



## Spatial Analysis of Distribution of Secondary Schools in Giwa Zone of Kaduna State, Nigeria

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Received: October, 2016

Revised and Accepted: December, 2016

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### Abstract

*This study used Buffer and overlay analyses to investigate the spatial pattern of the distribution of government secondary schools in Giwa zone of Kaduna State in northwestern Nigeria. The analyses were done in a Geographic Information System (GIS) environment. Findings revealed that about 80% of the secondary schools are concentrated in the northeastern part of the area covering the headquarters of Giwa, Kudan and Sabon-Gari local government areas. While the central area around Kakangi and the southwestern part around Kidandan and Kadage are grossly underserved with very few schools and even no schools in places like Kadage and Idasu. Results of the buffer analysis revealed that Giwa local government headquarters and the immediate neighbourhoods covering Shika, Yakawada are the most accessible areas to secondary schools in the zone. However, Kakangi and Kadage are the areas with the lowest degree of accessibility to schools in the zone. There is the need to provide more secondary schools in Kidandan, Kakangi and Kadage corresponding to the population sizes in the wards and if possible redistribute the secondary schools that are more concentrated in the headquarters, and also construct more access roads to facilitate going to the schools in the area.*

**Keywords:** Accessibility; Buffer analysis; Overlay analysis; Spatial distribution; Secondary schools.

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### 1.0 INTRODUCTION

Education has provided the impetus for socioeconomic transformation in many parts of the world. The provision of educational facilities is crucial for producing literate citizens that are required to develop a nation. The literacy rate in Nigeria is estimated at 61.3% (UNICEF, 2010). Nigeria needs to revamp the educational system in order to attain the vision of becoming one of the largest economies by the year 2020. One way of achieving this is to have proper information on the location and distribution of educational facilities across the various political regions of the country, in order to ensure equity in the distribution of these facilities (Olamiju and Olujimi, 2011).

The constitution of the Federal Republic of Nigeria has obliged the government to provide free and

compulsory basic education for all the citizens. The basis for achieving this is not mere provision of educational facilities alone, but such facilities must be equitably distributed in order to reach out to the hitherto neglected rural population.

The development of educational infrastructure is a pre-requisite to national development. Educational facilities are very important in both rural and urban areas. Therefore, their distribution, accessibility as well as utilization have become issues of interest to geographers (Olamiju and Olujimi, 2011). The reason for this interest is based on desire to improve the quality of human life. Government has a direct role to play in the provision of educational facilities. One of the most outstanding educational problems in Nigeria, as in other parts of the developing world, is the inadequate number of secondary schools especially in the northern part of the country

(Inobeme and Ayanwole, 2009). The problem of inadequate secondary schools is aggravated by location inequalities in the location of the few available schools. The spatial disparity in the distribution of secondary school is most severe between urban and rural areas. Although, majority of the population of Nigeria reside in the rural areas, there are very few secondary schools that serve the rural dwellers. Inobeme and Ayanwole (2009) observed that even in the urban areas, there is inequality in the distribution of schools due to a number of factors ranging from political to environmental accessibility. In addition, there are variations in the distribution of secondary schools among different zones of the cities. This scenario is not restricted to Nigeria but extends to other parts of the world whereby educational facilities are typically concentrated in settlement centers within the higher levels of the settlement hierarchy (Kučerová & Kučera, 2012).

Empirical studies by Okafor (1988) and Olajuyin et al. (1997) on the effect of location on the utilization of healthcare facilities in Nigeria revealed uneven distribution of public facilities which eventually affect the patronage of such facilities. Therefore, when educational facilities are unevenly distributed in a region, there is every tendency that such facilities would be underutilized and the people to be serviced become disadvantaged in the use of such facility. The provision of educational facilities in an area should be among the top priorities of government at both local and state levels. However mere provision of schools does not translate to their accessibility and utilization by the target community. This is because there are factors influencing access and utilization of schools in an area.

