SITE SELECTION OF ELECTORAL POLLING UNIT USING GEOSPATIAL TECHNOLOGY FOR ZARIA, KADUNA STATE NIGERIA

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DECLARATION

I declare that the work in this thesis entitled "Site Selection of Electoral Polling Unit Using Geospatial Technology For Zaria, Kaduna State Nigeria" has been performed by me in the Department of Geomatics under the supervision of Dr. T.O. Adewuyi and Prof. A. A. Musa. The information derived from the literature has been duly acknowledged in the text and list of references provided. No part of this project report was previously presented for another degree or diploma at any university.

ATTA KAKA ZENABU

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Date

CERTIFICATION

This thesis entitled SITE SELECTION OF ELECTORAL POLLING UNIT USING GEOSPATIAL TECHNOLOGY FOR ZARIA, KADUNA STATE NIGERIA by ATTA KAKA ZENABU meets the regulation governing the award of the degree of M.Sc Geomatics of Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

I dedicate this work to Almighty Allah, for seeing me through this program and to my brother.

ACKNOWLEDGEMENT

Thanks are probably intricate than one may think, for the simple reason that it is impossible to write in a few lines all the people who have contributed to achieving this important goal of my life (but they all know it).

My deepest gratitude goes to ALMIGHTY ALLAH for His infinite blessings, whose mercy has been keeping me alive till this day in sound health. Alhamdulillah, all praises belong to Allah for His blessings and protection, indeed I am deeply indebted to Him, without which my work would not have been possible.

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ABSTRACT

This study gives an insight to the site selection of electoral polling unit using geospatial technology for Zaria, Kaduna State Nigeria aimed at creating an appropriate model for citing polling units. For the purpose of this work, a base map, SRTM data, pollulation data and Landsat 8 satellite imagery were used to generate the land-use map of Zaria and to as well show the nature of the topography of the study area using ArcGIS 10.1, and IDRISI software. A seven parameters criterion was extracted from INEC objectives and summarized to polling unit proximity to voters, Road accessibility to INEC officials, Land use (public buildings, and open spaces), Clinic proximity, Slope and elevation, GMS masts and Water bodies. The generated thematic maps of these criteria were standardized using fuzzy logic approach. A weight for each criterion was generated by comparing them with each other according to their importance. With the help of these weights and criteria, final site suitability map was prepared. Analyzes of the data to determine a relative suitability for each goal was carried out and finally reclassifying preference into three categories of high, medium and low. Using geospatial techniques (multi-criteria evaluation) in IDRISI selva software, and ArcMap 10.1 to create map of existing polling units, suitability map, and comparision map are the results obtained. Comparison of existing and proposed polling units area was made with the aim of determining areas of similarity and areas of disparity. A final suitability map was created for locations of proposed polling units. It was shown how AHP and GIS can be used to create a suitability model of polling unit sites. The above result showed Zaria has an average of 894,600 square meters (894.600km^2) in area and majority of the area at present been used as farmland. The population of registered voters is about 415432 with Sabon Gari LGA having 242276 and Zaria LGA having 173156. The result obtained from the map and validated shows that the suitability map of zaria produced has 0.09 consistency ratio and average of 36% of area not suitable, 56% of area fairly suitable and 8% Suitable (Most of the points

which fall within this percentage). Thus, polling units that fell within the not suitable region can be redistributed or removed from the lists, also electoral polling units should not be cited in area that fall within not suitable area/constraints (rock/highland and water), while areas with high suitability are expected to have more polling units. Electoral polling units should not be cited in area that fall within not suitable area/constraints (rock/highland and water).

CHAPTER ONE

INTRODUCTION

1.1 Background To The Study

Over the years, the perceived increased level of corruption in Nigeria has procured enormous complaints and agitation for a better government and thus a general demand for credible elections in the country. The Independent National Electoral Commission (INEC) an independent body charged with the responsibility of conducting and supervising elections in Nigeria has over the years modernized its information technology infrastructure from the outdated voting system of inaccurate paper records, and polling cards to the newer electronic system. (GIS Best practice, 2009).

The Independent National Electoral Commission also, before the 2015 general elections in Nigeria saw the necessity to reconfigure the structure of polling units in the country as well as create additional ones in other to improve upon the electoral process for free, fair, peaceful and credible elections in 2015 and beyond.

Polling units (PUs) is a place where a citizen can either register to vote or to vote. The essence of suitable polling units in an electoral process cannot be over emphasized so much that INEC has to create additional 30000 polling units before the 2015 elections. This decision of increasing the polling units faced a lot of criticism from certain interest before and after the election. The criticism was centred largely on an alleged conspiracy theory, that the Commission has done a disproportional distribution of the polling units across Nigeria under the new arrangement, which is aimed at foisting the dominance of one section of the country over the others for political advantage The Independent National Electoral Commission in its defence claims the decision was an exercise undertaken to ease the access of voters to their ballot boxes by: Decongesting overcrowded polling units and dispersing

voters as evenly as possible among all the Pus, locating PUs more effectively within commuting distances of voters, given that movement is usually restricted on Election Day, Relocating the PUs from "in-front of" private houses, and such other unsuitable places, to public buildings or where this is not possible, to public open spaces where tents can be provided; Locating the PUs inside classrooms or such other suitable enclosures, in line with International best practices; Splitting large PUs such that they have on average 500 registered voters; and creating additional PUs to cater for the splitting of large polling units as well as new settlements not serviced by any existing PU (INEC, 2014).

This study focuses on the suitability analyses of polling units in Nigeria as it meets with the above mentioned objectives in other to achieve free, fair, peaceful and credible elections using Zaria, Kaduna State as case study. It involves using Geographic Information System (GIS) for analyses by integrating the map of Zaria, Its Landuse map, its slope map, existing location of polling units to derive the Independent National Electoral Commission suitability criterion for appropriate analyses.

1.2 Statement of the Problem

Availability of adequate and suitable polling units is an essential factor in ensuring a free, fair and credible election in any country. INEC's critical look into this factor has ensured a successful election in 2015. For the success of elections, and to discard the unwarranted criticism usually met by additional polling units and its distribution. It is necessary to analyse the suitability of the present polling units in the country.

The GIS-based approaches to land-use suitability mapping have their roots in the applications of hand-drawn overlay techniques used by American landscape architects in the late nineteenth and early 20th century (Collins *et al.*, 2001). McHarg (1969) advanced the overlay techniques by proposing a procedure that involved mapping data on the natural and human-

made attributes of the environment of a study area, and then presenting this information on individual, transparent maps using light to dark shading (high suitability to low suitability) and superimposing the individual transparent maps over each other to construct the overall suitability maps for each land-use.

In a series of two articles, Malczewski and Ogryczak (1996) clearly defined the multiple criteria location problem. They also compared the advantages and the disadvantages of different Multi-Criteria Evaluation (MCE) methods. Localization problems have also been treated with a more intensive use of GIS. Carver (1991) used GIS to evaluate various alternatives for nuclear waste sites. Then, he evaluates the effectiveness of three Multi-Criteria Decision Analysis (MCDA) techniques used to compare scenarios in order to select the best one.

Onut and Soner (2007) used Analytical Heirarchy Process (AHP) to draw up hierarchy principles and calculate relative weight, then used Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) to fuzzify, and establish a site selection mode for solid waste transport station. Dey and Ramcharan (2007) used AHP to establish hierarchy framework of evaluation factors, and through expert questionnaires comparing each hierarchy and its relative weight could be used as reference for the site selection of quarry expansion decisions.

Tegou, Polatidis and Haralambopoulos (2007) used land suitability to evaluate wind farm siting, integrating MCDA and GIS, then AHP to calculate principle weight, and finally select a suitable site for wind farm. Furthermore, Senes and Toccolini (1998) combined UET (Ultimate Environmental Threshold) method with map overlays to evaluate land suitability for development. Hall *et al.* (1992) and Wang (1994) also used map overlays to define homogeneous zones, but then they apply classification techniques to assess the agricultural

land suitability level of each zone. These classification techniques can be based on Boolean and fuzzy theory (Hall *et al.,* 1992) or artificial neural networks (Wang, 1994).

The above literature all have one thing in common, their research goal is to build a site selection model, and use AHP to systemize the complicated problems of multi-principle, establish related factors and its calculated relative weight, and then integrate the spatial analysis function of GIS, overlay map layers of each related factors, screening and presenting the best suitable distribution areas of the research, and finally provide it to related agencies as reference for spatial decision making.

However, past studies often ignored the spatial analysis, and are in lack of related spatial selection model. Therefore, this study wishes to combine these two analysis tools, compensate for each other's inadequacies, in order to make the results of this study more complete. Combining GIS and MCE is also a powerful approach to land suitability assessments. GIS enable computation of the criteria while a MCE can be used to group them into a suitability index. Following a similar approach, Eastman *et al.* (1993) produced a land suitability map for an industry near Kathmandu using IDRISI (a raster GIS) and AHP (Analytical Hierarchy Process) (Saaty, 1980).

1.3 Research Question

How efficient are the existing polling units in Zaria metropolis, taking into cognizance INEC's criterion to achieve suitable polling units in other to improve electoral process in Nigeria? These resulted to the following questions to be asked which include;

i. Are there sufficient polling units in the study area?
ii. Where are the appropriate locations to site polling units?
iii. What is the relationship between the polling units and facilities such as public institutions, hospitals, open spaces, roads?

iv. Are there significance differences between the existing polling units and the proposed polling units (using a particular criteria e.g. population, distance and cordinate?

1.4 Aim and Objectives

The aim of this research is to use geospatial technique to create a suitability model for citing polling units in Zaria.

Simply stated, the objectives of this study are to:

i. To collect location data from INEC and map the current location and distribution of existing polling units in Zaria.
ii. To create spatial analysis of polling units across the study area containing information on polling stations, villages, districts, health centres and mobile network showing connectivity and accessibility with road network.
iii. To generate a suitability model for citing of subsequent polling units in Zaria using Multicriteria analysis.
iv. To compare existing and proposed polling units to determine areas of similarity and areas of disparity (validation).

1.5 Scope and Limitations

This research covers the determination of suitable locations for polling units within Zaria only, though it is pertinent that other local governments within Kaduna state and even other states of the federation should be considered as well. This can be in subsequent studies linked to this research. The study does not go outside the context of establishing polling units using geospatial technique within a GIS environment.

This work is based on a standard assessment and further detailed analysis for specific suitability which will be recommended based on International and INEC specifications. This

involved the use of biophysical, socio-economic and environmental datasets or variables. Furthermore, the Multicriteria analysis carried out in this research made use of various data majorly from years preceding 2015. The research is carried out within a time frame of 12 month - from data collection, processing, analysis, to the final report submission.

The limitation of this project is based on the resolution of the imagery used which is Landsat 8 of year 2015. Landsat series data can provide long-term, high quality multi-band images for environmental monitoring and assessment at regional, national and global scales (Xu *et al*, 2009). Thus, if the correction of the errors such as radiometric and geometric distortion in the imagery for the classification of landuse map of Zaria is not properly removed then there is a tendency of error in the results to be produced. These errors cannot be completely removed.

1.6 Justification of the Study

The thrust of this study is to examine how GIS can be used to solve the problem of polling station location. GIS is not just magic box, as people assume it to be, but (simply) an extension of one's analytical thinking. It has no inherent answers, only those of the analyst, it is a tool, just like statistics is a tool, and it's a food for thought.

GIS will be a very useful tool for promoting free, fair and credible election as a means of ensuring that democracy and good governance prevails in states across Nigeria. All these can be achieved if the polling station as centres of vote collection is well located (or mapped).

Once the location of voting sites has been officially approved, map should be prepared showing the location of voting stations and relevant electoral districts and voting subdivision boundaries. To overcome such difficulty, GIS techniques come as a helping tool in order to generate such comprehensive maps and in a precise manner. This research seeks to achieve this goal. The timing of production of these maps is very important, it is one of the first actions that should be undertaken as soon as voting stations location are determined.

This research is justifiable in the sense that, it aim is to analyse appropriate locations for polling units within the study area because polling stations should be available to people within a community/ward in general without any form of influence (bias). Polling units are meant to satisfy the civic needs of the people. The proper location/accessibility of polling station, just like educational service, health service etc. is an essential feature of a well-developed political region, or any settlement and therefore should be sought after by politicians, community and opinion leaders. The irregular location of polling station in Nigeria has been a major obstacle for free, fair and credible election in Nigeria. Most polling stations located are usually influenced by individuals (well connected), high government officials, as well as traditional rulers. For instance, it has come to notice that during previous elections, polling stations were being located in some traditional rulers' palace.

Also, for the security of life and property after the whole exercise has been carried out. Since over the year there is usually destruction of life and properties. Legal implication to this effect is that the parties end up with various complains to different court which now determines the faith of the prosecutors. Logistic planning is an essential factor in every process to be carried out, this help to make proper decisions in the process of carrying out the election exercise. For instance, the provision of meal for the electorate officers, good siting condition against sun/rain, provision of election materials and transportation of the materials to the office for coalition e.t.c. Moreso, the supervision of the election by the relevant agencies such as Police, Army, Airforce, International election observers, Corp members, e. t. c. should be well cared for during and after the exercise.

This research will help to improve on the electoral process which will result to a free, fair and credible election within Zaria, Kaduna State Nigeria.

1.7 Study Area

The study area considered in this research is Zaria metropolis which lies within geographical coordinates of longitudes 7°36’0” E to 7°46’0” E and latitude 11°2’0” N to 11°12’0” N. It comprises two local government areas namely: Zaria and Sabongari LGA.

Zaria is a very large heterogeneous city whose approximate 1.1 million population (2006 Census) comes from different parts of the world. It is second size only to the State capital Kaduna. Zaria is easily accessible from different parts of the country by air via Kaduna, Kano, and Abuja by rail and road via Kaduna, Jos, Kano and Sokoto. It is located on the high plains of Northern Nigeria; 652.6 meters above the sea level and some 950 km away from the coast. The Zaria region is characterized by gently rolling plains dotted with groups of rocky residual hills developed on granite bedrock.The land uses include agricultural, commercial, residential, institutional and open spaces. Zaria is also known for its educational growth. It is home to many federal and state institutions.

Generally, agricultural activities form the mainstay of the people's economy in the study area and this engages directly or indirectly more than 70 percent of the population. The even climate, rich annual rainfall and availability of wide variety of mineral and agricultural resources all attest to the economic potential of the study area. The area is a major region of animal husbandry. Major food and cash crops produced includes, cotton, groundnut, guinea corn, millet, beans, rice, sugar cane and maize.

Zaria consists of an existing 24 voters Registration Areas (RA) and 601 Polling Units (PU) recognized by INEC as at the 2015 general elections. Below is a graphical representation of its location with respect to the map of Kaduna State.

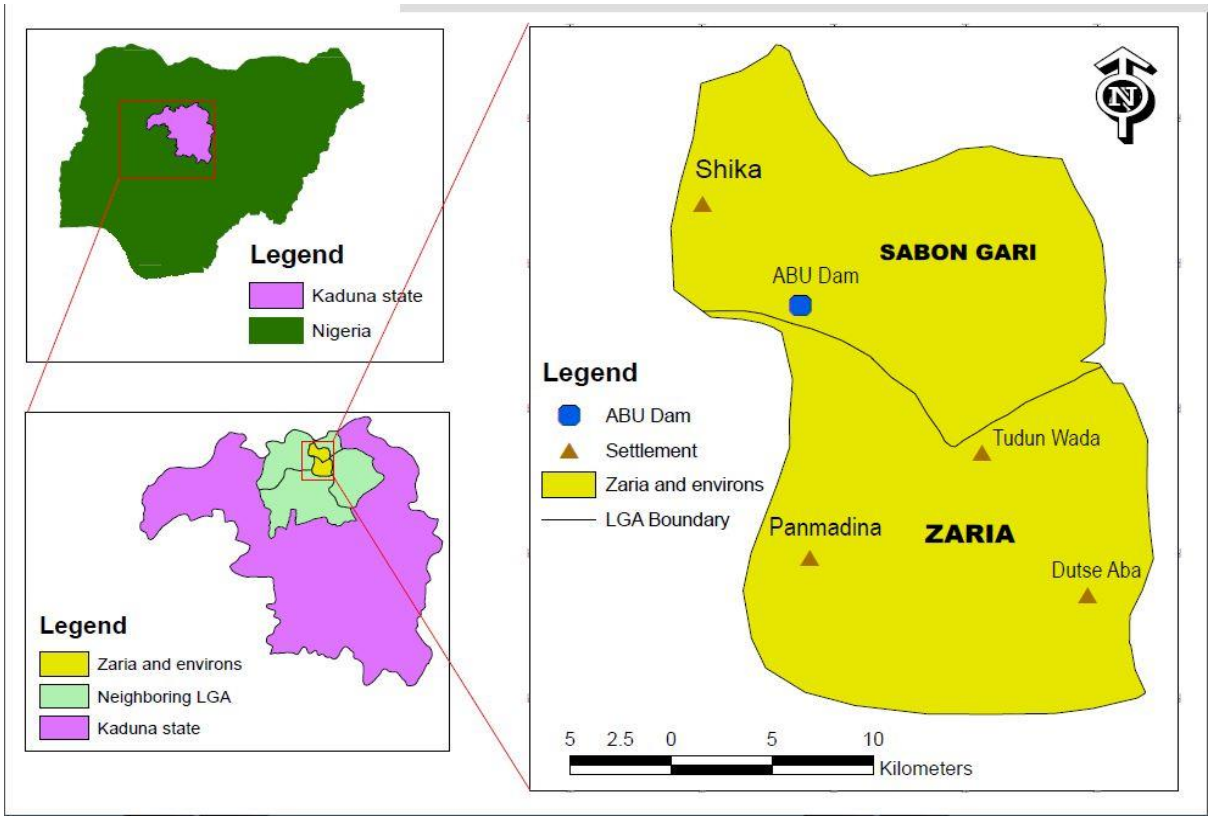


Figure 1.1: Map of the area of study.

Source: (Modified after http://www.gadm.org) (2013).

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

A Geographic Information System (GIS) is a computer-based information system for input, management, analysis, and output of geographic data and information. It deals with collection, storage, retrieval, manipulation, analysis, and display of spatially related information. GIS applications has been explored over a wide range of fields which includes public health, crime mapping, national defence, sustainable development, natural resources, climatology, landscape architecture, archaeology, regional and community planning, transportation and logistics e.t.c. GIS application has also been successfully explored in conducting a free and fair election in Nigeria as in the case of 2015 elections.

Suitability analysis in a GIS context is a geographical or GIS-based process used to determine the appropriateness of a given area for a particular use. The basic premise of GIS suitability analysis is that each aspect of the landscape has intrinsic characteristics that are to some degree either suitable or unsuitable for the activities being planned. Suitability is determined through systematic, multi-factor analysis of the different aspect of the terrain. Model inputs include a variety of physical, cultural, and economic factors. The results are often displayed on a map that is used to highlight areas from high to low suitability.

2.1 Theoretical Framework

2.1.1 The concept of election

Election is a very important component of the democratic process in any country because, it is a formal decision-making process by which a population chooses an individual to hold public office, and hence all the other variables of democracy revolve around elections

(Uwaifo, 2012). It is the cornerstone in democracy, it allow a viable and peaceful change without acrimony or violence. Elections offer a unique opportunity to create a legitimate government and governance in the system, unlike other undemocratic systems change is impossible, but democracy offers a periodic change through elections based on the performance of the political party in power.

Election in Nigeria is a serious business, because of the power, fame, economic benefit and the influence it commands. It is seen as a source of livelihood and a rapid means to acquire wealth and power in the society. Therefore, there is a violent scramble among the political gladiators, actors and others for political offices. This is to maintain their grip on key strategic positions in government, not for services to the people or for the duties and responsibilities of the office, but for among others things, societal recognition, political relevance, money, and government contracts (Uwaifo, 2012).

2.1.1.1 The purpose of election

Elections, according toOdukoya, (2007) as quoted by Uwaifo, (2012), serve three main purposes in a democratic society. Firstly, elections serve as a means for people to choose their representatives; secondly elections are a means of choosing governments; and thirdly elections give legitimacy to the political system.

Elections serve many purposes for democratic consolidation and transitions. It gives the masses the opportunities to have a say in who governs them and how they are governed. Elections are constant reminder to public office holders of the limited nature of modern government. Other purposes of elections are but are not limited to the following.

Election gives common people the right to choose their leader, thus, the government is hence answerable to the common mass.

a. It serves as the most legitimate means of resolving intra-elite conflicts.

b. It facilities orderly and smooth transfer of political power from one level to another.

c. It enhances participatory democracy and contributes to the effectiveness of the political system in attaining societal goals and objectives.

d. It breeds confidence and trust in the electoral process.

e. It allow for effective and efficient assessment of the democratic system in a country.

Odukoya, (2007) as quoted by (Uwaifo, 2012) further asserted the value and essence of elections, by contending that election is an empirical demonstration of a citizen's liberty and political choice. It is for this that it serves to legitimized the government. That it provide a veritable platform for transformation of the lives and welfare of the people through good governance. It serves the purpose of creating confidence and legitimacy to the electoral process and adding value also to whole process.

2.1.2 Some election requirement definitions

2.1.2.1 Polling Ward

A polling ward is a geographical area created by the sub-division of a Nigerian Parliamentary constituency for the purposes of an election. It is a geographical sub-division of an electoral area; polling wards are the basic building blocks and serve the place where voters go to vote. In some cases, each electoral ward is divided into two or more polling wards unless there are special circumstances. Given the size of wards in Nigeria, it is difficult to envisage what those special circumstances might be in practice (ACE, 2015).

2.1.2.2 Polling place

A polling place is the building or area in which polling units will be selected by the Electoral Returning Officer. A polling place within a polling ward must be designated so that polling stations are within easy reach of all electorates from across the polling ward. Some authorities designate the entire polling ward as the polling place.It should be considered that polling places should always be defined more specifically than simply the polling ward - for example, by designating the name of the polling place (normally a particular building or area and its environs) (ACE, 2015).

In other words, a polling place is a geographical area in which a polling unit is located. Also, geographical area can be defined as tightly as a particular building or as widely as the entire polling district. Where a polling place is not named, by default it is the whole polling ward. In practice this is the norm unless it becomes necessary to take the polling station outside of its polling district when a particular place is defined (ACE, 2015).

2.1.2.3 Polling Unit/booth

A polling unit is the actual location where the process of voting takes place and must be within the polling place for the particular polling ward. Unlike polling wards and polling places which are fixed by the Electoral Commission, polling units are chosen by the relevant Returning Officer for the election. To increase eligible citizens' participation in exercising their franchise, polling units within, or very close to the premises of politicians, traditional rulers, religious bodies, state and local authorities, private properties, etc., as well as in open spaces, are relocated to public buildings, preferably public schools (ACE, 2015).

2.2 Elections in Nigeria

Elections in Nigeria from 1999 till date have continued to recycle in a vicious violence and unimaginable manipulation especially from the political elites; this has attracted the attention of local and International community (Suberu, 2007). The challenges in restructuring the dilemma of electoral process in Nigeria from transiting power from ruling party to opposition parties peacefully has relegated good governance to the back pew (Rakner and Svasand, 2002). The history of elections in Nigerian state has been characterized by threats to statehood based on the manipulation of ethnicity as divisive mechanism for the acquisition of political power by political actors, the fragile nature of political cum democratic institutions is acquainted with poor democratic culture among Nigerian citizen (Omodia and Egwemi, 2011).

The electoral process in first and second republics was terminated with coup d'état from the military juntas (Kurfi, 1983). This tied good governance in the stagnant hands of political leaders and the saboteurs from the opposition parties on the basis of government in power to reconcile cracks in statehood due to electoral contest (Azelama, 2010).

Nigeria has witnessed five general elections in this fourth republic: in 1999, 2003, 2007, 2011 and then in 2015. It appears that incumbency factor from the holders of power is a stumbling block to good governance. This electoral process is on the purview of the Independent, Electoral Management Body (EMB) known as Independent National Election Commission (INEC) in Nigeria (Ajayi, 2006). The high handedness in manipulating the 1999, 2003 and 2007 electoral process by the ruling Party (PDP) and other political parties in all the polling centres nationwide is alarming, this has led to political killings, religious bigotry, industrial actions, insecurity and other socio-economic malady (Ayoade, 2008). The election was rigged with bitterness full of rancour, the ruling party (PDP) acted with desperation to ensure

winner-takes-all syndrome with “do or die” affair for the interest of their party (African Report, 2007).

Similarly, the 2011 elections were a beehive that democracy is a pre-condition for good governance, from what we experience before and after the elections this exercise move Nigeria to a greater height for instance the governorship and Senatorial elections that brought Governor Rochas Okoracha of Imo state and Senator Chris Ngige of Anambra Central senatorial district in 2011 is a clear testimony that peoples vote can count in Nigerian elections at allodds (Vanguard, January 10, 2012) quoted by Nnamani (2014).

The umpire body under the headship of Professor Attahiru Jega came with the reform to overhaul Nigeria electoral body and remove all the bad eggs especially the state resident commissioners who are bent on collecting “Fat-Brown-Envelops” to pronounce their pay master as winner of the election to jeopardize good governance. The services of academic Professors were employed in all the polling centres nationwide as collation and returning officers to sanitize the rot in the electoral body (Nnamani, 2014). After the total cleansing of the electoral body, the losers in 2011 general elections especially from the opposition parties decided to plunge the nation in a collapsed state because of their parochial and personal interest.

Everyone who is familiar with elections in Nigeria will agree with the assessment provided by scholars that, Nigeria is in the league of less successful countries in the areas of election management and its outcomes because of the different interest in Nigeria contending for different level of position in government. Elections in Nigeria are significant not only on the political level, but also in the area of economics. Given the highly centralized nature of government as a result of decades of military rule, political power and economic resources are concentrated in the hands of political leaders. As such, politics in Nigeria could be called

the ‘politics of allocation’, through which electoral victory is intimately tied to ‘access to the state as an avenue for wealth accumulation and conferment of status’ (CDD, 2003)as quoted by (Uwaifo, 2012).

2.2.1 The Nigerian electoral process

According to Elekwa (2008), the election process (electoral process) relates to the entire cycle ranging from the provision of voter education to the dissolution of the National Assembly. Furthermore, INEC (2006), deposes that the different phases of the electoral process include the following:

i. Delimitation of electoral boundaries
ii. Registration of voters
iii. Notice of elections
iv. Nomination of candidates
v. Election campaigns
vi. Elections, announcement of results and completion of tribunal sittings
vii. Participation of other organizations
viii. Resolution of electoral conflicts resulting from the participation of other organizations, people, groups, etc.

The figure below shows the electoral cycle which encompasses the whole of the electoral process as performed in Nigeria.

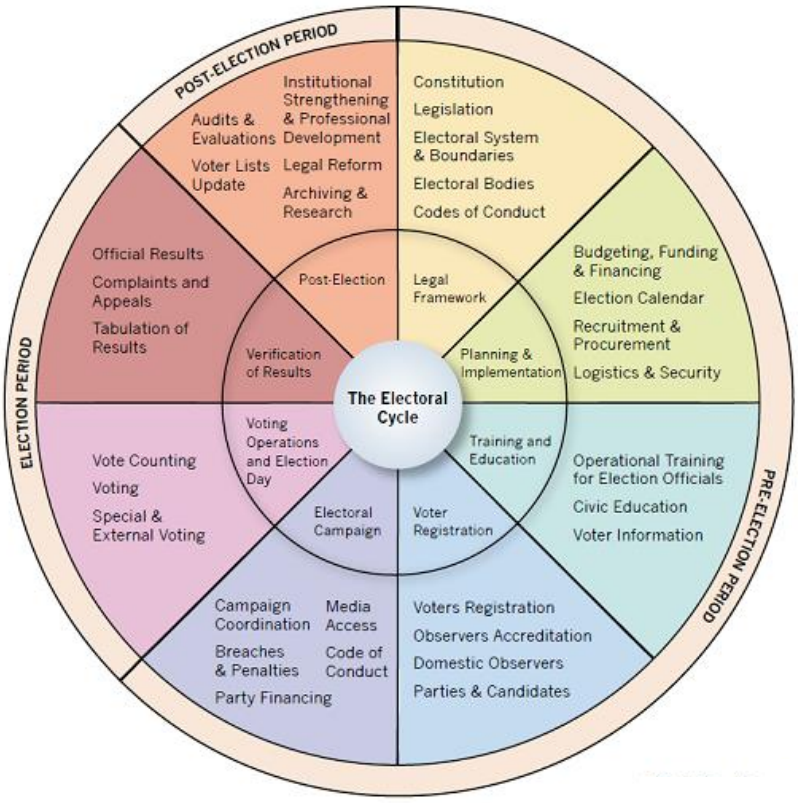


Figure 2.1:The electoral cycle showing the electoral process in Nigeria.
(Source: INEC, 2015)

Ezeani (2004) rightly concluded that the electoral process is a complex process that encompasses the good intentions and undesirable outcomes of election administration, particularly in emerging democracies where general elections are often marred by culturally hued electoral malpractices. In the Nigerian case, the truth remains that the electoral process is immensely characterized by a culture of electoral malpractices. Electoral malpractices refer to illegalities committed by government officials responsible for the conduct of elections, political parties, groups or individuals with sinister intention to influence an election in favour of a candidate or candidates.

2.3 Review of Related Researches

2.3.1 AHP on site selections

Analytic Hierarchy Process (AHP) was proposed by American scholar Dr.Saaty in 1970. This method can be used in predicting, analyzing, planning and solving complicated questions,

and can also be used to evaluate program, manage conflicts, or distribute resource into a hierarchy during system's decision-making process (Lin, 1988). It first decomposes the complicated situation into a hierarchy and its factors, and gives each factor a subjective determine value based on their relative importance, then finally integrate these results to determine the factor's priority or relative importance(Chang and Lin, 2007) as quoted by (Tseng*et al.,* (nd)) . Therefore, many past studies mostly used AHP as analysis method to evaluate ecotourism indicators.

Onut and Soner (2007) used AHP to draw up hierarchy principles and calculate relative weight, then used Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) to fuzzify, and establish a site selection mode for solid waste transport station. Dey and Ramcharan (2007) used AHP to establish hierarchy framework of evaluation factors, and through expert questionnaires comparing each hierarchy and its relative weight could be used as reference for the site selection of quarry expansion decisions. From this, the application of AHP has a very wide range and it can cross over different site selection topics. Because the site selection of potential ecotourism resource area also matches the characteristics of multi-principle and multi-goal, many scholars chose AHP as their main research method when doing ecotourism related site selection evaluation.

2.3.2 GIS in site selections

GIS is a geographic information system that integrates map and data, collects spatial data in digital form, captures, stores, manipulates, analyzes, manages, and presents all types of geographical data, and is an important tool for handling and analyzing geographical information (Shi, 2000). GIS is divided into four parts from its framework: computer hardware, software, database and user. This is a rapid growing interdisciplinary new technology in recent years. The theory and technology it covers come from many different

subjects, including geography, cartography, surveying, mathematics, and information science. From the application level, its involvement is even more extensive, covering environmental impact assessment, resource management, land planning, urban and regional planning, geographical location, traffic management, transport planning, forest management, conservation, and archaeological investigation. It can be said that all subjects related to geographical elements or spatial data can use GIS to assist.

Due to its multi-spatial analysis function, GIS is often used in location selection studies, exploring location arrangement or evaluate site selection; for instance, Tegou, et al (2007) used land suitability to evaluate windfarm siting, integrating MCDA and GIS, then AHP to calculate principle weight, and finally select a suitable site for wind farm. Furthermore, Senes and Toccolini (1998) combined UET (Ultimate Environmental Threshold) method with map overlays to evaluate land suitability for development. Hall *et al.* (1992) and Wang (1994) also used map overlays to define homogeneous zones, but then they apply classification techniques to assess the agricultural land suitability level of each zone. These classification techniques can be based on Boolean and fuzzy theory (Hall *et al.,* 1992) or artificial neural networks (Wang, 1994).

GIS has been used extensively in site selection, and the biggest difference GIS has compare to past site selection tools is when doing site selection, it can effectively integrate attribute data of each source, perform spatial analysis, create spatial analysis process, and finally use particular map image to present analysis results (Chang and Lin, 2007) as quoted by (Tseng*et al.,* (nd)). For this reason, Tseng*et al.* (nd) used GIS to undergo overlay analysis of the attribute layers needed from ecotourism resource indicators, then present the distribution of potential ecotourism resource areas in a map form.

2.3.3 Integrating AHP and GIS on site selections

By integrating AHP and GIS, it combines the dual characteristics of multi-criteria and spatial characteristic, and recently this is often used in studies related to spatial decision supporting system. For example, Vahidnia, Alesheikh and Alimohammadi (2009) used the combination of fuzzy AHP and GIS in its Multi-Criteria Decision Analysis (MCDA) process, in order to determine the best location for a new hospital in Tehran City. To search for a best suitable location fora landfill in Turkey, Sener, Sener, Nas andKaraguzel (2010) analyzed each evaluation element through AHP, and then used GIS to overlay all the related map layers; four candidate locations were selected, and finally discussion and suggestion were made on each candidate location.

