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Original Research Paper

The Extent of Urban Forestry in Ado-Ekiti, Nigeria

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As urbanization is increasing there are huge and growing environmental problems accompanying the growth of many, urban areas of the developing world which are raising general concern. This research work focuses on the forestry in Ado-Ekiti, Nigeria. The data used in the study was obtained through Landsat Thematic Mapper, interview and observation. The study was divided into five zones for easy data collection, analysis and comparison purposes. Satellite imagery was obtained for the analysis of the vegetation in the study area. Landsat TM (Thematic Mapper) was used for the analysis and classification. It was discovered that vegetative covers were not well distributed within the built-up areas, they were more at the periphery of all the zones.

Keywords: Urban forestry, Landsat thematic mapper, Vegetative cover, Ado-Ekiti.

INTRODUCTION

Miller (1997) defined Urban Forestry as "an integrated city-wide approach to the planting, care and management of trees in the city to secure multiple environmental and social benefits for urban dwellers". Grey and Deneke (1986) gave a more comprehensive definition as "Urban and Peri-urban forestry is defined as the planned integrated and systematic approach to the management of trees in urban and peri-urban areas for their contribution to the physiological, sociological and economic well-being of Urban society". Urban forestry deals with groups of trees and individual trees where people live. It is multifaceted because urban areas include a great variety of habitats (streets, parks, derelicts, corners etc) and it is concerned with a great range of benefits and problems.

A relatively large number of studies have been carried out on urban and peri-urban forestry (Grey and Deneke, 1986; FAO, 1988; 1995, 1999). Some considering the changing perception of Urban forestry (Heisler, 1978, Leonard, 1989), the role of trees and other vegetation in and around densely populated areas (Jim, 1986, 1987, 1989) as well as the opportunities and challenges related to their planting, conservation and use (Jellicoe, 1985; Gilbert and Gugler 1992; Jim, 1993). Some examined the structure, conditions and management of the urban forests and discuss the beneficial impacts of trees on the environment of urban areas (Heisler 1977; Arnold, 1980; Clouston, 1981; Douglas, 1983; Huang et al, Adebayo and Owolabi, 2004; Owolabi 2011). Trees are indicators of community's ecological health. When trees are large and healthy, the ecological systems – soils, air and water – that support them are also healthy. In turn, healthy trees provide valuable environmental benefits. The greater the tree cover and the lesser the impervious surface, the more ecosystem services are produced in terms of reducing storm, water runoff, storing and sequestering atmospheric carbon and reducing energy consumption due to direct shading of residential buildings (Adebayo and Owolabi 2004).

Urban vegetation is very important for people's living because it not only provides visual joy for people but also influences directly or indirectly, urban environmental aesthetic values through its physical characteristics (Zhang & Feng, 2005). For example, it influences urban environmental conditions and energy fluxes by selective reflection and absorption of solar radiation and by the moderation of evapotranspiration (Small, 2001). Thus, a reliable measure of the distribution of vegetation is getting more significant. At present, several studies have pointed to urban green spaces as a resource in promoting public health and providing valuable ecosystem services to urban dwellers (Maas et al. 2006, Alvery, 2006; Jim and Chem, 2008; Rafael et al 2009; James et al. 2009).

Despite, the numerous significance of trees in urban settings, it has been discovered that in recent time, most modern urban countries are devoid of vegetative cover. Hence, windstorm disasters have become an annual occurrence in these cities particularly in tropical Africa and most especially in

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Nigeria. The urban heat Island is contributing significantly to the issue of global warming.

This research work will look into the extent of urban forestry in a tropical country, urban area with emphasis on the historical trends and the current status of tree planting in Ado-Ekiti, Nigeria.

THE STUDY AREA

Ado-Ekiti, the study area, is situated at about 48 kilometres north of Akure, Ondo state capital; about 344 kilometres north of Lagos (Nigeria) and about 750 km south-west of Abuja, the Federal Capital Territory (FCT). Ado –Ekiti is the Ekiti state is the Ekiti state capital and a Local Government Headquarter in one of the sixteen Local Government Area in Ekiti state. It lies within Latitude $7^0$10' and $7^0$45' north of the Equator and Longitudes 5^o10' and 5^o28'east of the Greenwich meridian.

