LAND USE AND LAND COVER MAPPING IN ILORIN AND ITS ENVIRONS, KWARA STATE, NIGERIA

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ABSTRACT

Land use and land cover mapping of the outskirt of Ilorin has been neglected over the years. Thus, spatial accurate and qualitative information on the categories of features of the outskirt of the city are not available. This study therefore, maps the land use/cover of the city and its environs using satellite imageries. The methods of analysis that were adopted include visual interpretation of the spot XS of 1994 and the soft copy image of Nigeria sat-1 of 2004 was interpreted using the onscreen digitization function of the ERDAS Imagine version 8.31. The results show that out of the total areal coverage of 761.183km^2 , cultivated land has the highest percentages of the land use pattern, 663.081km^2 (87.1%) in 1994 and 593.489 km^2 (77.9%) in 2004. On the other hand, vegetal cover, which is an important resource and helps in maintaining ecosystems, had only 12.469km^2 (1.7%) areal coverage in 1994 and 31.42212km^2 in 2004. It is therefore, the submission of this paper that there should be need to develop rural resources management policies to protect natural resources such as vegetation cover, soil, water resources, edible plants and wild animals from extinction.

Key words; Land use, land cover, Ilorin, Vegetal cover, area photograph Geographic Information system

INTRODUCTION

Lo (1976) simply defined land use as the use of land made by man. Lillesand and Kiefer (1987) opined that the term land use relates to the human activities associated with specific piece of land. For instance, on a tract of land that is being used for a housing purpose, its land use could be described as residential or urban use. While a parcel of land, which is used for farming activities could be said to be an agricultural land use. In other words, land use shows how people use the landscape. Land cover on the other hand, according to Comber et al (2005), refers to the natural (Forest and grass cover) and artificial (Building) surface cover on the ground.

For humans to satisfy their wants, interaction occurs between them and their environment. Thus, the use to which land is put in any environment obviously reflects the needs of human beings. The more human being puts the land into use (as a resource), the closer is the human being -environment relationship. And this will then necessitates an unavoidable need to study and monitor land use/cover mapping periodically in order to acquire the desired data for environmental planning for the comfort of human being.

Nigam (2002) used satellite images of 1993 and 1996 to map land use and land cover in the rural urban fringe area of Enschede city of The Netherlands. The methodology adopted involved the visual interpretation of land use and land cover. The results indicated that between 1993-1996, industrial land use increased by 37.1 hectares and during the period 1996-1998, grass land use decreased by 2.8 hectares.

Kuleli (2005) used land sat TM imageries of 1992 and 2000 to monitor land use and land cover changes in northeastern Mediterranean coast, Turkey. The results indicated that there was a decrease of 25.87% from 1991-2000 in the wetland surface. Moreover, an increase of 53.27% and decrease of 49.95% were determined in the shallow of wetland and sand dune respectively. Kuleli (2005) thus, submitted that in order to prevent this rapid

change, sustainable agricultural policies and ecosystem restorations were indispensable for the region. In another study, Panikkar (2008) has demonstrated the utility of GIS/Image processing System to monitor changes (between 1930-1990) in the forest cover around Dehradun and Mussooric in Uttar Pradesh, India using data collected from the topographical maps and remote sensing media (IRS Data). It was observed that in 1930, the forest cover accounted for about 45% of the total study area of 445km^2. By 1960, it was reduced to 150km^2 (34% of the area). Between 1960-1990, there was a drastic reduction in the forest cover to about 82km^2 which is equivalent to 18.7% of the study area.

A number of studies (Olorunfemi, 1987, 1985, 1983 and 1982; Muhamood, 1984; Aderamo, 1997; and Adedibu et al, 1998) have used aerial photographs and to a lesser extent satellite images to produce series of maps of Ilorin. But, the areal extent of these works as per the categories of land use/cover patterns for this study is restricted only to the built-up area of the city. In other words, the classes or land patterns considered by these studies were only those found within the built-up area. Through such works, it is not possible, therefore, to have an empirical data of land use/cover patterns of the rural urban fringe area of Ilorin. For clarity of expression, these studies did not focus on mapping the vegetation cover of the outskirt of Ilorin. And there is no available literature that does. This is a worrisome development considering the adverse effects of devegetation, which can include reduction in biological production, soil erosion and scarcity of wood. Some others are patchy ground water, extinction of wild animals and plants.