Adejuyigbe (1973) observed that low patronage of schools in Nigeria could be attributed to several factors such as distance and type of facility available. Therefore, there is the need to understand the pattern of the distribution of schools in an area to enhance their access and utilization. In the past few years,

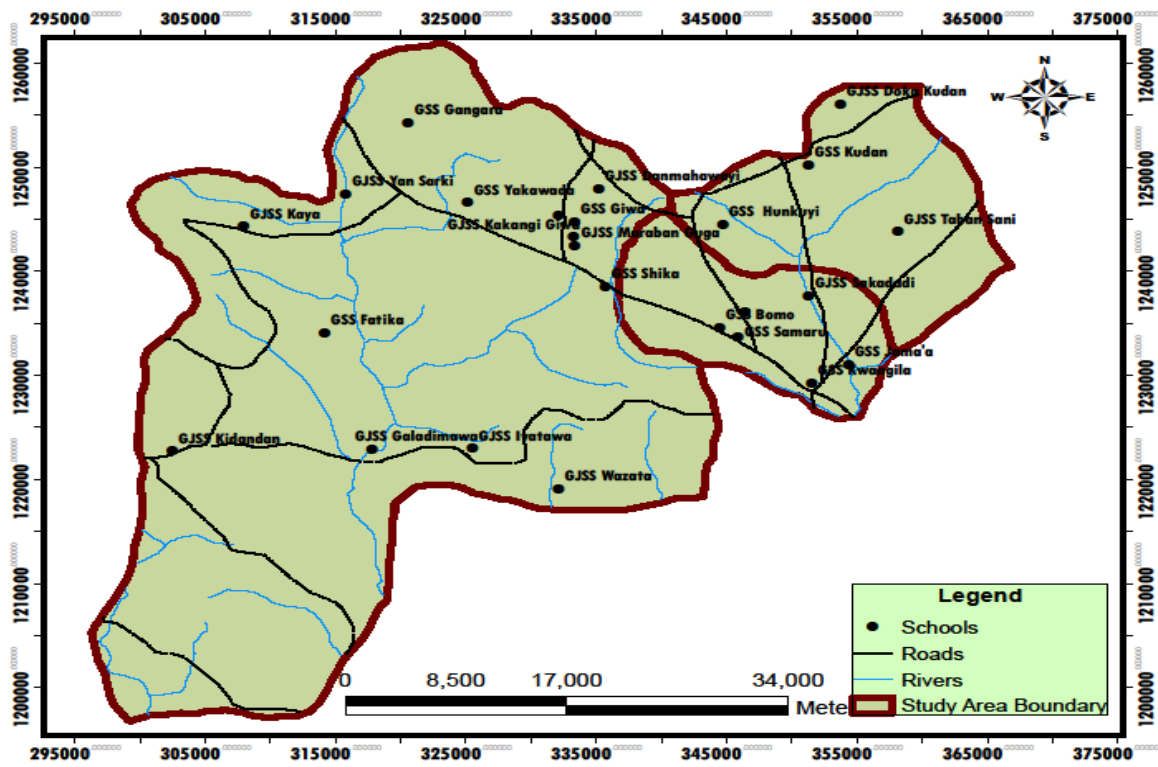
relevant studies have been carried relating to utilization of educational facilities in Nigeria. For example, Abbas (2012) developed a database management system for mapping of secondary education infrastructure in Kaduna State of Nigeria. Moreover, Olamiju and Olujimi (2011) analyzed the location of public educational facilities in Nigeria. Similarly, Musa and Mohammed (2012) examined the spatial distribution of secondary schools in Bida Town of northcentral Nigeria. They observed inequality in the distribution of the schools and low level of utilization by the residents. Recently, Ogunyemi *et al.* (2014) employed Geographical information system (GIS) to analyze accessibility to secondary schools in Ogun State of southwestern Nigeria. Their findings revealed that only about 50% of the students have good access to schools in the area. Also, Mustapha et al. (2015) used GIS techniques to evaluate accessibility to government primary schools in Ilorin West of Kwara State in northcentral Nigeria. Findings of their study showed a random pattern in the spatial distribution of the schools in the area. Therefore, GIS provides the appropriate method of analyzing the spatial distribution of educational facilities.

### ***1.1 Objectives of the Study***

Therefore, this study employed GIS to analyze the distribution of government secondary schools in Giwa zone with a view to investigate the spatial pattern of the distribution as well as the relationship between the pattern of the distribution and geographic accessibility to the schools in the area.

### ***1.2 The Study Area***

Giwa educational zone comprises of 3 Local Government Areas namely Giwa, Kudan and Sabon-Gari situated in Kaduna State of northwestern Nigeria. It is located between latitudes 11°00' and 11°42' N, and longitudes 7°05' and 7°47' E of the Greenwich Meridian as shown in Figure 1.



