LOCATION ANALYSIS AND CREATION OF GEO-DATABASE FOR PUBLIC SECONDARY SCHOOLS IN KADUNA EDUCATION ZONE, KADUNA STATE, NIGERIA

BY

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CERTIFICATION

This dissertation entitled Location Analysis and creation of Geo-database for Public Secondary Schools in Kaduna Education Zone, Kaduna State, Nigeria; by Nyam Jim, Lorna, Gambo meets the requirements for the award of the degree of Master of Science in Remote Sensing and GIS of Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

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DECLARATION

I, Nyam Jim, Lorna, Gambo, hereby affirm that this thesis entitled was composed by me and is a record of my own findings under the supervision of Dr J.O. Folorunsho and Dr. B. Akpu and has not been submitted for the award of any degree at any other university. All sources of information are acknowledged by means of references.

NYAM JIM, Lorna, Gambo _____ _____

Signature **Date**

DEDICATION

This thesis is dedicated to my father, Saviour, Redeemer and friend `Yeh-shu-ah`, in whom I get all my inspirations, and my family for their love, support and encouragement.

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First and foremost, I would like to express my appreciation to God who saw me through my studies in Ahmadu Bello University, Zaria, and made it possible for me to write this thesis; especially the Holy Spirit who was my guide and taught me how to go about the research.

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ABSTRACT

The provision of education as a social service around the world is predominantly done by the public sector. The location of education facilities is known to influence their utilization and efficiency, as proximity to them influences the decision to seek and receive education. The study therefore, analyzed the location of public secondary schools in Kaduna Education zone.The study also developed a geo database for the public secondary schools in the study area so as to enable effective and efficient planning and management of these schools in the study area. Google Earth image covering the study area was used. Data on the facilities were obtained: Number of classes, class size, number of teachers, number of students, taught subjects, libraries, laboratories, sporting facilities were obtained through the administration of questionnaires.Geographic coordinates of schools were obtained using a hand-held Global Positioning System (GPS). Population and demographic data of localities within the Zone, list of schools, Students' Enrolment data for state secondary schools within Kaduna Education Zone 2013/14 session were obtained from the National Population Commission, Kaduna State Ministry of Education and the Universal Basic Education Board respectively. The data analysis was carried out using ArcGIS 10.1.The study observed that 38 public secondary schools were located in the study area and these schools were meant to serve all 26 localities in the study area. It was observed that 46% of the 26 localities in the study area had no school representation and for the 54%) that do have school representation, their distribution were not equitable based on the population of the localities. The study also observed that their distribution pattern as clustered in the built-up areas where these schools are located . It was also observed that some of the schools had insufficient facilities or lacked basic facilities. For instance, it was observed that 42% of the schools do not have libraries and 32% do not have laboratories. Other utilities such as electricity, water, toilets and class rooms were also lacking or inadequate in these schools. The study recommends the use of GIS in school data handling should be encouraged as it makes decision making easier and also enhance the proper distribution of these facilities. The study also recommends the creation of a model for the proper distribution of basic school facilities.

TABLE OF CONTENTS

LIST OF TABLES

Table **Page**

LIST OF FIGURES

Figure **Page**

LIST OF APPENDICES

Appendix **Page**

CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Public service is defined as all activities delivered by the government to fulfil those needs that society requires to go through life (Anwaruddin,2005). It can also refer to all organizations that exist as part of government machinery for implementing policy decisions and delivering services that are of value to the citizens. This is a mandatory institution of the state under the 1999 Constitution of Nigeria (Kayode, Adegba and Anyio,2013).The delivery of these services is achieved through institutional arrangements adopted by the government to provide public goods and services to its citizens. Public Service delivery has been one of the key functions of the public sector which uses civil service bureaucracies as the instrument for the delivery of services (World Development Report, 2004).

Carlson *et al*, (2005) conceptualized service delivery as the relationship between policy makers, service providers and poor people. According to them, it encompasses services and their supporting systems that are typically regarded as a state responsibility. These include social services (primary education and basic health services), infrastructure (water, sanitation, roads and bridges) and services that promote personal security (justice, police etc.).

In Nigeria, government constitutes the major service provider through the Public Service. As public health, education, water systems and infrastructure have largely deteriorated for a variety of reasons; provision of these services is increasingly being delivered by International Non Governmental Organizations (INGOs) or through the commercial and informal private sectors. It is with this recognition that Wild, Chamber, King and Harris (2012), stated that

despite bold plans and massive injections of international and domestic resources, public service delivery is still failing in many areas in most poor developing countries. This suggests that there is a need to revisit approaches to assisting service delivery sectors. They argued that a shift of emphasis is needed, towards a greater focus on understanding how a range of institutional and governance arrangements can shape service delivery processes and outcomes.

Service delivery however is seen to remain lower than what is targeted. People suffer from many hurdles when they need to access any government service either because of lack of information or due to bureaucratic procedures and attitudes; like types of services available, location of service facilities, processes or procedures to access these services (Tamrakar, 2010). This fact was concurred with by Nirmala (2008), who stated that the lack of information and complex regulations could be further barriers to citizens or customers in dealing with government services. This creates frustration and dissatisfaction among citizens towards government.

The provision of education as a social service around the world is predominantly done by the public sector. It accounts on average for 85% and 78% of primary and secondary enrolment respectively (Barro and Jong-Wha, 2000**).** Education in Nigeria is overseen by the Ministry of Education. And the local authorities take responsibility for implementing policy for state-controlled public education and state schools at a regional level. The education system is divided into primary education, secondary education and tertiary education (Wikipedia, 2013)

Education is one of the most important factors in Nigeria's quest to become one of the largest economies by the year 2020. However, with the recent state of education in Nigeria, measures need to be taken to overhaul the system in order for it to serve as a reliable and efficient vehicle for the attainment of the vision. Secondary education is a programme of public education immediately following elementary schooling. It begins generally at the age of 12 to 14 and continues for four to six years. Some secondary education, such as vocational schooling, is terminal and prepares the student for employment upon graduation. Others lead to advanced training in colleges, universities, or technical schools (Encarta, 2009; Abbas, 2012).

The emphasis on educational services is based on the total dependence of development and policy actualization on the level of education in any society. If educational services are not adequately provided then good and usable information cannot be gotten. Education is vital to national development because it provides the citizenry with information which can be used for effective and sustainable planning and management of their resources to get maximum profit for the resources available in their area (Nirmala, 2008). Education is a fundamental human right and it is essential to ensure that all are able to realise their potential.

Countries around the world view education as a good investment for national development because it is expected to produce the required quantity and quality of human resources for the economic growth using the right mix of inputs. During the last few years, emphasis on development in Nigeria is shifting from traditional to new approaches with spatial efficiency. Among the growing interest in social problems is a concern that economic growth and technological development should not continue to receive disproportion attention at the expense of concerns for spatial equity in the location and allocation of social amenities. Since

every citizen of a country has a right to government amenities, there is concern that some people have easy access to these social facilities while others experience tremendous difficulties in getting at them due to prohibitive distance and time constraints (Ikporukpo, 1987).

In Nigeria, Public school enrolment has continued to increase without a corresponding increase in educational facilities (Asiyai, 2012). In Kaduna State, the net enrolment ratio in senior secondary schools was 24% both for girls and boys in 2005/06 (Chang and Rwehera, 2008). Compared to the National ratios, Kaduna State is only one percentage point below average in net enrolment; Kaduna had a higher gross enrolment ratio for boys (76%) than the Nigerian average (70%). In contrast girls' participation is lower (62%) compared to 65% nationally. A considerable proportion (80%) of junior secondary school completers moved into the senior secondary education in 2006. This means there is an increase in the population of students in the senior secondary schools and yet there are not enough infrastructures to absorb these numbers (Chang and Rwehera, 2008).

Many states have recently been investing in building new schools. However, according to the Education Management Information System (EMIS) data, there are no clear patterns on school supply nationally from 2006 to 2010, although in part this is because of the lack and/or unreliability of data on the number of schools. Data for the private sector, in particular, are missing for many states. However, the 2010 Nigeria Education Data Survey (NEDS) reported long distances for many children in more rural and northern areas, especially at secondary level, thus suggesting school supply issues (Humphreys and Crawford, 2014).

According to Schmenner (1979), location decision making is an essential endeavour for effective public service delivery. The siting of outlets, production and distribution facilities, and service centres requires location choices to be made. Where these facilities or services are located is a primary factor in the success or failure of the activity. As a result, location analysis approaches which assist planning processes continue to be important in both the public and private sectors given the costs and viability implications involved (Murray, 2002).

The trend towards using Geographic Information Systems (GIS) to support decision making for Ministries of Education and educational facilities are becoming very important for planning purposes. GIS is in the implementation stages in many developed countries of the world and also in the developing countries. Makino and Watanabe (2002) concluded that GIS is a very useful tool to analyze the school-planning situation. Besides the simplification of educational administration, and expansion of compulsory education, enforcing the clear school planning policies, and creating the digital database that can be used in GIS, this will have more positive influence on improving school services and qualities for the current and future children (Eray, 2012).

Geographic Information Systems (GIS) are a powerful set of computer-based tools used to collect, store, manipulate, analyze and display spatially referenced information (Burrough and McDonnell 1998). GIS techniques such as School mapping has much been used in the last two decades for educational planning (Maguire, Godchild and Rhind, 1991). Mapping of schools is a normative approach to the micro-planning of school locations. It is also used to investigate and ensure the efficient and equitable distribution of resources within and between school systems when large-scale reform or significant expansion of an educational system takes place (Caillods, 1983). GIS database provides comprehensive framework and

organization of spatial and non-spatial data to efficiently help decision makers and planners. It apparently provides a mapping tool for the relationships between the distribution of schools and the school age population within the populated areas (Hite, 2006). It is an efficient tool in managing and planning the accessibility to the educational facilities.

High population growth in developing countries always put excessive pressure on government for facility management. Unless there is a tool to help decision makers in locating of schools according to the standardized criterion, it will be mystery planning (Al-Rasheed and El-Gamily, 2013).

1.2 STATEMENT OF THE RESEARCH PROBLEM

Traditionally, Geographers have been interested in the spatial aspects of phenomena, which include the distribution questions, who gets what and where? Geographical location is important in these matters because people live in places and thus location is one of the determinants of access to essential goods and services in geographic space (Babatimehin, Ayanlade, Babatimehin and Yusuf, 2011).

The location of education facilities is known to influence their utilization and efficiency, as proximity to them does influence the decision to seek and receive education. This implies that the location of educational facilities particularly public ones which are more affordable and accessible may influence accessibility to educational opportunity (Inobeme and Ayanwole, 2009).

Kaduna State had 501 schools of which 373 are public and 128 private schools in the junior secondary school level in 2006. The total number of pupils enrolled was 187,047 pupils representing 39.3 % gross enrolment ratio. All together, three LGAs had an enrolment ratio less

than 20% of the total pupils enrolled – Birnin Gwari (3,325), Giwa (3,375) and Soba (2,891). As expected the best off area was Kaduna North, a major urban centre, with 18,854 pupils enrolled. Kaduna South enrolment ratio was very low at 35.5% (11,402). Only four LGAs had an enrolment ratio greater than 50%. Overall, in contrast to the situation in primary education, a shortage of schools seems to be a major obstacle to increasing access to junior secondary education. Indeed all LGAs with a gross enrolment ratio of less than 20% have less than three junior secondary schools per 10,000 children. Giwa; has two schools per 10,000 children and a gross enrolment ratio of 15.3 % (Appendix II) (Chang and Rwehera, 2008).

The distribution of senior secondary schools within Kaduna state was not different from what was observed in the junior secondary schools. The median number of senior secondary schools per LGA was 12, but four LGAs had half that number or less, while five others had more than double. Giwa and Kudan LGAs had, on average, a school per more than 3,150 children (aged 15-17), while Sabon Gari, Sanga and Zangon Kataf had one for less than 700 children. Even the public schools were not equitably distributed for example, Zangon Kataf had 29 public schools, ten times more schools than Kudan (three schools) when its population was only two and a third times larger (Appendix III) (Chang and Rwehera, 2008).

The problem of inadequate government established secondary schools are aggravated by location inequalities in the location of the few available schools. However, the need for the expansion of these facilities to meet the ever increasing population gives all levels of government, the concern to establish more public educational facilities. Since schools are considered quite necessary and essential by all, it follows that any attempts to establish such

useful facilities will require the need to locate them in places where they can command maximum use by the people they are supposed to serve (Inobeme and Ayanwole, 2009)

Olamilu and Olujimi (2011) analyzed the regional location of public educational facilities in the Akure region of Nigeria. They focused on two categories of educational facilities – primary and secondary. Data used were collected by the use of open ended questionnaires targeted at heads of Government ministries, parastatals and educational institutions. The results revealed that Akure South alone had more public secondary schools than Akure North and Ifedore sub regions put together. In Akure North sub region, there were eight public secondary schools. Iju settlement with a population of 16,526 had three secondary schools while Ita-Ogbolu settlement with a higher population of 17, 643 had only one secondary school. Oba-Ile and Igoba settlements with a population of 6, 058 and 400 respectively had one secondary school each. Oba-Ile settlement which had a higher population than Odudu, Igbatoro and Igoba settlements put together had three secondary schools. This is a clear indication of the fact that government does not take into cognizance population figures before the location of educational facilities. Facilities are located based on political decision rather than conforming to planning standards. It was observed that there was a regional imbalance in the distribution of educational facilities in the region.

Inobeme and Ayanwole (2009) assessed the spatial distribution of Government secondary schools in Zaria area of Kaduna state. The results revealed that 61 secondary schools exist in the study area. Sabon Gari had the highest concentration of schools (39.3%), followed by Zaria City (16.4%), Wusasa/Gaskiya axis (11.5%), Samaru (9.8%), Palladan/Hanwa axis (8.2%), while Jushi, Waje and Kongo each had 3.3%. The results also revealed that areas like Dakaci and Dogarawa were not provided with secondary schools whether government owned

or private. An indication of gross inadequacy and inequity in the allocation of both Government and Private owned secondary schools among the various localities in the study area was observed. In addition, for an area of this magnitude to have less than a 100 Secondary schools (both Government owned and Private secondary schools put together) goes to show inadequate provision of Secondary schools services by government and other private agencies.

Abbas (2012) undertook a study on database management and mapping of secondary education infrastructure in Sabon Gari and Zaria Local Government areas, Kaduna State, Nigeria using GIS techniques. The result revealed that 36% of the schools had library, computer, chemistry, physics, and biology laboratories while the remaining 64% of the schools did not have all the facilities, these shows that learning conditions in the schools are not conducive due to lack of teaching materials. The research also revealed that most of the secondary schools in the study areas were concentrated in Sabon Gari while Kuregu and Ungwan Abashi had no secondary schools.

Although many studies have been carried out on various aspects of the education sector, not all researchers used GIS in their research work. With the increasing interest in the use of GIS in educational decision making, this research will be conducted using GIS techniques to analyze the locations of public secondary schools and the creation of a geo database of available school facilities in the study area. This is the gap this study intends to fill and provide in-depth information for the management of educational service delivery in the study area. The following are the research questions:

1. Where are the public secondary schools in Kaduna education zone located?

2. What is the spatial distribution of the public secondary schools?
3. What is the pattern of the spatial distribution of the public secondary schools?
4. What is the spatial accessibility of the schools from the residents (catchments area)?
5. What are the facilities available in the public secondary schools?

1.3 AIM AND OBJECTIVES OF THE STUDY

The aim of this study is to analyze the location and create a geo-database for public secondary schools in Kaduna education zone. This aim will be achieved through the following objectives which are to:

i. identify locations and map out the spatial distribution of all public secondary schools within the study area
ii. analyse the spatial distribution pattern of these schools within the study area
iii. analyse the spatial accessibility of these schools within the study area
iv. create a geo database for available facilities in the public secondary schools.

1.4 SCOPE OF THE STUDY

The Kaduna State Ministry of Education has grouped all public secondary schools into education zones. These zones were created to assist the Ministry of Education in data collection (staff, students and infrastructure) and the management of all government owned secondary schools. These zones are twelve in number and are listed as follows: Anchau, Birnin-Gwari, Giwa, Godogodo, Kachia, Kaduna, Kafanchan, Lere, Rigachikun, Sabon-Tasha, Zaria and Zonkwa. The scope of this research covered all Public Secondary Schools within Kaduna Education Zone of the Ministry of Education of Kaduna State. The zone is located within the Metropolitan area of Kaduna Township. The spatial extent of the research

covers Hayin Banki, Badarawa, Kawo, Ungwan Sarki, Ungwan Shanu, Abakwa, Ungwan Rimi, Doka and Kabala Costain for Kaduna North LGA; Badikko, Kurmin Marshi, Kabala West, Ungwan Muazu, Tudun Nupawa and Tudun Wada for Kaduna South LGA; also, Rigasa for Igabi LGA. The knowledge extent covered the identification, mapping, analysis of location and generation of geo-database for all public secondary schools in Kaduna Education Zone. The temporal extent of the research covered only public secondary schools as at 2014(2013/2014 school session).

1.5 JUSTIFICATION OF STUDY

This research is to assist the Kaduna State Ministry of Education in envisaging areas within the study area that need assistance on issues by providing relevant up to date information which can be used for effective planning, identifying areas within the study area that have issues concerning the location of schools, their spatial distribution, accessibility of the schools and expansion/closure of old schools or sighting of new schools The research was aided with the application of GIS techniques. This means the research was based on geo-referenced data which provided accurate data with regards to location. This can help the Zone inspectors properly plan their visits to schools

Relevant information on the research problem can be collected from interested parties, stored in the form of a database and analysed. The analysed data was presented in visual form. This will assist the Ministry by giving them a visual representation of what is on ground in the study area. The study area was selected because of its proximity to the researcher. All state secondary schools, offices and willing personnel within the Education zone were accessible to the researcher. This helped in reducing cost for the research.

CHAPTER TWO: CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

2.1 INTRODUCTION

This chapter reviews definitions of concepts, structure and characteristics of Education, Geographic Information Systems and Database. It also presents relevant literature reviews aimed at facilitating the understanding and importance of the application of GIS techniques in social service delivery.

