green spaces today. A railway line passes through Alalubosa, and green spaces can be found to the right and to the left of the railway.

4th*res:* Alesinloye was fully green up until the early 90's, Alesinloye is a market place, and however green spaces can be found at the back of the market. Alesinloye road was dualized in the early 2000, so areas that were green then have been replaced with road network extension.

10. Anfani, Osasami, UMC, Imalefalafia, Arere

*1st res:*Anfani is around Rind-Road area, and real development started after independence, the area is majorly a residential area, there you have the college crescent, which was constructed in the 60's. Anfani area has little or no green spaces today, there are too many buildings which are compact

2nd res: Ososami community was green up until the 50's, the area is both a residential area and commercial, the area is also compact in nature and therefore there are little or no green spaces in the area.

3rd res: UMC area started experiencing significant development after independence, development was gradual in the area, and as such we can still find green spaces scattered around UMC.

4th res: Imalefalafia is around Liberty area and the area was grasses until the MID 50's. The popular Tribune office is located around the area. Today the green spaces are found in confined areas and residential compounds

5th res: Development started around 1950 in Arere, and it is one of the core areas in Ibadan. The Ogunpa canal passes through Arere community, as such there are green spaces along the canal. Today green spaces can only be found in confined areas or people's compound.

11. Oluyole, D- Rovans area, Ring road, Orita Ikereku, Elewura

1st res: There were a lot of green spaces in Oluyole area until the 70's, people had farmland in those areas, the area is an industrial zone today. Industries such as P&G, Pepsi, Sumal were green up until the 80's and 90's.

2nd res: Settlement began to spring up in 80's and 90's around the D-Rovans areas, development around there is compact, and such green spaces can only be found in confined areas and front of people's houses.

3rd res: Pressure from the core areas forced people to look for houses in the interior areas, so Ring-Road has been green up until the mid-70's, development can be found along major roads as well in the interior part of Ring-Road. Areas such as Palms Mall are recent development in the late 90's/2000. Today green spaces can be found in confined areas

4th res: Orita Kereku has been green up until the 50's. Rapid development took place between 60's and 70's, today they are little or no green spaces and the development there is also compact in nature. The area was dualized in the early 2000.

5th res: Settlement began to spring up significantly in the 80's in Elewura. Till today there are scanty green spaces across Elewura, most of the buildings here are modern.

12. Apata, Moor plantation, IAR & T, Ago Taylor, Odo Ona

1st res: Apata area was full of grasses and forest up until the mid-60's, gradual development started with modern structures, market, and hotel. Green spaces could be found up until the 2000

2nd res: Moor Plantation/IAR&T is a government reserved area, human activities started after independence. They are green till date with few offices and settlement in the area. Such as the NCRI office

3rd res: Ago Taylor area was green up till the 80's. It is a residential area which comprise personal residence of workers of IAR&T. Green spaces in this area are scattered around this area.

4th res: Odo Ona area was developed in the 60's. It is close to Moor plantation. Houses in this areas are compact, this result in a scanty vegetation across the area. Also new houses are built along major road.

13. Ikolaba, UCH, Agodi GRA

1st res: Settlements in Ikolaba area started springing up after independence. They houses are modern in nature, Development started between the 80's it is a residential area with a dense population. Green spaces are found in houses around this areas.

2nd res: UCH area was developed in 40's owing to development of the Hospital, it is a built up area with modern structures and offices. It was dualized in the early 2000. There are still moderate green spaces scattered in this area.

3rd res: Agodi area had lot of green spaces and scanty houses forming the settlement in the 40's. Development started with the building of the prison and the siting of Ibadan North LGA, it is a built areas with scanty vegetation and green spaces which are confined to compound of houses in this area.

Appendix E-1

FOCUS GROUP DISCUSSION -Contd

Good morning sirs and ma, can you kindly please describe the situation of green spaces in your community from pre-independnece to date.

14. Bodija, Ashi, Akingbola, Oluwonla.

1st res: Bodija area was a green area in the 30's and 50's. This area is a planned residential area. There was green spaces in this area up until the 70's and 80's when houses started to spring up in this areas mainly inhabited by civil servants. Houses in this area are compact and green spaces are confined to compounds of the residents.

2nd res: Ashi area had green spaces up until the 60's. There was a rapid increase and development in the 80's in this area. Houses in this area are compact in nature. As such green spaces are confined and can be found in the compounds of houses in this area.

3rd res: Akingbola area is close to Ashi area it had green spaces up until the 60's and 80's. The buildings here are compact and traditional in nature (not modern). As such there are little or no green spaces in this area today.

4th res: Oluwonla area was green up until the 60's. This area is built area, the houses in this area are compact in nature, as such there is little or green spaces in this area as of today.

15. Emmanuel College layout, Agbowo, Orogun.

1st res: Emmanuel College layout area was fully green up until the 50's. The interior part of this area still have scanty vegetation

2nd res: Settelement in the Agbowo area are built together and compact in nature. This area was green up until the 40's and 50's. Development started in the 60's, as such there are little or no green space in this area. As of today, they are confined and found only in compounds of houses in this area.

3rd res: Orogun area was green up until the 40's, people started moving to the area because of the filling up of the Agbowo area, as such there are little or no green space today. Little green spaces can only be found in compounds of houses around this area.

Appendix E-1

FOCUS GROUP DISCUSSION -Contd

Good morning sirs and ma, can you kindly please describe the situation of green spaces in your community from pre-independnece to date.

16. Coco cola Layout, Oremeji, Sango, Polytechnic, Samonda.

1st res: Settlement in the Coca-Cola area sprang after 1955. Before this time this area was a green space, the houses in this area are compact in nature. As such there is little or no green spaces at all in this area.

2nd res: Oremeji area was green up until the 50's, the interior parts of this area were not developed up until the 80's. The houses in this area are compact in nature and as such there are little or no green spaces in this area as of today.

