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

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ABSTRACT

The ultimate goal of most educational facilities is the ease of accessibility to users and consumers alike. Location of Primary schools should be based on factors such as proximity, population as well as economy efficiency for sustainable development. The study uses geographic information system (GIS) techniques to show spatial distribution of private primary schools and accessibility level to private primary education. The data used for this study were acquired from primary and secondary sources. The primary data were acquired through field survey using questionnaire to obtained student settlements data and a handheld Global Positioning System (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 Private primary schools and the total area in kilometer were used to determine the pattern of distribution of Private primary schools in the study area. Settlements, road network, 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 1.01 and Z-Score of 0.36 and the network analysis shows 62.7% travelling distance below 2km and 37.3% travelling below 2km to schools.
Keywords: GIS, Geospatial, Nearest Neighbour, Network Analysis, Accessibility.

I. INTRODUCTION

Primary education otherwise referred to as elementary education, which is usually received in primary school is the initial and important stage of education. Primary education is different from infants' education received by parents and post primary education. It is compulsory for children to receive primary education in most countries, although it is agreeable for children to be home schooled at this stage of education. The major aim of primary education includes accomplishment of basic numeracy and literacy among pupils as well as building justification in arithmetic, science, geography, history and social sciences. (Amir and Roghaieh, 2012). Primary Education plays an important role in the life of every citizen and the nation at large. Nigeria is one of many countries that concur to education as an undoubted means of fulfilling national development, thereby making private individuals, government and organizations to set up educational institute at all level to meet educational yearnings and wants of the citizens; although the expectation for equal distributions of educational infrastructure still remain a major challenge (Adebola, 2011).

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 practical importance of school location is based on the needs of the residents. 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 economic, the possibility of getting from home to a multitude of destinations offering a spectrum of opportunities for work and play.

In most cases, measures of accessibility include both an impedance factor, reflecting the time or cost of reaching a destination, and an attractiveness factor, reflecting the qualities of the potential destinations. (Handy and Niemeier, 1997). An important element of accessibility is choice in both destinations and modes of travel. Accessibility which also refers to the relative ease of reaching a particular area or location can be limited by various factors such as mobility, road connectivity, land use pattern, quality and affordable (cost) transport system option. (Todd Litman 2015).

There is every need for primary school to be easily accessible and affordable as it is the bedrock of any educational endeavors and considering the age of the pupils. Adequate accessibility to educational facilities has become a challenge over the years, most private schools ownership always target the populated areas for sitting their schools thereby limiting level of accessibility to those facility and making users in the rural areas travel longer distance than expected to access the schools of choice.

Accessibility with respect to distance travel by students calls for sufficient study using spatial techniques which will provide adequate and comfortable accessibility to the target population and serve as a guide for even distribution of school across the study area. It can also be noted that most primary schools in Ilorin west local government are more profit oriented instead of the public benefit because most of the schools are private owned who tend to target the populated (urban) areas for sighting the school for financial benefits. In line with this, the study evaluates the accessibility to private primary schools in Ilorin West Local Government Area, kwara State, Nigeria using GIS Approach. This project therefore aims at evaluating accessibility to private primary schools in Ilorin west local government area of Kwara State, Nigeria using GIS approach.

The objective of this research is (i) identify spatial pattern of distribution of private primary schools in Ilorin west local government. (ii) evaluate the level of accessibility in terms of distance travel to private primary schools.

STUDY AREA

Ilorin West Local Government Area (LGA) of Kwara State lies within 4°28 ′10″E, 8°34 ′28″N and 4°35 ′35″E, 8°24 ′09″N. It has a total land area of about 105 square kilometers and a population of 364,666 as at 2006 census with population density of 3501 per. square kilometer. Ilorin West serves as host for the state capital administrative headquarters with major markets such as Oja- Oba, Oja-Tuntun, and Mandate. The Local Government consist of Twelve (12) electoral wards (Adewole, Ajikobi, Alanamu, Badari, Baboko, Magaji Nngeri, Ogidi, Oko-erin,Oloje, Ojuekun/Sarumi, Ubandawaki and wara/Osin/ Egbejila) as shown in Fig. 1.

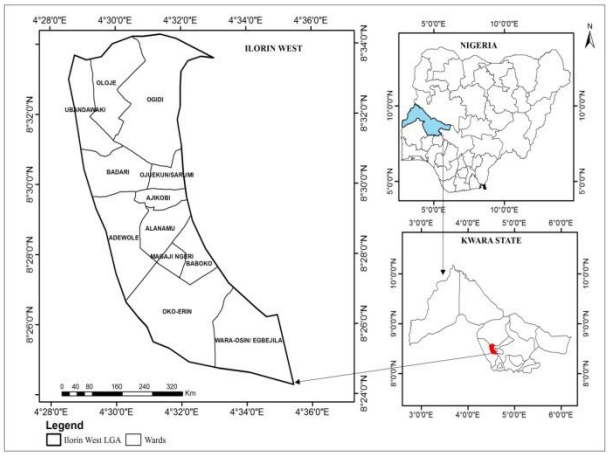

Figure1: Map of the study area.