2.2 CONCEPTUAL FRAMEWORK

2.2.1 Education

The Oxford Advanced Learner`s Dictionary defines Education as a process of teaching, training and learning especially in schools or colleges, to improve knowledge and develop skills. Education is the platform through which information is transferred. If educational services are not adequately provided then good and usable information cannot begotten. Education is vital to national development because it provides the citizenry with information which can be used for effective and sustainable planning and management of their resources to get maximum profit for the resources available in their area. Educational facilities such as schools are used to provide this information. Education in its general sense is a form of learning in which the knowledge, skills, and habits of a group of people are transferred from one generation to the next through teaching, training, research, or simply through auto didacticism. Generally, it occurs through any experience that has a formative effect on the way one thinks, feels, or acts (Wikipedia, 2013).

Different philosophers and educationists from both Eastern and Western schools of thought have explained the term ‘education’ according to the need of the hour. According to

Parankimalil (2012), some renowned educationists have defined education in various ways: Mahatma Gandhi defined education as an all-round drawing out of the best in child and man (body, mind and spirit); Dr. Zakir Husain defined Education as the process of the individual mind, getting to its full possible development; Pestalozzi defined Education as a natural, harmonious and progressive development of man's innate powers; and finally John Dewey who defined Education as the process of living through a continuous reconstruction of experiences. However, for the purpose of educational statistics, education, according to UNESCO, is understood to involve, organized and sustained communication designed to bring about learning (UNESCO, 2011). The goal of education should be the full flowering of the human on this earth. According to UNESCO, the physical, intellectual, emotional and ethical integration of the individual into a complete man/woman is the fundamental aim of education (Aggarwal and Thakur, 2003).

The different meanings and definitions of education as given above lead us to the conclusion that education should have a comprehensive definition. Thus, education may be defined as a purposive, conscious or unconscious, psychological, sociological, scientific and philosophical process, which brings about the development of the individual to the fullest extent and also the maximum development of society in such a way that both enjoy maximum happiness and prosperity. In short, education is the development of individuals according to their needs and demands of society, of which they are an integral part. The above remarks of different educators highlight the following special features of education:

- Education is both unilateral as well as bi-polar in nature.
- It is a continuous process.
- It is knowledge or experience.

- It is development of particular aspects of human personality or a harmonious integrated growth.
- It is conducive for the good of the individual or the welfare of the society.
- It is a liberal discipline or a vocational course.
- It is stabilizer of social order, conservator of culture, an instrument of change and social reconstruction.

2.2.1.1 Structure of the Education System in Nigeria

According to the constitutional provisions, the main responsibilities of the Federal government in basic education are in the realm of policy formulation, coordination and monitoring. Direct control by the Federal government is preponderantly at the tertiary level. Only a handful of institutions at the secondary level (the Unity Schools and technical colleges) enjoy federal direct control. The bulk of secondary schools in the country are under the purview of state government which are also directly responsible for a considerable proportion of the nation's tertiary institutions. The local governments have statutory managerial responsibility for primary education, with the federal and state government exercising appropriate oversight functions.

The National Policy on Education (years) stipulates a 6-3-3-4 structure offering six years of primary, three years of junior secondary, three years of senior secondary and four years of higher education. The hierarchical structure of the educational system has as its base, Early childhood education in which government's role has been limited to setting standards, providing curriculum guidelines and training teachers with the private sector providing educational service. Primary and junior secondary education constitutes basic education that

is free and compulsory. A special nomadic education programme for the children of migrant herding and fishing communities is also encompassed in the basic education package. The senior secondary level includes both an academic curriculum provided in general secondary schools and other curricula provided in technical colleges and vocational centers. Adult and non-formal education caters for the needs of a good number of young people who do not reach the senior secondary level, while Islamic education forms an important traditional part of the formal and informal delivery of education in Nigeria with varying degrees of integration with formal education on a state- to- state basis.

One other stratum in the structure is technology and science education. Technology education is composed of pre-vocational education at the primary and junior secondary levels, vocational training in technical colleges and vocational training centers, technical education in polytechnics and monotechnics and some professional education in universities. The tertiary level of education comprises of universities, polytechnics and colleges of education charged with responsibilities for the production of different categories of high caliber manpower required for national development (Education Sector Analysis Unit, Federal Ministry of Education, Nigeria, 2002). The structure of the formal educational system is summarized in Figure 2.1.

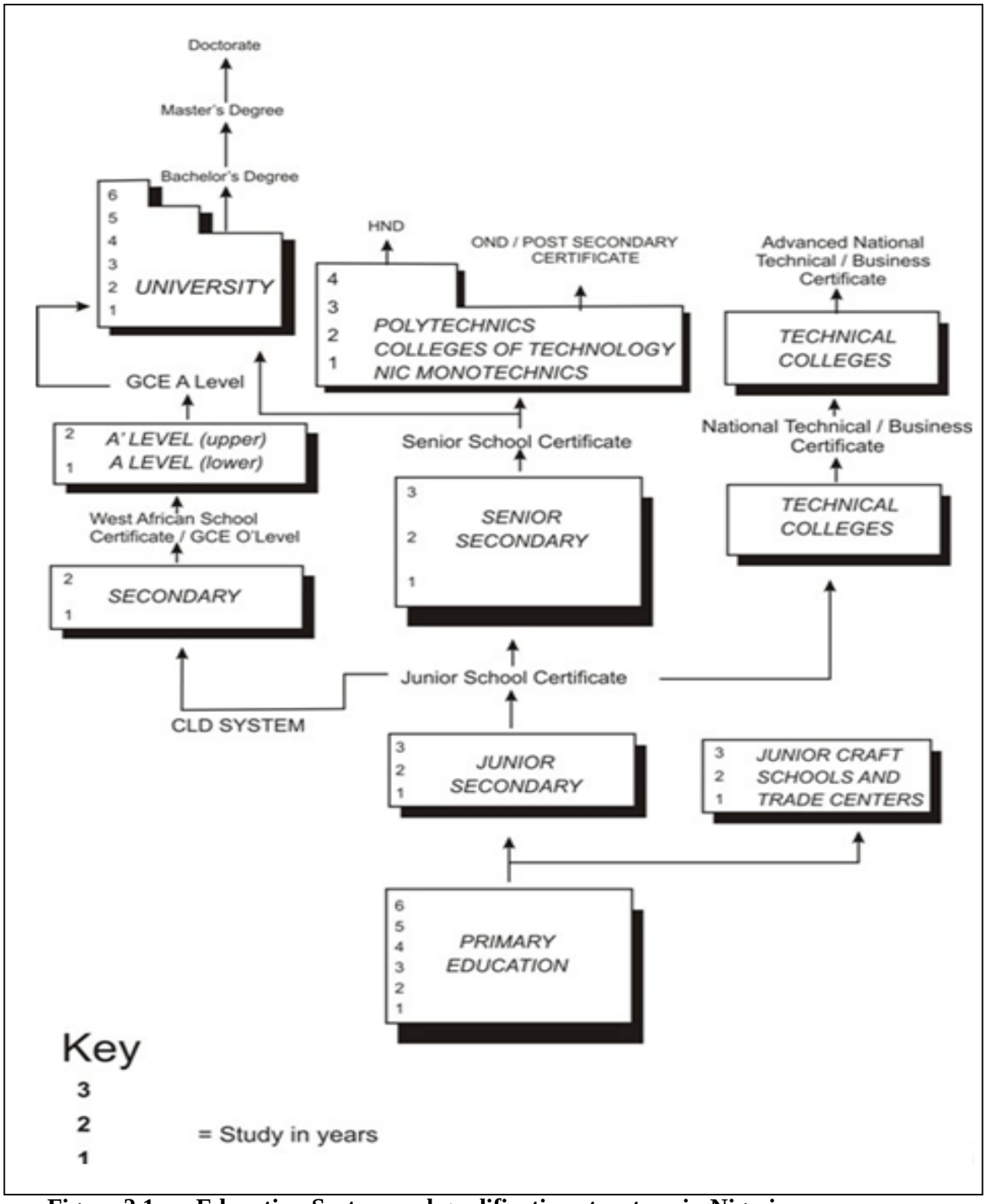

Figure 2.1: Education System and qualification structure in Nigeria
Source: World Education News and Reviews (WENR, 2011).

2.2.1.2 Secondary Education

Secondary education follows immediately after primary education and is also referred to, as post primary education. The 2 tier, 3,3 system consisting 3 years of junior and senior secondary schooling respectively, was introduced in 1982 following the introduction of the 6-3-3-4 education system of education. Prior to this, secondary education was for a duration of 5 years followed in most cases by a 2 year higher school certificate which also existed then. In Nigeria, as elsewhere in the world, secondary education is the second stage traditionally found in formal education, beginning about age 11 to 13 and ending usually at age 15 to 18. It is thus the education for the adolescent years, i.e. from about age 12 to 18 years of age. The National Policy on Education (1999) defines secondary education similarly, stating that it is the education children receive after primary education and before the tertiary stage.

Institutions that provide secondary education feature four main nomenclatures: Secondary School, College, Grammar school, and High School. The National Policy on Education also spells out the broad goals of secondary education as being, to prepare the individual for useful living within the society, and higher education. In order to achieve this goal, the document further states that secondary education shall:

i. Provide all primary school leavers with the opportunity for education of a higher level, irrespective of sex, social status, religious or ethnic background;
ii. Offer diversified curriculum to cater for the differences in talents, opportunities, and future roles;

iii. Provide trained manpower in the applied science, technology and commerce at sub-professional grades;

iv. Develop and promote Nigerian languages, art and culture in the context of world's cultural heritage;

v. Inspire its students with a desire for self-improvement and achievement of excellence;

vi. Foster national unity with an emphasis on the common ties that unite us in our diversity;

vii. Raise a generation of people who can think for themselves, respect the views and feelings of others, and respect the dignity of labour;

viii. Provide technical knowledge and vocational skills necessary for agricultural, industrial, commercial and economic development (Encyclopedia Britannica, 2003).

2.2.2 Geographic Information Systems (GIS)

A GIS is basically a computerized information system like any other database, but with an important difference: all information in GIS must be linked to a geographic (spatial) reference (latitude/longitude, or other spatial coordinates). There are many different definitions of GIS, as different users stress different aspects of its use. For example: The Environmental Systems Research Institute (ESRI) defined GIS as an organized of computer hardware, software, geographic data and personnel designed to efficiently capture, store, update, manipulate, analyze and display geographically referenced information. ESRI also provided a simpler definition of GIS as a computer system capable of holding and using data describing places on the earth's surface. The United States Geological Survey (USGS) defined GIS as a computer hardware and software system designed to collect, manage, analyze and display geographically (spatially) referenced data. (Gangwar, 2013)

A GIS produces maps and reads maps. Its major advantage is that it permits identifying spatial relationships between specific different map features. It can create maps in different scales, projections and colours. But it is not just a map modelling tool. It is primarily an analytical tool that provides new ways of looking at, linking and analysing data by projecting tabular data into maps and integrating data from different, diverse sources. This it does by allowing creation of a set of maps each with different themes (soils, rainfall, temperature, relief, water resources etc) (Gangwar, 2013)

From its early beginnings, GIS has been an integrating technology both from the point of view of its development as well as its use. This is because, once geographic information of any kind is translated into digital foam in a GIS, it becomes easy to copy, edit, analyze, manipulate and transmit it. This allows vital linkages to be made between apparently unrelated activities based on a common geographic location. This has led to fundamental changes in the way resource management decisions are made in a variety of situations - forest management, marketing management, utility management, transportation, as well as in agricultural, environmental and regional planning and management. Some potential agricultural applications where GIS can lead to better management decisions are: precision farming, land use planning, watershed management, pest and disease management, irrigation management, resources inventory and mapping, crop area assessment and yield forecasting, biodiversity assessment, genetic resources management, etc (Gangwar, 2013).

2.2.3 Database Management Systems (DBMS)

Information is the result of processing raw data to reveal its meaning. Data processing may be as simple as organizing data to reveal patterns or as complex as making forecasts or drawing inferences using statistical modelling. Such information can then be used as the foundation for decision making. The production of accurate, relevant and timely information is the key to good decision making. In turn, good decision making is the key to business survival in a global market. Timely and useful information requires accurate data which must be generated properly and stored in a format that is easy to access and process. And like any basic resource, the data environment must be managed carefully. Data Management is a discipline that focuses on the proper generation, storage, and retrieval of data (Rob and Coronel, 2007)

2.2.3.1 The Database

Efficient data management typically requires the use of a computer database. A database is a shared, integrated computer structure that stores a collection of end user data i.e. raw facts of interest to the end user and metadata or data about data through which the end user data are integrated and managed. The metadata provides a description of the data characteristics and the set of relationship that link the data found within the database. A database can also be defined as a collection of related information stored to provide the availability to many users for different purposes. The content of database is obtained by combining data from various sources in an organization. So that data are available to all users and redundant data can be minimized or eliminated. Database systems are designed to manage large bodies of information. The management of data involves both definition of structure for storage of information. In a sense, the database resembles a very well organized electronic filing cabinet

in which a powerful software known as a data management system helps to manage the cabinet`s content. A database management system (DBMS) is a collection of programmes that manage the database structure and controls access to the data stored in the database (Rob and Coronel, 2007)

A database represents some aspect of the real world, sometimes called the mini-world or the Universe of Discourse (UOD).Changes to the mini-world is reflected in the database. A database is a logically coherent collection of data with some inherent meaning. A random assortment of data cannot correctly be referred to as a Database. A database is designed, built, and populated with data for a Specific purpose. It has an intended group of users and some preconceived applications in which these users are interested (University of Mumbai, not- dated).

2.2.3.2 Data Models

A data model is a way of storing and retrieving the data. There are three different data models. Data models differ in the way they allow users to view and manipulate relationships between entities. Each has its own way of storing the data. The following are the three data models: Hierarchical, Network and Relational.

a. Hierarchical Model

In this model, data is stored in the form of a tree. The data is represented by parent child relationship. Each tree contains a single root record and one or more subordinate records.

This model supports only one-to-many relationship between entities. This was used in IBM's Information management system (IMS) (Srikanth technologies, not-dated).

b. Network Model

In this model, data is stored along with pointers, which specify the relationship between entities. This was used in Honeywell's Integrated Data Store, IDS. This model is complex. It is difficult to understand both the way data is stored and the way data is manipulated. It is capable of supporting many-to-many relationship between entities, which hierarchical model does not (Srikanth technologies, not-dated).

c. Relational Model

The concept of the relational approach was first set out by Edgar Frank Codd in 1970 as a means of describing data with their natural structure only and ensuring independence of user written application programmes from the detailed storage formats of data within a database (Healey, 1991).

The relational model is the most successful mode of all three models. The relational model is based on the theory of sets and relations of mathematics. It represents data in the form of a table. A table is a two dimensional array containing rows and columns. Each row contains data related to an entity such as a student. Each column contains the data related to a single attribute of the entity such as student name. One of the reasons behind the success of relational model is its simplicity. It is easy to understand the data and easy to manipulate. Another important advantage with the relational model, compared with the remaining two models is, it does not bind data with relationship between data item. Instead it allows you to have dynamic relationship between entities using the values of the columns. Almost all database systems that are sold in the market, now a day, have either complete or partial

implementation of the relational model. A DBMS that is based on relational model is called a Relational Database Management System (RDBMS) (Srikanth Technologies, not-dated).

2.2.3.3 RDBMS Properties

An RDBMS is easily accessible. You execute commands in the Structured Query Language (SQL) to manipulate data. SQL is the international Standards Organization (ISO) standard language for interacting with a RDBMS. An RDBMS provides full data independence. The organization of the data is independent of the applications that use it. You do not need to specify the access routes to tables or know how data is physically arranged in a database. A relational database is a collection of individual, named objects. The basic unit of data storage in a relational database is called a table. A table consists of rows and columns used to store values. For access purpose, the order of rows and columns is insignificant. You can control the access order as required. When querying the database, you use conditional operations such as joins and restrictions. A join combines data from separate database rows. A restriction limits the specific rows returned by a query (Shah, no-date).

An RDBMS enables data sharing between users. At the same time, you can ensure consistency of data across multiple tables by using integrity constraints. An RDBMS uses various types of data integrity constraints. These types include entity, column, referential and user defined constraints. The constraint, entity, ensures uniqueness of rows, and the constraint column ensures consistency of the type of data within a column. The other type, referential, ensures validity of foreign keys, and user-defined constraints are used to enforce specific business rules. An RDBMS minimizes the redundancy of data. This means that similar data is not repeated in multiple tables. (Shah, not-dated).

2.2.3.4 Geo database

A spatial database or geo database is a database that is optimized to store and query data that represents objects defined in a geometric space. Most spatial databases allow representing simple geometric objects such as points, lines and polygons. Some spatial databases handle more complex structures such as 3 dimension objects, topological coverage, linear networks, and triangulated irregular network (Wikipedia, 2014).

Spatial databases are a specific type of database. They store representations of geographic phenomena in the real world to be used in a GIS. They are special in the sense that they use other techniques than tables to store these representations. This is because it is not easy to represent geographic phenomena using tables. A spatial database is not the same as a GIS, although they have a number of common characteristics. A spatial database focuses on concurrency, storage, integrity and queries especially, but not only spatial data. The phenomena that we want to store representations for in a spatial database may have point, line, area or image characteristics and different storage techniques exist for each of them. An important choice in the design of a spatial database application is whether some geographic phenomenon is better represented as a point, a line or as areas (Rolf, 2001).

2.2.4 Location Analysis

Location analysis is a technique for discovering, assessing and specifying the optimal placement of an organization's people, information, activities, and materials. Location models are key in performing location analysis by providing a well-documented common vision of current and desired location arrangements (Advanced Strategies, Inc, 2015). Location analysis is an important decision and should not be taken lightly. The physical location of business functions is an important part in the supply chain strategy of an

organization. Location should be defined by strategy of an organization (University of Texas Arlington not dated).

According to Schmenner (1979), location decision making is an essential endeavour for effective public service delivery. The siting of outlets, production and distribution facilities, and service centres requires location choices to be made. Where these facilities or services are located is a primary factor in the success or failure of the activity. As a result, location analysis approaches which assist planning processes continue to be important in both the public and private sectors given the costs and viability implications involved (Murray, 2002).

