THE APPLICATION OF GEOGRAPHIC INFORMATION SYSTEMS TO THE SPATIAL DISTRIBUTION OF POVERTY IN EKITI STATE, NIGERIA.

By:
AYENI, Gabriel Olusegun (Ph.D),
Ekiti State Community and Social Development Agency,
Plot 20, Bank Road, Ado-Ekiti, Nigeria.
E - mail: Segunike@yahoo.com.

And

Afolabi, Funso Isola- Owa (Ph. D),
Department of Geography and Planning Science,
Ekiti State University, Ado- Ekiti, Nigeria.
E- mail: funsoafolabiowa@yahoo.com

ABSTRACT.

Every nation in the world, developed or developing has a number of the population living below the poverty line. There is the need to know who are the poor and where they are located hence, the study considered the application of Geographic Information Systems to the spatial distribution of poverty in Ekiti State for the year 2009. The Core Welfare Indicator Questionnaire of Ekiti state was subjected to factor analysis statistics. The result of the factor analysis statistics showed that access to social facilities accounted for 26.5% of explaining the poverty level of the state whilst unemployment, nutritional problems, dependency rate and wealth creation by local institutions contributed 20.8%, 17,6%,13.0% and 8.6% respectively while the remaining 13.6% was as a result of extraneous factors. The finding was that there were variations in the level of poverty amongst the various LGAs in the State. It was recommended that GIS should be applied to test-run some of the developmental policies and agenda before the actual implementation by the necessary stakeholders.

KEYWORDS: Poverty, Social facilities, Unemployment, Dependency rate, Nutritional problems, and Wealth creation.

1.0: **Introduction.**

Poverty is one of the most serious problems confronting Nigerians today. According to National Bureau of Statistics (2011), 60.9% of the Nigeria population or approximately 100 million people live in abject poverty in 2010 on less than $1 or N250 a day and that the percentage of Nigerians living in abject poverty has increased from 54% in 2004 to 61% in 2010. As a measure of poverty, the gini-coefficient, according to Razia Khan is described as a measure of income inequalities and that if the gini-coefficient is high, then, income inequality is high. The NBS report showed that in 2004, the gini-coefficient was 0.4296 whereas, in 2010, it was 0.4470, indicating that inequality increased by 4.1% nationally.

Generally, social services in Nigeria are inadequate and of poor quality. These inadequacies are especially prevalent in poor communities with least expectations in urban areas especially, State capitals. The poor are concentrated in communities, which are poorly served with limited or no health, clinics, schools or roads to reach them and electricity supply (Shamaki, 2006). Similarly, the provision of good housing has a profound influence on the accessibility to electricity supply, health, education, efficiency and well-being at any community (Onorkerhonoye, 1994). The realms of poverty are extended to more than a mere income level and include the accessibility to all forms of public services that include health, electricity, enterprises infrastructure and so on (Afolabi, 1995).

The poverty profile of Ekiti state can be succinctly captured by the reports of the Core-welfare Indicators questionnaire survey of 2009 as follows: about three-quarter (74.8%) of the population had access to water while only 46.9% had access to safe water. Almost 79.4% of the households used firewood as a source of fuel for cooking while kerosene or oil accounted for 20.6% of the usage in the state. About 53% of the households

used toilets; uncovered latrines, 30.1%; while the rest had no toilets facilities. The adult literacy rate was 69.7% which disaggregated into 71.7% and 64.7% for urban and rural areas respectively.

The survey findings reported that 90.3% had access to primary education while that of secondary school was 44.8%. Unemployment rate was 4.7% and 5.7% had access to health services while a consistent decreasing trend was observed for all parameters from access to needs, to usage and satisfaction. Furthermore, about 26.9% of the children under the age of five were stunted, 9.6% of the children were wasted and 15.5% underweight. However, this differ from urban to rural. Contribution to expenses on education was 49.2% for females and 50.8% for males but for food expenses, females accounted for 53.4% as against 46.6% of the male counterparts. All these data showed that Ekiti State is not insulated from the pangs of poverty.

