International Journal of Development and Sustainability
ISSN: 2186-8662 – www.isdsnet.com/ijds
Volume 6 Number 11 (2017): Pages 1721-1742
ISDS Article ID: IJDS17091201

Creating spatial geo-database for public secondary schools facilities in Sabon-Tasha education zone Kaduna state, Nigeria

Hosea Tanko *, Buhari Ayuba, Mugu A. Barnabas

Department of Geography, Ahmadu Bello University, Zaria, Nigeria

Abstract

The aim of this research was achieved through identifying and mapping of public secondary schools in the study area with some basic facilities, analyzing the distribution pattern of the schools, examining the characteristics of facilities in the public secondary schools and finally, creation of GIS database for the schools. The attribute data was obtained through the administration of checklist to the Principals of the schools. An administrative map of the study area was obtained from the Kaduna State Ministry of Lands and Survey to derive the base map through digitizing process. The coordinates of each school were obtained using a hand-held GPS receiver. The map was geo-referenced and digitized, in order to exhibit the real coordinate system in ArcGIS 9.3. Finally, a GIS database was created and the spatial and attribute data were encoded and analysis carried out using Arc GIS 9.3software. 51 public secondary schools were identified in the study area. The number of schools to population of secondary school age group in each locality showed that the schools were grossly inadequate for the population available. The distribution pattern of the schools was found to be clustered. The results showed that 37.3% of schools are located in Chikun LGA while Igabi LGA was revealed to be the most disadvantaged with a proportion of 1.9%. The results also revealed that 74.5% of the schools had no computer while 11.8% had library facilities. Also, only about 14% of the schools had assembly halls and perimeter fence, 78.4% had potable water, 5.6% of the senior secondary schools had biology and physics laboratories while 2.8% had chemistry laboratory. The findings revealed an inequality in the provision of educational facilities placing some LGA's to be educationally disadvantage in the study area.

Keywords: GIS, Mapping; Spatial Distribution; Database

Cite this article as: Tanko, H., Ayuba, B. and Barnabas, M.A. (2017), "Creating spatial geo-database for public secondary schools facilities in Sabon-Tasha education zone Kaduna state, Nigeria", *International Journal of Development and Sustainability*, Vol. 6 No. X, pp. 1721-1742.

* Corresponding author. *E-mail address:* hossygodson@yahoo.com

1. Introduction

Nigeria has three levels of education; primary, secondary and tertiary. Inspectorate units of the states' ministries of education are responsible for monitoring the facilities, information on staff and students' enrolment and quality control. Officials at inspectorate divisions also advise ministries of the cadre and location of schools. Schools within inspectorate units overlap in their location within particular Local Government Areas (Mathew and Thomas 2009).

FRN (2004) posits that the success of education is hinged on proper planning, efficient administration, adequate planning, and effective siting. Within this context, the framework of action adopted at the World Education Forum in Dakar in 2000 to the goal of Education for all (EDA) was reaffirmed by Nigeria (Mark and Varghese, 2011). The progress of education depends on a variety of resources. Prominent among which are qualified teachers', teaching facilities, conducive physical environment and an ideal school location (Abdulkarim, 2004).

Educational facilities were referred to by Adepoju and Fabiyi (2010), and Amnesty International (2012) as the basic structures necessary for learning such as; school buildings, furniture, laboratories, instructional materials, computer facilities, libraries, sport facilities, etc. In many developing countries of Africa, social facilities are unevenly distributed (Emmanuel, 2000). One of the most outstanding educational problems in Nigeria, as in other parts of the developing world, is the inadequate number of schools in various parts of the country especially in the northern part (UNICEF, 2005). The inadequacy and uneven distribution of facilities may be ascribed to poor forecast of facilities needs of schools due to poor planning strategies arising from inadequate and poor statistics (Edun, 2005).

Public service is defined as all activities delivered by the government to fulfill those needs that society requires to go through life (Anwaruddin, 2005). 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). 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. 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).

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. The distribution of

senior secondary schools is far from being equitable among LGAs in the state, as some local government areas have 5 times as many schools as others (Chang and Rwehera, 2008).

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).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). Education occupies a very unique position in the national development program of the nation. It is the bedrock of socio-economic and political advancement. Therefore, the right approach to achieving best results in the Education reform programs is to have a good Educational statistical data base (National Bureau of Statistics (NBS), 2009).

According to Khalid and Hamdy (2013), 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. 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).

A growing number of countries developed as well as developing have decided to transfer crucial planning and management decisions to lower levels of the administration, such as regional or zonal offices. Planners require regular information to monitor the progress made by different regional or zonal offices and if where necessary, to intervene so as to ensure an equitable development of the education system (De Grauwe, 2002). However, providing data does not guarantee its use for decision making in the ministry of education because the relationship between information producers and decision-makers is complex. The ultimate aim of information is to guide and influence the choice of decisions, but many decisions are taken without reference to the available data even on matters of education (De Grauwe, 2002).

Thomson and Hardin, (2000) posited that the quality of planning and decision making process are strongly influenced by the data availability and data completeness. Eighty percent of time and costs occupied in developing GIS is allocated to database acquisition and integration. The central mission of ensuring success for learning centers on education reform initiatives that highlight the need for data in policy, management, and instructional changes.

While school mapping and GIS share the same philosophy of looking at education through geographical spectacles, the area of focus for school mapping is at a micro-level. GIS, however, enable the user to work at any level, from the country as a whole right down to individual schools and then right up again to any chosen level of geographical aggregation. The most important goal of school mapping is to rationalize school resources by using geographical units of analysis. Homogeneous zones are identified, school problems and needs are analyzed in each area, and proposals are made for rationalization and reorganization in each mapping area (John, 1996).

GIS helps in making the presentation of data more attractive than traditional static maps, and through considering geographical (spatial) factors, the analysis becomes “finer” and more precise, increasing the

likelihood that ensuing strategies more pertinent. More flexible assistance can be provided in prospective planning at multiple levels or units of analysis: national, regional, provincial/district, and local level (De Grauwe, 2002).

The availability of the GIS database comprehensive framework and spatial planning as well as non spatial data has become a tool to assist in the planning and decision making (Olubadewo *et al*., 2013). A GIS database created can assist the present government in proper distribution of schools, improve the existing facilities and provide additional facilities for planning and management of educational resources (Abbas, 2012).

The aim of this research is:

- To create spatial database for public secondary school facilities in sabon-tasha Education zone of Kaduna state. This was achieved through the following objectives:
- Identify and map the spatial distribution of public secondary schools in the study area.
- Analyze the distribution pattern of the public secondary schools in the study area.
- Create a spatial database for the facilities in the study area.
- Examine the available facilities in the public secondary schools in the study area.

2. The study area

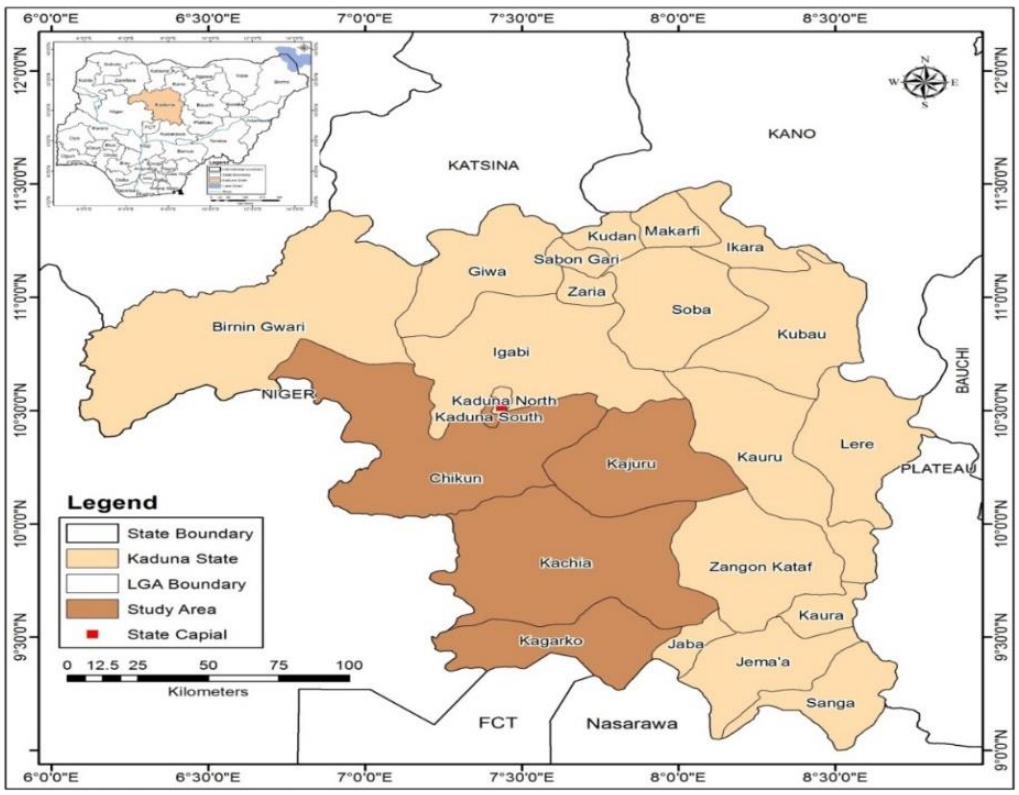


Figure 1. The Study Area (Source: Adapted from Kaduna State Ministry of Lands and Survey, 2016)

The study area is located between latitudes 9º 20" and 10º 40" North of the equator, and longitude 6º 40" and 8º 00" East of the Greenwich Meridian. It is situated in Kaduna State of Nigeria. The state is located in the north-west geo-political zone of the federal republic of Nigeria. It is presently made up of 23 local government areas. The study area extends to Kaduna-South, Chikun, Kajuru, parts of Kachia, Kagarko and Igabi Local Government Areas carved out by the ministry of education as sabon tasha education zone solely for education administration (Figure 1).