The above literature all have one thing in common, their research goal is to build a site selection model, and use AHP to systemize the complicated problems of multi-principle, establish related factors and its calculated relative weight, and then integrate the spatial analysis function of GIS, overlay map layers of each related factors, screening and presenting the best suitable distribution areas of the research, and finally provide it to related agencies as reference for spatial decision making.

Facing the increasing complex of public policy issues, the spatial analysis ability of GIS has gained more and more attention, and is often seen in multi-criteria site selection studies. Current site selection studies of ecotourism mostly use AHP to establish their hierarch framework, and have already been seeing results in the establishment of indicators and principles. But past studies often ignored the spatial analysis of ecotourism, and are in lack of related spatial selection model. Therefore, this study wishes to combine these two analysis tools, compensate for each other's inadequacies, in order to make the results of this study more complete.

Combining GIS and MCE is also a powerful approach to land suitability assessments. GIS enable computation of the criteria while a MCE can be used to group them into a suitability index. Following a similar approach, Eastman *et al.* (1993) produced a land suitability map for an industry near Kathmandu using IDRISI (a raster GIS) and AHP (Analytical Hierarchy Process) (Saaty, 1980).

2.4 Geographic Information System (GIS) in the Electoral and Political Process

2.4.1 The Geographic Information System (GIS) concept and its uses

New technologies have created a powerful paradigm shift in political campaigning (Spiller & Bergner, 2010). Elected officials are no longer merely pictures on a classroom wall or caricatures on a television screen. The convergence of the Internet, computers, and social media tools has made politics and election an immediate as well as interactive process. Political candidates have an intimacy with their constituents on a large scale that would not have been possible without modern technology. One of the most significant tools is a Geographic Information System (GIS), which is a sophisticated mapping technology (Hanewicz, 2012). The Electoral Commission and politicians can review political hot spots at a glance or determine which neighbourhoods to focus their message. The diverse applications of GIS have made its use attractive to people in business, industry, government, and education.

A Geographic Information System is a computer-based database system that is used to store, analyze, and manipulate geographically referenced data. The most common output of a GIS is a map, and the online website, MapQuest, is a familiar example (Hanewicz, 2012). Spatial data stored in a GIS contain latitude and longitude or x,y coordinates, which are used to draw roads, geographic borders (e.g., state boundaries or voting districts), and pinpoint locations. Attribute fields can be used to add information such as the name of a city, which can be

displayed onscreen or printed on a map. Hanewicz (2012) noted that inherent in any GIS application is the capability to enter data through actions such as scanning and digitizing maps, importing existing database information, or entering data directly into the system. What makes a GIS so powerful is its ability to layer thematic maps vertically, such as a population density map over a city map, and calculate distances between two or more locations accurately.

Geographic Information Systems have their roots in the geography profession, and their use can be traced back to the mid-1950s (DeMers, 2003). Initially, geographers created maps of natural resources. These activities were funded primarily through government officials, because they had the money to support these costly endeavours. Professionals in other fields began using GIS for their own operations as information technology and processing power expanded while related computing costs decreased (Pick, 2008). Leading industries that use GIS systems include utility companies, transportation authorities, real estate corporations, and retail stores. Utility company personnel are able to plan and map power lines or water pipes as well as track the location of their customers (Fritz andSkerfving, 2005; Grimshaw, 2000; Somers, 2004). Transportation authorities track fleets of trucks in real time by integrating Global Positioning System (GPS) tools with their GIS systems. GIS technology can help manage plans to add new airports and runways while increasing safety and efficiency (Kalinski, 2010). GIS has the capability to track events and trends, which makes it a valuable tool for health care professionals and law enforcement officials.

It is however important to note that, while there has been an increase in GIS use among business and government personnel, its application in higher education has not been as widespread (Sanders, Jr., Kajs, and Crawford, 2001).

2.4.2 Geographic Information System (GIS) for election planning and management

It has been postulated that the GIS technology presents the most appropriate technology for delimitation of voting districts and for constructing a reliable reference framework for facilitating voting purposes over geographical space. Although it is possible to construct GIS manually, the term is frequently used to connote a computer-based tool for creating, mapping and analysing data with geographic (i.e. spatial) references. This makes electronic GIS to be viewed and described as an intelligent mapping technology (Ingwe *et al*., 2012). Using GIS for precincting and redistricting and other election support activities is still an unexplored world for many countries. Some governments both within and outside Nigeria have embraced GIS technology in land-use planning, parcel database maintenance, transportation analysis, and infrastructure management. So, why not for election support as well?

One of the areas that have attracted interest in the Internet is application of GIS in mapping the electoral process. Mapping and spatial analysis improve the electoral process hence GIS is used to deliver critical information to stakeholders. Application areas include managing voter address data, locating polling stations and delivering election results. Some of the maps are not only conventional static maps used to display electoral information, they are also interactive hence attracting voter/ user participation. Ko (2010) analyzed the strength of interactive electoral maps and stressed that media websites including television and newspaper websites used them to display and tract the election results. Also, because of its dynamic nature they can equally be used for projecting outcomes based on displayed census figures (Udoh, 2014).

GIS is not just magic box, as people assume it to be, but (simply) an extension of one's analytical thinking. It has no inherent answers, only those of the analyst, it is a tool, just like statistics is a tool, it is a food for thought. GIS will be a very useful tool for promoting free,

fair and credible election as a means of ensuring that democracy and good governance prevails in the country (Nigeria), Africa, even to other countries of the world; all these can be achieved if the polling station as centres of vote collection are well located(or mapped).

2.4.3 The use of Geographic Information System (GIS) for electoral boundary delimitation and redistricting

The term "boundary delimitation" usually refers to the process of drawing electoral district boundaries. However, it can also be used to denote the process of drawing voting areas (also called polling areas, districts or election precincts) for the purposes of assigning voters to polling places. The term has been employed to describe the process of demarcating administrative boundaries such as state/province, county or municipality lines as well. The periodic delimitation of electoral boundaries, or redistricting or redistribution, is necessary in any representative system where single-member districts or wards or where multimember districts/wards are used. If electoral boundaries are not periodically adjusted, population inequities develop across wards (Carlton, 1989).

Redistricting is a constitutional mandate. At intervals, all local, state, and federal government officials are expected to use census data to redraw their election districts. The purpose of redistricting is to maintain appropriate representation that reflects changes in the population. Many regulations have been enacted to protect the “one person, one vote” edict, since this process can be a politically sensitive activity. Redistricting can impact significantly the fate of incumbents, political parties, interest groups, school districts, and citizens. Distribution of public funds is also a salient concern. Nunnari and Ueda (2010) found that counties that were divided into more congressional districts through redistricting received less federal funding.

Historically, redistricting was based on hand-drawn maps often produced in private, smoke-filled rooms. It was an arduous process, required numerous man hours, and may or may not

have resulted in equitable outcomes. According to Hanewicz (2012), redistricting is a geographic problem and GIS is the geographic solution. Mapping technology has been used in the redistricting process since the 1980s. Today, powerful computers are affordable to the average user, and thousands of solutions cost much less to produce. Geographic Information System technologies have already been used successfully to share information with citizens and receive feedback from them as well.

It is therefore imperative to note that, the power of a Geographic Information System is that it is not just a one-dimensional technology. Thematic layers can be used to create a multidimensional view of a geographic area over time. This type of mapping can show changes in population density, fluctuations in air quality, or evolving political-party affiliation. Consequently, administrators throughout the political system have found innovative ways in which to use the spatial and organizational capabilities of a GIS.

2.4.3.1 Tasks involved in drawing electoral ward/district boundaries

Although the rules for delimitation vary markedly across countries, the tasks involved in drawing districts are generally very similar. Drawing district boundaries entails:

i. Allocating seats to sub-regions of the country, such as states or provinces;

ii. Creating a database minimally composed of maps and population data;

iii. Assigning geographic units to districts until all geographic units within the territory have been assigned;

iv. Summarising and evaluating the districting plan.

This can be a complex, time-consuming and expensive process.

2.4.3.2 Delimiting voting areas

Most countries, regardless of the type of election system employed, delimit voting areas for the administration of elections. Voting areas are contiguous geographic areas in which all the voters are assigned to the same voting (or polling) station. Since voting areas are used for election administration purposes only, the boundaries of these areas tend to be less controversial, and the delimitation of these areas is usually left to the discretion of election administrators. However, the data required and the tasks involved in the delimitation of voting areas are similar to those involved in drawing electoral district lines(Handley and Bernard, 2008).

2.4.3.3 GIS and boundary delimitation or delineation

Geographical Information Systems (GIS) store spatial and attribution data for redistricting purposes, the spatial data is location-based information; the attribute data is data that describes a particular location. An example of spatial data would be the location of a house (spatially known as a point) or occupied dwelling while examples of attribute data could be the address of the house, the street name on which it is located, the electoral district in which it is found and the number of people living in the house to mention only a few (Handley,2006). The ability to relate spatial information to attribute data is what makes GIS a powerful tool for redistricting purposes.

Moreover, GIS shortens the time required to draw boundary lines and aggregate/display the demographic data related to the map. While GIS can be costly, it may be a cost worth bearing depending on the frequency of redistricting and on the size of the area to be redistricted. The instantaneous feedback and ease of creating multiple scenarios for consideration improves the redistricting process.

Handley (2006) stressed that, while there are a number of software packages specifically marketed as redistricting software, whichever package is chosen should contain the following functions to be considered optimal:

a) Create/modify/delete new boundaries
b) Assign census polygons (counting areas) to new boundaries using a wide variety of methods
c) Display running population counts and demographics as census blocks (the smallest population count aggregation area) are assigned to new boundaries
d) Display and print maps and reports
e) Query and select data
f) Validate new boundaries
g) Overlay with satellite imagery
h) Allow block (counting areas) splitting
i) Multi-lingual (tools and reports/maps for countries with more than one ”official” or ”national” language)
j) Access to other Geographic data via the Web

Redistricters using GIS software have a variety of sophisticated tools at their disposal for creating district plans. GIS software can be used to draw new wards/districts by assigning geographic units to the wards or by moving particular geographic units out of one electoral ward into another (Handley, 2006). The effects of the reassignment on the population, or any other demographic or political characteristics of the districts, can be immediately reflected on the computer screen as shown in the following screen capture:

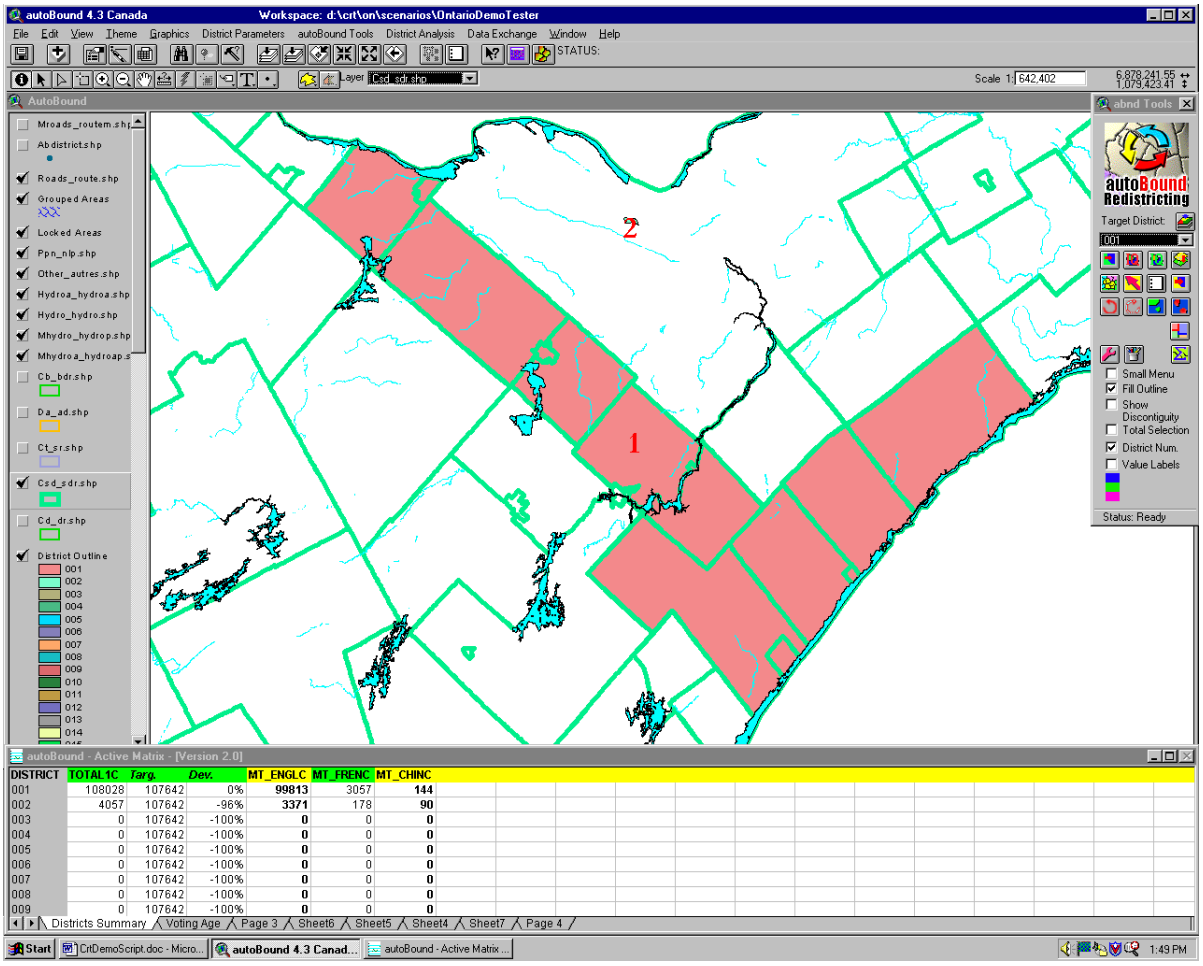


Figure 2.2: Electoral boundary delimitation executed in Arcmap.

(Source: ACE, 2015)

In the above figure, each boundary line can be dragged to a new location. Each polygon (enclosed area) can be added to the one touching it. The corresponding demographic variables, shown in the table under the map, update automatically. Once a new plan has been created, the GIS software can produce a map and report of the new district plan or any individual district. GIS software essentially consolidates all redistricting operations into one efficient system.

2.4.3.4 Limitations of GIS for electoral boundary delineation

While GIS is a great improvement over manual redistricting, GIS software does not provide a Push button ("Push a button and it's done") solution to boundary delimitation. The basic activity of redistricting, aggregating census blocks into a new or existing electoral district to approach population equality in the redistricting plan (and mapping the result) is only one requirement in redistricting, albeit the most important. Others factors that may need to be considered include legislation such as the Voting Rights Act (USA), and the Official Languages Act (Canada), minority representation, linguistic representation, racial representation, geographical size (geographically large and/or compact districts), transportation routes, administrative boundaries, community of interest (or identity), historical pattern of a district and contiguity. It would be very difficult to weight the preceding factors to the effect that they could be used efficiently within a GIS system, hence, a great deal of human interaction with the redistricting scenarios generated is required (Carlton, 1989).

Complexity of the GIS software must also be considered. The most optimal software packages also require a knowledgeable user. To get a boundary delimitation body operating in as little time as possible, it may be necessary to hire consultants or GIS technicians to assist. Alternatively, the electoral management body, if it is required to assist the boundary authority, may have GIS staff available for that purpose.

2.4.4 Considerations for delineating voting areas

Voting areas are administrative units that are used only for conducting elections. They are contiguous geographic areas where all voters within the circumscribed territory are assigned to the same polling place. Voting areas are known by a variety of different labels, depending

on the country. In Commonwealth countries, for example, they may be referred to as polling areas, voting or election districts, or election precincts (ACE, 2015).

Voting areas are necessary for the technical implementation of an election. A given territory must be subdivided in such a way as to enable voters to travel as conveniently as possible to a polling site and cast their ballots. In addition, assigning electors to voting areas allows election administrators to keep track of who is voting. This ensures that no one casts more than one ballot.

Unlike electoral districts, where the type of electoral system determines how crucial delimitation is to the outcome of an election, the delimitation of voting areas has a minimal effect on election outcomes. Voting areas are used merely to collect votes; they are not used to translate votes into seats in a legislative or parliamentary body.

Because voting areas are used for election administration only, the delimitation of voting areas is not controversial and is normally left to the discretion of election administrators. Electoral laws or regulations, however, may specify certain criteria for delimiting voting areas.

2.4.5 Criteria for delimiting voting areas (polling units)

According to ACE (2015), the following criteria should be considered when delimiting voting areas, even if no criteria are specified by law:

i. Population size
ii. Pre-existing administrative and electoral district boundaries
iii. Convenience and accessibility for voters.
iv. The proximity of the polling place to populated areas
v. Signage for voters and people with disabilities
vi. Management and configuration of the polling station

vii. Capacity of polling places to accommodate more than one polling station if necessary

viii. The number of registered voters within the district

ix. Recent development (Land Use) and population changes

Carlton (1989) opined that, although voting areas differ dramatically in size of population: within a country as well as in different countries, there is a minimum and a maximum number of voters that can be efficiently and effectively served by a single polling unit. It may not be feasible to establish a polling unit for only a handful of voters. On the other hand, assigning too many voters to a single polling unit can result in long lines of frustrated voters waiting to cast their ballots at an election. The optimal minimum and maximum numbers vary, depending on local conditions and available resources and technology.

Administrative and electoral district boundaries should be taken into account when creating voting areas because these boundaries determine who votes for a particular set of offices and candidates at an election. If the boundaries of voting areas cross administrative or electoral district boundaries, election administration will become more complex. Different ballot styles listing different offices and candidates will be needed for voters within a single voting area. Producing and disseminating several different ballot styles within a single voting area can be complicated and expensive.

Convenience and accessibility are also important factors to consider when drawing voting areas. The boundaries of a voting area should be drawn around a polling unit that is centrally located, easy to travel to, and accessible to all eligible voters assigned the polling site. Factors such as the time needed to travel to the polling unit and accessibility to public transportation should also be taken into account. Some countries, for example, specify by law the maximum distance that voters can be expected to travel to cast their ballots (Carlton, 1989).

2.5 Multi-Criteria Decision Analysis (MCDA)

Multi-criteria Decision Analysis sometimes also referred to as Multi Criteria Evaluation (MCE) often requires the decision maker to provide qualitative assessments for determining:

a) The performance of each alternative with respect to each criterion and
b) The relative importance of the evaluation criteria with respect to the overall objective of the problem.

As a result, uncertain, imprecise and subjective data are usually present which make the decision-making process complex and challenging (Deng and Yeh, 1998; Yeh*et. al.*, 1999) as quoted by (Akomolafe, 2015).

MCDA describes any structured approach used to determine overall preferences among alternative options, where the options accomplish several objectives. In MCA, desirable objectives are specified and corresponding attributes or indicators are identified. The actual measurement of indicators need not be in monetary terms, but are often based on the quantitative analysis (through scoring, ranking and weighting) of a wide range of qualitative impact categories and criteria. Different environmental and social indicators may be developed side by side with economic costs and benefits. Explicit recognition is given to the fact that a variety of both monetary and nonmonetary objectives may influence policy decisions.

Multi-criteria analysis or multi-objective decision making is a type of decision analysis tool that is particularly applicable to cases where a single-criterion approach (such as cost-benefit analysis) falls short, especially where significant environmental and social impacts cannot be assigned monetary values. MCA allows decision makers to include a full range of social, environmental, technical, economic, and financial criteria.

2.5.1 Decision

A decision is a choice between alternatives. The alternatives may represent different courses of action, different hypotheses about the character of a feature, different classifications, and so on. These set of alternatives is called the decision frame(Eastman, 2012).

2.5.2 Decision Rule

The procedure by which criteria are selected and combined to arrive at a particular evaluation, and by which evaluations are compared and acted upon, is known as a decision rule. A decision rule might be as simple as a threshold applied to a single criterion (such as, all regions with slopes less than 35% will be zoned as suitable for development) or it may be as complex as one involving the comparison of several multi-criteria evaluations.

Decision rules typically contain procedures for combining criteria into a single composite index and a statement of how alternatives are to be compared using this index. For example, we might define a composite suitability map for agriculture based on a weighted linear combination of information on soils, slope, and distance from market. The rule might further state that the best 5000 hectares are to be selected. This could be achieved by choosing that set of raster cells, totalling 5000 hectares, in which the sum of suitability is maximized. It could equally be achieved by rank ordering the cells and taking enough of the highest ranked cells to produce a total of 5000 hectares. Having insight from Diamond and Wright (1989), the former might be called a choice function(known as an objective function or performance index in mathematical programming literature) while the latter might be called achoice heuristic.

2.5.3 Criterion

A criterion is some basis for a decision that can be measured and evaluated. It is the evidence upon which an individual can be assigned to a decision set. Criteria can be of two kinds:

factors and constraints, and can pertain either to attributes of the individual or to an entire decision set.

i. Factors

A factor is a criterion that enhances or detracts from the suitability of a specific alternative for the activity under consideration. It is therefore most commonly measured on a continuous scale. Factors are also known as decision variables in the mathematical programming literature and structural variables in the linear goal programming literature (Ignizio, 1985).

ii. Constraints

A constraint serves to limit the alternatives under consideration. A good example of a constraint would be the exclusion from development of areas designated as wildlife reserves. Another might be the stipulation that no development may proceed on slopes exceeding 30% gradient. In many cases, constraints will be expressed in the form of a Boolean (logical) map: areas excluded from consideration being coded with a 0 and those open for consideration being coded with a 1.

2.5.4 Objective

Decision rules are structured in the context of a specific objective. The nature of that objective and how it is viewed by the decision makers (i.e., their motives) will serve as a strong guiding force in the development of a specific decision rule. An objective is thus a perspective that serves to guide the structuring of decision rules. Objectives are thus very much concerned with issues of motive and social perspective (Lemmessa, 2011).

2.6 Multi-Criteria Decision Analysis in GIS

Decision making is a systematic procedure for analyzing complex decision problems. The strategy is to divide a decision problem into small parts, analyzing each part and aggregating them to reach a meaningful solution. Decision making is defined as a selection of alternatives

and is used in many fields in both the social and natural sciences, including GIS. Geographers are often interested in connecting spatial components with decisions. For this reason GIS and Multi Criteria Decision Analysis (MCDA) complement each other (Elliot and Petrova, 2004).

MCDA offers a wide range of techniques and methods for decision makers to incorporate into a GIS environment. GIS offers unique capabilities for autoimmunization, managing and analyzing a variety of spatially related problems. GIS can provide techniques for analyzing geographic events where the analysis depends on spatial arrangements of the events. Many problems in environmental, economic and natural science are spatially related; therefore a combination of GIS and decision methods can benefit the decision making process.

MCDA also involves a set of alternatives that are evaluated under certain criteria. There are two major classes of MCDA. One is Multi Attribute Decision Making (MADM) and the other is Multi Objective Decision Making (MODM). MADM is based on choice from a small set of feasible attributes using decision criteria and priorities. MODM is designed to deal with feasible attributes bounded from particular constraints. Multiple objectives in MODM are considered simultaneously (Malczewski, 1999).

As indicated earlier, the primary issue in Multi Criteria Decision Analysis (MCDA) or Multi-Criteria Evaluation is concerned with how to combine the information from several criteria to form a single index of evaluation. In the case of Boolean criteria (constraints), the solution usually lies in the union (logical OR) or intersection (logical AND) of conditions. However, for continuous factors, a weighted linear combination (Voogd, 1983) is most commonly used. With a weighted linear combination, factors are combined by applying a weight to each followed by a summation of the results to yield a suitability map, i.e.:

$$S = \sum w_i c_i \qquad (2.1)$$

Where:

S = Suitability

w_i = Weight of factor i

c_i = Criterion score of factor i

As Stated by Eastman (2012), this procedure is not unfamiliar in GIS and has a form very similar to the nature of a regression equation. In cases Boolean constraints also apply, the procedure can be modified by multiplying the suitability calculated from the factors by the product of the constraints, i.e.:

$$S = \sum w_i c_i \times \prod c_j \qquad (2.2)$$

Where: c_j = Criterion score of the constraint j

$\prod$ = Product.

2.6.1 Criterion scores

All criteria are usually measured in different scales, which mean that they need to be standardized before being aggregated. There are different methods of scaling. The method that is used in IDRISI is known as linear scaling. It uses minimum and maximum values of the raw data in order to standardize criteria into range of 0 - 1 real scale or from 0 - 255 byte scale. The following formula is used:

$$x_i = \frac{(R_i - R_{\min})}{(R_{\max} - R_{\min})} * STANDARDIZED\ RANGE \qquad (2.3)$$

Where: R = raw value/score of the pixel

A critical issue in the standardization of factors is the choice of the end points at which set membership reaches either 0.0 or 1.0 (or 0 and 255). Research has suggested that blindly

using a linear scaling (or indeed any other scaling) between the minimum and maximum values of the image is ill advised. In setting these critical points for the set membership function, it is important to consider their inherent meaning. (Eastman, 2012).

2.6.2 Criterion weights

A wide variety of techniques exist for the development of weights. In very simple cases, assigning criteria weights may be accomplished by dividing 1.0 among the criteria. Breaking the information down into simple pairwise comparisons in which only two criteria need be considered at a time can greatly facilitate the weighting process, and will likely produce a more robust set of criteria weights. A pairwise comparison method has the added advantages of providing an organized structure for group discussions, and helping the decision making group to narrow in on areas of agreement and disagreement in setting criterion weights (Lemmessa, 2011).

The techique described and implemented in IDRISI is that of pairwise comparisons developed by Saaty (1977) in the context of a decision making process known as the Analytical Hierarchy Process (AHP). In Saaty's technique, weights can be derived by taking the principal eigenvector of a square reciprocal matrix of pairwise comparisons between the criteria. The comparisons concern the relative importance of the two criteria involved in determining suitability for the stated objective. Ratings are provided on a 9-point continuous scale (Figure 2-3). For example, if the decision maker feels that proximity to roads is very strongly more important than slope gradient in determining suitability for industrial siting, he would enter a 7 on this scale. If the inverse were the case (slope gradient was very strongly more important than proximity to roads), he would enter 1/7.

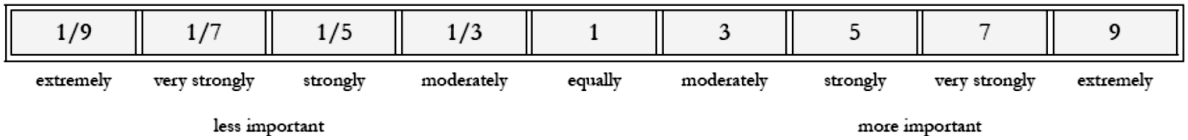


Figure 2.3: The continuous rating scale.
(Source: ACE, 2015)

All GIS software systems provide the basic tools for evaluating such a model. In addition, in IDRISI, a special module named MCE has been developed to facilitate this process. However, the MCE module also offers a special procedure called an Ordered Weighted Average that greatly extends the decision strategy options available. The procedure will be discussed more fully in the section on Evaluation below. For now, however, the primary issues relate to the standardization of criterion scores and the development of the weights (Eastman, 2003).

Geographical or spatial data is defined as unorganized data that is associated with a location. When the data is organized, analyzed and interpreted, it then becomes information. In this stage the data can be useful for the decision making process. Decision making processes that include geographical data and information are related to a geographical or spatial decision method (Elliot and Petrova, 2004).

Many managers and decision makers use data that is geographically related. For example, the population density by census tract refers to a particular location. Geographical and spatial data are interchangeable. In this case, facts, results of observation, remote-sensing images, census figures and statistics can be considered geographical data.

2.6.2.1 Criteria weighting methods

A decision maker outlines his preferences by assigning weights to the evaluation criteria. Deriving weights for each suitability criteria is a fundamental requirement for applying the

Analytic Hierarchy Process (AHP) method (Malczewski, 1999; 2004). The determination of the particular criterion weight is therefore a crucial step in Multicriteria Evaluation (MCE). The AHP is considered to be an adequate mathematical method for this step (weighting of factors) when analyzing complex decisional problems (Saaty, 1980 and Malczewski, 2004). It derives the weights by comparing the relative importance of the criteria in a pairwise manner. The weights can be derived using different methods. Most commonly used methods include ranking, rating, pairwise comparisons (AHP) and trade-off analysis.

Table 2.1: Summary of methods for assessing Criterion Weights.

	METHODS			
Features	**Ranking**	**Rating**	**Pairwise Comparison**	**Trade-off Analysis**
Number of Judgments	N	N	n(n-1)/2	<n
Response scale	Ordinal	Interval	Ratio	Interval
Hierarchical	Possible	Possible	Yes	Yes
Underlying Theory	None	None	Statistical/ heuristic	Axiomatic/ deductive
Ease of use	Low	High	High	Medium
Trustworthiness	Approximation	Not precise	Quite precise	Quite precise
Software availability	Spreadsheets	Spreadsheets	EXPERT CHOICE	LOGICAL DECISIONS (LD)
Use in a GIS environment	Weights can be imported from a spreadsheet	Weights can be imported from spreadsheet	Component of IDRISI	Weights can be imported from LD

Source: Malczewski (1999)

The decision rule combines the evaluation of criterion and weights of criteria and provides an overall assessment of the alternatives. It arranges the decision space by means of one-to-one or one-to-many relationships of outcomes to decision alternatives. A decision rule can be as simple as applying a threshold to a single criterion or as complex as involving a comparison of many multi criteria evaluations.Sensitivity analysis determines how the recommended action is affected by the change of inputs. This analysis checks for robustness of the decision

making process. It helps users to learn how decision elements interact in order to determine the most preferable alternative.

A fuzzy set indicates the measure of membership of the criterion, most commonly suitability or risk, and is a soft classifier. Hard classification or Boolean classifications provide a distinct division between what is a member and what is not, commonly referred to as a AND or a OR operator. The fuzzy set membership indicates a range of potential membership generally expressed on a scale of 0 to 1. This is particularly useful in raster based MCE applications of GIS. These fuzzy sets are commonly used with weighted linear combinations (WLC) and ordered weighted averages (OWA) (Elliot and Petrova, 2004).

The WLC combine the AND operators with OR operators (AND/OR) and is often used as an averaging operator (Jiang 2000). Therefore the aggregation process of WLC can be seen as a fuzzy measure. When using OWA the use of a AND or an OR operator is also known as MIN/MAX aggregation.

The standardization of factors can sometimes contribute to inappropriate standardization. Standardizations can over-generalize the factors and affect the overall decision making process. The disadvantages and advantages will be explained further in the AHP section.

2.6.3 Analytic Hierarchical Process (AHP)

The Analytic Hierarchy Process (AHP) is a multi-criteria decision-making approach and was introduced by Saaty (1980 and 1994). The AHP has attracted the interest of many researchers mainly due to the nice mathematical properties of the method and the fact that the required input data are rather easy to obtain. The AHP is a decision support tool which can be used to solve complex decision problems. It uses a multi-level hierarchical structure of objectives, criteria, sub-criteria, and alternatives. The pertinent data are derived by using a set of pairwise comparisons. These comparisons are used to obtain the weights of importance of the

decision criteria, and the relative performance measures of the alternatives in terms of each individual decision criterion. If the comparisons are not perfectly consistent, then it provides a mechanism for improving consistency (Triantaphyllou and Mann, 1995).

The Analytic Hierarchy Process (AHP), is an effective tool for dealing with complex decision making, and may aid the decision maker to set priorities and make the best decision. By reducing complex decisions to a series of pairwise comparisons, and then synthesizing the results, the AHP helps to capture both subjective and objective aspects of a decision. In addition, the AHP incorporates a useful technique for checking the consistency of the decision maker's evaluations, thus reducing the bias in the decision making process.

2.6.3.1 How the AHP works

The AHP considers a set of evaluation criteria, and a set of alternative options among which the best decision (goal) is to be made. It is important to note that, since some of the criteria could be contrasting, it is not true in general that the best option is the one which optimizes each single criterion, rather the one which achieves the most suitable trade-off among the different criteria.

The AHP generates a weight for each evaluation criterion according to the decision maker's pairwise comparisons of the criteria. The higher the weight, the more important the corresponding criterion. Next, for a fixed criterion, the AHP assigns a score to each option according to the decision maker's pairwise comparisons of the options based on that criterion. The higher the score, the better the performance of the option with respect to the considered criterion. Finally, the AHP combines the criteria weights and the options scores, thus determining a global score for each option, and a consequent ranking. The global score for a given option is a weighted sum of the scores it obtained with respect to all the criteria (Temiz and Tecim, 2009).

Table 2.2: Table showing the scale for pair-wise comparisons

Intensity of importance	Definition
1	Equal importance
2	Equal to moderate importance
3	Moderate importance
4	Moderate to strong importance
5	Strong importance
6	Strong to very strong importance
7	Very strong importance
8	Very to extremely strong importance
9	Extreme importance

In AHP methodology, calculations are performed to find the maximum eigenvalue (λ), consistency index (CI), consistency ratio (CR) and normalized values for each criteria/alternative. It should be noted that for preventing bias through criteria weighting, the Consistency Ratio is usually used. λ represents average value of the consistency vector, CI provides a measure of departure from consistency and CI and CR are calculated as shown in the following equations respectively.

$$CI = \frac{\lambda_{max} - n}{n - 1} \tag{2.4}$$

$$CR = \frac{CI}{RI} \tag{2.5}$$

Where:

n = the number of items being compared in the matrix

λ_{max} = the largest Eigen value

RI = random consistency index

RI is the random index and depends on the number of elements being compared, as shown in the table below (Saaty, 1980).