The town is situated on a fairly high level with about 390 meters above sea level in the south-eastern part of Ireje stream and about 540 meters above sea level in the north-eastern limits of the town. The landscape is dotted with rounded inselbergs and steep-sided hills with gradients ranging from 33^o to 44^o.

The climatic condition of Ado-Ekiti is similar to the general climate of the South-Western Nigeria characterized by seasonal wet and dry seasons with double maxima rainfall occurring in July and September. The onset and cessation of the rainy season are often marked by severe thunderstorms (Adebayo, 1993), which are mainly experienced in the afternoons and occasionally at night.

Temperature in the region is, however, more uniform throughout the year with very little deviation from an annual mean of about 27^oC and a range of 3.7^o C between the month of highest temperature- February and the month of lowest temperature-August. The climatic conditions of Ado-Ekiti favours tree cultivation coupled with indoor and outdoor all-year-round recreation activities.

METHODOLOGY

The data used in this study was obtained through Landsat Thematic Mapper, interview and observation. The study area was divided into five zones for easy data collection analysis and comparison purposes (Table 1 and Figure 1).

Satellite imagery was obtained for the analysis of the vegetation in the study area. Landsat TM (Thematic Mapper) was used for the analysis and classification. The satellite image has a 30 meter resolution. The image was subjected to image processing using appropriate module in Idrisi Andes. The image was processed to correct for various image error that might be associated with the image. Therefore, the image was corrected for Radiometric and Geometric Restoration to remove errors introduce to the image as a result of atmospheric impact and fallout of sensor among others.

The image was then enhanced to aid visual interpretation. The Idrisi Module was used to construct a three-band 24-bit composite image for visual analysis. Band 3, 4 and 5 was used for the composite. The composite image was thereafter imported into the ArcGIS environment for further spatial Analysis. The study area was identified from the large image and subsequently extracted for proper analysis. With the image of the study area clipped out from the larger image, the image was subjected to classification.

Supervised classification was employed. This was done by creating signatures using appropriate module in ArcGIS environment. The study area was majorly classified into four land use (vegetation, Built up Area, Swampy Area and water body). After the classification, the entire area was calculated, the area of each zone and the area of each land use in each of the zones were also calculated.

THE CURRENT STATUS OF TREE PLANTING IN ADO-EKITI

The current status of tree planting in the study area was obtained through Landsat Thematic Mapping and observation during data collection. As it was stated earlier in the methodology, the study area was divided into five zones for easy data collection analysis and comparison (Fig.1).

Information from table 1 shows the land use pattern of the study area as recorded from landsat TM Zone I had 65% of vegetation cover and 27.4% of built-up area (Fig 2) Despite the fact that some residents in the area said they had to remove trees to pave way for shops or more residential buildings we still had 65% of vegetation cover. This was influenced by the fact that most of the green cover concentrated around Christ School, Christ Girls School, Government House Ground, Anglican Grammar School and Odua Textile green belt. The concentrations around these areas had greatly influenced the percentage of vegetation cover. Though, this is not saying that the green cover was restricted to this area alone but they were scattered and were more in the newly developing suburbs. The Zone also had 7.3% of swampy area. (Fig. 2).

Zone 2 had the highest percentage (62.4%) of built up area and the least percentage of vegetation cover (36.7%), (Fig. 3). This was so because it is the central Business District (CBD) of the study area where the buildings are closely knitted and not well planned and also covers the least square meters (Table 2 and Fig. 3) compared with other zones. Most of the vegetation percentages obtained from the zone were concentrated around some public schools and churches. The zone also had 0.86% of swampy area.