3rd res: Sango area was green up until the 50's. The settlement in the Sango area are compact in nature, asides this there is a market in this area too. This area has no green spaces in the interior parts and houses in the interior parts are not modern.

4th res: The Polytechnic area is a planned area, there area was a fully green space up until the 50's and 60's. Development came significantly after the inception of the Polytechnic Ibadan. As of today there are scanty green vegetation.

5th res: Settlement in this area did not start developing significantly up until the 90's and 2000. Before this time Samonda area was green. Buildings in this area are mainly for commercial purposes and there is still scanty vegetation in this area.

17. *Oke Bola, Seven Day Adventist Area, Aleshinloye, Railway headquarters, Agbokoju*

1st res: Oke-Bola area had few settlement around the 40's by the mid-50's it was becoming heavily built, this continued, today there are no green spaces in this area.

2nd res: Seventh Day Adventist had settlements by mid-30's, green spaces were still visible this was the inner city, settlements increased drastically, green spaces diminished. There is little or no green spaces around here, except those confined to residential compounds.

3rd res: Aleshinlonye Settlements were growing after 1955, being one of the core of the Ibadan city green spaces around reduced drastically in the mid 60, and there are little or no green spaces in this area anymore.

4th res: The Railway headquarters side had minimal green spaces. The area has been green until the 80's when settlement began to spring up due to population pressure and congestion at the city center. Today, the green spaces have drastically reduced and can be found scattered across the areas.
5th res: Agbokoju has been moderately a green spaces. The area was green into the 80's where settlement began to spring up due to increase in population and overcrowding of the city center. As of present, the green spaces have reduced immensely and can be found scantily across the areas.

Appendix E-2
Plates of typical FGDs

Plate 1: FGD covering Orunyan, Kosodo Jro Bale, Adodo, Oja

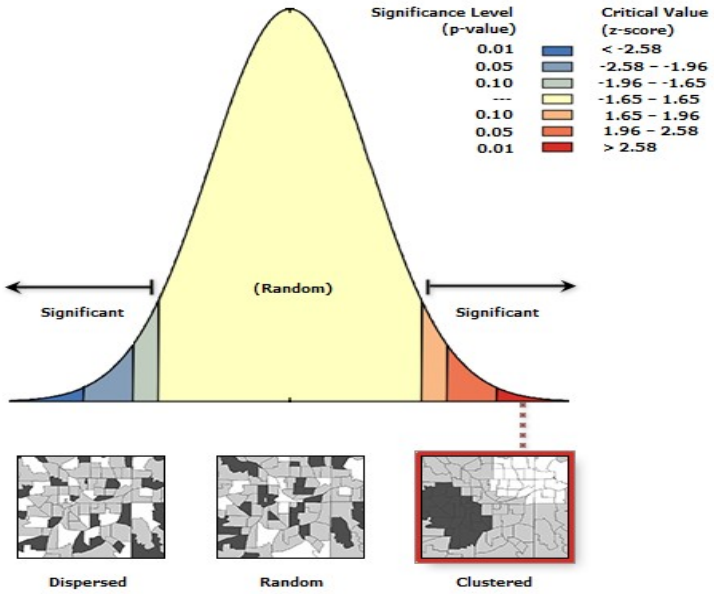
Plate 2: FGD covering Popoyemoja, Fol o Asat a, Koboomoje, Iwale Ozile Oba

Plate 3: FGD covering Kudeti, Dede, Oke Oluokun, Eleta, Oja Oba

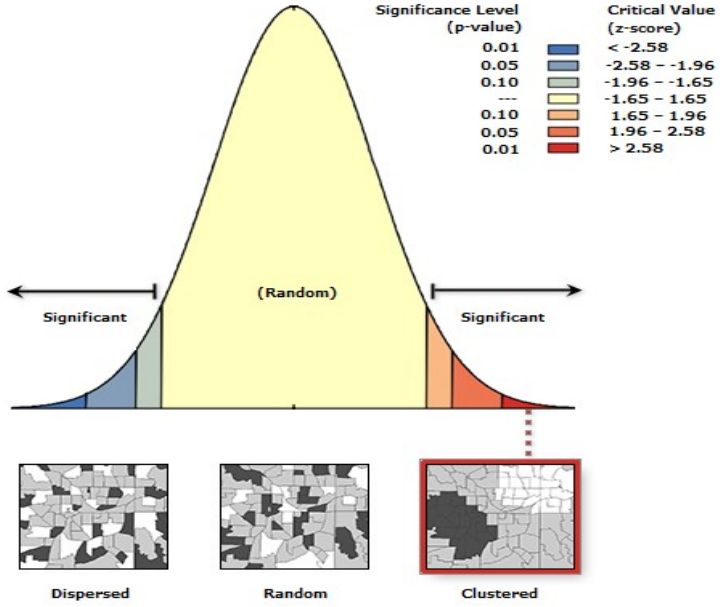
Plate 4: FGD covering Felele, Ilupeju, Molete, Odo Oba, Orangebde

Appendix F

OUTPUT GRAPHS FROM THE GLOBAL MORAN'S I - contd



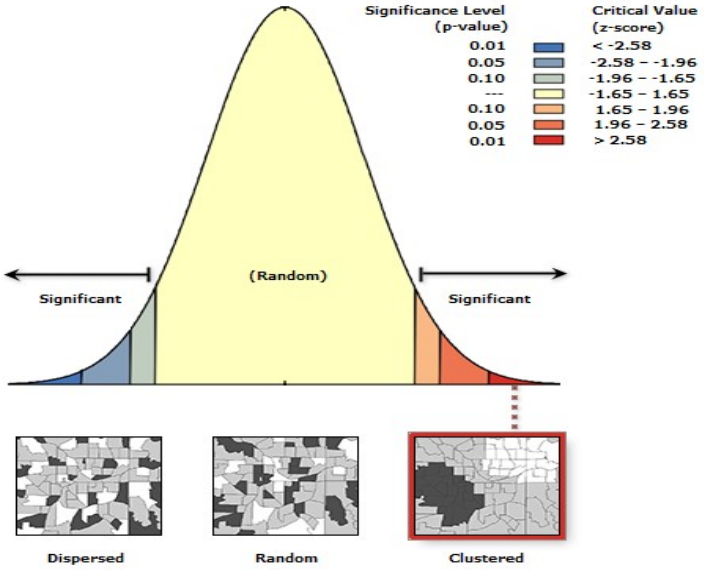
Distributional Pattern of Green Spaces for 1972 (Clustered) *Source: Authors' Analysis*