Many public sector activities occur at specific locations in urban areas, and many of them are linked in particular locations for long periods of time. Examples of such activities include major transportation nodes (such as train stations, airports. or harbor facilities), city parks. schools, museums and hospitals. Government administrative buildings are also frequently kept in fixed locations for decades at a time or even longer. Clearly, it is often of value to firms or individuals to be located in close proximity to such facilities because it is necessary or desirable to take advantage of the services that they provide. Indeed, the most casual observation suggests that the location of public facilities can have a substantial impact on private sector location choices. This raises issues that are of importance both for positive economics and for policy evaluation (Thisse and Wildasin, 1992).

The location of a public facility is itself a policy decision and one which is often of intense interest to certain parties – landowners, developers, persons interested in public investment as an instrument for dealing with urban blight, etc. As is always true in the economic evaluation of public policy, it is necessary to understand the effect of the policy on private sector

behavior if one is to develop a comprehensive accounting of its social benefits and costs. In the present instance it is apparent that a proper analysis of the implications of public facility location requires consideration of the effect of this decision on the spatial structure in an urban area. Moreover, because the presence of public facilities may influence the nature of the spatial structure in an urban area, they may also influence the evaluation of other politics whose impact is likely to be sensitive to this structure (Thisse and Wildasin, 1992).

Most important in the consideration of school location are the population to be served and the distance the children would have to travel to get to school every day. This has become the concern of the educational planner who uses school densities as a rough index of school location and expansion as well as in the improvement of services provided. Therefore, the distance travelled to school in educational planning should be a *sine qua non* in the approval and location of schools (Duze, 2010).

2.2.5 Spatial Autocorrelation

Spatial autocorrelation is the correlation among values of a single variable strictly attributable to their relatively close location positions on a two-dimensional (2-D) surface, introducing a deviation from the independent observations assumption of classical statistics. Spatial autocorrelation exists because real-world phenomena are typified by orderliness, pattern, and systematic concentration, rather than randomness. Tobler's first law of geography encapsulates this situation: ''everything is related to everything else, but near things are more related than distant things.'' To this maximum should be added the qualifier: ''but not necessarily through the same mechanisms.'' In other words, spatial autocorrelation means a dependency exists between values of a variable in neighboring or proximal

locations, or a systematic pattern in values of a variable across the locations on a map due to underlying common factors (Griffith, 2009).

Spatial autocorrelation has many interpretations: a nuisance parameter, self-correlation, map pattern, a diagnostic tool, a missing variables surrogate, redundant information, a spatial process mechanism, a spatial spillover, and the outcome of a real unit demarcation. A map pattern is a systematic organization of values for some variable across a map resulting in visually conspicuous texture that consists of global, regional, and local trends, gradients, swaths, or mosaics. Interpreting spatial autocorrelation as a map pattern emphasizes conspicuous trends, gradients, swaths or mosaics across a map. Consider a constant, which is the degenerate case (a constant has no variance) of perfect positive spatial autocorrelation: once the value of a constant is known at a single location, it is known at all locations (Griffith, 2009). An example of spatial autocorrelation is the Global Moran`s Index.

Moran Coefficient index of spatial autocorrelation, involves the computation of cross-products of mean adjusted values that are geographic neighbors (i.e. co variations), that ranges from roughly (–1, –0.5) to nearly 0 for negative, and nearly 0 to approximately 1 for positive, spatial autocorrelation, with an expected value of –1/ (n – 1) for zero spatial autocorrelation, where n denotes the number of areal units (Griffith, 2009).

The Spatial Autocorrelation (Global Moran's I) tool measures spatial autocorrelation based on both feature locations and feature values simultaneously. Given a set of features and an associated attribute, it evaluates whether the pattern expressed is clustered, dispersed, or random. The tool calculates the Moran's I Index value and both a z-score and p-value to evaluate the significance of that Index. P-values are numerical approximations of the area

under the curve for a known distribution, limited by the test statistic (ESRI Developer Network, 2015).

2.3 LITERATURE REVIEW

2.3.1 Education from a global perspective

The importance of education in human development is not a new discovery. From classical economists to recent writers on economic development fully recognised that education is critical for economic and social development (Smith 1776; Marshall 1890; Becker 1993; Sen *et al* 1995 cited in Haq and Haq 1998)). Education is the key for building human capabilities and for opening opportunities. It stimulates and empowers people to participate meaningfully in their own development. With the above knowledge of the global community, the world is still facing a large number of populations who have never been to any educational institutions. In 2000, more than 880 million adults around the world were illiterate, and more than 113 million children were out of schools at the primary level, 60 percent of whom were girls (UNESCO, 2000).

The crisis is more in the developing world. Majority of the world's illiterates live in these countries, of which 395 million in the South Asian region (Haq and Haq, 1998). The out of school children in South Asia consists of about two fifths of such children in the globe. The last two global conferences on education held respectively in Jomtien (1990) and Dakar (2000) brought the world leaders in a forum and reaffirmed their commitment to basic education for all. It was reported that despite the constraints, some progress have been made during the decade of 1990's. The adult literacy rate went up from 64 percent in 1990 to 76 percent in 1997 (UNDP, 1999). The net enrolment rate reached at over 80 percent in the developing region and gender disparities declining. Even then many countries could not

achieve the targets of the Jomtien conference within the given timeframe, and so Education for All is still a dream. The last conference, which was held in Dakar, Senegal, has set new targets for the nations to be achieved by the year 2015AD. The goals of the Dakar conference include: ensuring early childhood care, equitable access to participation in school and life skills programmes, improve adult literacy situation, improving quality of education, and especial care for disadvantage groups and ethnic minorities. The challenge for the nations is not to postpone it again (Ahmed and Nath, 2003).

2.3.2 Education and National Development

Education opportunities and their expansion provides the base for national economic development, individual economic welfare, and also narrows social inequalities by promoting a meritocratic basis for status attainment in which the talented can rise to appropriate positions in the economy, regardless of social background (Hannum & Buchmann,2005). Hannum and Buchmann also found that countries with better-educated citizens have healthier and slower-growing populations, as educated individuals make more informed health choices, live longer, and have fewer and healthier children. Education is a priority sector in every well-meaning society. Thus, Burtch (2006) referred to education as a major force in economic, intellectual, social and cultural empowerment. Its value in bringing about character and attitudinal change ranks as important as its ability to reshape human potentials for desired development.

Education is vital to national development because it provides the citizenry with information which can be used for effective and sustainable planning and management of their resources to get maximum profit for the resources available in their area. Educational facilities such as schools are used to provide this information. Successive governments in Nigeria have tried to

develop the country through basic education to her citizenry. For instance, the Free Primary Education was introduced by the regional government of Western Nigeria in 1955 (Akpan, 1996).In 1976, the Universal Primary Education (UPE) programme was introduced in the country. These programmes failed to achieve these objectives. At the advent of democratic governance in May, 1999, the government made education one of its priorities by introducing Universal Basic Education (UBE). The Universal Basic Education scheme was put in place to improve on the limitations of Universal Primary Education (UPE) of the1970s. One of the objectives of the UBE scheme that bothers on availability as relates to even spread (as stated by the Federal Ministry of Education, 1999) is developing in the entire citizenry a strong consciousness for education and a strong commitment to its vigorous promotion.

It is quite obvious that the objective of developing the entire citizenry cannot be achieved unless the public education facilities are evenly distributed taking into consideration the population density and land area coverage per school. In this manner government grants should be made available for equitable funding of the schools in order to ensure equitable development of the citizenry (Olamilu and Olujimi, 2011).

2.3.3 Geographic Information Systems in Educational Service delivery.

GIS is useful in the analysis and evaluation of the performance of different services, and identifying disadvantaged urban areas for the redistribution of services where it also serves as compared to what is already planned (Wikipedia, 2015). It is a powerful set of tools for collecting, storing, retrieving at will, transforming and displaying spatial data from the real world for a particular set of purposes (Burrough and McDonnell, 1998). GIS can be used for many different purposes in public services, especially in educational planning and management (Attfield, Tamiru, and Parolin, 2002; Kong, Yin, and Nakagoshi, 2007).

Educational services is one of the most important public services that must be provided to members of any locality, as the education sector is the most associated with the construction of the future and the achievement of the renaissance and overall development sectors, because of its direct links to political reality and the economic, social and cultural sectors. So, governments are striving to provide educational institutions of all levels in order to accelerate progress and prosperity, where the progress and people's development are measured by available services to the population, not only the amount of these services , but the quality of these services and their conformity with international standard and specifications in the planning (Shquair, 2009). The planning and distribution depends on several criteria like: the distance, population and other land use. Also taking into account the urban expansion in those areas, and the assessment of the needs of the future population in respect of educational services (Mörtberg, Balfors and Knol, 2007) (Lagrab and Aknin, 2015).

Geographical Information Systems (GIS) are being implemented in the public sector because of their potential in supporting planning and decision making. Prior researches discuss the promises of GIS such as efficient management of data, information reuse and public policy implementation. As a result of these promises, geographical information systems and related technologies have been widely adopted in Europe, the United States and Africa within the public sector (Kurwakumire, 2011). Studies have been carried out in different parts of the world and on different aspects of educational service delivery such as school mapping and database management using GIS techniques

2.3.4 Related Researches

Aliyu, Sule and Youngu (2011), carried out an assessment of the effectiveness of the Millennium Development Goals (MDGs) target in the Abuja Municipal Area Council

(AMAC) metropolis, Abuja using Geographic Information Systems (GIS). Spatial and attribute data of every primary and secondary school in Garki and Wuse districts were used for the study. Their findings revealed that 60% of the schools did not have access to the Internet, 21% of the schools had no library and 63% of the schools were found to lack Elementary Science Laboratories as stipulated in the National Policy on Education. It was also observed that, the closest distance between public schools to Area 1 and Wuse Central bus-stops was 0.769 and 1.15 m, respectively.

Abbasid (2012) undertook a study on database management and mapping of secondary education infrastructure in Sabon Gari and Zaria Local Government areas, Kaduna State, Nigeria using GIS techniques. The data used were collected from questionnaires and a handheld GPS. It was observed that a total of 55 secondary schools were located in the study area with a total of 56% being private while the remaining 44% were public secondary schools.36% of the 55 schools had library, computer, chemistry, physics, and biology laboratories while the remaining 64% did not have all the facilities. 45% of the total number of schools had examination hall with a capacity of greater than or equals to 250 students, while 53.36% had less than 250 students or none. Also,73.21% of the total number of schools in the study area had the total number of classes greater than 12, while about 25% had less than 12 classes. The research also revealed that most of the schools were within a distance of two kilometres from residential area except for Unguwan Abashi and Zabi Zaria that did not have schools close to them so the students had to travel more than 2km to the nearest school to them.The research also revealed that most of the secondary schools in the study areas are concentrated in Sabon Gari while Kuregu and Ungwan Abashi have no secondary schools.

Sule, Abdullahi and Bungwon (2012) created a Geospatial Database for Primary Schools in Kaduna Metropolis. A base map of the study area, a list of schools and school coordinates were used for the study. The research revealed that areas like Sabon Tasha, Unguwan Television, Unguwan Romi, Tudun Wada and Unguwan Sanusi have the largest concentration of schools Rigasa, Mando, Narayi, Malali and Unguwan Rimi have fewer schools and Kaduna town had very few schools as it is the commercial area of the city. Rigasa Ungwan Rimi, Barnawa, Kabala Costain and Badarawa with their large population have few schools, not enough to serve the entire community.

Al-Rasheed and El-Gamily (2013) carried out a study on the efficiency of GIS as a tool for the management of Educational services and infrastructure in Kuwait. The research revealed the geographical analysis of the girl's secondary schools shows that high percentages of 54% of the districts have no girl's secondary school. Only 47% of the districts have one or more girls` schools in which 33% have met the general standards of one school per district. The remaining 13% of the districts show that 12% have three girls schools and 1% has three girl's secondary schools. It was also revealed that complementary to the girl's secondary school system is the boy's secondary schools which are distributed to accommodate the boys of the secondary school age. Similar to the girls, about 55% of the districts have no schools. The remaining 45% of the districts have one or more schools, in which 39% met the standard of one boy's secondary school per district and only 6% have 2 schools. None of the districts contained more than two boy's secondary schools.

Ogunyemi *et al* (2014) examined the spatial distribution of secondary schools and the accessibility levels of the students in Yewa South LGA of Ogun state, and the factors that gave rise to them with a view to providing a frame work for effective placement of students.

Data used include primary data collected using questionnaires and a hand held GPS, and secondary data that include the Administrative map, population figures of staff and students, names and address of the secondary schools and school placement sheets. The analysis was carried out using network analysis in a GIS environment. The field survey and data collected revealed that there were 25 Secondary Schools in Yewa South of which 60% were public secondary schools and 40% private secondary schools. The total samples in the local government area were 415 students using total population of students in each school as a frame. It was also observed that of the 415 students, 50.60% travel less than two kilometres to their school, while 49.40% travel more than two kilometres to their schools.

CHAPTER THREE: THE STUDY AREA AND METHODOLOGY

3.1 INTRODUCTION

This section of the research describes the location of study area, population, economic activities in the study area and the geographical settings of the environment such as the climate, relief and drainage, vegetation and soil. Similarly, the methodology adopted for the research will be discussed

3.2 THE STUDY AREA

3.2.1 Location and Size

The study area is situated between Latitudes $10^{o}29`N$ - $10^{o}35`N$ of the equator, and Longitudes $7^{o}21`E$ - $7^{o}29`E$ of the Greenwich meridian. The study area is located in Kaduna metropolis which is the capital city of Kaduna State in Northern Nigeria It covers mainly Kaduna North local government area, and some localities within Igabi and Kaduna South local government areas. 39 Government owned schools are located within the zone. The zone shares borders with Igabi local government area to the North and Northwest, and River Kaduna to the Northeast and South. The study is restricted to Kaduna Education Zone (See Figure 3.1).

3.2.2 Physical Setting

The climate is of the tropical continental type (Aw) which is characterized by a well defined wet and dry season, strong seasonality in rainfall and temperature distributions (Koppen, 1928). Kaduna falls within the Northern central high plains. It`s regional topography consist of a rolling part terrain with little relief situated about 30.48 meters above the 609.6 meters contour line above sea level. The formation of Kaduna is of basement complex rocks which

constitutes the largest single geological and hydrological unit in the area. The main types of rocks of this unit are the granites, gneisses and magnates Kaduna is predominately drained by River Kaduna which is a major tributary of the River Niger. It slopes gently from the north to the South west and its tributaries which flow from Jos plateau dividing the town into two. The dominance of the Kaduna river system is so great that this region can be properly designated the upper Kaduna basin (Doxiodid and Associates, 1973).

Kaduna lies within the northern guinea savannah. It consists of tall woodland and tall grass savannah species with gallery forest along the main river course The vegetation cover of the study area is made up of scattered trees but predominantly grasses (*andropogonspp*) which are almost completely absent during the long dry season (Folorunsho, 2012). However, at onset of the rainy season, the grasses sprout and the shrubs that have shed their leaves will regrow very rapidly, but no sooner had they become well established, then the rains come to an end (Iguisi, 1996) The natural vegetation of the study area which was initially woodland savannah has been replaced with a variety of vegetation cover especially the Eucalyptus and ornamental trees in the government reserved areas, while much of the area is now built-up (Jeb, 2014).

The soil over Kaduna area are generally of the Northern plains laterite, formed from drift deposits which mantle the solid sedimentary and Pre- Cambrian basement granite rocks. Kaduna lies within the Zaria soil group where the covering material may be up to 4.26 meters in depth. Being of fine texture, this soil is relatively difficult to work because it tends to become water logged with heavy rainfall and too dried out and cracked during the dry season period (Folorunsho, 2012).

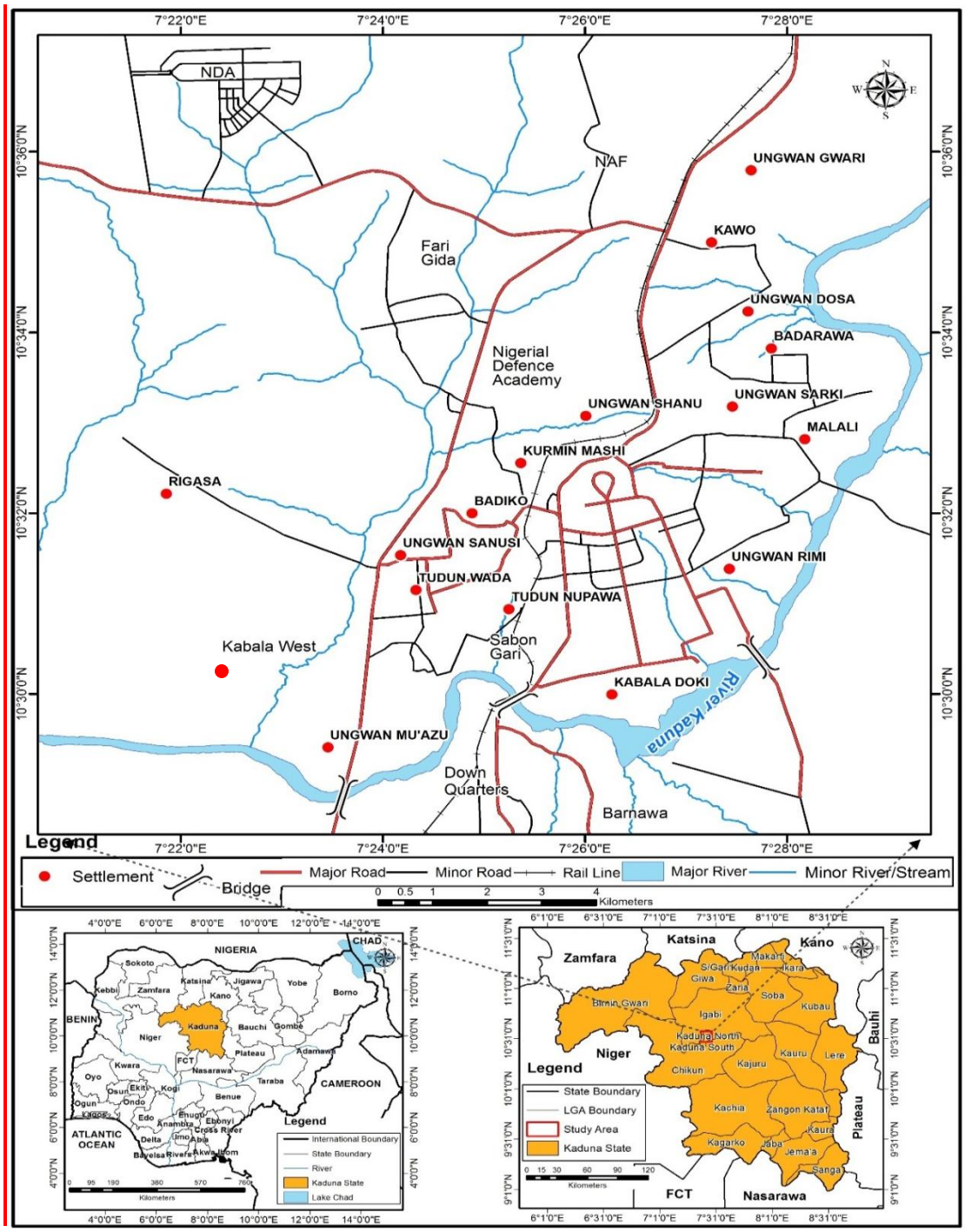

Figure 3.1: Kaduna Education Zone
Source: Adapted from Kaduna Metropolis Street Map 2013.