II. METHODS AND MATERIAL

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 private primary schools and the total area in kilometer were used to determine the pattern of distribution of private

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 below and above 2km. 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 for analysis. The total sample drawn across the private schools in the study area for this study is two hundred and twenty (220) samples using total population of students in each school as a frame to determine the number of questionnaire to be administered in each school. In other 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.

III. RESULTS AND DISCUSSION

A. Spatial Distribution of Private Primary Schools

The field survey and data collected reveal that there are 94 private 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-Nngeri, Ogidi, Oko-erin, Oloje, Ojuekun/Sarumi, Ubandawaki and Wara/Osin/Egbejila) as shown in fig.2 below.

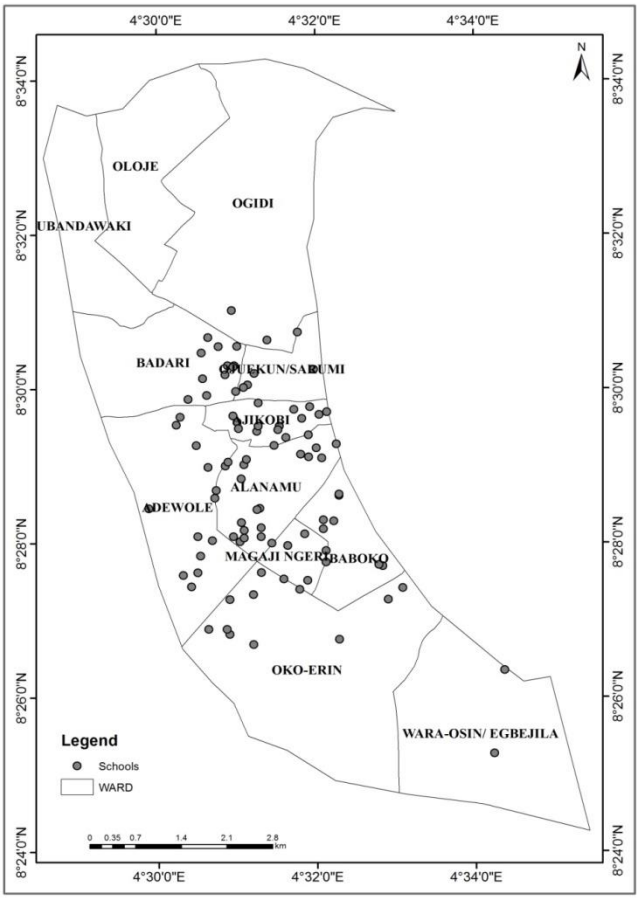

Figure 2: Spatial Distribution of Private Primary Schools.

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 1.01 and Z-Score of 0.36 as shown in fig.3 below. This means that the distribution of schools does not follow any particular pattern and d schools are distributed randomly.

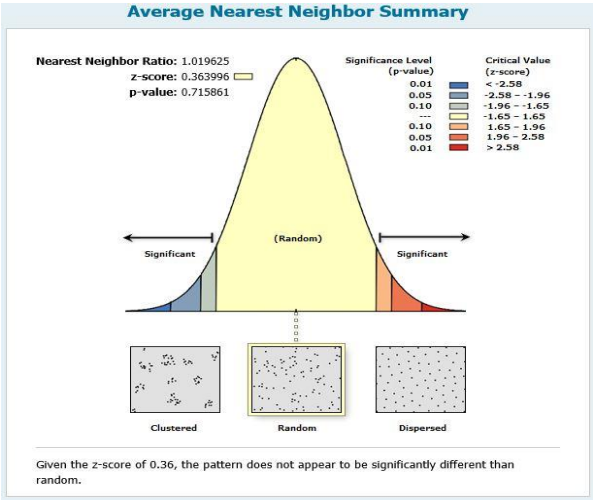

Figure.3: ANN of Private Primary Schools.

B. 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 travel to get to their various schools with some travelling below and above 2km.

C. Travel Distance Analysis

The travel distance analysis between settlements and school locations for all the Private Primary schools in the study area reveal the mean distance as shown below

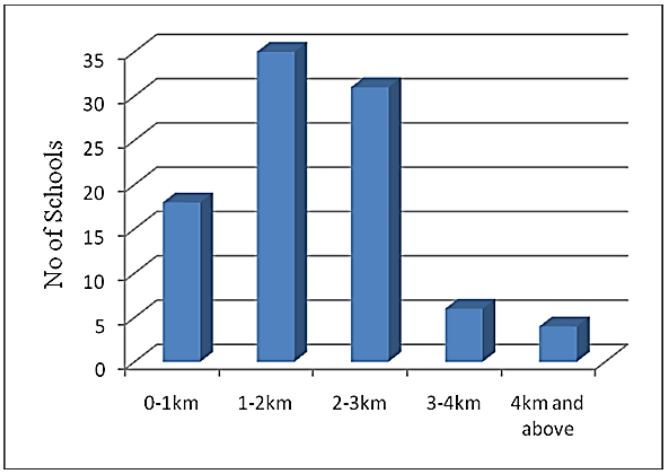

Figure.4: Bar chat representation of the Mean Travel Distance

The result shows that Out of 220 respondents, 138 students travel below 2km from home to their schools which form 62.7% of the sample while 82 students travel above 2km to their schools which make up 37.3% of the sample. This indicates that students that travel below 2km distance to school represent the highest percentage which is informed by closeness of schools to their residents while students that travelled above 2km distance to school form the lowest percentage which could be as a result of inadequate school facilities, peer group, absence of primary school in an area (rural) as well as parental influences.

