

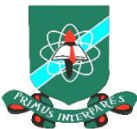
# **Gombe Journal of Geography and Environmental Studies (GOJGES)**

**Vol. 1 N0.2 Jun. 2020**

**e-ISSN: 2714-321X**

**p-ISSN: 2714-3201**

**<http://www.gojgesjournal.com>**



## GEOSPATIAL ANALYSIS OF THE DISTRIBUTION OF PUBLIC AND PRIVATE PRIMARY SCHOOLS AND THEIR RELATIONSHIP WITH POPULATION AND LAND AREA IN GOMBE METROPOLIS, GOMBE STATE, NIGERIA

**Maina, Benjamin**  
Department of Geography,  
Faculty of Science  
Gombe State University,  
Gombe, Nigeria.

**Idoma, Kim**  
Department of Geography,  
Faculty of Science  
Gombe State University,  
Gombe, Nigeria.

**Corresponding author's email /Phone: benmaina82@gsu.edu.ng /07062191813**

### Abstract

*This study investigated the distribution of government and private primary schools and their relationship with population and land area in Gombe Metropolis, Gombe State, Nigeria. The data employed for this study were acquired from primary and secondary sources. Global Positioning System (GPS) receivers, were used to capture the coordinates of primary schools and were analyzed with the help of ArcGIS 10.2. Findings of the study revealed that about 80% of the schools were privately owned. Clustered pattern of spatial distribution predominate in the metropolis and part of Kwami local government area. Whereas a fragment of Akko local government that is in the metropolis exhibit linear spatial distribution. The result revealed that private primary schools have strong positive correlation of 0.738 at  $p < 0.01$  with ward area but showed a weak and not significant relationship with population distribution. Result of the regression analysis revealed that, ward areas have strong positive contributions of 1.598 to variation in primary school distribution, while population contributed 0.0002. To promote basic education in the Gombe metropolis, the provision of schools should be made more equitable throughout the city and the services of city planners should be employed to provide more lands for the construction schools.*

**Key words:** Analysis, Geospatial distribution, Land area, Metropolis, Primary schools

### 1. Introduction

Education is a major force in socioeconomic transformation and cultural empowerment in many parts of the world (Umar, Muhammad, Ibrahim, Wahirahyel and Amina, 2016). Hence, the provision of educational facilities is crucial for producing literate citizens that are required to develop a nation. Primarily, social economic development in a country such as Nigeria would be lagging in the absence of a well-articulated educational system that would reduce illiteracy and improve the human resources (Musa and Mohammed, 2012). In spite of the relevance of education to a nation's development,

access to basic education in Nigeria lately is limited owing to disproportionate distribution of educational facilities and prevalence of poverty in the country (Owoola, 2002). Importantly, the location of education facilities influences their utilization and efficiency. This is because proximity to them do influence the decision to seek and receive education. However, governments have initiated programmes like the Universal Basic Education (UBE) and Sustainable Development Goals (SDGs) programme to boost the quality of basic education, the

distribution of and accessibility to these services remain a mirage. The locational inequalities of educational facilities is common across the various political regions of the country, but most severe between urban and rural areas. Nigeria being the country with the highest population of blacks in the world has huge human resource potential for growth and development, many of which have little access to quality education (Inobeme and Ayanwole, 2009). A good number of studies (Kinda, 2017; Umar, Muhammad, Ibrahim, Watirahyel and Amina, 2016; Musa and Mohammed, 2012; Inobeme and Ayanwole, 2009; Owoola, 2002) have examined the spatial disparity in

the location of educational facilities in Nigeria and beyond. However, it is unclear how well the services have been distributed and accessed in Gombe metropolis, Gombe state, Nigeria. It is in this regard that the paper aimed at assessing the distribution of government and privately owned primary and secondary schools in Gombe Metropolis, Gombe State Nigeria. Specifically, the paper examined the distribution of public and private secondary and primary schools in the study area, analyzed the spatial pattern of the distribution and assessed the adequacy and accessibility of the public and private schools to people of the study area.

## 2. Materials and Methods

### 2.1 Study Area

The study area is Gombe Metropolis, Gombe State. Gombe metropolis is located between latitude  $10^{\circ}15'N$  and  $10^{\circ}19'N$  and between longitudes  $11^{\circ}07'E$  and  $11^{\circ}15'E$ . Kwami LGA bound it to the north, Akko LGA to the Southwest and Yamaltu Deba LGA to the east. It has an altitude of 500 meters above mean sea level and occupies a total area of about  $54km^2$  (Maina Bet-al.,(2017). The Metropolis is characterized by a tropical climate with two distinct seasons; a rainy season (May-October) and a dry season (November-April) (Maina Bet-al., 2016). Based on the vegetation classification of Nigeria, Gombe falls into Sudan savannah vegetation belt. The monthly mean temperature records show a range from  $18^{\circ}$  to  $39^{\circ}$  and annual rainfall of 954mm (Ileoje, 2001). The Metropolis has an estimated population of 319,875 people based on 2006

population census (FRN, 2007).

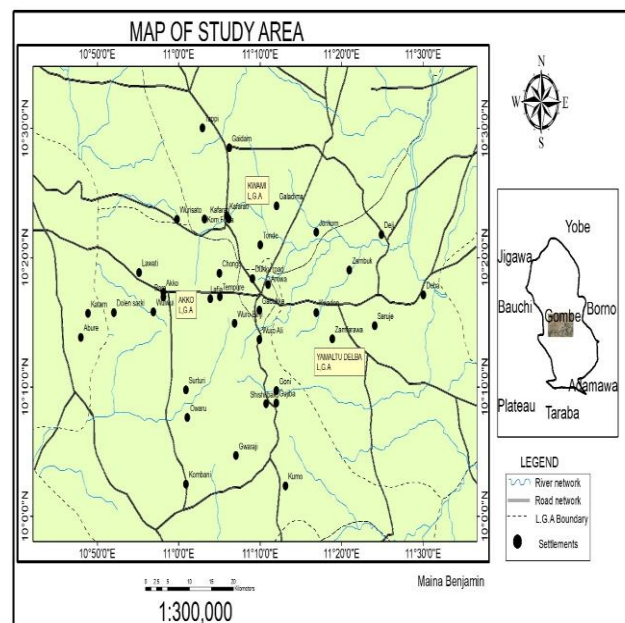


Figure 1: Study Area

Source: GIS and Remote Sensing Unit, Dept. of Geography, Gombe State University, Gombe (2019)

