A Geographic Information System Based
Approach for High Resolution Poverty Map Production

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ABSTRACT

INTRODUCTION

 Many countries of the world are confronted with widespread poverty and have limited resources for poverty alleviation. To minimize the error of inclusion and exclusion, policymakers must have accurate and detail poverty maps that allow identification of where development lags and where investments in infrastructure and service could have the greatest impact.

RESEARCH PROBLEM

 Many mapping techniques have been proposed for the production of poverty maps [Bigman and Fofack 2000; Bigman, Dercon, Guillaume and Lamotte 2000]. Unfortunately, none have given consideration to the use of the isoline mappingtechnique.

A study carried out in 2005 revealed the fact that, poverty is widespread in Akwa Ibom State [Ekpo and Uwatt 2005]. This study was based on a state-wide household survey funded by the State Government.

Unfortunately, the outcome of the study was not presented in map form. Also, the result of the survey was aggregated on the basis of Local Government Areas instead of village communities.

In this study, the case of Akwa Ibom State, Nigeria is used to illustrate the fact that, high resolution poverty map [i.e. a map that shows details of how the incidence of poverty varies within an area] can be produced from sample household surveys if the data are aggregated on village community basis.

LOCATION OF STUDY AREA

Akwa Ibom State lies between latitude 4^030^0 and 5^030^0N and long 7^030^0 and 8^015^0E.
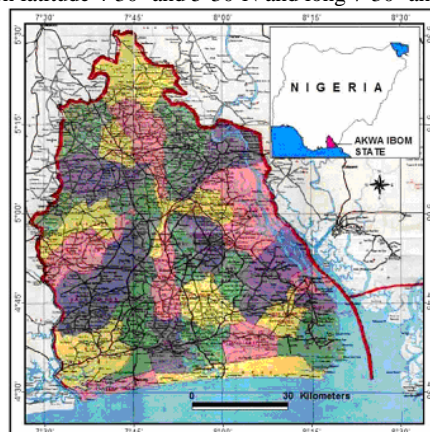
Figure 1: Location of Akwa Ibom State, Nigeria.

THEORETICAL CONSIDERATION

It is evident from literature that, most poverty maps are produced using the choropleth mapping technique. One of the disadvantages of this mapping technique is the confusion of thought that it gives rise to. There is always the possibility that uniform shading will be taken to imply uniformity of distribution over an area [Robinson, Morrison, Muehrcke, Kimerling, and Guptill 1995].
In this study, the use of isolines is proposed. Contrary to choropleth maps, isoline maps are based on the assumption that, the phenomenon represented has a continuous distribution and smoothly changes in value in all directions of the plane.

Moreover, if the administrative map of an area is superimposed on poverty map drawn with isolines, a particular district/region could be subdivided by many isolines representing different levels of poverty. This counters the impression of uniform distribution usually given by choropleth maps [Robinson, Morrison, Muehrcke, Kimerling, and Guptill 1995].
Associated with isoline mapping technique is interpolation. There are many interpolation schemes [Chang 2000]. In this study, the inverse distance weighted interpolation scheme is used. It is a local method that assumes that the unknown value of a point is influenced more by nearby control points than those further away.
Considering the indicators of poverty, studies have shown that villages/communities lying close together have more homogeneous socio-economic characteristics and the population is subject to the same agroclimatic and geographic conditions[Bigman and Fofack 2000; Bigman, Dercon, Guillaume and Lamotte 2000]

MATERIALS AND METHODS
Data acquisition and Mapping
The data used in this study were those that resulted from the household survey carried out in 2005.
The household survey and computations were carried out using measures and approaches recommended and utilized by World Bank (Ekpo and Uwatt 2005). The data was linked to an existing database of the basemap. To create the isoline maps, the data was converted into grids and the grids interpolated using Arcview 3.2a GIS software with Spatial Analyst extension.

Analysis of Results
Figure 2 is a poverty map produced from the data. This map shows the spatial distribution of the poor in Akwa Ibom State. The choropleth map does not show variation within the administrative units. This makes targeting the poor difficult.
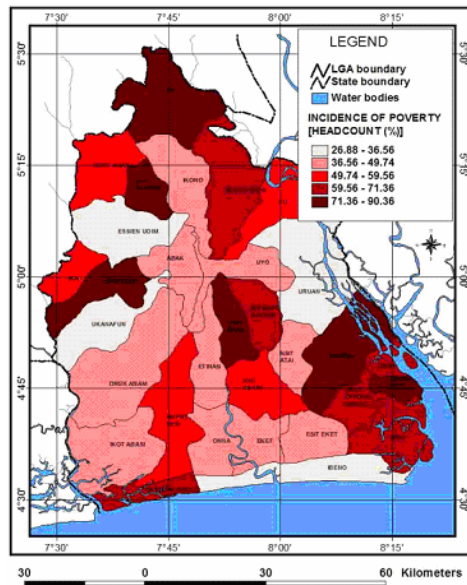
Figure 2: Akwa Ibom State: Incidence of Poverty.

Figure 3 shows the incidence of poverty using isolines. This map reveals the possible variation in the incidence of poverty within the different administrative units.
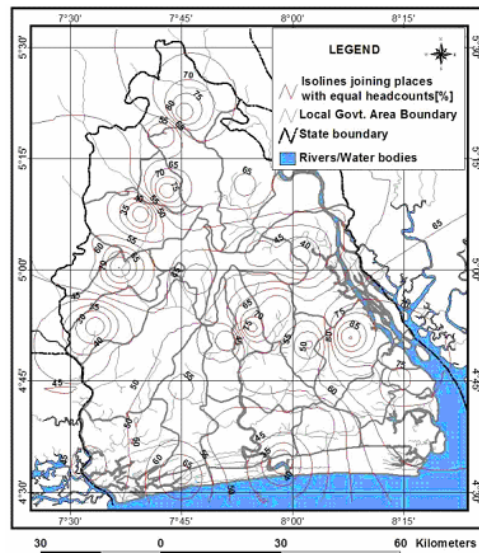

Figure 3: Isoline Map showing Poverty Profile in Akwa Ibom State.