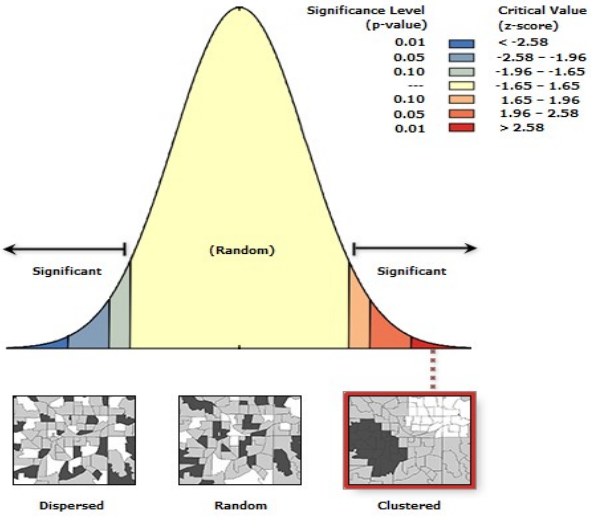
Distributional Pattern of Green Spaces for 1985 (Clustered) *Source: Authors' Analysis*

Appendix F

OUTPUT GRAPHS FROM THE GLOBAL MORAN'S I - contd



Distributional Pattern of Green Spaces for 2000 (Clustered) *Source: Authors' Analysis*



Distributional Pattern of Green Spaces for 2015 (Clustered) *Source: Authors' Analysi*

APPENDIX G

Principal Component Analysis for Ibadan Localities (PCA) ;
An extract of the result from PCA for the 104 localities

ABAYOMI

Locality

	Initial	Extraction
Gender	.542	.393
Age	.809	.729
Ethnicity	.628	.596
Religion	.789	.587
Occupation	.820	.904
Highest level of Education	.793	.731
Monthly Income	.772	.844
Housing types	.329	.131
Housing Wall Materials	.455	.384
Roofing Housing Materials	.478	.448

Extraction Method: Principal Axis Factoring.

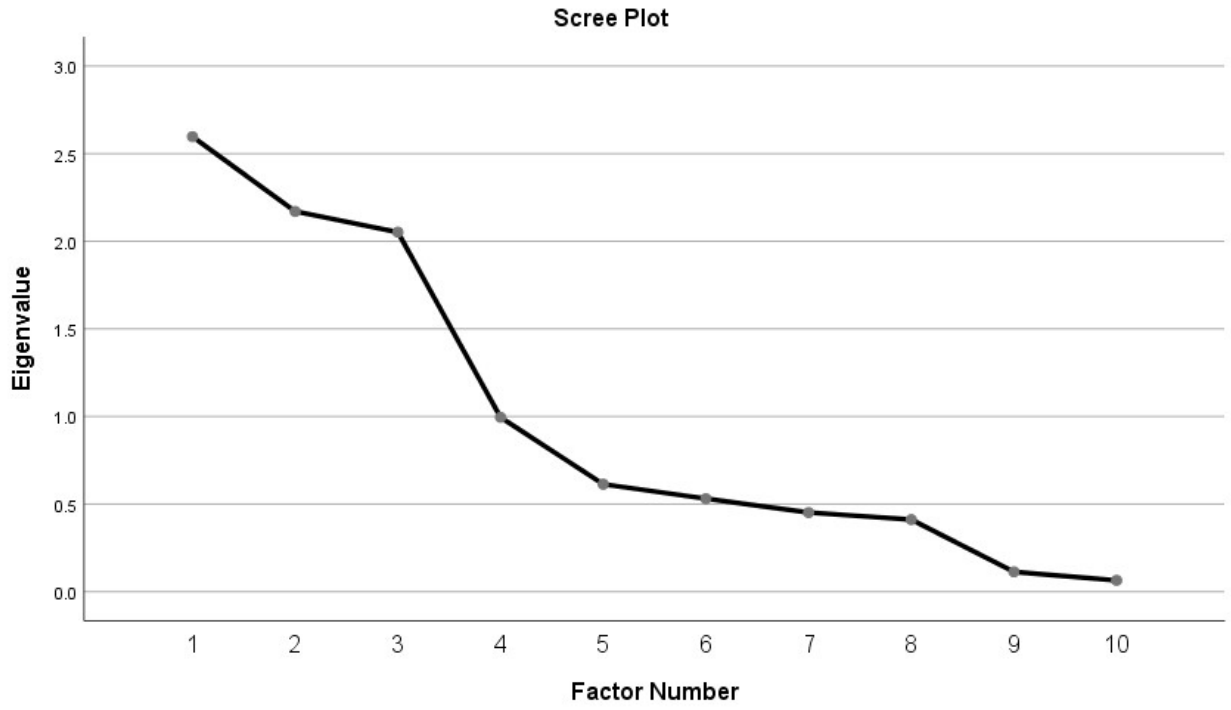
Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.597	25.971	25.971	2.255	22.546	22.546	2.017	20.166	20.166
2	2.170	21.705	47.676	1.849	18.489	41.034	2.014	20.142	40.308
3	2.052	20.521	68.197	1.643	16.434	57.469	1.716	17.161	57.469
4	.995	9.953	78.151						
5	.613	6.134	84.284						
6	.531	5.308	89.592						
7	.452	4.517	94.109						
8	.412	4.116	98.225						
9	.113	1.132	99.357						
10	.064	.643	100.000						

Extraction Method: Principal Axis Factoring.