## 2.2. Methodology

Primary and Secondary data were used for this study. Primary data, which included coordinates of the schools captured with the aid of handheld Global Positioning System (GPS) receivers. High-resolution image and land use map of Gombe metropolis were also obtained. The land use map was scanned, geo referenced, and thematic features such as road network, local government's boundary, and other existing infrastructures were extracted using onscreen digitizing. GPS coordinate of schools, schools data (Names and addresses), were properly geo-coded and integrated into ArcGIS database. All digitized thematic data were updated with google earth image. The data analysis was carried out using the Nearest Neighbour Analysis.

School locations, number of primary schools in each ward and the total area in kilometres were used to determine the pattern of distribution of primary schools in the study area. Analysis was done in the ArcGIS environment (Spatial Statistics) to obtain the result of Nearest Neighbourhood Analysis. Relationship between primary school distribution, population and land area were conducted to determine if population distribution of each ward and its total land area have relationship with the number of private and public primary schools in the study area. Regression analysis was also conducted to determine if total population and land area influence the distribution of private and public primary schools in the various wards.

$$r = \frac{\sum xn/n - \bar{x}\bar{y}}{\sqrt{(\sum x^2/n - \bar{x}^2)(\sum y^2/n - \bar{y}^2)}} - - \text{Equation 1}$$

Where:  $r$  = Correlation coefficient.,  $X$  = Build-up Area, and  $Y$  = Agricultural land Area.

$$Y = a + b_1X_1 - - - \text{Equation 2}$$

Where:  $Y$  = Agricultural Land Area,  $X_1$  = Build-up Area, and  $a$  and  $b$  are constant.

The Nearest Neighbour Analysis, which examine the distance between each point and the closest point to it and measures the extent to which a particular pattern is clustered (nucleated), Random and Regular (uniform) was used. The Manhattan distance method, which measures the distance between two points along axes at right angles, was adopted to determine the spatial pattern of distribution of primary schools in the study area. The Manhattan method was more suitable over the Euclidean method that measure the distance between two points along a straight line.

The Nearest Neighbour formula is given as:

$$R_n = 2\bar{d}\sqrt{n/a} - - - \text{Equation 3}$$

Where

$R_n$  = the nearest neighbour index

$a$  = the size of the study area (metropolis)

$\bar{d}$  = the mean distance between the primary schools

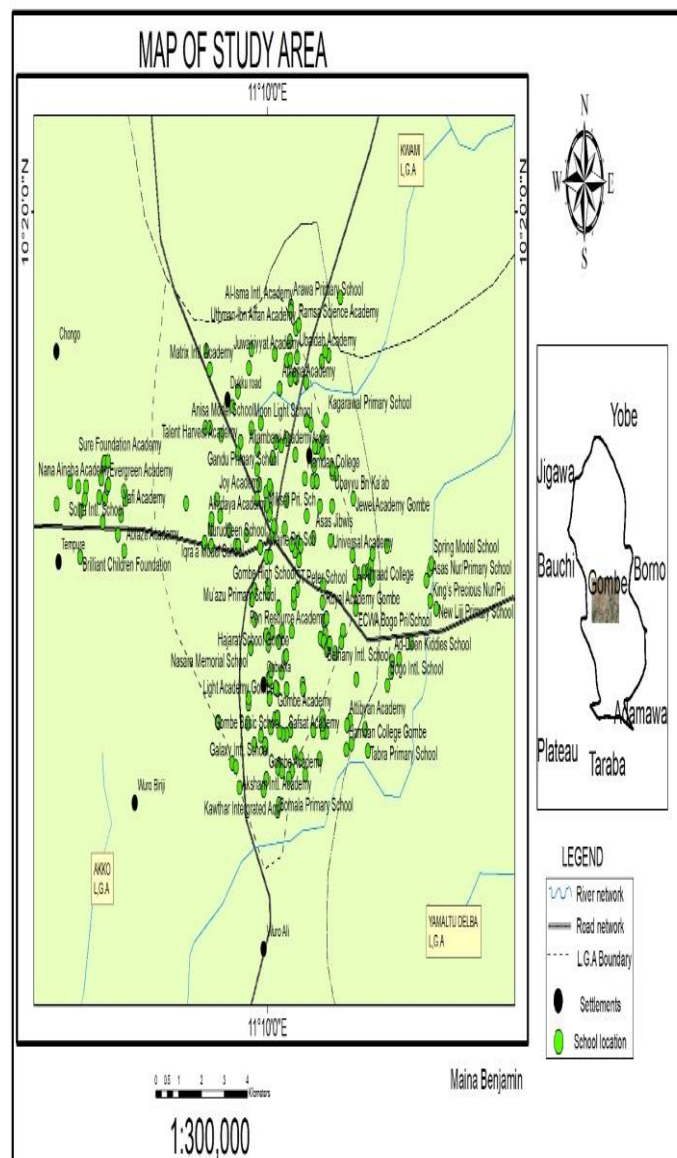
$n$  = the total number of primary schools.

Therefore, When  $R_n$  = zero. The pattern is clustered. This means that all the points are close to the same location. When  $R_n$  = one. The pattern is random. Meaning the observation does not follow any pattern and When  $R_n$  = 2.15. The pattern is regular. This means that there is an accurate regular pattern where each point is equidistant from its neighbours.