3. Materials and method

3.1. Data types and sources

The following data were required for this study:

- Administrative map of the study area: Administrative map of Kaduna State was sourced from the Ministry of Lands and Survey to serve as the base map. The LGA's were digitized to display the location of the public secondary schools.
- Comprehensive data of the public secondary: This was obtained from the Sabon-Tasha Education zone of the Ministry of Education Kaduna State for the year 2016. The data has been recorded for 51 public secondary schools within the zone. Information contained in the data includes; school name, address, number of students in each class, number of class rooms in each school etc. These data was used to develop the database.
- List of facilities in each school in the study area: A checklist was administered to the principals of all the schools in the study area to authenticate the information received from the Education zone. This was useful for various types of analysis.
- Location and Coordinates of each school in the study area: Coordinates of each public secondary school was obtained using the Garmin 76C5X Handheld GPS receiver. This was used to display on the map of the study area the location of the public secondary schools.
- Existing literature from journals, seminar papers, reports, theses, textbooks, conference proceedings and web references formed the Secondary data.

3.2. Techniques of data analysis

A combination of descriptive and overlay analysis was employed in the analysis of the data. The descriptive statistics such as appropriate maps and tables were employed to illustrate the distribution of Public secondary schools in the study area.

To identify and map the spatial distribution of public secondary schools in the study area, the location of each school was gotten with the aid of a Handheld GPS Receiver and the coordinate of each school was captured. The coordinates and other attributes of the schools were copied in Microsoft excel and saved as CSV (comma delimited) format. It was then imported into ArcGIS 9.3 using the add XY command at the tools menu. The

location of each school was used to determine general spatial distribution of schools within the study area. This was done by overlaying the coordinates of the schools on the geo-referenced map of the study area. The process is referred to as a point on polygon overlay. The map overlaid with the schools coordinates forms composite maps showing the distribution of public secondary schools within the study area.

For the analysis of the distribution pattern of the public secondary schools, nearest neighbor was used to evaluate whether the spatial patterns of schools are clustered, dispersed or random. Using the ArcGIS 10.1 spatial statistic tools 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.

A spatial database was created using Microsoft Excel and ArcGIS 9.3 software based on the attribute data derived from the Education zone and the checklist. The database was done by adding required number of fields (columns) to the table and entering the data for each school in their corresponding records (rows). Data attributes collected includes the following; name of schools, Local Government Area were the schools are located, number of male teachers, number of female teachers, total number of teachers, male non-teaching staff, female non-teaching staff, total number of non-teachers, total number of students, number of class rooms in each school, number of functional computers, number of computer teachers, number of student furniture, number of staff furniture, toilets, library, assembly hall, source of drinking water. The table was created in Microsoft Excel and saved as CSV (comma delimited) format which is recognized and accepted by the ArcCatalog extension of ArcGIS. The file was imported into Arc Map environment using the add XY Command at the tools menu for analysis. Update and changes can be effected in any school attribute as well as adding more attributes in the ArcGIS interface by an authorized ArcGIS application user.

The availability of some of the secondary schools facilities were examined using the query builder.

Queries were carried out on the database to assess some of the available facilities in the schools. The queries performed were as follows;

i. Public secondary schools without computer facilities
ii. Public secondary schools with library
iii. Public secondary schools with assembly hall
iv. Public secondary schools with perimeter fence
v. Public secondary schools with biology laboratory
vi. Public secondary schools with chemistry laboratory
vii. Public secondary schools with physics laboratory

4. Results and discussion

The study identified and mapped 51 public secondary schools meant to serve 48 localities in the six local government areas that make up the study area. It also analysed the distribution pattern, collected the coordinates of each Public secondary school and created a spatial database for the Public secondary schools in the study area.

Table 1. Distribution of Public Secondary Schools in Sabon-Tasha Education Zone

S/No	L.G.A	No. of Schools	Percentage (%)
1	Chikun	19	37.3
2	Kachia	6	11.8
3	Igabi	1	1.9
4	Kagarko	4	7.8
5	Kajuru	15	29.4
6	Kaduna-South	6	11.8
Total	**6**	**51**	**100**

Source: Field Survey, (2016)

Table 1 shows the distribution of public secondary schools within the study area. From the table, Chikun local government area has the highest number with a total of 37.3% schools out of the 51 public secondary schools in the study area, the schools are distributed all over the local government area but majority of the schools are located in the urban centers of the local government area. This situation reveals an imbalance in the distribution of public secondary schools within the local government which makes school children walk long distances to attend school. The table also reveals a different situation with Kajuru local government area having 29.4% of the public secondary schools in the study area but were most of the schools are located in villages with difficulty in accessibility. Only few schools are located along the major road linking Kaduna and Kachia LGA which are GJSS/GSS Kasuwan Magani, GJSS/GSS Kufana, GSS Idon, GJSS Afogo, GJSS Iburu, and GSS Tudun Mare. Both Kachia and Kaduna-South local government areas are having 11.8% of the total number of schools while Kagarko and Igabi are having 7.8% and 1.9% respectively.

Figure 2 reveals the pattern of spatial distribution of public secondary schools within the study area. Considering the results in table 1 and figure 2, it shows that the distribution of public secondary schools in the study area is uneven and has placed some places at disadvantage. This result is similar with the outcome of the study carried out by Akpan and Njoku (2013) that identified the spatial location of schools in Ikot Ekpene LGA as uneven and almost randomly distributed such that some wards are essentially educationally deprived. Also, Inobeme and Ayanwole (2009) whose findings shows a great unevenness in the distribution of secondary schools in Zaria area.

From Table 2, it can be seen that Kakuri has the highest number of schools with 5.88%, followed by Barnawa 3.92%. The remaining 46 localities with a school each has 1.96%. Nassarawa has 19.32% of the school age group population making it the second highest after Kakuri with 24.31% and still having one school same as Kutura with 0.06% the lowest population. This shows that the distributions of these Public schools were not made based on the population of the Secondary school age group projections (15.7%) of the localities.

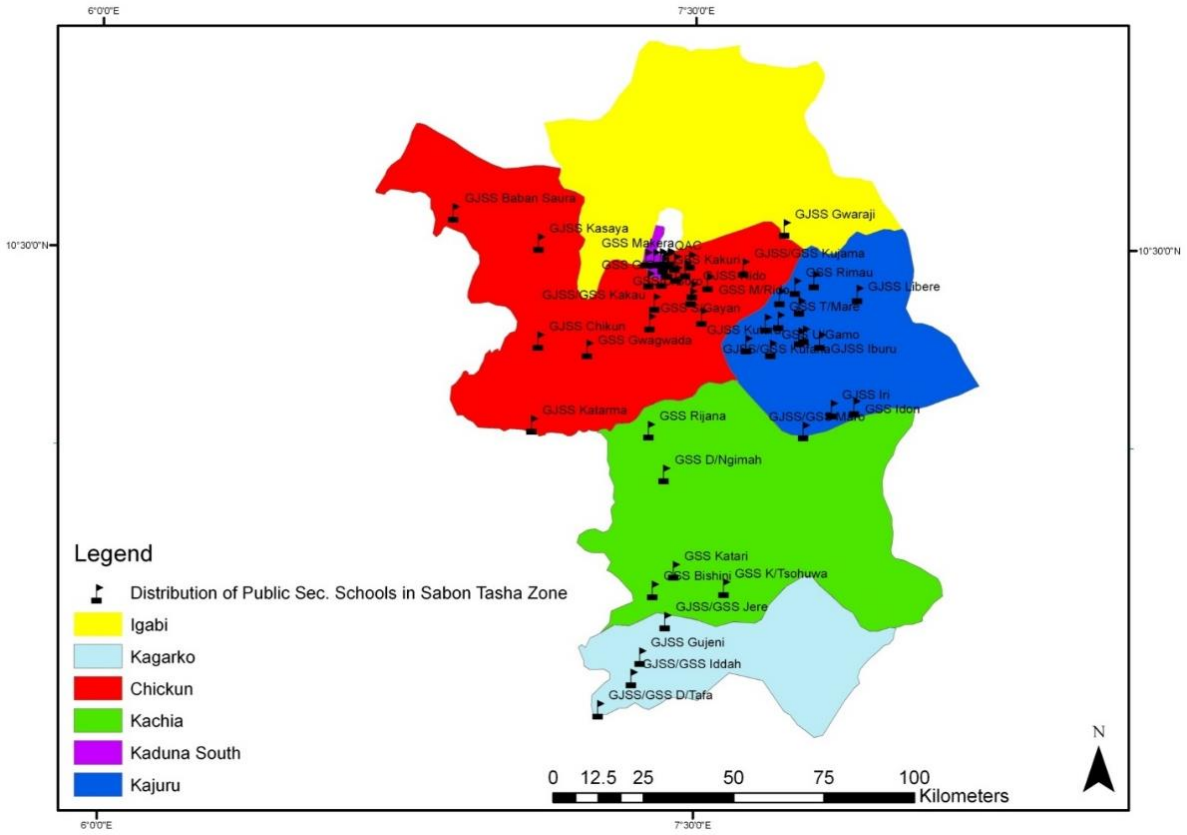


Figure 2. Spatial Distribution of Public Secondary Schools in Sabon-Tasha Zone (Source: Author's Analysis, 2016)