All governments whether at national, state, local or even, at community levels, are concerned with the wellbeing of their people. Human being is the most important asset for any society. Decision makers are always concerned with such decision as to who needs what, where and when vis-a-vis the limited resources. Information is therefore one of the critical elements underpinning decision making to economic, social and political development. The information must be accurate and current. Geographical Information System (GIS) and other associated scientific

data capture like Satellite and Global Positioning Systems (GPS), readily provide good instruments to obtain accurate and current information especially about who are the poor and where they are located.

1.1: Poverty Indices.

Poverty like hunger, illiteracy etc are abstract concepts, which are not seen in the real world. In trying to produce maps that would support the user in decision making, we are in reality trying to map out certain indices that may point at the prevalence or otherwise of that phenomenon which the user is deciding on. The indices may include employment, health standards, education, water supply, housing and housing characteristics, electricity supply, methods of waste disposal, commercial activities, etc. These are quantitative data that need to be symbolized for comparative analysis; thus, GIS has the facilities to show the geometric constant differences with ease for better interpretation and planning.

Growth and poverty reduction have received attention in Nigeria (for example, Aigbokan, 1985, 1988; Obadan, 1997; Ogwunike and Ekpeyong, 1995; Onokhoraye, 1982; Shamaki, 2006; among several of such studies). However, none of these studies have attempted to examine the spatial distribution of poverty in Ekiti state through mapping technique. Furthermore, previous studies on Nigeria have discussed poverty profiles and various government policies in reducing poverty but failed to capture major tools for targeting the poor using mapping techniques. This paper intends to capture this aspect of neglect by previous studies. This paper therefore dwelled on making realistic geographical tool to target the poor and aim at assisting decision- making process and further act as a database for other researchers.

2.0: The Study Area.

The region under study is located between latitudes 7^0 35" and 7^0 39"north of the equator and longitudes 5^0 11" and 5^0 15" east of the Greenwich meridian. Ekiti state is

located in the tropical climate with distinct wet and dry seasons. The state lies within the equatorial climatic belt characterized by alternating tropical wet and dry seasons and classified as Koppen's Aw climatic type (Ojo, 1980).Ekiti state shares boundaries with Kwara state in the north, Kogi state in the north-east, Osun state in the west and Ondo state in the south and south-east. The state is generally an upland area. It is underlain by metamorphic rock of the basement complex rocks. It is thus an undulating surface consisting of old plains with outcrops dome rocks that may either be found in group or in isolation (Bankole, 2006;8).These groups of rocks are found in Ado, Ikere, Efon, Okemesi, Ogotun areas of the state. These rocks contains minerals like gold in Ijero, Okemesi, Ikere (Afolabi, 2008; 100).Clay soils are abundant in the state, thus, Ire Ekiti in Oye LGA is famous for the production of clay blocks that do not require artificial coloration.

The state benefits from the double maxima of rainfalls. The rainy seasons usually commence from April to October while the dry seasons resume from late october or at times from November to March with temperature ranges of between 21^0c and 28^0c. The southern part of the state like Ikere,

Emure, Ise/Orun, Ekiti South-west, Ekiti west and part of Ijero, Gbonyin local government areas experience typical tropical rainforest while the guinea savanna forest are found in Moba, Ilejemeje, Ikole and Ekiti east local government areas.

3.0: **Materials and Methods.**

The instrument used in this study is the questionnaire schedule. The questionnaire was designed to obtain information about the respondent's inaccessibility to social infrastructure as essentials of life. In carrying out this research work, the administrative map of the state was collected from the ministry of Lands and Housing, Ado Ekiti. The map contains the sixteen Local Government Areas (LGAs) that make up the State. The map was

digitized and exported to Arc GIS platform, hence, represented the spatial data. Raster-vector operation was then performed through geo-referencing of the raster dataset using UTM projection (Universal Transverse Mercator) zone 32s.

Systematic random sampling technique was adopted to select the household in the selected communities that make up each of the LGAs. A sum of five hundred copies of the questionnaire were administered in each LGAs making a total of 8,000 copies. In each LGA, 50 copies of the questionnaire were administered in those communities that were purposely selected. The data obtained from the completed and retrieved questionnaires were analyzed using Microsoft SPSS version 10.0 and the results were subjected to factor analysis to partition the experimental variables into factors that actually influence poverty.

Hypothesis Tested.