### 3. Results and Discussion

#### 3.1. The Spatial Distribution Pattern of Primary Schools in the study area

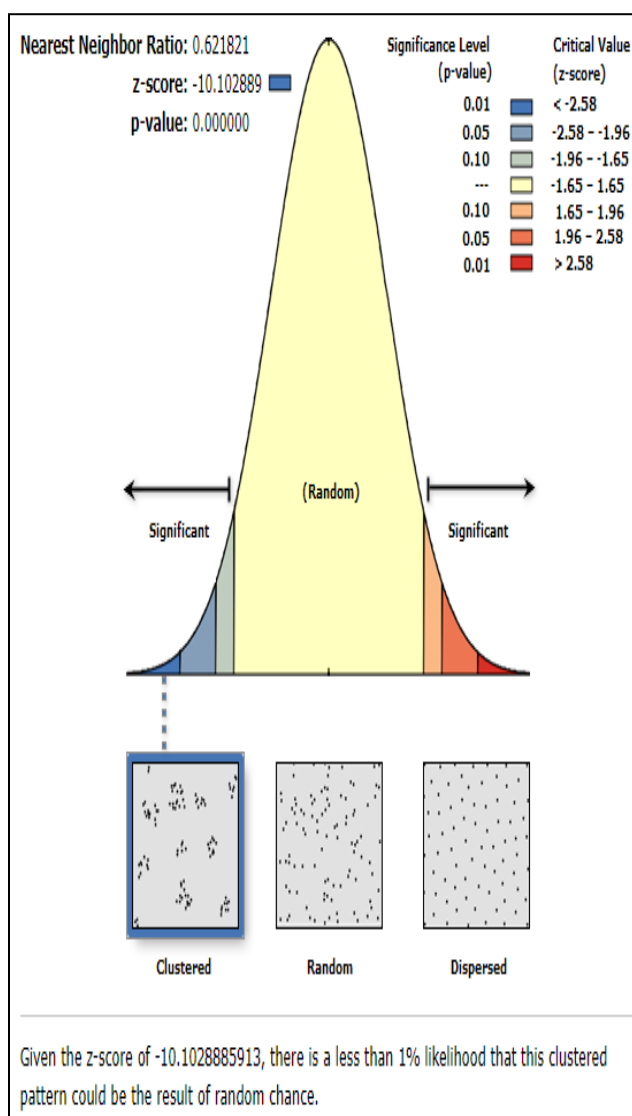
Two hundred and twenty-one Government and Private primary schools were identified in the study area across the 13 political wards of the three LGAs that made up Gombe metropolis. The Nearest Neighbour Analysis for the spatial distribution of primary schools in the study area revealed a clustered pattern (see Fig. 2 and 3.) for the overall distribution of primary school in Gombe metropolis. While the spatial distribution pattern in the following specific local government shows Clustered pattern; Gombe and Kwami local government areas indicate cluster pattern while Akko local government exhibit linear spatial distributions. This indicates that most of the primary schools are located in the centre of the metropolis, which is urban bias occasioned by the high population density in the Central Business District (CBD).



**Figure2: Study area showing the spatial distribution of primary schools**

GIS and Remote Sensing Unit, Dept. of Geography, Gombe State University, Gombe (2019)





|                                |                        |
|--------------------------------|------------------------|
| <b>Observed Mean Distance:</b> | <b>241.7392 Meters</b> |
| <b>Expected Mean Distance:</b> | <b>388.7601 Meters</b> |
| <b>Nearest Neighbor Ratio:</b> | <b>0.621821</b>        |
| <b>z-score:</b>                | <b>-10.102889</b>      |
| <b>p-value:</b>                | <b>0.000000</b>        |

**Figure 3: Average Nearest Neighbour Analysis**  
Source: GIS and Remote Sensing Unit, Dept. of Geography, Gombe State University, Gombe (2019)

### 3.3 Spatial Distribution of Primary schools based on wards in the study area

Based on the analyses in Table 1, out of the 221 schools identified in the study area, Garko ward of Gombe metropolis has the highest number of schools (88). 13 schools were government schools while private individuals owned 75 schools. Bojaga and Shamaki wards had 24 primary schools owned by both private individuals and government. The least is K/Kumbiya with only one private school and no government school. Figure 4 shows the details of the distribution of private and government schools in the study area based on each ward. The analyses in figure 4 suggests the need for the government to provide more schools in the study area to cope with increasing population of the metropolis (Table 2). Additionally, there is the need for the government to revamp the educational system in order to attain the vision of becoming one of the largest economies by the year 2020.

### 3.4 Distribution of Private and Government Schools in the Study area

Based on the analysis in Table 1, government schools in the study area amounted to 36, while Private school is 185. It indicated that 75% of primary schools in Gombe is privately owned. The result further indicated that public/government primary schools in Gombe metropolis are inadequate compared to the population. Since, private establishments are more profit oriented, it could be deduced that most of the schools in Gombe are beyond the reach of the poor. Hence, the need for the



government to establish more schools to cater for the peasant population.