3.2.3 School System

The formal education system is delivered through a number of institutions ranging from Early Childhood and Care Development (ECCD) classes, mostly attached to primary school settings or provided by partners in the private sector, through primary and junior secondary schools (under the universal basic education provision), senior secondary schools to universities, colleges of education and polytechnics. Literacy and non formal education are provided by various organizations, including Mass literacy agencies, Non-governmental organizations (NGOs) and Religious denominations. This is commonly found at state level, including Kaduna State (Chang and Rwehera, 2008).

The State Ministry of Education (SMOE) is the major institution responsible for the overall education sector policy, planning and monitoring and is directly responsible for the management of secondary schools. Two other ministries have policy and management responsibilities for senior secondary level science and technology education and higher-level polytechnic (Ministry of Science and Technology) and health-related higher education institutions (Ministry of Health).Various aspects of education delivery and implementation are devolved to governmental agencies and parastatals. Of these, SUBEB (the State UBE Board) has played a key role in supporting primary schools and is expected to do so in implementing the Universal Basic Education (UBE) and Education for All (EFA) programmes. The Education Resource Centre (ERC), together with the various inspectorate bodies, aim to ensure quality of education through performance monitoring and other means and the Mass Adult Education agency has special responsibilities for literacy and non formal learning among the adult and hard-to-reach youth populations in the state. The Teacher Service Board (TSB) is responsible for staffing and recruitment at secondary level. The

private sector and nonprofit organizations also provide a range of education services at all level ((Chang and Rwehera, 2008).

3.2.4 Population

Kaduna Metropolis is densely populated and the population has been increasing over the years. The population has shown a steady and rapid increase as follows; 10,653 in 1913, 44,540 in 1952, 149,910 in 1963 and 800,000 in 1991. The population of Kaduna metropolis in 2014 using the exponential method of population projection recommended by the National Population Commission was estimated to be about 1,917,183 with a growth rate of 2.75% (N.P.C.1991).

The population of the total localities within Kaduna Education Zone was 651,998 in 1991 (NPC.1991). Using the exponential projection formula [$Po = P1 (1+ r)^{n}$] at 2.75% growth rate, the population of Kaduna Education Zone was estimated at about 1,286,775 in 2014. The zone comprises of all the localities within Kaduna North LGA, and some localities within Kaduna South and Igabi LGAs.

Kaduna North LGA with a total number of 18 settlements/ localities had a total population of 753,772, Kaduna South with seven settlements/ localities had a total population of 389,951 and Igabi with one settlement/locality had a total population of 143,052 (See table 3.1).

Table 3.1: Projected Population of Localities within Kaduna Education Zone

LGAs	Localities	Population (1991)	Population(Projected) (2014)
Kaduna North	Abakpa	13,539	26,720
	Badarawa	32,737	64,609
	Doka	53,911	106,398
	Hayin Banki 1	16,538	32,639
	Hayin Banki 2	33,930	66,964
	Kabala Costain	13,566	26,774
	Kabala Doki	22,694	44,789
	Kawo	37,107	73,234
	Kotoko Barracks	5,671	11,192
	Malali	22,677	44,755
	N.D.A. Kawo	437	863
	Ungwan Gwari	10,781	21,277
	Ungwan Sarki	6,509	12,846
	Ungwan Garba (Hayin Banki)	11,284	22,270
	Ungwan Dosa	19,658	38,797
	Ungwan Rimi	52,717	104,042
	Ungwan Shanu	18,442	36,397
	Ungwan Kanawa	9,732	19,207
		381,930	**753,772**
Kaduna South	Ungwan Sanusi	23,971	47,309
	Badikko	16,265	32,100
	Kurmin Mashi	20,026	39,523
	Kabala West/ Ungwan Muazu	37,713	74,430
	Tudun Nupawa	39,311	77,584
	Tudun Wada	60,299	119,005
		197,585	**389,951**
Igabi	Rigasa	**72,483**	**143,052**
Total Population		**651,998**	**1,286,775**

Source: Modified from NPC, 1991.

From the NPC 1991 population distribution by age group data, it was stated that 15.7% of Kaduna States population, represented the Secondary school age group (ages 12 to 18). With this data, it was possible to get the population of this age group from the projected population of 2014 (see Tables 3.2a and 3.2b).

From the projected population data in tables 3.2a and 3.2b, a total population of 202,026 represented the secondary age group of which 87,503 represented the junior secondary school age group (6.8%) and 114,524 the senior secondary school age group (8.9%). It was also observed that the population of the senior secondary age group was greater than that of the junior secondary school age group.

Table 3.2a: Projected Population Distribution of Secondary School Age Group in Kaduna North LGA

LGAs	Localities	Population (1991)	15.7% of Population.	Pop. Projected (2014)	15.7% of Projected Pop.	Junior secondary age group population 6.8% (12-14)	Senior secondary age group population 8.9% (15-18)
Kaduna North	Abakpa	13,539	2,126	26,720	4,195	1,817	2,378
	Badarawa	32,737	5,140	64,609	10,144	4,393	5,751
	Doka	53,911	8,464	106,398	16,705	7,235	9,470
	Hayin Banki 1	16,538	2,597	32,639	5,124	2,220	2,904
	Hayin Banki 2	33,930	5,327	66,964	10,513	4,554	5,959
	Kabala Costain	13,566	2,130	26,774	4,204	1,821	2,383
	Kabala Doki	22,694	3,563	44,789	7,032	3,046	3,986
	Kawo	37,107	5,826	73,234	11,498	4,980	6,518
	Kotoko Barracks	5,671	890	11,192	1,757	761	996
	Malali	22,677	3,560	44,755	7,027	3,043	3,984
	N.D.A. Kawo	437	67	863	136	59	77
	Ungwan Gwari	10,781	1,693	21,277	3,341	1,447	1,894
	Ungwan Sarki	6,509	1,022	12,846	2,017	874	1,143
	Ungwan Garba (Hayin Banki)	11,284	1,772	22,270	3,496	1,514	1,982
	Ungwan Dosa	19,658	3,086	38,797	6,091	2,638	3,453
	Ungwan Rimi	52,717	8,277	104,042	16,335	7,075	9,260
	Ungwan Shanu	18,442	2,895	36,397	5,714	2,475	3,239
	Ungwan Kanawa	9,732	1,528	19,207	3,016	1,306	1,710

Source: Modified from NPC, 1991.

Table 3.2b: Projected Population Distribution of Secondary School Age Group in Kaduna South and Igabi LGAs

LGAs	Localities	Population (1991)	15.7% of Population	Pop. Projected (2014)	15.7% of Projected Pop.	Junior secondary age group population 6.8% (12-14)	Senior secondary age group population 8.9% (15-18)
Kaduna South	Ungwan Sanusi	23,971	3,764	47,309	7,428	3,217	4,211
	Badikko	16,265	2,554	32,100	5,039	2,183	2,856
	Kurmin Mashi	20,026	3,144	39,523	6,205	2,688	3,517
	Kabala West/ Ungwan Muazu	37,713	5,921	74,430	11,686	5,061	6,625
	Tudun Nupawa	39,311	6,172	77,584	12,181	5,276	6,905
	Tudun Wada	60,299	9,467	119,005	18,684	8,092	10,592
Igabi	Rigasa	72,483	11,380	143,052	22,459	9,728	12,731
Total Population 3.2a &3.2b		**651,998**	**102,365**	**1,286,775**	**202,026**	**87,503**	**114,524**

Source: Modified from NPC, 1991.

3.3 METHODOLOGY

This section describes the data types and sources, tools and procedures that were used in this research in order to achieve the set objectives.

3.3.1 Reconnaissance Survey

A reconnaissance survey of the study area was carried out. This was to enable the researcher have an idea or have a better view of the total size of the study area, the localities and number of public secondary schools within the area and other important information which were of use during the data collection phase.

3.3.2 Data type and Sources

i. Primary data and Sources

- Google Earth Image of Kaduna Metropolis. This was obtained from Google Earth (2014)
- Geographic Coordinates of Public Secondary Schools using a handheld Global Positioning System (GPS).
- Data on the available facilities in each school e.g. Year school was established, number of classes, class size, number of teachers, number of students, taught subjects, libraries, laboratories, sporting facilities etc. These were obtained through administering questionnaires.

ii. Secondary Data and Sources

- Population and demographic data of localities within Kaduna Education zone were obtained from the National Population Commission.

- Students' Enrolment data for state secondary schools within Kaduna Zone 2013/14 session obtained from Kaduna State Ministry of Education and Universal Basic Education Board.
- Literature materials were acquired from appropriate sources which include related books, journals, research thesis/proposals, documents and materials from related websites.

3.3.3 Data Processing

The satellite imagery of Kaduna Metropolis was imported into the ArcGIS environment and geo-referenced.This was done by converting the imagery to Universal Transverse Mercator (UTM) projection system with World Geodetic System (WGS) 84, 32N Minna datum, for easy measurement of distance. Geo-referencing is the registering of data to a geographic coordinate system by assigning geographic information such as location and position to the data sets. This enabled the researcher to define the existence of the data sets in the physical space as well as establish their location in the real world.

A subset of the area of interest was extracted from the larger scenes of the geo-referenced satellite imagery. The subset imagery of the study area was then digitized to delineate relevant features (roads, settlements, bridge, rail line, and rivers/streams) and all the shape files created using ArcGIS 10.1 The shape files represent relevant features in point, line or polygon forms.

The non spatial data were organizes as attribute table and related to the geographical locations/coordinates of the schools to create a geo database. All the attributes acquired using the questionnaire were copied into an attribute table, saved as a database file format in the

ArcGIS software and stored for analysis. This was done by adding required number of fields (columns) to the table and entering the data for all the schools in their corresponding records (rows).

3.3.4 Techniques of Data Analysis

i. Identify and locate all Public Secondary schools within the study area.

   A list of documented public secondary schools was acquired from the zone office. The names and addresses of these schools were identified. The coordinates of each school in the study area were acquired with a handheld GPS and copied in Microsoft excel, CSV (comma delimited) format.

ii. Mapping the spatial distribution of the schools within the study area

   The digitized base map of the study area was geo-referenced in ArcGIS 10.1.The locations of the public secondary schools acquired with the handheld GPS were copied into Microsoft Excel in tabular form. Using the add XY tool in ArcGIS, the locations of all the public secondary schools were imported into the software interface. All shape files holding relevant data layers were then spatially overlaid to create a combination visual map of point, line and polygon feature classes. Thus the X and Y displayed the geo-referenced locations of each school in the study area.

iii. Analyse the spatial pattern of the schools within the study area.

   For the analysis of the spatial pattern of the Public secondary schools, Spatial autocorrelation based on the Moran's Index (Moran's I) spatial statistics was used to evaluate whether the spatial patterns of the schools are clustered, dispersed or random. Using the ArcGIS 10.1 spatial statistical tool, the Moran's I value, the Z score or P value

was calculated to assess the index. A Moran's I value close to +1.0 indicates clustering, while a value close to -1.0 indicates dispersion.

iv. Analyse the accessibility of the schools within the study area

For the analysis of accessibility of the public secondary schools, buffering which is an ArcGIS spatial analysis tool was used. A buffer of 2km (UNESCO Standard) was constructed from each school, to the nearest built-up areas or settlements. The buffering of the schools gave an estimate of the schools proximity to the nearest built-up areas or settlements. The 2km buffer represents the maximum distance a child should travel to school (maximum walking distances to school) stated by UNESCO standards.

v. Create a geo-database for Public Secondary Schools within the study area

Based on the geographical coordinates and the data derived from the questionnaires administered to all 38 public secondary schools, a geo-database was created using ArcGIS 10.1 software. In the development of the geo database, the data from each school were entered into an attribute table. Tables were created in the ArcCatalog extension of ArcGIS and database file were created. The required number of fields (columns) were be added to the table together with the attributes for all Public Secondary Schools in their corresponding fields (rows). The relational database management system (RDMS) model was used in creating the geo-database. Query operations were performed to extract relevant information about the schools using the Query builder. Structured Query Language (SQL) was used to manipulate the data during the Query operations.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 INTRODUCTION

This chapter dwells on the presentation and analysis of result obtained from the research analysis. The research was carried out under the following sub-themes: identifying and locating of all public secondary schools within the study area; mapping out the spatial distribution of the schools within the study area; analyze the spatial distribution pattern; analyze the spatial accessibility of the schools within the study area; and create a geo-database for available facilities in the public secondary schools within the study area.

4.2 IDENTIFYING AND LOCATING ALL PUBLIC SECONDARY SCHOOLS IN KADUNA EDUCATION ZONE

A total of 38 secondary schools were identified as state owned in the study area. 19 were identified as junior secondary schools, 11 as senior secondary schools and eight had both junior and senior year groups.These schools were meant to serve the 26 localities in the study area. (See Tables 4.1a and 4.1b).

From tables 4.1a and 4.1b, it can be seen that Doka had the highest number of schools with 18.4%, followed by Tudun Wada and Rigasa with 13.5% each. Kawo and Ungwan Sarki with 10.5%. Kabala Costain, Ungwan Rimi, Kurmin Marshi, Ungwan Muazu with 5.5% and finally, Tudun Nupawa, Kabala West, Ungwan Shanu, Malali and Badarawa with 2.6% . It was also observed that 46% of the 26 localities have no school representation. Tables 4.1a and 4.1b also show the distributions of these public secondary schools did not correspond with the population of the secondary school age group projections (15.7%) of the localities.

Table 4.1a: Distributions of Public Secondary Schools and Secondary School Age Group in Kaduna Education Zone

(Kaduna North LGA)

LGAs	Localities	No. of Schools	Names of Public Secondary Schools	Percentage (%)	Secondary School Age Group (Pop.)	Percentage (%)
Kaduna North	Abakpa	0		0	4,195	2.1
	Badarawa	1	GJSS Badarawa	2.6	10,144	5.0
	Doka	7	GGSS Independence.Way(Snr&Jnr),GSS Doka (Snr &Jnr),GGSS Doka (Snr & Jnr),KASSES.	18.4	16,705	8.3
	Hayin Banki 1	0		0	5,124	2.5
	Hayin Banki 2	0		0	10,513	5.2
	Kabala Costain	2	GGSS Kabala Costain (Snr & Jnr).	5.3	4,204	2.1
	Kabala Doki	0		0	7,032	3.5
	Kawo	4	GGSS Kawo, GSS Kawo (Snr & Jnr), Sardawna Memorial College.	10.5	11,498	5.7
	Kotoko Barracks	0		0	1,757	0.9
	Malali	1	Capital School.	2.6	7,027	3.5
	N.D.A. Kawo	0		0	135	0.1
	Ungwan Gwari	0		0	3,341	1.7
	Ungwan Sarki	4	GGSS Ungwan Sarki (Snr & Jnr), GSS Ungwan Sarki (Snr & Jnr).	10.5	2,017	1.0
	Ungwan Garba (Hayin Banki)	0		0	3,496	1.7
	Ungwan Dosa	0		0	6,091	3.0
	Ungwan Rimi	2	GJSS Ungwan Rimi, Rimi College.	5.3	16,335	8.1
	Ungwan Shanu	1	AMM GJSS Ungwan Shanu.	2.6	5,714	2.8
	Ungwan Kanawa	0		0	3,016	1.5

Source: Field Survey (2014).

Table 4.1b: Distributions of Public Secondary Schools and Secondary School Age Group in Kaduna Education Zone (Kaduna South and Igabi LGAs)

LGAs	Localities	No. of Schools	Names of Public Secondary Schools	Percentage (%)	Secondary School Age Group (Pop.)	Percentage (%)
Kaduna South	Ungw an Sanusi	0		0	7,428	3.7
	Badikko	0		0	5,039	2.5
	Kurmin Mashi	2	Govermnet College Kaduna, GSS Kurmin Mashi	5.3	6,205	3.1
	Kabala West/Ungwan Muazu	3	AMNS Kabala West, GGSS Ungwan Muazu (Snr & Jnr).	7.9	11,686	5.8
	Tudun Nupawa	1	GSS Tudun Nupawa.	2.6	12,181	6.0
	Tudun Wada	5	GJSS Richifa Street, GGSS Maimuna Gwarzo (Snr & Jnr),GSS Kargi Road Snr & Jnr.	13.2	18,684	9.2
Igabi	Rigasa	5	GSS Rigasa Main (Snr & Jnr),GJSS Rigasa Central,GSS Rigasa Tankin Ruwa, GSS Kadi.	13.2	22,459	11.1
TOTAL		**38**		**100**	**202,026**	**100**

4.1 a & b

Source: Field Survey (2014).