H_o: There was no spatial variation in the distribution of poverty in the State.
H_i: There was spatial variation in the distribution of poverty in the State.

4.0: Results and Discussions.

Factor analysis here, helps to summarise interrelationships and establish levels of variances in decision variables as they influence a given phenomenon - poverty. About 32 poverty variables were considered in each of the 16 LGAs. After a careful examination of the results of orthogonal and oblique rotations, the quartimax rotation tends to minimize the number of factors used to explain each variable and therefore, considered most appropriate for interpretation. The following five factor groupings were obtained: Access to social facilities (Factor 1) contributed 26.52% to poverty level, Unemployment, Nutritional problems, Dependency rate and Wealth creation by local institutions contributed 20.77%,
17.49%, 13.00% and 8.63% respectively. The five factors contributed a total of 86.41%,

while the remaining 13.59% was accounted for by extraneous factors, which are unique to the variables among others.
Each of these poverty factors was used as input to obtain the poverty maps as follows:
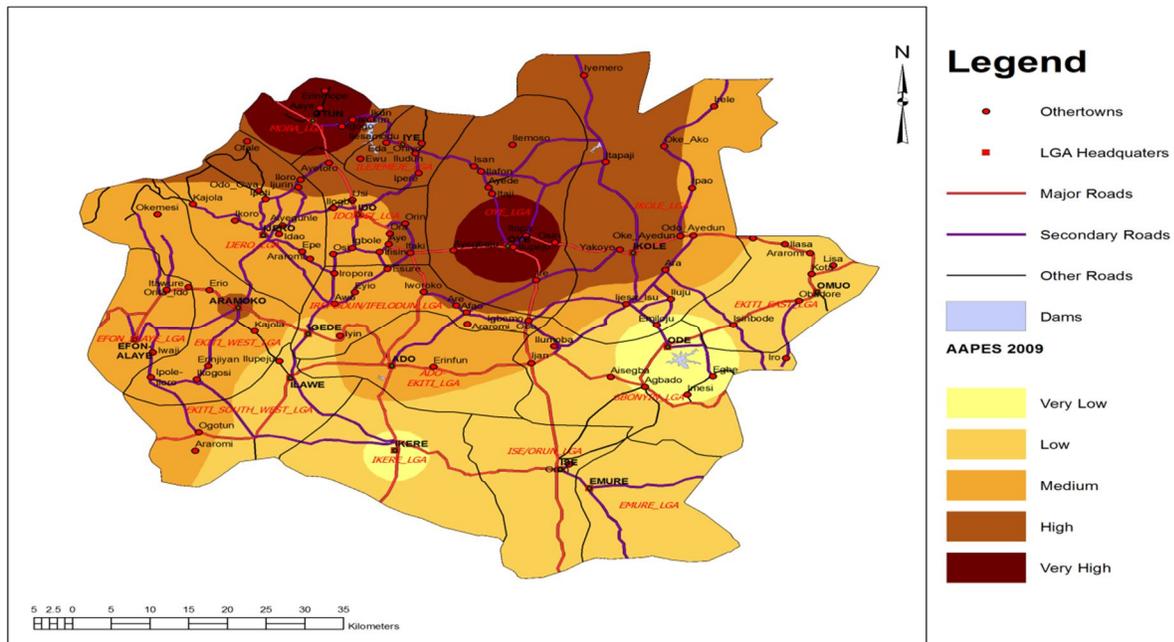
4.1: Social facilities.

Access to social facilities was very high in Ado, Ikere and part of Ekiti South West LGAs. This is explained by the presence of both the federal, state and local government in Ado and Ikere. The two LGAs could boast of the presence of tertiary institutions. Development from Ado no doubt has a spill-over effects to nearly all adjourning LGAs. Ekiti-south west, Ido/Osi, Ikere, Ekiti West enjoyed relatively medium supply of social facilities while Moba, Ilejemeje and the northern parts of Ikole LGAs have low access and finally, the eastern fringes of Gbonyin, Ekiti East, Emure areas experience very low provision of social facilities. These areas are populated mainly by migrant tenants in the various cocoa farmsteads. There are little or no access to primary and secondary education, access roads, potable water and necessary health facilities. They travel to the LGA headquarters to access these facilities.