**Table 1 Distribution of Private and Government primary schools according to wards**

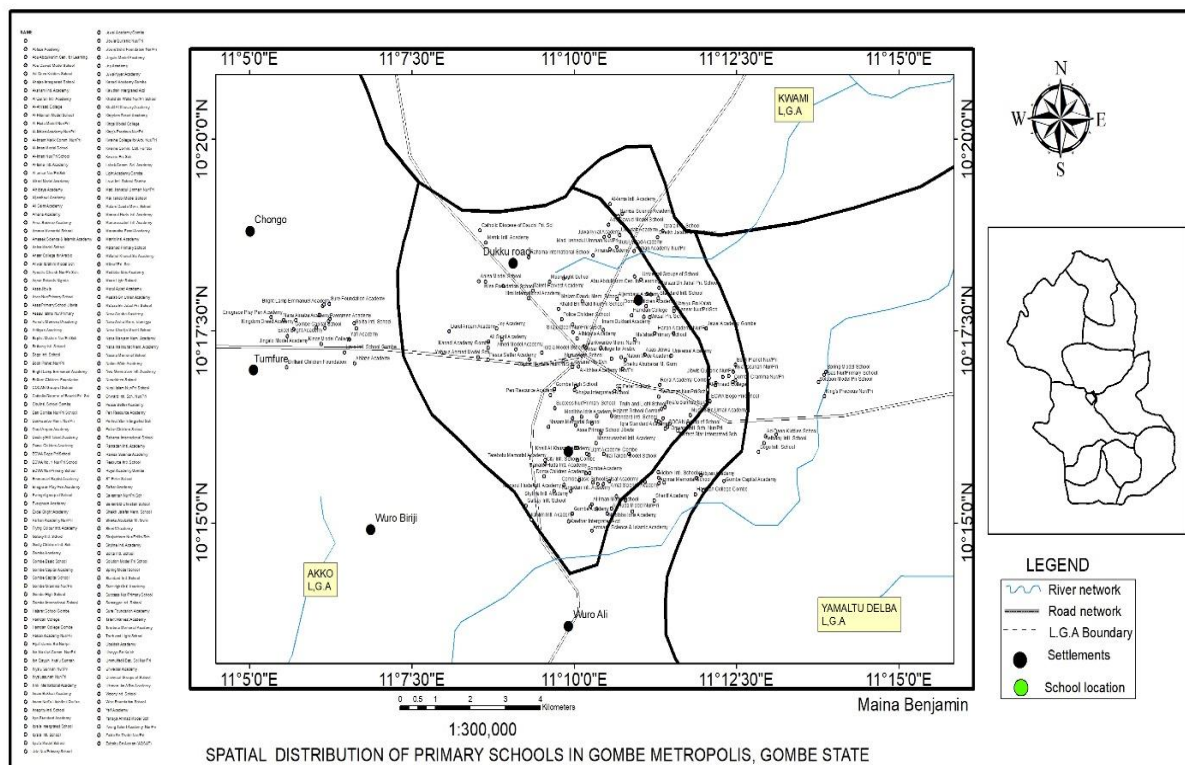
| <i>S/N</i> | <i>Ward</i> | <i>Number of Gov't School</i> | <i>Number of Private School</i> | <i>Total</i> |
|------------|-------------|-------------------------------|---------------------------------|--------------|
| 1.         | Ajiya       | 0                             | 3                               | 3            |
| 2.         | Bajoga      | 4                             | 20                              | 24           |
| 3.         | B/East      | 0                             | 11                              | 11           |
| 4.         | B/West      | 2                             | 7                               | 9            |
| 5.         | Dawaki      | 2                             | 4                               | 6            |
| 6.         | Garko       | 13                            | 75                              | 88           |
| 7.         | Herwagana   | 2                             | 11                              | 13           |
| 8.         | J/Fari      | 1                             | 6                               | 7            |
| 9.         | K/Kumbiya   | 0                             | 1                               | 1            |
| 10.        | Kwadon      | 1                             | 4                               | 5            |
| 11.        | Nassarawo   | 2                             | 11                              | 13           |
| 12.        | Pantami     | 2                             | 15                              | 17           |
| 13.        | Shamaki     | 7                             | 17                              | 24           |
| Total      |             | 36                            | 185                             | 221          |

**Source: Fieldwork, 2019.**

**Table 2: Wards, Population and Land Area in Gombe Metropolis**

| <i>Wards</i>    | <i>Population</i> | <i>Area (sqkm)</i> | <i>Area (%)</i> |
|-----------------|-------------------|--------------------|-----------------|
| Nasarawo        | 17809.00          | 7.74               | 18.57           |
| Bolari East     | 22366.00          | 1.93               | 4.62            |
| Bolari West     | 37655.00          | 0.62               | 1.49            |
| Kumbiya Kumbiya | 19085.00          | 0.22               | 0.53            |
| Pantami         | 32157.00          | 5.15               | 12.35           |
| Jekadafari      | 25568.00          | 6.37               | 15.29           |
| Shamaki         | 51745.00          | 7.55               | 18.12           |
| Bajoga          | 20549.00          | 7.94               | 19.05           |
| Ajiya           | 5260.00           | 0.69               | 1.65            |