Against this backdrop, this paper seeks to fill the desired and relevant gap of obtaining an empirical data on the vegetal cover of the rural urban fringe area of Ilorin. More so, the areal coverage of other land use/cover classes for this study (cultivated, built-up and water body), are being investigated in order to ascertain and map their areal coverage for the years under focus (1994 and 2004). These land use/cover information can be needed and\or used by land resources planners to evaluate past management decisions, as well as to draw a balance between their current decisions before they are implemented.

STUDY AREA

Ilorin (and its environs) is situated approximately between latitudes 8^0 $31^{'}39^{''}$N - 8^0 $36^{'}$ $00^{''}$N and longitude 4^0 $23^{'}$ $31^{''}$ – 4^0 $39^{'}$ $12^{''}$ E (Fig. 1).The area is characterized by two seasons; wet and dry.The dry season commences in November and ends in March. From November to January, temperature typically ranges from 33^{o}C to 34^{o}C while from February to April, values are frequently between 34.6^{o}c and 37^{o}c (Oyegun and Olaniran, not dated; Oloru, 1998). The wet season lasts for seven months, beginning from April to October with mean rainfall of about 1318mm. It rains for about an average of 11 days per month during this period, except in September when it rains at least once in two days. The rain fall peak is in June-August. The relative humidity is about 80 percent (Oyegun and Olaniran, not dated).

The natural vegetation falls within the guinea savannah belt. The major river is the Asa River with tributaries like Agba, Atikeke, Osin and others. Most river valleys and poorly drained sites usually support fringe forests since they are only cultivated occasionally and are rarely disturbed by fires. During the rainy season, the trees and grasses are green and luxuriant. On the other hand, in the dry season, the vegetation becomes brown and dry.

According to Dosiadis and Associates (1976), the first estimate of the population of Ilorin was made in 1911 and this put the town population at 36,343. The 1953 census indicates the town's population at 40,994. The figure rose to 208,546 in the 1963 census. The population in 1991 was put at 532,088. The 2006 census gives population of Ilorin as 777,667 (NPC, 2007).