Localities like Rigasa and Tudun Wada with the highest population (11.1% and 9.2%) have less secondary schools than Doka with 8.3%. Ungwan Rimi (8.1%) with almost the same population as Doka and a population greater than that of Kawo and Ungwan Sarki with 5.7% and 1% representation respectively, has less public secondary schools. This shows that the distribution of public secondary schools in the study area are not equitable.

4.3 MAPPING OF PUBLIC SECONDARY SCHOOLS IN KADUNA EDUCATION ZONE

To achieve the objective of mapping the public secondary schools in the study area, table in Appendix iv and Figures 4.1, 4.2 and 4.3 were produced. The table shows the list of the public secondary schools in the study area. The table also contains the geographical coordinates of the schools and the zonal office of Kaduna education zone. From the table, it can be seen that a total of 38 public secondary schools were in the study area. The spatial distribution of the schools and the zone`s office is also shown in Figures 4.1, 4.2 and 4.3.

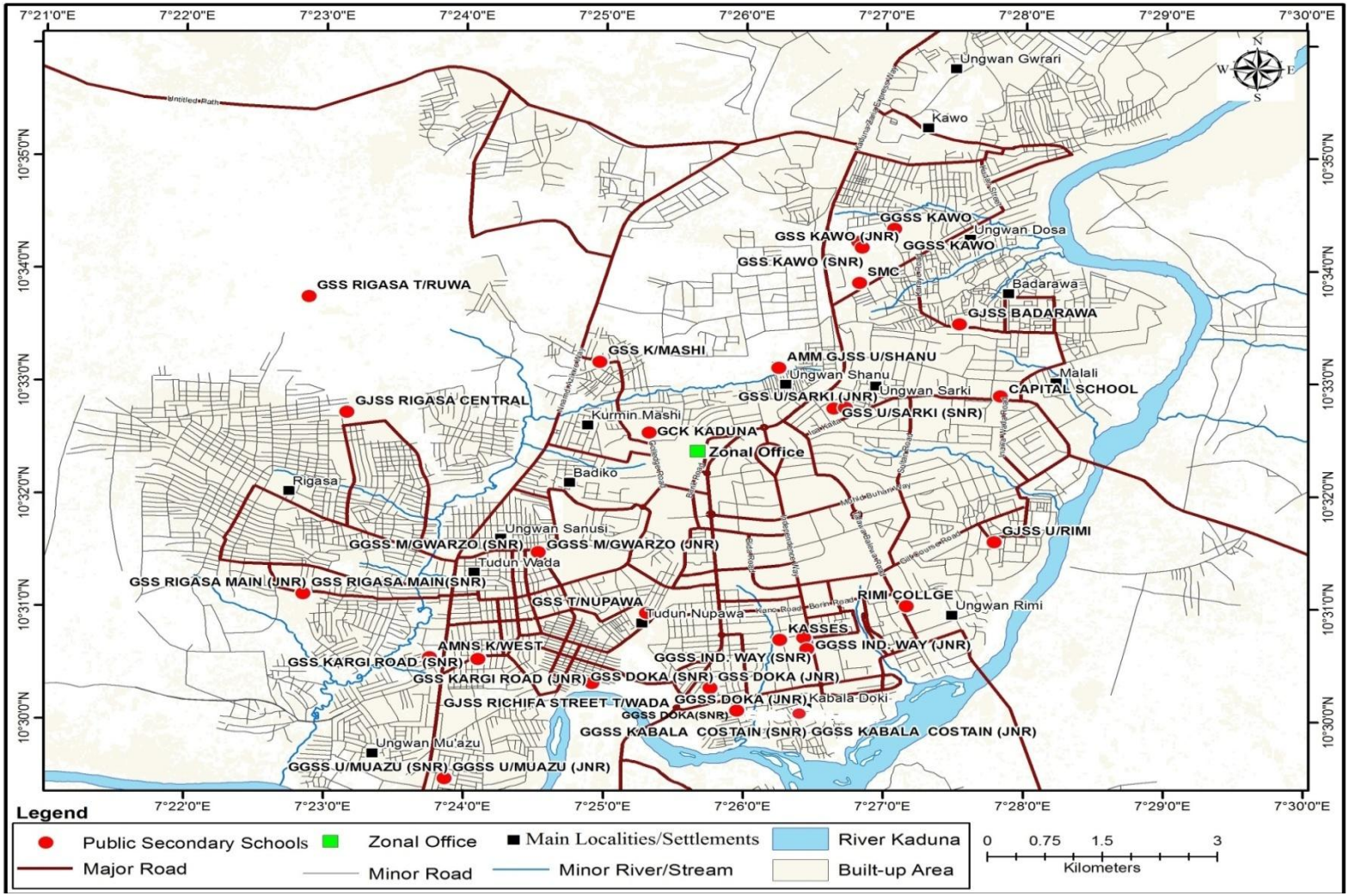

Figure 4.1: Spatial Distribution of all Public Secondary Schools in the Study Area

Source: Author's GIS Analysis, 2014.

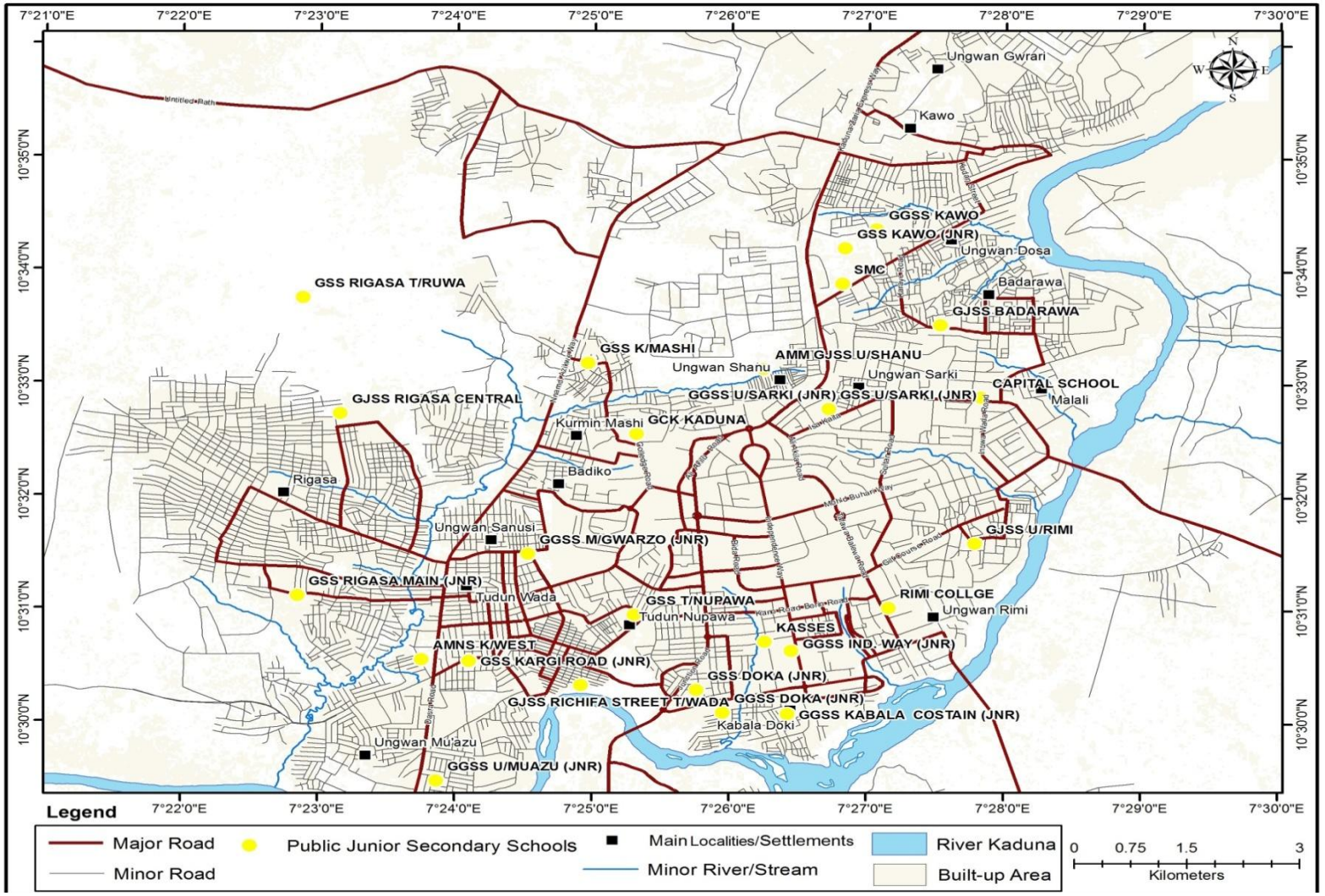

Figure 4.2: Spatial Distribution of Public Junior Secondary Schools in the Study Area.

Source: Author's GIS Analysis, 2014.

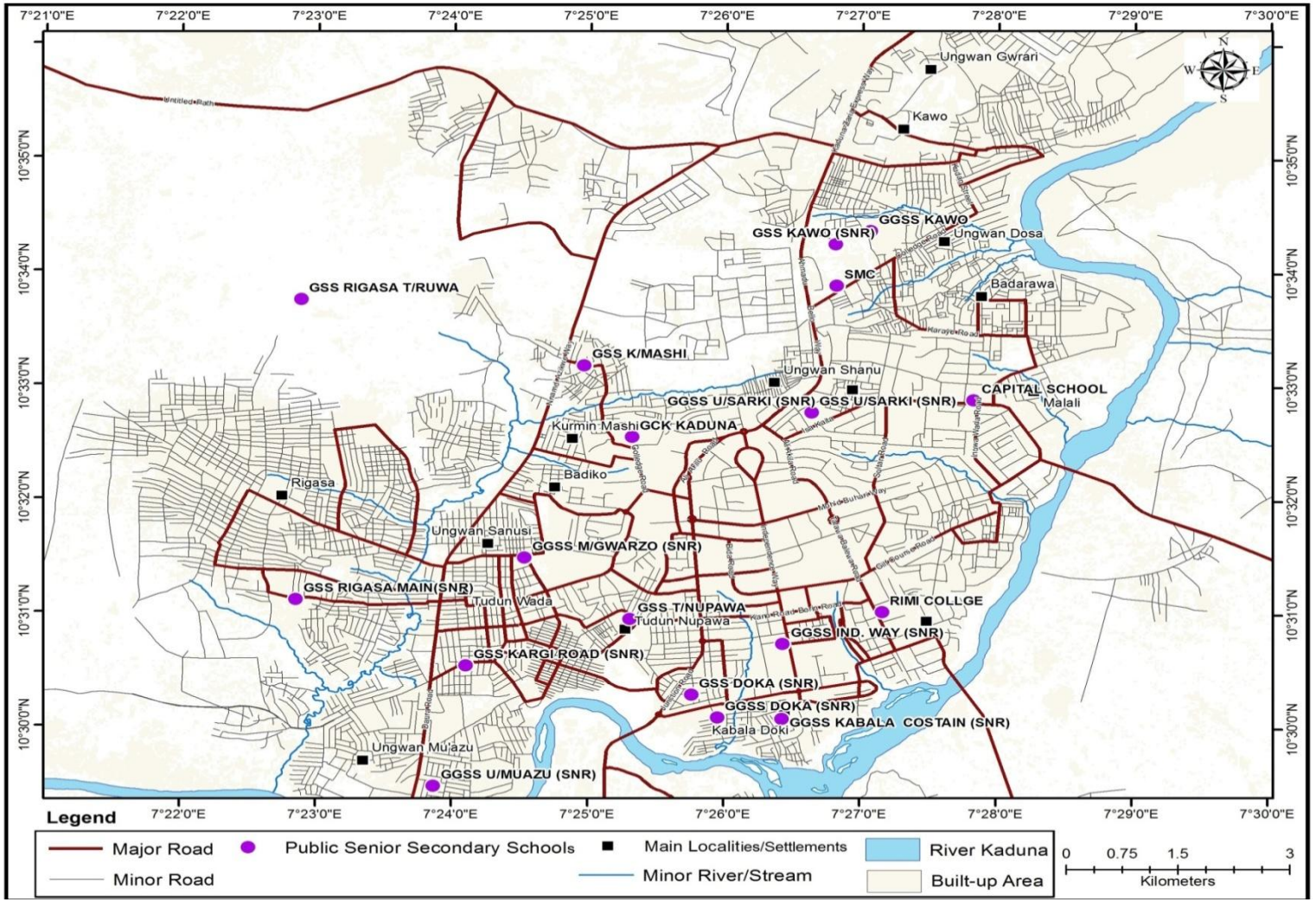

Figure 4.3: Spatial Distribution of Public Senior Secondary Schools in the Study Area.

Source: Author's GIS Analysis, 2014.

4.4 DISTRIBUTION PATTERN OF PUBLIC SECONDARY SCHOOLS IN KADUNA EDUCATION ZONE

In an attempt to understand the distribution pattern of secondary schools in the study area, Spatial Autocorrelation (Moran`s Index) was used.

The result from the report for the junior public secondary schools shows the following values: Moran Index value 1.120686, Z score 1.218490 and P value 0.223038. Given a Z score of 1.22, the pattern does not appear to be significantly different from random.

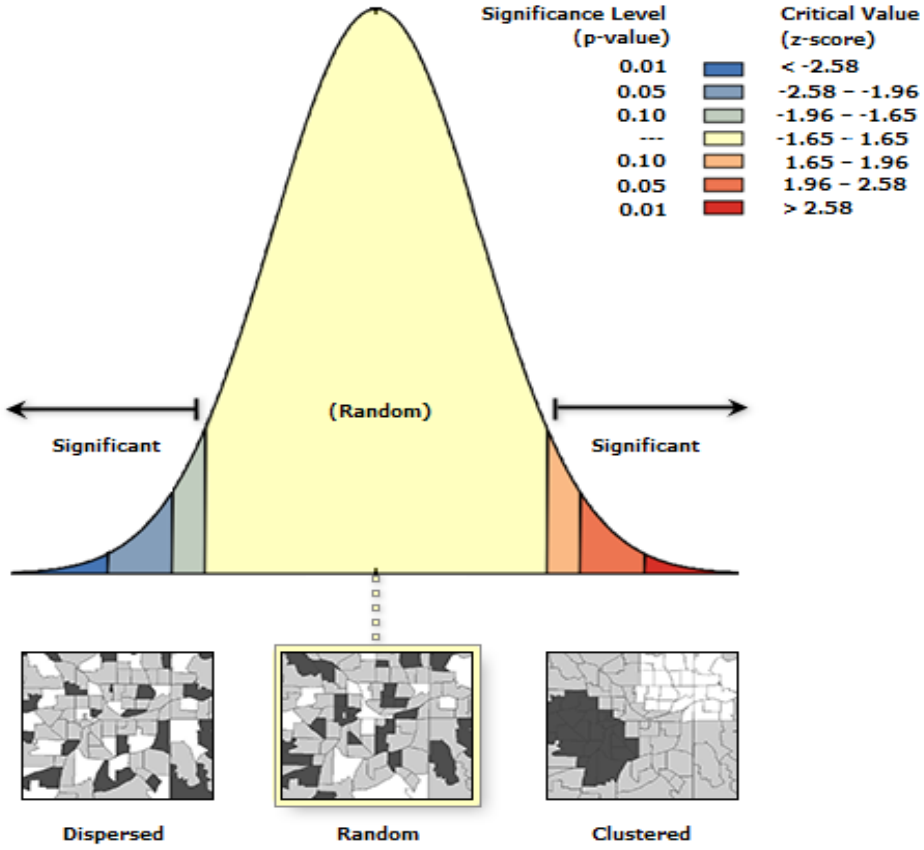

Figure 4.4: Spatial autocorrelation report for junior public secondary schools.
Source: Author's GIS Analysis 2014.

The result from the report for the senior public secondary schools shows the following values: Moran Index value 0.983250, Z score 1.096583 and P value 0.272824. Given a Z score of 1.10, the pattern does not appear to be significantly different from random.

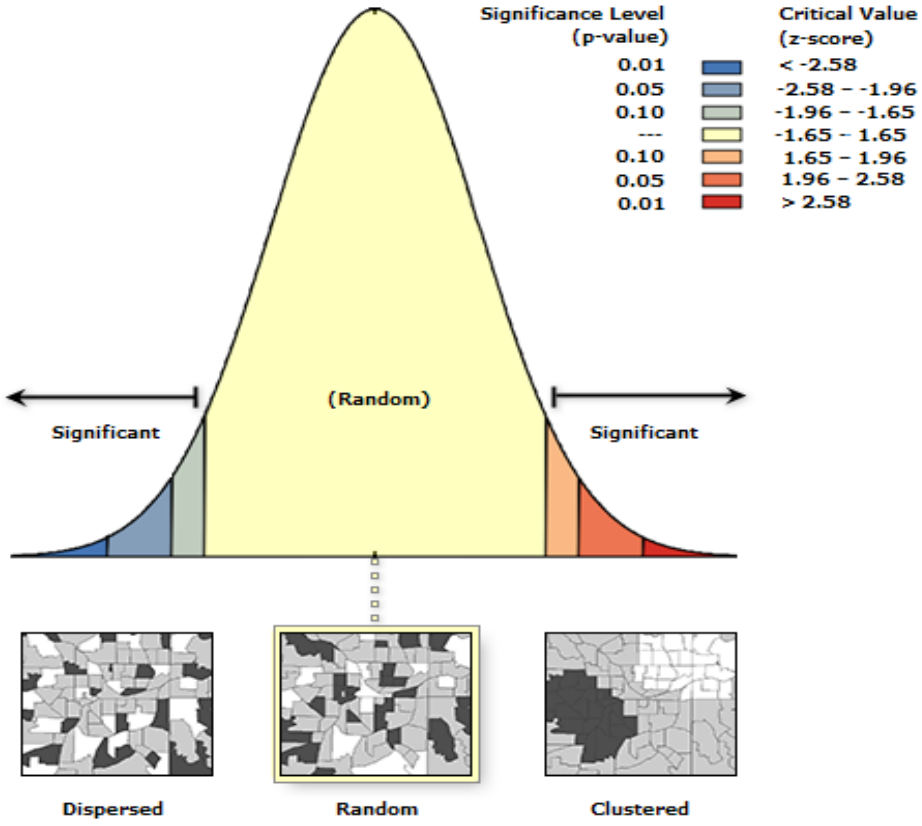

Figure 4.5: Spatial autocorrelation report for senior public secondary schools.
Source: Author's GIS Analysis 2014.