APPENDIX G

Principal Component Analysis for Ibadan Neigbourhoods (PCA) - Contd



Factor Matrix[a]

	Factor		
	1	2	3
Monthly Income	.836	-.378	.045
Highest level of Education	.611	-.244	-.545
Housing Wall Materials	.525	.285	-.164
Housing types	.333	-.031	.138
Occupation	.537	.708	-.339
Religion	.300	.645	.285
Age	.432	-.577	.457
Roofing Housing Materials	-.129	.194	.628
Ethnicity	.285	.448	.561
Gender	-.364	.276	-.430

Extraction Method: Principal Axis Factoring.
a. 3 factors extracted. 15 iterations required.

Principal Component Analysis for Ibadan Neigbourhoods (PCA) - Contd

Rotated Factor Matrix[a]

	Factor		
	1	2	3
Occupation	.936	-.140	-.088
Religion	.602	.010	.473
Housing Wall Materials	.587	.152	-.128
Age	-.227	.822	.035
Monthly Income	.270	.818	-.319
Gender	.049	-.603	-.164
Housing types	.168	.319	.032
Highest level of Education	.343	.315	-.717
Roofing Housing Materials	-.078	.095	.658
Ethnicity	.392	.229	.624

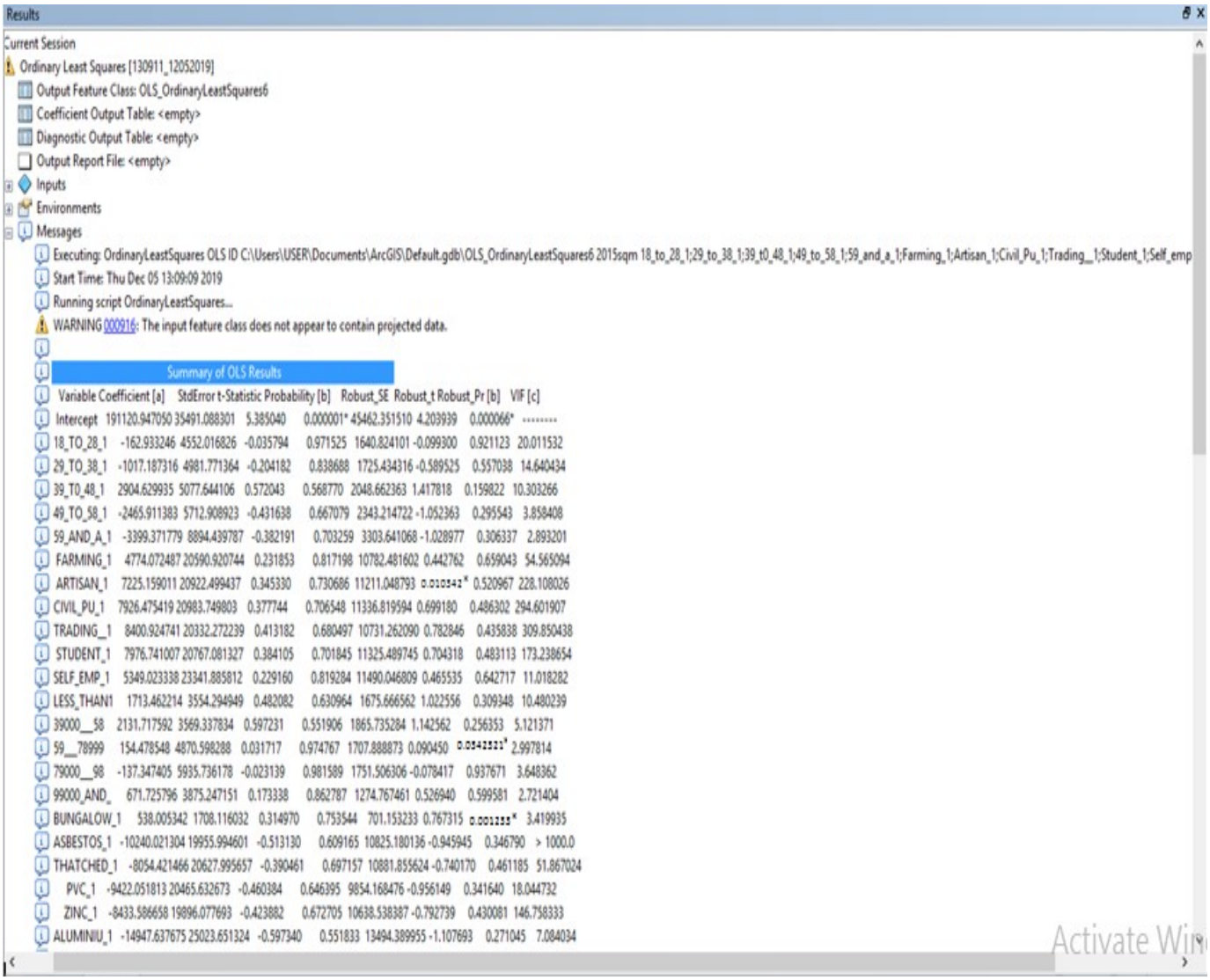
Extraction Method: Principal Axis Factoring.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

Factor Transformation Matrix

Factor	1	2	3
1	.660	.718	-.221
2	.720	-.522	.456
3	-.212	.461	.862

Extraction Method: Principal Axis Factoring.
Rotation Method: Varimax with Kaiser Normalization.