Table 2. Distribution of Secondary School Age Group in Sabon-Tasha Education Zone

LGAs	LOCALITIES	NO. OF SCHOOLS	PER. %	SECONDARY AGE GROUP	PER. %
CHIKUN	BABA SAURA	1	1.96	218	0.22
	CHIKUN	1	1.96	137	0.13
	KAKAU	1	1.96	323	0.32
	KANKOMI	1	1.96	133	0.13
	KASAYA	1	1.96	92	0.09
	KUJAMA	1	1.96	932	0.94
	KIDUNU	1	1.96	152	0.15
	NARAYI	1	1.96	7336	7.44
	NASSARAWA	1	1.96	19056	19.32
	RIDO	1	1.96	469	0.47
	SABON TASHA	1	1.96	8444	8.56
	UNGWAN ROMI	1	1.96	2535	2.57
	BAGADO	1	1.96	116	0.11
	GWAGWADA	1	1.96	299	0.30
	GONIN GORA	1	1.96	1179	1.19
	KUDENDAN	1	1.96	233	0.23
	MARABA RIDO	1	1.96	310	0.31
	SABON GAYAN	1	1.96	376	0.38
	UNGWAN BARO	1	1.96	153	0.15
KACHIA	KATARMA	1	1.96	281	0.28
	RIJANA	1	1.96	1197	1.21

	BISHINI	1	1.96	216	0.21
	DOKA NGIMA	1	1.96	81	0.08
	KATARI	1	1.96	1125	1.14
	KORON TSOHUWA	1	1.96	84	0.08
KAGARKO	DULLA TAFA	1	1.96	74	0.07
	GUJENI	1	1.96	89	0.09
	IDDAH	1	1.96	418	0.42
	JERE	1	1.96	2428	2.46
KAJURU	AFOGO	1	1.96	118	0.11
	GYENGYERE	1	1.96	102	0.10
	IBURU	1	1.96	196	0.19
	KAJURU	1	1.96	655	0.66
	KALLAH	1	1.96	1174	1.19
	K/MAGANI	1	1.96	1563	1.15
	KUFANA	1	1.96	1352	1.37
	KUTURA	1	1.96	67	0.06
	LIBERE	1	1.96	99	0.10
	IDON	1	1.96	204	0.20
	IRI	1	1.96	80	0.08
	MARO	1	1.96	245	0.24
	RIMAU	1	1.96	746	0.75
	TUDUN MARE	1	1.96	87	0.08
	UNGWAN GAMO	1	1.96	236	0.23
KADUNA-	BARNAWA	2	3.92	10127	10.27
SOUTH	KAKURI	3	5.88	23975	24.31
	TELEVISION	1	1.96	8782	8.90
IGABI	GWARAJI	1	1.96	306	0.31
TOTAL		**51**	**100**	**98600**	**100**

Source: Field Survey (2016)

In an attempt to understand the distribution pattern of secondary schools in the study area, average nearest neighbor analysis was used. The result from the report in figure 3 indicates clustering in the distribution of public secondary schools in the study area. Most of the secondary schools in the study area are concentrated in urban parts such as Kakuri and Barnawa. Given the Z-score of -2.33, indicates that there is less than 5% likelihood that this clustered pattern could be the result of random chance. This shows that the siting of schools was not done to meet the demand of the localities in the study area, but for other interests. And because of the clustering, most of the localities in the study area are disadvantaged in the provision of secondary education. This result is similar with the outcome of the study carried out by Olamiju and Olujimi (2011) revealing that most of the remote areas are not serviced with educational facilities.

Using the attributes data collected through the use of a checklist, a GIS Database for the public secondary schools in Sabon-Tasha education zone was created as shown in Appendix A. Queries carried out on the database revealed that there are 542 female and 381 male teaching staff in the study area. 36.8% of these teachers had a National Certificate of Education (NCE) while 47.7% had Bachelor of Education Certificate. The remaining 15.5% had certificates such as Master in Education, Higher National Diploma, Ordinary National Diploma, Senior Secondary School Certificate Examination etc.

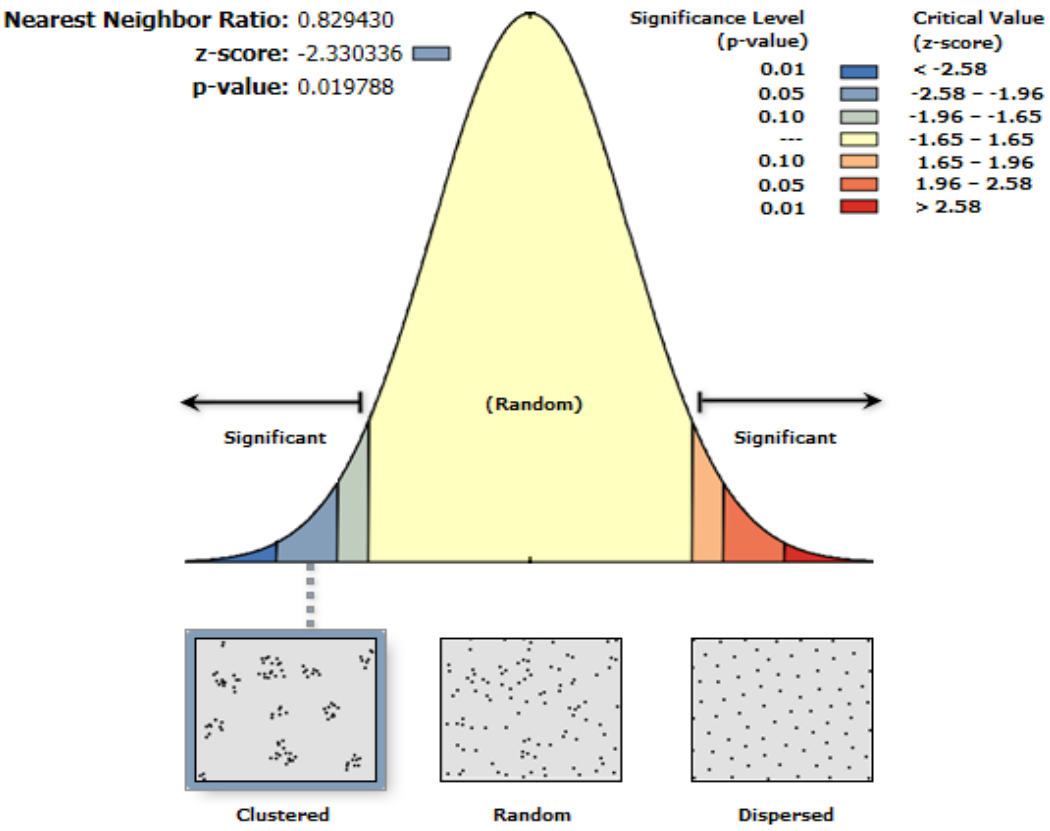


Figure 3. Nearest Neighbor Analysis (Source: Author's Analysis, 2016)

Revealed from the result also are a total of 602 functional classrooms in the study area which accommodates a total of 36962 students out of which 58.7% are females while 41.3% are males. This depicts that on the average, a classroom accommodates about 61 students in the study area. Also, the result reveals that there are approximately 16 furniture in each class which means about 4 students per furniture. This suggest that there is overstretch of facilities in the study area and confirms the result of the research by Abbas, (2012) where he found that majority of the classrooms in Zaria and Sabon-gari LGAs are overcrowded.

Queries of some basic facilities in the various schools were performed on the database such as the followings.

4.1. Public secondary schools without computer facilities in the study area

Table 3 and figure 4 shows the spatial distribution of public secondary schools without computer facilities in the study area. An examination of the Table reveals that 74.5% of the total public secondary schools in the study area had no computer facility. Chikun LGA has the highest number of schools without computer 39.5%, followed by Kajuru LGA with 31.6%. Kaduna-South LGA had 10.5% while both Kachia and Kagarko had 7.9%

respectively. Igabi LGA with only 1 school has no computer facility. This implies that majority of the public secondary schools located in the study area had no computer facilities.

Table 3. Distribution of Public Secondary Schools without Computer Facilities in Sabon-Tasha Education Zone.

