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EVALUATION OF LAND USE CHANGES IN OWERRI MUNICIPALITY NIGERIA BETWEEN 1994 AND 2014

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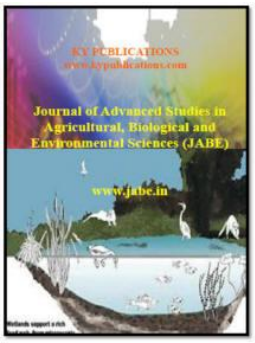

ABSTRACT

Urban Land Use changes in Owerri Municipality between 1994, 2004 and 2014 were evaluated. The procedures used were through Remote sensing "ENVI" and GIS "Arch GIS 9.3" technology. Landsat images of ETM 30 by 30m resolution of 1994, 2004 and 2014 were obtained from Landsat Global Land-use facility and Nigeria copy (base map) of State, Local Government and town maps, to demarcate six land use types (Built-up area, vegetation, farmland, forest, open space and water body). Results obtained indicate that from 1994 to 2004, Built up area and farmland increased by 23.4% and 27.0%, respectively while forest, open space, vegetation and water body decreased by 48.0%, 13.7%, 6.3%, and 25.0% in that order. Similarly, the analysis of change detection across 2004 to 2014 show that Built-up area and farmland maintained their increase by 92.8% and 33.0% respectively, while forest, open space, vegetation and water body decreased by 37.5%, 74.4%, 77.8% and 3.4%, respectively. The net negative impact of these changes should on the urban ecology should be controlled

Key words: Land use, Owerri Municipality, Remote sensing and GIS

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INTRODUCTION

Human intervention in Urban land introduces changes on land use which always bring about alterations in the relationships among land factors. This alterations are local and place specific and occur incrementally in ways that often escape our attention (De – Sherbinin, 2002). Land-use change over time is an inevitable phenomenon occurring globally due to both temporary and permanent interest of the inhabitants in a particular area (Eludoyin, 2010). This transformation could be either minor or major but the basic fact remains that changes continually take place especially in urban areas. Such changes also tend to originate from the existing areas of the same class and many models take advantage of this features to predict future change.

The Owerri Municipal Council was formally the headquarters of old Owerri Local Government Area of Imo State before it became a Municipal Council in 1996.

The Council has an Urban setting and is the landlord to most government ministries, departments and agencies. It is also the epicenter of all socio-economic and religious activities in the State.

Demography and fast urbanization of Owerri Municipality are now bringing profound social and ecological changes to the extent that attainment of healthy environment is becoming more and more difficult. This has become a major concern to both the State Government and General Public. The environmental challenges consequent upon this urban land use dynamics are yet to be fully identified, understood and evaluated for effective preventive and mitigation measures to be adopted. Lack of such vital information creates serious

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problems to the city planners and on the urban terrestrial and aquatic ecology. Land use change has significant impact on the feedback of hydro-climatic processes on the surface hydrology (Odunuga and Oyebande, 2007). Understanding of past land use practices and current land use pattern, and projection of future land use as affected by various factors such as population size and distribution, economic development and technology are used to determine the effects of land use on the earth system (Adeniyi and Omojola, 1999). This article examines the Landuse, changes that have take place in Owerri Municipality between 1994 and 2014.

METHODLOGY

The Study Area

Owerri Municipality is the capital of Imo State, Nigeria and it falls between latitudes 5^0 23' and 5^0 25' N, and longitudes 7^0 2' and 14^0 33' E (Imo State Government, 1984) (Figure 1). The geology of the area has been identified as Benin Formation (Ofomata, 1975). (According to Reyment (1965), the sediments consist of yellow and white sands with pebble levels, and the sands are sometimes cross-bedded.) The soil types consist of ferrealitic soils (ferrealso|s) characterized by good drainage.