Table 2.3: Random inconsistency indices (RI) for n=1, 2, ..., 15.

N	RI	N	RI	N	RI
1	0.00	6	1.24	11	1.51
2	0.00	7	1.32	12	1.48
3	0.58	8	1.41	13	1.56
4	0.90	9	1.45	14	1.57
5	1.12	10	1.49	15	1.59

Source: (Saaty, 1980)

If CR<0.10, the ratio indicates a reasonable level of consistency in the pair-wise comparison; however, if CR≥0.10, the values of the ratio indicates inconsistent judgments.

If the maximum eigenvalue, CI and CR are satisfactory, then decision is taken based on the normalized values; otherwise the procedure is repeated until these values lie in a desired range.

2.6.3.2 AHP and Fuzzy standardization of factors

In order to perform AHP in IDRISI, a fuzzy standardization must be performed for all factors. The factors are rescaled to a particular common range according to some function by fuzzy standardization. In order to use fuzzy factors within MCE, these factors are standardized to the byte level range of 0–255. The suitability increases as the areas get closer to the value of 255 (Temiz and Tecim, 2009).

2.6.3.3 Pairwise comparison

The pairwise comparisons create a ratio matrix and weights determined by normalizing the eigenvector with the maximum eigenvector of the ratio matrix. Thomas Saaty developed this method in 1982 and it is incorporated in AHP.

	Road Proximity	Town Proximity	Slope Gradient	Small Holder Settlement	Distance from Park
Road Proximity	1				
Town Proximity	1/3	1			
Slope Gradient	1	4	1		
Small Holder Set.	1/7	2	1/7	1	
Distance from Park	1/2	2	1/2	4	1

Figure 2.4**:** An example of a pairwise comparison matrix for assessing the comparative importance of five factors to suitability.
Source: Vaidya and Kumar, (2006)

2.6.4 Suitability analysis (mapping) and Spatial Multi-Criteria Decision making

Suitability analysis or mapping, conceptualized as Multiple Criteria Decision Making problem, implies the assignment of values to alternatives that are evaluated along multiple decisions or criteria (Pereira *et al.*, 1993). In this regard, for Suitability Analysis in a raster environment, each grid cell in the database is taken as an alternative to be evaluated for its quality or appropriateness for specific purposes. Therefore, land suitability is a biological productivity of an area for a given set of uses (Lemmessa, 2011).

Criteria are both qualitative and quantitative. Decisions have to be taken at various levels starting from selecting, for instance, different livestock groups until the allocation of these groups for area that suite best. So the suitability analysis is a multiple criteria decision-making process.

2.6.5 Multi Criteria Analysis and GIS for suitability mapping

The GIS-based approaches to land-use suitability mapping have their roots in the applications of hand-drawn overlay techniques used by American landscape architects in the late nineteenth and early 20th century (Collins *et al.*, 2001). McHarg (1969) advanced the overlay techniques by proposing a procedure that involved mapping data on the natural and human-

made attributes of the environment of a study area, and then presenting this information on individual, transparent maps using light to dark shading (high suitability to low suitability) and superimposing the individual transparent maps over each other to construct the overall suitability maps for each land use.

Progress in computing sciences, including Geographical Information Systems (GIS) and Multi-Criteria Evaluation (MCE) can help planners handle this complexity of choosing a suitable site for a project. Choosing an appropriate location for an activity or a facility is obviously related to decision support and MCE. The problem can be generalized as a question of what must be done and where it should be realized. The purpose of planning (what) can involve a hospital (Malczewski and Ogryczak, 1990; Malczewski, 1991), a solid waste transfer station (Gil and Kellerman 1993), or more generally, any type of public facility. In a series of two articles, Malczewski and Ogryczak (1996) clearly defined the multiple criteria location problem. They also compared the advantages and the disadvantages of different MCE methods. Localization problems have also been treated with a more intensive use of GIS. Carver (1991) used GIS to evaluate various alternatives for nuclear waste sites. Then, he evaluates the effectiveness of three MCDA techniques used to compare scenarios in order to select the best one.Suitability assessment is similar to choosing an appropriate location, except that the goal is not to isolate the best alternatives, but to map a suitability index for the entire study area.

In summary of the research given to cite the polling units, a combination of Geographical Information System (GIS) and Analytical Hierarchy Process (AHP) is used in order to get the best location for the polling units considering all the international criteria necessary like land-use, roads, clinic, water bodies, population, slope and elevation. Idrisi selva and ArcGIS 10.1 software can be used to achieve suitability analysis for site selection. Since ArcGIS have

modules for image processing, interpretation and classification while Idrisi has modules for multi-criteria evaluation (MCD) which helps the decision maker to provide qualitative assessment for determining the performance of each alternative with respect to each criterion and the relative importance of the evaluation criteria to the overall objective of the problem. The strategy in combining MCD and GIS is to divide a decision problem into small parts, analyzing each part and aggregating them to reach a meaningful solution.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

For the purpose of this work, a base map, SRTM data, pollution data derived from population density map and Landsat 8 satellite imagery were used to generate the land-use map of Zaria, population of Zaria and to as well show the nature of the topography of the study area using ArcGIS 10.1, and IDRISI software. A seven parameters criteria was extracted from INEC objectives and summarized to polling unit proximity to voters, Road accessibility to INEC officials, Land use (public buildings, and open spaces), Clinic proximity, Slope and elevation, GMS masts and Water bodies.

This software was used for site suitability analysis using ArcGIS and IDRISI. The generated thematic maps of these criteria were standardized using fuzzy logic approach. A weight for each criterion was generated by comparing them with each other according to their importance. With the help of these weights and criteria, final site suitability map was prepared.

Analyzes of the data to determine a relative suitability for each goal was carried out and finally reclassifying preference into three categories of high, medium and low. Below is the flow chart of the methods used in achieving the aims.

For validation the map of the existing polling unit was superimposed on the produced map, a buffer of 50m was made based on the pollution of registered voters and further analysis were made using ArcGIS for necessary recommendation and proposals.

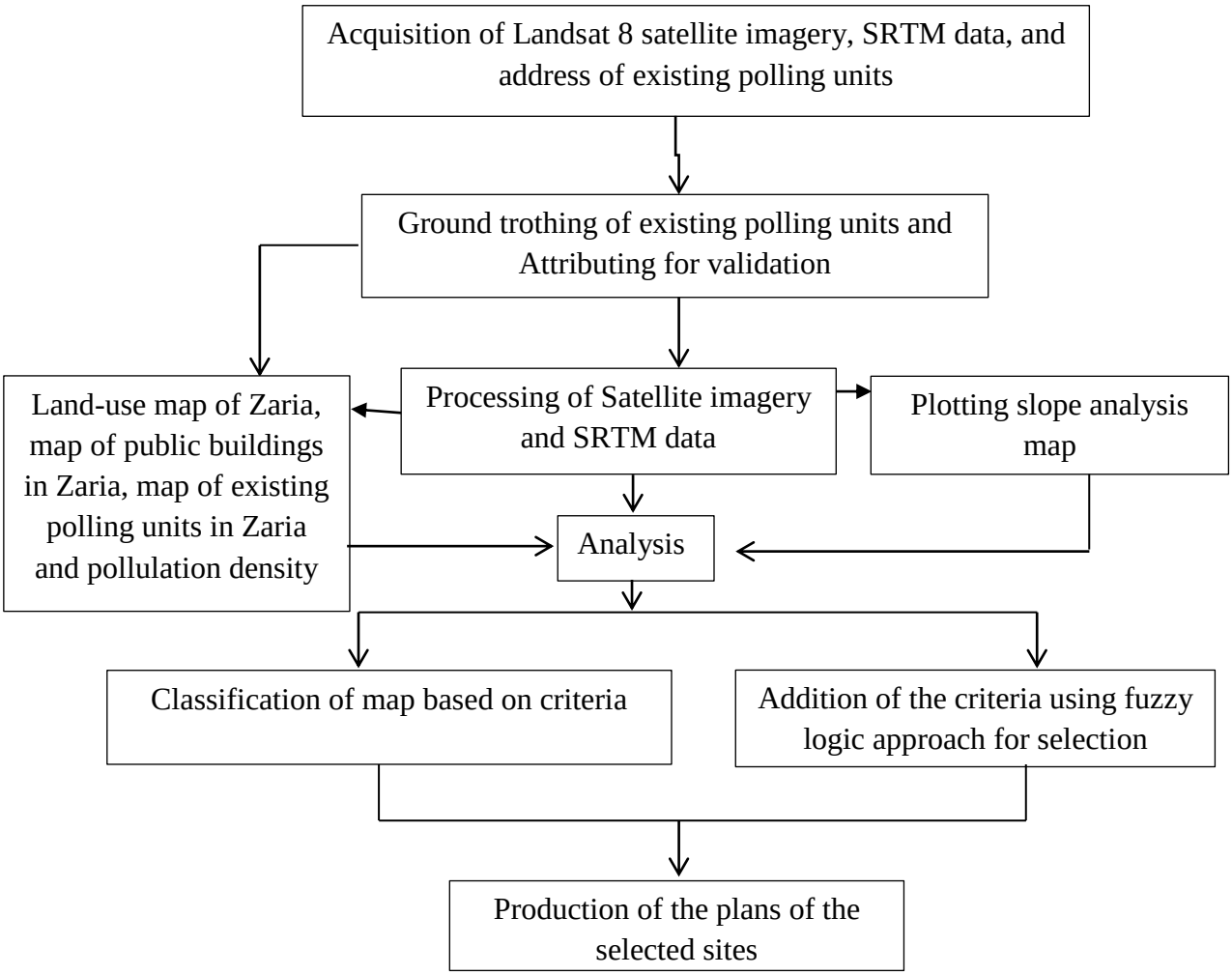


Figure 3.1: A flow chart of the methodology employed in this study

3.1 Reconnaissance

A reconnaissance survey was carried out in two phases which includes the field and office recce. The office recce which entails gathering information on the acquisition of data from INEC office, SRTM data from USGS web page, and acquisition of land use map from the Department of Geography, A.B.U., Zaria. The field recce involved how best is the use of handheld GPS to acquire the coordinate of the existing polling units and drive through of the study area to know the nature of the terrain.

3.2 Data

The dataset are both the primary and secondary data which are tabulated below. The primary dataset are required to provide detailed information to be used, the description of such information is shown in the Table 3.1 while the secondary data set would aid in the reviewing past jobs, knowing the limitations, recommendations and how to improve on such in carrying out the research.

Table 3.1: Description of datasets used in this study

S/N	Data Type	Date	Resolution/Scale	Source
1	Interview	May 2015	Not applicable	INEC office Abuja
2	GPS coordinates	2015		Field work
3	Imagery of Zaria (LANDSAT 8)	2015	30m	USGS website
4	SRTM	2015	90m	USGS website

The data used in this study as tabulated above is obtained from two basic sources:

3.2.1 Primary Data Source:

a) The interview was conducted by having discussion with INEC official at their Abuja Office and also asking of the location of the address of the existing polling unit from the people staying at each wards.

b) A handheld GPS (Garmin eTrex 10) was used in picking of the Coordinates of the address of the existing polling unit for validation test. And the Imagery for processing and derivation of land use while the SRTM data for the plotting of the Topography.

3.3 Equipment

The following equipment was available for the project:

a) A handheld GPS receiver (Garmin eTrex12); this is used for the ground trouthing of existing address of polling units. The data obtained were in Northing and Easting in UTM Zone 32P.

b) A Computer with ArcGIS 10.1, IDRISI selva 17.0 and Microsoft offices software installed; this is used for the processing of data and also for proper analysis to be carried out.

c) Booking sheet; this is used for the booking of the geocoded data on site against the address.

d) Landuse map of Zaria; this is used for the extraction of factors to be used for the suitability analysis.

3.4 Pre-Processing of raster and vector data

3.4.1 Data format

Using IDRISI selva, data from ArcMap 10.1 was imported by creating a new project on the idrisi explorer menu bar. Then using the file menu, importing of vector and raster can be converted to .vct and .rst respectively.

The maps are then displayed using the display menu tool. The maps imported as vectors include; built up area, industrial area, institutional area, highway, major road, other road, railway, track, hospital, masts, and schools while the maps imported as rasters include classified map, and slope (degree) map. The vectors were then rasterized by using the RASTERVECTOR command in IDRISI selva. During the rasterization, an initialization process was carried out for the entire vectors.

The copy spatial parameter from other image is selected and the classified image parameter is used so as to ensure the same cell numbers for each row and column for all the images (780 X 1147) during image addition and multiplications.

The distance map for each rasterized vector is created using the keyword DISTANCE and the resultant map for each factor was created.

The BREAKOUT function was used to separate all the six (6) classes in the classification map. Each class became criteria, and the factors (Open space, farmland, settlements, and wetlands) and constraints (water and rock). For the purpose of this work the farmland which covers majority of the area was discarded to avoid depicting the whole area as unsuitable.

3.4.2 Standardization

Using the key word FUZZY in IDRISI selva, a dialogue box arrear where by each rasterized vector is selected and given a user-defined value ranging from a-d and having a data output format in byte (0-255).

The Table 3.2 below gives the value of each factor in meters that was assigned for this project. The fuzzy logic map generated for each factor is shown in Figure 3.2 below using other road as an instance.

Table 3.2: Fuzzy membership value in meter assign for each factor

Factors	**a**	**b**	**c**	**d**
Hospital	100	600	800	>1000
Mast	100	500	1000	>1500
School	50	400	700	>1000
Built-up	100	500	700	>1000
Settlements	100	500	700	>1000
Industrial area	300	700	800	>1500
Institutional area	100	400	1000	>1500
Highway	200	500	700	>1000
Major road	100	400	800	>1000
Other road	100	400	700	>1000
Population	100	400	800	>1000
Railway	100	400	800	>1200
Tracks	100	600	800	>1000

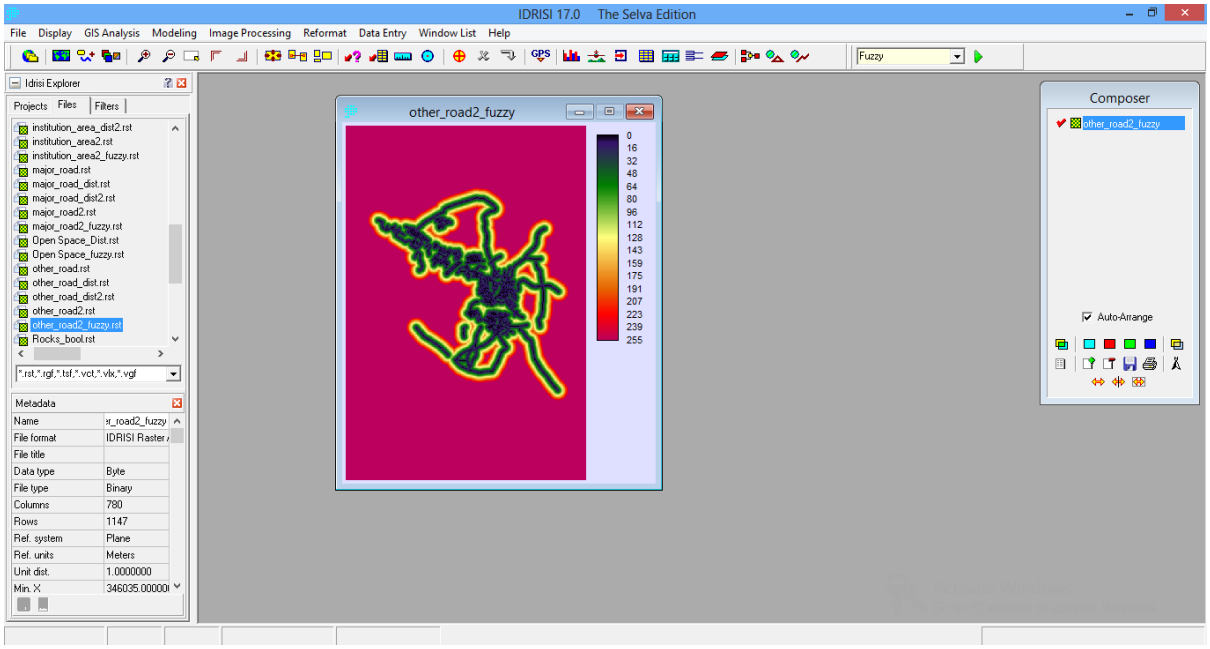


Figure 3.2: Print screen of the fuzzy logic of other_road

3.4.3 Analytic Hierarchy Process (AHP)

The keyword Weight was used to generate the eigenvector of weight of each factor tabulated above. The lower triangular matrix was filled based on the consistency ratio of factor compared to the others. Below is showing the relationship between the factors ranging from extremely less important (1/9) to extremely more important (9).

Table 3.3: Weight matrix showing comparism of each factor against one another

Factors	BtU	Hwy	Ind	Ist	Mrd	OpS	Otr	Sch	Stm	Trk	Hsp	Mst	Rly
Built-up (BtU)	1												
Highway (Hwy)	1/3	1											
Industrial (Ind)	1/3	1/3	1										
Institutional (Ist)	9	7	8	1									
Major road (Mrd)	½	3	3	1/5	1								
Open space (OpS)	7	8	8	3	8	1							
Other road (Otr)	3	3	3	1/3	3	1/5	1						
School (Sch)	7	7	8	7	7	1/2	4	1					
Settlement (Stm)	½	3	7	1/3	3	1/3	3	1/3	1				
Track (Trk)	3	3	5	1/3	3	1/5	2	1/3	½	1			
Hospital (Hsp)	3	5	5	1/3	3	1/5	3	1/3	1/2	3	1		
Mast (Mst)	½	½	2	1/5	1/3	1/9	1/5	1/3	1/3	1/3	½	1	
Railway (Rly)	1/3	1/3	3	1/3	3	1/9	1/3	1/5	1/3	1/3	1/3	3	1

The eigenvector of weight derived from the above matrix consistency is given below;

builtup_area2_fuzzy.rst : 0.0353

highway2_fuzzy.rst : 0.0255

industrial_area2_fuzzy.rst : 0.0127

institution_area2_fuzzy.rst : 0.1345

major_road2_fuzzy.rst : 0.0279

Open Space_fuzzy.rst : 0.2358

other_road2_fuzzy.rst : 0.0530

sch2_fuzzy.rst : 0.2075

Settlement_fuzzy.rst : 0.0798

track2_fuzzy.rst : 0.0594

hosp_2_dist_fuzzy.rst : 0.0765

mast2_fuzzy.rst : 0.0222

railway_2fuzzy.rst : 0.0298

Consistency ratio = 0.09, Consistency is acceptable.

From the above result, it is clear that open space is most important followed by schools, institutional areas, settlements, hospital, track, other road, built up area, railway, major road, highway, mast and industrial area in order of most to less importance for this analysis. The summation of the vector values is 1.

The map of existing polling units was created after the geocoding process using ArcMap 10.1. The data of the coordinates picked were imported into ArcMap 10.1 against the boundary of Zaria showing the local government divisions. This is to see the way the result fall so that it can be used for proper validation. See APPENDIX III for map.

LandSat8 imagery was imported into the view and the composite imagery produced with a false colour composite of 7, 5, 2 for Red, Green and Blue respectively. This shows the areas of vegetation, settlements, and water bodies as shown in the Figure 3.3 below shows the satellite imagery of Zaria after the colour composite has been added to the bands.

Figure 3.3: Landsat 8 satellite imagery of parts of Zaria acquired in 2014

Then the SRTM data was clipped for the whole of Zaria and the slope analysis map made in degree is as shown below. The height which ranges from 603-800m running from low to high land ranging from black to white respectively as shown in the Figure3.4 below.

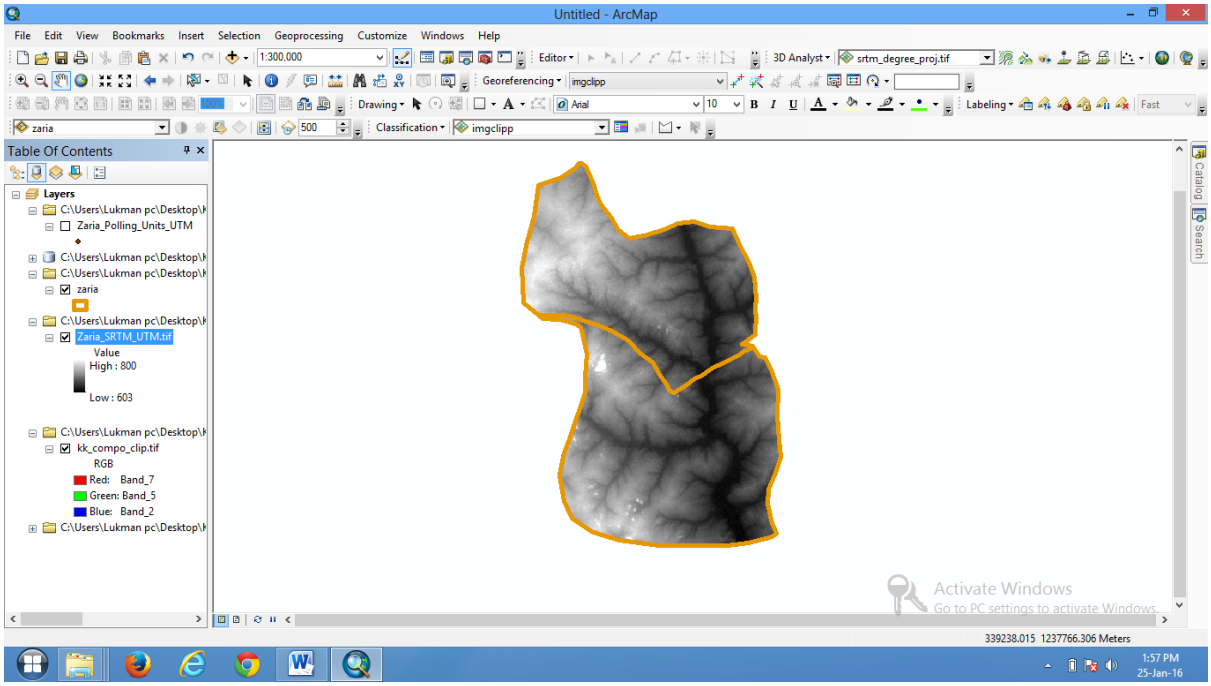


Figure 3.4: SRTM Data of Zaria in ArcMap view window

The map of the slope analysis in degree was carried out using the slope command in ArcMap 10.1, importing the SRTM data and also specifying the slope in degrees. The resultant map produced show the values ranging from 0-26.451° ranging from blue to yellow colours respectively as shown in Figure 3.5 below.

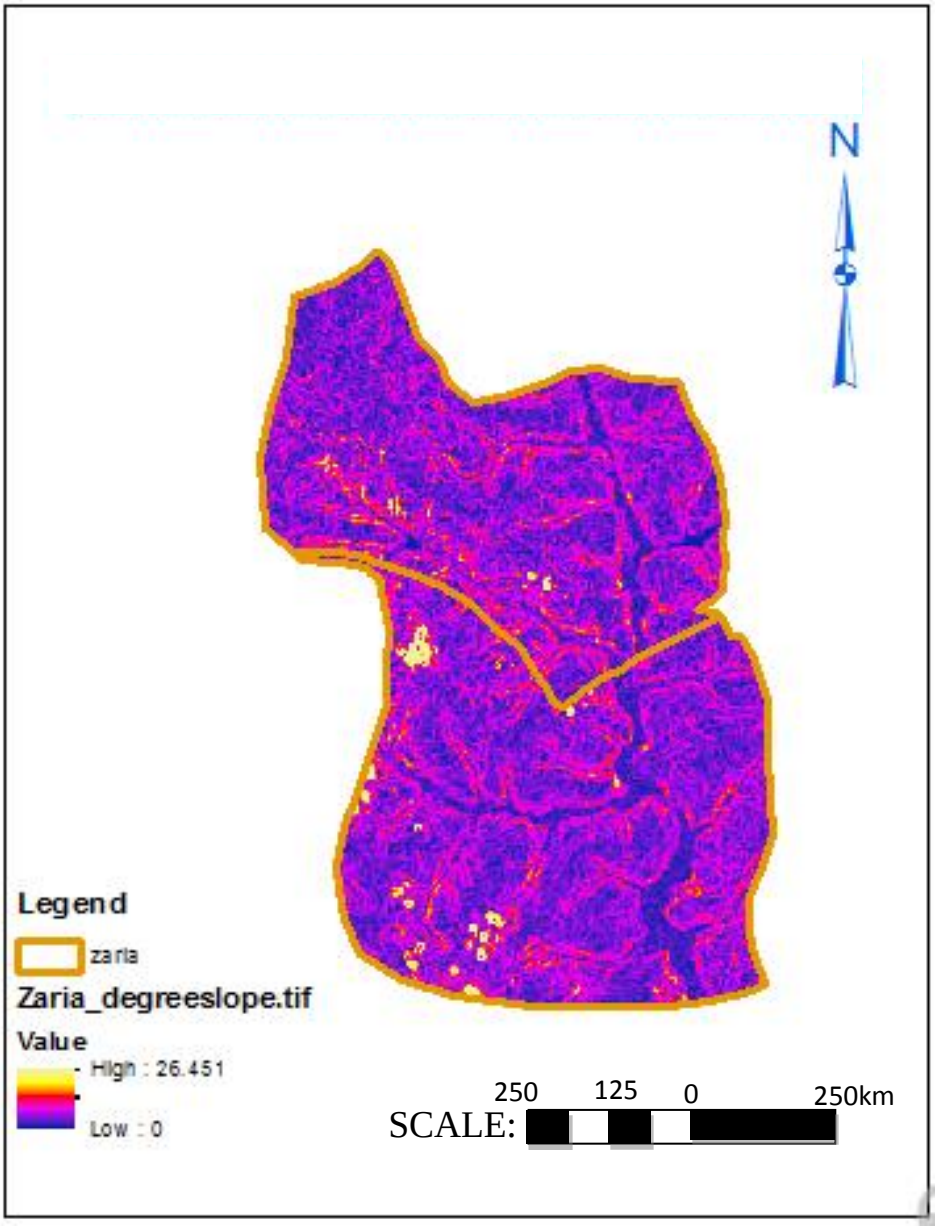


Figure 3.5: The nature of terrain in Zaria

More so, the image was classified into Six (6) classes which are water, open space, farmlands, rock, settlement, and wetlands shown by colour blue, yellow, green, black, red, and light blue respectively as shown in Figure 3.6 below. This was derived using the image classifier tool in ArcMap 10.1 and by saving training samples and the signature class for future editing.

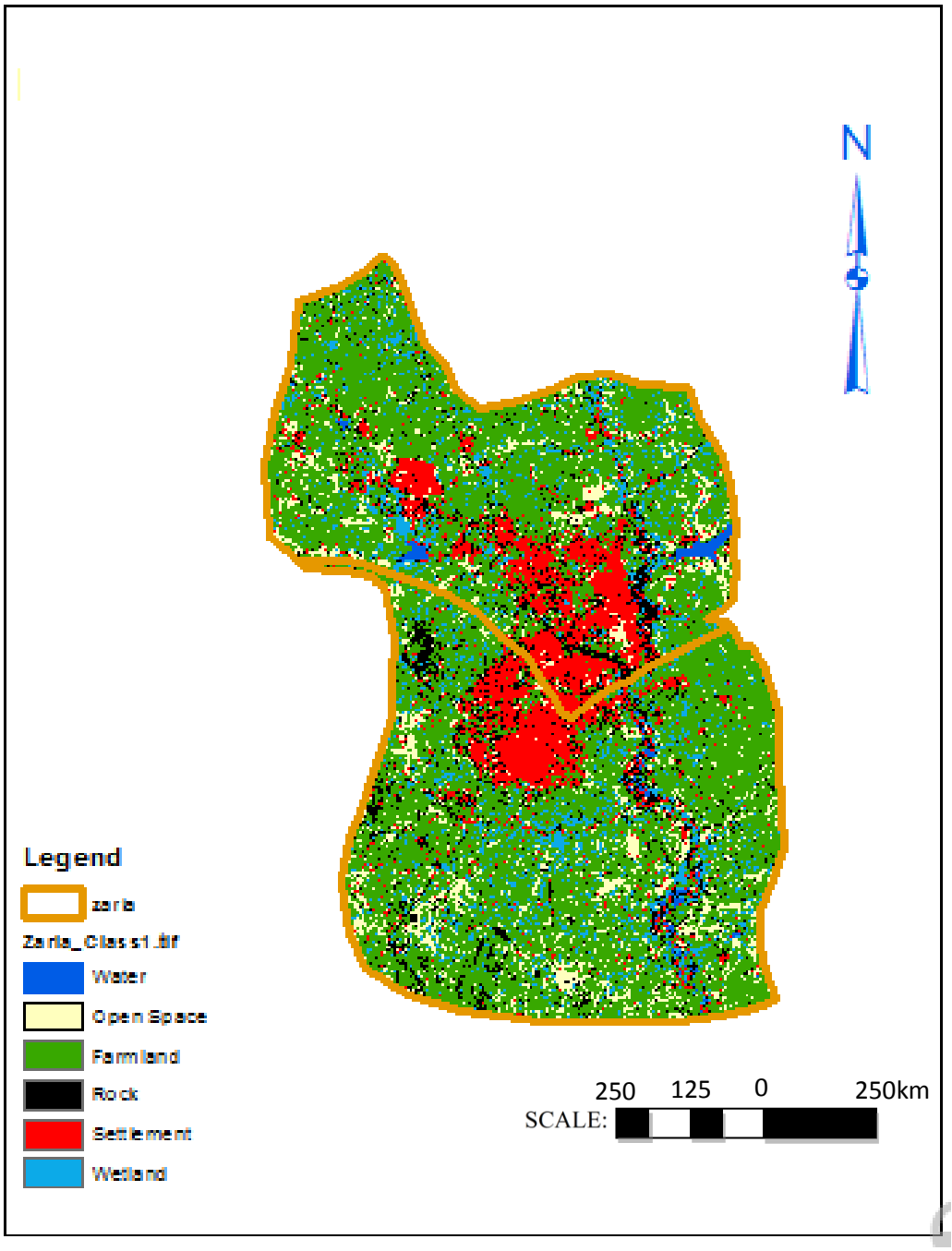


Figure 3.6: Classified imagery of Zaria

Also, the Landuse map showing the hospitals, road network, Railway line, settlement (High, Medium, and low), stream, industrial area, and institution area was imported into ArcMap 10.1 and the plan is produced as shown in Figure 3.7.

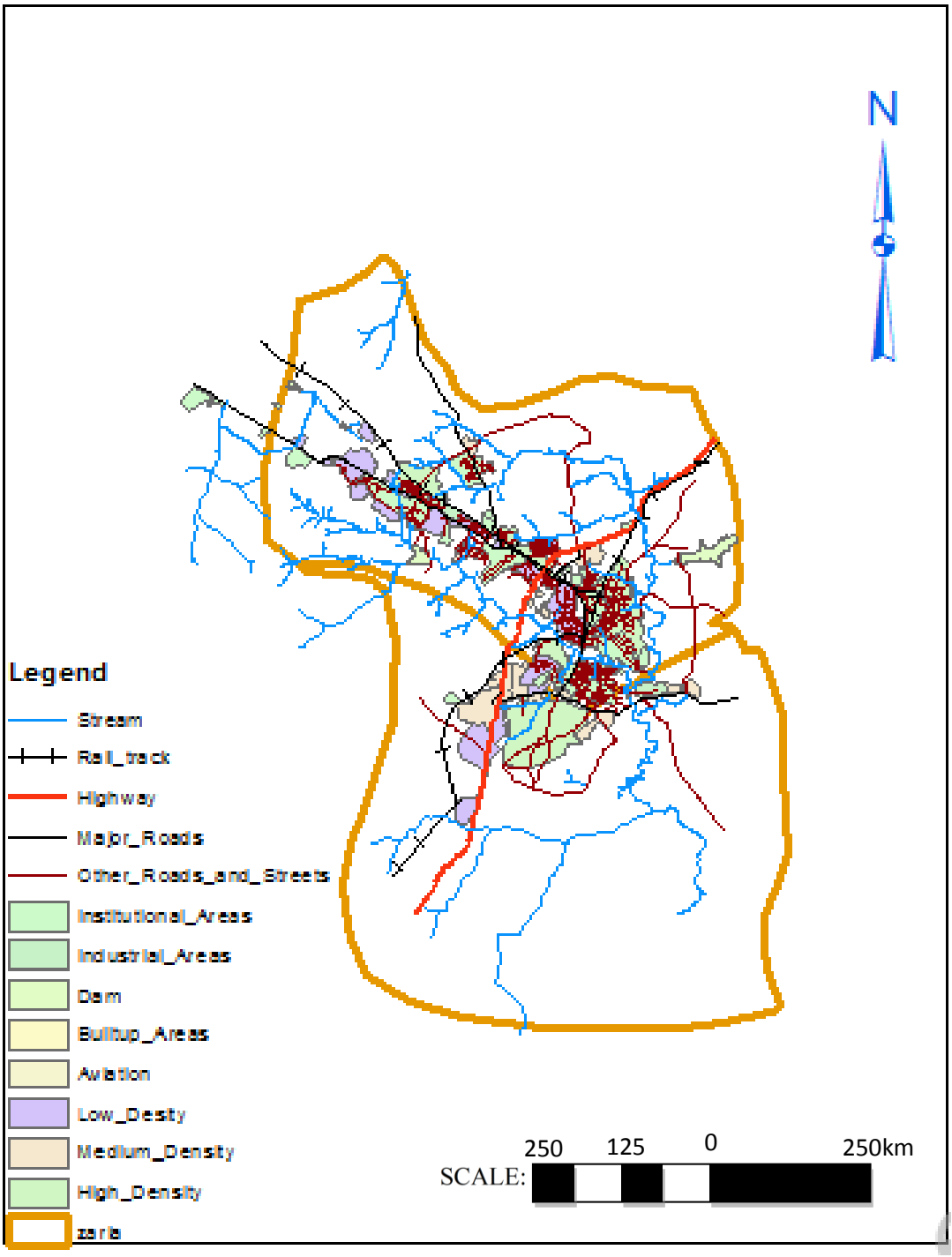


Figure 3.7: 2014 Landuse map of Zaria
Source: Department of Geography, ABU Zaria

However, the population densisty map was created using the estimate value of 500 people per polling unit in a ward. The arc catalogue tool was used in ArcGIS 10.1 to plot the map and the resultant map is as shown in Figure 3.8.