S/No	L.G.A	No. of Schools	Percentage (%)
1	Chikun	15	39.5
2	Kachia	3	7.9
3	Igabi	1	2.6
4	Kagarko	3	7.9
5	Kajuru	12	31.6
6	Kaduna-South	4	10.5
Total	**6**	**38**	**100**

Source: Field Survey (2016)

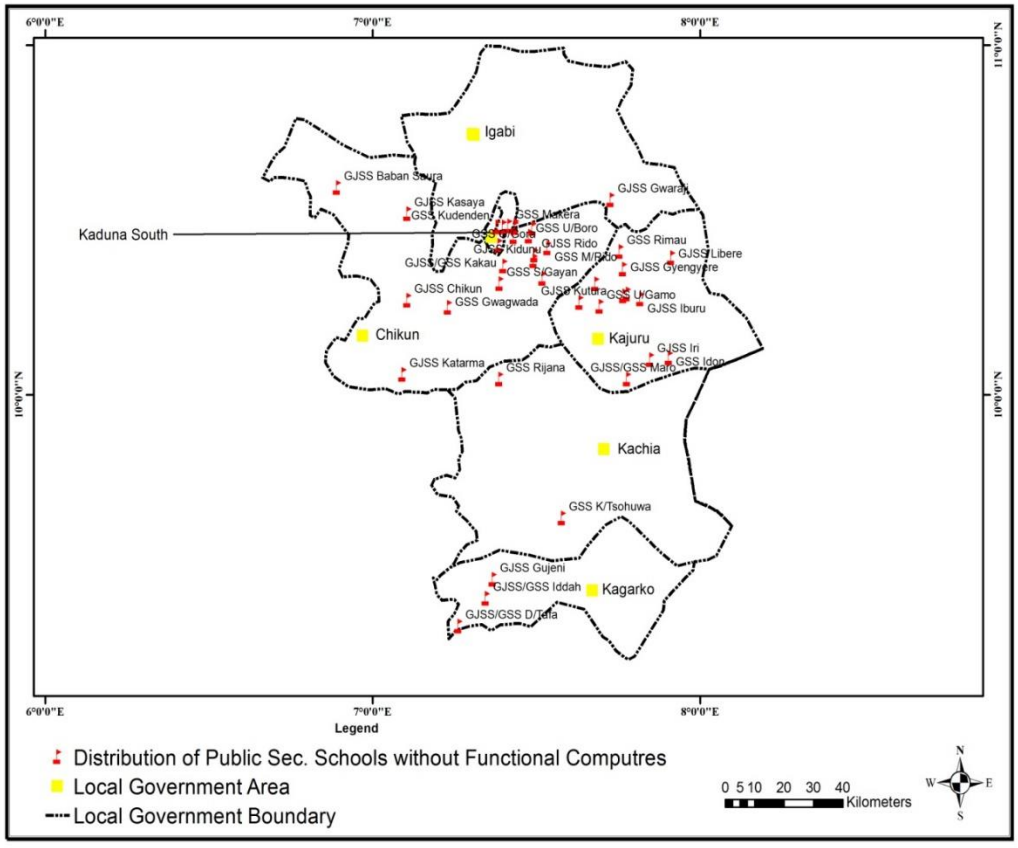


Figure 4. Spatial Distribution of Public Secondary Schools without Computer Facilities. (Source: Author's Analysis, 2016)

4.2. Public secondary schools with library in the study area

Table 4 and figure 5 shows that only 6 schools out of 51 schools had libraries, 4 of the schools comprising 66.7% are located in Chikun LGA while the remaining 2 (33.3%) are located in Kaduna-south LGA. This shows a worrying trend of lack of libraries in public secondary schools within the study area.

Table 4. Distribution of Public Secondary Schools with Library in Sabon-Tasha Education Zone.

S/No	L.G.A	No. of Schools	Percentage (%)
1	Chikun	4	66.7
2	Kachia	0	0.0
3	Igabi	0	0.0
4	Kagarko	0	0.0
5	Kajuru	0	0.0
6	Kaduna-South	2	33.3
Total	**6**	**6**	**100**

Source: Field Survey (2016)

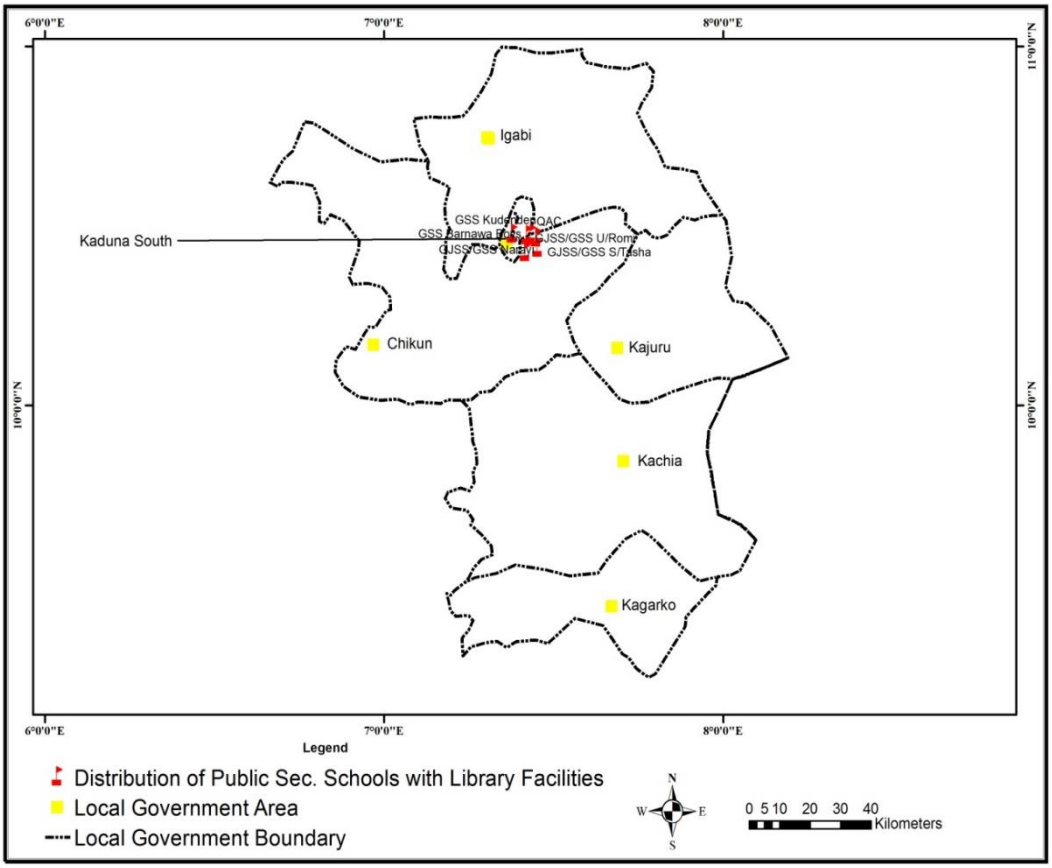


Figure 5. Spatial Distribution of Public Secondary Schools with Library Facilities. (Source: Author's Analysis, 2016)

4.3. Public secondary schools with assembly hall in the study area

Table 5 and figure 6 clearly shows that majority of public secondary schools in the study area did not have assembly halls were only about 14% had assembly hall. 42.8% of the schools with assembly hall are located in Kajuru LGA followed by Kaduna-South LGA with 28.6%. Chikun and Kachia LGAs both had 14.3% while Igabi and Kagarko had 0.0% each.

Table 5. Distribution of Public Secondary Schools with Assembly Hall in Sabon-Tasha Education Zone

S/No	L.G.A	No. of Schools	Percentage (%)
1	Chikun	1	14.3
2	Kachia	1	14.3
3	Igabi	0	0.0
4	Kagarko	0	0.0
5	Kajuru	3	42.8
6	Kaduna-South	2	28.6
Total		**7**	**100**

Source: Field Survey (2016)

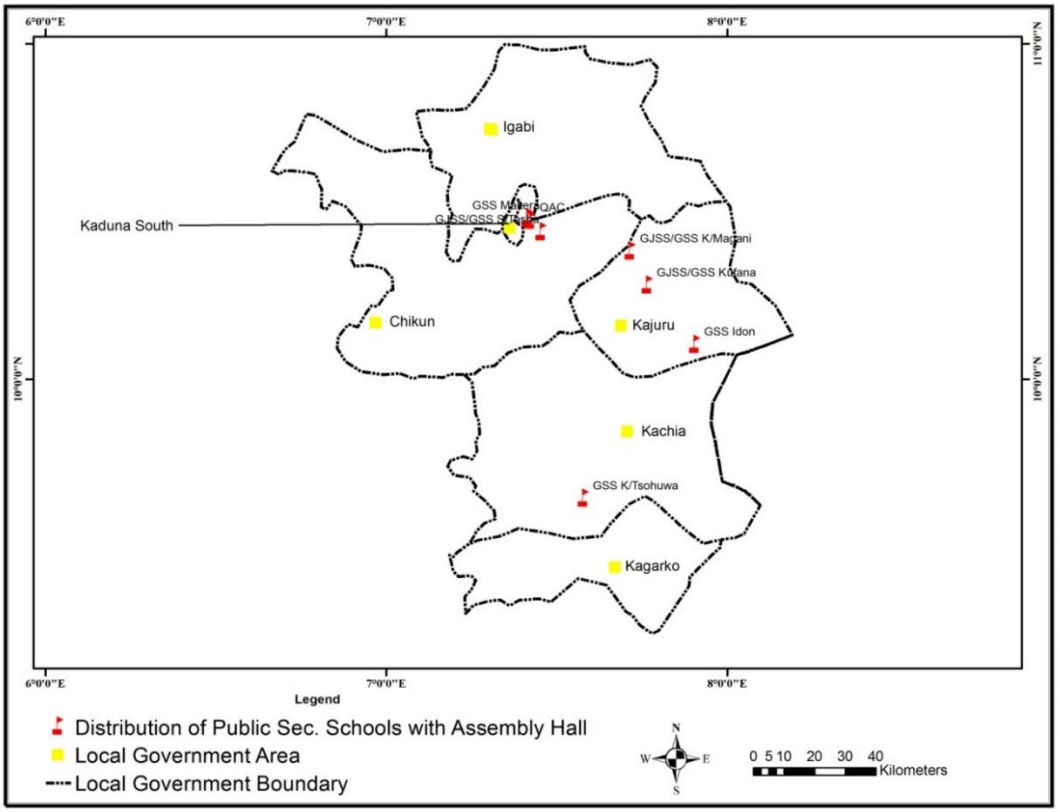


Figure 6. Spatial Distribution of Public Secondary Schools with Assembly Hall (Source: Author's Analysis, 2016)

4.4. Public secondary schools with perimeter fence in the study area

Table 6 and figure 7 clearly shows us that out of the 51 schools in the study area, only about 14% had perimeter fence. 57.1% of the total number of schools with fence comprising of 4 schools are located in Kaduna-South LGA while 42.9% comprises of 3 schools in Chikun LGA. These schools are all located in urban centers as seen in figure 7 thereby signifying the lack of security to facilities and students in public secondary schools in the study area.