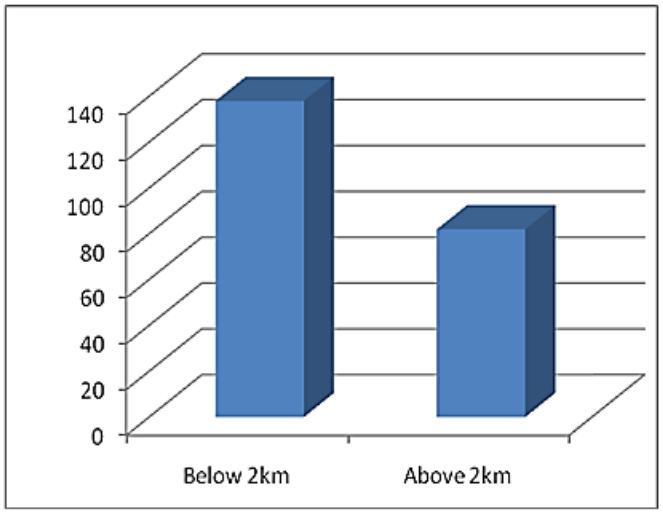

Figure.5 : Travel Distance above and below 2km

Sample maps showing travelling distance from origin (Settlement) to Destination (School) above and below 2km distance each is shown below.

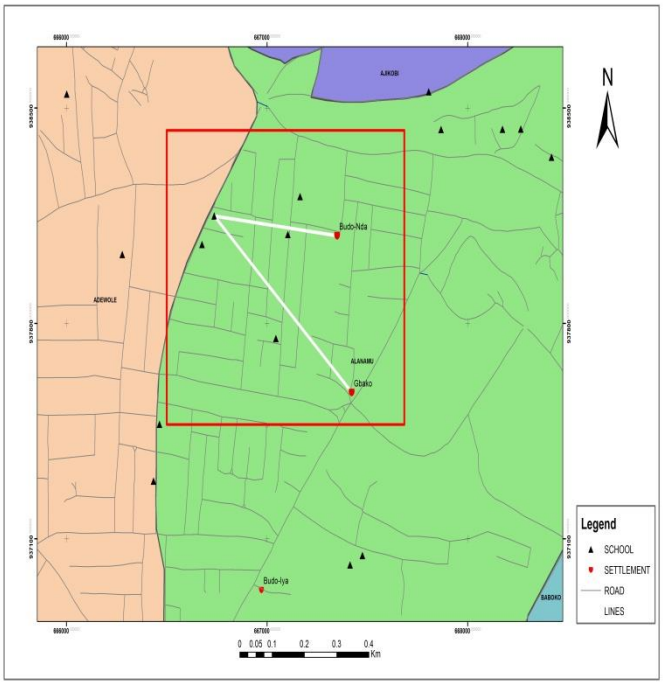

Figure 6 : Hamid Model Nur/Pri School

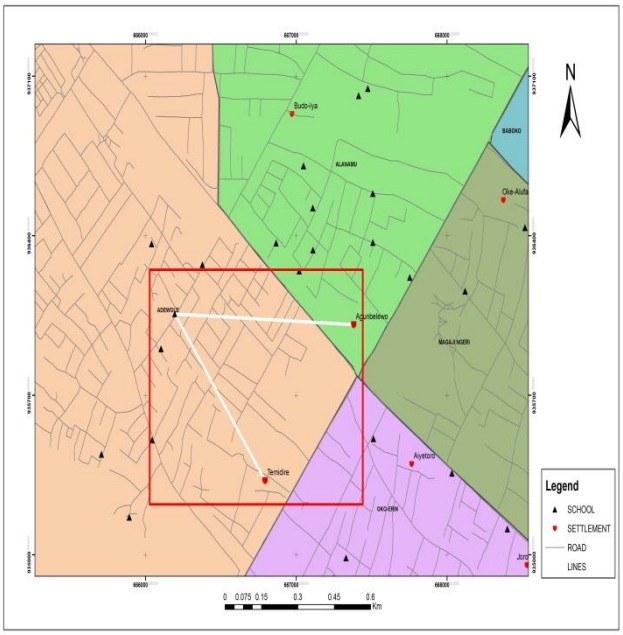

Figure.7: Oluwatoyin Nur/Pri School

IV. CONCLUSION

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 in dire need and also to consider the nature of accessibility to primary schools.

It is therefore recommended that educational stakeholders should raise the standard of all schools in terms of structure, quality of staff, enriched curriculum to meet the standards required so as to avoid travelling longer distance to access quality education at the expense of schools closer to them.

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