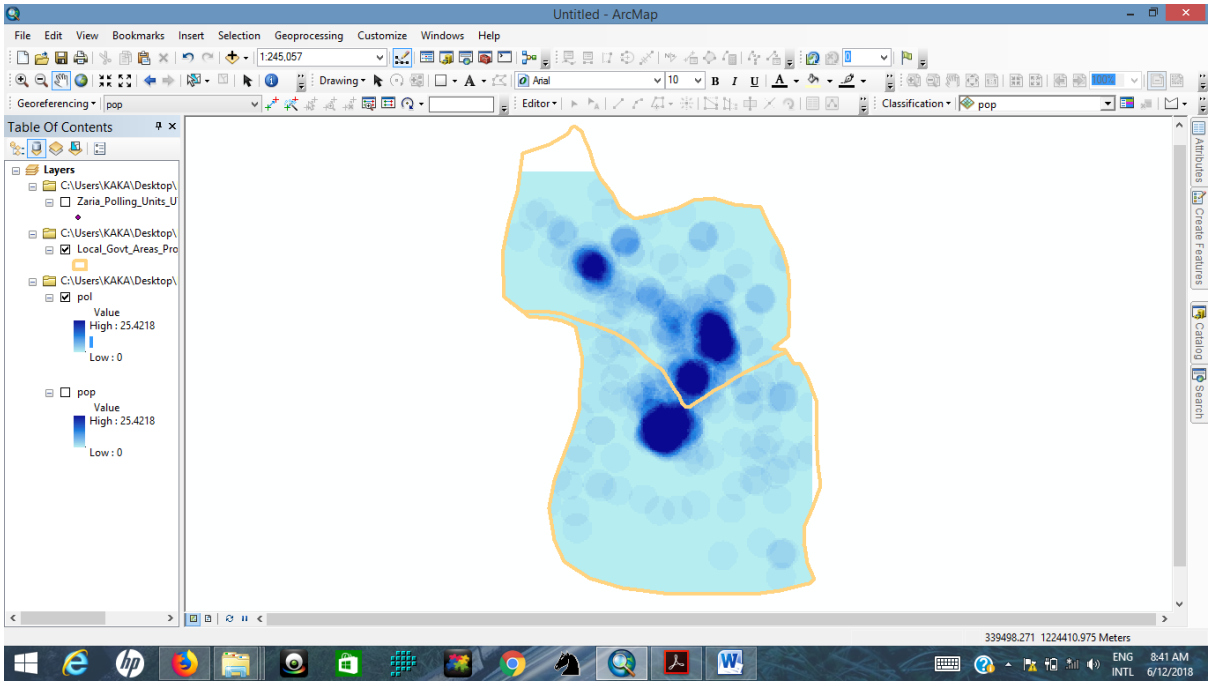


Figure 3.8: Raster image of population density in ArcMap 10.1 window

3.4.3.1 Weighted Linear Combination (WLC)

Using the image calculator function in IDRISI selva, the multiplication of each weight by the corresponding fuzzy map is done and then the addition of the thirteen (13) factors (including the slope map). The result obtained is shown in Figure 3.8 for the summation while the constraints were multiplied against each other and the resultant map is shown in Figure 3.9 below. The multiplication of the factors map by the constraint map gives the suitability map of the polling unit as shown in Figure 3.10. The RECLASS module was used to classify the map into highly Unsuitable, Unsuitable, fairly suitable, suitable and highly suitable as shown in Figure 3.11.

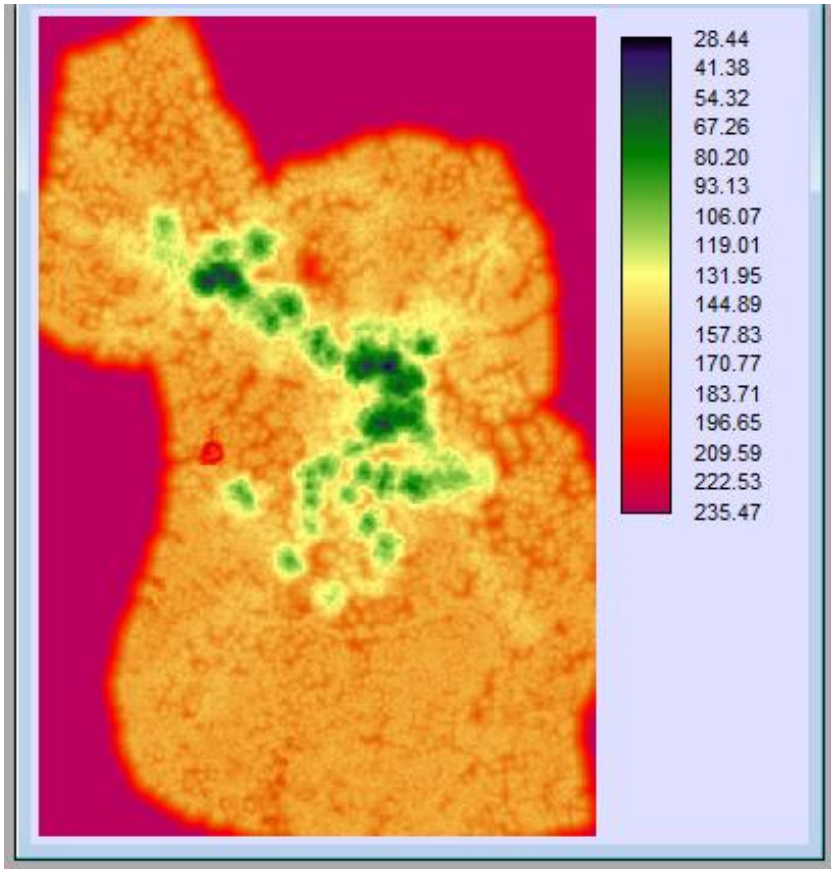


Figure 3.8: Pixel value summation of all the thirteen (13) factors

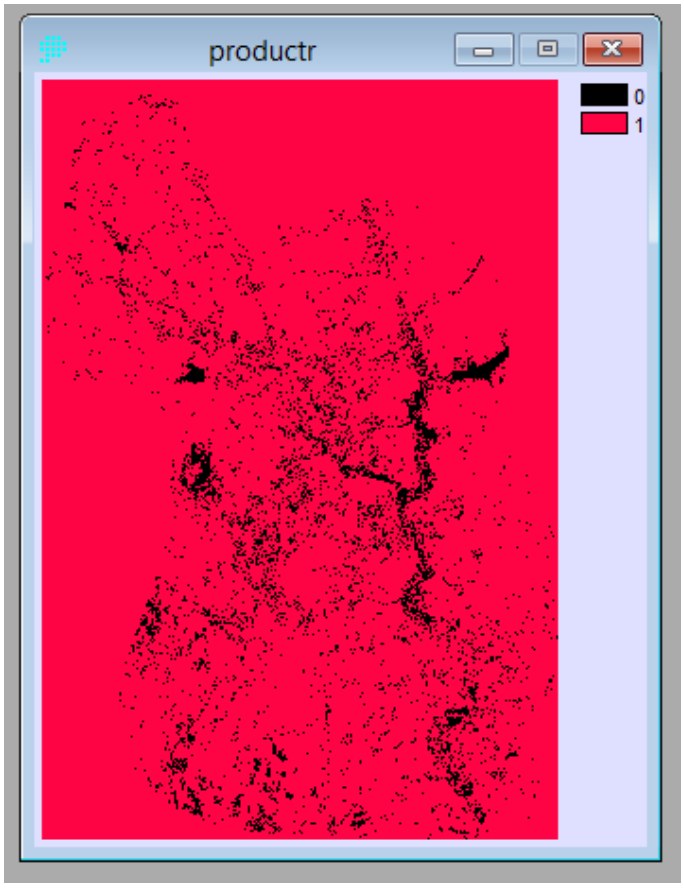


Figure 3.9: Pixel value product of the two (2) constraint; rock and waterbodies

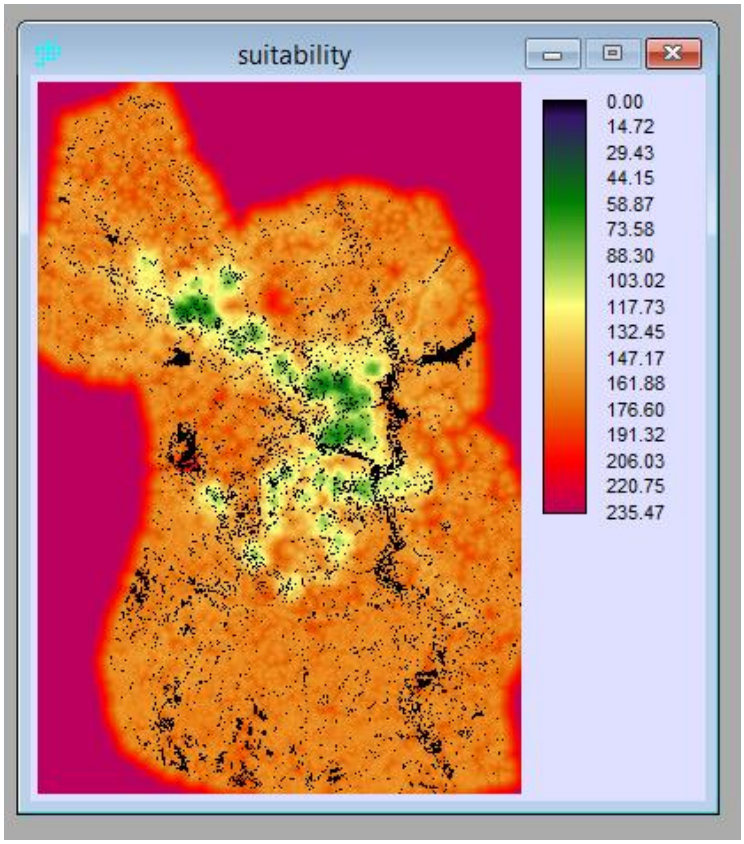


Figure 3.10: Pixel Values of Suitability of the polling unit

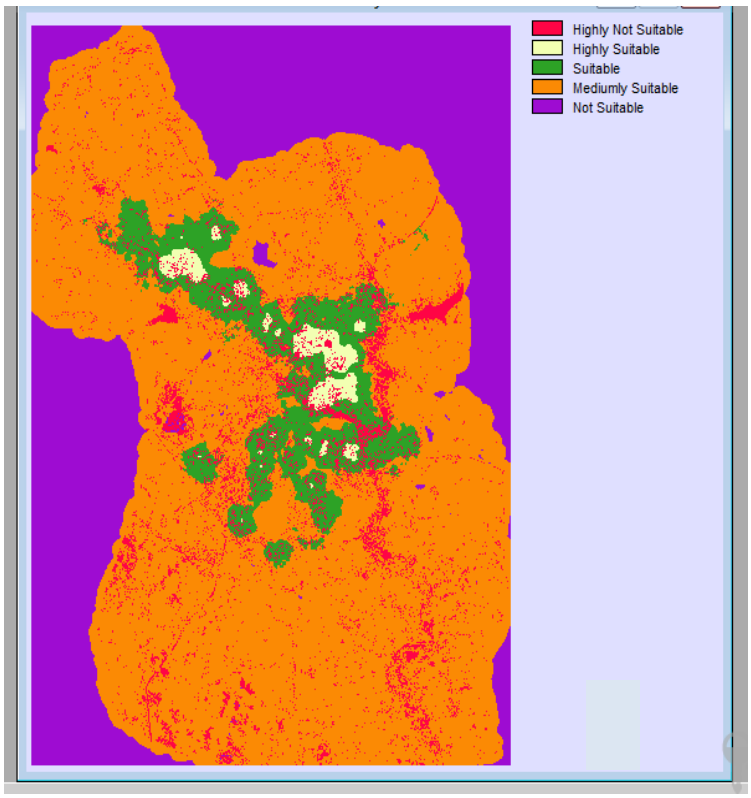


Figure 3.11: Reclassified Pixel value of suitability

The map is then exported to Arcmap 10.1, and the new raster map is as shown in Figure 3-12 below. This is required for the calculation of the area of each class defined based on the pixel values of each cell.

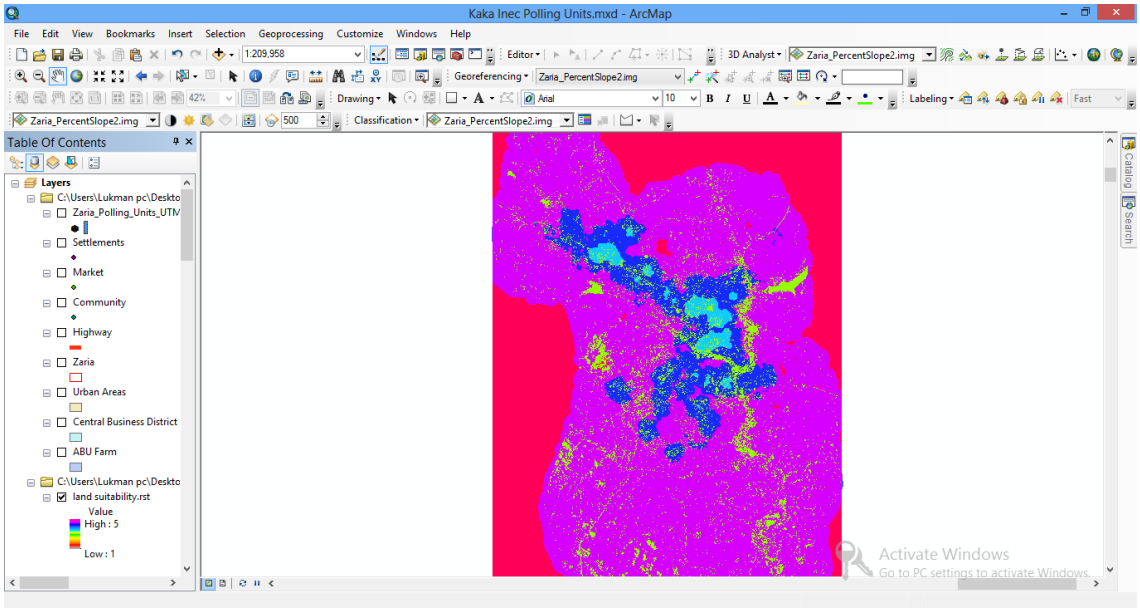


Figure 3.12: Raster map imported into ArcMap 10.1 window

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Introduction

Using geospatial techniques (multi-criteria evaluation) in IDRISI selva software, and ArcMap 10.1 to create map of existing polling units, suitability map, and comparision map the results obtained are interpreted and discussed. Comparison of existing and proposed polling units area was made with the aim of determining areas of similarity and areas of disparity. A final suitability map was created for locations of proposed polling units.

4.1 Distribution of Existing Polling Units

The map shows that areas which are residential have more polling units clustered around them while that of vegetation have polling units scattered around it where as the very low and high land have no polling unit within its reach as seen in Figure 4-1. Moreso, there is cluster of polling unit between the Sabon Gari local government and that of Zaria. Zaria local government had more polling unit compared to Sabon Gari local government. It was noted that some points fell outside the boundary. These points which are not suppose to be outside. Also, See APPENDIX III for map.

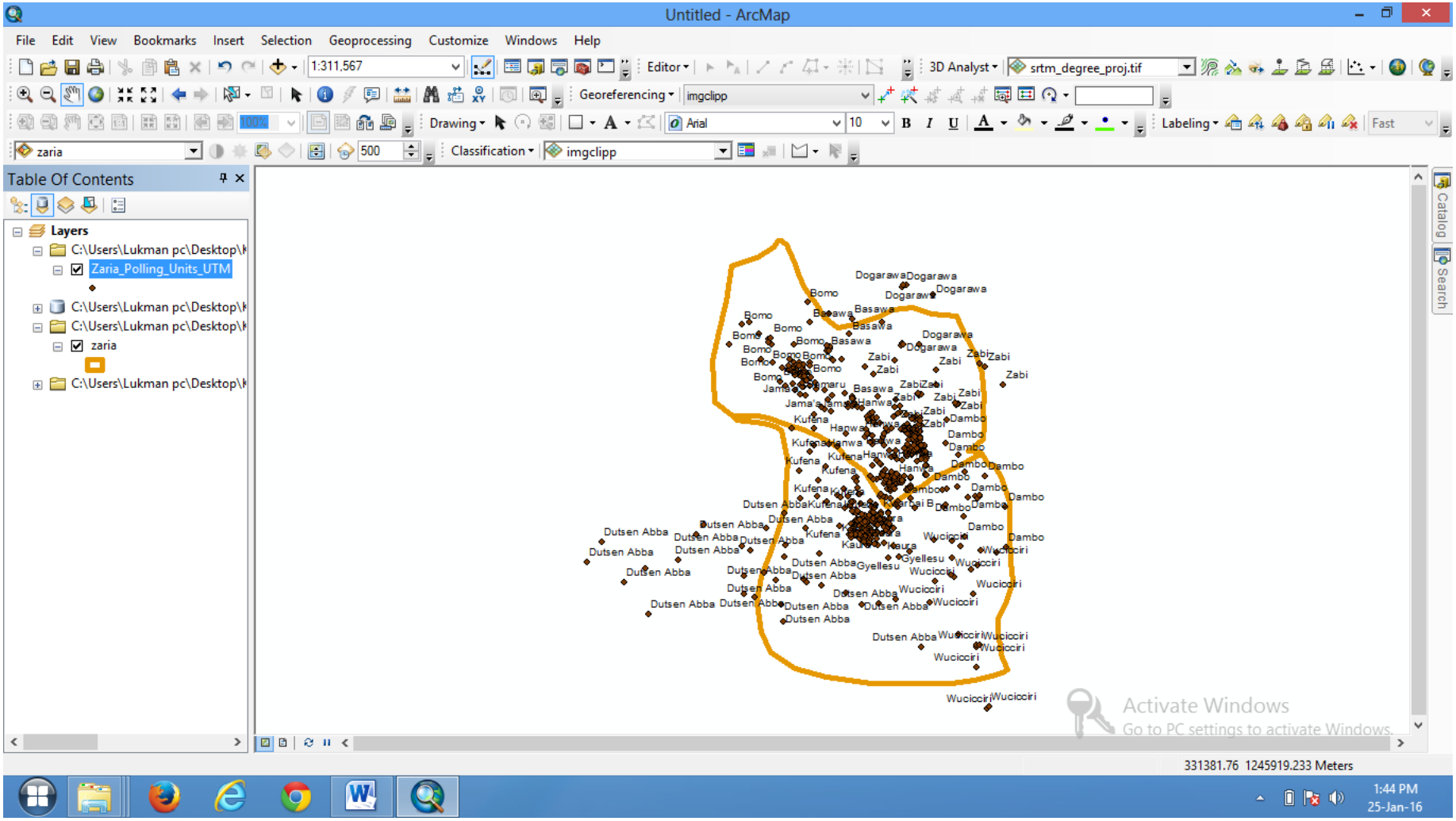


Figure 4.1: Map of existing polling units in Zaria in ArcMap view

4.2 Suitability model

The model derived shows that areas highly Unsuitable; are the high and low lands within Zaria environs. This places do not have polling unit around it that is why they are called highly unsuitable region, Unsuitable; these are regions that falls outisude the boundary, they are not suitable points since they are outside the boundary, fairly suitable; they are open space used for vegetation where by small settlements are located, suitable; these are regions around the settlement area whereby polling units can be cited and highly suitable; are regions with high suitability. See Appendix III. The Table 4.1 below show the results obtained while validating the model.

Table 4.1: Validation of the results obtained

S/No	Classes	Percentage (%)	No of Polling Units	**Recommended No**
1	Highly Suitable	1	6	**10**
2	Suitable	7	42	**50**
3	Fairly Suitable	56	337	**450**
4	Unsuitable	29	174	**90**
5	Highly not Suitable	7	42	**1**

4.3 Discussion

Land suitability in this research has been extracted by weighted linear combination overlay technique based on Multi-criteria Decision Analysis (MCDA) using GIS, a process that has resulted in suitability being portrayed in five classes namely: highly unsuitable, highly suitable, suitable, fairly suitable, and unsuitable ranging from 1-5 has shown in the histogram. The statistical module is explored for the discussion of the results obtained by plotting the histogram as shown in Figure 4-2. From the result the mean of the classes is 4.000, and the standard deviation is 0.994.

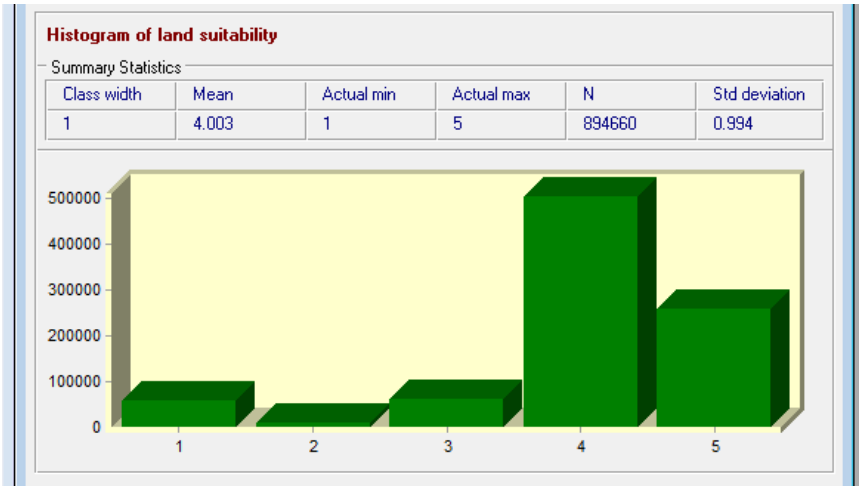


Figure 4.2: Histogram of suitability classes

Hence, the area of the cells area from 0-4 is as shown in figure 4.3 below.

With the above area derived the pie chart shown in Figure 4.3 shows that area with highly unsuitable covers over 7% of the area while that of highly suitable covers 1%, suitable covers 7%, fairly suitable covers 56% and unsuitable covers 29%.

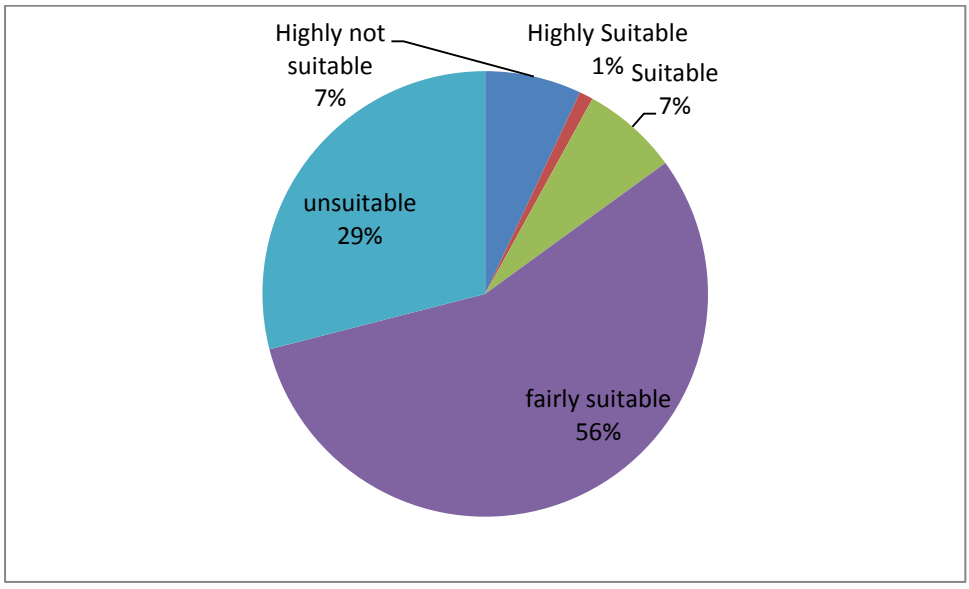


Figure 4.3: Pie chart of the five (5) classes

4.3.1 Comparison of existing and proposed polling units for validation

The above result was validated by plotting the existing polling unit on the suitability map as shown in Figure 4.4 below. It was observed that about 13 points of the 601 points fell outside the boundary region then for those within about 20 fell within the constraints (highly unsuitable), about 35 fell within the fairly suitable then the rest ranges fell within the range of highly suitable to suitable.

The similiarity between the existing and proposed polling units are as follows;

i. Regions highly suitable and suitable have more points within its pixel value.
ii. Regions highly unsuitable have no points within its pixel values.
iii. Regions with fairly suitable have scattered points with denote areas of high farmland and less/ small settlement.

The disparity between theem is that some points fell within the unsuitable regionwhich ought not to be so. Also, areas around the hill have three polling units surrounding it.

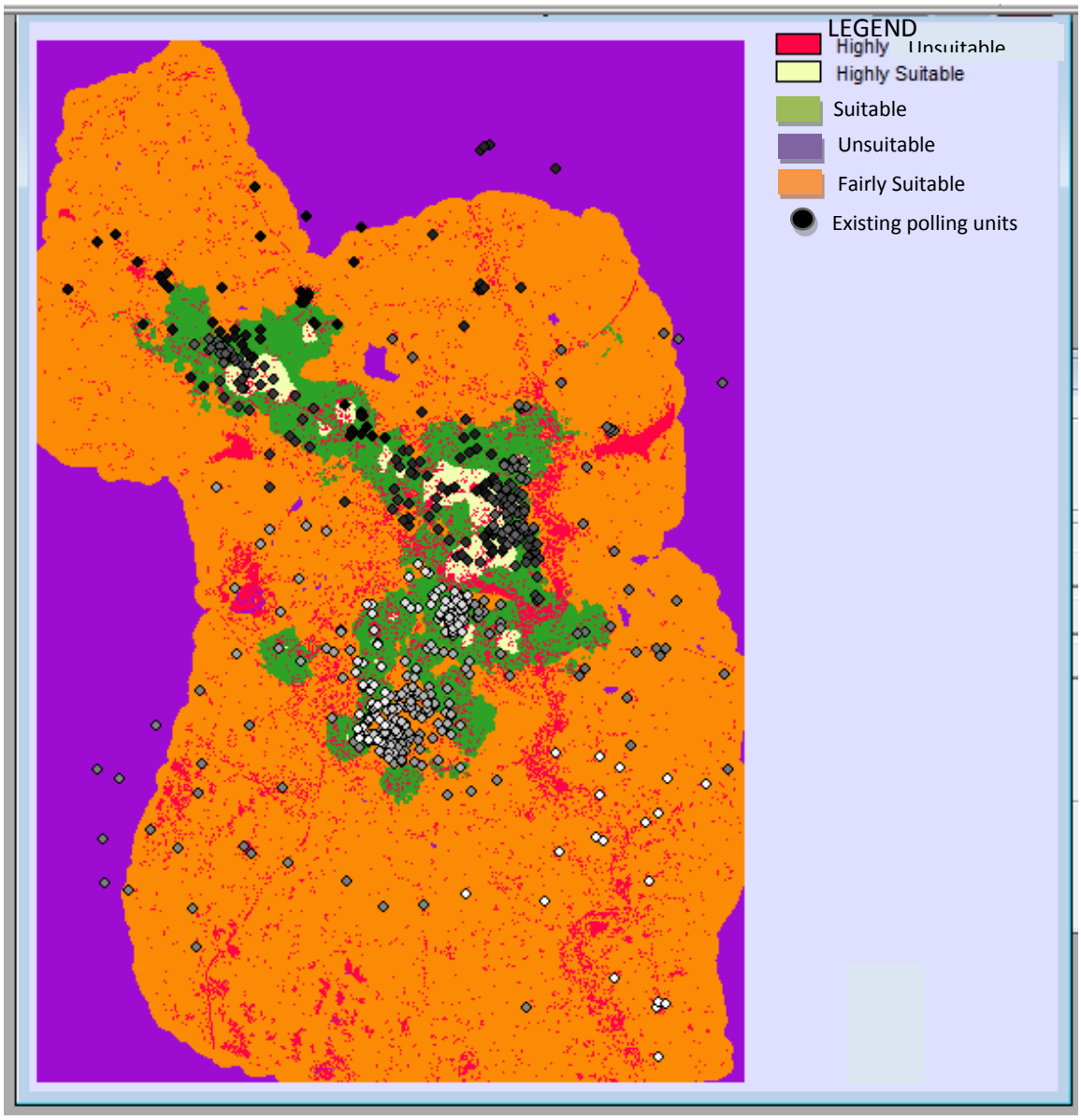


Figure 4.4: Existing polling unit superimposed on the suitability pixel values

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.0 Introduction

With the rapid growth of the advent of technological development in the world, Geospatial technology has been seen to tackle various problems in life. Using it for site selection of electoral polling unit helps in decision making for planning purposes is a major tool that can aid good result.

The methods and software involved may seem cumbersome but at last the end result gives a good conclusion to the end users.

5.1 Summary

The map of the current location and distribution of existing polling unit was carried out, using multicriteria analysis; the suitability model was generated for citing polling units in zaria and finally; comparism was made between the existing model and the proposed poling units with the aim of determining areas of similarities and disparity for validation purposes. The research was successfully carried out, the results obtained seems satisfactory.

5.2 Conclusion

In conclusion, it has been seen how AHP and GIS can be used to create a suitability model of polling unit sites. From the above result, Zaria has an average of 894,600 square meters (894.600km^2) in area and majority of the area at present been used as farmland. The result obtained from the map and validated shows that the suitability map of zaria produced has 0.09 consistency ratio and average of 36% of area not suitable, 56% of area fairly suitable and 8% Suitable (Most of the points which fall within this percentage). A 25m buffer was

created and it was observed that areas with more intersections fell within region of high suitability and that with low suitability fell has no intersection.

Thus, polling units that fell within the not suitable region can be redistributed or removed from the lists.

5.3 Recommendations

The following recommendations are needed for the purpose of this work;

i. Electoral polling units should not be cited in area that fall within not suitable area/constraints (rock/highland and water).
ii. Areas with high suitability are expected to have more polling units.
iii. To aid decongestion of polling units, there can be more than one polling unit in a ward to ensure proper voting is carried out.
iv. To carry out the research for large scale, very high resolution imagery should be used.

5.4 Contribution to knowledge

At the completion of this research, the following contribution to knowledge were derived which are as follows;

1. The study has been able to develop a suitable model for citing polling units in Zaria using Geospatial Technology.
2. The study has also been able to establish a more comprehensive database to handle both spatial and non spatial variables relating to polling unit in Zaria.

REFERENCES

ACE (The Electoral Knowledge Network) (2015). *The ACE Encyclopaedia: Boundary Delimitation.* Retrieved on December 31, 2015 from http://aceproject.org/ace-en/pdf/bd/at_download/file.

African Report (2007): "Internet watch: the 2007 presidential election in Nigeria" Retrieved on December 31, 2015 from www.opennet.net/research/bulletin/014.

Ajayi .K. (2007): "Election Administration in Nigeria and the Challenges of the 2007 Elections" *Medwell Journals*, 2(2), 142-151.

Ayoade J. (2008): "Godfather Politics in Nigeria" in Money, Politics and Corruption in Nigeria" IFES Nigeria Election Support Programme, Abuja.

Azelama, J. (2010): *Nigerian Government and Politics*. Benin City: Ever Blessed Publications.

Carlton, H. (1989). The Impact of New Technology and New Census Data on Redistricting in the 1990s, in Redistricting in the 1990s: *A Guide for Minority Groups*, ed. William O'Hare (Population Reference Bureau, Inc.)