Fig. 4.1: Social Facilities, 2009.
Source: GIS Output.

4.2: Unemployment Rate.

Whilst Ikole, Ekiti East, Gbonyin, Ise/Orun, Emure and Efon Alaaye, Moba LGAs recorded least rate of unemplyment, Ilejemeje, Ijero, Ekiti west recorded medium level of unemplyment. These areas have forest resources like cocoa, coffee, timber etc to engage both migrant tenant farmers from other parts of the country and the indigenes of the state. Ado and Ekiti south west recorded the highest level of unemployment; perhaps, due to migration from other parts of the state to the state capital by different levels of job seekers.

Fig. 4.2: Unemployment Rate, 2009.
Source: GIS Output.

4.3: Nutritional Problems.

    Nutritional problems are more severe in Ilejemeje, Ekiti South West and Ijero LGAs. it is a fact that most farmers sell the best of their farm produce whilst they eat the remnants- poverty being epitomised. There were more stunted and malnourished children while the State capital and Ikere LGA enjoyed high nutritional value. This can be attributed to the standard of living and access to social infrastructure. The level of unemployment here is low, hence, there income can relatively afford them better nutritional value. Nutritional problem is of moderate level relatively in Ikole, Ise/Orun, Emure, Ekiti East and Oye LGAs.
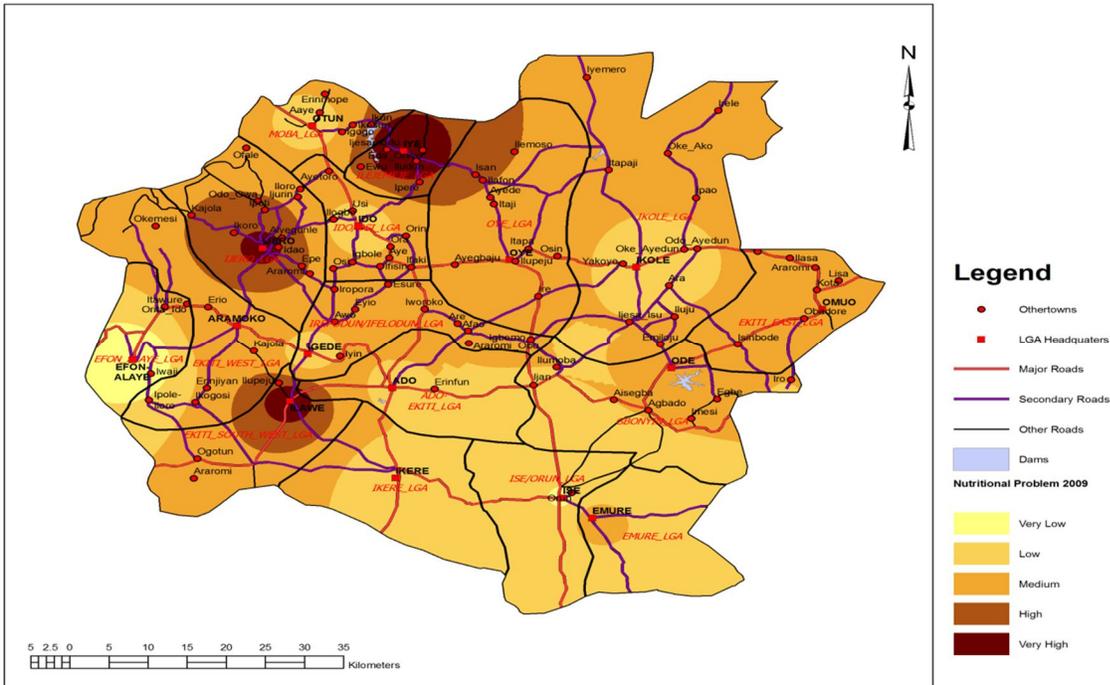
.

Fig. 4.3:Nutritional Problems, 2009.
Source: GIS Output.

4.4: Dependency Rate.