| Dawaki          | 25565.00          | 1.57               | 3.76            |
| Herwagana       | 14587.00          | 1.91               | 4.57            |
| Total           | 272346.00         | 41.69              | 100.00          |

**Source: NPC, 2006.**



**Figure 4: Map of the study area showing spatial distribution of schools**

**Source:** GIS and Remote Sensing Unit, Dept. of Geography, Gombe State University, Gombe (2019)

**Table 3: Geographical Coordinate of the Primary Schools**

| School                     | Latitude        | Longitude       | School                                        | Latitude        | Longitude       | School                     | Latitude        | Longitude      |
|----------------------------|-----------------|-----------------|-----------------------------------------------|-----------------|-----------------|----------------------------|-----------------|----------------|
| Good Shepherd              | 10° 17' 34.088" | 11° 9' 58.362"  | Kundulum Primary School                       | 10° 19' 15.990" | 11° 10' 43.146" | Gombe Academy              | 10° 15' 7.032"  | 11° 9' 58.128" |
| Khalid Bn Walid Nur/Pri Sc | 10° 17' 47.139" | 11° 9' 45.251"  | Universal Nursery/Primary Juwairiyyat Academy | 10° 18' 46.848" | 11° 10' 10.350" | Kawthar Intergrated Acd.   | 10° 15' 1.422"  | 11° 9' 54.672" |
| Police Children School     | 10° 17' 39.033" | 11° 9' 48.222"  | Ubaidah Academy                               | 10° 18' 43.374" | 11° 10' 27.588" | Al-Hilamah Model School    | 10° 15' 29.646" | 11° 9' 50.448" |
| Idi Primary School         | 10° 17' 37.212" | 11° 10' 4.522"  | Mad. Irshadul Ummah Nur/Pri                   | 10° 18' 44.934" | 11° 10' 41.802" | Manarul Huda Intl. Academy | 10° 15' 25.050" | 11° 9' 41.216" |
| Loddo Primary School       | 10° 17' 38.651" | 11° 10' 12.646" | Abu Dawud Model School                        | 10° 18' 44.094" | 11° 10' 32.130" | Galaxy Intl. School        | 10° 15' 13.386" | 11° 9' 15.066" |
| Jauro Gote Primary School  | 10° 17' 44.597" | 11° 11' 36.711" |                                               | 10° 18' 53.095" | 11° 10' 31.518" | Aksham Intl. Academy       | 10° 15' 2.664"  | 11° 9' 20.170" |
| Nomadic Primary School     | 10° 18' 49.234" | 11° 9' 36.909"  | Ramsa Science Academy                         | 10° 18' 59.658" | 11° 10' 40.536" | Doma Children Academy      | 10° 15' 36.102" | 11° 9' 31.980" |
| Matrix Intl. Acd. Gombe    | 10° 18' 38.799" | 11° 8' 38.168"  | Uthman Ibn Affan Academy                      | 10° 19' 1.734"  | 11° 10' 44.130" | City Intl. School Gombe    | 10° 15' 46.050" | 11° 9' 32.856" |
| Anisa Model School         | 10° 18' 8.800"  | 11° 8' 31.731"  | Al-Isma Intl. Academy                         | 10° 19' 9.162"  | 11° 10' 33.072" | Terebotu Memorial Acd.     | 10° 15' 48.970" | 11° 9' 33.072" |