Carver, S. J., (1991). Integrating Multicriteria Evaluation with Geographical Information Systems. *International Journal of Geographical Information Systems, 5*, 321–339.

Collins, M. G., Steiner, F. R. and Rushman, M. J. (2001). Land-use Suitability Analysis in the United States: Historical Development and Promising Technological Achievements. *Environmental Management 28* (5), 611–621.

DeMers, M. N. (2003). *Fundamentals of geographic information systems (2nd ed.).* Hoboken, NJ: John Wiley & Sons, Inc.

Deng, H. and Yeh, C. H. (1998). Fuzzy Ranking of Discrete Multicriteria Alternatives. *Proceedings of the IEEE Second International Conference on Intelligent Processing Systems* (ICIPSÕ98), 1998, pp. 344-348.

Dey, P. K., and Ramcharan, E. K. (2007). Analytic hierarchy process helps select site for limestone quarry expansion in Barbados. Journal of Environmental Management, 88(4), 1384-1395.

Diamond, J. T. and Wright, J. R. (1989). Efficient Land Allocation, *Journal of Urban Planning and Development*, *115*(2), 81-96.

Eastman, J. R., Kyem, P. A. K., and Toledano, J., (1993). A Procedure for Multiobjective Decision Making in GIS under Conditions of Conflicting Objectives. In: *Proceedings of European Conference on Geographical Information Systems*, EGIS'93 (Utrecht: EGIS Foundation), pp. 438–448.

Eastman, J. R. (2003). *IDRISI Kilimanjaro Tutorial*. Clark Labs, Clark University, Worchester, USA. Retrieved from http://www.clarklabs.org

Eastman, J. R. (2012). *IDRISI Selva Tutorial, Manual version 17.* Clark Labs, Clark University, Worchester. Retrieved from http://www.clarklabs.org

Elekwa, N.N. (2008): "The Electoral Process in Nigeria: How to Make INEC Succeed. *The Nigerian Electoral Journal.* 2(1) 30-42

Elliot, S. and Petrova, S. (2004). Multi Criteria Decision Making in Geographic Information Systems. *Decision Methods for Environmental Management and Policy*, May 10, 2004.

Ezeani, E. O. (2004): "Electoral Malpractice in Nigeria: The Case of 2003 General Elections" *Nigerian Journal of Public Administration and Local Government*. XII (1) 143-162.

Fritz, O., and Skerfving, P. (2005). Monitoring and analysis of power line failures: An examples of the role of GIS. In J. B. Pick (Ed.), *Geographic information systems in business* (pp. 301-323). Hershey, PA: Idea Group Publishing.

Gil, Y. and Kellerman, A. (1993). A Multicriteria Model for the Location of Solid Waste Transfer Stations: the Case of Ashdod, Israel. *Geojournal*, *29*, 377–384.

Grimshaw, D. J. (2000). *Bringing geographical information systems into business.* New York: John Wiley & Sons, Inc.

Hanewicz, C. (2012). Geographic Information Systems and the Political Process. A paper presented at the Western Political Science Association 2012 Annual Meeting Portland, Oregon March 22-24, 2012

Hall, G. B., Wang, F. and Subaryono. (1992). Comparison of Boolean and Fuzzy Classification Methods in Land Suitability Analysis by Using Geographical Information Systems. *Journal of Environment and Planning, Vol. 24,* 497–516.

Handley, L. and Bernard, G. (2008). eds. *Redistricting In Comparative Perspective.* Oxford ; Oxford University Press, New York, USA.

Handley, L. (2006). *Boundary Delimitation. A write-up for* ACE: The Electoral Knowledge Network, under the supervision of IFES. Available online at: https://aceproject.org/ace-en/topics/bd/bdc/bdc02/default

Ignizio, J. P. (1985). Introduction to Linear Goal Programming. *Quantitative Applications in the Social Sciences, 56,* Sage Publications, London.

Independent National Electoral Commission – INEC (2006): *Building Confidence in the Electoral System*. Abuja: Independent National Electoral Commission.

Independent National Electoral Commission – INEC (2015). The Election Management System (EMS). A Project Report prepared by the Independent National Electoral Commission, Abuja.

Ingwe, R., Odu, E., Ojong, M. and Angiating, I. (2012). Need for Rationalism: Proposing Geo-Information Solutions for Surmounting Challenges Hampering Administrative Management of Voters Registration in Northern Cross River State, Nigeria. *International Journal of Business and Behavioral Sciences, 2(3).*

Kalinski, A. (2010, May 10). NextGen, airport bottlenecks hot topics at AAAE GIS conference. *Geospatial Solutions*, GeoIntelligence, retrieved on February 25, 2012, from http://www.gpsworld.com/gis/geointelligence/nextgen-airport-bottlenecks-hot-topics-aaae-gis-conference-9918

Ko, F. G. (2010). Benefits of Interactive Electoral Vote Map. Available at: http://www.articlebliss.com/Art/450398/10/ Benefits-of-Interactive-Electoral-Vote-Map.html

Kurfi, A. (1983): *The Nigerian General Elections 1959 and 1979 and the Aftermath*. Ibadan: Macmillan.

Lemmessa, F. (2011). *Rangeland Suitability Analysis for Livestock Production Using GIS and Remote Sensing: The Case of Yabello Woreda, Southern Ethiopia.* (M.Sc. Thesis. School of Graduate Studies of Addis Ababa University, AAU, Ethiopia). Retrieved from http://etd.aau.edu.et/dspace/bitstream/123456789/3464/1/Thesis_Fikadu_Lemmessa%20(2011).pdf

Malczewski, J. and Ogryczak, W. (1990). An Interactive Approach to the Central Facility Location Problem: Locating Paediatric Hospitals in Warsaw. *Geographical Analysis, 22*, 244–258.

Malczewski, J. (1991). Central Facility Location and Environmental Health. *Environment and Planning, A* (23), 385–395.

Malczewski, J. and Ogryczak, W. (1996). The Multiple Criteria Location Problem: 2 Preference-based Techniques and Interactive Decision Support. *Environment and Planning, A*(28), 69–98.

Malczewski, J. (1999). *GIS and Multicriteria Decision Analysis*, John Wiley & Sons, Inc., New York.

Malczewski, J. (2004). GIS-based Land-use Suitability Analysis: A Critical Overview. *Progress in Planning*. *62*(2004) pp. 3–65. Ontario, Canada. Available from http://www.elsevier.com/locate/pplann

McHarg, I. L. (1969). *Design with Nature.* Wiley, New York, USA.

Nnamani, D. O. (2014). *Electoral Process and Challenges of Good Governance in the Nigerian State (1999-2011).* Journal of Good Governance and Sustainable Development in Africa (JGGSDA), *2(3):78-99*, December, 2014. Website: http://www.rcmss.com. ISSN: 2354-158X (Online) ISSN: 2346-724X (Print)

Nunnari, S., and Ueda, M. (2010). The effects of redistricting on distributive outcomes. Retrieved on February 10, 2012, from http://www.hss.caltech.edu/~snunnari/redistricting.pdf

Nunnari, S., and Ueda, M. (2010). The effects of redistricting on distributive outcomes. Retrieved on February 10, 2012, from http://www.hss.caltech.edu/~snunnari/redistricting.pdf

Odukoya, A (2007). 'Democracy, Elections, Election Monitoring and Peace Building in West Africa, *Africa Journal of International Affairs, 10(1),pp: 147, 152.*

Omodia, S. and Egwemi, V. (2011): Party Politics and Challenge of Political Representation in Nigeria. *International Journal of Business and Social Sciences* 2(22): 270 – 275.

Onut, S., and Soner, S. (2007). Transshipment site selection using the AHP and TOPSIS approaches under fuzzy environment. Waste Management, 28(9), 1552-1559.

Pereira, J. M. C. and Duckstein, L. (1993). A Multiple Criteria Decision-making Approach to GIS-based Land Suitability Evaluation. *International Journal of Geographical Information Science, 7*(5), 407-424.

Pick, J. B. (2008). *Geo-business GIS in the digital organization*. Hoboken, NJ: John Wiley & Sons, Inc.

Rakner, L. and Svasand, L. (2007): "Multi party elections in Africa's new Democracies" Michelson *Institute Report* No. 7.

Saaty, T. L. (1977). A Scaling Method for Priorities in Hierarchical Structures, *Journal of Mathematical Psychology, 15*, 57-68.

Saaty, T. L. (1980). *The Analytic Hierarchy Process*. McGraw-Hill International, New York, NY, U.S.A.

Sanders, Jr., R. L., Kajs, L. T., and Crawford, C. M. (2001). Electronic mapping in education: The use of geographic information systems [Electronic version]. *Journal of Research on Technology, 34.*

Senes, G. and Toccolini, A. (1998). Sustainable Land-use Planning in Protected Rural Areas in Italy. *Journal of Landscape and Urban Planning, Vol 41*, pp107–117.

Sener, S., Sener, E., Nas, B., and Karaguzel, R. (2010). Combining AHP with GIS for landfill site selection: A case study in the Lake Beysehir catchment area (Konya, Turkey). Waste Management, 30(11), 2037-2046.

Somers, R. (2004). Southern company builds an enterprise GIS framework. *Geospatial Solutions, 14*(4). Retrieved July 2, 2005, from http://www.geospatial-online.com/geospatialsolutions/article/articleDetail.jsp?id=89948

Spiller, L. D., and Bergner, J. (2010). American elections and the competition to govern. *Competition Forum, 8*(2), 306+. Retrieved February 2, 2012, from Questia.

Suberu, R. (2007): "Nigeria's muddled Elections" *Journal of Democracy,* 18(4): 95-110.

Tegou, L. I., Polatidis, H., and Haralambopoulos, D. A. (2010). Environmental management framework for wind farm siting: Methodology and case study. Journal of Environmental Management, 91(11), 2134-2147.

Temiz, N. and Tecim, V. (2009). The Use of GIS and Multi-Criteria Decision-Making as a Decision Tool in Forestry. *Operational Research Society Ltd 0953-5543 OR Insight 22*(2), 105–123. Retrieved from http://www.palgrave-journals.com/ori/journal/v22/n2/full/ori20088a.html, doi:10.1057/ori.2008.8

Triantaphyllou, E. and Mann, S. H. (1995). Using the Analytic Hierarchy Process for Decision Making In Engineering Applications: Some Challenges. *International Journal of Industrial Engineering: Applications and Practice*, *2*(1), pp. 35-44, ISSN 1072-4761.

Tseng, T. A., Ding, T. J., Collins, J. R. and Y-Su, W. (nd). *Site Selection Model of Potential Ecotourism Development Area: from the Resources Aspect.*

Udoh, J. C. (2014). Electoral Mapping and the Mass Media: Can Nigeria Learn from USA? *Journal of Educational and Social Research, MCSER Publishing, Rome-Italy*, 4(1), *ISSN 2239-978X*, *ISSN 2240-0524*. Doi:10.5901/jesr.2014.v4n1p279

Uwaifo, S. O. (2012). Elections, Social Insecurity and Nigeria's International Image: A Case Study of Elections between 1999 and 2011. A Masters Degree Dissertation Submitted To the Department Of Political Science and International Relations, College Of Development Studies, Covenant University, Ota, Ogun State

Voogd, H. (1983). *Multicriteria Evaluation for Urban and Regional Planning*. Pion Ltd., London.

Vaidya, O. S. and Kumar, S. (2006) Analytic Hierarchy Process: An Overview of Applications. *European Journal of Operational Research, 169*, 1–29.

Vahidnia, M. H., Alesheikh, A. A., and Alimohammadi, A. (2009). Hospital site selection using fuzzy AHP and its derivatives. Journal of Environmental Management, 90(10), 3048-3056.

Wang, F. (1994). The Use of Artificial Neural Networks in a Geographical Information System for Agricultural Land-Suitability Assessment. *Environment and planning A*, Vol. 26, 265–284.

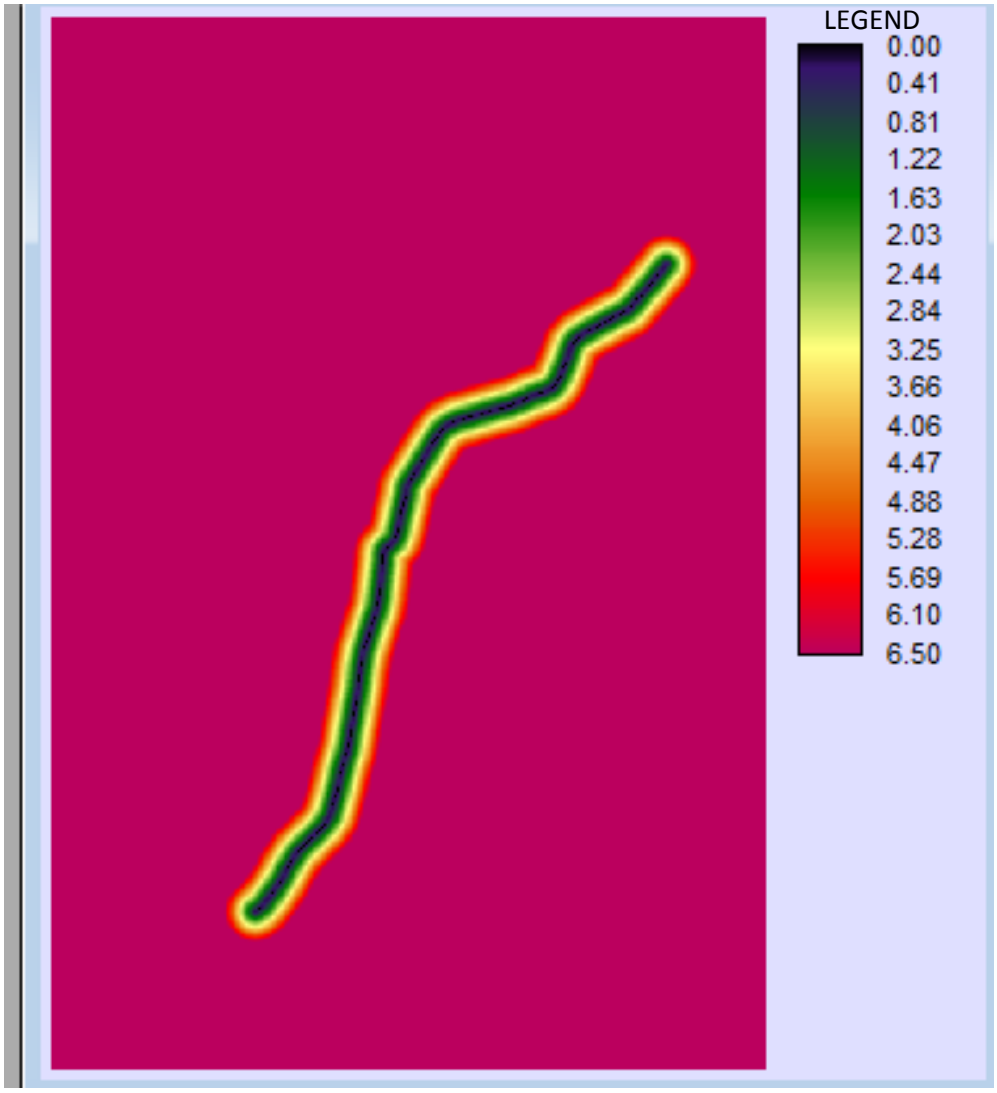
Yeh, C. H., Deng, H. and Pan, H. (1999). Multi-Criteria Analysis for Dredger Dispatching Under Uncertainty. *Journal of the Operational Research Society, vol 50*, pp. 35-43.