APPENDIX H -1
SPREADSHEET RESULT OF THE ORDINARY LEAST SQUARE (OLS)



Results

Current Session

Ordinary Least Squares [130911_12052019]

Output Feature Class: OLS_OrdinaryLeastSquares6

Coefficient Output Table: <empty>

Diagnostic Output Table: <empty>

Output Report File: <empty>

Inputs

Environments

Messages

Executing: OrdinaryLeastSquares OLS ID C:\Users\USER\Documents\ArcGIS\Default.gdb\OLS_OrdinaryLeastSquares6 2015sqm 18_to_28_1;29_to_38_1;39_t0_48_1;49_to_58_1;59_and_a_1;Farming_1;Artisan_1;Civil_Pu_1;Trading__1;Student_1;Self_emp

Start Time: Thu Dec 05 13:09:09 2019

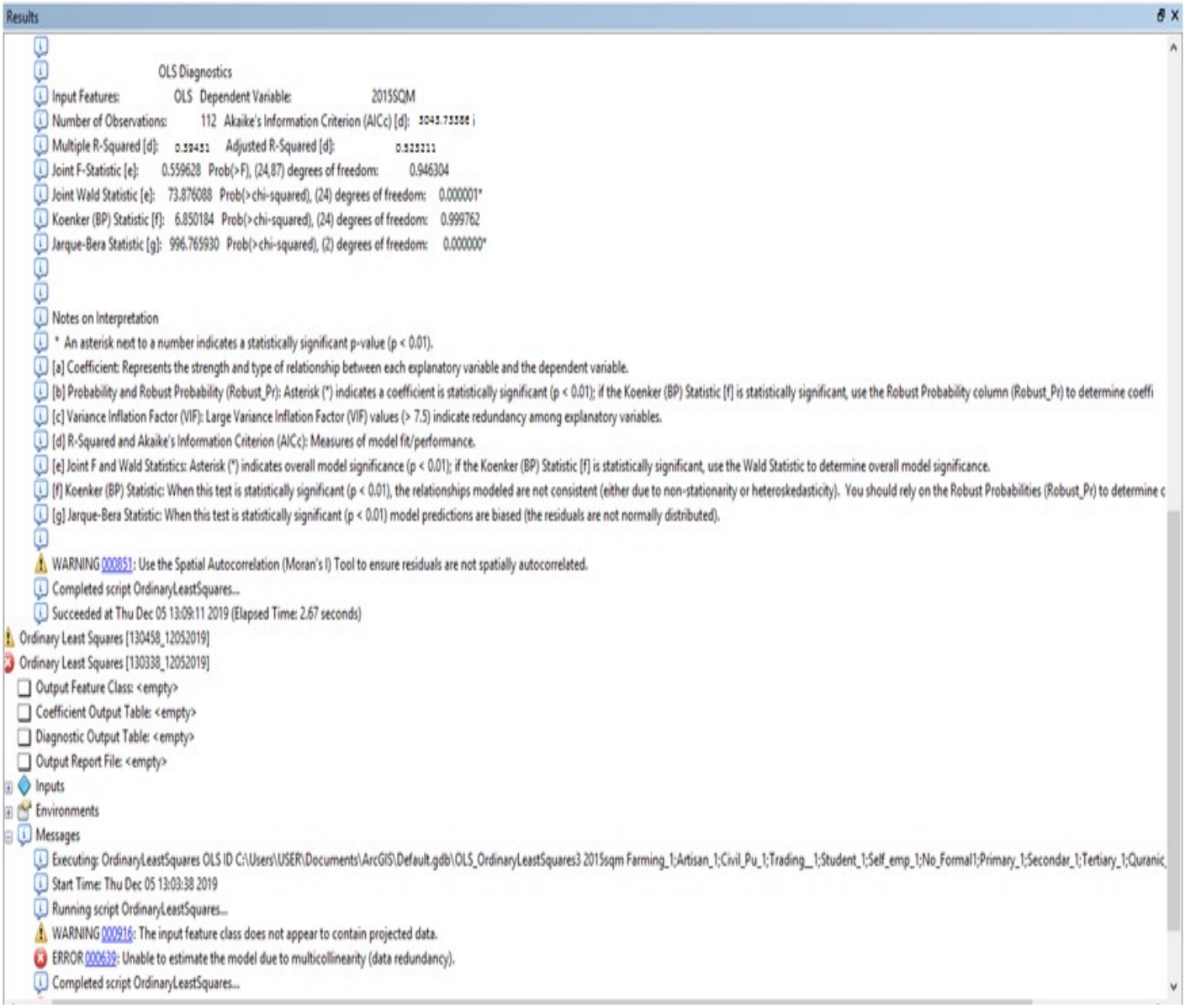
Running script OrdinaryLeastSquares...

WARNING 000916: The input feature class does not appear to contain projected data.

