A Geospatial Approach to Evaluation of Accessibility to Government Primary Schools in Ilorin West Local Government Area, Kwara State, Nigeria

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ABSTRACT
Primary education otherwise known as elementary education often in primary school is typically the first and important stage of compulsory education coming between early childhood education and secondary education. The study employed GIS techniques to show spatial distribution of primary schools and accessibility to primary education. The data used for this study were acquired from primary and secondary sources. The primary data were acquired through field review using questionnaire to obtained student settlements data and a hand – held GPS receiver to capture the coordinates of primary schools. The secondary data used for this study include a high resolution image, administrative map and school data. The data analysis was carried out using nearest neighbor and network analysis. School location, number of government primary schools and the total area in kilometer were used to determine the pattern of distribution of primary schools in the study area. Settlements, roads, schools location, number of primary schools and school enrolments were used to generate accessibility to school. A set of origin-destination (OD) matrix was performed on the network dataset to evaluate the travel distance to school by students. The result of the spatial pattern of distribution carried out using the Manhattan method of Nearest Neighbor analysis in Ilorin West Local Government shows a Random pattern of distribution with NNR of 0.93 and Z-Score of -0.80 and the network Analysis with travel distance to school of 62\% below 2km and 32\% above 2km.

Key words: Primary Education, Geospatial, Nearest Neighbor, Network Analysis, Accessibility.
1. INTRODUCTION

Education plays an important role in our society. United Nations Educational, Scientific, and Cultural Organization (UNESCO) indicate that the development of education is important to the development of economy all over the world (UNESCO 2006). World Bank opined that the GDP (Gross Domestic Product) of a country will increase 3% every year with increasing level of education. Education is a basic human right, and is indispensable for the realization of other human rights as a means for accessing broader social, economic, political and cultural benefits. Because it is transformative and empowering, education contributes to building more societies through reducing poverty and inequalities, enhancing acceptance of diversity, and promoting respect for the rule of law (World Bank 1996).

Education system is a complex organization of interactions between interdependent bodies, groups, and individuals all aimed at the achievement of educational goals. The stakeholders are usually the governments, religious groups, voluntary organizations, teachers Associations, the teachers, the parents and the general public. (Taiwo, 1980). Educational infrastructure is one essential infrastructural aspect that needs to be strenuously and consistently developed in the society. (Inobeme and Ayanwole 2009). Sitting educational facilities should be based on the principle of fairness, accessibility and economic effectiveness to every individual irrespective of economic status and geographical location. (Musa and Mohammed, 2012).

In most countries, it is compulsory for children to receive primary education although it is permissible for parents to provide it. The major goals of primary education are achieving basic literacy and numeracy among all pupils as well as establishing foundations in science, mathematics, geography, history and other social sciences. The relative priority of various areas and the methods used to them are an area of considerable political debate. (India 2009 ADG Publications).

Accessibility to education is referred to as the measure of the extent to which a country is able to satisfy household/Community demand for education. (Owolabi, 2006). The ideal goal of city government is providing services to maintain the viability of each neighborhood. (Toulmin, 1998). In both urban and rural environment, school planning is a type of facility planning, and the distribution of schools is determined by the availability and accessibility for people’s schooling. The practical importance of school location is based on the needs of the residents. The planning of the primary school is of vital importance for both urban and rural development. What keeps residents in metropolitan areas is accessibility, the potential for interaction, both social and economical, the possibility of getting from home to a multitude of destinations offering a spectrum of opportunities for work and play (Handy, 1997) cited by Lu (2004). Geurs and Ritsema (2001). Define accessibility as the extent to which the land use transport system enables individuals or goods to reach destination by means of transport mode(s), in other words, accessibility concerns both on the pattern of activities and on the links between activities.

Kwara State with the capital at Ilorin is one of the first 12 states created in May 1967 to replace the nation’s four region. Originally the State was known as West Central State but the name was changed to Kwara, a local name for the Niger River. Kwara state today has a total Landmass of 36,825 square kilometers (Kwara State Education Sector Analysis, 2nd draft March 2008). Kwara State at present has 16 local Government Area www.kwarastate.gov.ng/main/article/about-kwara-state. (Updated 3 years ago). Kwara State Economic Empowerment and Development Strategy, (KWA-SEEDS), 2000.

1.1 Aims
The aim of the study is to examine the spatial distribution of Primary school and evaluate the accessibility level to the settlements in Ilorin West Local Government.
1.2 Objectives

- To identify spatial pattern of distribution of primary schools in Ilorin west local government.
- To examine the level of accessibility in terms of distance travel to primary schools.

1.3 Study Area

Ilorin West Local Government Area of Kwara State is in the transitional zone between Northern and Southern parts of Nigeria. The Area lies within latitude 8°30'00"N and longitude 4°35'00"E. It has a total land area of 105 kilometers square and a population of 364,666 as at 2006 census (NPC 2006). The Local Government is divided into Twelve (12) electoral wards (Adewole, Ajikobi, Alanamu, Badari, Baboko, Magaji-Nngeri, Ogidi, Oko-erin, Oloje, Ojuekun/Sarumi, Ubandawaki and wara/Osin/Egbejila) and the data for this research is collected across the 12 electoral wards in the local government.

