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Research Article

Using GIS and Remote Sensing Techniques to Determine Effect of Land use on Vegetative Land Cover in Obio/Akpor L.G.A, Rivers State

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Abstract: The result of the work showed a rapid growth in built-up land occupying 182.2km^2 (70.0%) and cultivation occupying 7.4km^2 (2.9%) in 2017 in the study area. While, in1985 witnessed a reduction in these classes having 83.4km^2 (32.0%) and 3.7km^2 (1.4%) respectively. In 1985, Vegetation occupied 169.9km^2 (65.3%) and experienced a reduction in 2017 to 67.4km^2 (25.9%) while water body remained 3.3km^2(1.3%) with little or no notable changes between the referenced years. It was also observed that the changes that occurred in the sampling points at the referenced years replicated itself in other parts of the study area, hence, the recommendation to raise awareness among relevant stakeholders about the importance of protecting vegetative landcover as well as the adverse effects and consequences associated with deforestation, overgrazing and improper agriculture activities on vegetation.

Keywords: GIS, stakeholders, overgrazing, vegetation.

INTRODUCTION

The study of land use and land cover changes is very important to have proper planning and utilization of natural resources and their management [1]. With the invent of remote sensing and Geographical Information System (GIS) techniques, land use/cover mapping has given a useful and detailed way to improve the selection of areas designed to agricultural, urban and/or industrial area of a region [2]. Application of remotely sensed data makes it possible to study the changes in land cover in less time, at low cost and with better accuracy [3] in association with GIS that provides suitable platform for data analysis, update and retrieval [4]. Remote sensing has been widely used in updating land use/cover maps and land use/cover mapping has become one of the most important applications of remote sensing [5].

Vegetation is a key component of an ecosystem and, as such, is involved in the regulation of various biogeochemical cycles, e.g., water, carbon, nitrogen. It converts solar energy into biomass and forms the base of all food chains, and influences the energy balance at the earth's surface and within the atmospheric boundary layer, often mitigating extremes of local climate; it releases oxygen and sequesters carbon. Vegetation affects soil development over time, generally contributing to a more productive soil; provides wildlife habitat and food.

Land use and land cover (LULC) changes detection is very essential for better understanding of landscape dynamic during a known period of time having sustainable management. It is a wide spread and accelerating process, mainly driven by natural phenomena and anthropogenic activities, which in turn drive change that would impact natural ecosystem [6, 7].

MATERIALS AND METHODS

Study Area

The study area, Obio/Akpor is a Local Government Area which makes up part of the Port Harcourt metropolis, Rivers State. It is one of the major centres of economic activities in Nigeria, and a major city in the Niger Delta area of Nigeria.

It is bounded by Port Harcourt LGA to the south, Oyigbo and Eleme to the east, Ikwerre and Etche to the north, and Emohua to the west. It lies between Latitudes 4° 45'N and 4° 60'N and Longitudes 6° 50'E and 8° 00' E.

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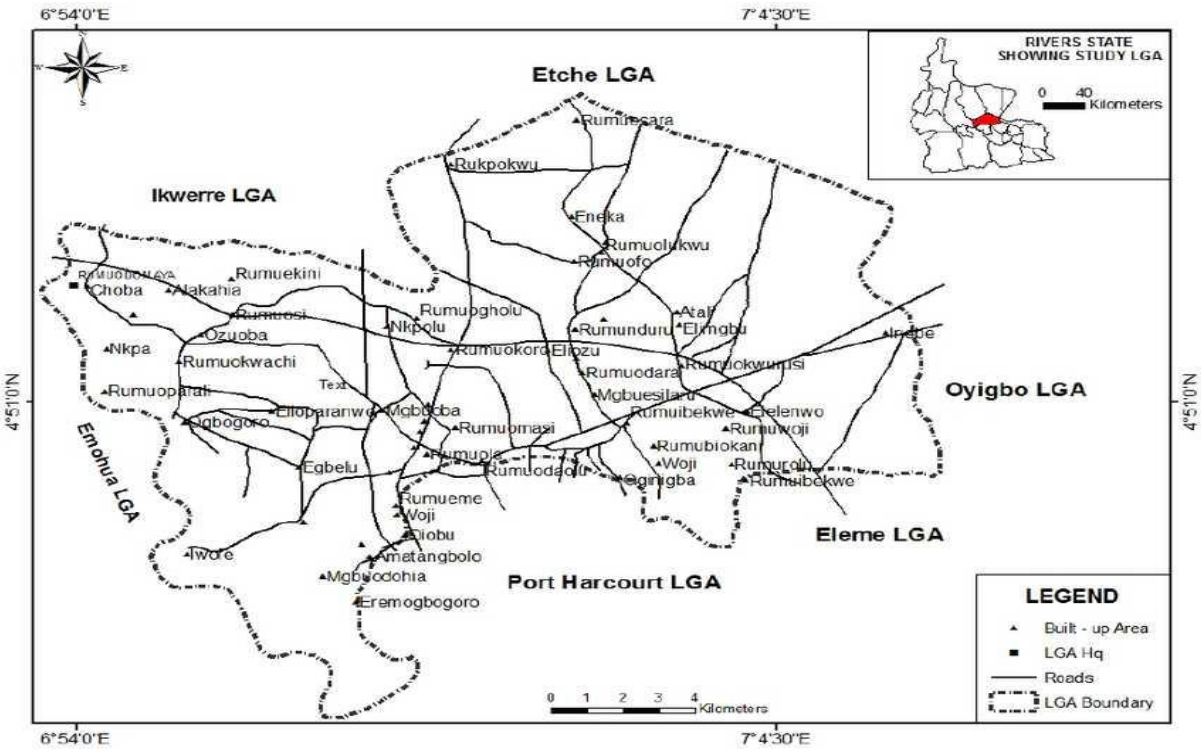