Table 6. Distribution of Public Secondary Schools with Perimeter Fence in Sabon -Tasha Education Zone

S/No	L.G.A	No. of Schools	Percentage (%)
1	Chikun	3	42.9
2	Kachia	0	0.0
3	Igabi	0	0.0
4	Kagarko	0	0.0
5	Kajuru	0	0.0
6	Kaduna-South	4	57.1
Total		**7**	**100**

Source: Field Survey (2016)

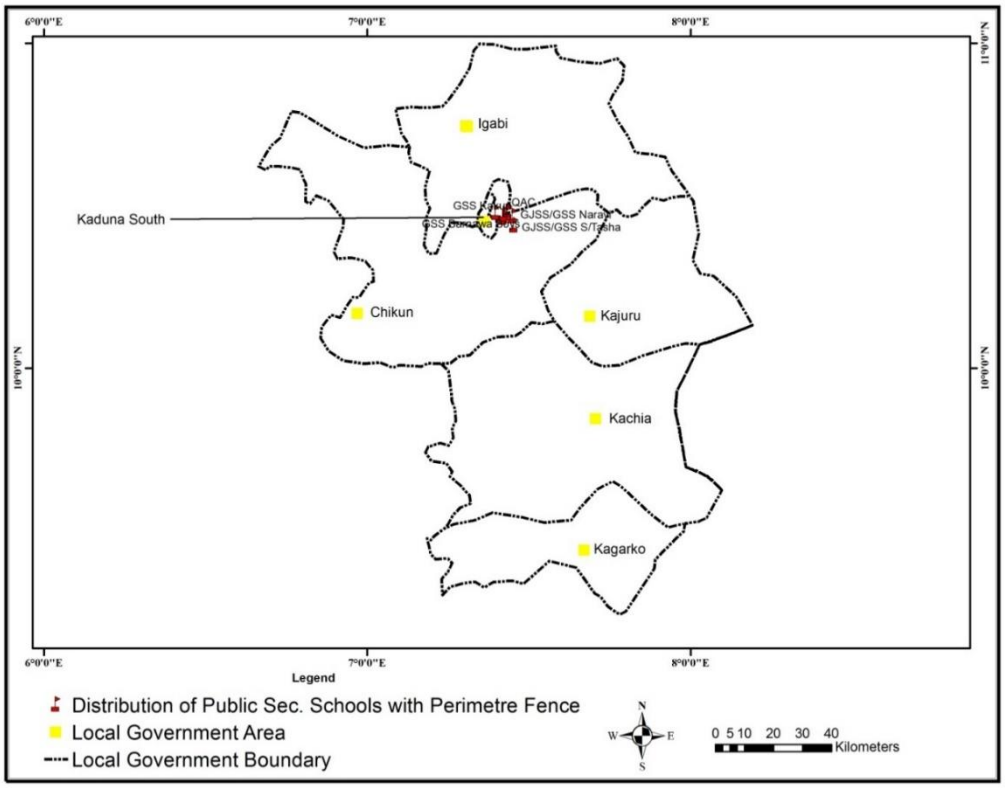


Figure 7: Spatial Distribution of Public Secondary Schools with Perimeter Fence (Source: Author's Analysis, 2016)

4.5. Public secondary schools with biology laboratory in the study area

Laboratories are among the most important facilities in secondary schools. Out of the 51 public secondary schools in the study area, 36 schools are both senior and junior secondary schools while 15 are purely junior secondary schools. Table 7 reveals only 5.6% comprising of two schools out of the 36 senior secondary schools had Biology laboratories. Figure 8 shows the distribution of Biology laboratories in the study area.

Table 7. Distribution of Public Secondary Schools with Biology Laboratory in Sabon-Tasha Education Zone

S/No	L.G.A	No. of Schools	Percentage (%)
1	Chikun	0	0.0
2	Kachia	0	0.0
3	Igabi	0	0.0
4	Kagarko	0	0.0
5	Kajuru	1	50.0
6	Kaduna-South	1	50.0
Total		**2**	**100**

Source: Field Survey (2016)

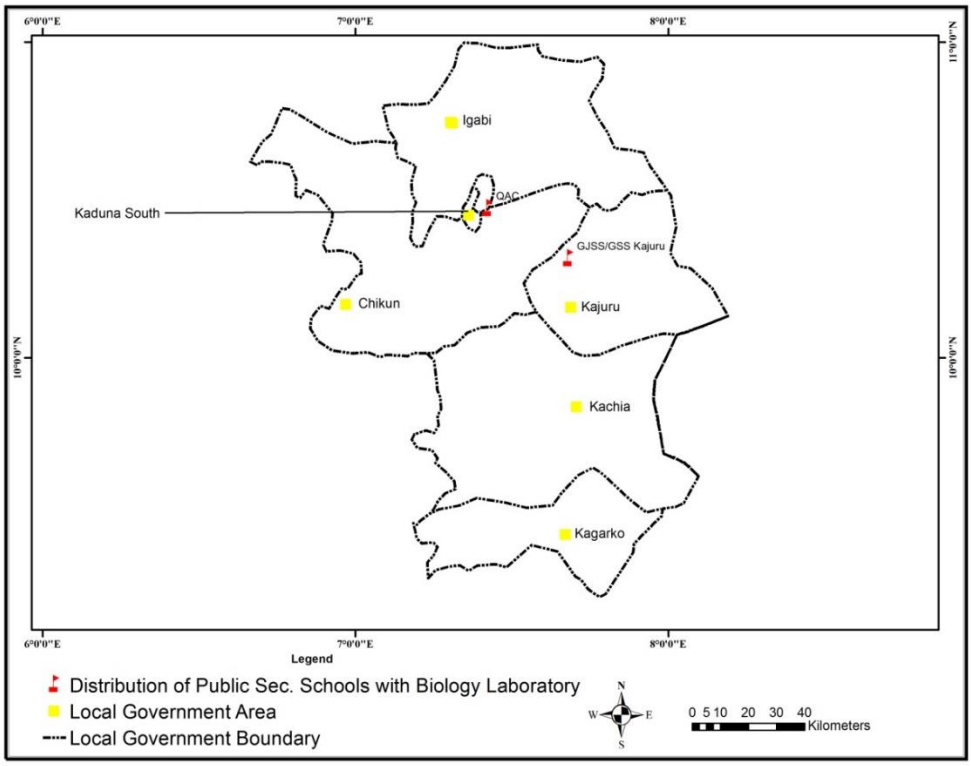


Figure 8. Spatial Distribution of Public Secondary Schools with Biology Laboratory (Source: Author's Analysis, 2016)

4.6. Public secondary schools with chemistry laboratory in the study area

Table 8 reveals that only 2.8% comprising of one school had chemistry laboratory. This situation is worrying and shows how laboratory facilities are poorly available in the study area. . Figure 9 shows the distribution of Chemistry laboratories in the study area.

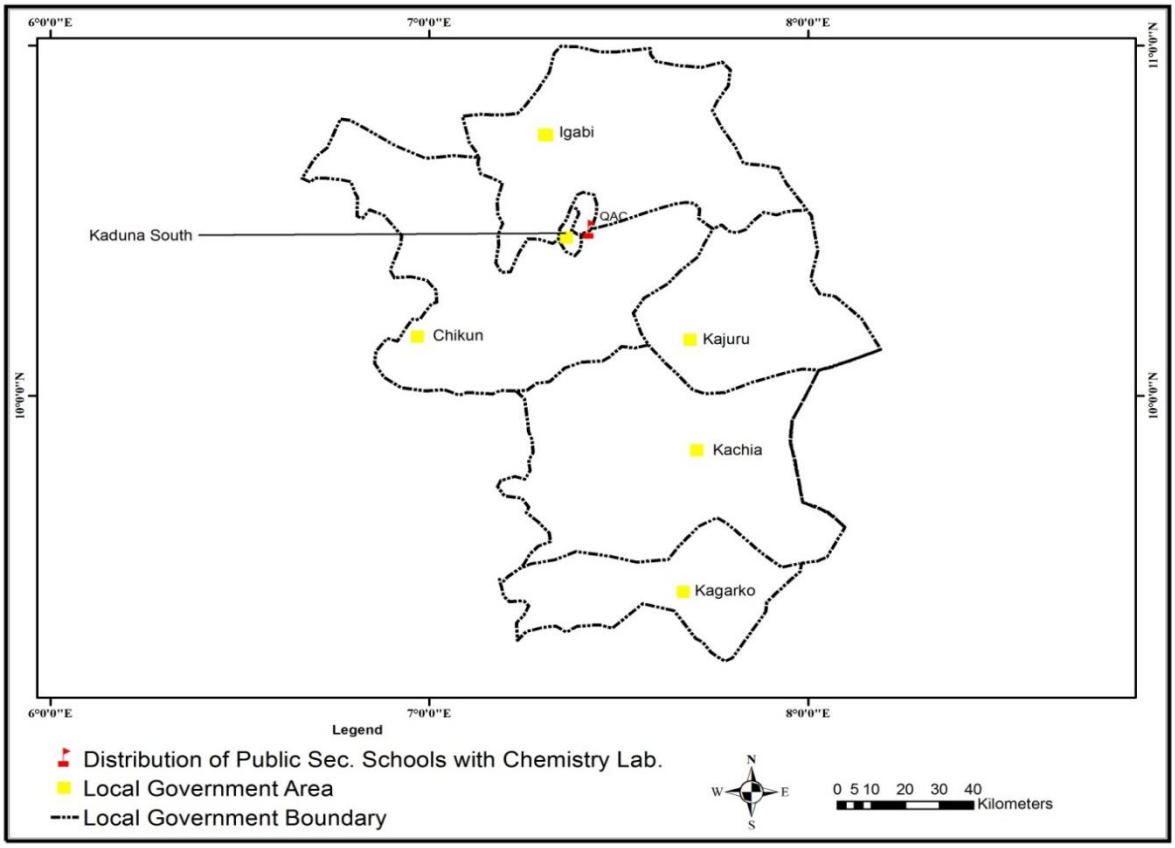


Figure 9. Spatial Distribution of Public Secondary Schools with Chemistry Laboratory (Source: Author's Analysis, 2016)