Fig.1; Ilorin West Local Government Area.

2. METHODOLOGY

2.1 Data Sources and Collection

The data used for this study were acquired from primary and secondary sources. The primary data were acquired through field survey using questionnaire to obtain student settlements data and a hand – held GPS receiver to capture the coordinates of primary schools. The secondary data used include a high resolution image, administrative map and school data. The data analysis was carried out using Nearest Neighbor Analysis and Network Analysis. School location, number of government primary schools and the total area in kilometer were used to determine the pattern of distribution of primary schools in the study area. Settlements, roads, schools location, number of primary schools and school enrolments were used to generate accessibility to school in terms of travel distance. Analyses were done in the ArcGIS environment to obtain the Network Analysis.

The data obtained from the administered questionnaire were coded and integrated in the GIS environment. The administrative map was scanned and geo referenced to WGS 1984 UTM Zone 31N. Personal geo
database, feature dataset and feature classes for existing settlements, roads and wards were created in GIS environment. The existing roads were digitized from high resolution image of the study area, settlements and wards were therefore digitized from the geo-referenced administrative map. The digitized roads were converted to network dataset upon which the network analysis is performed for distance analysis between the schools and the settlements. The data obtained from the administered questionnaire, School data and GPS point coordinates of primary schools were typed into excel spread sheet for easy integration into the GIS environment.

3. RESULTS AND DISCUSSION

3.1 Spatial Pattern of Primary Schools

The field survey and data collected reveal that there are 29 government primary schools that fall within the boundary of Ilorin West Local Government Area. The Local Government is divided into Twelve (12) electoral wards (Adewole, Ajikobi, Alanamu, Badari, Baboko, Magaji-Nnger, Ogidi, Oko-erinh, Oloje, Ojuekun/Sarumi, Ubandawaki and Wara/Osin/Egbejila) as shown in fig.2 below.

![Fig. 2; Distribution of Schools.](image)

The result of the spatial pattern of distribution of primary schools carried out in Ilorin West local government shows a randomly distributed pattern with NNR of 0.93 and Z-Score of -0.80 as shown in fig.3. This means that the distribution of schools does not follow any pattern.
Fig. 3. ANN of Primary Schools.

Given the z-score of -0.80, the pattern does not appear to be significantly different than random.

Fig. 4. Distribution of Settlements
3.2 Spatial accessibility to primary schools and travel distance analysis

Network Analysis which was performed on the network dataset in GIS environment to evaluate the accessibility pattern, nearest school to students and a set of origin destination (OD) matrix was also carried out. The road network analysis carried out between the student residents and school locations show different categories of distances students need to travel to get to their various schools with some travelling below and above 2km.

3.2.1 Travel Distance Analysis

The travel distance analysis between settlements and school locations for all the Public Primary schools in the study area reveal the mean distance of 1.88km for AbataBabaoyoLgea School, 1.36km AdetaLgea Authority School, 1.95km Ajegunle/JooroLgea, 0.75km Ali Ara Lgubea School, 2.50km Al-Adabiyah Kamaliyah School, 2.50km AldyaudeenLgea School, 3.10km 1ST Mandate Lgea School, 2.52km Mount Carmel LgeaSchool, 1.25km Wesley LgeaSchool, 2.76km ShubanLgea school, 1.35km Sheikh Alimi L.G.E.A School, 1.60km Baptist LgeaSchool,1.90km PakataLgea Authority School, 0.55km OsinAremuLgeaSchool, 0.68km Oko Erin School, 2.60km AloreLgeaSchool, 2.05km Oke-PakataLgea, 1.50km OkeAponuLgea Authority School, 1.37km Ogidi Ilorin West Lgea School, 1.40km OdotaLgea Authority School, 0.88km JooroLgeaSchool,1.10km Hi -WanuLgeaSchool, 1.25km GbagbaLgeaSchool, 2.25km GaaOdotaLgeaSchool and 0.79km BabokoLgeaSchool, 1.83km Ansarul Islam School , 1.10km AnifowosheLgeaSchool, 2.10km Federal Low Cost Ube School and 1.40km BarakatLgubeaSchool.

Overall, 1st Mandate LGEA Primary School has the highest mean distance of 3.10km and OsinAremu LGEA Primary School has the least mean distance of 0.55km.

The result of the travel distance by students from their settlements to school is shown below for all the primary schools. See figure 5-33.
Fig. 9. Al-Adabiyyah Kamaliyyah.

Fig. 10. Aldyaudeen Primary Sch.

Fig. 11. Ali-Ara Primary Sch.

Fig. 12. Alore Primary Sch.

Fig. 13. Anifowoshe Primary Sch.