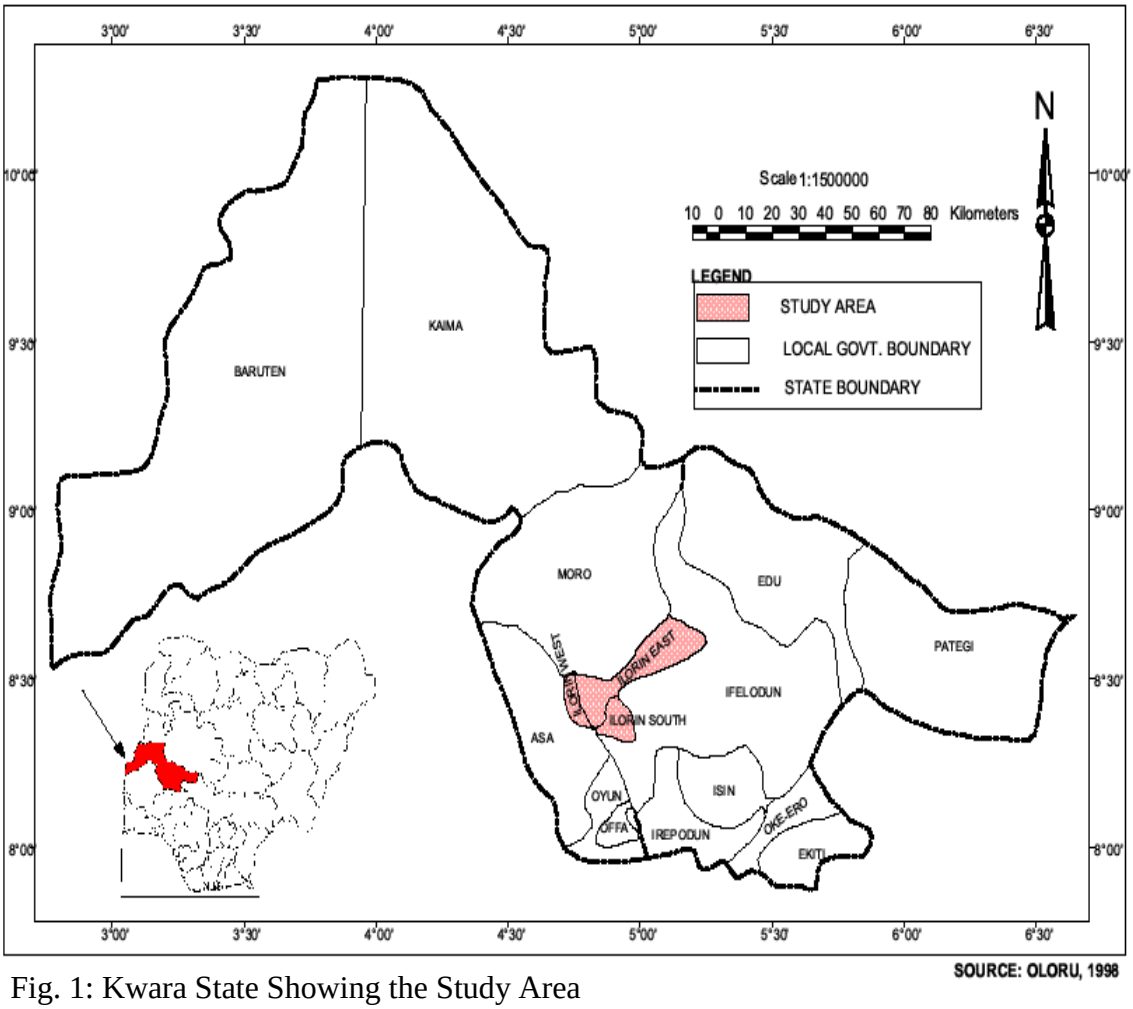

Fig. 1: Kwara State Showing the Study Area

MATERIALS AND METHODS

The data used for this work were obtained through the interpretation of Spot XS image of 1994 and Nigeria Sat-1 image of 2004 (Table 1).

Table 1: Some Basic Information on Satellite Images of Ilorin

Satellite Image	**Spot Xs**	**Nigeria Sat-1**
Date	3rd Dec. 1994	2004
Sensor	High Resolution Visible (HRV)	Thematic mapper
Resolution	20 Meters	32 meters
Projection	Universal Transverse Mercater (UTM)	Universal Transverse Marcater (UTM)
UTM Zone	31	31
Spheroid	Clarke 1880	Clarke 1880
Acquisition Source	Department of Remote Sensing/GIS, Fed Min. of Agric and Rural Development , Mando Kaduna, Nigeria	National Space Research Development Agency (NSRA) Abuja, Nigeria

Source: Compiled by the Author

Additionally, some reference data were used as base maps. These include Ilorin-west LGA map of 2001 on a scale of 1:50,000; Ilorin and its Environs street guide map of 1987 on a scale of 1:20,000. The Ilorin maps were obtained from the Survey Division, Kwara State

Ministry of Lands and Surveys. Visual interpretation of the Spot XS, 1994 (Printed image) was carried out for the identification of land use/cover categories of interest (i.e. built- up area, vegetal cover, cultivated area and water body). The printed copy was used for the interpretation because the digital data was not available for use.

The visually interpreted layers from the hard copy satellite image were digitized using calcomp A_0 digitalizing tablets. The uses of visual interpretation clues such as shape, size, tone, pattern etc as well as local knowledge of the study area were of paramount importance in the interpretation process as they made the recognition of the features easy.