SOURCE: Auhor's Analysis  
 Figure-1. The map of Giwa Zone showing the distribution of secondary schools.

According to Koppen's classification, Giwa zone falls within the tropical wet and dry climatic zone. The dry season consists of hot and harmattan period stretching between the months of November and March. The hamattan is very cold accompanied by strong wind blowing from the north-east of the Sahara region. The wet season (rainy) season is experienced between the months of April and October having an annual range varying from 800mm to 1,300mm and the long time average is 1,100mm, most of which falls in late April to early October. The rain storms are usually violent and sometimes accompanied by thunder and lightning. In the eastern part of the area, the soils are deep greedy-brown sandy loams which become heavier at depth. In the western part on the higher portions, the soils are gravelly and stony and overly ironstone, gneiss or quartzite at shallow depths. The difference in landscape and soils has greatly influenced the vegetation in the area. On the good soil, land has been farmed for many decades; hence parklands dotted with large trees dominate the scenery. On the land that is left uncultivated, herbaceous fallows develop with pioneer communities of annual grasses and many herbs, which over the years are gradually invaded by perennials. In the western part of area, the vegetation is much less disturbed, although repeated burning and cutting have reduced the arboreal cover to an open 2.3m fall shrub savanna (Mortimore, 1970).

According to the 2006 population census, the zone has a population of about 718, 689. Giwa has a total population of about 286,427 of which 144,218 are males and 142,209 are females. Kudu has a population of 138,992 comprising of 70,951 males and 68,041 females. The population of Sabon-Gari is 293,270 of which 148,605 are males and 144,665 are females. The indigenes of the area are mainly Hausa, Fulani and few other tribes who migrated from other places in search of employment. They include Yoruba, Igbo, Jabba, and Igala. The area is endowed with suitable land for agriculture and industrial development. Agriculture is the major activity in the area and it is mostly carried out on small scale, mainly for family consumption and little surplus are usually taken to the market for sale. A wide variety of crops are grown among which include maize, sorghum, millet, cowpea, groundnuts etc. Vegetable and sugarcane are also grown in the *fadama* (flood plain).

## 2.0 MATERIALS AND METHODS

A reconnaissance survey was carried out to familiarize with the area. Data used for this study were gathered from both secondary and primary sources. The primary data was obtained using Germain GPS to take the coordinates (longitude and latitude) of the schools. The secondary data included

the list of secondary schools in the area obtained from the Zonal Office of Ministry of Education in Giwa Local Government Area. The list showed 25 schools as presented in Table 1. They were disaggregated into Giwa, Kudan and Sabon-Gari

Areas. The schools comprise of both junior and senior secondary schools. Also the topo map of Kaduna state was used as a base map to digitize the area of study.

**Table-1.** List of Government Secondary Schools in Giwa Zone of Kaduna State.

S/No	Name of schools	Waypoint	Northing	Easting
1	Government secondary school Bomo	013	11°10'40.7	007°38'12.3
2	Government secondary school Yakawada	014	11°16'21.1	007°23'51.9
3	Government secondary school Gangara	015	11°20'10.0	007°23'08.8
4	Government Junior secondary school KankangiGiwa	016	11°10'49.2	007°27'15.7
5	Government secondary school Giwa	017	11°14'52.9	007°28'29.8
6	Dr. shehuLawalGiwa Girls secondary school	018	11°15'17.1	007°28'04.9
7	Government junior secondary school Kaya	019	11°15'03.4	007°14'25.9
8	Government secondary school Fatika	020	11°09'31.4	007°17'52.5
9	Government Junior secondary school MarabanGuga	021	11°13'00.4	007°32'25.5
10	Government secondary school Shika	022	11°11'45.1	007°34'04.2
11	Government Junior secondary school Danmahawayi	023	11°18'27.0	007°34'31.6
12	Government secondary school Kudan	025	11°19'09.1	007°45'04.9
13	Government Junior secondary school DokaKudan	026	11°21'31.2	007°46'48.1
14	Government Junior secondary school TabanSani	027	11°16'09.0	007°47'01.6
15	Government secondary school Hunkuyi	028	11°15'27.4	007°38'58.3
16	Government Junior secondary school Bassawa	029	11°10'56.8	007°40'10.6
17	Government Junior secondary school Sakadadi	030	11°11'01.0	007°43'34.6
18	Government secondary school Kwangila	031	11°07'21.0	007°42'43.3
19	Government secondary school Jama'a	032	11°07'58.0	007°39'58.5
20	Government secondary school samara	033	11°10'10.4	007°39'37.8
21	Government Junior secondary school Galadimawa	034	11°03'28.4	007°19'54.3
22	Government Junior secondary school Kidandan	035	11°03'19.3	007°11'29.9
23	Government Junior secondary school Iyatawa	036	11°03'32.5	007°24'08.2
24	Government Junior secondary school Wazata	037	11°00'39.6	007°29'38.9
25	Government Junior secondary school Yan Sariki	038	11°07'07.1	007°35'52.5