Table 8. Distribution of Public Secondary Schools with Chemistry Laboratory in Sabon-Tasha Education Zone

S/No	L.G.A	No. of Schools	Percentage (%)
1	Chikun	0	0.0
2	Kachia	0	0.0
3	Igabi	0	0.0
4	Kagarko	0	0.0
5	Kajuru	0	0.0
6	Kaduna-South	1	100
Total		**1**	**100**

Source: Field Survey (2016)

4.7. Public secondary schools with physics laboratory in the study area

Table 9 also reveals that only 5.6% comprising of two schools out of the 36 senior secondary schools had physics laboratory. Figure 10 shows the distribution of Physics laboratories in the study area. This poorly distributed laboratory within the study area is really a worrying situation. The phenomenon is similar to the findings of Abbas (2012) were he revealed that 36% of the schools in Sabon-gari and Zaria LGAs have computer, biology, chemistry and physics laboratories while the remaining 64% of the schools did not have all the facilities.

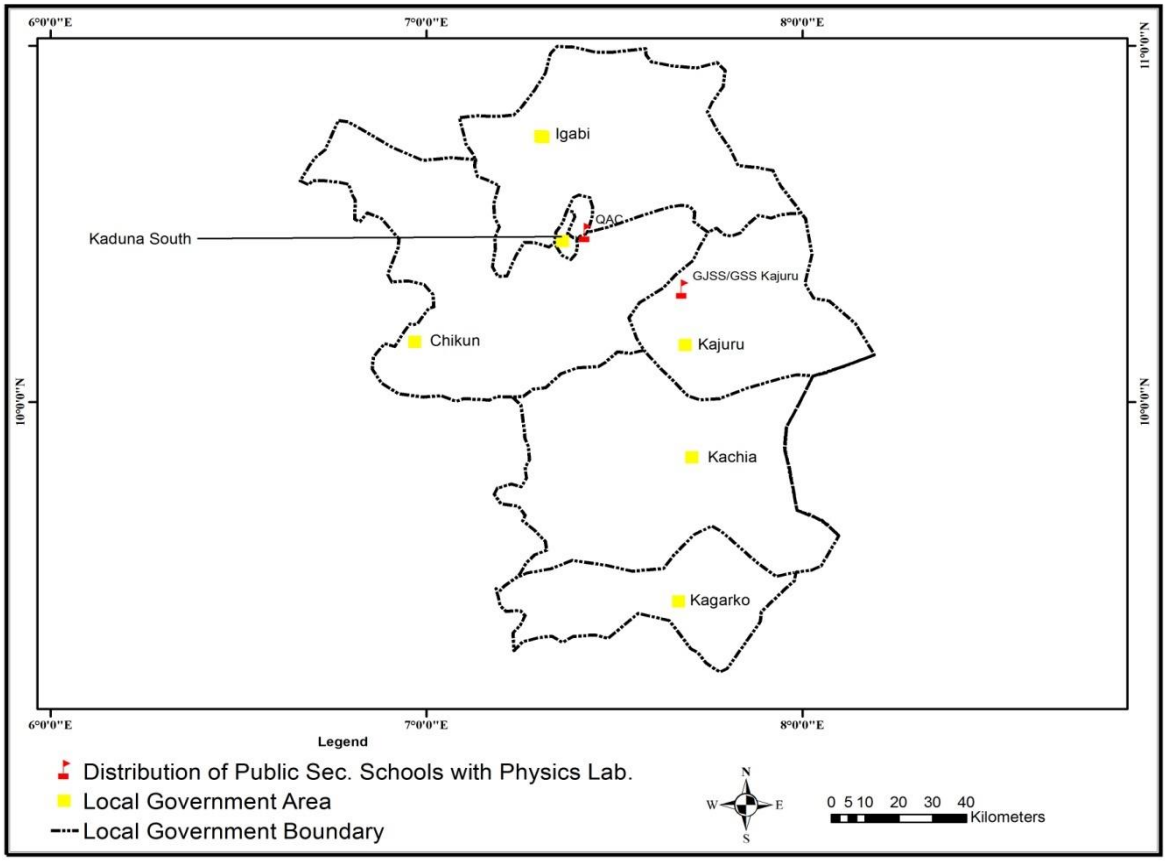


Figure 10. Spatial Distribution of Public Secondary Schools with Physics (Source: Author's Analysis, 2016)

Table 9. Distribution of Public Secondary Schools with Physics Laboratory in Sabon-Tasha Education Zone

S/No	L.G.A	No. of Schools	Percentage (%)
1	Chikun	0	0.0
2	Kachia	0	0.0
3	Igabi	0	0.0
4	Kagarko	0	0.0

S/No	L.G.A	No. of Schools	Percentage (%)
5	Kajuru	1	50.0
6	Kaduna-South	1	50.0
Total		**2**	**100**

Source: Field Survey (2016)

5. Conclusion and recommendation

The aim of this study was to create spatial database for public secondary schools facilities within Sabon-Tasha education zone of Kaduna state. The study identified a total of 51 public secondary schools comprising of 36 senior and 15 junior secondary schools in the study area. The research successfully mapped all the public secondary schools and displayed their spatial location over the study area. The study revealed that there is inequality in the distribution of educational facilities in all the six LGAs comprising the study area and most of the facilities such as libraries, assembly halls and laboratories are insufficient.

The study effectively showed the capability of GIS as a tool for planning and management of educational facilities. It is an effective method of tracking the nature of necessary facilities to ensure an effective teaching, learning, management, policy making and implementation to take place. It is therefore recommended that GIS database should be given full attention to guide policy making, planning and implementation within the educational sector. There is also need to review the distribution pattern of public secondary schools in all education zones within the state as schools overlap in some LGAs. Finally, the distribution of schools should be made based on the population of the secondary school age group of the localities. This will help to expand and upgrade some existing schools as well as build new ones.

References

Abbas, I. I. (2012), "Database Management and Mapping of Secondary Education Infrastructure in Sabon-Gari and Zaria Local Governments, Kaduna State, Nigeria", *Science and Technology*, Vol. 2 No. 2, pp. 1-7.

Abdulkarim, B. (2004), "The problems of teaching map reading in secondary schools", working paper, in-house workshop for geography teachers in Zaria inspectorate division M.O.E, Zaria zone Kaduna, April 2004.

Adepoju, A. and Fabiyi, A. (2010), *Universal Basic Education in Nigeria: Challenges and Prospects,* Education Industrial Nigeria Ltd, Ibadan, Nigeria.

Akpan, P.E, and Njoku, E.A. (2013), "Towards a Sustainable Distribution and Effective Management of School Facilities in Ikot Ekpene LGA of Akwa Ibom State: A Geographic Information Systems Option", *Mediterranean Journal of Social Sciences*, Vol. 4 No. 15, pp. 77-84.

Amnesty International. (2001), "Right to education project: special project on Africa", available at: http://www.right-to-education.org (Accessed 7 March 2016).

Anwaruddin, A. (2005), "Improving Public Service Delivery through Bureaucracy Reform", paper presented at the ADB- sponsored NAPSIPAG launching international conference, 6-8 December 2004, Kaula Lumpur, available at: http://mazawang.wordpress.com/2009/12/11/improving-public-service-delivery-throughbureaucy (accessed 11 May 2016).

Asiyai, R.A (2012), "Assessing School Facilities Public Secondary Schools in Delta State, Nigeria", *International Multidisciplinary Journal Ethopia*, Vol 6(2), No. 25, pp. 192–105.

Chang, G. C. and Rwehera, M. (2008), *Kaduna State Sector Analysis,* Kaduna Sate Ministry of Education, Kaduna, pp. 18-21.

De Grauwe, A. (2002), "Introduction to Geographical Information System: in Attfield, I., Tamiru, M. and Parolin, B. (Ed.), *Improving micro-planning in education through a Geographical Information System: Studies on Ethiopia and Palestine,* UNESCO Publishing, Paris, France, pp. 7-17.

Edun, T. (2005), "Towards Improving the Standard of Primary Education in Nigeria", in Adenuga, A. (Ed.), *Reversing Dwindling Enrolment Trend in Public Primary Schools in Ogun State,* Elegant, Lagos, pp.8-15.

Emmanuel, T. A. (2000), "Analysis of Spatial Distribution of Social Facilities in Jalingo Local Government Area Taraba State", Unpublished M.Sc. Thesis, Department of Geography ABU Zaria.