The result from the report for all the public secondary schools within the study area shows a Moran Index Value of 0.800843 which shows positive spatial autocorrelation and this indicates clustering in the distribution of all the public secondary schools in the study area. Most of the secondary schools in the study areas are concentrated in Doka, Kawo, Ungwan Rimi, Ungwan Sarki, Tudun Wada and Rigasa. These are known to be some of the oldest settlements in Kaduna Township and have some of highest population within the township.

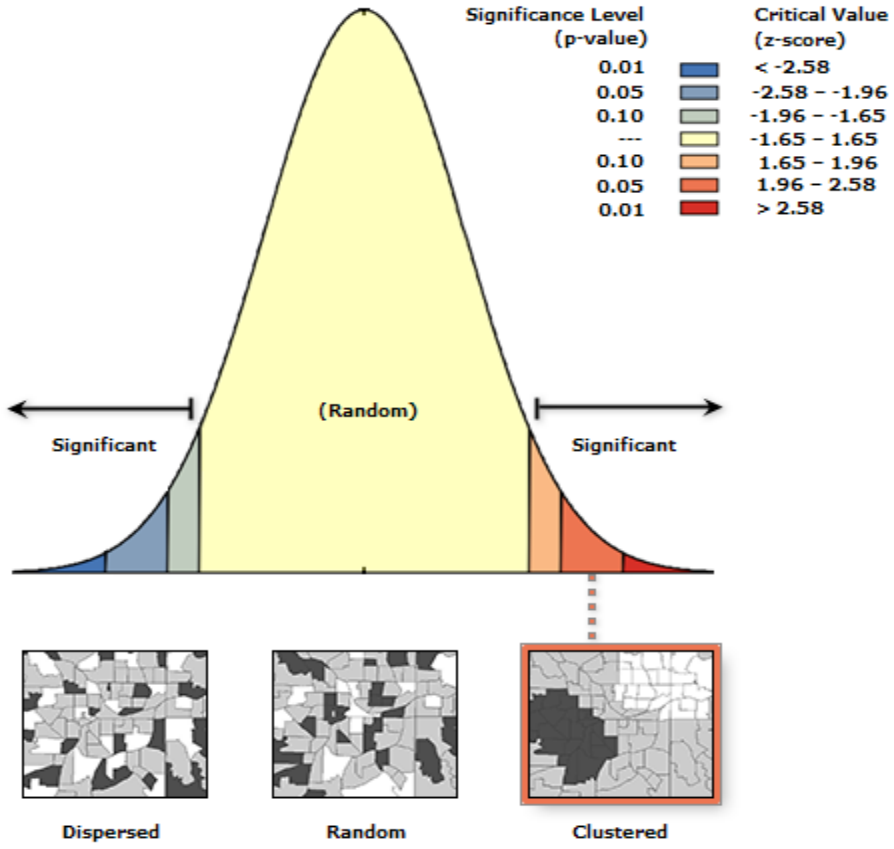

Figure 4.6: Spatial autocorrelation report for all public secondary schools.
Source: Author's GIS Analysis 2014.

Given the Z-score of 2.53, indicates that there is less than 5% likelihood that this clustered pattern could be the result of random chance. Though the pattern was observed to be clustered, the schools were evenly distributed. This shows that the majority of the public secondary schools within the study area are sited in the settlements with the highest population which coincidentally are the oldest settlements in Kaduna Township. And because of this clustering, some of the less populated localities in the study area are disadvantaged in the provision of public secondary education service delivery.

4.5 SPATIAL ACCESSIBILITY OF SCHOOLS TO SETTLEMENTS IN KADUNA EDUCATION ZONE

The analysis of accessibility of schools was based on the UNESCO standard of two kilometres (walking distance to school). A buffer of 2000 metres was created from each school to determine the catchment area of each school and to observe if the schools were accessible to all the built up areas where a majority of the population reside (See Figure 4.7).

It was observed that the buffer of the schools covered most of the built up areas which means all the schools are accessible to a majority of the population of the study area. Only some parts of Rigasa and Ungwan Gwari were disadvantaged because students in these locations would have to travel more than 2km to get to the nearest schools within their locality.

Although the schools are accessible to a majority of the population, most of the schools were not sited based on the UNESCO set standards (two kilometre walking distance from residence). This means some of these schools are not utilized to their maximum capacity while others are over utilized.

In implementing the compulsory free education programme, many States in Nigeria stipulated that schools should be located at not more than one kilometer from the residences of the communities to be served. This was one major reason why schools were opened in almost every hamlet in the country. But today, it does appear that many Nigerian children still travel long distances to and from school (Duze, 2010). No set standards were made with regards to walking distance from residence to the knowledge of the researcher, hence the use of the UNESCO world set standards.

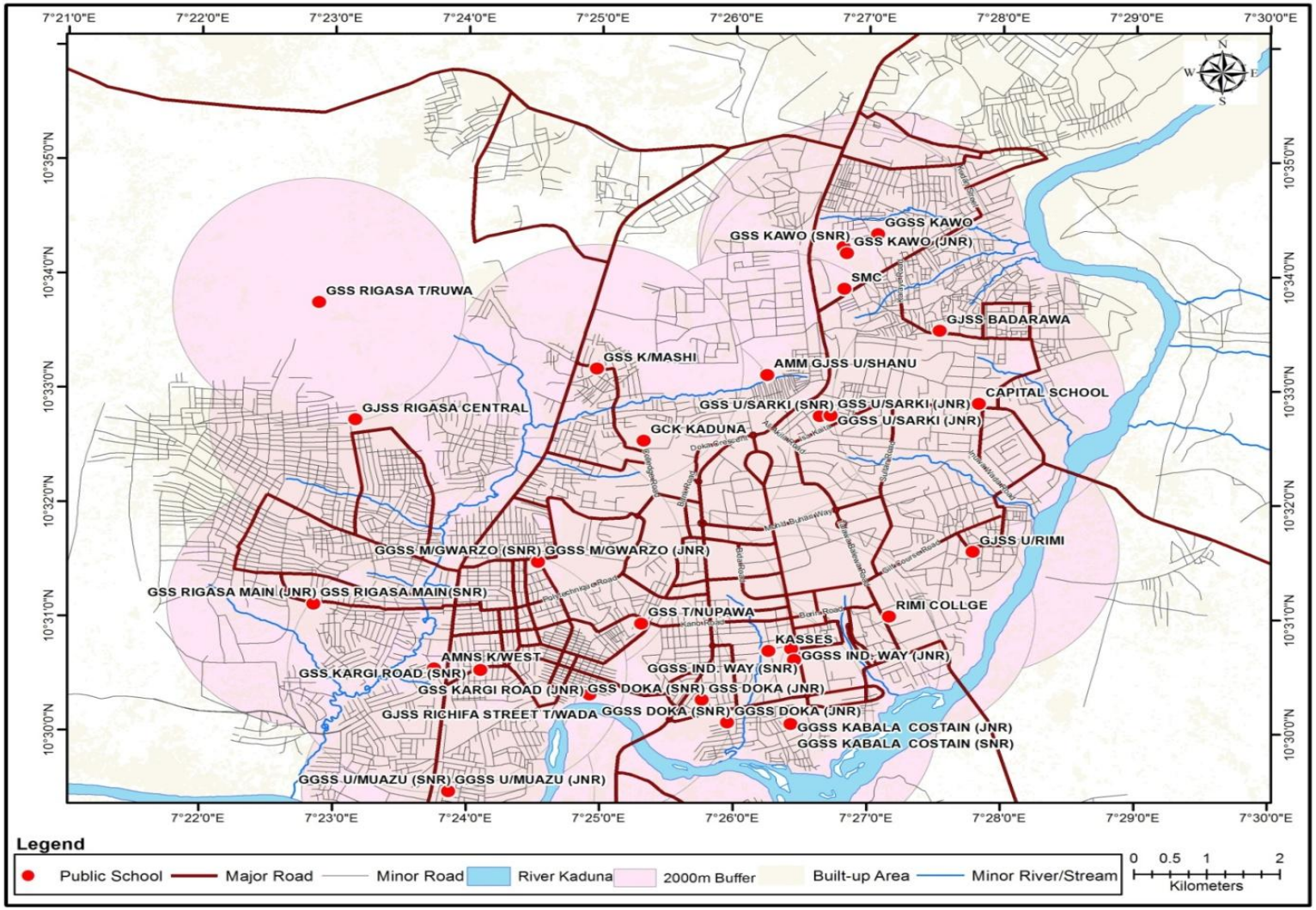

Figure 4.7: Spatial Distribution and Accessibility of the Schools (2000 metres

Source:Author's GIS Analysis, 2014.

4.6 AVAILABLE FACILITIES IN THE SCHOOLS

Three tables were created from the data obtained from the administrated questionnaire (see Tables in appendix v, vi and vii). These tables were used to create the geo database file. Queries of some basic facilities from the database created were done and the resultant results are shown in Figures 4.8 and 4.9.

4.6.1 Schools with Laboratories

Table 4.2 shows 32% (12) of the schools have no laboratories while 68% (26) have laboratories. Figure shows the distribution of laboratories in the public secondary schools. The schools with no laboratories are represented in red. The laboratories in the senior secondary schools include the following: Physics, Chemistry, Biology, Computer, Agricultural science, Food and Nutrition, Home Economics, Fine Art, Technical Drawing and Wood work. These laboratories may vary in some schools because of the subjects being offered in the schools. The junior secondary schools have the following laboratories: Multipurpose, Computer, Basic science, Home economics, Technical and Wood work. (See Tables 4.3(a & b) and 4.4(a &b).

Table 4.2: Laboratories Distribution In the Schools

Laborotaries	No. of Schools	Percentage (%)
Schools with no laboratories	12	32 %
Schools with Laboratories	26	68 %
TOTAL	38	100 %

Source: Author's GIS Analysis, 2015.

Table 4.3a: Distribution of Laboratories in Public Junior Secondary Schools within Kaduna Education Zone (Kaduna North LGA).

LGAs	Names of Public Junior Secondary Schools	Laboratories (Types)
Kaduna North	GJSS Badarawa	Computer
	GGSS Independence Way (Jnr)	Nil
	GSS Doka (Jnr)	Computer
	GGSS Doka (Jnr)	Nil
	KASSES	Nil
	GGSS Kabala Costain (Jnr)	Multipurpose
	GGSS Kawo *	Biology, Chemistry, Physics, Computer and Fine Art
	GSS Kawo (Jnr)	Basic science
	Sardawna Memorial College *	Biology, Chemistry, Physics, Home economics, Agric science, Basic science, Computer, Wood work and Technical drawing
	Capital School *	Biology, Chemistry, Physics, Computer, Integrated science, Wood work and Technical drawing.
	GGSS Ungwan Sarki (Jnr)	Nil
	GSS Ungwan Sarki (Jnr)	Nil
	GJSS Ungwan Rimi	Nil
	Rimi College *	Biology, Chemistry, Physics, Home economics, Basic science
	AMM GJSS Ungwan Shanu	Home economics and Basic science

Source: Field Survey (2014).

Table 4.3b: Distribution of Laboratories in Public Junior Secondary Schools within Kaduna Education Zone (Kaduna South and Igabi LGAs).

LGAs	Names of Public Junior Secondary Schools	Laboratories (Types)
Kaduna South	Government College Kaduna *	Biology, Chemistry, Physics, Home economics, Computer, Food and nutrition, Fine arts
	GSS Kurmin Mashi *	Multipurpose
	AMNS Kabala West	Nil
	GGSS Ungwan Muazu (Jnr).	Multipurpose and Home economics
	GSS Tudun Nupawa *	Science, Home economics and Computer
	GJSS Richifa Street	Nil
	GGSS Maimuna Gwarzo (Jnr)	Technical and Computer
	GSS Kargi Road (Jnr)	Multipurpose ,Computer and Wood work
Igabi	GSS Rigasa Main (Jnr)	Nil
	GJSS Rigasa Central	Nil
	GSS Rigasa Tankin Ruwa *	Chemistry and Physics
	GSS Kadi	Nil

Source: Field Survey (2014).

***Public secondary schools with junior and senior year groups.**

Table 4.4a: Distribution of laboratories in Public Senior Secondary School within Kaduna Education Zone (Kaduna North LGA).

LGAs	Names of Public Senior Secondary Schools	Laboratories (Types)
Kaduna North	GGSS Independence Way (Snr)	Biology, Chemistry, Physics, Home economics and Computer
	GSS Doka (Snr)	Multipurpose and Computer
	GGSS Doka (Snr)	Multipurpose, Home economics and Computer
	GGSS Kabala Costain (Snr)	Biology, Chemistry, Physics, Home economics and Computer
	GGSS Kawo *	Biology, Chemistry, Physics, Computer and Fine Art
	GSS Kawo (Snr)	Biology, Chemistry, Physics and Agric science
	Sardawna Memorial College *	Biology, Chemistry, Physics, Home economics, Agric science, Basic science, Computer, Wood work and Technical drawing
	Capital School *	Biology, Chemistry, Physics, Computer, Integrated science, Wood work and Technical drawing.
	GGSS Ungwan Sarki (Snr)	Biology, Chemistry, Physics, Home economics and Computer
	GSS Ungwan Sarki (Snr)	Multipurpose and Computer
	Rimi College *	Biology, Chemistry, Physics, Home economics, Basic science

Source: Field Survey (2014).

Table 4.4b: Distributions of laboratories in Public Senior Secondary Schools within Kaduna Education Zone (Kaduna South and Igabi LGAs).

LGAs	Names of Public Senior Secondary Schools	Laboratories (Types)
Kaduna South	Govermnet College Kaduna *	Biology, Chemistry, Physics, Home economics, Computer, Food and nutrition, Fine arts
	GSS Kurmin Mashi *	Multipurpose
	GGSS Ungwan Muazu (Snr)	Multipurpose, Home economics, Science and Computer
	GSS Tudun Nupawa.*	Science, Home economics and Computer
	GGSS Maimuna Gwarzo (Snr)	Science, Home economics and Computer
	GSS Kargi Road (Snr)	Nil
Igabi	GSS Rigasa Main (Snr)	Multipurpose. Chemistry and Physics
	GSS Rigasa Tankin Ruwa, *	Chemistry and Physics

Source: Field Survey (2014).

***Public secondary schools with junior and senior year groups.**

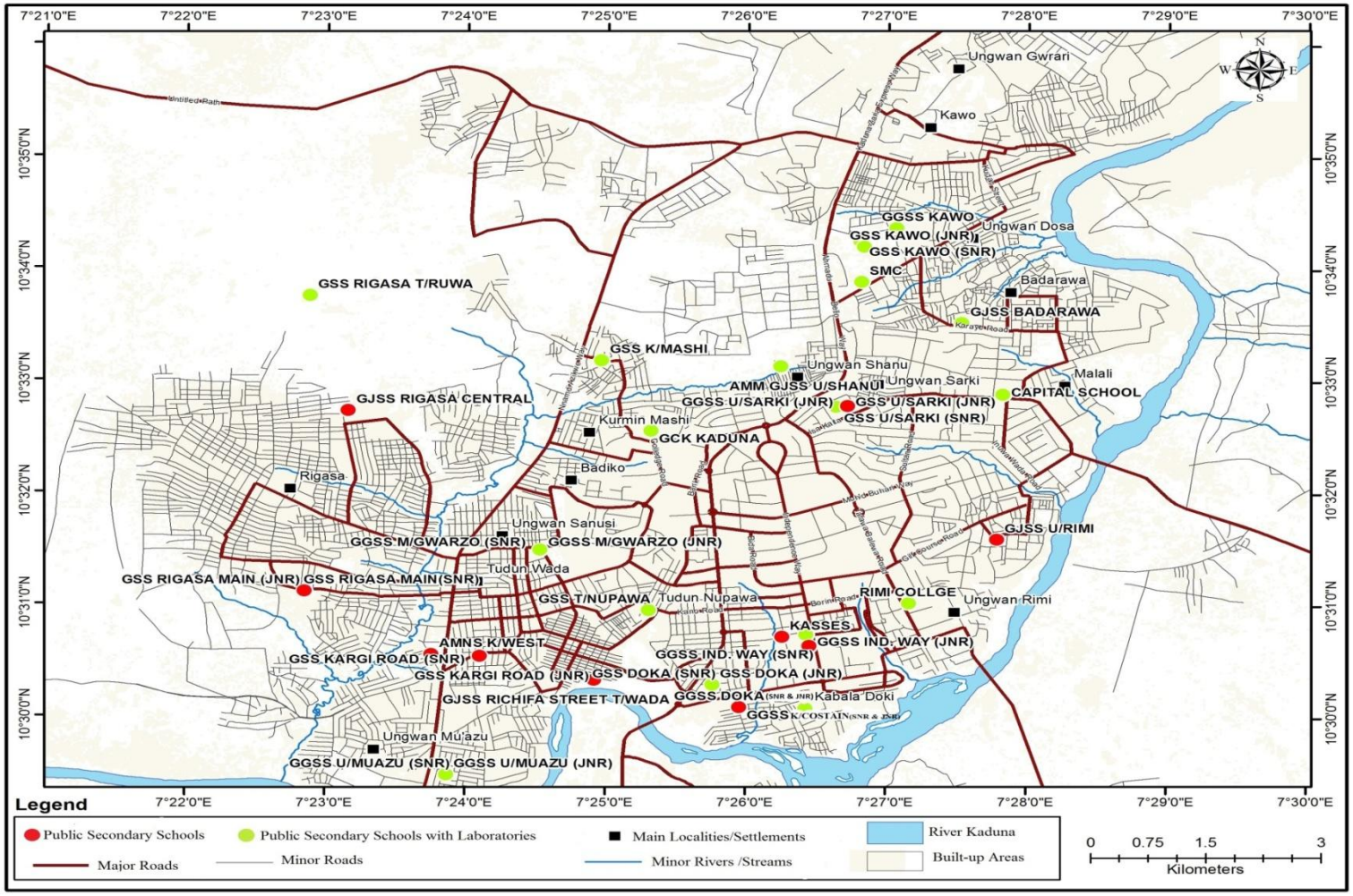

Figure 4.8: Spatial Distribution of Public Secondary Schools with Laboratories

Source: Author's GIS Analysis, 2014.