|                             |                 |                 |                               |                 |                 |                                 |                 |                 |
|-----------------------------|-----------------|-----------------|-------------------------------|-----------------|-----------------|---------------------------------|-----------------|-----------------|
| Wise Foundation School      | 10° 18' 8.499"  | 11° 8' 37.876"  | Amana Academy                 | 10° 18' 28.944" | 11° 10' 17.202" | Nasara Memorial School          | 10° 16' 14.813" | 11° 9' 35.982"  |
| Joy Academy                 | 10° 17' 31.598" | 11° 8' 48.088"  | Sheikh Ja'afar Mem. School    | 10° 18' 43.134" | 11° 11' 16.692" | Hassan Cen. Primary School      | 10° 17' 12.642" | 11° 10' 7.033"  |
| Darul Arqam Academy         | 10.295726       | 11.142928       | Iqra'a Intl. School           | 10° 18' 48.132" | 11° 11' 21.618" | Nana Maryam Mem. Acad.          | 10° 17' 28.066" | 11° 11' 14.132" |
| Alheri Model Academy        | 10° 17' 23.088" | 11° 8' 52.888"  | Kwaive Comm. Coll. For Sci    | 10° 16' 17.777" | 11° 11' 44.761" | Universal Academy               | 10° 17' 10.478" | 11° 11' 29.600" |
| Evengel group of School     | 10° 17' 15.502" | 11° 9' 5.888"   | Mus'ab Bn Umair Academy       | 10° 16' 24.155" | 11° 11' 47.102" | Royal Academy Gombe             | 10° 16' 47.762" | 11° 11' 18.877" |
| Kanadi Academy              | 10° 17' 16.680" | 11° 8' 40.224"  | Ecwa Bogo Pri/School          | 10° 16' 35.167" | 11° 12' 5.311"  | Asas Jibwis                     | 10° 17' 11.624" | 11° 11' 5.001"  |
| Nana Aisha Mem. Islamiyya   | 10° 17' 21.433" | 11° 8' 40.366"  | Jewel Academy Gombe           | 10° 17' 31.800" | 11° 12' 1.712"  | Kwaive College for Arb. Nur/Pri | 10° 17' 16.584" | 11° 10' 24.378" |
| All Saint Academy           | 10° 17' 57.733" | 11° 8' 46.544"  | Excel Bright Academy          | 10° 17' 31.938" | 11° 6' 9.344"   | Herwagana Primary School        | 10° 17' 4.998"  | 11° 10' 38.880" |
| Pace Setter Academy         | 10° 17' 7.451"  | 11° 8' 40.133"  | Integrity Intl. School        | 10° 17' 42.368" | 11° 6' 4.022"   | Dankwanbo Mem. Nur/Pri          | 10° 17' 17.028" | 11° 10' 10.818" |
| Destiny Hill Talent Academy | 10° 18' 4.989"  | 11° 8' 54.288"  | Sevenfold Christian School    | 10° 17' 32.477" | 11° 6' 1.399"   | Ansar College for Arabic        | 10° 17' 18.018" | 11° 10' 8.976"  |
| Talent Harvest Academy      | 10° 18' 1.555"  | 11° 9' 21.555"  | Gombe Capital School          | 10° 17' 31.502" | 11° 5' 40.532"  | Apostlic Church                 | 10° 17' 9.504"  | 11° 10' 43.200" |
| Ilimi International Academy | 10° 17' 55.378" | 11° 9' 17.861"  | Brilliant Children Foundation | 10° 17' 1.744"  | 11° 5' 34.162"  | Nur/Pri Sch. Nation Wide Acady  | 10° 17' 7.446"  | 11° 10' 47.046" |
| Rahama International School | 10° 18' 27.522" | 11° 9' 17.989"  | Nana Ainaba Academy           | 10° 17' 38.111" | 11° 5' 31.355"  | Sheiku Abubakar M. Gumi         | 10° 17' 0.186"  | 11° 10' 44.442" |
| Imam Bukhari Academy        | 10° 17' 40.924" | 11° 11' 4.155"  | Jingalo Model Academy         | 10° 17' 25.832" | 11° 5' 34.834"  | Young Talent Acad. Nur/Pri      | 10° 17' 8.274"  | 11° 10' 34.266" |
| Miksaf                      | 10° 17' 40.776" | 11° 11' 9.491"  | Kingdom Breed Academy         | 10° 17' 38.288" | 11° 5' 42.522"  | Gombe High School               | 10° 16' 44.488" | 11° 9' 41.610"  |
| Al-ansar Nur/Pri/Sch.       | 10° 17' 45.362" | 11° 11' 31.924" | Enograce Play Pen Academy     | 10° 17' 40.598" | 11° 5' 19.744"  | Pen Resource Academy            | 10° 16' 39.714" | 11° 9' 37.740"  |
| Ubayyu Bn Ka'ab             | 10° 17' 47.481" | 11° 11' 31.933" | Kings Model College           | 10° 17' 19.594" | 11° 6' 5.912"   | J/Fari Nur/Primary School       | 10° 17' 7.724"  | 11° 9' 14.994"  |
| Hanan Academy Nur/Pri       | 10° 17' 28.300" | 11° 11' 31.655" | Evergreen Academy             | 10° 17' 37.755" | 11° 6' 12.698"  | Baptist Modern Nur/Pri/Sch.     | 10° 17' 7.750"  | 11° 9' 18.344"  |
| Standard Intl. School       | 10° 16' 19.032" | 11° 10' 49.380" | Bright Lamp Emmanuel Acd      | 10° 17' 49.499" | 11° 6' 7.341"   | Yahaya Ahmad Model Sch.         | 10° 17' 9.469"  | 11° 8' 30.982"  |
| Savannah Nur/Pri/Sch.       | 10° 16' 38.455" | 11° 11' 17.770" | 4C Academy                    | 10° 17' 50.734" | 11° 6' 8.555"   | Iqra'a Model School             | 10° 17' 13.022" | 11° 9' 29.910"  |
| Truth and Light School      | 10° 16' 28.900" | 11° 11' 20.716" | Sure Foundation Academy       | 10° 17' 51.099" | 11° 6' 13.567"  | Nuruddeen School                | 10° 17' 6.871"  | 11° 9' 49.622"  |
| Ihya'u Sunnah Nur/Pri       | 10° 16' 30.292" | 11° 11' 23.522" | Start right Intl. Academy     | 10° 17' 39.314" | 11° 6' 14.000"  | Al-Ikhlal Academy Nur/Pri       | 10° 17' 2.224"  | 11° 10' 3.752"  |
| Godly Children Intl. Sch.   | 10° 16' 21.802" | 11° 11' 21.904" | Ablaze Academy                | 10° 17' 4.788"  | 11° 6' 36.722"  | New Liji Primary School         | 10° 16' 35.128" | 11° 13' 59.352" |
| Nana maimunat Mem. Acd.     | 10° 16' 19.822" | 11° 11' 15.304" | Love Intl. School Gombe       | 10° 17' 13.400" | 11° 6' 27.582"  | Solution Model Pri School       | 10° 16' 49.896" | 11° 13' 45.420" |
| Ibn Qayyin Ihy'a'u Sunnah   | 10° 16' 18.128" | 11° 11' 19.877" | Yafi Academy                  | 10° 17' 23.454" | 11° 6' 32.077"  | King's Precious Nur/Pri         | 10° 16' 38.982" | 11° 13' 51.010" |
| Iqra Standard Academy       | 10° 16' 13.688" | 11° 11' 24.099" | Maranatha Excel Academy       | 10° 17' 31.655" | 11° 6' 38.414"  | Asas Nur/Primary School         | 10° 16' 55.620" | 11° 13' 50.646" |
| Cocin Group of School       | 10° 16' 14.886" | 11° 11' 25.898" | Solita Intl. School           | 10° 17' 35.850" | 11° 6' 36.308"  | Spring Model School             | 10° 16' 58.230" | 11° 13' 52.426" |