Summary of OLS Results

Variable	Coefficient [a]	StdError	t-Statistic	Probability [b]	Robust_SE	Robust_t	Robust_Pr [b]	VIF [c]
Intercept	191120.947050	35491.088301	5.385040	0.000001*	45462.351510	4.203939	0.000066*	.....
18_TO_28_1	-162.933246	4552.016826	-0.035794	0.971525	1640.824101	-0.099300	0.921123	20.011532
29_TO_38_1	-1017.187316	4981.771364	-0.204182	0.838688	1725.434316	-0.589525	0.557038	14.640434
39_T0_48_1	2904.629935	5077.644106	0.572043	0.568770	2048.662363	1.417818	0.159822	10.303266
49_TO_58_1	-2465.911383	5712.908923	-0.431638	0.667079	2343.214722	-1.052363	0.295543	3.858408
59_AND_A_1	-3399.371779	8894.439787	-0.382191	0.703259	3303.641068	-1.028977	0.306337	2.893201
FARMING_1	4774.072487	20590.920744	0.231853	0.817198	10782.481602	0.442762	0.659043	54.565094
ARTISAN_1	7225.159011	20922.499437	0.345330	0.730686	11211.048793	0.644542*	0.520967	228.108026
CIVIL_PU_1	7926.475419	20983.749803	0.377744	0.706548	11336.819594	0.699180	0.486302	294.601907
TRADING__1	8400.924741	20332.272239	0.413182	0.680497	10731.262090	0.782846	0.435838	309.850438
STUDENT_1	7976.741007	20767.081327	0.384105	0.701845	11325.489745	0.704318	0.483113	173.238654
SELF_EMP_1	5349.023338	23341.885812	0.229160	0.819284	11490.046809	0.465535	0.642717	11.018282
LESS_THAN1	1713.462214	3554.294949	0.482082	0.630964	1675.666562	1.022556	0.309348	10.480239
39000__58	2131.717592	3569.337834	0.597231	0.551906	1865.735284	1.142562	0.256353	5.121371
59__78999	154.478548	4870.598288	0.031717	0.974767	1707.888873	0.090450	0.0542331*	2.997814
79000__98	-137.347405	5935.736178	-0.023139	0.981589	1751.506306	-0.078417	0.937671	3.648362
99000_AND_	671.725796	3875.247151	0.173338	0.862787	1274.767461	0.526940	0.599581	2.721404
BUNGALOW_1	538.005342	1708.116032	0.314970	0.753544	701.153233	0.767315	0.001233*	3.419935
ASBESTOS_1	-10240.021304	19955.994601	-0.513130	0.609165	10825.180136	-0.945945	0.346790	> 1000.0
THATCHED_1	-8054.421466	20627.995657	-0.390461	0.697157	10881.855624	-0.740170	0.461185	51.867024
PVC_1	-9422.051813	20465.632673	-0.460384	0.646395	9854.168476	-0.956149	0.341640	18.044732
ZINC_1	-8433.586658	19896.077693	-0.423882	0.672705	10638.538387	-0.792739	0.430081	146.758333
ALUMINIU_1	-14947.637675	25023.651324	-0.597340	0.551833	13494.389955	-1.107693	0.271045	7.084034

APPENDIX H -1
SPREADSHEET RESULT OF THE ORDINARY LEAST SQUARE (OLS)



APPENDIX H -2

SPREADSHEET RESULT OF THE GEOGRAPHICALLY WEIGHTED REGRESSION (GWR)

FID	Observed	Cond	LocalR2	Predicted	Intercept	C1_Artisan	C2_hut	C3_18_399	C4_single_
0	11300	5.998826	0.228026	49565.668068	124232.266273	53.442963	53548.505652	4231.850058	1975.944537
1	84800	5.72855	0.158096	56292.08792	79142.181534	2051.346591	48015.111936	1218.342191	2203.565947
2	900	5.107384	0.057085	79265.446142	65270.254397	3175.752822	42841.328775	430.751352	1829.988714
3	10500	5.857299	0.136954	22882.378085	48292.688898	1465.785198	5790.429277	1570.099578	1586.863504
4	300	5.228522	0.020409	31282.589291	30439.319321	896.278345	6587.146574	659.279143	274.184341
5	100	5.198514	0.018396	31151.064601	32602.250147	588.558403	14817.77523	-361.72477	-163.9357
6	200	5.190669	0.020527	32317.198949	34302.212035	358.689699	21576.267522	84.001915	445.125604
7	10400	4.434938	0.065015	117497.996909	134900.538471	6233.412235	99025.550156	1226.80792	4974.142789
8	63400	6.352105	0.078032	209579.478782	521466.856002	3094.387259	369464.232694	17605.50404	10176.101115
9	23800	4.92883	0.044101	68136.020149	84930.671804	929.783578	19434.687137	2302.195373	185.270941
10	100	5.841929	0.133646	3199.985827	61717.575298	1394.739475	4606.334694	1928.944732	1725.084334
11	10600	4.767773	0.042985	94304.253617	63704.961109	291.643242	28890.291205	3350.980535	2203.73443
12	112300	5.777978	0.041228	153937.53464	187953.46597	7907.500714	127389.642661	1770.09885	417.766868
13	3100	5.256102	0.016859	14880.695865	28149.002855	915.362108	6143.779784	415.057387	553.841223
14	32100	5.56815	0.093414	48461.520137	115150.81782	10031.261973	78596.963983	1854.165105	2949.007509
15	147400	6.004883	0.076696	107496.2478	213347.257079	6457.393867	34363.535358	1188.612932	5541.072525
16	653900	9.880725	0.239944	492842.784584	1372457.31697	19834.902786	1166876.88899	53785.222917	20213.404662
17	2400	5.579503	0.076678	27165.582364	38889.404916	1237.66516	4143.365713	1184.	1180.

APPENDIX H -2
SPREADSHEET RESULT OF THE GEOGRAPHICALLY WEIGHTED REGRESSION (GWR)

FID	Observed	Cond	localR2	Predicted	Intercept	C1_Artisan	C2_hut	C3_18_399	C4_single_
								698066	392085
18	1231100	7.619105	0.195923	583717.851811	1133924.13218	15567.122025	903880.356977	46845.092128	22290.750584
19	35100	5.152034	0.041088	35092.514547	53780.271711	463.114766	24718.204693	2428.299999	1064.611261
20	295400	6.605939	0.2618	231141.285244	243912.292496	32046.450609	186866.020241	5388.936925	4831.474121
21	2100	5.215255	0.015571	27252.900926	29150.183961	766.09346	11478.463521	268.985796	398.618576
22	45100	6.071147	0.20675	20688.05468	110818.892249	190.543591	50273.190124	4557.432518	734.785308
23	37100	4.50241	0.098204	15029.256288	113942.178567	9978.324489	74382.495844	1979.924692	5657.705236
24	31200	5.757901	0.106183	322403.082154	420976.623991	6534.495317	258876.250939	14680.110925	11489.210657
25	100	5.387149	0.032621	15398.436819	35801.664471	672.686129	7179.030943	189.596115	1306.793685
26	134200	5.159373	0.073319	135939.977623	168726.772877	3728.255778	68953.995984	1027.698555	6557.359051
27	113200	6.016299	0.186575	165468.852201	279336.301007	29072.326062	208015.432543	2985.127061	4115.177434
28	69900	6.0573	0.229691	145518.690498	179636.648447	22033.050107	126285.959873	5219.802871	4844.844458
29	413600	4.441254	0.147825	286063.191723	218373.448594	23026.891307	172539.719072	4675.395139	12715.44546
30	28800	5.650519	0.112402	83352.353894	133943.651798	3668.593037	71701.017625	3106.131414	3417.022111
31	28800	6.22716	0.113035	77680.249364	158042.96744	5740.194148	47639.407698	3169.38348	3469.442367
32	100	5.196253	0.037074	40865.410107	34404.694872	204.053531	26195.005213	751.327166	928.661248
33	221100	5.682871	0.16121	82450.360595	104947.280034	178.578307	35903.974304	2951.835285	1960.174692
34	84300	6.561876	0.26609	189029.643186	202638.171256	27150.568463	148785.241501	5811.260971	5089.346427
35	394100	5.745867	0.175604	271438.103241	426581.747955	39818.575579	303510.34392	1137.156585	6613.955143
36	394100	5.93674	0.218154	387808.	552136.	.	.	.	10614.