The Municipal Council experiences tropical climate with two main regimes – a dry season (November to March and a wet season (April to November). Rainfall figures for rainy season ranges from 2000 to 2200mm per month while the driest months have less than 23mm rainfall per month. The mean daily maximum temperatures is usually about 27^0C throughout the year (Unamma *et al*., 1985). The most important vegetation in the area is the tropical rainforest (Igbokwe *et al*., 1982), but this vegetation has long been disturbed and almost dominated by human interference. Owerri Municipality has a population of 127,213 (National Population Commission, 2006). The dominant land use activities are buildings or built-up area for infrastructural development.

4.3 Data Collection

Remote Sensing "ENVI" and Geographic Information System "ArcGIS 9.3" were used in the production of land use maps of 1994, 2004 and 2014. The landsat Images of ETM 30 by 30m resolution of 1994, 2004 and 2014 were obtained from Landsat Global Land-Use and Land-Cover facility (www.glfc.com) and the Nigerian copy (base map) of State, Local Government Area and town maps which was delineated to Owerri Municipal Local Government Area of Imo State was got from the Regional Centre for Training in Aerospace Survey (RECTAS) at Ile-Ife, Osun State, Nigeria. The Landsat images ETM+ at band 2, 3, 4 for the years 1994, 2004 and 2014 respectively were made to pass through processes of image composition and enhancement, geo-referencing, region of interest selection, digitizing and image classification. A supervised classification was performed on colour composites of band 2, 3 and 4 into the following Land-Use classes; Built-up areas, Vegetation, Forest, Open Spaces, Farm Lands and water bodies.

Thus, the landsat images were composited, designed and classified and post classified using supervised minimum distance method. The post classification analyses carried out includes; **Confusion Matrixes**- for accuracy assessment in kappa coefficient, Class Statistics- to observe the mass class conformation per year calculated in square kilometer, **Change Detection**- to detect changes of mass class between 1994-2004 and 2004-2014. Subsequently, the classified imageries of 1994, 2004 and 2014 were **Vectorised**- conversion of mass class to vector for easy enhancement in GIS environment and exported to ArcGIS 9.3 where their respective mass class maps were produced.

The Land-Use classification class statistics for each year in (km^2) was copied to Microsoft office where table and charts were created. Also, the vectorised images of each year was exported to ArcGIS and clipped (clip analysis) with the study area boundary. The resultants were categorized in the ArcGIS environment using the symbiological property method as shown below in figure 2.

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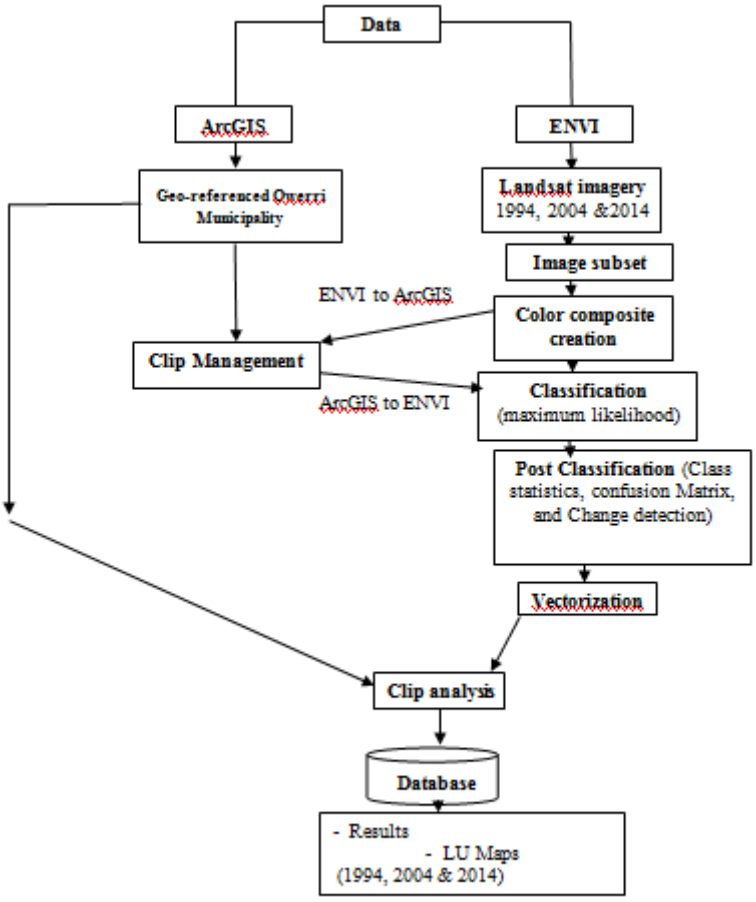