|                               |                 |                 |                               |                 |                 |                                 |                 |                 |
|-------------------------------|-----------------|-----------------|-------------------------------|-----------------|-----------------|---------------------------------|-----------------|-----------------|
| Onward Intl. Sch. Nur/Pri     | 10° 16' 17.200" | 11° 11' 28.155" | Anwar Ibrahim Model Sch.      | 10° 15' 33.612" | 11° 10' 4.356"  | Sabon G Nassarawo Pri. Sch.     | 10° 17' 2.688"  | 11° 12' 0.420"  |
| Perfect Stat Intergrated Sch. | 10° 16' 11.911" | 11° 11' 35.670" | Gombe Academy                 | 10° 15' 38.490" | 11° 10' 10.740" | Nassarawo Primary School        | 10° 17' 7.134"  | 11° 12' 49.360" |
| Kamara Primary School         | 10° 16' 38.010" | 11° 10' 37.302" | Zubairu Bn Auwan (AQSAT)      | 10° 15' 38.892" | 11° 10' 14.066" | Al-Ahraad College               | 10° 16' 44.226" | 11° 12' 3.168"  |
| Mu'azu Primary School         | 10° 16' 36.096" | 11° 10' 15.720" | Manarul Huda Intl. Academy    | 10° 15' 48.838" | 11° 10' 2.700"  | Imam Nafi'u Litahfizul Qur'an   | 10° 16' 53.478" | 11° 12' 4.416"  |
| Kwaine College                | 10° 17' 1.844"  | 11° 9' 58.474"  | Light Academy Gombe           | 10° 15' 53.424" | 11° 10' 13.464" | Zaidu Bn Thabit Nur/Pri         | 10° 16' 49.140" | 11° 12' 10.500" |
| Gombe International School    | 10° 16' 44.550" | 11° 10' 41.772" | Nana Khadija Model School     | 10° 16' 9.234"  | 11° 13' 6.480"  | Al Qur'an Intl. Academy         | 10° 16' 47.478" | 11° 12' 10.344" |
| ST Peter School               | 10° 16' 42.570" | 11° 10' 36.936" | Ad-Deen Kiddies School        | 10° 16' 7.860"  | 11° 12' 56.544" | Ibn Mas'ud Comm. Nur/Pri        | 10° 16' 54.158" | 11° 12' 17.214" |
| Hajarat School Gombe          | 10° 16' 23.412" | 11° 10' 34.370" | Bogo Intl. School             | 10° 15' 55.482" | 11° 12' 50.196" | Jibwis Qur'anic Nur/Pri         | 10° 16' 54.858" | 11° 12' 22.734" |
| Jaiz Nur/Primary School       | 10° 16' 23.470" | 11° 10' 20.760" | Gombe Capital Academy         | 10° 15' 32.766" | 11° 12' 18.264" | Gombe Grammar Nur/Pri           | 10° 16' 50.102" | 11° 12' 26.424" |
| Ecwa No. 1 Nur/Pri School     | 10° 16' 46.944" | 11° 10' 1.116"  | Flying Colour Intl. Academy   | 10° 15' 37.210" | 11° 11' 57.018" | Emmanuel Baptist Academy        | 10° 16' 51.414" | 11° 12' 28.884" |
| Ahajas Intergrated School     | 10° 16' 43.710" | 11° 10' 0.138"  | Attibyan Academy              | 10° 15' 34.866" | 11° 11' 52.782" | Ihya'ussunah Nur/Pri            | 10° 16' 58.164" | 11° 12' 26.898" |
| Ma'ahad Primary School        | 10° 17' 23.100" | 11° 10' 55.488" | Hamdan College Gombe          | 10° 15' 22.350" | 11° 11' 51.846" | Book Planet Nur/Pri             | 10° 17' 3.570"  | 11° 12' 28.788" |
| Al-Imam Malik Comm. Nur/Pri   | 10° 17' 30.879" | 11° 10' 26.886" | Standard Intl. School         | 10° 15' 31.266" | 11° 11' 22.896" | Bethany Intl. School            | 10° 17' 2.358"  | 11° 12' 55.356" |
| Bubayero Primary School       | 10° 17' 26.394" | 11° 10' 3.370"  | Ammar Memorial School         | 10° 15' 31.126" | 11° 11' 18.090" | Nurul Islam Nur/Pri School      | 10° 16' 17.760" | 11° 10' 16.218" |
| Jalo Waziri Primary School    | 10° 17' 32.044" | 11° 9' 45.078"  | Al-Iman Nur/Pri School        | 10° 15' 39.600" | 11° 11' 17.622" | Flying Colour Intl. Academy     | 10° 16' 10.080" | 11° 10' 24.444" |
| Alhidaya Academy              | 10° 17' 23.980" | 11° 10' 2.571"  | Victory Intl. School          | 10° 15' 35.190" | 11° 11' 17.706" | Manarussabel Intl. Academy      | 10° 16' 2.160"  | 11° 10' 19.968" |
| Sirajuddeen Nur/Pri/IsI/Sch.  | 10° 17' 28.960" | 11° 9' 58.682"  | Sheriff Academy               | 10° 15' 17.364" | 11° 11' 13.614" | Mai Takobi Model School         | 10° 15' 53.568" | 11° 10' 27.068" |
| Waziri Primary School         | 10° 15' 58.700" | 11° 12' 6.084"  | Ummulfadil Bsc. Sci Nur/Pri   | 10° 15' 53.634" | 11° 10' 50.484" | Amat Science Academy            | 10° 15' 32.370" | 11° 10' 32.244" |
| Shongo Idrisa Pri. School     | 10° 17' 29.326" | 11° 5' 0.900"   | Hijal Islamic Sci Nur/pri     | 10° 15' 32.154" | 11° 11' 5.280"  | Safsat Academy                  | 10° 15' 30.270" | 11° 10' 26.916" |
| Sheik Ibrahim Bogo Pri. Sch.  | 10° 16' 17.634" | 11° 13' 23.406" | Iqra'a Intergrated School     | 10° 15' 25.302" | 11° 11' 59.134" | Gombe Basic School              | 10° 15' 24.240" | 11° 10' 21.738" |
| Tabra Primary School          | 10° 15' 21.432" | 11° 12' 22.230" | Miftahul Khairat Sci Acd      | 10° 15' 9.156"  | 11° 10' 53.418" | Ramadan Intl. Academy           | 10° 15' 31.356" | 11° 10' 17.070" |
| Koica Model Primary School    | 10° 15' 41.124" | 11° 10' 58.626" | Sumayyat Intl. School         | 10° 15' 17.640" | 11° 10' 47.460" | Khalil Al Khusary Academy       | 10° 15' 54.198" | 11° 10' 11.226" |
| Barunde Primary School        | 10° 15' 56.280" | 11° 10' 49.746" | Aqsat Schools Nigeria         | 10° 15' 20.714" | 11° 10' 38.742" | 3Rs & Skills Success Nur/Pri    | 10° 15' 58.512" | 11° 10' 0.888"  |
| Bomala Primary School         | 10° 14' 50.868" | 11° 10' 13.944" | Al-Huda Model Nur/Pri         | 10° 15' 11.358" | 11° 10' 34.152" | Jibwis Solid Foundation Nur/Pri | 10° 15' 58.626" | 11° 10' 2.808"  |
| Hamradu Kafi Pri. School      | 10° 15' 22.981" | 11° 9' 56.190"  | Modibbo Idris Academy         | 10° 15' 7.468"  | 11° 10' 30.114" | Asas Primary School             | 10° 16' 16.356" | 11° 10' 1.200"  |
| Wuro Birije Primary School    | 10° 15' 15.474" | 11° 9' 10.014"  | Al-Iman Model School          | 10° 15' 14.724" | 11° 10' 16.152" | Modibbo Idris Academy           | 10° 16' 22.848" | 11° 10' 6.528"  |
| Wuro Juli Primary School      | 10° 15' 36.432" | 11° 8' 50.383"  | Dan Gombe Nur/Pri School      | 10° 15' 12.882" | 11° 10' 14.886" | Asma'u Memerial Academy         | 10° 16' 21.756" | 11° 9' 58.236"  |
| Arawa Primary School          | 10° 19' 11.274" | 11° 10' 33.300" | Amsaek Science & Islamic Acd. | 10° 14' 54.042" | 11° 10' 16.050" | Success Nur/Primary School      | 10° 16' 29.550" | 11° 9' 41.988"  |