Zone 3 had the second highest vegetation cover of 67.5% and 20.9% of built-up area (Table 2 and Fig.4). The vegetation cover in the zone spread over the entire zone as it houses both the State and Federal housing Estates where 'enlightened people' who use trees, flowers and grasses for landscaping and for fruit gathering in their compounds are many. Also around Ori-Ekiti, Agric road, *Olokemeji*, etc. there were a lot of '*Igi Odan*' tree which had large crown cover (Fieldwork, 2010 observation). Despite the fairly evenly spread of the vegetation, there were still some concentrations around the two 'Eid' Praying Ground and Ado Grammar School axis where there were many stands of teak and acacia trees. They had 11.6% of swampy area which was the second largest in the study area (Fig.4).

Zone 4 had 58.8% of vegetation cover and 28.7% of built-up area (Table.2 and Fig. 5). The vegetation covers in the zone were fairly distributed all over the zone. Though there were some major concentration at the Government palm tree plantation along Agric-Ajilosun road, A.U.D 'Eid' praying ground and AUD Grammar School. The zone had the second highest percentage of built-up area due to the accommodating topography of the area. The zone also had the highest percentage of water body as it houses the Ajilosun water works where a dam was constructed to supply portable water to Ado-Ekiti metropolis and 10.4% of swampy area.

Table 1. Data collection Zone in the Area Zonation of Ado Ekiti

Zone	Area covered
Zone 1	Fajuyi, Dallimore Textile, Basiri, Adebayo area
Zone 2	Okesa, Ereguru, Oke Ori omi, Palace, Oja Oba Ijigbo (the core area)
Zone 3	Oke-Ila, Federal and State Housing Estate, Mathew, Odo-Ado Area
Zone 4	Ajilosun, Oke-bola, Cocacola, Omolayo Area,
Zone 5	Irona, Elekute,Omisanjana, Falegan Area.