Eray, O. (2012), "Application of Geographic Information Systems (GIS) in Education", *Journal of Technical Science and Technologies*, Vol. 1 No. 2, pp. 53-58.

Federal Republic of Nigeria FRN (2004), *National policy on Education 4th Edition*, NERDC Press, Lagos, Nigeria.

Inobeme, J. and Ayanwole, K. (2009), "An Assessment of the Spatial Distribution of Government Secondary Schools in Zaria Area, Kaduna State",*The Information Manager,* Vol. 9 No. 1, pp. 1.

John, M. (1996), *Education Planning and Management and the use of Geographical Information Systems,* UNESCO, Paris, France.

Khalid, A. and Hamdy, I. E. (2013), "GIS as an efficient tool to manage educational services and infrastructure in Kuwait", *Journal of Geographic Information System,* Vol. 5 No. 1, pp. 12.

Mark, B. and Varghese, N.V. (2011), *Directions in educational planning*, IIEP-UNESCO, Paris, France.

Matthew, A. and Thomas, M. (2009), "Education Needs Assessment for Kaduna City", MCI social sector working paper series No.3, Nigeria, June 2009.

Murray, A.L. (2002), "Site placement uncertainty in location analysis", available at: http://gisknowledge.net/topic/problem_solving_and_decision_making/murray_ceus_03.pdf (accessed 5 May 2016).

National Bureau of Statistics. (2005), "Social Statistics in Nigeria", available at: https://www.nyu.edu/projects/scacco/files/NBS_Social_Statistics_in_Nigeria_2009.pdf (accessed 11 May 2016).

Nirmala, K.C. (2008), "The Impact of the Participation of Non-Governmental Organizations upon the Health Service Delivery in Nepal", available at: http://www.pactu.edu.np (accessed 5 April 2016).

Olamiju, I.O. and Olujimi, J. (2011), "Regional analysis of locations of public educational facilities inNigeria: The Akure region experience", *Journal of Geography and Regional Planning,* Vol. 4 No. 7, pp. 428-442.

Olubadewo, O. O., Abdulkarim, I. A. and Ahmed, M. (2013), "The use of GIS as Educational Decision Support System (EDSS) for primary schools in fagge local government area of kano state Nigeria", *Academic Research International,* Vol. 4, No. 6, pp. 46-63.

Tamrakar, R. (2010), "Impact of citizen charter in service delivery: A case of district administration office, Kathmandu", available at: http://www.mppg-nsu.org/attachment/119_Thesis_Rojina Tamraka_.pdf (accessed 10 April 2016).

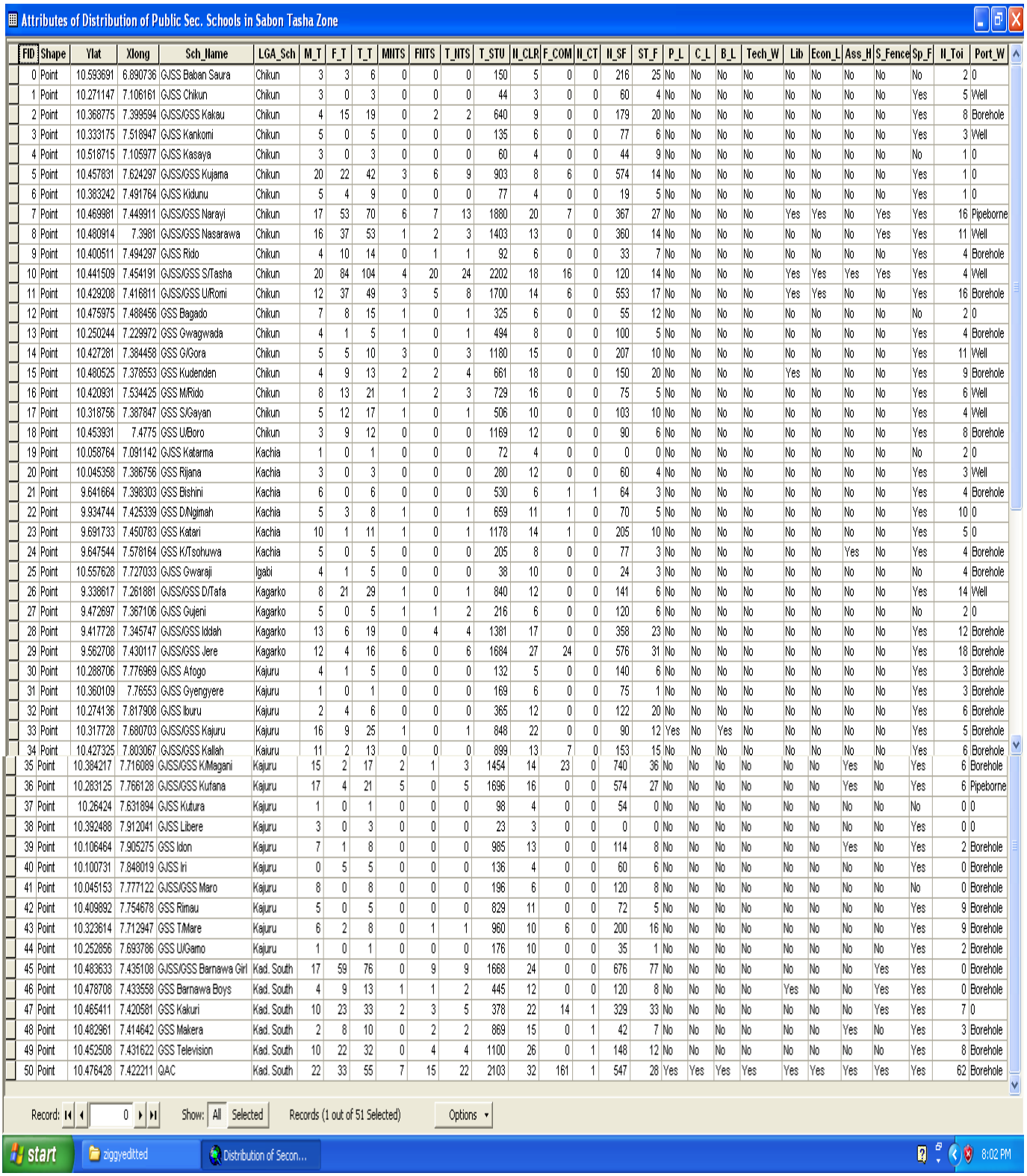
Thomson, C. and Hardin, P. (2000), "Remote sensing/GIS integration to identify potential low-income housing sites", *Cities,* Vol. 17 No. 2, pp. 97-109.

UNICEF Nigeria (2005), "The Children Education", available at: http://www.unicef.org/nigeria/children (accessed 7 March 2016).

World Development Report. (2004), "Making Services Work for Poor People", available at: http://www.imf.org/external/pubs/ft/fandd/2003/09/pdf/devaraja.pdf (accessed 10 April 2016).

Appendix A

GIS database for public secondary schools in Sabon Tasha education zone (Next Page)