APPENDIX I

FUZZY MAPS OF FACTORS

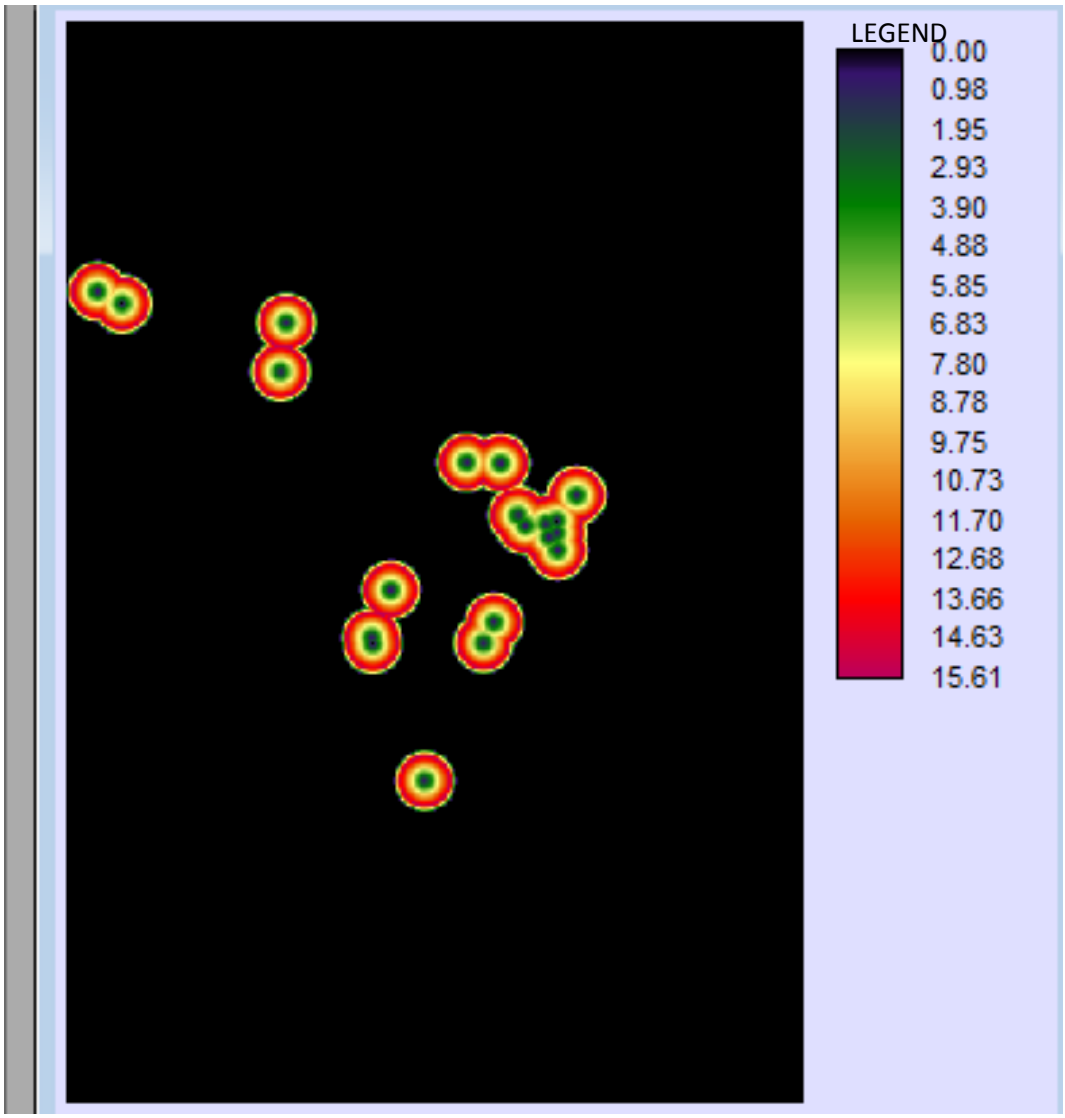
1. Highway map

Figure showing the fuzzy map of highway in Zaria



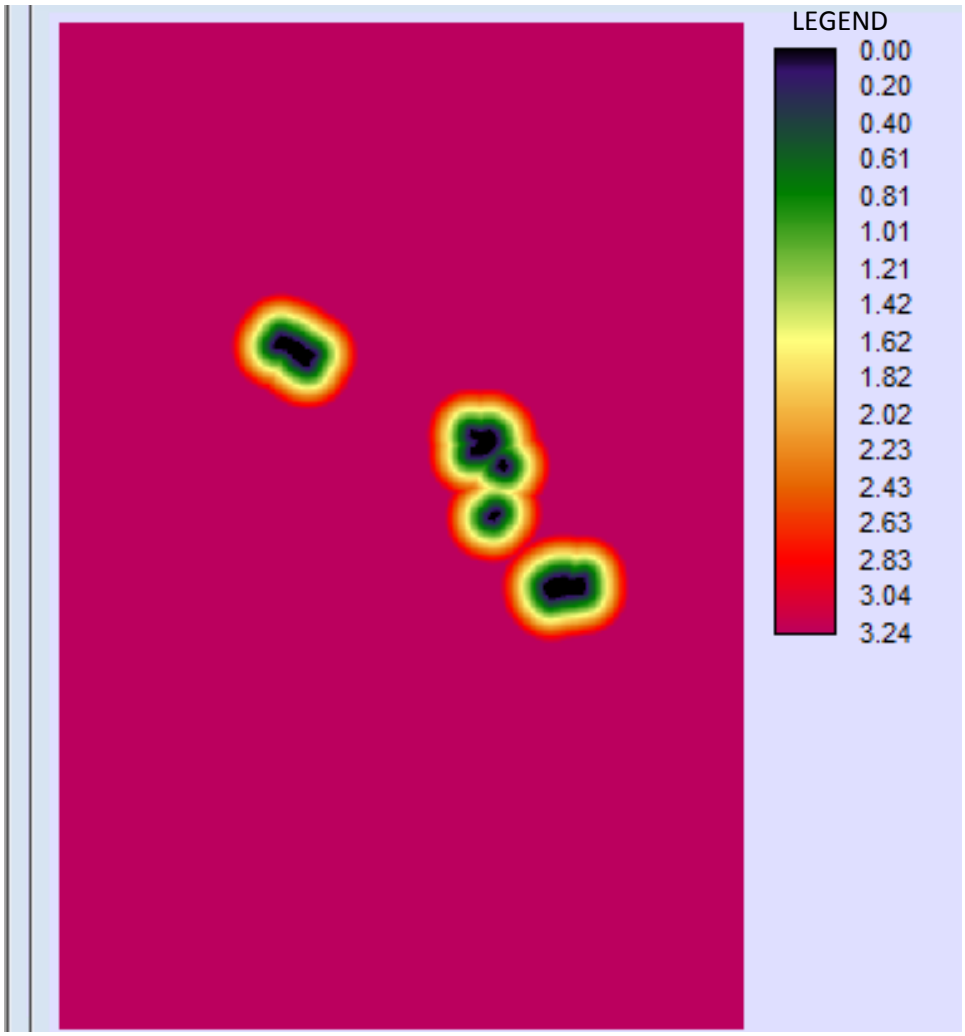
2. Hospital map

Figure showing the fuzzy map of hospitals in Zaria



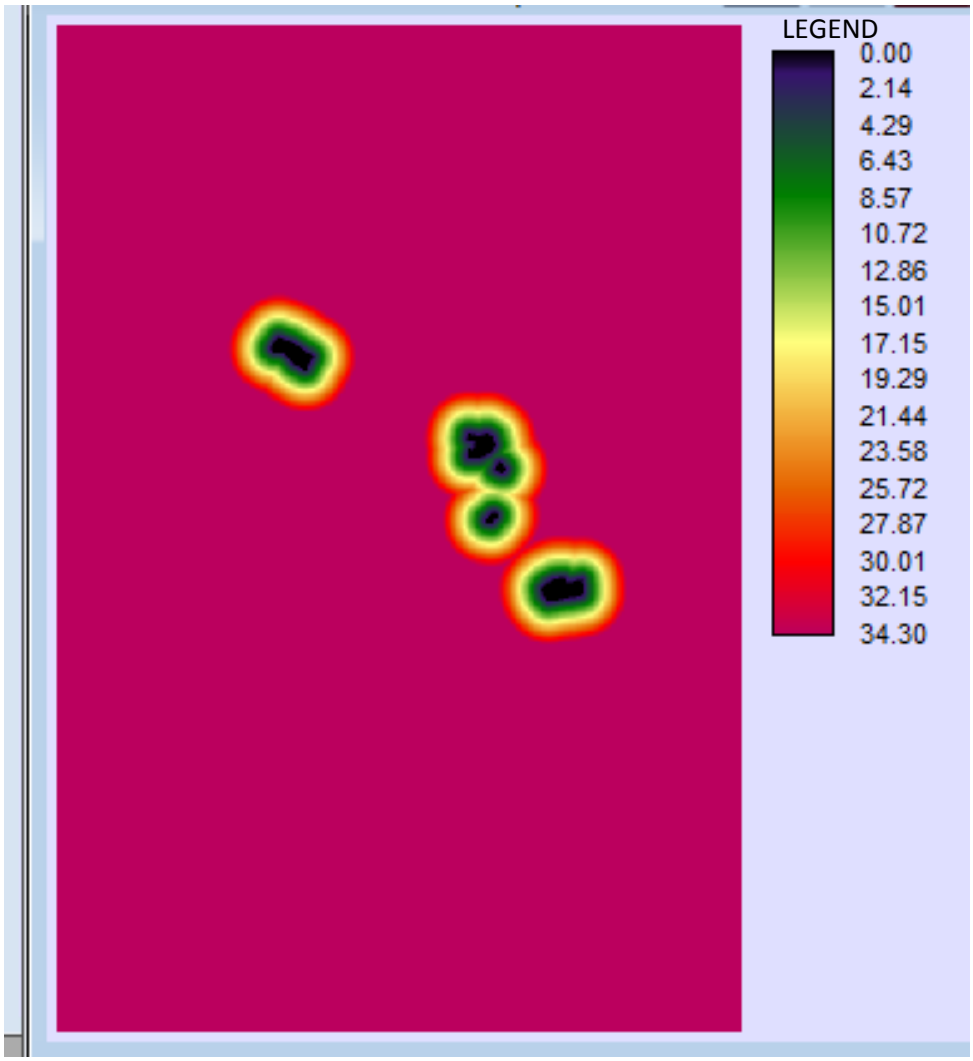
3. Industrial map

Figure showing the fuzzy map of industries in Zaria



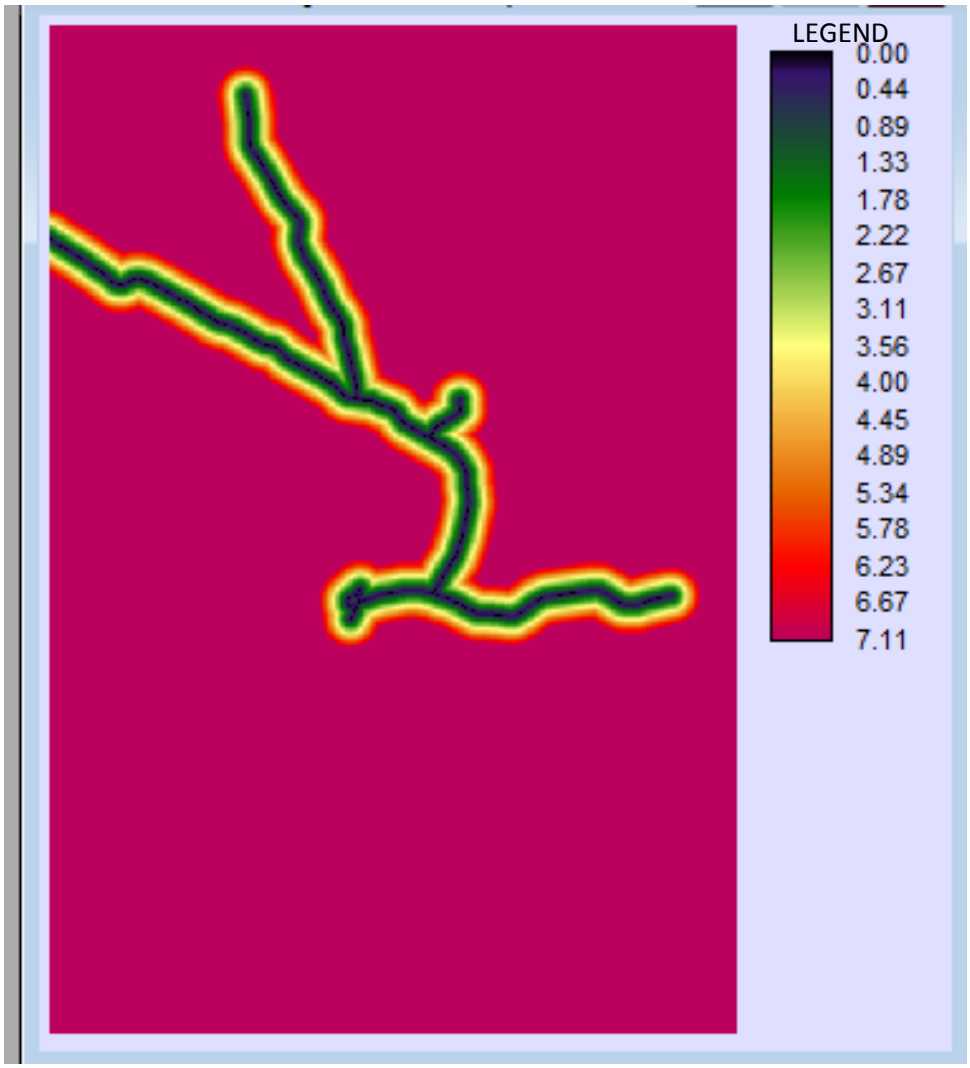
4. Institutional map

Figure showing the fuzzy map of institutions in Zaria



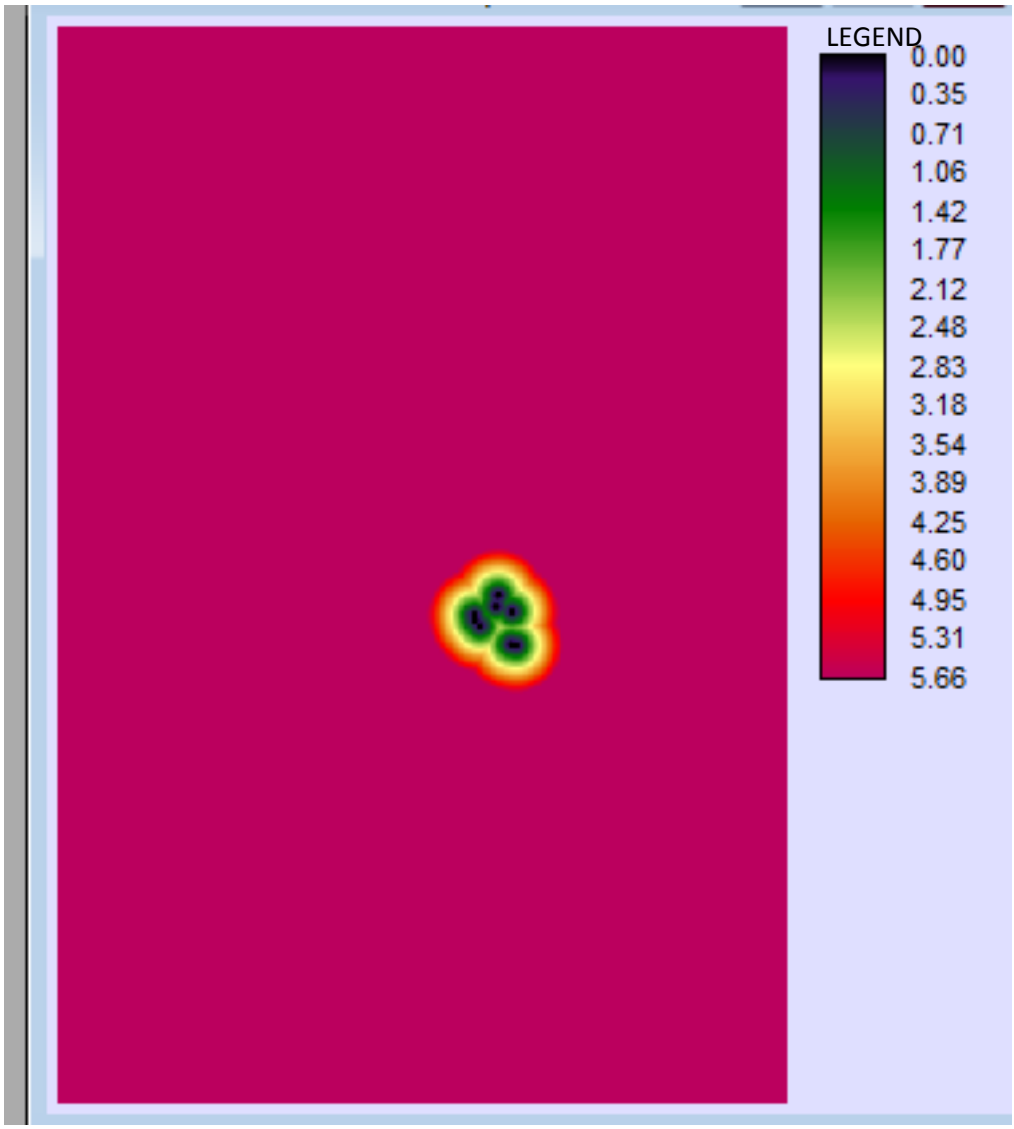
5. **Major road**

Figure showing the fuzzy map of major roads in Zaria



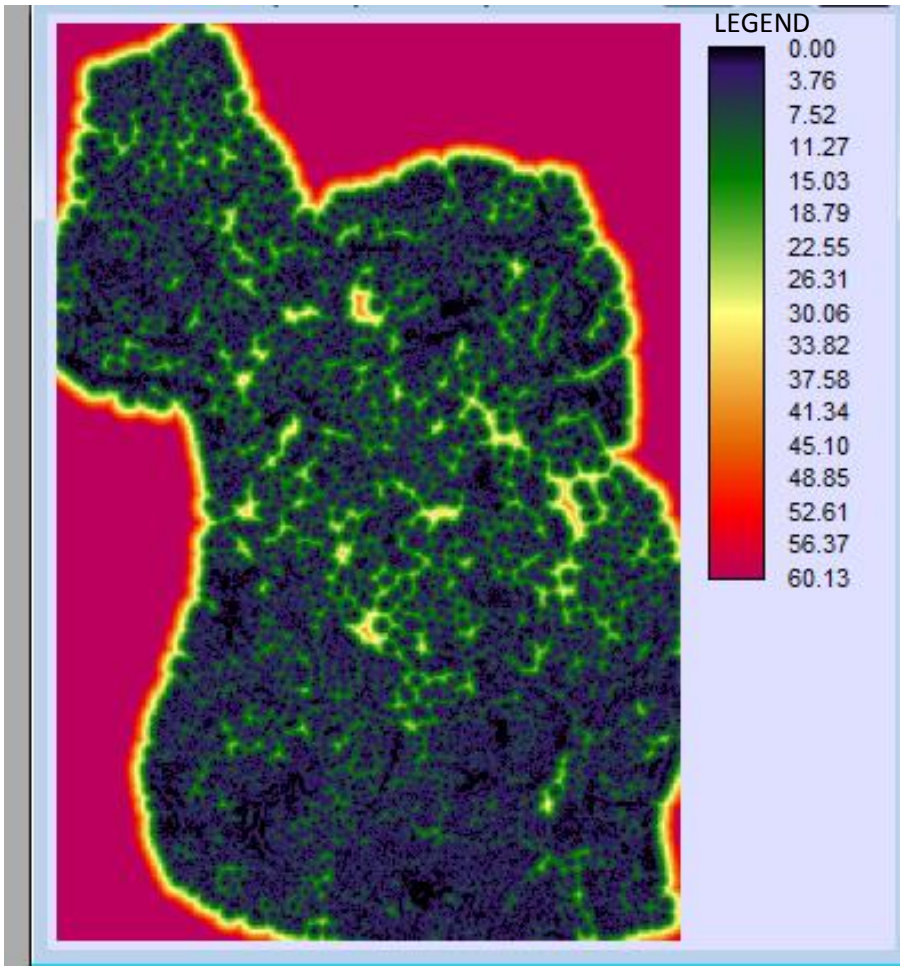
6. Mast map

Figure showing the fuzzy map of masts in Zaria



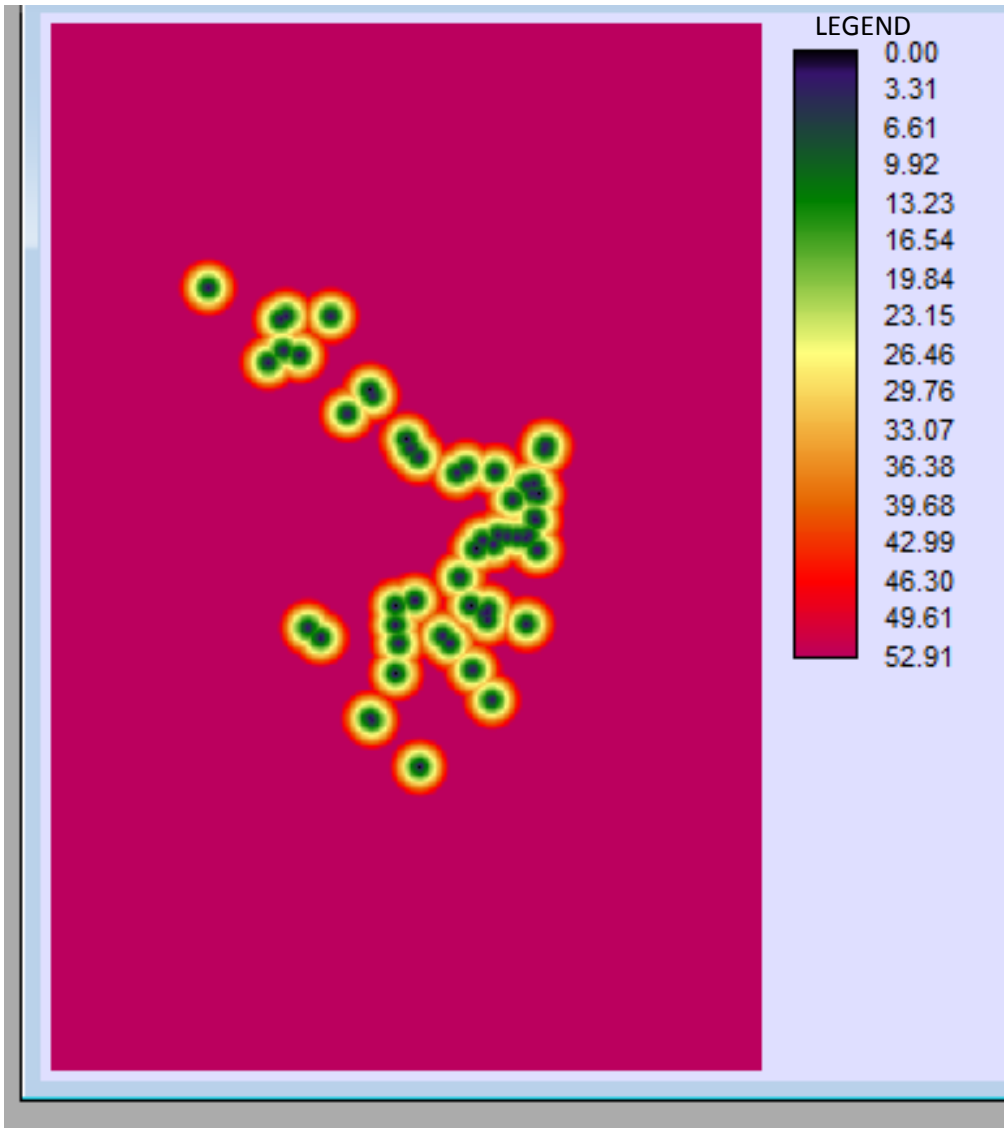
7. Open spaces map

Figure showing the fuzzy map of open spaces in Zaria



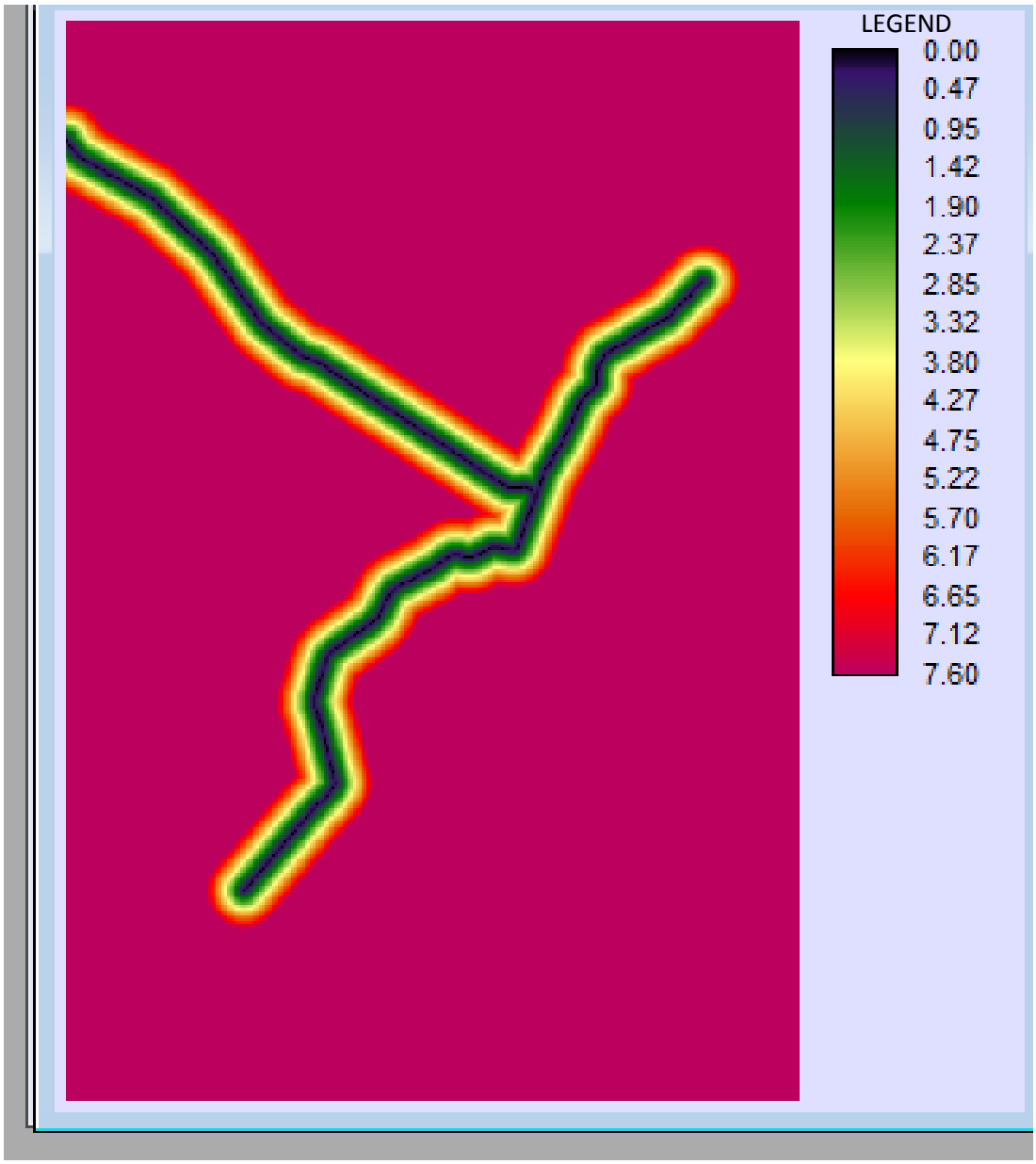
8. School map

Figure showing the fuzzy map of schools in Zaria



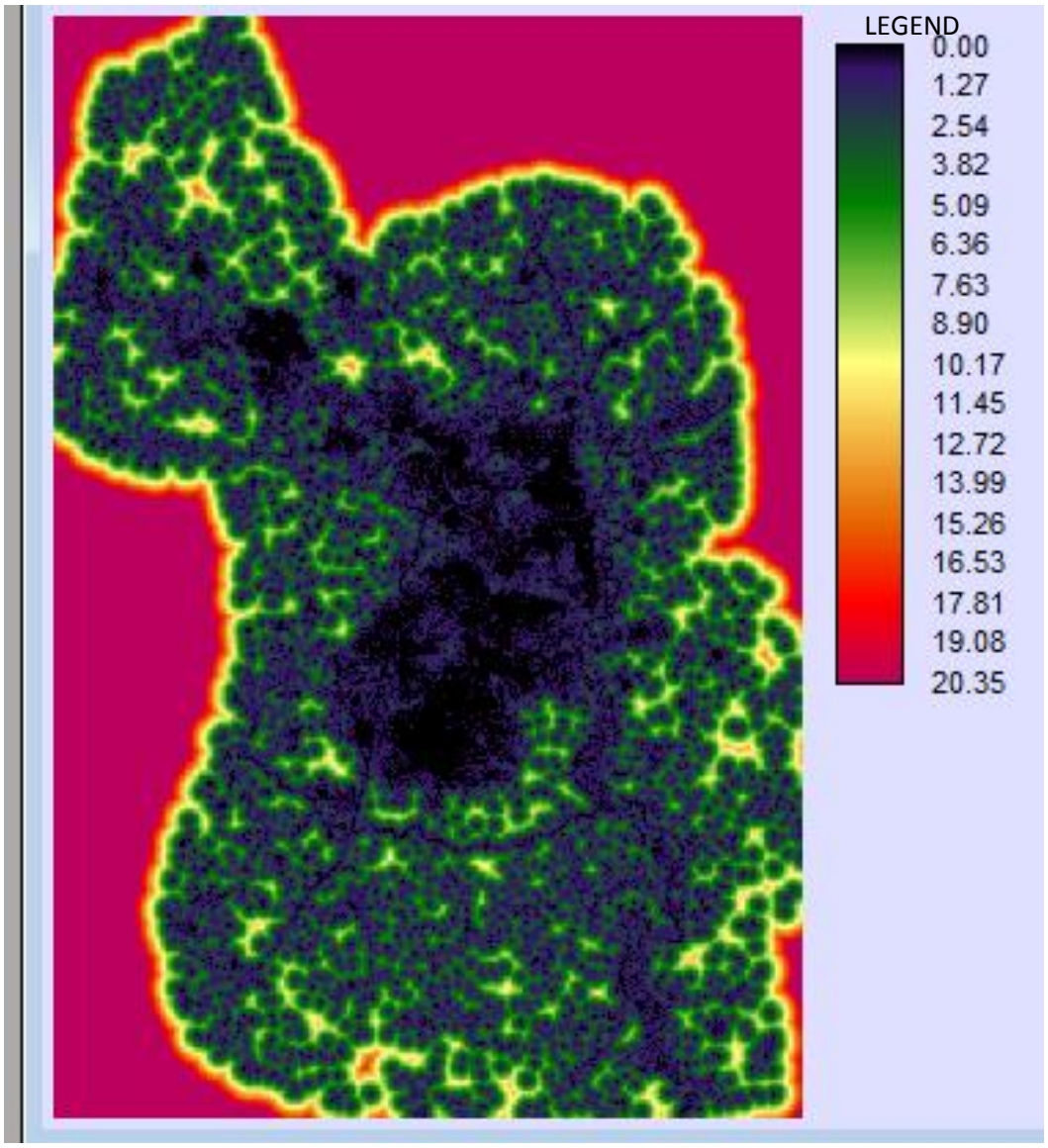
9. Railway map

Figure showing the fuzzy map of railway route in Zaria



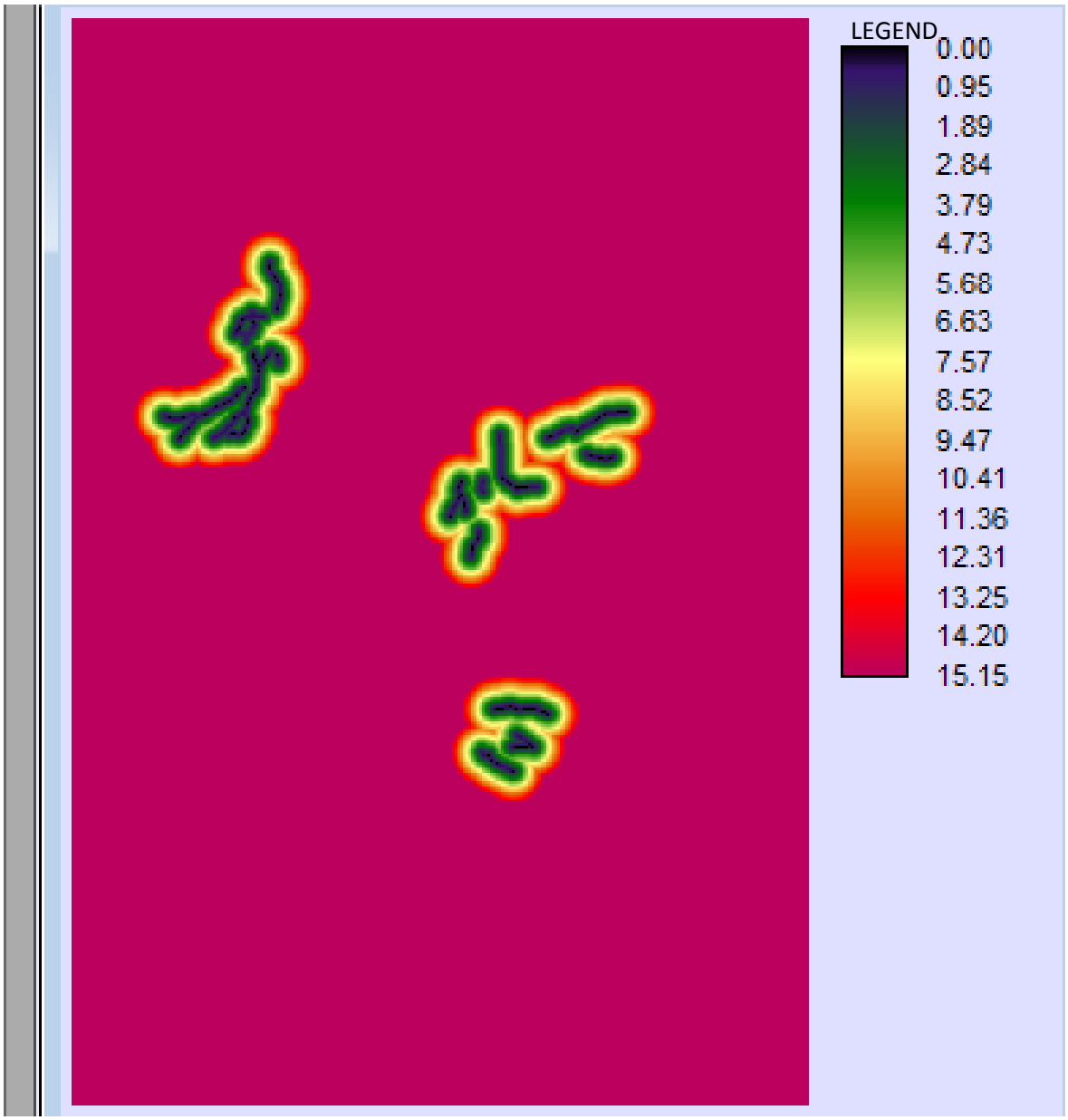
10. Settlement map

Figure showing the fuzzy map of settlements in Zaria



11. Track map

Figure showing the fuzzy map of track route in Zaria



APPENDIX II

LIST OF EXISTING POLLING UNIT

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
Fed. govt. girls college/ admin block	18/19/04/001	Kaduna	Sabon Gari	Basawa	7.684798541	11.14783714	
Nat. inst. leather research/ admin block	18/19/04/002	Kaduna	Sabon Gari	Basawa	7.682416962	11.17145616	
Basawa l.g.a i/ l.e.a. basawa	18/19/04/003	Kaduna	Sabon Gari	Basawa	7.672733358	11.17777929	
Ung. sarki/ k/g sarki	18/19/04/004	Kaduna	Sabon Gari	Basawa	7.673333189	11.18017297	
Basawa/ k/g makama	18/19/04/005	Kaduna	Sabon Gari	Basawa	7.67366582	11.17938304	
K/g liman/ danladi	18/19/04/006	Kaduna	Sabon Gari	Basawa	7.672161425	11.17898533	
Ung. gobirawa/ l.e.a. basawa	18/19/04/007	Kaduna	Sabon Gari	Basawa	7.673860541	11.1804056	
Hayin yamma/ hayi	18/19/04/008	Kaduna	Sabon Gari	Basawa	7.671907829	11.17791021	
Dupa dupa/ amfani house	18/19/04/009	Kaduna	Sabon Gari	Basawa	7.673062242	11.20342359	
Basawa/ l.e.a. barracks	18/19/04/010	Kaduna	Sabon Gari	Basawa	7.675659411	11.17163134	
Tudun muntsira/ tudun muntsira	18/19/04/011	Kaduna	Sabon Gari	Basawa	7.671408492	11.18117338	
Unguwan makera/ makera house	18/19/04/012	Kaduna	Sabon Gari	Basawa	7.689464578	11.20000533	
Unguwan na'inna/ na'inna house	18/19/04/013	Kaduna	Sabon Gari	Basawa	7.693342209	11.13825124	
Unguwan rimi/ u.p.e ung rimi	18/19/04/014	Kaduna	Sabon Gari	Basawa	7.687572474	11.18980797	
Gindin durumi/ gindin durumi	18/19/04/015	Kaduna	Sabon Gari	Basawa	7.659544593	11.19736291	
Kofar kudu/ kofan kudu	18/19/04/016	Kaduna	Sabon Gari	Basawa	7.672936541	11.17757699	
Palladan/ k/g sarkin palladan	18/19/04/017	Kaduna	Sabon Gari	Basawa	7.691412281	11.14140215	
Gindin mangwaro layin zomo/ k/g m. dahiru	18/19/04/018	Kaduna	Sabon Gari	Basawa	7.69682171	11.13773588	
Sarkin baka road/ k/g sarkin baka	18/19/04/019	Kaduna	Sabon Gari	Basawa	7.689806248	11.14547467	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
Gindin tsamia/ hayin liman	18/19/04/020	Kaduna	Sabon Gari	Basawa	7.687167189	11.1402502	
Aviation gate/ aviation gate	18/19/04/022	Kaduna	Sabon Gari	Basawa	7.686710065	11.13837733	
Ung. fulani/ l.e.a. palladan	18/19/04/023	Kaduna	Sabon Gari	Basawa	7.690358284	11.14452393	
Nainna/ l.e.a. palladan	18/19/04/024	Kaduna	Sabon Gari	Basawa	7.690046009	11.1444777	
Basawa ii/ l.e.a. barracks	18/19/04/025	Kaduna	Sabon Gari	Basawa	7.675851522	11.17114344	
Bomo village/ makaranta arabic	18/19/03/001	Kaduna	Sabon Gari	Bomo	7.616165615	11.19782067	
Kwakware manu/ barkin titi	18/19/03/002	Kaduna	Sabon Gari	Bomo	7.657661445	11.21171162	
Bomo kaya/ mangwaron yusuf	18/19/03/003	Kaduna	Sabon Gari	Bomo	7.629776434	11.18539941	
Bomo village i/ l.e.a. bomo	18/19/03/004	Kaduna	Sabon Gari	Bomo	7.632441536	11.18222446	
Bomo gari/ gindin chedinya	18/19/03/005	Kaduna	Sabon Gari	Bomo	7.63045187	11.18349965	
Hayin sambo/ gindin mangwaro	18/19/03/006	Kaduna	Sabon Gari	Bomo	7.611052969	11.19564154	
Dansa'a/ l.e.a dansa'a	18/19/03/007	Kaduna	Sabon Gari	Bomo	7.648037461	11.18182319	
Kurmin bomo/ k/g yusha'u	18/19/03/008	Kaduna	Sabon Gari	Bomo	7.622899722	11.18948292	
Ung. gwaiba/ k/g m/anguwa	18/19/03/009	Kaduna	Sabon Gari	Bomo	7.64536244	11.17149631	
Mil gwoma gari/ l.e.a. mil gwoma	18/19/03/010	Kaduna	Sabon Gari	Bomo	7.602152088	11.18145845	
Area c abu/ opposite maintenance office	18/19/03/011	Kaduna	Sabon Gari	Bomo	7.633354488	11.16961388	
Area bz abu/ bz round about	18/19/03/012	Kaduna	Sabon Gari	Bomo	7.642591347	11.15272125	
Area eg abu/ golden nursery school	18/19/03/013	Kaduna	Sabon Gari	Bomo	7.624579031	11.1713603	
Dorawa road/ hayin dogo	18/19/03/014	Kaduna	Sabon Gari	Bomo	7.651952025	11.16962002	
Basawa road/ kwakware chemist	18/19/03/015	Kaduna	Sabon Gari	Bomo	7.654230768	11.16527636	
Kano road/ ggss samaru	18/19/03/016	Kaduna	Sabon Gari	Bomo	7.659892166	11.16944498	
Uban doma road/ near railway line	18/19/03/017	Kaduna	Sabon Gari	Bomo	7.657654317	11.16182241	
Mamman yola road/ bakin shago	18/19/03/018	Kaduna	Sabon Gari	Bomo	7.656398694	11.16193156	

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Nashukan road/ bakin kasuwa	18/19/03/019	Kaduna	Sabon Gari	Bomo	7.647907547	11.16913285	
Yan mangworo/ yan mangworo	18/19/03/020	Kaduna	Sabon Gari	Bomo	7.655518272	11.16330101	
Kowa store/ l.e.a. kallon kura	18/19/03/022	Kaduna	Sabon Gari	Bomo	7.65943177	11.16704694	
Galadima road/ k/g mai angwan	18/19/03/023	Kaduna	Sabon Gari	Bomo	7.655093062	11.16808844	
Yaro road/ yaro bomo house	18/19/03/024	Kaduna	Sabon Gari	Bomo	7.652036816	11.16723467	
Bomo kaya/ g/sarkin house	18/19/03/025	Kaduna	Sabon Gari	Bomo	7.631544485	11.18642238	
Area es ii/ abu, zaria	18/19/03/026	Kaduna	Sabon Gari	Bomo	7.638799089	11.1557341	
Chikaji youth club/ b7 bala mai albasa	18/19/05/001	Kaduna	Sabon Gari	Chikaji	7.727350174	11.1213708	
Chikaji sabon layi/ l.e.a. chikaji	18/19/05/002	Kaduna	Sabon Gari	Chikaji	7.728701495	11.12476135	
Chikaji polo/ by musa burabisco	18/19/05/003	Kaduna	Sabon Gari	Chikaji	7.726413306	11.1241744	
Chikaji gari/ by mai kifi road	18/19/05/004	Kaduna	Sabon Gari	Chikaji	7.72731271	11.12473195	
Bakin dogo/ commerce school	18/19/05/005	Kaduna	Sabon Gari	Chikaji	7.724353272	11.12252792	
Chikaji/ by dantine maikifi	18/19/05/006	Kaduna	Sabon Gari	Chikaji	7.729246507	11.12620222	
Bandale road/ by bandale house	18/19/05/007	Kaduna	Sabon Gari	Chikaji	7.727400782	11.12195238	
Chikaji/ by beauty guest inn	18/19/05/008	Kaduna	Sabon Gari	Chikaji	7.715570962	11.1222534	
Mtd barracks/ mtd barracks	18/19/05/009	Kaduna	Sabon Gari	Chikaji	7.717890046	11.12357665	
Dururmi	18/19/05/010	Kaduna	Sabon Gari	Chikaji	7.727301042	11.12202434	
Ggss dogon bauchi/ ggss dogon bauchi	18/19/05/011	Kaduna	Sabon Gari	Chikaji	7.729483743	11.1046041	
Old hospital road/ ggss dogon bauchi	18/19/05/012	Kaduna	Sabon Gari	Chikaji	7.728903892	11.10387832	
Warri street/ by 21 mai guzami house	18/19/05/013	Kaduna	Sabon Gari	Chikaji	7.732177757	11.10479357	
Lagos street i/ by 21 mai guzami house	18/19/05/014	Kaduna	Sabon Gari	Chikaji	7.729446441	11.10933088	
Lagos street ii/ by alangade house	18/19/05/015	Kaduna	Sabon Gari	Chikaji	7.732653842	11.10579318	
New hospital road/ hospital road	18/19/05/016	Kaduna	Sabon Gari	Chikaji	7.7289711	11.10583251	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
Kalaber street ii/ by area court	18/19/05/019	Kaduna	Sabon Gari	Chikaji	7.728548872	11.11101113	
Mamman club/ by mamman daku club	18/19/05/021	Kaduna	Sabon Gari	Chikaji	7.727620435	11.10651967	
Main market/ by police station	18/19/05/022	Kaduna	Sabon Gari	Chikaji	7.72682668	11.10903954	
Mamman daku street/ ggss dogon bauchi	18/19/05/023	Kaduna	Sabon Gari	Chikaji	7.729523063	11.10438833	
Yan awaki/ by mobil filling station	18/19/05/024	Kaduna	Sabon Gari	Chikaji	7.709716888	11.12682076	
Chikaji youth club ii/ b7 bala mai albasa	18/19/05/025	Kaduna	Sabon Gari	Chikaji	7.72741652	11.12084327	
Dogarawa i/ chikin gari	18/19/09/001	Kaduna	Sabon Gari	Dogarawa	7.724112784	11.13462896	
Ung fulani/ l.e.a. ang fulani	18/19/09/002	Kaduna	Sabon Gari	Dogarawa	7.720256665	11.13816187	
Ung alh barau/ k/g alh barau diko	18/19/09/003	Kaduna	Sabon Gari	Dogarawa	7.719286018	11.13196677	
Kabama ranji/ k/g chindo	18/19/09/004	Kaduna	Sabon Gari	Dogarawa	7.707698378	11.14579611	
Dogarawa/ k/g mai anguwan	18/19/09/005	Kaduna	Sabon Gari	Dogarawa	7.722106269	11.13397613	
Ung nomi/ nomi house	18/19/09/006	Kaduna	Sabon Gari	Dogarawa	7.724038468	11.13938115	
Kwanta reshe/ k/g mai anguwan	18/19/09/007	Kaduna	Sabon Gari	Dogarawa	7.728803329	11.13342935	
Ung sakadadi/ upe sakadadi	18/19/09/008	Kaduna	Sabon Gari	Dogarawa	7.724480303	11.18191	
Ung sarki/ upe sakadadi	18/19/09/009	Kaduna	Sabon Gari	Dogarawa	7.725275955	11.18333839	
Ung mal isa/ k/g mal isa	18/19/09/010	Kaduna	Sabon Gari	Dogarawa	7.725686879	11.1820091	
Dan mai kwaruwa/ maishellaro house	18/19/09/011	Kaduna	Sabon Gari	Dogarawa	7.710875235	11.19778582	
Ung barashi/ ung barashi	18/19/09/012	Kaduna	Sabon Gari	Dogarawa	7.720216306	11.17101284	
Ung sarki/ k/g sarki	18/19/09/013	Kaduna	Sabon Gari	Dogarawa	7.72609498	11.18240062	
Gwanda/ gindin rimi karofi	18/19/09/014	Kaduna	Sabon Gari	Dogarawa	7.724979032	11.22273514	
Bauda/ k/g mai anguwan	18/19/09/015	Kaduna	Sabon Gari	Dogarawa	7.731987981	11.10790159	
Zangon dan barno/ upe zangon dan barno	18/19/09/016	Kaduna	Sabon Gari	Dogarawa	7.737312935	11.18240745	
Gabashin gwanda/ gwanda	18/19/09/017	Kaduna	Sabon Gari	Dogarawa	7.747233351	11.21749097	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
Gwanda village/ k/g mai anguwan	18/19/09/018	Kaduna	Sabon Gari	Dogarawa	7.727694383	11.22441862	
Gwanda/ ung madaki	18/19/09/019	Kaduna	Sabon Gari	Dogarawa	7.726130024	11.22372592	
Danladi gangare/ k/g alh audu concord	18/19/08/001	Kaduna	Sabon Gari	Hanwa	7.704169002	11.11213079	
Rafin sidi/ makera	18/19/08/002	Kaduna	Sabon Gari	Hanwa	7.700951499	11.11962289	
Ung sarki/ k/g sarki	18/19/08/003	Kaduna	Sabon Gari	Hanwa	7.704192216	11.1141136	
Hanwa/ upe hanwa	18/19/08/004	Kaduna	Sabon Gari	Hanwa	7.704007876	11.11843565	
Makaranta/ k/g alh ahmadu	18/19/08/005	Kaduna	Sabon Gari	Hanwa	7.702537858	11.1135479	
Ung nashuka/ ung nashuka	18/19/08/006	Kaduna	Sabon Gari	Hanwa	7.705747099	11.12705495	
Jim harrison hotel/ harrison hotel gate	18/19/08/007	Kaduna	Sabon Gari	Hanwa	7.699692009	11.12284374	
Yan lemu/ yan lemu	18/19/08/008	Kaduna	Sabon Gari	Hanwa	7.704922184	11.12784581	
Hanwa lowcost i/ zaria hotel gate	18/19/08/009	Kaduna	Sabon Gari	Hanwa	7.700333068	11.13137631	
Hanwa lowcost ii/ 10a lowcost	18/19/08/010	Kaduna	Sabon Gari	Hanwa	7.701564412	11.12953559	
Kwarin ayuba/ gindin kuka	18/19/08/011	Kaduna	Sabon Gari	Hanwa	7.685136189	11.1192257	
Gidan dan tanko/ k/g dantanko	18/19/08/012	Kaduna	Sabon Gari	Hanwa	7.70527769	11.13043263	
Bakin kora/ kwangila	18/19/08/013	Kaduna	Sabon Gari	Hanwa	7.707602916	11.13096388	
Ung mal. sani i/ upe kwangila	18/19/08/014	Kaduna	Sabon Gari	Hanwa	7.702508389	11.13399668	
Ung mal. sani ii/ k/g malam sani	18/19/08/015	Kaduna	Sabon Gari	Hanwa	7.703936286	11.13441248	
Liverpool avenue/ fascomgate	18/19/08/016	Kaduna	Sabon Gari	Hanwa	7.710038907	11.11477444	
Manchester street/ manchester street	18/19/08/017	Kaduna	Sabon Gari	Hanwa	7.718286381	11.1031897	
Park road/ hamzeh store	18/19/08/018	Kaduna	Sabon Gari	Hanwa	7.721661033	11.10175079	
Circular road/ union bank site	18/19/08/019	Kaduna	Sabon Gari	Hanwa	7.720260087	11.10374077	
Commonwealth road/ govt. lodge z4	18/19/08/020	Kaduna	Sabon Gari	Hanwa	7.713052824	11.1111956	
Hanwa road/ farm seed house	18/19/08/021	Kaduna	Sabon Gari	Hanwa	7.712135862	11.11774281	

