

Landuse landcover dynamics of abuja fct, nigeria



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ABSTRACT

This study is about the Landuse/Landcover Dynamics of Abuja FCT, Nigeria. Abuja, the Federal Capital of Nigeria is a new, fast developing settlement area. As the City becomes more urban, the farmlands are reducing along with some landcover changes. Am using Landsat ETM images from 1987 and 2006 to show the different changes that has taken place within these periods due to population growth, increase in socio-economic activity, urban planning, environmental forces etc.

INTRODUCTION

Remote sensing has been an important component of urban and regional planning for long and has been used for many applications ranging from rural-urban change detection, deforestation, mineral exploration, vegetation changes, climate changes etc.

The need for an accurate, relevant and detail and current information on the Earth's land use and land cover dynamics is increasing and despite advances in satellite image technology, computer assisted image classification is still unable to produce accurate landuse /landcover maps and statistics. (Lo and Choi, 2004). A significant component of change detection methods using remote sensing is related to the characterization of both natural and urban ecosystem.

Barnsley et al. (2001: p. 116) refer to land cover as “ the physical materials on the surface of a given parcel of land (e. g. grass, concrete, tarmac, water),” and land use as “ the human activity that takes place on, or makes

use of that land (e. g. residential, commercial, industrial)”. Land use can consist of varied land covers, (i. e. a mosaic of biogeophysical materials found on the land surface). (Treitz et al. 2004) Remote sensing data record the spectral properties of surface materials, and hence, are more closely related to land cover than to Landuse which constitute a mixture of social, cultural, economic policy factors, which have little physical importance with respect to reflectance properties, and hence has a little relationship to remote sensing. Land use cannot be measured directly by remote sensing, but rather requires visual interpretation or sophisticated image processing. (Treitz et al. 2004)

Information acquired from remote sensing data has often been used to help in Policy and decision making, resource management and planning, thereby providing insight into land-cover /land-use patterns, and trends . There has been a change in scale in the way in which remote sensing technologies, and analysis methods are being used to map out how land-cover and land-use change both at local, landscape, regional and continental scales that this days remote sensing images from satellite and airborne platforms provide digital data at scales of observation that meet various mapping criteria for characterizing different land covers. Land cover /land use can be mapped operationally now with satellites which provide high spatial detail thereby great scales of information as compared to aerial photographs. High spatial detail local- to landscape-scale analysis has great potential because satellites currently provide scales of information comparable to aerial photographs.

For change to be detected between the different dates without error, a consistent atmosphere between dates must be modelled so that variations in atmospheric depth (i. e visibility) do not influence surface reflectance to the extent that land-cover change is detected with mistakes. (Treitz et al. 2004)

A lot of study has been done on Landuse/landcover change by different people (Knorn et al, 2009, Erickson D. L, 1995, Mesev et al. 1997, Moller-Jensen. 1997, Pauleit et al 2005, Poudevigne 1997, Rembold et al. 2000, Senay G. B and R. L. Elliott. 2000, Song et al. 2001). All these studies using very different tools and approach have pointed out different causes and effects of landuse/landcover dynamics.

METHOD

STUDY AREA

The study area, Abuja the federal capital territory of Nigeria is situated within the geographic coordinates of Latitude: 09 10' 00" N and Longitude: 007 11' 00" E. It is located in the centre of Nigeria. Abuja was built mainly in the 1980s and officially became Nigeria's capital on 12 December 1991. It has an area coverage of 713km²(275. 3sqmi) and density of 1, 091. 9/km²(2, 828/sqmi). As of the 2006 census, the city is said to have a population of 778, 567.

REMOTE SENSING IMAGE DATA

The images used in this analysis were gotten from remote sensing centre in Nigeria. The images are landsat Tm image acquired in 1987 and Landsat ETM image acquired 2006.

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LANDSAT-1 was the first satellite (EOS), to be launched in the world. It was launched in 1972 in United States. Its excellent ability to observe the earth far from space made it important for use in different remote sensing applications. Following LANDSAT-1, LANDSAT-2, 3, 4, 5, and 7 (currently operated as a primary satellite) were launched.

IMAGE PROCESSING. These involves those operations that are normally required before the main analysis and extraction of information from the image and are grouped into two classes namely the radiometric and geometric corrections. Radiometric corrections include correcting the data for sensor irregularities and atmospheric noise, so that the data represent accurately the reflected radiation measured by the sensor. In geometric corrections variations in geometric distortions due to sensor-Earth conversion of the data (measured by the remote sensor) into real world coordinates on the Earth's surface is carried out. Image processing helps in image preprocessing, enhancement, transformation, classification and analysis.

CLASSIFICATION.

Classification helps in categorizing and organizing the information deduced from the images. Before going into proper classifying, it is necessary to carry out image enhancement, false colour composition (in different band) and contrast stretching, which helps in making the different features appear clearly thereby help greatly in making visual interpretation easy and clear to see and distinguish the images in false colour (band 4: 3: 2).

Classification of landcover is done through digital image classification by using the spectral information represented by the digital numbers in one or more spectral

bands, and classify each pixel based on its spectral property and assigning class to the image.

In this analysis two approaches to image classification was used. The per-pixel unsupervised classification and object-oriented supervised classification.

UNSUPERVISED CLASSIFICATION.

These classification creates a thematic raster layer from remotely sensed image by allowing the software identify statistical pattern in the data without using any real ground data. (Lillesand et al. 2008).

SUPERVISED CLASSIFICATION

In supervised classification requires that the analyst is familiar with the geographical area and the different surface cover types in that area. Which means the analyst is supervising the classification by categorizing the correct landcover with the correct associated pixel value.

The objects within range were classified using 3 criteria, the segmentation performance to delineate urban object, the classification method performance on the fuzzy logical concepts and capability to create hierarchical link of landcover/landuse classes

CHANGE DETECTION.

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In change detection, Images from earlier years are compared to recent images, to tangibly measure the differences in the sizes and extents of the loss or reduction or in some cases increase in any landcover class. Data from a variety of sources are used to provide complementary information. In this analysis, landsat image of 1987 and that of 2006 was compared to deduce the different changes that have taken place within that time frame between the years.

ANALYSIS AND DISCUSSION.

From what we can see from the images in fig 8 and table 7, the green colour shows increasing about 10% or more while the Red colour shows decreasing of about 10% or more. We can see that there is an increase in change in most of the landcover class with very little decrease (waterbody) observed. A lot of change has taken place as can be seen from the various images. Urbanisation has the highest increase due to developmental changes because Abuja is fast growing and developing. The vegetation is decreasing too and some of the rocky soil has reduced and some of the bare and rocky ground had some increased urban development.