4.6.2 Schools with Libraries

Table 4.3 shows 42% (16) of the schools have no libraries while 58% (22) have libraries. Figure shows the distribution of libraries in the public secondary schools. The schools with no libraries are represented in red.

Table 4.5: Library Distributin In Schools

Library	No. of schools	Percentage (%)
Schools with Libraries	22	58 %
Schools with no Libraries	16	42 %
Total	38	100 %

Source: Author's GIS Analysis, 2015.

Some of the schools with libraries also have internet services which aid the students with current literature materials not available in the libraries for their research work and assignments, while the schools without libraries make use of the textbooks and teaching aids provided by the schools and teachers. Students are sometimes asked to visit close by internet cafes or libraries for assignments and research work.

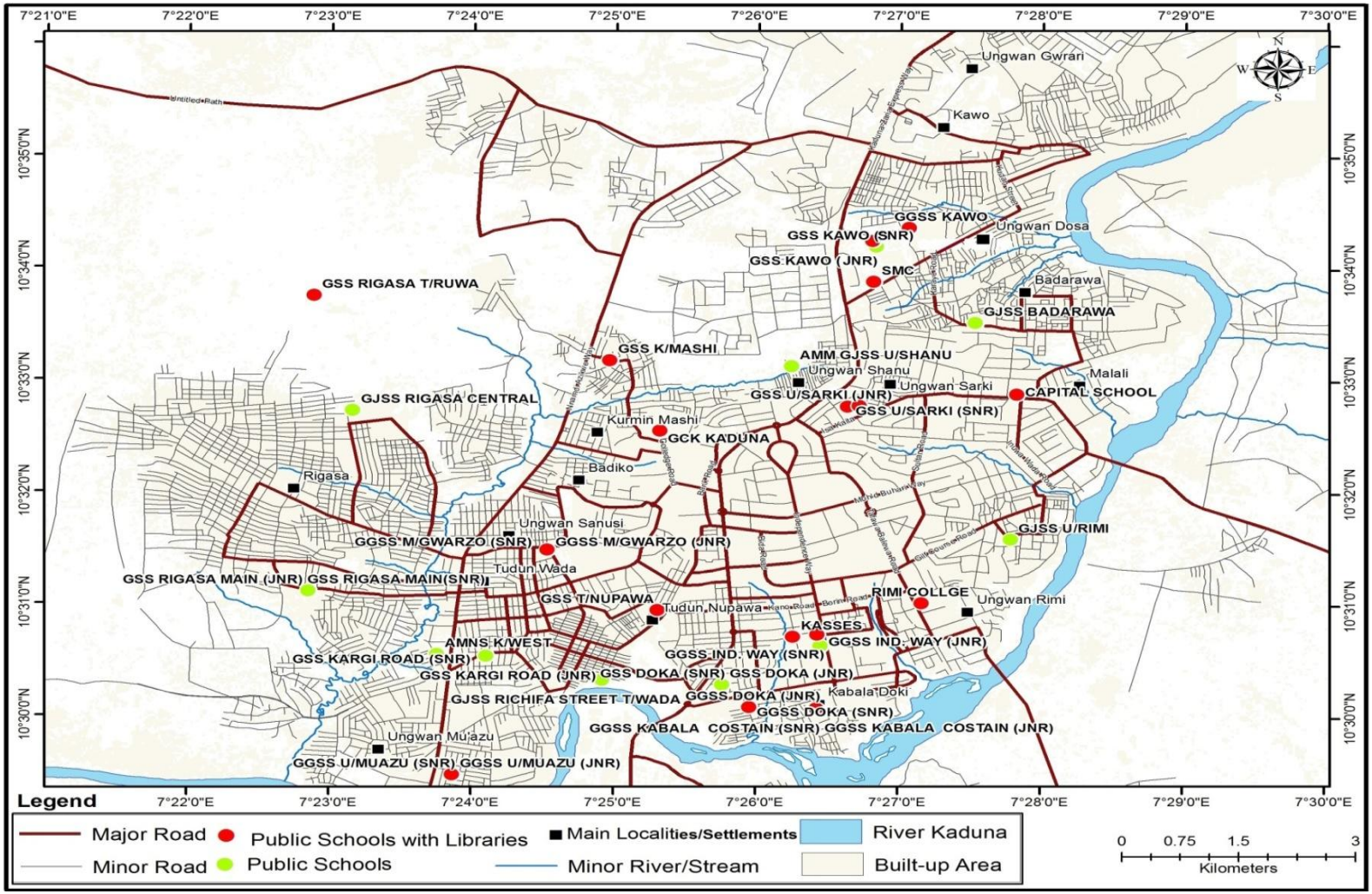

Figure 4.9:Distribution of Public Secondary Schools with Libraries

Source: Author's GIS Analysis, 2014.

4.6.3 Classrooms and Classroom Capacity in Schools

Table 4.6 shows Capital School with the highest number of classes (81) and GJSS Kadi with the lowest number of classes (2).It was also shown, using the classroom capacity of 1 teacher: 30 students (UNESCO standard 2002), with the total population of students in each classroom, that none of the secondary schools in the study area meets this standard. 84% of the public secondary schools in the study area have a classroom population of more than 30 students, while 16% have a classroom population of less than 30 students. Therefore, effort was made to calculate the needed number of classroom as against the observed number of classrooms in each school. The calculation for the needed number of classrooms was done by considering the total population of students in each school. The total population of students was divided by thirty (30) to ascertain the number of classrooms needed.

Formula for Classroom Capacity: Total population/ 30 = Number of classrooms.

From the tables created using the classroom capacity formula, it was observes that 84% (32) of the schools were over populated. 53% (17) of the over populated schools were junior secondary schools, 25% (eight) were senior secondary schools, and 22% (seven) were public secondary schools with both junior and senior year groups (see Tables4.5a,b and c).This indicates that the junior secondary schools or year groups are the most populated of the public secondary schools.

Table 4.6a: Number of Classrooms and Classroom Capacity of Schools in Kaduna North LGA.

S/No	School	Total Enrolment	No. of Classrooms	Classroom Capacity	Excess	No. of Classrooms Needed
1	GGSS Kawo	1,026	30	900	126	**4**
2	GJSS Badarawa	1,382	18	540	840	**28**
3	GSS Kawo (Snr)	460	20	600	-140	**-**
4	GSS Kawo (Jnr)	1,216	20	600	616	**21**
5	SMC	2,046	50	1,500	546	**18**
6	GGSS Ungwan Sarki (Snr)	500	24	750	-250	**-**
7	GGSS Ungwan Sarki (Jnr)	422	11	330	92	**3**
8	GSS Ungwan Sarki (Snr)	400	12	360	40	**1**
9	GSS Ungwan Sarki (Jnr)	389	11	330	59	**2**
10	AMM Gjss Ungwan Shanu	918	12	360	558	**19**
11	KASSES	224	6	180	44	**2**
12	GJSS Ungwan Rimi	982	12	360	622	**21**
13	Rimi College	1238	28	840	398	**13**
14	GGSS Independence Way (Snr)	745	20	600	145	**5**
15	GGSS Independence Way (Jnr)	1186	14	420	766	**26**
16	GGSS Kabala Costain (Snr)	615	18	540	75	**3**
17	GGSS Kabala Costain (Jnr)	838	18	540	298	**10**
18	GSS Doka (Snr)	381	12	360	21	**1**
19	GSS Doka (Jnr)	483	15	450	33	**1**
20	GGSS Doka (Snr)	304	10	300	04	**-**
21	GGSS Doka (Jnr)	460	9	270	190	**6**
22	Capital; School	3,200	81	2,430	770	**26**

Source: Field Survey (2014)

Table 4.6b: Number of Classrooms and Classroom Capacity of Schools in Kaduna South LGA.

S/No	School	Total Enrolment	No. of Classrooms	Classroom Capacity	Excess	No. of Classrooms Needed
1	GCK Kaduna	1,305	60	1,800	-495	-
2	GSS Kurmin Marshi	560	15	450	110	**4**
3	GSS Tudun Nupawa	2,300	24	720	1,580	**53**
4	GJSS Richifa Street T/Wada	125	9	270	-145	-
5	GGSS Maimuna Gwarzo (Snr)	1426	35	1,050	376	**13**
6	GGSS Maimuna Gwarzo (Jnr)	2200	24	720	1,480	**49**
7	GGSS Ungwan Muazu (Snr)	894	22	660	234	**8**
8	GGSS Ungwan Muazu (Jnr)	1159	23	690	469	**16**
9	GSS Kargi Road (Snr)	580	16	480	100	**3**
10	GSS Kargi Road (Jnr)	735	18	540	195	**7**
11	AMNS Kabala West	813	11	330	483	**16**

Source: Field Survey (2014)

Table 4.6c: Number of Classrooms and Classroom Capacity of Schools in Igabi LGA

S/No	School	Total Enrolment	No. of Classrooms	Classroom Capacity	Excess	No. of Classrooms Needed
1	GSS Rigasa Main (Snr)	729	15	450	279	**9**
2	GSS Rigasa Main (Jnr)	790	15	450	340	**11**
3	GJSS Rigasa Central	380	9	270	110	**4**
4	GSS Rigasa T/Ruwa	710	11	330	380	**13**
5	GJSS Kadi	72	2	60	12	-

Source: Field Survey (2014)

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter presents the summary findings of the research and make recommendations.This research work analyzed the location and creation of database for public secondary schools in Kaduna Education zone using GIS techniques and showed how these techniques can be used for effective management of educational service delivery in the zone.

5.2 SUMMARY OF FINDINGS

The research illustrated the effectiveness of Geographic Information System (GIS) in analyzing the location and the creation of a geo database for public secondary schools in Kaduna Education Zone. GIS is one of the information technologies that have evolved to allow people to solve many geographic problems quickly, effectively and easily with the abilities to make analysis, especially location analysis in combination with traditional database systems. The findings of this research revealed the following:

a. Kaduna Education Zone consists of 38 public secondary schools. And these schools are meant to provide the 26 localities within the zone with secondary school education.

b. The study revealed that distribution of these schools was not equitable. The populations of the localities were not always considered before the schools were sited at their current location.

c. It was noticed that 46% of the localities had no schools. For the 56% that had schools, the numbers of schools in some localities were not adequate for the population. Rigasa and Tudun Wada with the highest population (11.1% and 9.2%) have 5 public secondary schools each. Doka with 8.3% has 7 public secondary

schools**.** Ungwan Rimi 8.1% with almost the same population as Doka and a population greater than that of Kawo (4) and Ungwan Sarki (4) with 5.7% and 1% representation respectively, has less public secondary schools (2).

d. It was observed that the public secondary schools are clustered. Most of the secondary schools are concentrated in Doka, Kawo, Ungwan Sarki, Tudun Wada and Rigasa.

e. It was also observed that all the schools lacked or have inadequate basic facilities. For instance, it was observed that 42% (16) of the schools do not have libraries, and 32% (12) do not have laboratories. Other facilities such as classrooms are inadequate because of the student population. 84% (32) of the public secondary schools in the study area are over populated.

f. Finally, it was observed from the 15.7% (202,026) of the projected population of 2014 (secondary school age group), only 21,700 of 87,503 of the junior age group and 12,493 of 114,524 of the senior age group were registered students during the 2013/14 school session within Kaduna Education zone. This shows that only 17% of the secondary school age group were registered students in public secondary schools.

5.3 CONCLUSIONS

This research analyzed the location and the creation of a Geo-database for all public secondary schools in Kaduna Education Zone. It was revealed that despite the provision of 38 public secondary schools by the State Government in the study area, there is still the case of in equitability in the spatial distribution of these schools.

This research was also able to demonstrate the dynamic capabilities of GIS application in location (spatial distribution), accessibility and database analysis. This will help educational authorities and ministries of Education to visualize the location of state owned (public) schools on base maps and consider the nature of accessibility (selection of school sites) and placement of facilities, students and staff in public secondary schools.

5.4 RECOMMENDATIONS

From the foregoing, the following recommendations are made:

a. The use of GIS in school data handling should be encouraged as it assist in carrying out various analysis which can indicate where facilities are inadequate, lacking or not properly distributed. This makes decision making easier and also enhance the proper distribution of these facilities.

b. There is a need for the expansion of some schools or the creation of new schools to increase the rate of enrolment and absorb the excesses from the over populated schools .The distribution of the schools in the future should be made based mainly on the population of the secondary school age group of the localities.

c. A model for the spatial distribution of some basic school facilities such as libraries, laboratories and classrooms among others should be made. For instance, using the classroom capacity of 1 teacher: 30 students (UNESCO standard 2002), with the total population of students in each classroom to get the number of classrooms needed in each school. This will give the actual number of classes needed in these schools.

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APPENDIX I

MSC/SCIE/0850/2010 – 2011

Department of Geography,
Faculty of Science,
Ahmadu, Bello, University,
Samaru, Zaria.

Dear Respondent,

QUESTIONNAIRE ON SCHOOL FACILITIES AND UTILIZATION

I am an MSc Student of the Geography department, Ahmadu Bello University, Zaria and currently carrying out a research on Location Analysis for Sustainable Educational Service Delivery in Kaduna Education Zone, Kaduna State. This exercise is purely for academic purposes and all information supplied will be treated with the utmost confidentiality and anonymity. Thank you.

INSTRUCTIONS

I. Please fill the appropriate spaces as provided in each of the items below.

II. Tick the appropriate boxes where applicable.

III. Leave out any questions where answers you are not sure of.

IV. Where spaces provided are too small, please use the additional page attached.

V. Other comments are also welcome on every answer given.

SECTION A: SCHOOL FACILITIES

1) Name of school ……..

2) What year was the school established.....

3) Total number of subjects taught in the school. [ ]. Please list names of subjects

……

……

……

……Do you have electricity in the school? a) Yes [ ], b) No [ ].

4) If yes, what is your source? a) PHCN [ ], b) School Generator [ ].

5) Do you have water supply? a) Yes [ ], b) No [ ].

6) If yes, what is your source? a) Water Board [ ], b) Borehole [ ], c) Well [ ].

7) Does the school have adequate toilet facilities for both staff and students? a) yes [ ], b) No [ ]

8) If yes, please state number allocated to staff [ ] and students [ ]

9) Total number of staff rooms in the school …….

10) Total number of classes in the schools ……

11) How many year groups do you have in the school? a) 3 [ ], b) 6 [ ]

12) How many classes are allocated to each year group/streams.....?

13) Does the school have a library? a) Yes [ ], b) No [ ].

14) Does the school have an e –library? a) Yes [ ], b) No [ ].

15) If yes, please state no. of computers in the e –library ……..?

16) Does the school have laboratories? a) Yes [ ], b) No [ ].

17) If yes, please list names of laboratories .....

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……?

18) Does the school have a games/ sports field? a) Yes [ ], b) No [ ].

If yes, what type of games/ sports do you play? Please list names of games/ sports activities available in the school .....

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SECTION B: STAFF AND STUDENTS DATA

19) Total number of staff in the school ……. Male [ ], Female [ ].

20) Total number of teaching staff in the school …….Male [ ], Female [ ].

21) Total number of students in the school …….. Male [ ], Female [ ].

22) Total number of students in each year group .....

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……

23) Number of students in each class. Please indicate the name of each class (streams)in each year group (e.g. J.S.1-3 or S.S.1-3classes – SC, A1, A2... B1) and no. of students in each class

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Note. Question (26) will aid in finding the average class size of the school.

SECTION C: VIEWS AND RECOMMENDATIONS.

24) Do you think the school is meeting the needs/ demands of the localities within the school`s catchment area? a) Yes [ ], b) No [ ].

25) What are your views on the utilization of the facilities in the school? Are the facilities a) effectively utilized [ ], b) under-utilized [ ], c) over utilized [ ].

If your answer to question (26) is B or C, please state why and recommend ways to solve this problem?

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APPENDIX II

NUMBER OF JUNIOR SECONDARY SCHOOLS BY LGA (2005/2006) IN KADUNA STATE

LGAS	No. of schools			Enrolment		
	Public	Private	Total	Public	Private	Total
Birnin gwari	14	0	14	3325	0	3325
Chikun	19	18	37	10747	1644	12391
Giwa	13	0	13	3375	0	3375
Igabi	23	7	30	10378	639	11017
Ikara	12	0	12	3916	0	3916
Jaba	11	2	13	4724	212	4936
Jemaa	20	5	25	8948	992	9940
Kachia	28	4	32	8295	237	8532
Kaduna North	21	19	40	16258	2596	18854
Kaduna South	9	30	39	7058	4344	11402
Kagarko	17	0	17	6699	0	6699
Kajuru	12	0	12	5692	0	5692
Kaura	12	0	12	5647	0	5647
Kauru	16	0	16	6439	0	6439
Kubau	10	0	10	5313	0	5313
Kudan	5	0	5	3206	0	3206
Lere	23	5	28	12444	669	13113
Makarfi	9	0	9	3261	0	3261
Sabon Gari	15	23	38	12946	2466	15412
Sanga	12	3	15	4570	564	5134
Soba	14	0	14	2891	0	2891
Zangon Kataf	39	3	42	10607	656	11263
Zaria	19	9	28	14413	876	15289
Kaduna State	**373**	**128**	**501**	**171152**	**15895**	**187047**

Source: Nigeria Education Management Information System (NEMIS); key indicators by LGAs and States 2006 - projected

APPENDIX III

NUMBER OF SENIOR SECONDARY SCHOOLS BY LGA (2005/06) IN KADUNA STATE.