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Rock road/ rock road	18/19/08/022	Kaduna	Sabon Gari	Hanwa	7.712304287	11.11995295	
Sokoto road i/ mayfair clinic	18/19/08/023	Kaduna	Sabon Gari	Hanwa	7.713840382	11.12338926	
Sokoto road ii/ nepa bus stop	18/19/08/024	Kaduna	Sabon Gari	Hanwa	7.721098667	11.10743248	
Rafin sidi ii/ makera	18/19/08/026	Kaduna	Sabon Gari	Hanwa	7.699064773	11.11709319	
Hanwa makera/ k/g mai anguwan	18/19/08/027	Kaduna	Sabon Gari	Hanwa	7.700669177	11.11987558	
Akenzua hall/ police gate abu	18/19/02/001	Kaduna	Sabon Gari	Jama'a	7.659801481	11.15323796	
Suleiman hall/ suleiman dinning hall	18/19/02/002	Kaduna	Sabon Gari	Jama'a	7.653030438	11.15378167	
Amina hall/ amina dinning hall	18/19/02/003	Kaduna	Sabon Gari	Jama'a	7.655011788	11.15242483	
Senior staff quarters/ staff quarters	18/19/02/004	Kaduna	Sabon Gari	Jama'a	7.656736616	11.14601542	
Danfodio hall/ dinning hall	18/19/02/005	Kaduna	Sabon Gari	Jama'a	7.647596922	11.15467942	
Alexander hall/ ribado common room	18/19/02/006	Kaduna	Sabon Gari	Jama'a	7.65403505	11.1521128	
Ramat hall/ ramat hall	18/19/02/007	Kaduna	Sabon Gari	Jama'a	7.648974448	11.14971402	
Karaye/ mango tree	18/19/02/008	Kaduna	Sabon Gari	Jama'a	7.662840371	11.13291431	
Jama'a/ l.e.a. jama'a	18/19/02/009	Kaduna	Sabon Gari	Jama'a	7.669996183	11.13696324	
Ung. danyero/ bakin kwakware	18/19/02/010	Kaduna	Sabon Gari	Jama'a	7.660640958	11.15873337	
Zangon shanu i/ aviation gate 2	18/19/02/011	Kaduna	Sabon Gari	Jama'a	7.668363422	11.13831258	
Silver jubilee/ football field	18/19/02/012	Kaduna	Sabon Gari	Jama'a	7.670172549	11.15039988	
A.b.u./ demonstration school	18/19/02/013	Kaduna	Sabon Gari	Jama'a	7.654034276	11.15526871	
Zangon shanu ii/ alhudahuta gate	18/19/02/014	Kaduna	Sabon Gari	Jama'a	7.672525085	11.14352639	
Hayin liman/ liman house	18/19/02/015	Kaduna	Sabon Gari	Jama'a	7.662565571	11.12338879	
Kwarin kubanni/ mai angwan house	18/19/02/016	Kaduna	Sabon Gari	Jama'a	7.674555643	11.13498681	
Industrial dev. centre/ admin block	18/19/02/017	Kaduna	Sabon Gari	Jama'a	7.663434531	11.15500235	
Police gate/ police gate ABU	18/19/02/018	Kaduna	Sabon Gari	Jama'a	7.663868313	11.15066036	

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Abu dam quarters/ abu staff school	18/19/02/019	Kaduna	Sabon Gari	Jama'a	7.653266016	11.14701688	
Zangon shanu iii/ aviation gate ii	18/19/02/020	Kaduna	Sabon Gari	Jama'a	7.675874273	11.14656693	
Ung. mai sule/ by kwakware	18/19/07/001	Kaduna	Sabon Gari	Jushin waje	7.742345519	11.09034581	
Ung. mai gwando i/ l.e.a. jushin waje	18/19/07/002	Kaduna	Sabon Gari	Jushin waje	7.742624436	11.09732942	
Liman saidu road/ liman house	18/19/07/004	Kaduna	Sabon Gari	Jushin waje	7.742051758	11.1013997	
Rsm kumasi/ yan mangori	18/19/07/005	Kaduna	Sabon Gari	Jushin waje	7.739553086	11.10301636	
Bamidele street/ bamidele street	18/19/07/006	Kaduna	Sabon Gari	Jushin waje	7.741947033	11.1048586	
Tanko street/ l.e.a. ung. kanawa	18/19/07/007	Kaduna	Sabon Gari	Jushin waje	7.741789282	11.10605244	
Ung. kanawa/ l.e.a. ung. kanawa	18/19/07/008	Kaduna	Sabon Gari	Jushin waje	7.742046109	11.1063171	
Hajiya street/ army children school	18/19/07/009	Kaduna	Sabon Gari	Jushin waje	7.741380433	11.10651691	
Mochu street/ army children school	18/19/07/010	Kaduna	Sabon Gari	Jushin waje	7.739581416	11.10648726	
Alhaji street/ army children school	18/19/07/011	Kaduna	Sabon Gari	Jushin waje	7.738072232	11.10890372	
Bello street/ army children school	18/19/07/012	Kaduna	Sabon Gari	Jushin waje	7.740513705	11.10861792	
Ung. fulani/ l.e.a. ang fulani	18/19/07/013	Kaduna	Sabon Gari	Jushin waje	7.735962826	11.1074045	
Ung abdul tela/ abdul tela house	18/19/07/014	Kaduna	Sabon Gari	Jushin waje	7.737742865	11.10825976	
Musa street/ by sikerie house	18/19/07/015	Kaduna	Sabon Gari	Jushin waje	7.73983854	11.1107336	
Army depot ss quarters/ by senior staff qtrs	18/19/07/016	Kaduna	Sabon Gari	Jushin waje	7.725495754	11.10130172	
Army depot/ by warrant officers qtrs	18/19/07/017	Kaduna	Sabon Gari	Jushin waje	7.739235749	11.10150963	
Nms students/ by nms staff qtrs	18/19/07/018	Kaduna	Sabon Gari	Jushin waje	7.742218003	11.09150535	
Nms student/ by school field	18/19/07/019	Kaduna	Sabon Gari	Jushin waje	7.742286771	11.09724335	
Gdss chindith/ gdss chindith	18/19/07/020	Kaduna	Sabon Gari	Jushin waje	7.735858226	11.10010017	
Nms workshop/ nms workshop	18/19/07/021	Kaduna	Sabon Gari	Jushin waje	7.743004801	11.09078637	
Ungwar kanawa ii/ army children's school	18/19/07/022	Kaduna	Sabon Gari	Jushin waje	7.742324271	11.10703159	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
Babban titi/ by alh. katango house	18/19/06/001	Kaduna	Sabon Gari	Muchia	7.732198284	11.11862094	
Aggrey/ himma club	18/19/06/002	Kaduna	Sabon Gari	Muchia	7.732701897	11.11941736	
Kasim/prince road/ mai bala house	18/19/06/003	Kaduna	Sabon Gari	Muchia	7.738302704	11.11521655	
Ali baba street/ l.e.a. muchia	18/19/06/004	Kaduna	Sabon Gari	Muchia	7.733195582	11.12273103	
Zobe/bidda road/ l.e.a. muchia	18/19/06/005	Kaduna	Sabon Gari	Muchia	7.732925442	11.12251105	
Durumin baba mai albasa/ d/baba m albasa	18/19/06/007	Kaduna	Sabon Gari	Muchia	7.732322037	11.12111559	
Madugu road/ madugu road	18/19/06/008	Kaduna	Sabon Gari	Muchia	7.731253658	11.12083769	
Bankole road/ hajiya habiba house	18/19/06/009	Kaduna	Sabon Gari	Muchia	7.733550117	11.12031289	
Enugu road/ no.2 enugu road	18/19/06/010	Kaduna	Sabon Gari	Muchia	7.733273881	11.11960467	
Durumi sabbi/ by durumi	18/19/06/011	Kaduna	Sabon Gari	Muchia	7.730438448	11.12443527	
Tobacco road/ tobacco road	18/19/06/012	Kaduna	Sabon Gari	Muchia	7.729752219	11.1193452	
Dorawa road/ k/g sarki muchia	18/19/06/013	Kaduna	Sabon Gari	Muchia	7.728953906	11.12009182	
Bindare road/ by kwakware	18/19/06/014	Kaduna	Sabon Gari	Muchia	7.734995398	11.12402585	
Ondo road/ ondo road	18/19/06/015	Kaduna	Sabon Gari	Muchia	7.736713098	11.12024614	
Abba road/ by sani abba house	18/19/06/016	Kaduna	Sabon Gari	Muchia	7.730397703	11.12354729	
Tsugugi central/ alh. wakili house	18/19/06/017	Kaduna	Sabon Gari	Muchia	7.737083148	11.12219772	
Onitsha road/ abdul wakili house	18/19/06/018	Kaduna	Sabon Gari	Muchia	7.738265173	11.12122052	
Galma road/ red house	18/19/06/019	Kaduna	Sabon Gari	Muchia	7.738304421	11.11520663	
Sapele/dikko road/ k/g sarki	18/19/06/020	Kaduna	Sabon Gari	Muchia	7.736240255	11.11574732	
Ung. tsauni/ by isiyaka mai nama	18/19/06/021	Kaduna	Sabon Gari	Muchia	7.738514963	11.11770433	
Shika road/ dan lami ali house	18/19/06/022	Kaduna	Sabon Gari	Muchia	7.734163332	11.11530794	
Victoria/prince road/ l.e.a. marmara	18/19/06/023	Kaduna	Sabon Gari	Muchia	7.735091153	11.11743438	
Marmara/ ibadan street/ l.e.a. marmara	18/19/06/024	Kaduna	Sabon Gari	Muchia	7.734941346	11.1168379	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
Liman street/ liman street	18/19/06/025	Kaduna	Sabon Gari	Muchia	7.733784229	11.11446163	
Uche portharcourt road/ uche road	18/19/06/026	Kaduna	Sabon Gari	Muchia	7.733088291	11.1161118	
Kings road i/ h/court	18/19/06/027	Kaduna	Sabon Gari	Muchia	7.734629209	11.12034467	
Kings road ii/ l.e.a. s/gari	18/19/06/028	Kaduna	Sabon Gari	Muchia	7.733915465	11.118401	
Prince road/ l.e.a.marmara	18/19/06/029	Kaduna	Sabon Gari	Muchia	7.734834325	11.11715887	
Ung. dankuka/ no.6 tsugugi	18/19/06/030	Kaduna	Sabon Gari	Muchia	7.738537297	11.11671419	
Danraka estate i/ behind union bank	18/19/01/001	Kaduna	Sabon Gari	Samaru	7.655998721	11.15705425	
Danraka estate ii/ by kwakware	18/19/01/002	Kaduna	Sabon Gari	Samaru	7.654212111	11.15938604	
Danyaro road/ by durumi	18/19/01/003	Kaduna	Sabon Gari	Samaru	7.653534885	11.1596947	
Tunau road/ tunau house	18/19/01/004	Kaduna	Sabon Gari	Samaru	7.653230807	11.16095036	
Dandafo road/ by dunya tree	18/19/01/005	Kaduna	Sabon Gari	Samaru	7.651991869	11.16053731	
Ahmed road/ ahmed road	18/19/01/006	Kaduna	Sabon Gari	Samaru	7.65150988	11.16156534	
Yusuf i/ yusuf road	18/19/01/007	Kaduna	Sabon Gari	Samaru	7.650653891	11.16196109	
Yusuf ii/ yusuf road	18/19/01/008	Kaduna	Sabon Gari	Samaru	7.651066678	11.1626328	
Sarki road i/ by sarki house	18/19/01/009	Kaduna	Sabon Gari	Samaru	7.649983583	11.16275155	
Sarki road ii/ by independence cinema	18/19/01/010	Kaduna	Sabon Gari	Samaru	7.650483199	11.1636752	
Naibi road/ naibi house	18/19/01/011	Kaduna	Sabon Gari	Samaru	7.647671599	11.16433718	
Masallari road i/ l.g.a. saidu	18/19/01/012	Kaduna	Sabon Gari	Samaru	7.647582726	11.16656084	
Masallari road ii/ l.g.a. saidu	18/19/01/013	Kaduna	Sabon Gari	Samaru	7.647212846	11.16646876	
Ahim basawa road/ gindin mangoro	18/19/01/014	Kaduna	Sabon Gari	Samaru	7.64743393	11.16489463	
Makaranta road i/ l.g.a. amina	18/19/01/015	Kaduna	Sabon Gari	Samaru	7.644588905	11.16384037	
Makaranta road ii/ l.g.a. amina	18/19/01/016	Kaduna	Sabon Gari	Samaru	7.644973593	11.16431305	
New extension/ l.e.a amina	18/19/01/017	Kaduna	Sabon Gari	Samaru	7.644625543	11.16679137	

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Habibu road/ biye house	18/19/01/018	Kaduna	Sabon Gari	Samaru	7.647779862	11.16283137	
Leather research/ admin block	18/19/01/019	Kaduna	Sabon Gari	Samaru	7.657536149	11.1568148	
Iya road/ by kasuwan dare	18/19/01/020	Kaduna	Sabon Gari	Samaru	7.649315718	11.16277086	
Agric quarters/ l.e.a. amina	18/19/01/021	Kaduna	Sabon Gari	Samaru	7.640100989	11.16531975	
Daraka estate 111/ behind union bank	18/19/01/022	Kaduna	Sabon Gari	Samaru	7.65575761	11.15936366	
Sarki road 111/ by sarki house	18/19/01/023	Kaduna	Sabon Gari	Samaru	7.64889106	11.16006082	
Club street i/ recreation club	18/19/10/001	Kaduna	Sabon Gari	Unguwan gabas	7.732348878	11.10976995	
Benin street i/ zumunta social club	18/19/10/003	Kaduna	Sabon Gari	Unguwan gabas	7.733997588	11.10683812	
Benin street ii/ janex	18/19/10/004	Kaduna	Sabon Gari	Unguwan gabas	7.730079057	11.11117306	
Railway qrts. i/ recreation railway club	18/19/10/005	Kaduna	Sabon Gari	Unguwan gabas	7.729785453	11.11557623	
Railway qrts. ii/ dogon bauchi junction	18/19/10/006	Kaduna	Sabon Gari	Unguwan gabas	7.729570092	11.11228689	
Ung jaba market/ sal mai shayi house	18/19/10/007	Kaduna	Sabon Gari	Unguwan gabas	7.741470303	11.11098506	
Ung jaba i/ s. baba house	18/19/10/008	Kaduna	Sabon Gari	Unguwan gabas	7.74097468	11.11103508	
Ung jaba ii/ hausa	18/19/10/009	Kaduna	Sabon Gari	Unguwan gabas	7.737756167	11.11205531	
Jeka da kwarin ka/ sule dandaudu	18/19/10/010	Kaduna	Sabon Gari	Unguwan gabas	7.738109834	11.11275946	
Jeka da kwarin ka/ u/line	18/19/10/011	Kaduna	Sabon Gari	Unguwan gabas	7.735658398	11.11235518	
Jeka da kwarin ka/ w/line	18/19/10/012	Kaduna	Sabon Gari	Unguwan gabas	7.736609115	11.112168	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
Ung jaba/ g/mai anguwa	18/19/10/013	Kaduna	Sabon Gari	Unguwan gabas	7.741547305	11.11152055	
T. line/ late zakari magwaro	18/19/10/014	Kaduna	Sabon Gari	Unguwan gabas	7.733518453	11.1118909	
Saidu street/ japan electronics	18/19/10/015	Kaduna	Sabon Gari	Unguwan gabas	7.738475061	11.1103728	
Freetown street/ freetown street	18/19/10/016	Kaduna	Sabon Gari	Unguwan gabas	7.736985776	11.10907356	
Rimi street/ l.e.a. ja'afaru	18/19/10/017	Kaduna	Sabon Gari	Unguwan gabas	7.735451281	11.1109125	
Bigman street/ area garden	18/19/10/019	Kaduna	Sabon Gari	Unguwan gabas	7.73834418	11.11132641	
Ja'afan street/ l.e.a. ja'afaru	18/19/10/020	Kaduna	Sabon Gari	Unguwan gabas	7.735242683	11.1111093	
Egbo road/ l.e.a. ja'afaru	18/19/10/021	Kaduna	Sabon Gari	Unguwan gabas	7.734908944	11.11089123	
William street/ k/g lawal maitaba	18/19/10/022	Kaduna	Sabon Gari	Unguwan gabas	7.735784487	11.10935037	
Bigman street ii/ area garden	18/19/10/023	Kaduna	Sabon Gari	Unguwan gabas	7.738755827	11.11169867	
Ibo road ii/ l.e.a. jafaru	18/19/10/024	Kaduna	Sabon Gari	Unguwan gabas	7.733716694	11.11123853	
Tohu zabi/ tohu village	18/19/11/001	Kaduna	Sabon Gari	Zabi	7.705006081	11.16165683	
L.e.a. ranji/ l.e.a. ranji	18/19/11/002	Kaduna	Sabon Gari	Zabi	7.699016064	11.16689912	
Maraba gwanda/ bakin titi	18/19/11/003	Kaduna	Sabon Gari	Zabi	7.74950486	11.16433041	
Zabi ung sarki/ k/g sarki	18/19/11/004	Kaduna	Sabon Gari	Zabi	7.737585205	11.14693724	
Unguwan galadima/ by galadima house	18/19/11/005	Kaduna	Sabon Gari	Zabi	7.736672054	11.14717497	
Zabi gari/ upe zabi	18/19/11/006	Kaduna	Sabon Gari	Zabi	7.738910837	11.14723418	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
Hayin gada/ by hayin gada village	18/19/11/007	Kaduna	Sabon Gari	Zabi	7.749402168	11.15434942	
Hayin fulani/ by dinya tree	18/19/11/008	Kaduna	Sabon Gari	Zabi	7.797250388	11.15442092	
Katanga i/ by upe	18/19/11/009	Kaduna	Sabon Gari	Zabi	7.780141727	11.16923047	
Katanga ii/ by upe	18/19/11/010	Kaduna	Sabon Gari	Zabi	7.784338816	11.16725701	
Ung mauzu/ by maiunguwa	18/19/11/011	Kaduna	Sabon Gari	Zabi	7.76402695	11.13998178	
Ung sarki/ by sarki house	18/19/11/012	Kaduna	Sabon Gari	Zabi	7.765351608	11.14056631	
Ung liman/ by liman buhari house	18/19/11/013	Kaduna	Sabon Gari	Zabi	7.764356517	11.14106959	
Ung mai nuhu/ by mal nuhu house	18/19/11/014	Kaduna	Sabon Gari	Zabi	7.763372561	11.14160481	
Yan tukwane/ ginery gate	18/19/11/015	Kaduna	Sabon Gari	Zabi	7.739187685	11.12590235	
Hayin ojo ii/ mai anguwa house	18/19/11/017	Kaduna	Sabon Gari	Zabi	7.735211547	11.1317319	
Bakin dogo i/ gindin aduwa	18/19/11/018	Kaduna	Sabon Gari	Zabi	7.732739156	11.13066894	
Bakin dogo ii/ gidan hira	18/19/11/019	Kaduna	Sabon Gari	Zabi	7.732385882	11.12992629	
Ung abdu gwarzo/ by abdu gwarzo house	18/19/11/020	Kaduna	Sabon Gari	Zabi	7.736584377	11.12941532	
Govt. commercial college/ admin block g.c.c zr	18/19/11/021	Kaduna	Sabon Gari	Zabi	7.738392096	11.13118561	
Namarwa road/ by namarwa house	18/19/11/022	Kaduna	Sabon Gari	Zabi	7.737599234	11.12639391	
Zabi gari ii/ by dan kura house	18/19/11/023	Kaduna	Sabon Gari	Zabi	7.736862592	11.14789112	
Hayin ojo iii/ tsakiya gari	18/19/11/024	Kaduna	Sabon Gari	Zabi	7.737946548	11.12889266	
Ang. malamai/ k/g mai anguwa	18/23/10/019	Kaduna	Zaria	Dambo	7.75702896	11.1293562	
Bizara i/ l.e.a. bizara	18/23/10/007	Kaduna	Zaria	Dambo	7.755283345	11.06806068	
Bizara ii/ l.e.a. bizara	18/23/10/008	Kaduna	Zaria	Dambo	7.75689022	11.07002787	
Dakace i/ k/g sarkin dakace	18/23/10/010	Kaduna	Zaria	Dambo	7.756998001	11.08096294	
Dakace ii/ l.e.a. dakace	18/23/10/011	Kaduna	Zaria	Dambo	7.754672189	11.0802659	
Dakace iii/ l.e.a. dakace	18/23/10/012	Kaduna	Zaria	Dambo	7.754643965	11.0804802	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
Dakace iv/ l.e.a. dakace	18/23/10/021	Kaduna	Zaria	Dambo	7.769881545	11.09334061	
Dambo i/ k/g sarkin dambo	18/23/10/001	Kaduna	Zaria	Dambo	7.780538583	11.07576756	
Dambo ii/ no.8 bamalli road	18/23/10/002	Kaduna	Zaria	Dambo	7.778104492	11.07631037	
Dambo iii/ l.e.a. dambo	18/23/10/006	Kaduna	Zaria	Dambo	7.779485146	11.07416208	
Dambo iv/ l.e.a. dambo	18/23/10/020	Kaduna	Zaria	Dambo	7.79942438	11.04037842	
Fanganu/ k/g mai anguwa	18/23/10/005	Kaduna	Zaria	Dambo	7.769250543	11.06143679	
K/mai rogo gaba/ k/g alh. salisu kakeyi	18/23/10/018	Kaduna	Zaria	Dambo	7.765550972	11.10499073	
Kakeyi village i/ l.e.a. kakeyi	18/23/10/016	Kaduna	Zaria	Dambo	7.756323551	11.11277842	
Kakeyi village ii/ l.e.a. kakeyi	18/23/10/017	Kaduna	Zaria	Dambo	7.756165919	11.11277407	
Ung. gaga i/ k/g maiunguwa	18/23/10/014	Kaduna	Zaria	Dambo	7.780749243	11.07634184	
Ung. gaga ii/ k/g maiunguwa	18/23/10/015	Kaduna	Zaria	Dambo	7.784221309	11.09039827	
Ung. katika i/ k/g mai anguwa	18/23/10/004	Kaduna	Zaria	Dambo	7.798648481	11.06887738	
Ung. mangu/ k/g maiunguwa	18/23/10/013	Kaduna	Zaria	Dambo	7.764576528	11.08271402	
Ung. s/noma i/ l.e.a. dambo	18/23/10/003	Kaduna	Zaria	Dambo	7.772399571	11.07523516	
Babban abu/ k/g m. ang.	18/23/12/022	Kaduna	Zaria	Dutsen Abba	7.511982867	11.04272923	
Dallatu/ k/g m. ang.	18/23/12/020	Kaduna	Zaria	Dutsen Abba	7.611801476	11.03994876	
Dorayi/ k/g m. ang.	18/23/12/004	Kaduna	Zaria	Dutsen Abba	7.686036258	11.00737147	
Dutsen abba/ l.e.a. dumbi	18/23/12/001	Kaduna	Zaria	Dutsen Abba	7.641600274	10.98764153	
Fantan/ k/g m. ang.	18/23/12/027	Kaduna	Zaria	Dutsen Abba	7.543258086	11.02425859	
Hange/ l.e.a. hange	18/23/12/013	Kaduna	Zaria	Dutsen Abba	7.641902751	11.03307389	
Kafi mardanni/ l.e.a. k/mardanni	18/23/12/029	Kaduna	Zaria	Dutsen Abba	7.584750778	11.05532304	
Kasuwan dutse/ l.e.a. k/dutse	18/23/12/023	Kaduna	Zaria	Dutsen Abba	7.613178615	11.01944763	
Kugu/ l.e.a. kugu	18/23/12/017	Kaduna	Zaria	Dutsen Abba	7.627546948	11.02181618	