**Source:** Kaduna State Ministry of Education (2015).

## 2.1 GIS Analysis

The following GIS techniques were used in the analysis:

- Digitization: Giwa, Kudan and SabonGari local government areas were digitized from the base map of Kaduna State.
- The digitized map was georeferenced using UTM coordinate system.
- The coordinates of the schools were recorded in Excel and the Excel file was imported into GIS environment as point data.

- Overlay: The point data were overlaid on the shape files of the areas to show the distribution of the schools.
- Buffering: A 3km buffer was created around each school to analyze accessibility and patronage pattern of the schools.

## 3.0 RESULTS AND DISCUSSION

Table 1 shows the locations and distribution of government secondary schools under Giwa zone. It is observed from the table that out of the 25 schools in

the area, 13 are senior secondary schools while 12 are junior secondary schools. Of these, there is only 1 girls' secondary school, the rest are mixed schools.

Over the years, the population of Giwa has been on the increase. The 1991 census data showed that the area had a total population of 170,235, and this increased to about 286,427 in 2006. This growing population, majority of which are youths requires enough secondary school facilities to cater for the people in the area. However, Table 2 shows that there are 15 secondary schools under Giwa division. The Local Government Area has 11 wards comprising of Giwa, Shika, Kidandan, Galadimawa, Kakangi, Gangara, Danmahawayi, Karau-Karau, Idasu,

Panhauya and Yakawada. However, the allocation of secondary schools is not based on the population distribution in the area as illustrated in Table 3. For example, both Gangara with population of 34,371 and Kadage with population of 6,588 have 1 secondary school each. While Idasu and Kidandan wards respectively with population of 22,914 and 21,768 have 2 and 1 secondary schools. It is evident that the distribution of secondary schools in the area is unfair, haphazard and not guided by informed educational policies. This is in agreement with the findings of Mustapha et al. (2015) which discovered a random pattern in the spatial distribution of schools that are not guided by population distribution in the wards (Musa and Mohammed, 2012).

**Table-2.** List of Secondary Schools under Giwa Division.

S/NO	NAMES OF SCHOOLS	WAYPOINT	NORTHING	EASTING
1	Government secondary school Yakawada	014	11°16'21.1	007°23'51.9
2	Government secondary school Gangara	015	11°20'10.0	007°23'08.8
3	Government Junior secondary school KankangiGiwa	016	11°10'49.2	007°27'15.7
4	Government secondary school Giwa	017	11°14'52.9	007°28'29.8
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10	Government Junior secondary school Danmahawayi	023	11°18'27.0	007°34'31.6
11	Government Junior secondary school Galadimawa	034	11°03'28.4	007°19'54.3
12	Government Junior secondary school Kidandan	035	11°03'19.3	007°11'29.9
13	Government Junior secondary school Iyatawa	036	11°03'32.5	007°24'08.2
14	Government Junior secondary school Wazata	037	11°00'39.6	007°29'38.9
15	Government Junior secondary school Yan Sariki	038	11°07'07.1	007°35'52.5

**Table-3.** Analysis of the distribution of secondary schools in Giwa Division.

S/N	Wards	Population	Available secondary schools
1	Giwa	63014	2
2	Shika	54135	2
3	Gangara	34371	1
4	Yakawada	29216	2
5	Idasu	22914	2
6	Kidandan	21768	1
7	Galadimawa	20050	1
8	Kakangi	13748	1
9	Dan mahawayi	12030	1
10	Panhauya	8593	1
11	Kadage	6588	1

On the other hand, Kudan Local Government Area with a population of 138,992 has only 4 secondary schools as shown in Table 4. This depicts gross inequality in the distribution of schools in the area. However, the distribution of the schools in the area is more balanced than those of Giwa and Sabon-Gari Local Government Areas.