Plate-2: Map of Obio/Akpor LGA showing its communities
Source: Arokoyu *et al*., (2015) [8]

DATA

a) Primary Source: This was gotten from direct field observation- reconnaissance survey to get a general idea of the area features. Ground truthing was undertaken to confirm that features shown on both the satellite imageries and maps actually also existed on the ground.. Pre-processing activities such as image restoration were performed on the images to enhance the readability of the features on satellites images.

b) Secondary Source: This was sourced from journals, textbooks, articles, magazines, gazette, and other publications.

Land Use Change Analysis

The images which represent specific periods were used to study land use changes within the study area. Geographical Information System (GIS) was used to perform analysis on the acquired satellite images to determine the changes in land use and percentage change in the total areas covered for the study. Landsat 7 thematic imageries of 1985 and 2017. The imageries covered the entire study area under study.

Software Used for Remote Sensing Analysis

Software Used was Arc GIS 10.1 - This was used to display, process and enhance the image used. It was also used for carving out Obio/Akpor L.G.A and Subsequently the sampling points from the satellite images of Rivers State.

RESULTS AND DISCUSSION

Table-1: Showing classes and distribution of Landuse and Landcover in the study area

Classes	Distribution
Built Up	Residential, commercial and industrial areas
Cultivation	Land used for growing crops
Vegetation	Ornamental trees, orchards, lawns and shrubs
Water Body	Lakes, rivers, permanent open water, ponds, reservoirs

Source: Researcher's Classification (2019)

Table-2: Showing Landuse and Landcover Change between 1985 and 2017

	1985		2017		
Classes	**Area(km^2)**	**Area in Percentage (%)**	**Area(km^2)**	**Area in Percentage (%)**	**Magnitude of Change (%)**
Built up	83.4	32.0	182.2	70.0	38
Cultivation (farmlands)	3.7	1.4	7.4	2.9	1.5
Vegetation	169.9	65.3	67.4	25.9	-39.4
Water Body	3.3	1.3	3.3	1.3	0
Total	**260.3**	**100**	**260.3**	**100**	

Source: Researcher's Computation (2019)

Table-2, shows that built-up area was 83.4km^2 (32.0%) in 1985 .This was due to the fact that most people abandoned their farms and lands to seek for white collar jobs (rural/urban migration).There was an increase in this to 182.2km^2 (70.0%) in in the year 2017. This was completely due to an increase in urbanization, industrialization, oil exploration resulting from an increment in the population of the study area, this subsequently had also lead to an increase in diseases, robbery, pollution as well as depletion and destruction of resources, land and food.

Cultivation was slated at 3.7km^2 (1.4%) in 1985 and had an increase to 7.4km^2 (2.9%) in 2017 due to the increase in agricultural practices for both commercial farming as well as subsistent farming. People went back to the earlier abandoned farming (mostly crops), due to the Governments' ban on importation of food as well as a change in government's policy on agriculture. Most agricultural products earlier imported, were thus grown locally, leading to a great boost in agriculture and agricultural activities in the study area.

In the year 1985, vegetation occupied a total area of 169.9km^2 (65.3%), of the study area. Though, there was a reduction in 2017 to 67.4km^2 (25.9%), due to an increase in the rate of urbanisation, industrialisation as well as commercial activities. These industries (banks, oil and gas servicing industries, gas stations and many more), occupied space and land which had been earlier covered by vegetation. In essence the vegetal cover of the study area had been interfered with (deforestation) to make space for industrialisation.