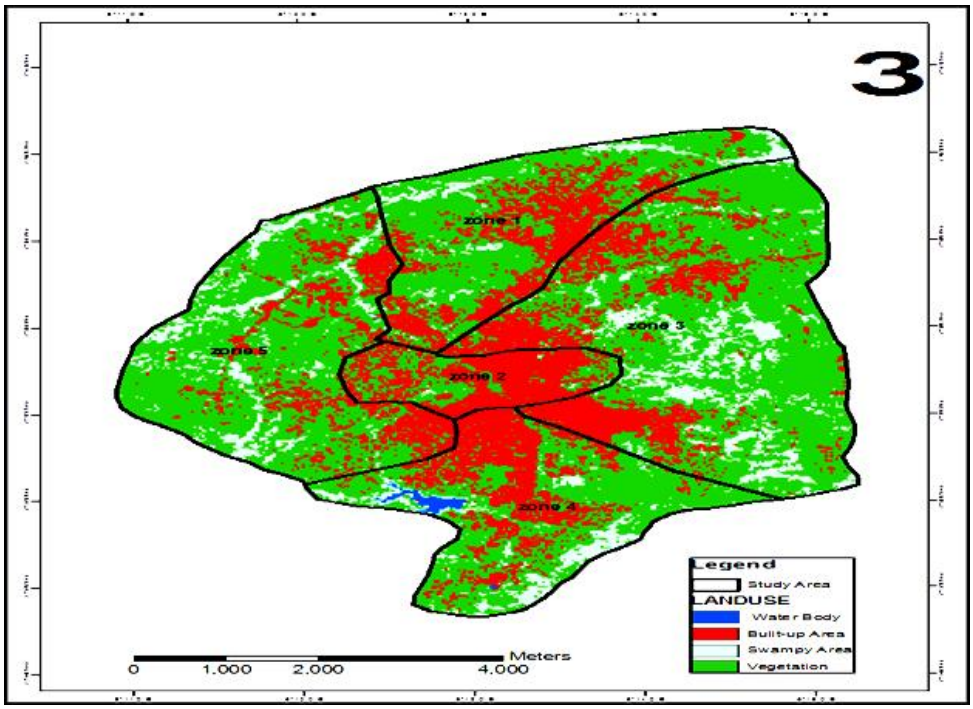

Fig.1. Zonation of Ado-Ekiti

Table 2. Landuse as Recorded from Landsat T.M

LANDUSE TYPE	SQUARE METERS											
	ZONE 1		ZONE 2		ZONE 3		ZONE 4		ZONE 5		CUMULATIVE TOTAL	%
	NO	%	NO	%	NO	%	NO	%	NO	%		
Built up	2551277.25	27.4	2072862	62.4	3863873.25	20.9	2750278.5	28.7	22060.70	17.0	13444362	25.1
Water body	-	-	-	-	-	-	195752.25	2.1	1624.5	0.1	197376.75	0.36
Swampy Area	685539	7.3	28428.75	0.86	2159772.75	11.6	1000692	10.4	1469360.25	11.8	5343792.75	9,8
Vegetation	607158.75	65	1219187.25	36.7	12511899	67.5	9581301	58.8	9124816.5	71.1	385087725	64.7
Total	9308385	100	3320478	100	18535545	100	9581301	100	12801872.25	100	53547581.25	100