Although Sabon-Gari has the largest population (of about 300,000 people) in the area, it has only 6 government secondary schools as shown in Table 5. In addition to the fact that the area is seriously under served, the distribution of schools in the area is grossly inequitable. It is observed that the number of government secondary schools in Giwa is more than twice that of Sabon-Gari which has more population than Giwa Local Government Area.

**Table-4.** List of Secondary Schools in Kudan Local Government Area.

S/NO	NAMES OF SCHOOL	WAYPOINT	NORTHING	EASTING
1	Government secondary school Kudan	025	11°19'09.1	007°45'04.9
2	Government Junior secondary school DokaKudan	026	11°21'31.2	007°46'48.1
3	Government Junior secondary school TabanSani	027	11°16'09.0	007°47'01.6
4	Government secondary school Hunkuyi	028	11°15'27.4	007°38'58.3

**Table-5.** List of Secondary Schools in Sabon Gari Local Government Area.

S/NO	NAMES OF SCHOOL	WAYPOINT	NORTHING	EASTING
1	Government secondary school Bomo	013	11°10'40.7	007°38'12.3
2	Government Junior secondary school Bassawa	029	11°10'56.8	007°40'10.6
3	Government Junior secondary school Sakadadi	030	11°11'01.0	007°43'34.6
5	Government secondary school Jama'a	032	11°07'58.0	007°39'58.5
6	Government secondary school samara	033	11°10'10.4	007°39'37.8

**Table-6.** Percentage Distribution of Secondary Schools in Each Local government Area.

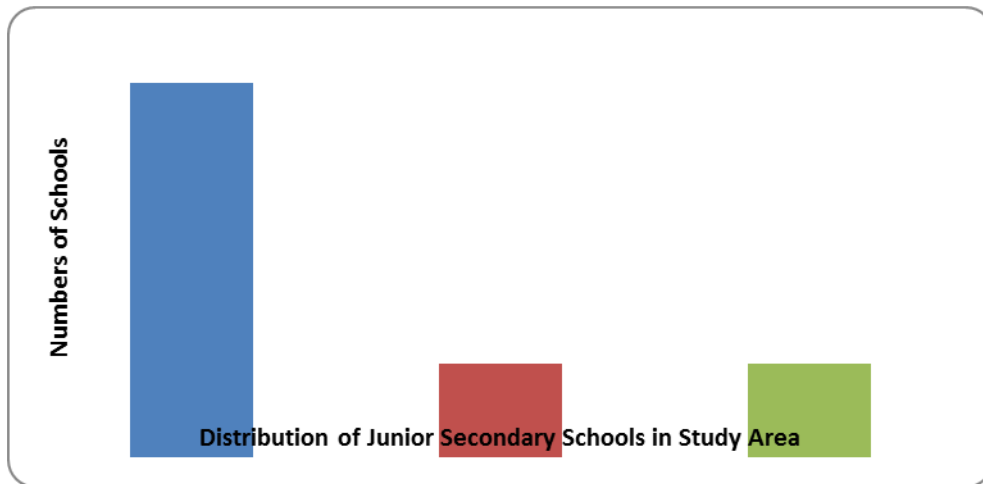
Level of school		Giwa No of Schools	%	Kudan No of schools	%	Sabon-Gari No of schools	%	Total
Junior schools	secondary	8	53	2	50	2	33	12
Senior schools	secondary	7	47	2	50	4	67	13
<b>Total</b>		<b>15</b>	<b>100</b>	<b>4</b>	<b>100</b>	<b>6</b>	<b>100</b>	<b>25</b>

It is also observed in Table 6 that there are no definite criteria used in the location and distribution of both junior and senior secondary schools in the area. But it is obvious that Giwa had more schools in spite of the fact that it has less population than Sabon-Gari. The factor of location of these schools could be politically motivated.