|                             |                 |                 |                          |                 |                 |                                |                 |                  |
|-----------------------------|-----------------|-----------------|--------------------------|-----------------|-----------------|--------------------------------|-----------------|------------------|
| Wuro Kesa<br>Primary School | 10° 18' 46.068" | 11° 11' 26.460" | Resource Intl.<br>School | 10° 15' 11.004" | 11° 10' 20.712" | Buba Kuti<br>Primary<br>School | 10° 16' 10.560" | 11° 10' 26.5560" |
|-----------------------------|-----------------|-----------------|--------------------------|-----------------|-----------------|--------------------------------|-----------------|------------------|

Source: Fieldwork, 2019.

### 3.5 Influence of wards area and Population on Primary School Distribution

Table 4 presents the relationship between ward area, population and primary school distribution. Result of the analysis revealed that there is a strong positive correlation of 0.642 and 0.711 at  $p < 0.05$  with ward area and public primary school distribution, and population and public school distribution respectively. The result also revealed that private primary school has strong positive correlation of 0.738 at  $p < 0.01$  with ward area but showed a weak and not significant relationship with population distribution. Result of the regression analysis of the influence of population distribution and ward area on private and public school on the hand

revealed that, the model has a significant statistically F-value of 7.324 at  $p < 0.05$  and both population and ward area accounted for 64.7% to the variance in spatial distribution of primary school in the study area ( $R^2 = 0.647$ , Adjusted  $R^2 = 0.558$ ). Ward area showed a strong positive contribution of 1.598 to variation in primary school distribution. This positive contribution suggested that a unit increase in ward area would lead to an increase in primary school in the area with 1.595 (Table 5). In addition, the 64.7% contribution of Ward area and population signifies that primary school distribution in the study area is strongly determined by population distribution and ward area.

Table 4: Relationship between Primary School Distribution, Wards area and Population

|                           | Ward Area | Population |
|---------------------------|-----------|------------|
| Government Primary School | 0.642*    | 0.711*     |
| Private Primary School    | 0.738**   | 0.406      |

Source: Fieldwork, 2019.

\*\*Correlation is significant at the 0.01 level

\*Correlation is significant at the 0.05 level

Table 5: Effect of wards area and Population on Primary School Distribution

| Model        | Un-standardized Coefficients |            | Standardized Coefficients |  | T     | Sig. level |
|--------------|------------------------------|------------|---------------------------|--|-------|------------|
|              | B                            | Std. Error | Beta                      |  |       |            |
| 1 (Constant) | 1.115                        | 3.676      |                           |  | .303  | 0.769      |
| Ward Area    | 1.595                        | 0.540      | 0.658                     |  | 2.953 | 0.018      |
| Population   | 0.0002                       | 0.000      | 0.293                     |  | 1.314 | 0.225      |

Source: Fieldwork, 2019.



#### 4. Conclusion

It was concluded based on the findings of this study that about 80% of the schools are private school while 20% are government Schools. In addition, clustered pattern of spatial distribution were identified in places close to Kwami local government areas while part of Akko local government that is in the metropolis exhibit linear spatial distributions. This indicates that most of the primary

schools are located in the centre of the metropolis. It was also concluded that there is inequality and adequacy in the spatial distribution of primary schools between different wards of Gombe metropolis. Similarly, it was concluded that ward area and population distribution determine the distribution of primary school, especially public schools.

#### 5. Recommendations

Based on the findings of this research, the following recommendations were made;

- i. The government and other development actors should ensure equitable provision of schools throughout the city with effective population related planning policies. There is an urgent need for intervention of planners and the used of GIS in planning.
- ii. City planners and government to take the necessary measures to provide lands in order to construct more schools or expanding the capacity of the existing ones, and give support to the small private schools.

- iii. Government should make purposeful efforts to address the problems of inadequate and lop-sided distribution of school facilities especially the need for the construction of more schools and other ancillary facilities in places they are lacking. This would reduce overcrowding and stretching of existing ones in order to make learning conducive.

#### References

Benjamin, M, Comfort. Maiguwa and Daniel.Davoo. Dabi (2016), the challenges of Solid Waste Management in Sustainable Urban development In Gombe Metropolis, Gombe State, Nigeria Jos-Plateau Journal of Environment and Sustainable Development (JPESD) Publication of the Faculty of Environmental Science, Plateau State University, Bokkos Volume 1, No 1, October 2016.

Benjamin, M. (2019). Analysis of physicochemical parameters and spatial variation of Groundwater quality in Gombe, Gombe state Nigeria. Analysis of Physicochemical Parameters and Spatial Variation of Groundwater Quality in Gombe, Gombe State Nigeria.

Benjamin, M, Sule Samuel, Amin Dawa Comfort, Kollos N. Paul and Dayil, Donatus (2017). Land use/Land Cover Change Detection of Gombe Metropolis, Gombe State, Nigeria, Academia Journal of Environmental Science 5(6): 000-000, June 2017



- DOI: 10.15413/ajes.2017.0803 ISSN: ISSN 2315-778 ©2017 Academia Publishing,
- Bukhari. Z, Rodzi. A and Noordin A. (2010) Spatial Multi-criteria Decision Analysis for Safe School Site Selection, *International Journal of Geoinformatics Research and Development* Vol. 1, Issue
- FRN: Federal Republic of Nigeria (2007) *Official Gazette: Legal Notice on Publication of the 2006 Census Report*, 4(94) B, pp. 185-186. Lagos, Nigeria. [http://www.mapsofworld.com/lat\\_lon\\_g/nigeria-lat-long.html](http://www.mapsofworld.com/lat_lon_g/nigeria-lat-long.html) Date accessed 17/03/2020
- Inobeme, J. and Ayanwale A. Kayode: An Assessment of the Spatial Distribution of Government Secondary Schools in Zaria Area, Kaduna State. *The Information Manager*, 9 (1):1-9
- Irshad Amir Jamal (2016). Multi-Criteria GIS Analysis for School Site Selection in Gorno Badakhshan Autonomous Oblast, Tajikistan
- Olamiju, I. and J. Olujimi, 2011. Regional analysis of locations of public educational facilities in Nigeria: The Akure region experience. *Journal of Geography and Regional Planning*, 4(7): 428-442.
- Owoola, M.A (2002) Between Policy and Practice: A Spatial Decision Support System – Based Assessment of Facility Location Planning in Nigeria. Symposium of Geospatial Theory, processing and Applications.
- Umar, H. A., Muhammad, I., Ibrahim, M.J., Watirahyel, W., and Maiwada, A., (2016) Spatial Analysis of Distribution of Secondary Schools in Giwa Zone of Kaduna State, Nigeria. *International Journal of Science for Global Sustainability*. 2(4), 102-112.
- UNICEF, 2010. *United Nations immunization children emergency Fund Report*. United Nations.