Dependency rate remain high in Ikere, Oye, Efon Alaaye and Irepodun/Ifelodun LGAs but ralatively at medium level in Ado, Ido/Osi, Moba and Emure LGAs. The case of Ado LGA can be explained by the fact that as the State capital, many incoming migrants would depend on some relations who are already resident in the town. They therefore added to the number of mouths that would be fed hence, increasing level of dependency. Social infrastructure would be stretched beyond limit with time if government does not increase their provisions. Ekiti East, Gbonyin and Ikole LGAs have relatively low dependency rate.
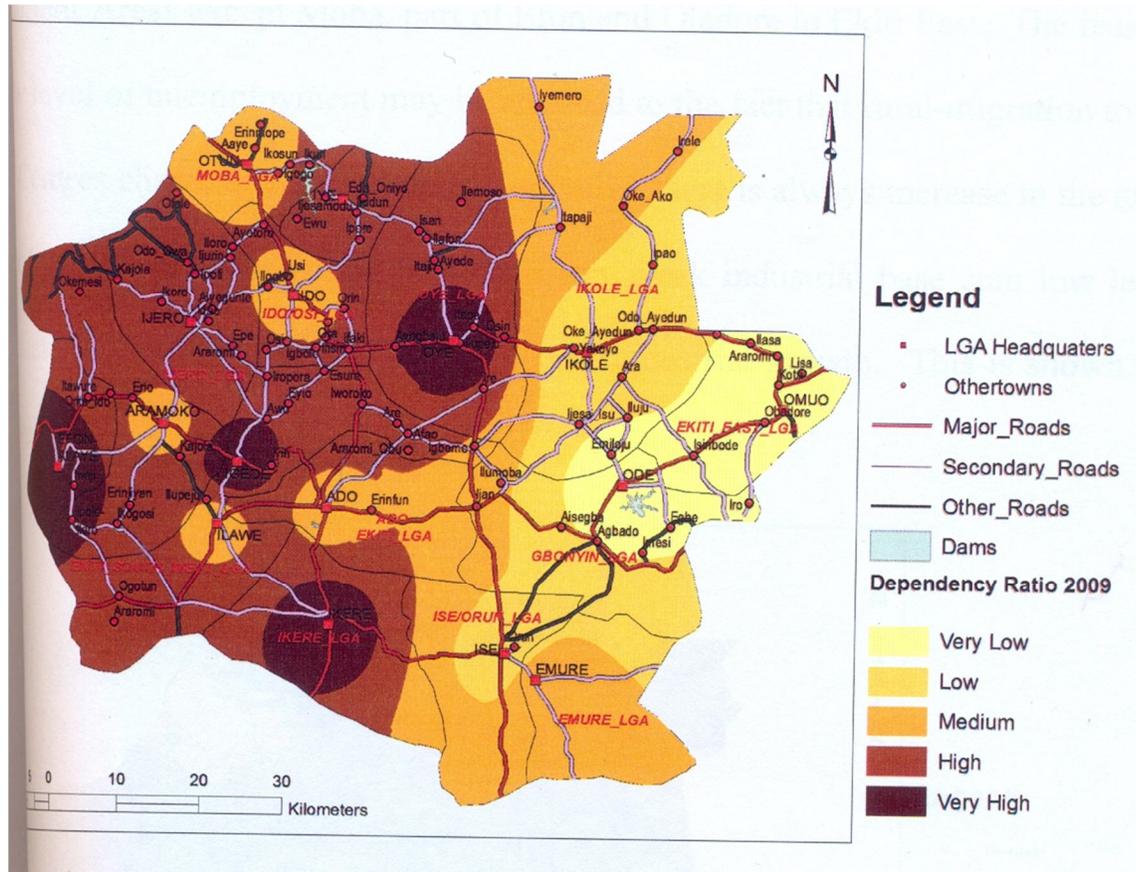
Fig. 4.4: Dependency Rate, 2009.
Source: GIS Output.

5.5: Wealth Creation.