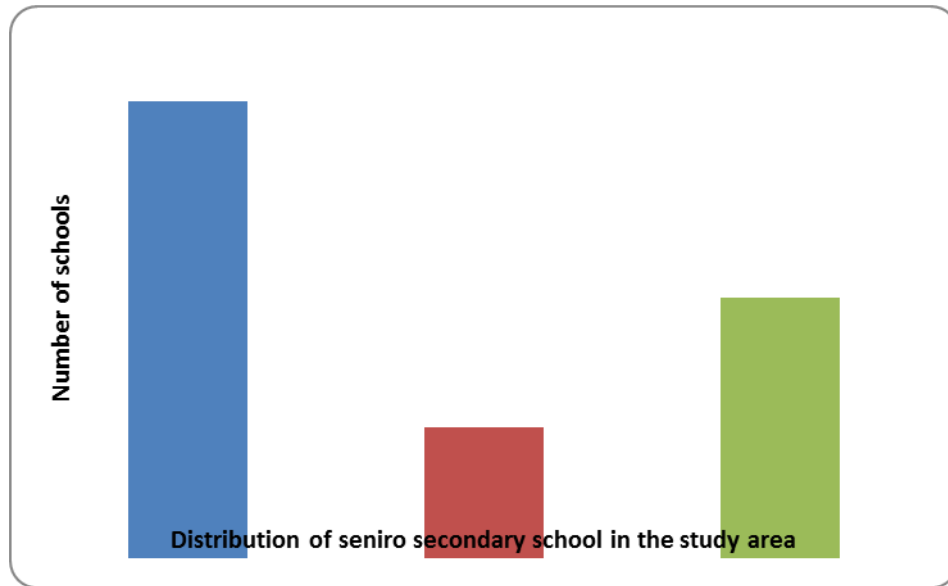
Moreover, data obtained from the Ministry of Education as shown in Table 6 revealed that there are 12 junior secondary schools distributed across Giwa Educational Zone, 8 of these schools fall under Giwa Division, while each of Kudan and Sabon-Gari LGAs has 2 junior secondary schools. Therefore, the distribution of government schools in the area can be said to be lopsided as depicted in Figure 2. However, Giwa which has more concentration of government secondary schools is more rural compared to Sabon-

Gari which is more urbanized. Hence, the few government schools in Sabon-Gari area are complemented by more private secondary schools in the area.

Furthermore, findings of this study as shown in Table 5 and Figure 3 indicate that out of the 13 senior secondary schools in the area, Giwa has 7; Sabon-Gari has 4, while Kudan has only 2 senior secondary schools. This implies that the dwellers of Sabon-Gari will pay more for education since government secondary schools which are cheaper are comparatively few in the area. But people in Giwa and Kudan would pay less for secondary school education since they have more concentration of government schools and therefore less competition for the schools.