LGA	Pop.(15-17)	Public	Private	Total
Birnin Gwari	17255	7	0	7
Chikun	25175	10	16	26
Giwa	19562	6	0	6
Igabi	29428	8	7	15
Ikara	13230	5	0	5
Jaba	10641	10	2	12
Jemaa	19120	14	5	19
Kachia	16709	14	2	16
Kaduna North	24526	14	16	30
Kaduna South	27607	7	28	35
Kagarko	16551	11	0	11
Kajuru	7567	7	0	7
Kaura	15252	9	7	16
Kauru	11621	9	0	9
Kubau	19273	7	0	7
Kudan	9505	3	0	3
Lere	22629	11	2	13
Makarfi	10001	5	0	5
Sabon Gari	19664	12	22	34
Sanga	10214	12	3	15
Soba	20044	7	0	7
Zangon Kataf	21630	29	3	32
Zaria	28015	10	8	18
Kaduna State	**415219**	**228**	**114**	**342**

Source: Schools - Kaduna Public and Private Schools SSS by School 2006

Population – 2006 general census with Core Welfare Indicator Questionnaire (CWIQ) age structure.

APPENDIX IV

PUBLIC SECONDARY SCHOOLS IN KADUNA EDUCATION ZONE AND THEIR COORDINATES

S.No	Schools	Latitude	Longitude
1	GGSS KAWO	**0330534**	**1169162**
2	GJSS BADARAWA	**0331377**	**1167601**
3	GSS KAWO (SNR)	**0330063**	**1168950**
4	GSS KAWO (JNR)	**0330110**	**11688 55**
5	SMC	**0330074**	**1168277**
6	GGSS U/SARKI (SNR)	**0329739**	**1166223**
7	GGSS U/SARKI (JNR)	**0329888**	**1166235**
8	GSS U/SARKI (SNR)	**0329739**	**1166223**
9	GSS U/SARKI (JNR)	**0329888**	**1166235**
10	AMM GJSS U/SHANU	**0329021**	**1166890**
11	KASSES	**0329035**	**1162439**
12	GJSS U/RIMI	**0331828**	**1164034**
13	RIMI COLLGE	**0330682**	**1162989**
14	GGSS IND. WAY (SNR)	**0329349**	**1162474**
15	GGSS IND. WAY (JNR)	**0329389**	**1162292**
16	GGSS KABALA COSTAIN (SNR)	**0329337**	**1161258**
17	GGSS KABALA COSTAIN (JNR)	**0329337**	**1161258**
18	GSS DOKA (SNR)	**0328123**	**1161650**
19	GSS DOKA (JNR)	**0328123**	**1161650**
20	GGSS DOKA (SNR)	**0328472**	**1161281**
21	GGSS DOKA (JNR)	**0328472**	**1161281**
22	GCK KADUNA	**0327331**	**1165829**
23	GSS K/MASHI	**0326692**	**1166991**
24	GSS T/NUPAWA	**0327297**	**1162880**
25	GJSS RICHIFA STREET T/WADA	**0326588**	**1161732**
26	GGSS M/GWARZO (SNR)	**0325887**	**1163875**
27	GGSS M/GWARZO (JNR)	**0325887**	**1163875**
28	GGSS U/MUAZU (SNR)	**0324657**	**1160176**
29	GGSS U/MUAZU (JNR)	**0324657**	**1160176**

30	GSS RIGASA MAIN(SNR)	**0322817**	**1163201**
31	GSS RIGASA MAIN (JNR)	**0322817**	**1163201**
32	GJSS RIGASA CENTRAL	**0323394**	**1166174**
33	GSS RIGASA T/RUWA	**0322897**	**1168064**
34	CAPITAL SCHOOL	**0331912**	**1166420**
35	GSS KARGI ROAD (SNR)	**0325100**	**1162128**
36	GSS KARGI ROAD (JNR)	**0325100**	**1162128**
37	AMNS K/WEST	**0324468**	**1162154**
38*	GJSS KADI		

Source: Field Survey (2014)

*****School coordinates could not be acquired.

APPENDIX V

SCHOOLS` STUDENTS POPULATION (2013/14 SCHOOL SESSION)

S.No	School	Year Group						Total
		JS1	JS2	JS3	SS1	SS2	SS3	
1	GGSS KAWO	161	146	143	219	202	155	**1026**
2	GJSS BADARAWA	410	482	490				**1382**
3	GSS KAWO (SNR)				250	160	50	**460**
4	GSS KAWO (JNR)	600	498	118				**1216**
5	SMC	210	296	330	372	475	363	**2046**
6	GGSS UNGWAN SARKI (SNR)				180	180	140	**500**
7	GGSS UNGWAN SARKI (JNR)	105	150	167				**422**
8	GSS UNGWAN SARKI (SNR)				80	160	160	**400**
9	GSS UNGWAN SARKI (JNR)	120	150	119				**389**
10	AMM GJSS UNGWAN SHANU	304	365	249				**918**
11	KASSES	75	64	85				**224**
12	GJSS UNGWAN RIMI	241	425	316				**982**
13	RIMI COLLEGE	150	220	270	250	225	123	**1238**
14	GGSS INDEPENDENCE WAY (SNR)				152	333	260	**745**
15	GGSS INDEPENDENCE WAY (JNR)	364	416	406				**1186**
16	GGSS KABALA COSTAIN (SNR)				285	205	125	**615**
17	GGSS KABALA COSTAIN (JNR)	258	300	280				**838**
18	GSS DOKA (SNR)				126	154	101	**381**
19	GSS DOKA (JNR)	135	141	207				**483**
20	GGSS DOKA (SNR)				92	129	83	**304**
21	GGSS DOKA (JNR)	147	160	153				**460**
22	GCK KADUNA	262	374	258	168	128	115	**1305**
23	GSS KURMIN MARSHI	92	130	134	90	114		**560**
24	GSS TUDUN NUPAWA	600	600	600	167	167	166	**2300**
25	GJSS RICHIFA SREET T/WADA	60	45	20				**125**
26	GGSS MAIMUNA GWARZO (SNR)				236	640	550	**1426**
27	GGSS MAIMUNA GWARZO (JNR)	800	750	650				**2200**
28	GGSS UNGWAN MUAZU (SNR)				350	282	262	**894**
29	GGSS UNGWAN MUAZU (JNR)	240	480	439				**1159**
30	GSS RIGASA MAIN (SNR)				300	220	209	**729**
31	GSS RIGASA MAIN (JNR)	214	304	272				**790**
32	GJSS RIGASA CENTRAL	110	120	150				**380**

33	GSS RIGASA T/RUWA	200	180	170	90	70		**710**
34	CAPITAL SCHOOL	600	400	400	600	600	600	**3200**
35	GSS KARGI ROAD (SNR)				290	200	90	**580**
36	GSS KARGI ROAD (JNR)	320	203	212				**735**
37	AMNS KABALA WEST	291	319	203				**813**
38*	GJSS KADI	22	23	27				**72**
	TOTAL	**21,700**			**12,493**			**34,193**

Source: Field Survey (2014)

APPENDIX VI

SCHOOLS` ACADEMIC STAFF

S.NO	Schools	Male	Female	Total
1	GGSS KAWO	32	26	**58**
2	GJSS BADARAWA	7	50	**57**
3	GSS KAWO (SNR)	20	16	**36**
4	GSS KAWO (JNR)	16	21	**37**
5	SMC	33	54	**87**
6	GGSS UNGWAN SARKI (SNR)	10	23	**33**
7	GGSS UNGWAN SARKI (JNR)	7	20	**27**
8	GSS UNGWAN SARKI (SNR)	18	8	**26**
9	GSS UNGWAN SARKI (JNR)	15	13	**28**
10	AMM GJSS UNGWAN SHANU	5	14	**19**
11	KASSES	12	8	**20**
12	GJSS UNGWAN RIMI	8	24	**32**
13	RIMI COLLEGE	34	48	**82**
14	GGSS INDEPENDENCE WAY (SNR)	14	34	**48**
15	GGSS INDEPENDENCE WAY (JNR)	13	32	**45**
16	GGSS KABALA COSTAIN (SNR)	14	32	**46**
17	GGSS KABALA COSTAIN (JNR)	19	29	**48**
18	GSS DOKA (SNR)	18	21	**39**
19	GSS DOKA (JNR)	19	22	**41**
20	GGSS DOKA (SNR)	15	21	**36**
21	GGSS DOKA (JNR)	3	29	**32**
22	GCK KADUNA	25	53	**78**
23	GSS KURMIN MARSHI	6	18	**24**
24	GSS TUDUN NUPAWA	8	24	**32**
25	GJSS RICHIFA STREET T/WADA	3	8	**11**
26	GGSS MAIMUNA GWARZO (SNR)	22	26	**48**
27	GGSS MAIMUNA GWARZO (JNR)	15	25	**40**
28	GGSS UNGWAN MUAZU (SNR)	23	25	**48**
29	GGSS UNGWAN MUAZU (JNR)	14	20	**34**
30	GSS RIGASA MAIN (SNR)	13	9	**22**
31	GSS RIGASA MAIN (JNR)	6	16	**22**
32	GJSS RIGASA CENTRAL	4	5	**9**
33	GSS RIGASA T/RUWA	16	3	**19**
34	CAPITAL SCHOOL	49	40	**89**

35	GSS KARGI ROAD (SNR)	9	20	**29**
36	GSS KARGI ROAD (JNR)	15	16	**31**
37	AMNS KABALA WEST	6	8	**14**
38	GJSS KADI	3	1	**4**
	TOTAL	**569**	**862**	**1431**

Source: Field Survey (2014)

APPENDIX VII

SCHOOLS` FACILITIES (SECTION A)

S.No	Schools	Year established	Electricity (source)	Water (source)	Toilets	Staff rooms
1	GGSS KAWO	1960	YES(PHCN,GENERATOR	YES(WATER BOARD,BOREHOLE,WELL)	35	2
2	GJSS BADARAWA	2003	YES(PHCN,GENERATOR	YES(WATER BOARD, BOREHOLE)	7	3
3	GSS KAWO (SNR)	1949	YES(PHCN,GENERATOR	YES(WATERBOARD,BOREHOLE)	9	3
4	GSS KAWO (JNR)	2000	YES(PHCN,GENERATOR	YES(BOREHOLE)	6	1
5	SMC	1967	YES(PHCN,GENERATOR	YES(WATER BOARD,BOREHOLE)	14	4
6	GGSS U/SARKI (SNR)	2008	YES(PHCN)	YES(BOREHOLE)	8	2
7	GGSS U/SARKI (JNR)	2008	YES(PHCN)	YES(BOREHOLE)	5	1
8	GSS U/SARKI (SNR)	1979	YES(PHCN)	YES(BOREHOLE, WELL)	9	1
9	GSS U/SARKI (JNR)	2008	YES (PHCN)	YES (BOREHOLE)	1	2
10	AMM GJSS U/SHANU	2005	NIL	YES(BOREHOLE,WELL)	2	2
11	KASSES	1979	YES (PHCN)	YES (WATER BOARD)	17	2
12	GJSS U/RIMI	2003	YES(PHCN)	YES(BOREHOLE)	12	1
13	RIMI COLLGE	1949	YES(PHCN)	YES(BOREHOLE)	5	4
14	GGSS IND. WAY (SNR)	1948	YES(PHCN)	YES(WATER BOARD)	2	1
15	GGSS IND. WAY (JNR)	2001	YES(PHCN)	NIL	0	1
16	GGSS KABALA COSTAIN (SNR)	1976	YES(PHCN,GENERATOR	YES(BOREHOLE,WELL)	4	4
17	GGSS KABALA COSTAIN (JNR)	2001	YES(PHCN)	YES(BOREHOLE)	12	3
18	GSS DOKA (SNR)	1999	NIL	NIL	2	2
19	GSS DOKA (JNR)	2008	YES (PHCN)	NIL	0	1
20	GGSS DOKA (SNR)	1991	YES(PHCN,GENERATOR	YES(WATER BOARD,BOREHOLE,WELL)	9	1
21	GGSS DOKA (JNR)	2008	YES(PHCN,GENERATOR	YES(WATERBOARD,BOREHOLE,WELL)	3	1
22	GCK KADUNA	1931	YES(PHCN)	YES(BOREHOLE)	10	1
23	GSS K/MASHI	2003	YES(PHCN)	NIL	6	1
24	GSS T/NUPAWA	2003	YES(PHCN,GENERATOR	YES(WATER BOARD,BOREHOLE,WELL)	12	1

25	GJSS RICHIFA STREET T/WADA	2008	NIL	YES(BOREHOLE)	0	1
26	GGSS M/GWARZO (SNR)	1980	YES(PHCN,GENERATOR	YES(WELL)	11	1
27	GGSS M/GWARZO (JNR)	1980	YES(PHCN)	YES(BOREHOLE)	10	3
28	GGSS U/MUAZU (SNR)	1990	YES(PHCN)	YES(BOREHOLE)	11	1
29	GGSS U/MUAZU (JNR)	2008	YES(PHCN,GENERATOR	YES(WATERBOARD,BOREHOLE,WELL)	15	4
30	GSS RIGASA MAIN(SNR)	1990	NIL	YES (WATER BOARD)	4	1
31	GSS RIGASA MAIN (JNR)	1990	NIL	YES(BOREHOLE)	4	1
32	GJSS RIGASA CENTRAL	2007	NIL	NIL	4	1
33	GSS RIGASA T/RUWA	2006	YES(GENERATOR)	YES(BOREHOLE,WELL)	9	1
34	CAPITAL SCHOOL	1957	YES(PHCN,GENERATOR	YES(WATER BOARD)	6	3
35	GSS KARGI ROAD (SNR)	1991	YES(PHCN)	YES(BOREHOLE)	3	1
36	GSS KARGI ROAD (JNR)	2008	YES(PHCN,GENERATOR	YES(BOREHOLE,WELL)	3	1
37	AMNS K/WEST	2009	NIL	YES(WELL)	0	1
38	GJSS KADI	2009	NIL	NIL	0	1

SCHOOLS' FACILITIES (SECTION B)

S.No	Schools	Classrooms	Library	E-library	Laboratories	Games/sports field
1	GGSS KAWO	30	YES	YES	BIO,CHEM,PHY,AGRIC,COMPUTER,F/ART	YES
2	GJSS BADARAWA	18	NIL	NIL	COMPUTER	YES
3	GSS KAWO (SNR)	20	YES	NIL	BIO,CHEM,PHYSICS,AGRIC	YES
4	GSS KAWO (JNR)	20	NIL	NIL	SCIENCE	YES
5	SMC	50	YES	YES	BIO,CHEM,PHY,H/ECONS,AGRIC,BASIC SCI,COMPUTER,W/WORK/T.D	YES
6	GGSS U/SARKI (SNR)	24	YES	NIL	BIO,CHEM,PHY,H/ECONS,COMPUTER	YES
7	GGSS U/SARKI (JNR)	11	NIL	NIL	NIL	YES
8	GSS U/SARKI (SNR)	12	YES	NIL	MULTI-PURPOSE, COMPUTER	YES
9	GSS U/SARKI (JNR)	11	YES	NIL	NIL	YES
10	AMM GJSS U/SHANU	12	NIL	NIL	H/ECONS, BASIC SCIENCE	YES
11	KASSES	6	YES	NIL	NIL	YES
12	GJSS U/RIMI	12	NIL	NIL	NIL	NIL
13	RIMI COLLGE	28	YES	NIL	BIO,CHEM,PHY,H/ECONS,BASIC SCIENCE	YES
14	GGSS IND. WAY (SNR)	20	YES	NIL	BIO,CHEM,PHY,H/ECONS,COMPUTER	YES
15	GGSS IND. WAY (JNR)	14	NIL	NIL	NIL	NIL
16	GGSS KABALA COSTAIN (SNR)	18	YES	YES	BIO,CHEM,PHY,H/ECONS,COMPUTER	YES
17	GGSS KABALA COSTAIN (JNR)	18	YES	YES	MULTI-PURPOSE	YES
18	GSS DOKA (SNR)	12	NIL	NIL	MULTI- PURPOSE, COMPUTER	YES
19	GSS DOKA (JNR)	15	NIL	NIL	COMPUTER	YES
20	GGSS DOKA (SNR)	10	YES	NIL	MULTI-PURPOSE,H/ECONS,COMPUTER	YES
21	GGSS DOKA (JNR)	9	YES	NIL	NIL	YES
22	GCK KADUNA	60	YES	NIL	BIO,CHEM,PHY,H/ECONS,COMPUTER,FOOD/NUT,FINE ARTS	YES
23	GSS K/MASHI	15	YES	NIL	MULTI-PURPOSE	YES
24	GSS T/NUPAWA	24	YES	NIL	SCIENCE, H/ECONS,COMPUTER	NIL
25	GJSS RICHIFA STREET T/WADA	9	NIL	NIL	NIL	YES
26	GGSS M/GWARZO (SNR)	35	YES	NIL	SCIENCE, H/ECONS,COMPUTER	YES

27	GGSS M/GWARZO (JNR)	24	YES	NIL	TECHNICAL,COMPUTER	YES
28	GGSS U/MUAZU (SNR)	22	YES	YES	MULTI-PURPOSE,H/ECONS,SCI,COMPUTER	YES
29	GGSS U/MUAZU (JNR)	23	YES	NIL	MULTI-PURPOSE,H/ECONS	YES
30	GSS RIGASA MAIN(SNR)	15	NIL	NIL	CHEM,PHYSICS,MULTI-PURPOSE	YES
31	GSS RIGASA MAIN (JNR)	15	NIL	NIL	NIL	
32	GJSS RIGASA CENTRAL	9	NIL	NIL	NIL	YES
33	GSS RIGASA T/RUWA	11	YES	NIL	PHYSICS, CHEMISTRY	YES
34	CAPITAL SCHOOL	81	YES	NIL	BIO,CHEM,PHY,COMPUTER,INT.SCIENCE,W/WORK/T.D	YES
35	GSS KARGI ROAD (SNR)	16	NIL	NIL	NIL	YES
36	GSS KARGI ROAD (JNR)	18	NIL	NIL	MULTI-PURPOSE,COMPUTER,WOOD WORK	
37	AMNS K/WEST	11	NIL	NIL	NIL	NIL
38*	GJSS KADI	2	NIL	NIL	NIL	YES