On the other hand, the soft copy image of Nigeria sat-1 of 2004 was interpreted using the onscreen digitization function of the ERDAS IMAGINE Version 8.31. There was then a coverage editing and coding of layers, which was done through the use of Arclnfo version 7.2.1. The areal coverage of each land use/cover is calculated through the use of the statistical function of Arc/view. Several field checks were carried out after the laboratory exercise to ascertain areas where there were doubts (unresolved cases) in respect of the interpretation of the features under investigation.

RESULTS AND DISCUSSION

Spot Xs hard copy of 1994 was interpreted to obtain the land use/cover of the area (fig 2). Statistics generated, revealed that the built-up area covered 75.816km^2 (9.9%). The areal coverage of the cultivated land, which was 663.087km^2 (87.1%), was the largest of the land use and land cover types. The vegetal component was the second lowest (12.469km^2; 1.7%) (Table 2). Thus, the vegetal spots can only be identified in a few areas, such as in the north-east, south-east, south-west and along Ogbomosho-Ibadanexpressroad.

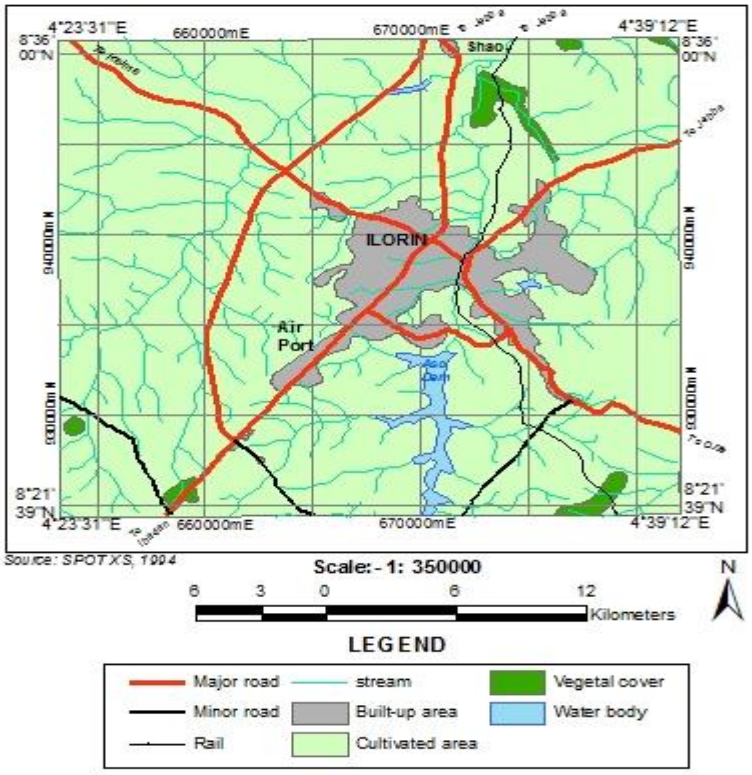

Fig. 2: Land use and land cover of Ilorin (1994)
Source: Author's Analysis

Table 2: Land Use/Land Cover Statistics of Ilorin and Environs, 1994

S/No	Land Use/Land Cover Class	1994 Area (Km^2)	% of Total
1	Built- up Area	75.816	9.9
2	Cultivated Area	663.081	87.1
3	Vegetal Cover	12.469	1.7
4	Water Body	9.811	1.3
	Total Area (Km^2)	761.183	100

Source: Author's Data Analysis

When the 2004 Nigeria sat-1 image (fig. 3) was interpreted, it gives limited information on roads and railways. This is due to its low spatial resolution of 32km. But, since information on these classes, were required, complementary information was sought from the work of Oloru (1998).