**Figure-2.** Distribution of junior secondary schools in the study area.



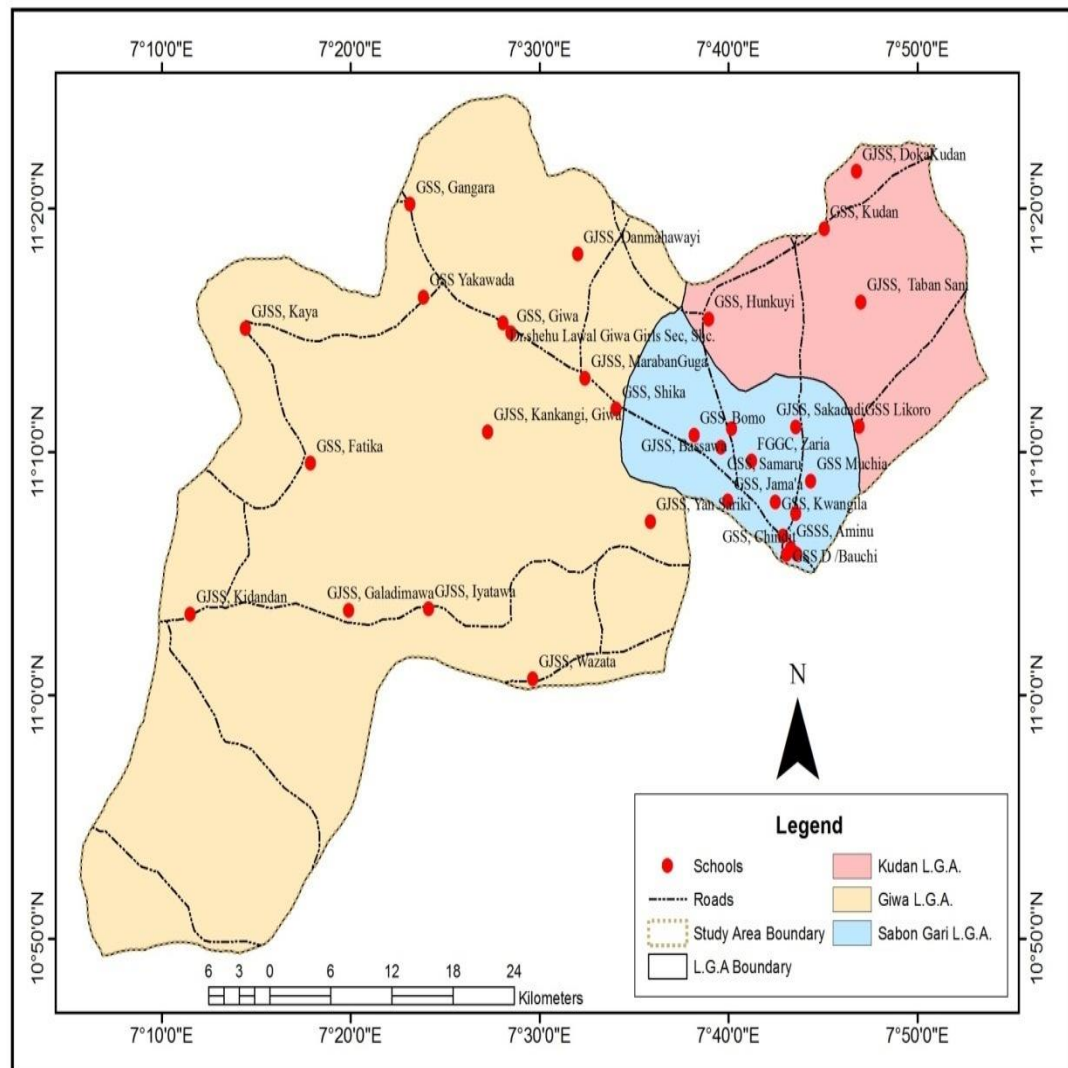
**Figure-3.**Distribution of senior secondary schools in the study area.

The pattern of the distribution of government secondary schools in the area is visualized in Figure 4. From the map it could be seen that the schools are not evenly distributed. Some areas have the government secondary schools concentrated at a particular area while some areas have none. For example, it could be seen from the map in Figure 4 that the secondary schools are more concentrated in the northeastern part of the area covering the headquarters of the three local government areas. While the central area around Kakangi and the southwestern area around Kidandan and Kadage in grossly underserved with very few schools and even no schools in some places in the area.

### 3.1 Buffering

Buffering is used in GIS to show the accessibility of a particular geographical phenomenon on the earth

surface in relation to population. This study used 3Km buffer to determine accessibility of the schools in relation to the population in the three local government areas of Giwa, Kudan and Sabon-Gari. Areas that fall within the buffer zone indicate that the population has good access to schools, while areas outside the buffer zone indicate that the population has poor or no accessibility in the area. Whereas, areas where there are intersections of buffer zones indicate that the population within the two buffer zones can access both schools. Results of the buffer analysis as presented in Figure 5 revealed that Giwa local government headquarters, Marabar-Guga, Shika, Bomo, Samaru, Jama'a and Kwangila are the most accessible areas to secondary schools in the zone. However, Kakangi and Kadage are the areas with the least accessibility to schools in the zone.