Attributes of Distribution of Public Sec. Schools in Sabon Tasha Zone

FID	Shape	Ylat	Xlong	Sch_Name	LGA_Sch	M_T	F_T	T_T	MHTS	FHTS	T_HTS	T_STU	H_CLR	F_COM	H_CT	H_SF	ST_F	P_L	C_L	B_L	Tech_W	Lib	Econ_L	Ass_H	S_Fence	Sp_F	H_Toi	Port_W
0	Point	10.593691	6.890736	GJSS Baban Saura	Chikun	3	3	6	0	0	0	150	5	0	0	216	25	No	No	No	No	No	No	No	No	No	2	0
1	Point	10.271147	7.106161	GJSS Chikun	Chikun	3	0	3	0	0	0	44	3	0	0	60	4	No	No	No	No	No	No	No	No	Yes	5	Well
2	Point	10.368775	7.399594	GJSS/GSS Kakau	Chikun	4	15	19	0	2	2	640	9	0	0	179	20	No	No	No	No	No	No	No	No	Yes	8	Borehole
3	Point	10.333175	7.518947	GJSS Kankomi	Chikun	5	0	5	0	0	0	135	6	0	0	77	6	No	No	No	No	No	No	No	No	Yes	3	Well
4	Point	10.518715	7.105977	GJSS Kasaya	Chikun	3	0	3	0	0	0	60	4	0	0	44	9	No	No	No	No	No	No	No	No	No	1	0
5	Point	10.457831	7.624297	GJSS/GSS Kujama	Chikun	20	22	42	3	6	9	903	8	6	0	574	14	No	No	No	No	No	No	No	No	Yes	1	0
6	Point	10.383242	7.491764	GJSS Kidunu	Chikun	5	4	9	0	0	0	77	4	0	0	19	5	No	No	No	No	No	No	No	No	Yes	1	0
7	Point	10.469981	7.449911	GJSS/GSS Narayi	Chikun	17	53	70	6	7	13	1880	20	7	0	367	27	No	No	No	No	Yes	Yes	No	Yes	Yes	16	Pipeborne
8	Point	10.480914	7.3981	GJSS/GSS Nasarawa	Chikun	16	37	53	1	2	3	1403	13	0	0	360	14	No	No	No	No	No	No	No	Yes	Yes	11	Well
9	Point	10.400511	7.494297	GJSS Rido	Chikun	4	10	14	0	1	1	92	6	0	0	33	7	No	No	No	No	No	No	No	No	Yes	4	Borehole
10	Point	10.441509	7.454191	GJSS/GSS S/Tasha	Chikun	20	84	104	4	20	24	2202	18	16	0	120	14	No	No	No	No	Yes	Yes	Yes	Yes	Yes	4	Well
11	Point	10.429208	7.416811	GJSS/GSS U/Romi	Chikun	12	37	49	3	5	8	1700	14	6	0	553	17	No	No	No	No	Yes	Yes	No	No	Yes	16	Borehole
12	Point	10.475975	7.488456	GSS Bagado	Chikun	7	8	15	1	0	1	325	6	0	0	55	12	No	No	No	No	No	No	No	No	No	2	0
13	Point	10.250244	7.229972	GSS Gwagwada	Chikun	4	1	5	1	0	1	494	8	0	0	100	5	No	No	No	No	No	No	No	No	Yes	4	Borehole
14	Point	10.427281	7.384458	GSS G/Gora	Chikun	5	5	10	3	0	3	1180	15	0	0	207	10	No	No	No	No	No	No	No	No	Yes	11	Well
15	Point	10.480525	7.378553	GSS Kudenden	Chikun	4	9	13	2	2	4	661	18	0	0	150	20	No	No	No	No	Yes	No	No	No	Yes	9	Borehole
16	Point	10.420931	7.534425	GSS M/Rido	Chikun	8	13	21	1	2	3	729	16	0	0	75	5	No	No	No	No	No	No	No	No	Yes	6	Well
17	Point	10.318756	7.387847	GSS S/Gayan	Chikun	5	12	17	1	0	1	506	10	0	0	103	10	No	No	No	No	No	No	No	No	Yes	4	Well
18	Point	10.453931	7.4775	GSS U/Boro	Chikun	3	9	12	0	0	0	1169	12	0	0	90	6	No	No	No	No	No	No	No	No	Yes	8	Borehole
19	Point	10.058764	7.091142	GJSS Katarma	Kachia	1	0	1	0	0	0	72	4	0	0	0	0	No	No	No	No	No	No	No	No	No	2	0
20	Point	10.045358	7.386756	GSS Rijana	Kachia	3	0	3	0	0	0	280	12	0	0	60	4	No	No	No	No	No	No	No	No	Yes	3	Well
21	Point	9.641664	7.398303	GSS Bishini	Kachia	6	0	6	0	0	0	530	6	1	1	64	3	No	No	No	No	No	No	No	No	Yes	4	Borehole
22	Point	9.934744	7.425339	GSS D/Ngimah	Kachia	5	3	8	1	0	1	659	11	1	0	70	5	No	No	No	No	No	No	No	No	Yes	10	0
23	Point	9.691733	7.450783	GSS Katari	Kachia	10	1	11	1	0	1	1178	14	1	0	205	10	No	No	No	No	No	No	No	No	Yes	5	0
24	Point	9.647544	7.578164	GSS K/Tsohuwa	Kachia	5	0	5	0	0	0	205	8	0	0	77	3	No	No	No	No	No	No	Yes	No	Yes	4	Borehole
25	Point	10.557628	7.727033	GJSS Gwaraji	Igabi	4	1	5	0	0	0	38	10	0	0	24	3	No	No	No	No	No	No	No	No	No	4	Borehole
26	Point	9.338617	7.261881	GJSS/GSS D/Tafa	Kagarko	8	21	29	1	0	1	840	12	0	0	141	6	No	No	No	No	No	No	No	No	Yes	14	Well
27	Point	9.472697	7.367106	GJSS Gujeni	Kagarko	5	0	5	1	1	2	216	6	0	0	120	6	No	No	No	No	No	No	No	No	No	2	0
28	Point	9.417728	7.345747	GJSS/GSS Iddah	Kagarko	13	6	19	0	4	4	1381	17	0	0	358	23	No	No	No	No	No	No	No	No	Yes	12	Borehole
29	Point	9.562708	7.430117	GJSS/GSS Jere	Kagarko	12	4	16	6	0	6	1684	27	24	0	576	31	No	No	No	No	No	No	No	No	Yes	18	Borehole
30	Point	10.288706	7.776969	GJSS Afogo	Kajuru	4	1	5	0	0	0	132	5	0	0	140	6	No	No	No	No	No	No	No	No	Yes	3	Borehole
31	Point	10.360109	7.76553	GJSS Gyengyere	Kajuru	1	0	1	0	0	0	169	6	0	0	75	1	No	No	No	No	No	No	No	No	Yes	3	Borehole
32	Point	10.274136	7.817908	GJSS Iburu	Kajuru	2	4	6	0	0	0	365	12	0	0	122	20	No	No	No	No	No	No	No	No	Yes	6	Borehole
33	Point	10.317728	7.680703	GJSS/GSS Kajuru	Kajuru	16	9	25	1	0	1	848	22	0	0	90	12	Yes	No	Yes	No	No	No	No	No	Yes	5	Borehole
34	Point	10.427325	7.803067	GJSS/GSS Kallah	Kajuru	11	2	13	0	0	0	899	13	7	0	153	15	No	No	No	No	No	No	No	No	Yes	6	Borehole
35	Point	10.384217	7.716089	GJSS/GSS K/Magani	Kajuru	15	2	17	2	1	3	1454	14	23	0	740	36	No	No	No	No	No	No	Yes	No	Yes	6	Borehole
36	Point	10.283125	7.766128	GJSS/GSS Kufana	Kajuru	17	4	21	5	0	5	1696	16	0	0	574	27	No	No	No	No	No	No	Yes	No	Yes	6	Pipeborne
37	Point	10.26424	7.631894	GJSS Kutura	Kajuru	1	0	1	0	0	0	98	4	0	0	54	0	No	No	No	No	No	No	No	No	No	0	0
38	Point	10.392488	7.912041	GJSS Libere	Kajuru	3	0	3	0	0	0	23	3	0	0	0	0	No	No	No	No	No	No	No	No	Yes	0	0
39	Point	10.106464	7.905275	GSS Idon	Kajuru	7	1	8	0	0	0	985	13	0	0	114	8	No	No	No	No	No	No	Yes	No	Yes	2	Borehole
40	Point	10.100731	7.848019	GJSS Iri	Kajuru	0	5	5	0	0	0	136	4	0	0	60	6	No	No	No	No	No	No	No	No	Yes	0	Borehole
41	Point	10.045153	7.777122	GJSS/GSS Maro	Kajuru	8	0	8	0	0	0	196	6	0	0	120	8	No	No	No	No	No	No	No	No	No	0	Borehole
42	Point	10.409892	7.754678	GSS Rimau	Kajuru	5	0	5	0	0	0	829	11	0	0	72	5	No	No	No	No	No	No	No	No	Yes	9	Borehole
43	Point	10.323614	7.712947	GSS T/Mare	Kajuru	6	2	8	0	1	1	960	10	6	0	200	16	No	No	No	No	No	No	No	No	Yes	9	Borehole
44	Point	10.252856	7.693786	GSS U/Gamo	Kajuru	1	0	1	0	0	0	176	10	0	0	35	1	No	No	No	No	No	No	No	No	Yes	2	Borehole
45	Point	10.483633	7.435108	GJSS/GSS Barnawa Girl	Kad. South	17	59	76	0	9	9	1668	24	0	0	676	77	No	No	No	No	No	No	No	Yes	Yes	0	Borehole
46	Point	10.478708	7.433558	GSS Barnawa Boys	Kad. South	4	9	13	1	1	2	445	12	0	0	120	8	No	No	No	No	Yes	No	No	Yes	Yes	0	Borehole
47	Point	10.465411	7.420581	GSS Kakuri	Kad. South	10	23	33	2	3	5	378	22	14	1	329	33	No	No	No	No	No	No	No	Yes	Yes	7	0
48	Point	10.482961	7.414642	GSS Makera	Kad. South	2	8	10	0	2	2	869	15	0	1	42	7	No	No	No	No	No	No	Yes	No	Yes	3	Borehole
49	Point	10.452508	7.431622	GSS Television	Kad. South	10	22	32	0	4	4	1100	26	0	1	148	12	No	No	No	No	No	No	No	No	Yes	8	Borehole
50	Point	10.476428	7.422211	QAC	Kad. South	22	33	55	7	15	22	2103	32	161	1	547	28	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	62	Borehole

Record: 0 Show: All Selected Records (1 out of 51 Selected) Options

start ziggyeditted Distribution of Secon... 8:02 PM

Source: Author's Analysis (2016)

Appendix B

Abbreviations used in database

1. Ylat: Northing
2. Xlong: Easting
3. Schl_Name: School Name
4. LGA_Sch: Local Government Area of School
5. M_T: Number of Male Teachers
6. F_T: Number of Female Teachers
7. T_T: Total Number of Teachers
8. MNTS: Number of Male Non-teaching Staff
9. FNTS: Number of Female Non- Teaching Staff
10. T_NTS: Total Number of Non-Teaching Staff
11. T_STU: Total Number of Students
12. N_CLR: Number of Class Rooms
13. F_COMP: Functional Computers
14. N_CT: Number of Computer Teachers
15. N_SF: Number of Student Furniture
16. ST_F: Number of Staff Furniture
17. P_L: Physics Laboratory
18. C_L: Chemistry Laboratory
19. B_L: Biology Laboratory
20. Tech_W: Technical Workshop
21. Lib: Library
22. Econ_L: Economics Laboratory
23. Ass_H: Assembly Hall
24. S_Fence: School with Fence
25. Sp_F: School with Sport Facilities
26. N_Toi: Number of Toilets
27. Port_W: School with Portable Drinking Water