Fig. 14. Ansarul Islam Primary Sch.

Fig. 15. Baboko Primary Sch.

Fig. 16. Baptist Primary Sch.
Fig. 17. Barakat Primary Sch.  
Fig. 18. Federal Low Cost Primary Sch.  
Fig. 19. GaaOdota Primary Sch.  
Fig. 20. Gbagba Primary Sch.  
Fig. 21. HiWanu Primary Sch.  
Fig. 22. Jooro Primary Sch.  
Fig. 23. Mount Camel Primary Sch.  
Fig. 24. Odota Primary Sch.
3.3 Accessibility level Assessment using UNESCO Standard

The total sample drawn across the schools in the study area for this study is one hundred (100) using total population of students in each school as a frame to determine the number of questionnaire to be administered in each school. In order to validate the result from network analysis using GIS, the accessibility level was also examined from the information obtained from the respondents. The travel distance by students from their residents to their various schools were categorized based on the UNESCO standard of 2km (walking distance to school) to determine number of students that are disadvantaged in terms of distance to schools.

Table 1: Percentage of students travelling above and below 2km walking distance in each school.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Name of schools</th>
<th>No of sample</th>
<th>Below 2km %</th>
<th>2km</th>
<th>Above 2km %</th>
<th>2km</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AbataBabaoyo LGEA</td>
<td>6</td>
<td>3</td>
<td>50</td>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>2.</td>
<td>Ajegunle/Jooro</td>
<td>2</td>
<td>2</td>
<td>100</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>Adeta A LGEA</td>
<td>5</td>
<td>3</td>
<td>60</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>4.</td>
<td>Ali-Ara Lgubea School</td>
<td>2</td>
<td>2</td>
<td>100</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>Aldyaudeen LGEA</td>
<td>2</td>
<td>1</td>
<td>50</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>6.</td>
<td>Al-Adabiyah Kamaliyah School</td>
<td>2</td>
<td>1</td>
<td>50</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>7.</td>
<td>TST Mandate LGEA</td>
<td>2</td>
<td>1</td>
<td>50</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>8.</td>
<td>Mount Camel LGEA</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>9.</td>
<td>Wesley School</td>
<td>4</td>
<td>3</td>
<td>75</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>10.</td>
<td>Shuban LGEA</td>
<td>5</td>
<td>2</td>
<td>40</td>
<td>3</td>
<td>60</td>
</tr>
<tr>
<td>11.</td>
<td>Sheikh Alimi LGEA</td>
<td>2</td>
<td>2</td>
<td>100</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>12.</td>
<td>Baptist LGEA</td>
<td>3</td>
<td>2</td>
<td>67</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>13.</td>
<td>Pakata LGEA</td>
<td>5</td>
<td>2</td>
<td>40</td>
<td>3</td>
<td>60</td>
</tr>
<tr>
<td>14.</td>
<td>Osin Aremu LGEA</td>
<td>4</td>
<td>4</td>
<td>100</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>15.</td>
<td>Oko-Erin LGEA</td>
<td>6</td>
<td>6</td>
<td>100</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>16.</td>
<td>Alore</td>
<td>3</td>
<td>2</td>
<td>67</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>17.</td>
<td>Oke-Pakata</td>
<td>4</td>
<td>1</td>
<td>25</td>
<td>3</td>
<td>75</td>
</tr>
<tr>
<td>18.</td>
<td>Oke-Apomu</td>
<td>3</td>
<td>2</td>
<td>67</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>19.</td>
<td>Ogidi LGEA</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>100</td>
</tr>
</tbody>
</table>
The result shows that out of 100 respondents, 62 students travel below 2km from home to their schools which form 62% while 32 students travel above 2km to their schools which make up 32%. This indicates that students that travel below 2km distance to school represent the highest percentage which is schooled by closeness of schools to their residents while students that travelled above 2km distance to school form the lowest percentage which could be informed by school facilities, peer group, absence of primary school, and availability of teachers as well as parental influence.

4. CONCLUSION
This study investigated the spatial distribution and accessibility in terms of travel distance to primary education in Ilorin West Local Government of Kwara State. Nearest Neighbor Analysis was performed to show the pattern of distribution of government primary schools which reveal a random pattern of distribution and Network Analysis which was performed on the network dataset generated from the digitized roads to evaluate the travel distance to school shows 62% of students travel below 2km and 32% travel above 2km.

The study has been able to demonstrate the dynamic capabilities of Geographic Information System applications in spatial distribution and accessibility to primary schools analysis in Ilorin West Local Government Area. This study will help zonal educational authorities and ministry of education to visualize the location of Primary schools on the map and guide them in sitting new schools to favor the areas that are disadvantaged and also to consider the nature of accessibility to primary schools. It is therefore recommended that Government should raise the standard of all schools in terms of structure, quality of staff, enrich curriculum and others to meet the standards of private schools in other to avoid travelling too far to access quality education at the expense of schools closer to them.

REFERENCES