Assets created was very high in Ado and the headquarter of Gbonyin LGA. This was explained the awareness created to form series of cooperative societies so as to have access to combined loans and other benefits from the State government like capacity building social cohesion. Although, there have been a lot of improvement in other parts of the State, but the level has not been matched by Emure, Ekiti- East and Efon Alaaye LGAs.
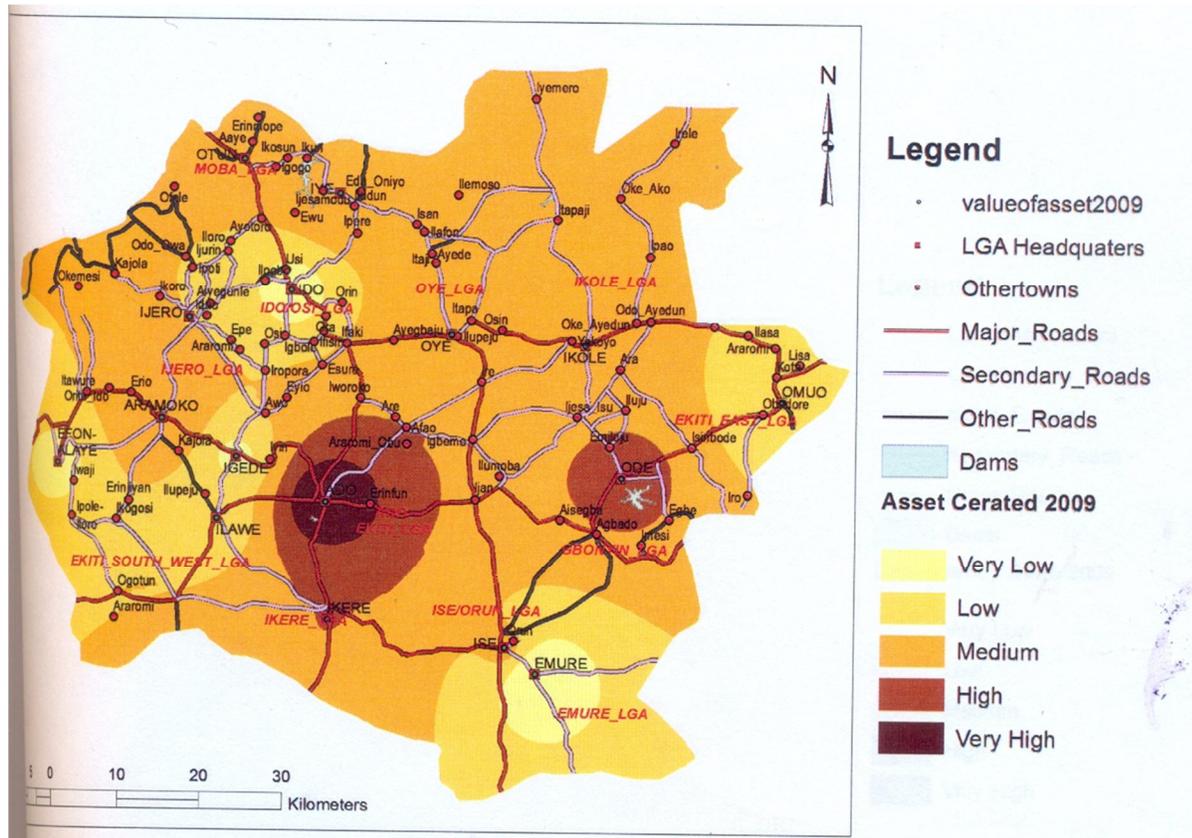
Fig. 5.5:Assets Created by Local Institution, 2009.
Source: GIS Output.

5.0: Testing of Hypothesis.

To test the hypothesis that there was no variation in the spatial distribution of poverty in the State, The analysis of variance method (ANOVA) was used. Table 1.1 provided answer to this. The alpha level was set at 0.05 or 5% level. Some poverty variables were considered as follows: spatial distribution of educational facilities was said to be significant at almost 100% confident level ($p < 0.001$) while the distribution of water was equally significant at almost 100% confidence level ($p< 0.001$).The spatial distribution of roads was significant at 95% confidence level ($p< 0.010$) while that of electricity was significant at 98.5% confidence level ($p< 0.015$) and the distribution of health facilities was significant at almost 100% confidence level ($p< 0.001$). The interpretation of this result is that the Null hypothesis (Ho): that there was no variation in the distribution of spatial poverty in the State was rejected for the alternative hypothesis (Hi); that, there was a significant variation in the spatial poverty distribution in the State.

Table 4.1: Analysis of Variance (ANOVA).