Water Bodies covered a total area of 3.3km^2 (1.3%) in the study area. There was no notable change between 1985 and 2017 of water bodies in the study area due to an absence of flooding. This would have led to an increase in the water volume and consequently the total area covered by water bodies. These changes was replicated in all parts of the study area.

Fig 1 and 2 below shows a graphical illustration of the land use rate between 1985 and 2017.

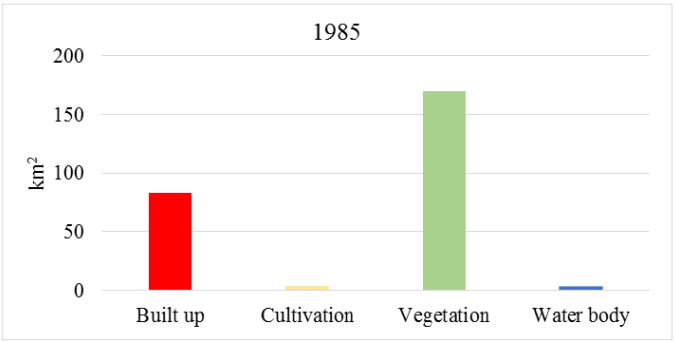

Fig-1: Chart showing the land use of 1985 (km^2)

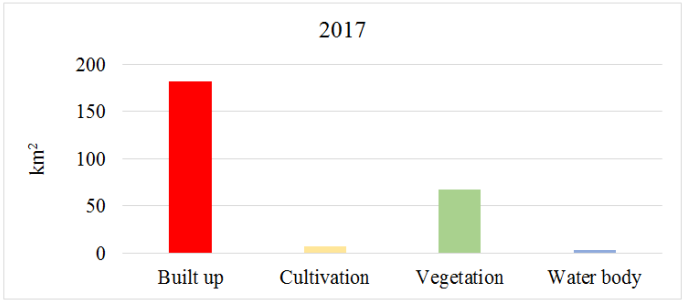

Fig-2: Chart showing the land use of 2017 (km^2)

Magnitude of Change

The graphical illustration below (Fig-3) shows that there were notable changes amongst land use type between 1985 and 2017. In 1985, built up areas occupied a low percentage of the study area, while in the year 2017 percentage of built up areas increased. This was largely due to increased urbanization in the study area. There was also a little increase in cultivation activities. People had resulted to subsistent farming during the ban on importation of some agricultural products by the government.

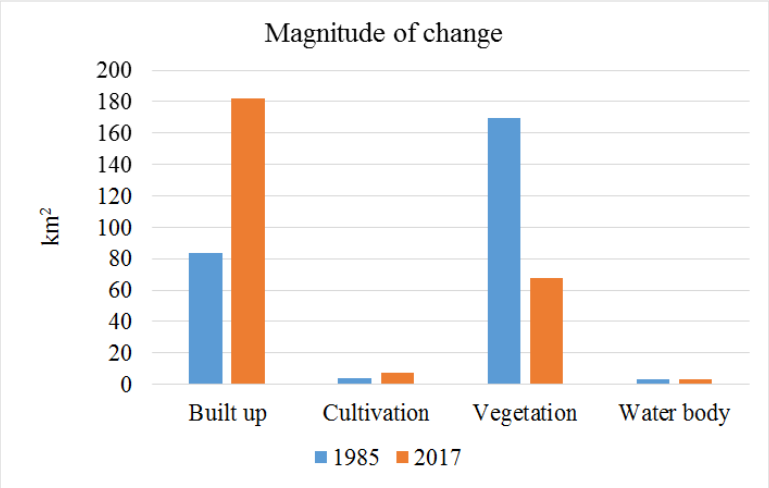

Fig-3: Magnitude of Change between 1985 and 2017

Distribution of landuse and landcover between 1985 and 2017 are showed in Plate 6 and Plate 7.