APPENDIX H -2
SPREADSHEET RESULT OF THE GEOGRAPHICALLY WEIGHTED REGRESSION (GWR)

FID	Observed	Cond	LocalR2	Predicted	Intercept	C1_Artisan	C2_hut	C3_18_399	C4_single_
				864385	741638	56217. 441488	401333. 644251	3395. 487111	484562
37	95400	4.887318	0.048988	54310. 555988	84850. 791988	. 272. 097279	. 24085. 340436	. 3217. 737385	817. 202671
38	6600	5.498788	0.101028	41962. 342329	61045. 216751	. 709. 136909	. 30198. 749484	730. 864111	. 2152. 023766
39	100	5.241714	0.021917	15304. 554492	29222. 60656	633. 089254	. 13322. 70925	177. 323811	-855.94949
40	87500	5.982506	0.185471	65022. 212359	100329. 036525	. 3593. 580654	. 85367. 021791	4461. 398396	. 2011. 434533
41	100	5.19002	0.071085	57778. 500802	55608. 435978	. 274. 090836	. 50957. 076039	1695. 835579	. 1740. 898017
42	65400	5.128439	0.031275	58388. 546265	48838. 032199	-693.37308	. 23588. 874148	. 526. 413146	764. 610494
43	200	5.215718	0.030795	32582. 098892	31070. 953996	401. 923552	. 19776. 082688	522. 851089	. 903. 601315
44	74500	5.313006	0.035186	106131. 400595	139701. 614266	2515. 324849	. 90899. 015054	. 2826. 561568	. 3290. 452315
45	112700	6.015415	0.199587	125165. 004042	151652. 572908	. 18269. 387207	. 104396. 601377	4589. 05841	4793. 241554
46	3300	5.305195	0.02662	7409. 231689	32144. 960331	623. 476035	. 10515. 862314	63.11910E	. 1112. 246869
47	32100	5.303569	0.040239	24245. 981382	35352. 2497	1059. 775089	349. 876571	. 1162. 796397	. 477. 553251
48	223100	5.440735	0.167988	200257. 695199	171298. 496735	. 17955. 255266	. 122643. 652796	4289. 21015	5295. 048208
49	20900	5.145708	0.07046	116094. 555245	131404. 478851	6859. 00953	. 83476. 166904	. 2484. 914361	. 5221. 037519
50	223100	5.049781	0.128953	186273. 985892	114937. 285186	. 10986. 899035	. 87649. 902453	3264. 024831	4886. 575073
51	135900	4.730075	0.085535	99428. 516684	96418. 802445	. 7314. 71541	. 62076. 677775	1398. 602387	4033. 110839
52	135900	4.818782	0.117684	139218. 266901	117612. 891231	. 10972. 984873	. 87877. 108403	3020. 664578	5452. 433029
53	381600	5.407824	0.175639	155131. 961815	77706. 267318	. 2225. 227446	. 81595. 517536	3707. 679332	. 2121. 793005
54	495700	8.339096	0.140547	530304. 988428	902098. 664945	. 18740. 479499	. 739903. 70379	. 33207. 952858	. 13238. 049311

APPENDIX H -2
SPREADSHEET RESULT OF THE GEOGRAPHICALLY WEIGHTED REGRESSION (GWR)

FID	Observed	Cond	LocalR2	Predicted	Intercept	C1_Artisan	C2_hut	C3_18_3999	C4_single_
55	30100	4.528757	0.048938	72389.790287	86056.193292	-869.231344	-36553.802594	4004.49469	3551.820711
56	213000	7.047328	0.260375	254076.24194	243251.491402	-33591.760703	-191627.654813	6095.501658	5478.876855
57	92200	5.62103	0.235597	135629.612104	72967.478821	-2836.61878	-84394.926339	3922.137884	-1597.530494
58	441500	6.337439	0.051288	256900.049992	396443.784124	-6509.101274	-283549.868309	10816.142963	-5167.276573
59	400	5.318404	0.050008	37850.503677	41952.182665	979.84574	-258.388773	-1446.056161	-522.160026
60	2500	5.292395	0.115755	59598.764115	155511.259907	-10460.01417	-109764.325222	-1316.854927	-4386.204084
61	20600	5.181334	0.039408	21158.300867	66032.836478	-684.363541	-51615.199586	-463.840506	-1804.908701
62	5100	5.19273	0.026	46449.355837	50900.823056	-213.365502	-36384.454438	-124.145194	-622.950792
63	56400	5.44106	0.088494	38863.223511	78646.103573	-269.899774	-16648.335467	-2192.161029	-1177.674586
64	56400	5.324261	0.058012	43391.425815	54863.371881	-671.763956	-3883.121314	-1780.917159	-623.205635
65	21700	5.469366	0.075682	51185.978261	52461.026722	-986.172432	-2020.674331	-1737.39701	-928.064399
66	200	5.370518	0.05697	16133.17435	42960.636976	-143.930735	-18544.304773	-443.914998	-1650.337629
67	1100	4.230757	0.087262	113481.842284	126620.745827	-10132.778684	-78851.801583	-723.95338	-7126.653825
68	391500	5.729877	0.163624	367619.290275	329770.624258	-31061.076317	-236838.568597	-1301.115144	-4939.301517
69	8700	5.222413	0.063455	38513.991137	72132.493736	-438.066103	-28476.216552	-3539.614746	-930.123692
70	1220400	6.160134	0.270826	922812.763965	836070.222471	-5107.007066	-481629.599372	-31268.445087	-20504.60699
71	34500	5.775519	0.146692	30375.176719	88266.312701	-774.794309	-24081.990993	-2360.754485	-2110.454552
72	70200	5.268237	0.099496	83758.48369	83508.185729	-6859.401868	-61663.835399	-1874.430085	-2878.522824
73	125700	5.037793	0.030544	51446.92479	54956.214075	-895.20469	-993.587913		