Poverty Variables	Source of Variance	Sum of Squares	df	Mean Square	F	Sig.
Educational facilities	Between Groups	61.016	2	30.58	32.545	0.000
	Within Groups	751.797	802	0.937		
	Total	812.813	804			
Water facilities	Between Groups	113.785	2	56.892	58.492	0.000
	Within Groups	780.071	802	0.973		
	Total	893.856	804			
Road Provision	Between Groups	4.653	2	2.326	7.501	0.001
	Within Groups	248.746	802	0.310		
	Total	253.399	804			
Electricity distribution	Between Groups	6.550	2	3.275	1.868	0.015
	Within Groups	1406.349	802	1.754		
	Total	1412.899	804			
Health facilities	Between Groups	153.000	2	76.500	65.481	0.000
	Within Groups	936.955	802	1.1168		
	Total	1089.955	804			

Source: Data Analysis (Computer Output, SPSS), 2010.

6.0: Conclusion.

The results show that poverty vary significantly across space in Ekiti state. The poor population has less access if any, to infrastructural facilities, like education, health, transportation facilities and the likes. Dependency rate is high in most rural areas and assets created by Community Development Associations are not very strong to withstand poverty crunches. A spatial consideration of poverty as against resource allocation/ input will go a long way in improving accessibility of the poor to resources and infrastructure for poverty reduction or alleviation. The government is encouraged to benefit from the immense

opportunities in the GIS platform to pursue actualisation of its development goals.
It is however concluded that state systems both economy and governance run on spatial data platforms in order to monitor the performance of government policies and goal setting.

REFERENCES.

Afolabi, F.I. (1995). *Women's recreation centres in Ado - Ekiti, Nigeria*. Hope Paper Mill

    (Nig) ltd, Ado - Ekiti, Nigeria, pp. 1-49.

Afolabi, F.I. (2008). *Entrepreneurship development*: Potentials, Practices and Problems. Solar

Flares, Lagos, Nigeria, pp.209-230.

Ayeni, G.O. & Bankole, B.O. (2015). Poverty Mapping: Potential application in the analysis   of poverty in Ekiti- State, Nigeria. *International Journal of Innovative Research and Advanced Studies (IJIRAS).* ISSN :2394 - 4404, (Online) Vol. 2, Issue 6, 2015.

Ayeni, G.O. & Odeyemi, C.A. (2015). Community- Driven Development Approach: A development paradigm shift in poverty reduction programme. *International Journal of Innovative Research and Advanced Studies (IJIRAS).* ISSN: 2394-4404. (Online) Vol.   2, Issue 8, 2015.

Ian Heywood, et al. (2011). *An introduction to Geographical Information Systems*, 4th   edition. Graficas Estella, Navarra, Spain, pp. 174-225.

Obadan, M.I. (1997). Analytical framework for poverty reduction: Issue of Economic growth versus other strategies. *Proceedings of the 1997 annual conference of the Nigeria Economic Society, Ibadan.*

Ojo, O. (1980). *Climate of Africa*. Heinemam Ibadan.

Onorkhoraye, A. G. (1982). Public service in Nigeria Urban Areas: A case study of Ilorin. *Nigeria Institute of Social and Economic research, Ibadan*.

Omole, F. K. (2001). Basic Issues in Housing Development. Femo Publications, Ondo,   Nigeria.

 Shamaki, M. A. & Dankani, I.M. (2010). An overview of poverty and access to electricity supply in Sokoto urban area, Nigeria. *Conference proceedings on contemporary   issues in infrastructural development and management in Nigeria.* JAS ventures   (Nigeria) Anyigba, Kogi State.

APPENDIX I
Total Variance Explained (Initial Eigen values)
Total Variance Explained

Component	Initial Eigen values		
	Total	% of Variance	Cumulative %
1	3.758	31.316	31.316
2	2.585	21.544	52.860
3	1.826	15.216	68.076
4	1.171	9.758	77.834
5	.756	6.300	84.134
6	.646	5.386	89.520
7	.376	3.135	92.654
8	.341	2.842	95.496
9	.235	1.960	97.456
10	.210	1.749	99.205
11	7.442E-02	.620	99.825
12	2.102E-02	.175	100.000

Extraction Method: Principal Component Analysis.

Field work, 2012.