**Figure-4.** The distribution of secondary schools in each local government area

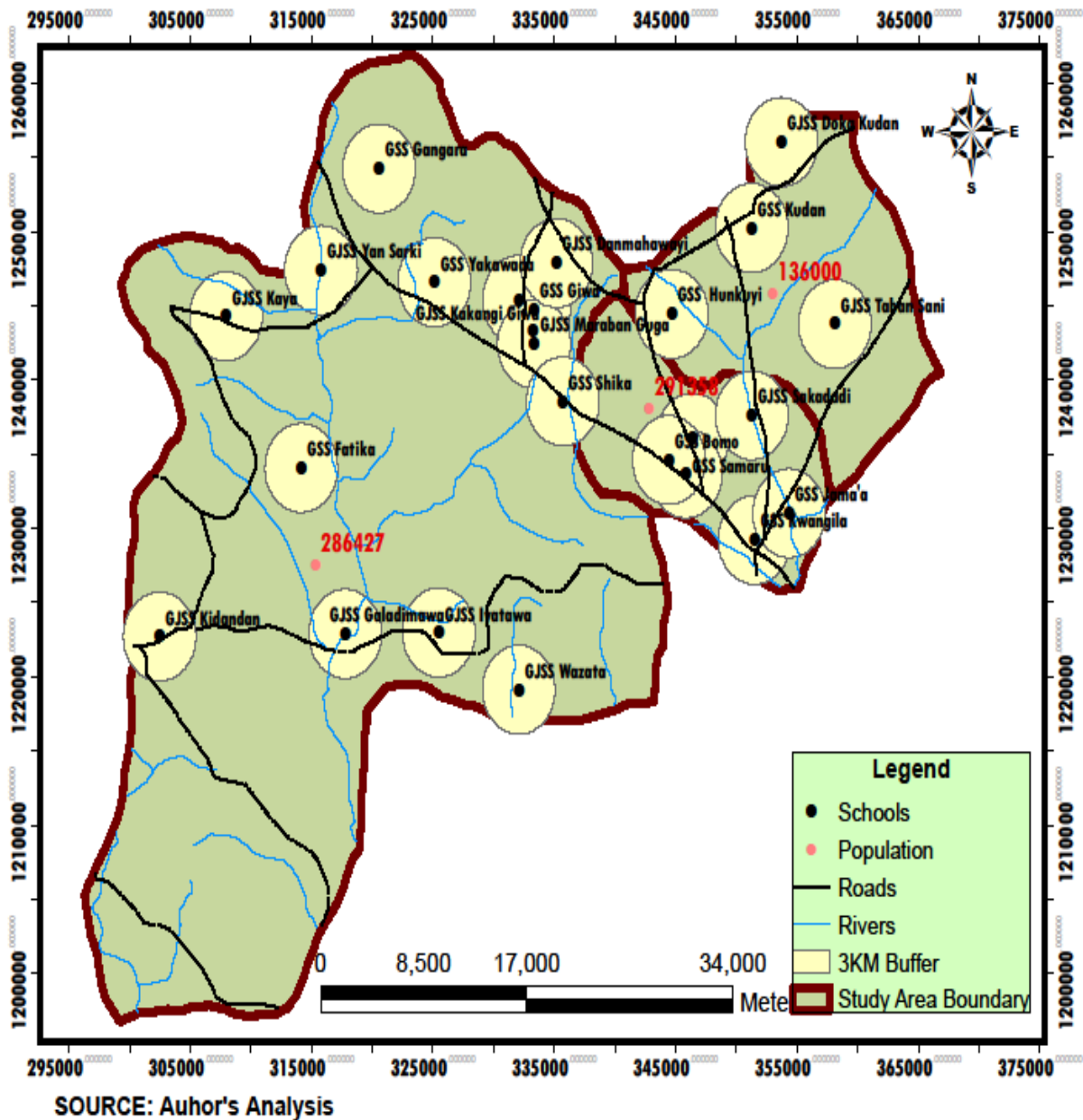


Figure-5. Map of Giwa zone showing the distribution of schools with the buffer zones.

#### 4.0 CONCLUSION

This study analyzed the distribution of government secondary schools in Giwa zone of Kaduna State, which comprises of Giwa, Kudan and Sabon-Gari Local Government Areas. The pattern of the distribution of the schools was found to be uneven in all the three LGAs. It was found that about 80% of the secondary schools are concentrated in the northeastern part of the area covering the headquarters of Giwa, Kudan and Sabon-Gari local government areas at the expense of the suburbs. The central area around Kakangi and the southwestern area around Kidandan and Kadage are grossly

underserved with very few or no schools in areas like Kadage and Idasu. Moreover, the level of accessibility to the schools varies over the area of study, whereby Giwa local government headquarters and the immediate neighbourhoods covering Shika, Yakawada were found to have the highest degree of accessibility, while Kakangi and Kadage are areas with the lowest degree of accessibility to the government secondary schools in the area.

#### 4.1 Recommendations

- The Kaduna State Ministry of Education should provide more secondary schools in the central area around Kakangi and the

southwestern area around Kidandan and Kadage.

- Also, the schools concentrated in the northeastern part should be redistributed based on the population distribution of the local government areas.
- There is the need to provide good transport network especially in the areas with the lowest level of accessibility to the schools.

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