Fig 2 Cartographic model of the study

RESULTS AND DISCUSSION

The mass class statistics and percentage occurrence observed in 1994, 2004 and 2014 land use types. The land use areas were grouped into built-up area, farmland, open space, forest, light vegetation and water bodies. The 1994 mass class shows that built-up area and vegetation were the dominant land use types covering 27.3% and 33.2%, respectively. In 2004, the built-up area dominated with 33.7% followed by vegetation with 31.1%, while others were farmland (16.2%), Forest (5.5%), open space (10.9%) and water body (2.6%). The analysis further indicates that in 2014, land use occurrences for built-up area, farmland, forest, open space, vegetation and water body were 65.0%, 21.6%, 3.4%, 6.9%, 2.8% and 0.3% in that order.

The overall results show that built-up area and farmlands increased in area from 1994 to 2014 while other activities decreased (figure 2). These changes are also shown in 1994, 2004 and 2014 mass classification of the study area in figures 3, 4 and 5 respectively.

The uncontrolled increase in built-up area and farmland, and decrease in vegetation implied that more impervious area were being developed and more soils exposed to erosion. The impervious area will cause less infiltration of water and more runoff. This can result to urban flood and transportation of waste and soil particles to the river. Similarly, when vegetation is removed, the soil is exposed to direct impact of rainfall which can cause detachment and transport of sediments from the farmland to the river where water quality is affected.

The open space maintained its area (7.3km^2) between 1994 and 2004. By 2014, it decreased to 1.6km^2 showing a difference of -4.7km^2 and a percentage change of (74.6%). This could be attributed to pressure from urbanization. Open space plays important roles in urban environment. It is used for solid waste collation, and

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lack of this provision results in haphazard disposal of wastes along the streets. Open space helps in ventilation of the area and is sometimes used for recreational activities. Aesthetically, it also prevents a general picture in Nigeria where we have a continuously built-up landscape.

CONCLUSION

Evaluation of land use change in Owerri Municipality during 1994 +0 2014 period, using remote sensing and GIS indicate increases and decreases of various land use types. Built-up area and farmland increased while open space, forest land, and vegetation decreased. These findings have linked the past land use activities with the present, and will provide useful information for sound decision making by the land administrators and general public on future developments of the area.

REFERENCES

Adeniyi, P.O. and Omojola, A. (1999). Land use Land Cover change Evaluation in Sokoto – Rima Basin of North Western Nigeria base on Archival of the Environment (AARSE). In Geoinformation Technology Applications for Resources and Environmental Management in Africa, PP 143 – 172.

Eludoyin, S.O. (2010). GIAS Assessment of Land-use and Land-cover changes in Obio/Akpor L.G.A., Rivers State, Nigeria.

Igbokwe, M.C., Ene, L.S.O. and Nzewi, G.I. (1982). A Review of Soil Fertility Investigations in the Eastern States of Nigeria. Federal Department of Agricultural Land Resources. Technical Report No. 5.

Imo State Government (1984). Atlas of Imo State. Imo State Ministry of Lands and Survey.

National Population Commission (NPC) (2006). Retrieved from En. Wikipedia. Org/wiki/owerri-municipal.

Odunuga, S. and Oyebande, L. (2007). Change Detection and Hydrological Implication in the Lower Ogun Flood Plain, SW Nigeria. IAHS Symposium on Remote Sensing for Environmental Monitoring and Change Detection. Perugia, ITALIE, VOL. 316.

Unamma, R.P.A., Odurukwe, S.O., Okereke, H.E., Ene, L.S.O. and Okili, O.O. (1985). Farming System of the Eastern Agricultural Zone of Nigeria. Ibadan: University of Ibadan Press.