APPENDIX H -2
SPREADSHEET RESULT OF THE GEOGRAPHICALLY WEIGHTED REGRESSION (GWR)

FID	Observed	Cond	LocalR2	Predicted	Intercept	C1_Artisan	C2_hut	C3_18_399	C4_single_
						372473	925007	364773	
74	67100	5.860265	0.097964	52640.	55080.	685.	.	.	.
				689737	899852	020619	1155.	1072.	1990.
							427442	516565	353747
75	200	5.367541	0.054639	29892.	31425.	1083.	355.	.	.
				223508	807938	682296	354885	790.	806.
								626066	803259
76	44900	4.585347	0.144648	.	162908.	.	.	4123.	9480.
				12939.	766045	17584.	127974.	308065	850627
				599469		836551	736311		
77	46500	4.385901	0.041817	85062.	77745.	.	.	.	2759.
				368455	854164	962.	47002.	2783.	723648
						656654	548027	22218	
78	73200	5.163255	0.076118	82494.	100225.	518.	.	1478.	.
				98786	170852	597255	73156.	378105	3407.
							313671		979554
79	87500	5.431746	0.181666	53690.	64766.	.	.	2718.	.
				854051	364829	1795.	61814.	043542	1947.
						055919	937537		643551
80	100200	5.545703	0.191525	204632.	343878.	16396.	.	.	.
				817834	014165	886312	179596.	12357.	13373.
							089721	800105	22009
81	1243700	5.18178	0.239057	492445.	359656.	.	.	4269.	19761.
				859709	827691	43877.	265768.	109759	543572
						978857	369492		
82	20700	5.298355	0.04924	63676.	78568.	.	.	522.	1167.
				776211	809265	4225.	54445.	773076	146994
						788051	353398		
83	221200	5.062114	0.207597	60822.	235461.	18718.	.	.	.
				384517	147829	676579	117301.	7903.	11941.
							653157	218179	867185
84	45700	4.263344	0.082799	169328.	151558.	.	.	30.330725	7553.
				544525	6238	10096.	104851.		236402
						436682	371342		
85	21100	4.761861	0.182522	223999.	234641.	.	.	4593.	13891.
				054706	761466	26833.	188417.	86394	167288
						25511	741642		
86	44800	5.727229	0.24325	79892.	73325.	.	.	3599.	.
				82119	934346	3056.	81141.	622972	1429.
						128665	815729		368897
87	123400	4.406686	0.056694	116559.	97331.	.	.	.	3657.
				447764	081417	5521.	41129.	528.	026653
						164783	017386	508795	
88	300	5.217743	0.030693	55045.	57678.	.	.	26.438242	223.
				977492	153559	1456.	39340.		336383
						592428	836079		
89	582300	5.20025	0.198985	282933.	259331.	15322.	.	.	.
				612469	701647	004864	92418.	6481.	13252.
							048258	168838	028375
90	74300	4.645371	0.042918	81152.	83095.	.	.	.	2063.
				5354	80604	3418.	28184.	1032.	09834
						192617	814916	016184	
91	2900	5.239249	0.114763	65339.	57637.	.	.	2491.	.
				882801	375937	961.	58021.	116495	1869.
						312988	664287		136648
92	495000	5.745132	0.331914	482822.	316556.	.	.	12010.	29085.

APPENDIX H -2
SPREADSHEET RESULT OF THE GEOGRAPHICALLY WEIGHTED REGRESSION (GWR)

FID	Observed	Cond	LocalR2	Predicted	Intercept	C1_Artisan	C2_hut	C3_18_399	C4_single_
				554648	486924	59761.649572	317061.249207	600585	331239
93	200	5.572587	0.084553	11926.278355	44237.773317	1260.594084	2530.03797	1496.515225	1086.626335
94	600	5.279992	0.092005	20061.674307	44013.425685	334.918471	34893.344794	1480.3031	1632.725964
95	134200	5.59311	0.064734	35063.94387	40482.634719	996.717024	1441.951858	878.218051	1441.113104
96	300	5.196943	0.030545	17357.351577	49315.995692	943.200354	31828.191758	-83.024727	406.373999
97	200	5.240131	0.081168	27170.254377	41158.810539	260.365351	35357.340689	1508.888811	1463.597608
98	14000	5.186629	0.022326	18175.046401	37199.183605	311.116973	17511.136691	474.277677	103.402088
99	84300	6.789408	0.136477	83610.796701	275887.561825	22757.54084	213115.312554	735.47639	3473.089572
100	100	5.312729	0.03014	15503.22608	30572.444732	1075.457726	706.277724	814.211918	602.751991
101	300	5.432184	0.048109	27925.331062	33748.454726	1143.676944	2266.350631	954.253744	914.932743
102	8900	5.349545	0.118543	45537.223076	52669.171132	-751.03286	40144.086524	1644.032359	1891.256679
103	14800	5.719336	0.082909	30601.92945	64545.287027	302.593203	17092.453068	298.410955	2261.397337
104	100	5.285955	0.01816	16888.851254	28640.24764	910.048613	5183.101745	376.900871	-722.95588