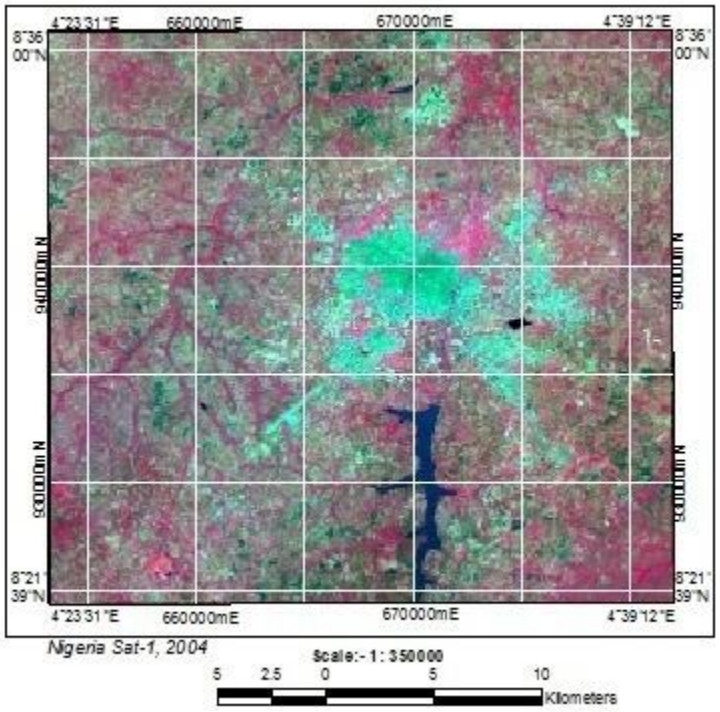

Fig. 3: Nigeria Sat- 1,(2004)

Table 3: Land Use/Land Cover Statistics of Ilorin and its Environs, 2004

S/No	Land Use/Land Cover Class	2004 Area (Km^2)	% of Total
1	Built - up Area	126.461	16.6
2	Cultivated Area	593.489	77.9
3	Vegetal Cover	31.42212	4.2
4	Water Body	9.811	1.3
	Total Area (Km^2)	761.183	100

Source: Author's Data Analysis.

The built-up area was mapped to be 126.461/km^2 (16.6%) and the water body covered 9.811/km^2 (1.3%). The vegetation areal extent was only 31.42212 Km^2 (4.2%) while the cultivated areal coverage was 593.489 km^2 (77.9%) (Table 3). Cultivated area here means the land that are presently being farmed and those under fallow! This empirical data shows a gross sign of devegetation, effects of which are enormous to include dispersal of wild animals. The work of Jibril (not released) revealed a similar finding as it noted that in 1976,

the vegetal cover was 121.787km^2 (15.9%) but dropped to just 23.553 km^2 (3.1%) in 1987. Also, in the same work, the cultivated parcel of land was as much as 584.340km^2 in 1976 and 667.722 km^2 in 1987. These findings buttress the assertion of Adeniyi (1972) and Onokerhoraye (1982) that agriculture was a major indigenous occupation of the people of Ilorin and its environs hence it dominates the landuse type..

CONCLUSION

Human being is instrumental to the development of almost every land use type. This is due to the fact that it is their activities that determine the uses to which land is put. A periodic mapping of these human activities using appropriate methods and tools is essential in order to obtain accurate data for environmental planning. The focus of this paper, which is on data collection in respect of the peripheral areas of the city of Ilorin is thus, justified by the fact that the survival of any urban centre is dependent upon the health and survival of the urban fringe. It is evident from the findings of this work that the urban fringe of Ilorin is highly being devegetated. This level and/or degree of degradation and depletion of vegetation cover can lead to various types of environmental problems such as soil erosion, patchy ground water and disappearance of plants and wild animals.

Based on this finding, the paper recommends that policy initiatives should be taken to forestall the uncontrolled devegetation and the consequent extinction of wildlife and reckless exploitation of natural resources through development of rural resources management policies. Such policies should be geared towards the introduction of conservation practices like forest reserves and/or deliberate promotion of afforestation schemes with a view of checking the environmental degradation.

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