Figure 4 is a refinement of figure 3. The areas between isolines are shaded based on a classification system. Here six classes of poverty are depicted. This number of classes can be reduced or increased depending on the resolution required.
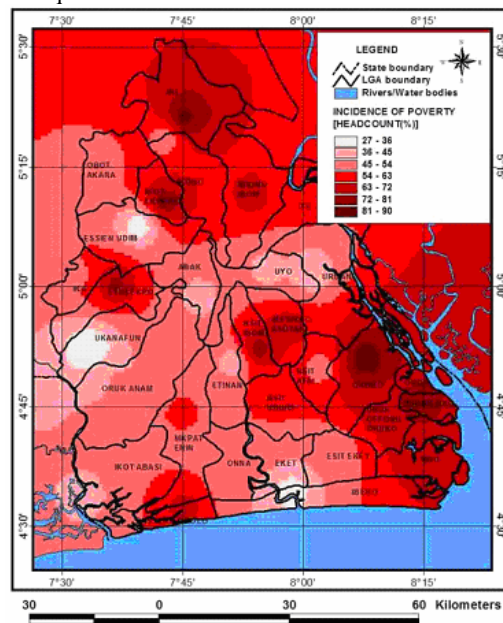

Figure 4: Akwa Ibom State: Incidence of Poverty.

Figure 5 and 6 are the result of overlay analysis to gather more information about the incidence of poverty in the area. The maps were obtained by zooming into part of the state, after overlaying the poverty map on the settlement map. With these maps, decision and policy makers can identify

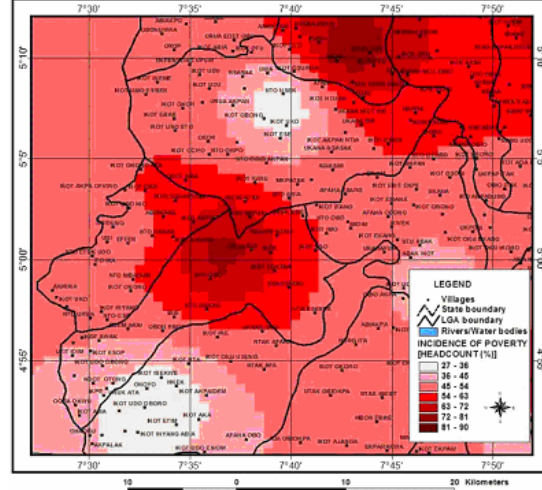communities for a particular poverty alleviation program.

Figure 5: Part of Akwa Ibom State showing incidence of Poverty and Villages in the Area.
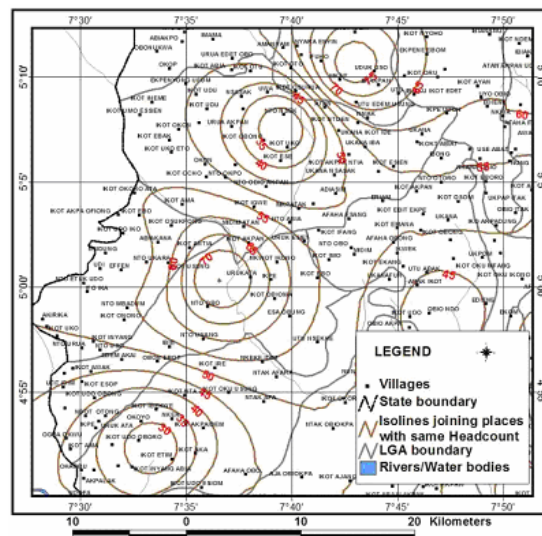

Figure 6: Akwa Ibom State: Incidence of Poverty and Locations of Villages.

Furthermore, since poverty in many communities is directly related to the absence or poor conditions of infrastructures and services like roads, transportation, water, electricity, health care, education and

marketplace, areas lagging behind can be identified by overlaying poverty maps on maps showing the distribution of these infrastructures.

Accuracy Assessment

The accuracy of the poverty maps would have been higher if household survey data was aggregated at village level. The data poor areas created as a result of sampling households in few village communities would have been taken care of by the interpolation scheme used.

CONCLUSION

This study shows that high resolution poverty maps can be constructed using isoline mapping technique and data aggregated at a village community level.

REFERENCES

Bigman, D., and Fofack, H., 2000 Geographical Targeting for Poverty Alleviation: An Introduction to the Special Issue. The World Bank Economic Review.ISSN 02586770, 14(1), pp129-145.

Bigman, D., Dercon, S., Guillaume, D., and Lambotte, M., 2000 Community Targeting for Poverty Reduction in Burkina Faso. The World Bank Economic Review.ISSN 02586770, 14(1),

pp167-193.

Chang, K., 2000 Introduction to Geographical Information Systems. McGraw-Hill Higher Education. ISBN 0072382694, PP 246-266.

Ekpo, A.H., and Uwatt,B. U., 2005, Akwa Ibom state of Nigeria: Poverty Profile and Economic Transformation. Foundation for Economic Research and Training, Uyo. ISBN 9783816403,

pp 60-96.

Robinson, A. H., Morrison, J. L., Muehrcke, P. C., Kimerling, A. J., and Guptill, S. C., 1995 Elements of Cartography. John Wiley & Sons, INC, New York. ISBN O471555797, PP 501-526.