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Kwaba/ k/g m. ang.	18/23/12/025	Kaduna	Zaria	Dutsen Abba	7.528307461	11.01445218	
Layin kutare majeru/ n.t.b.b.l.t. gate	18/23/12/010	Kaduna	Zaria	Dutsen Abba	7.642991732	11.04135523	
Maganda/ k/g m. ang.	18/23/12/026	Kaduna	Zaria	Dutsen Abba	7.545889854	10.99231228	
Makera/ k/g m. ang.	18/23/12/024	Kaduna	Zaria	Dutsen Abba	7.613867664	11.00637104	
Pam madina i/ l.e.a. pam madina	18/23/12/006	Kaduna	Zaria	Dutsen Abba	7.657687615	11.01532969	
Pam madina ii/ k/g sarkin n. pam madina	18/23/12/007	Kaduna	Zaria	Dutsen Abba	7.655407987	11.01754425	
Rafin gora/ k/g m. ang.	18/23/12/028	Kaduna	Zaria	Dutsen Abba	7.501594797	11.02839428	
Rafin yashi kwabai/ k/g m. ang.	18/23/12/021	Kaduna	Zaria	Dutsen Abba	7.566594972	11.03056827	
Sabon gida/ k/g dakace	18/23/12/019	Kaduna	Zaria	Dutsen Abba	7.618225087	11.03737351	
Sayen tunkara iii/ l.e.a. s/tunkara	18/23/12/031	Kaduna	Zaria	Dutsen Abba	7.656953372	11.05308135	
Sayentunkara ii/ k/g sarki s/tunkara	18/23/12/009	Kaduna	Zaria	Dutsen Abba	7.666729056	11.03485925	
Tankarau/ k/g a. madada	18/23/12/011	Kaduna	Zaria	Dutsen Abba	7.642049504	11.06307797	
Tudun gaude/ k/g m. ang.	18/23/12/018	Kaduna	Zaria	Dutsen Abba	7.640345357	10.99913802	
Ung. haran/ k/g mai ang. haran	18/23/12/012	Kaduna	Zaria	Dutsen Abba	7.696946746	10.99968702	
Ung. kako/ l.e.a. kako	18/23/12/005	Kaduna	Zaria	Dutsen Abba	7.739790957	10.96993243	
Ung. kanawa/ k/g m. ang.	18/23/12/016	Kaduna	Zaria	Dutsen Abba	7.629094823	11.05265773	
Ung. malamai i/ k/g m. ang.	18/23/12/014	Kaduna	Zaria	Dutsen Abba	7.621252377	11.00418142	
Ung. maliki/ l.e.a. u/maliki	18/23/12/030	Kaduna	Zaria	Dutsen Abba	7.579696799	11.04843844	
Ung. s. noma i/ ung. s. noma	18/23/12/015	Kaduna	Zaria	Dutsen Abba	7.635784637	11.01653065	
Yeskwakwe i/ l.e.a. yeskwakwe	18/23/12/003	Kaduna	Zaria	Dutsen Abba	7.709071194	11.00035085	
Zura/ tarayan sarki	18/23/12/002	Kaduna	Zaria	Dutsen Abba	7.668349396	11.01276641	
Congo gra/ children's park	18/23/07/011	Kaduna	Zaria	Gyellesu	7.728338493	11.0800658	
Congo road/ rimin tsiwa estate	18/23/07/010	Kaduna	Zaria	Gyellesu	7.724379081	11.08520456	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
Fage/kako/ k/g mal. tanko fage	18/23/07/019	Kaduna	Zaria	Gyellesu	7.730777639	11.0371661	
Fed. coll. of education/ fce campus	18/23/07/021	Kaduna	Zaria	Gyellesu	7.731569767	11.0833966	
Gyallesu i/ l.e.a gyallesu	18/23/07/001	Kaduna	Zaria	Gyellesu	7.731618818	11.0887532	
Gyallesu ii/ l.e.a gyallesu	18/23/07/002	Kaduna	Zaria	Gyellesu	7.73162953	11.08892331	
Gyallesu iii/ l.e.a gyallesu	18/23/07/003	Kaduna	Zaria	Gyellesu	7.731773383	11.08910684	
K/goyan low cost i/ gindin rimin boka	18/23/07/016	Kaduna	Zaria	Gyellesu	7.688349269	11.04849507	
K/goyan low cost ii/ kdpdc office	18/23/07/017	Kaduna	Zaria	Gyellesu	7.689674836	11.04654815	
Kogoro/ k/g mai anguwa	18/23/07/020	Kaduna	Zaria	Gyellesu	7.71617691	11.03274227	
Madaki road/ adison med. store	18/23/07/005	Kaduna	Zaria	Gyellesu	7.726536194	11.08656656	
Malama road i/ k/g balarabe kubau	18/23/07/008	Kaduna	Zaria	Gyellesu	7.722303176	11.08914089	
Malama road ii/ k/g liman	18/23/07/009	Kaduna	Zaria	Gyellesu	7.724017689	11.08913007	
Nagoyi/ ung. kayatu/ k/g dari	18/23/07/022	Kaduna	Zaria	Gyellesu	7.734679308	11.06793136	
Sabon layi i/ dakace rd k/g manu b/nike	18/23/07/013	Kaduna	Zaria	Gyellesu	7.717707151	11.07969335	
Sabon layi ii/ k/g bawa kugu	18/23/07/014	Kaduna	Zaria	Gyellesu	7.716700724	11.08071999	
Sarkin yaki road i/ (no.1) mangoron andi	18/23/07/006	Kaduna	Zaria	Gyellesu	7.725279439	11.08508571	
Sarkin yaki road ii/ k/g mal. ali	18/23/07/007	Kaduna	Zaria	Gyellesu	7.725340891	11.0866375	
Ung. sarkin rafi/ k/g s/rafi (no. 31)	18/23/07/018	Kaduna	Zaria	Gyellesu	7.723221465	11.03358212	
Wali road/ no. 28 k/g abdu bige	18/23/07/004	Kaduna	Zaria	Gyellesu	7.726936427	11.09022948	
Wtc/atc area/ wtc/atc junction	18/23/07/012	Kaduna	Zaria	Gyellesu	7.731487823	11.08171757	
Gidan kambarawa i/ k/g kambarawa	18/23/05/003	Kaduna	Zaria	Kaura	7.700475839	11.05148535	
Gidan kambarawa ii/ office m. ang.	18/23/05/004	Kaduna	Zaria	Kaura	7.699044652	11.04785441	
Kaura i/ l.e.a. kaura	18/23/05/001	Kaduna	Zaria	Kaura	7.705176598	11.04967156	
Kaura ii/ house no.159	18/23/05/002	Kaduna	Zaria	Kaura	7.703777418	11.04788748	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
Kaura iii / l. e. a. kaura	18/23/05/033	Kaduna	Zaria	Kaura	7.705108357	11.04961425	
Kofar gayan/ k/g m. kasimu	18/23/05/009	Kaduna	Zaria	Kaura	7.700356932	11.04366749	
Kwankira i/ k/g alh. ango	18/23/05/012	Kaduna	Zaria	Kaura	7.707657798	11.05071431	
Kwankira ii/ house no.226 kwankira	18/23/05/013	Kaduna	Zaria	Kaura	7.707840171	11.05066699	
Kwankira iii/ k/g tabari	18/23/05/014	Kaduna	Zaria	Kaura	7.707008892	11.04879069	
Kwankira iv / by nuhu bayaro house	18/23/05/034	Kaduna	Zaria	Kaura	7.711349644	11.0492264	
Makwalla i/ k/o isa	18/23/05/020	Kaduna	Zaria	Kaura	7.699086701	11.04869101	
Makwalla ii/ office m. ang.	18/23/05/021	Kaduna	Zaria	Kaura	7.699029093	11.04835776	
Makwalla iii/ k/g isa	18/23/05/022	Kaduna	Zaria	Kaura	7.700104765	11.04759089	
Mazangudu i/ l.e.a. m. gudu	18/23/05/010	Kaduna	Zaria	Kaura	7.699315008	11.04600512	
Mazangudu ii/ hagon falala	18/23/05/011	Kaduna	Zaria	Kaura	7.700388646	11.04204057	
Rimin doko i/ l.e.a. r/doko	18/23/05/015	Kaduna	Zaria	Kaura	7.707699504	11.04602403	
Rimin kambari i/ k/g sarkin dogari	18/23/05/025	Kaduna	Zaria	Kaura	7.702643867	11.05318828	
Rimin kambari ii/ k/g alh. godi	18/23/05/026	Kaduna	Zaria	Kaura	7.703332208	11.05353698	
Rimin kambari iii/ k/g sale maimanja	18/23/05/027	Kaduna	Zaria	Kaura	7.70268732	11.05046649	
Rimin kambari iv/ k/g alh. ya'u kafinta	18/23/05/028	Kaduna	Zaria	Kaura	7.704443433	11.05127983	
Runji i/ k/g m. soro	18/23/05/023	Kaduna	Zaria	Kaura	7.702422199	11.04793397	
Runji ii/ k/g kuka	18/23/05/024	Kaduna	Zaria	Kaura	7.703620503	11.04567705	
Shadantse i/ k/g m. dabo	18/23/05/005	Kaduna	Zaria	Kaura	7.701717381	11.04536941	
Shadantse ii/ k/g m. alu	18/23/05/006	Kaduna	Zaria	Kaura	7.701988074	11.04537436	
Shadantse iii/ no.42 zakara	18/23/05/007	Kaduna	Zaria	Kaura	7.702092624	11.04527193	
T/yanzare i/ k/g adamu	18/23/05/019	Kaduna	Zaria	Kaura	7.699388633	11.0491818	
Ung. bishar i/ k/g alh. yero	18/23/05/029	Kaduna	Zaria	Kaura	7.708330499	11.04151323	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
Ung. bishar i/ k/g malamin shanu	18/23/05/030	Kaduna	Zaria	Kaura	7.706018962	11.04243084	
Ung. bishar iii / k/g mai anguwa	18/23/05/031	Kaduna	Zaria	Kaura	7.70239902	11.04211409	
Ung. bishar iv/ k/g alh. yahaya briged	18/23/05/032	Kaduna	Zaria	Kaura	7.713339955	11.04296033	
Ung. karfe i/ district head office	18/23/05/017	Kaduna	Zaria	Kaura	7.7001703	11.04787874	
Ung. karfe ii/ k/g sani hulan gashi	18/23/05/018	Kaduna	Zaria	Kaura	7.701219477	11.04674458	
Zakara/ k/g shehu yaro	18/23/05/008	Kaduna	Zaria	Kaura	7.702070118	11.04310259	
Bayan dutse/ k.g. mai ung. karofi	18/23/13/011	Kaduna	Zaria	Kufena	7.6525296	11.09364514	
Dan magaji/ k.g. maiwada goga	18/23/13/013	Kaduna	Zaria	Kufena	7.687050341	11.07553258	
Gabari i/ l.e.a. gabari	18/23/13/007	Kaduna	Zaria	Kufena	7.673603333	11.1121386	
Gabari ii/ health clinic	18/23/13/008	Kaduna	Zaria	Kufena	7.679404732	11.11057213	
Kauran juli/ k.g. mua'zu gamji	18/23/13/001	Kaduna	Zaria	Kufena	7.681419858	11.0550174	
Kauren juli ii/ k/g m. mua'zu gamji	18/23/13/018	Kaduna	Zaria	Kufena	7.684681118	11.06709734	
Kufena i/ l.e.a. kufena	18/23/13/009	Kaduna	Zaria	Kufena	7.671324704	11.09629463	
Madakin saye i/ k/g m. ung. saye	18/23/13/017	Kaduna	Zaria	Kufena	7.653221335	11.07395558	
Rafin magaji/ k/g sule garba	18/23/13/015	Kaduna	Zaria	Kufena	7.662861228	11.11105033	
Tudun sarki kubanni/ k/g m. ung. t/sarki	18/23/13/016	Kaduna	Zaria	Kufena	7.646848317	11.12292825	
Ung. dankali i/ l.e.a. ung. dankali	18/23/13/005	Kaduna	Zaria	Kufena	7.68426073	11.08096733	
Ung. dankali ii/ l.e.a. ung. dankali	18/23/13/006	Kaduna	Zaria	Kufena	7.684309015	11.08083941	
Ung. madaki/ k/g madaki tsoho	18/23/13/014	Kaduna	Zaria	Kufena	7.666261778	11.0867151	
Ung. magaji/ k.g. mai ung. r/magaji	18/23/13/012	Kaduna	Zaria	Kufena	7.659764868	11.10650803	
Wusasa asibiti i/ front s.t. hospital	18/23/13/003	Kaduna	Zaria	Kufena	7.679674656	11.07595813	
Wusasa asibiti ii/ anna kitchener	18/23/13/004	Kaduna	Zaria	Kufena	7.682115687	11.07491911	
Wusasa kuregu/ l.e.a. wusasa	18/23/13/002	Kaduna	Zaria	Kufena	7.672220768	11.0719674	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
KWARBAI I/ PRI. SCH. MADARKACI	18/23/01/001	Kaduna	Zaria	Kwarbai A	7.716019879	11.06420859	
KWARBAI II/ PRI. SCH. MADARKACI	18/23/01/002	Kaduna	Zaria	Kwarbai A	7.716168346	11.06401387	
KWARBAI III/ L.E.A. FAD SONKA	18/23/01/003	Kaduna	Zaria	Kwarbai A	7.710244353	11.06446503	
KWARBAI IV/ L.E.A. FADI SONKA	18/23/01/004	Kaduna	Zaria	Kwarbai A	7.710308876	11.06436552	
KWARBAI V/ K/G M GARI	18/23/01/005	Kaduna	Zaria	Kwarbai A	7.710993876	11.06263742	
JUSHI I/ L.E.A JUSHI	18/23/01/006	Kaduna	Zaria	Kwarbai A	7.714611186	11.07500952	
JUSHI II/ K/C M ANG.	18/23/01/007	Kaduna	Zaria	Kwarbai A	7.71745989	11.07454059	
JUSHI III/ GINDIN ITACE L/COST	18/23/01/008	Kaduna	Zaria	Kwarbai A	7.722689672	11.0722318	
BANZAZZAU I/ L.E.A B/ZAZZAU	18/23/01/009	Kaduna	Zaria	Kwarbai A	7.72265764	11.06816256	
BANZAZZAU II/ K/G M ANGUWA	18/23/01/010	Kaduna	Zaria	Kwarbai A	7.721445734	11.07008099	
UNG. KATUKA I/ K/C MADAUCHI	18/23/01/011	Kaduna	Zaria	Kwarbai A	7.711885474	11.0593273	
UNG. KATUKA II/ K/C MADAUCHI	18/23/01/012	Kaduna	Zaria	Kwarbai A	7.711843889	11.05953979	
UNG. KATUKA III/ L.E.A. CHIDAWAKI	18/23/01/013	Kaduna	Zaria	Kwarbai A	7.716533208	11.05979566	
UNG. ASKA I/ L.E.A. A. KAHU	18/23/01/014	Kaduna	Zaria	Kwarbai A	7.712981707	11.05385853	
AMARU I/ K/G MADAKI SHEHU	18/23/01/015	Kaduna	Zaria	Kwarbai A	7.716942743	11.05045668	
AMARU II/ K/G MADAKI SHEHU	18/23/01/016	Kaduna	Zaria	Kwarbai A	7.71686813	11.05059315	
AMARU IV/ K/G NA INDA	18/23/01/018	Kaduna	Zaria	Kwarbai A	7.714398129	11.05181034	
UNG. LALLE I/ K/G M.ANG.	18/23/01/019	Kaduna	Zaria	Kwarbai A	7.716088792	11.05391837	
UNG. LALLE II/ K/G M.ANG.	18/23/01/020	Kaduna	Zaria	Kwarbai A	7.716044013	11.05391975	
MAKAMA DODO I/ L.E.A. M. DODO	18/23/01/021	Kaduna	Zaria	Kwarbai A	7.719717924	11.05316824	
KOFAR KONA I/ L.E.A. K/KONA	18/23/01/022	Kaduna	Zaria	Kwarbai A	7.719580029	11.04092588	
MAGAJIYA I/ K/G ADAKI SAIDU	18/23/01/023	Kaduna	Zaria	Kwarbai A	7.715146692	11.05702525	
MAGAJIYA II/ L.E.A. MAGAJIYA PRI.	18/23/01/024	Kaduna	Zaria	Kwarbai A	7.716938066	11.05591924	
MAGAJIYA III/ L.E.A. MAGAJIYA PRI.	18/23/01/025	Kaduna	Zaria	Kwarbai A	7.716834187	11.05614513	
KWARBAI VI/ L.E.A. MAGAJIYA PRI.	18/23/01/026	Kaduna	Zaria	Kwarbai A	7.716884048	11.05648268	
PADA I/ GINDIN GAWO	18/23/02/001	Kaduna	Zaria	Kwarbai B	7.707418934	11.06190224	
PADA II/ L.E.A. PADA	18/23/02/002	Kaduna	Zaria	Kwarbai B	7.707130855	11.06295176	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
PADA III/ L.E.A. PADA	18/23/02/003	Kaduna	Zaria	Kwarbai B	7.70700555	11.06281986	
PADA IV/ K/G SANKIRA	18/23/02/004	Kaduna	Zaria	Kwarbai B	7.708722298	11.06166757	
BABBAN DODO I/ L.E.A. B/DODO	18/23/02/005	Kaduna	Zaria	Kwarbai B	7.703341471	11.05844494	
BABBAN DODO II/ L.E.A. B/DODO	18/23/02/006	Kaduna	Zaria	Kwarbai B	7.703682991	11.05871185	
BABBAN DODO III/ K/G DALLATU SAMAILA	18/23/02/007	Kaduna	Zaria	Kwarbai B	7.701539275	11.05937864	
BABBAN DODO IV/ K/G SA'I LAWAL	18/23/02/008	Kaduna	Zaria	Kwarbai B	7.703948194	11.06261216	
RIMIN TSIWA I/ K/G SANI R/TSIWA	18/23/02/009	Kaduna	Zaria	Kwarbai B	7.704886919	11.06327873	
RIMIN TSIWA II/ K/G DANMADAMI	18/23/02/010	Kaduna	Zaria	Kwarbai B	7.703919736	11.06425689	
RIMIN TSIWA III/ RIMIN TSIWA ESTATE	18/23/02/011	Kaduna	Zaria	Kwarbai B	7.705656174	11.06471904	
RIMIN TSIWA IV/ L.E.A.RIMIN TSIWA	18/23/02/012	Kaduna	Zaria	Kwarbai B	7.703630435	11.06803406	
ALBARKAWA I/ K/G ADABALE	18/23/02/013	Kaduna	Zaria	Kwarbai B	7.70651593	11.05790252	
ALBARKAWA II/ K/G SANI MAI YASIN	18/23/02/014	Kaduna	Zaria	Kwarbai B	7.706148145	11.05664195	
ALBARKAWA III/ K/G ALKALI SHU'AIBU	18/23/02/015	Kaduna	Zaria	Kwarbai B	7.704766762	11.05865178	
ALBARKAWA IV/ L.E.A. OFFICE	18/23/02/016	Kaduna	Zaria	Kwarbai B	7.705055989	11.06020501	
MADAKA I/ K/G LIMAN	18/23/02/017	Kaduna	Zaria	Kwarbai B	7.710604861	11.05688018	
MADAKA II/ K/G DATTI	18/23/02/018	Kaduna	Zaria	Kwarbai B	7.710115947	11.05782308	
MADAKA III/ K/G TURAKI ALI	18/23/02/019	Kaduna	Zaria	Kwarbai B	7.710160122	11.05950631	
UNG. LIMAN II/ L.E.A. A/LIMAN	18/23/02/021	Kaduna	Zaria	Kwarbai B	7.707613467	11.05576256	
KOFAR DOKA I/ K/G TANKO KOFA	18/23/02/022	Kaduna	Zaria	Kwarbai B	7.709955394	11.07594607	
KOFAR DOKA II/ K/G TAFARKI	18/23/02/023	Kaduna	Zaria	Kwarbai B	7.712046909	11.07536334	
KOFAR DOKA III/ K/G GARBA KOFA	18/23/02/024	Kaduna	Zaria	Kwarbai B	7.710932296	11.07689918	
ANG. ALKALI I/ L.E.A. ANG. ALKALI	18/23/02/025	Kaduna	Zaria	Kwarbai B	7.703349385	11.07205671	
ANG. ALKALI II/ L.E.A. ANG. ALKALI	18/23/02/026	Kaduna	Zaria	Kwarbai B	7.703377189	11.07199431	
DANMADAMI I/ K/G SAMBO DISPENSER	18/23/02/027	Kaduna	Zaria	Kwarbai B	7.700569582	11.0617975	
DANMADAMI II/ K/G HUSSAINI MULKI	18/23/02/028	Kaduna	Zaria	Kwarbai B	7.698941156	11.0619591	
DANMADAMI III/ K/G ISA BAGOBIRI	18/23/02/029	Kaduna	Zaria	Kwarbai B	7.702321055	11.06240161	
LEMU I/ L.E.A. LEMU	18/23/02/030	Kaduna	Zaria	Kwarbai B	7.706483024	11.06961506	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
LEMU II/ L.E.A. LEMU	18/23/02/031	Kaduna	Zaria	Kwarbai B	7.706513024	11.06972323	
LEMU III/ PARADISE CINEMA	18/23/02/032	Kaduna	Zaria	Kwarbai B	7.706265682	11.06709546	
UNG. LIMAN III/ L.E.A. A/LIMAN	18/23/02/033	Kaduna	Zaria	Kwarbai B	7.708237333	11.05559246	
Babban gwani/ k/g mai anguwa	18/23/04/010	Kaduna	Zaria	Limancin-Kona	7.698902291	11.05288399	
Durumin jamo i / k/g sani tanunda	18/23/04/029	Kaduna	Zaria	Limancin-Kona	7.696477731	11.04522812	
Durumin jamo ii / k/g alh. ahmadu	18/23/04/030	Kaduna	Zaria	Limancin-Kona	7.698299892	11.04576668	
Durumin jamo iii / k/g dahiru wali	18/23/04/031	Kaduna	Zaria	Limancin-Kona	7.700068373	11.04510765	
Durumin mai garke/ district head office	18/23/04/009	Kaduna	Zaria	Limancin-Kona	7.698445388	11.05800058	
Kanfage i/ k/g soron sanyi	18/23/04/001	Kaduna	Zaria	Limancin-Kona	7.699645618	11.05387712	
Kanfage ii/ k/g alh. yaro da gari	18/23/04/002	Kaduna	Zaria	Limancin-Kona	7.698952556	11.05414622	
Kanfage iii/ k/g tankon mama	18/23/04/003	Kaduna	Zaria	Limancin-Kona	7.698789679	11.0530605	
Karauka ii/ k/g falalu kafinta	18/23/04/021	Kaduna	Zaria	Limancin-Kona	7.693179287	11.05017914	
Karauka iii/ k/g alh. awwal ibrahim	18/23/04/022	Kaduna	Zaria	Limancin-Kona	7.69392812	11.05027122	
Karauka iv/ k/g alh. shittu musa	18/23/04/023	Kaduna	Zaria	Limancin-Kona	7.69427274	11.04907331	
Karauka v/ k/g alh. ibrahim paki	18/23/04/024	Kaduna	Zaria	Limancin-Kona	7.691654191	11.05004364	
Kusfa i / k/g mush maizare	18/23/04/025	Kaduna	Zaria	Limancin-Kona	7.699191595	11.04700819	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
Kusfa ii/ k/g isa m. gari	18/23/04/026	Kaduna	Zaria	Limancin-Kona	7.695590056	11.04565363	
Kusfa iv / kg/ katuka	18/23/04/028	Kaduna	Zaria	Limancin-Kona	7.698491564	11.0453262	
Kusfai ii/ k/g abdu mai kare	18/23/04/027	Kaduna	Zaria	Limancin-Kona	7.698771937	11.04320807	
Kusufa v/ kg sambo	18/23/04/032	Kaduna	Zaria	Limancin-Kona	7.696660079	11.04769435	
Kwanmakama i/ k/g liman	18/23/04/017	Kaduna	Zaria	Limancin-Kona	7.696437446	11.05158882	
Kwanmakama ii/ k/g dillalai	18/23/04/018	Kaduna	Zaria	Limancin-Kona	7.691510935	11.05036986	
Limanci kona i/ k/g mustafa d/raka	18/23/04/013	Kaduna	Zaria	Limancin-Kona	7.696555734	11.05045956	
Limanci kona ii/ k/g mabuga	18/23/04/014	Kaduna	Zaria	Limancin-Kona	7.697592034	11.05082324	
Rimin bingida i/ k/g yayan dela	18/23/04/012	Kaduna	Zaria	Limancin-Kona	7.703344298	11.05344255	
Salamanduna i/ k/g pate	18/23/04/004	Kaduna	Zaria	Limancin-Kona	7.699581552	11.05530513	
Salamanduna ii/ leprosy clinic	18/23/04/005	Kaduna	Zaria	Limancin-Kona	7.700406882	11.05505602	
Ung. nupawa i/ k/g alkalin ja'e	18/23/04/015	Kaduna	Zaria	Limancin-Kona	7.701094598	11.05068834	
Ung. nupawa ii/ k/g dan kambari	18/23/04/016	Kaduna	Zaria	Limancin-Kona	7.700449392	11.05146211	
Ung. rubu i/ k/g lamido	18/23/04/007	Kaduna	Zaria	Limancin-Kona	7.697686251	11.0573184	
Ung. rubu ii/ off maianguwa	18/23/04/008	Kaduna	Zaria	Limancin-Kona	7.699548922	11.05777009	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
Ung. sirdi/ k/g sarkin sirdi	18/23/04/011	Kaduna	Zaria	Limancin-Kona	7.702265122	11.05421724	
Zangon matamaki/ zangon mataimaki	18/23/04/019	Kaduna	Zaria	Limancin-Kona	7.693993415	11.05021686	
A.b.t.h. i/ staff qtrs. abuth	18/23/06/005	Kaduna	Zaria	Tudun wada	7.715431743	11.08069264	
A.b.t.h. ii/ bus stop (opp) ABUTH	18/23/06/006	Kaduna	Zaria	Tudun wada	7.71310026	11.08432696	
Aliyu road/ k/g a/lawandi	18/23/06/032	Kaduna	Zaria	Tudun wada	7.716159744	11.08369932	
Dikko road/ k/g a. gana	18/23/06/029	Kaduna	Zaria	Tudun wada	7.720560408	11.08542573	
Dre bari i/ k/g b. doko	18/23/06/018	Kaduna	Zaria	Tudun wada	7.719811496	11.09153396	
Dre bari ii/ k/g hussaini b.	18/23/06/019	Kaduna	Zaria	Tudun wada	7.72127534	11.09102471	
Imam road/ k/g alh. imam	18/23/06/028	Kaduna	Zaria	Tudun wada	7.719901255	11.08586417	
Jibga/ l.e.a. n/huda	18/23/06/025	Kaduna	Zaria	Tudun wada	7.719360832	11.08218374	
Joji road i/ k/g alh. musa	18/23/06/012	Kaduna	Zaria	Tudun wada	7.721798907	11.09021668	
Joji road ii/ k/g mamman gusau	18/23/06/013	Kaduna	Zaria	Tudun wada	7.720068054	11.09018477	
Joji road iii/ k/g alh. dauda	18/23/06/014	Kaduna	Zaria	Tudun wada	7.71783648	11.09109207	
L. alkali i/ iro kaya	18/23/06/021	Kaduna	Zaria	Tudun wada	7.718091303	11.08683066	
Lemu i/ k/g alh. m. k.	18/23/06/016	Kaduna	Zaria	Tudun wada	7.72009971	11.09087509	
Lemu ii/ alh. d. jumo	18/23/06/017	Kaduna	Zaria	Tudun wada	7.719212665	11.0911479	
Makarfi i/ k/g a. abdu	18/23/06/030	Kaduna	Zaria	Tudun wada	7.720934764	11.08423167	
Makarfi ii/ k/g m. shanu	18/23/06/031	Kaduna	Zaria	Tudun wada	7.720126067	11.08485445	
Mil dakwata/ gidan habibalo	18/23/06/020	Kaduna	Zaria	Tudun wada	7.717203668	11.08448193	
Musan gwarzo i/ k/g m. gwarzo	18/23/06/022	Kaduna	Zaria	Tudun wada	7.719602224	11.08724542	
Musan gwarzo ii/ k/g alh. ibrahim	18/23/06/023	Kaduna	Zaria	Tudun wada	7.717008071	11.08793708	
Nuhu road/ hajiya famata	18/23/06/034	Kaduna	Zaria	Tudun wada	7.717439096	11.08210543	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
Rimi road i/ k/g alh. bawa	18/23/06/024	Kaduna	Zaria	Tudun wada	7.718136488	11.08897164	
Rimi road ii/ k/g alh. bawa	18/23/06/037	Kaduna	Zaria	Tudun wada	7.716728088	11.08883714	
S/aminu i/ k/g alh. y. dari	18/23/06/007	Kaduna	Zaria	Tudun wada	7.716502123	11.08421446	
S/aminu ii/ k/g alh. jafaru	18/23/06/008	Kaduna	Zaria	Tudun wada	7.716393614	11.08510362	
Sarki i/ child clinic	18/23/06/009	Kaduna	Zaria	Tudun wada	7.718742304	11.09022149	
Sarki ii/ k/g agoro	18/23/06/010	Kaduna	Zaria	Tudun wada	7.718168911	11.09288128	
Sarki iii/ l.g. office	18/23/06/011	Kaduna	Zaria	Tudun wada	7.72150853	11.08782861	
Shafi ii/ t/wada l.e.a.	18/23/06/027	Kaduna	Zaria	Tudun wada	7.720546	11.08785859	
Ung. bayo i/ l.e.a. pampo	18/23/06/001	Kaduna	Zaria	Tudun wada	7.713700657	11.08585908	
Ung. bayo ii/ l.e.a. pampo	18/23/06/002	Kaduna	Zaria	Tudun wada	7.713602328	11.08599729	
Ung. bayo iii/ behind cinema	18/23/06/003	Kaduna	Zaria	Tudun wada	7.714462867	11.08773953	
Ung. bayo iv/ k/g madakin kira	18/23/06/004	Kaduna	Zaria	Tudun wada	7.715407225	11.08981221	
Ung. dandutse i/ l.e.a. n/huda	18/23/06/035	Kaduna	Zaria	Tudun wada	7.71932085	11.08269495	
Ung. dandutse ii/ maternity clinic	18/23/06/036	Kaduna	Zaria	Tudun wada	7.720220157	11.08060163	
Waina road/ k/g alh. umar	18/23/06/026	Kaduna	Zaria	Tudun wada	7.720237104	11.08876599	
Zailani road/ hajiya falala	18/23/06/015	Kaduna	Zaria	Tudun wada	7.721950828	11.09162732	
Gaskiya i/ gaskiya village k/g h/sale	18/23/09/017	Kaduna	Zaria	Tukur Tukur	7.703049865	11.0896406	
Kwarin d. goma i/ k/g m. anguwa	18/23/09/009	Kaduna	Zaria	Tukur Tukur	7.713869749	11.09398761	
Kwarin d. goma iii/ l.e.a. t/jukun	18/23/09/011	Kaduna	Zaria	Tukur Tukur	7.712303536	11.09266166	
Magume i/ rahama store	18/23/09/015	Kaduna	Zaria	Tukur Tukur	7.707285397	11.08768049	
Magume ii/ poly gate	18/23/09/016	Kaduna	Zaria	Tukur Tukur	7.704937895	11.0878949	
Sabuwan ung. i/ k/g bako zuntu	18/23/09/012	Kaduna	Zaria	Tukur Tukur	7.711375611	11.09154732	
Sabuwan ung. ii/ k/g umar t/jukun	18/23/09/013	Kaduna	Zaria	Tukur Tukur	7.710678658	11.08893447	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
Sabuwan ung. iii/ k/g adamu m. almajirai	18/23/09/014	Kaduna	Zaria	Tukur Tukur	7.711729247	11.09077662	
Tudun jukun i/ l.e.a gaskiya	18/23/09/005	Kaduna	Zaria	Tukur Tukur	7.704479752	11.09717313	
Tudun jukun ii/ l.mahauta	18/23/09/006	Kaduna	Zaria	Tukur Tukur	7.710484758	11.0979299	
Tudun jukun iii/ k/g korau m. kananzir	18/23/09/007	Kaduna	Zaria	Tukur Tukur	7.707173473	11.10069861	
Tudun jukun iv/ k/g mohammed bayi	18/23/09/008	Kaduna	Zaria	Tukur Tukur	7.709432387	11.09863063	
Tukur tukur i/ l.e.a. tukur tukur	18/23/09/001	Kaduna	Zaria	Tukur Tukur	7.693979355	11.0815	
Tukur tukur ii/ k.g sarki t/tukur	18/23/09/002	Kaduna	Zaria	Tukur Tukur	7.693422988	11.08864833	
Tukur tukur iii/ g. durmin islamiya	18/23/09/003	Kaduna	Zaria	Tukur Tukur	7.691813624	11.08857781	
Tukur tukur iv/ adult education	18/23/09/004	Kaduna	Zaria	Tukur Tukur	7.693307661	11.08594767	
Kofar jatau i/ l.e.a kofar jatau	18/23/08/016	Kaduna	Zaria	Unguwan Fatika	7.688570291	11.06893216	
Kofar jatau ii/ kofar jatau	18/23/08/017	Kaduna	Zaria	Unguwan Fatika	7.690742811	11.07164987	
Kofar jatau iii/ k.g bala tanki	18/23/08/018	Kaduna	Zaria	Unguwan Fatika	7.691087132	11.06427199	
Kofar jatau iv/ l.e.a. kofar jatau	18/23/08/021	Kaduna	Zaria	Unguwan Fatika	7.689254821	11.0720204	
Marmara i/ kasuwa kauna	18/23/08/006	Kaduna	Zaria	Unguwan Fatika	7.694365043	11.05621984	
Marmara ii/ k.g bala riti	18/23/08/007	Kaduna	Zaria	Unguwan Fatika	7.69378694	11.05801682	
Marmara iii/ k.g ahmadu	18/23/08/008	Kaduna	Zaria	Unguwan Fatika	7.692889258	11.05848311	
Rimin danza ii/ k.g y. dozen	18/23/08/005	Kaduna	Zaria	Unguwan Fatika	7.691691338	11.05383957	
Ung. ali i/ k.g wakilin doka	18/23/08/019	Kaduna	Zaria	Unguwan Fatika	7.693940937	11.06486753	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
Ung. ali ii/ k.g madakin kira	18/23/08/020	Kaduna	Zaria	Unguwan Fatika	7.690791387	11.06432123	
Ung. fatika i/ l.e.a. ung. fatika	18/23/08/009	Kaduna	Zaria	Unguwan Fatika	7.693095097	11.06357298	
Ung. fatika ii/ k.g samaila	18/23/08/010	Kaduna	Zaria	Unguwan Fatika	7.693077707	11.0656843	
Ung. fatika iii/ k.g tanko	18/23/08/011	Kaduna	Zaria	Unguwan Fatika	7.690549794	11.06485178	
Ung. fatika iv/ k.g makama	18/23/08/012	Kaduna	Zaria	Unguwan Fatika	7.694101177	11.06503503	
Ung. iya i/ l.e.a. ung. iya	18/23/08/001	Kaduna	Zaria	Unguwan Fatika	7.692237161	11.05553666	
Ung. iya ii/ k.g. marafa	18/23/08/002	Kaduna	Zaria	Unguwan Fatika	7.692688251	11.05472863	
Ung. iya iii/ k.g. rayyanu	18/23/08/003	Kaduna	Zaria	Unguwan Fatika	7.691447831	11.05365072	
Ung. zaria i/ k.g. alh. dari	18/23/08/013	Kaduna	Zaria	Unguwan Fatika	7.696416462	11.07046953	
Ung. zaria ii/ k.g m. hassan	18/23/08/014	Kaduna	Zaria	Unguwan Fatika	7.694841012	11.07743235	
Ung. zaria iii/ k.g m. hassan	18/23/08/015	Kaduna	Zaria	Unguwan Fatika	7.695199708	11.07676986	
Danjinjiri i/ house no.74	18/23/03/010	Kaduna	Zaria	Unguwar Juma	7.692482396	11.04830083	
Danjinjiri ii/ k/g hassan kudi	18/23/03/011	Kaduna	Zaria	Unguwar Juma	7.690490848	11.0497913	
Iyanjuma ii/ k/g alhaji sani	18/23/03/015	Kaduna	Zaria	Unguwar Juma	7.697277183	11.0626619	
K/kuyambana i/ k/g dogara	18/23/03/004	Kaduna	Zaria	Unguwar Juma	7.690636757	11.05298326	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
K/kuyambana ii/ k/g kashim	18/23/03/005	Kaduna	Zaria	Unguwar Juma	7.689860031	11.05052684	
K/kuyambana iii/ k/g d. yaro	18/23/03/006	Kaduna	Zaria	Unguwar Juma	7.690741188	11.05285309	
Limanci i/ k/g bala iyali	18/23/03/001	Kaduna	Zaria	Unguwar Juma	7.695547929	11.05488857	
Limanci ii/ k/g m/kasuwa	18/23/03/002	Kaduna	Zaria	Unguwar Juma	7.697203103	11.05327572	
Limanci iii/ k/g m/kasuwa	18/23/03/003	Kaduna	Zaria	Unguwar Juma	7.697256724	11.05317185	
Ung. juma i/ k/g zubairu sada	18/23/03/016	Kaduna	Zaria	Unguwar Juma	7.695162747	11.05906736	
Ung. juma ii/ k/g ahmadu	18/23/03/017	Kaduna	Zaria	Unguwar Juma	7.694129561	11.05822251	
Ung. juma iii/ k/g kira	18/23/03/018	Kaduna	Zaria	Unguwar Juma	7.693291057	11.05956086	
Ung. juma iv/ k/g d. thoho g. rimi	18/23/03/019	Kaduna	Zaria	Unguwar Juma	7.694365413	11.05839049	
Ung. juma v/ k/g sani hamza	18/23/03/020	Kaduna	Zaria	Unguwar Juma	7.695318494	11.05898077	
Ung. m. sule i/ k/g koli	18/23/03/012	Kaduna	Zaria	Unguwar Juma	7.696214159	11.04809405	
Ung. m. sule ii/ k/g s. kura	18/23/03/013	Kaduna	Zaria	Unguwar Juma	7.695239626	11.04901664	
Yarbukka i/ k/g ibrahim dogara	18/23/03/007	Kaduna	Zaria	Unguwar Juma	7.692568641	11.04903615	
Yarbukka ii/ k/g galadima	18/23/03/008	Kaduna	Zaria	Unguwar Juma	7.68965096	11.04908231	
Yarbukka iv/ k/g abdu hayatu	18/23/03/021	Kaduna	Zaria	Unguwar Juma	7.689100376	11.05197658	

Polling Unit Name	Polling Unit ID	State	Local Govt Area	Wards	Latitude	Longitude	Population of Registered voters
Aba ii/ l.e.a. aba	18/23/11/008	Kaduna	Zaria	Wucicciri	7.760328886	11.02067383	
Bakin kogi/ k/g isa maikaji	18/23/11/017	Kaduna	Zaria	Wucicciri	7.748383357	11.04545335	
Batas/dalla/ k/g salamu dalla	18/23/11/005	Kaduna	Zaria	Wucicciri	7.779112302	10.95585022	
Bogari i/ l.e.a. bogori	18/23/11/012	Kaduna	Zaria	Wucicciri	7.775102958	11.02480544	
Bogari ii/ l.e.a. bogori	18/23/11/013	Kaduna	Zaria	Wucicciri	7.779151981	11.02765647	
Kaladi/damanko/ l.e.a. kaladi	18/23/11/010	Kaduna	Zaria	Wucicciri	7.745316192	11.00146224	
Rafin fa/ k/g mai anguwa	18/23/11/019	Kaduna	Zaria	Wucicciri	7.793108756	11.03621854	
Rafin gamji/ k/g mai anguwa	18/23/11/015	Kaduna	Zaria	Wucicciri	7.776376753	11.0076025	
Rubuchi ii/ l.e.a. rubuchi	18/23/11/021	Kaduna	Zaria	Wucicciri	7.786276532	10.92710917	
Rubuchi/ l.e.a. rubuchi	18/23/11/004	Kaduna	Zaria	Wucicciri	7.78777435	10.92829783	
Tudun gora/sabbi/ k/g m. ang. tudun gora	18/23/11/006	Kaduna	Zaria	Wucicciri	7.766100314	10.97872256	
Tudun iya/fanga/ k/g m. ang. fanga	18/23/11/009	Kaduna	Zaria	Wucicciri	7.749302227	11.0162745	
Tudun kusa/ l.e.a. t/kusa	18/23/11/016	Kaduna	Zaria	Wucicciri	7.761353482	11.0444503	
Ung. fulani/ k/g mai anguwa	18/23/11/018	Kaduna	Zaria	Wucicciri	7.761295104	11.03271483	
Ung. mahauta/ k/g mai anguwa	18/23/11/020	Kaduna	Zaria	Wucicciri	7.78133105	11.03759948	
Ung. waziri/ health centre	18/23/11/014	Kaduna	Zaria	Wucicciri	7.767174369	11.04078038	
Wucicciri i/ k/g sarkin wucicciri	18/23/11/001	Kaduna	Zaria	Wucicciri	7.778697935	10.97028821	
Wucicciri ii/ l.e.a. wucicciri	18/23/11/002	Kaduna	Zaria	Wucicciri	7.779285774	10.97172483	
Wucicciri iii/ gidan makera	18/23/11/003	Kaduna	Zaria	Wucicciri	7.781466029	10.97147643	
Zakara/ k/g mai anguwa	18/23/11/011	Kaduna	Zaria	Wucicciri	7.721528171	11.00352687	

APPENDIX III

1) MAP OF EXISTING POLLING UNITS

2) SUITABILITY MAP

3) SUPERIMPOSED MAP