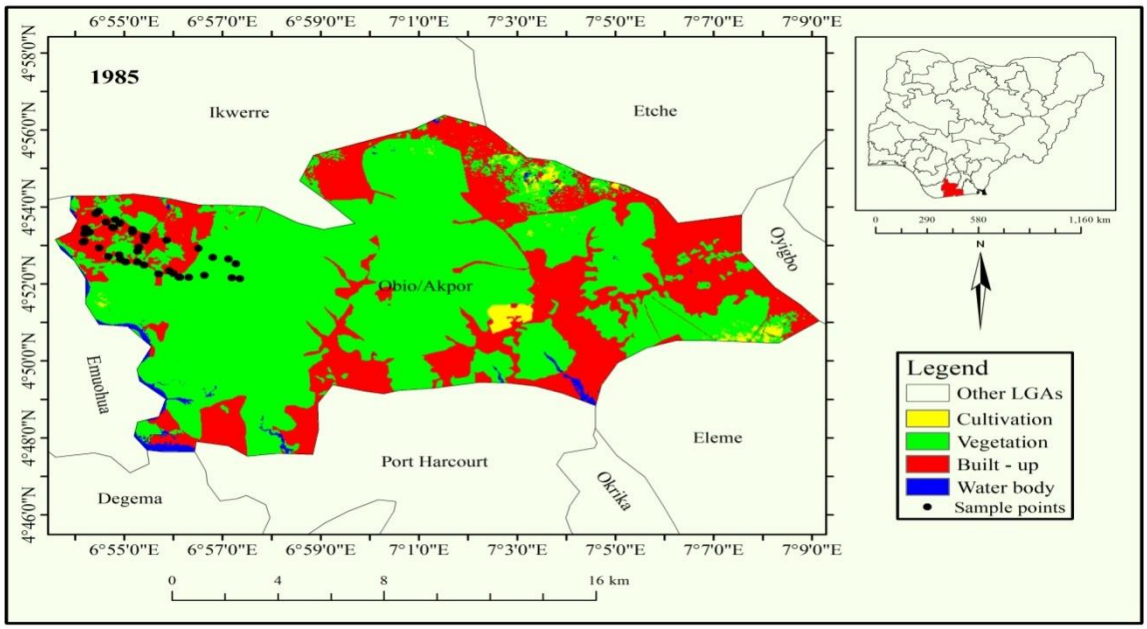

Plate-1: Map showing the land use in the study area in 1985

Source: Department of Geography and Environmental Management, University of Port Harcourt. Choba.

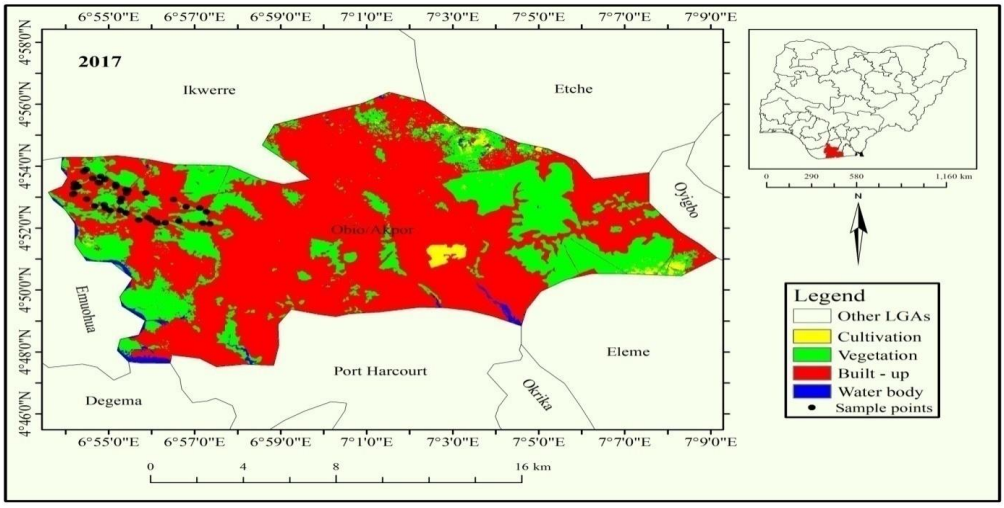

Plate-2: Map showing the land use in the study area in 2017
Source: Department of Geography and Environmental Management, University of Port Harcourt. Choba

RECOMMENDATION

From the study it can be seen that there has been a high percentage of built up areas in the study area between the years 1985 and 2017. This is explained by the expansions of pre-existing urban facilities through rapid construction of commercial, industrial and residential buildings as well as road networks. Overtime, built-up areas increases in spatial extent which in turn causes effects on the land cover and other land use types thus causing adverse effects on the soil, water, air and environment which has negative resultant effect in human beings.

The decrease of vegetation in spatial extent is mainly due to human activities which effect land cover types. This has had a negative impact on the study areas vegetation population. Overtime, the increase in human activities causes a reduction in the abundance of the plant communities, forgetting the role of vegetation as a carbon sink and in mitigation of global warming, nutrient cycling and reserve for biodiversity.

These findings show that there was a huge reduction in vegetation and an increase in built up areas overtime and thus a lot of changes on the land use and land cover between 1985 and 2017 in the study area.

The most important changes were the conversion of vegetation to built-up areas and cultivation lands; water body resources remained constant, decline in vegetation, cultivation and built-up areas showed increment. Moreover, the expansion of cultivation and built-up settlements and the decrease in vegetation lands occurred because of population pressure, which was caused by people flooding the study area for white collar jobs.

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