Source: *Field Survey, 2013*

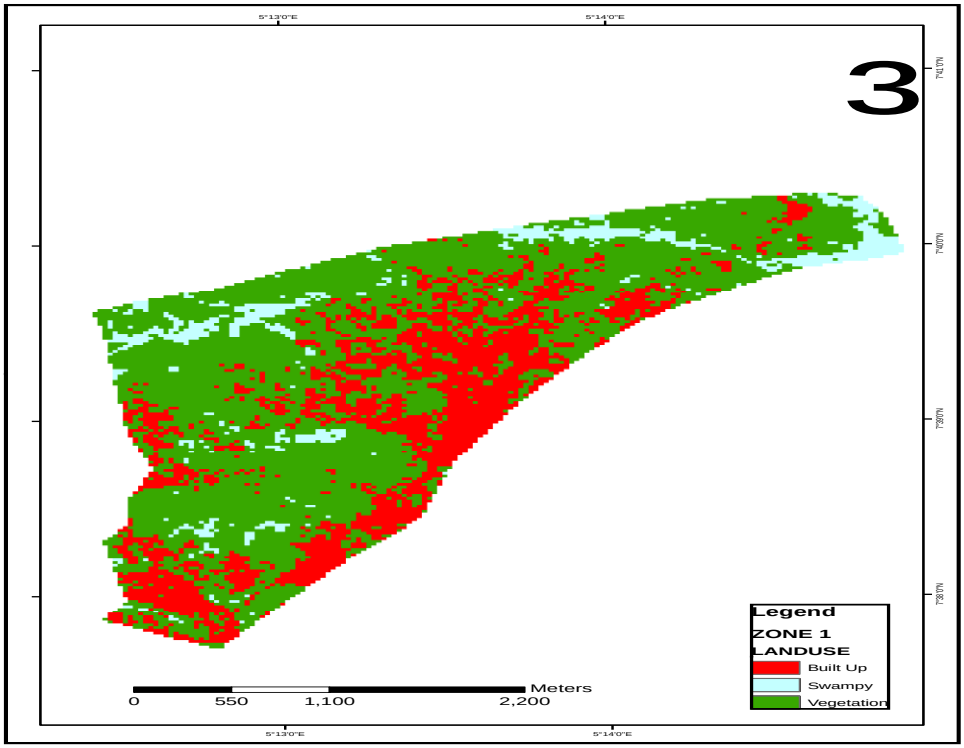

Fig. 2. Zone 1 Land Use

Fig. 3. Zone 2 Land Use

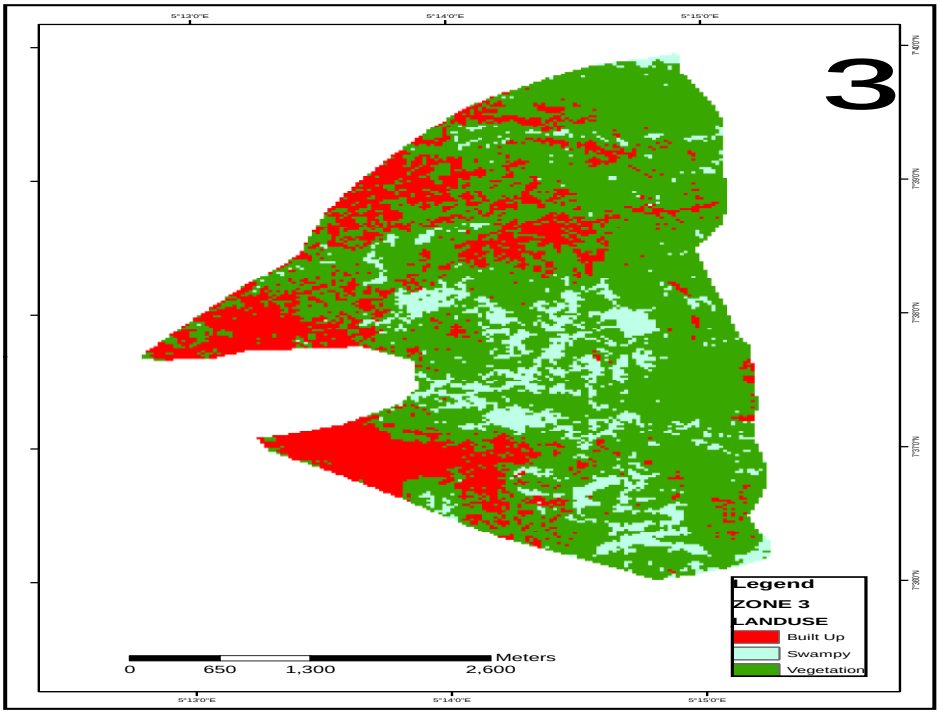

Fig. 4. Zone 3 Land Use

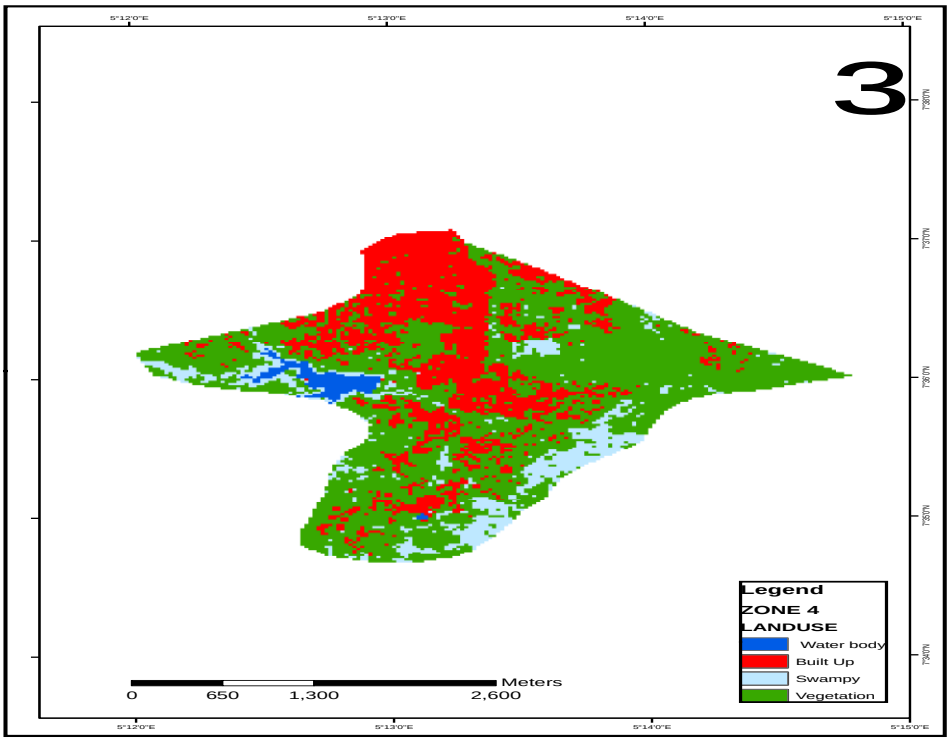

Fig. 5. Zone 4 Landuse

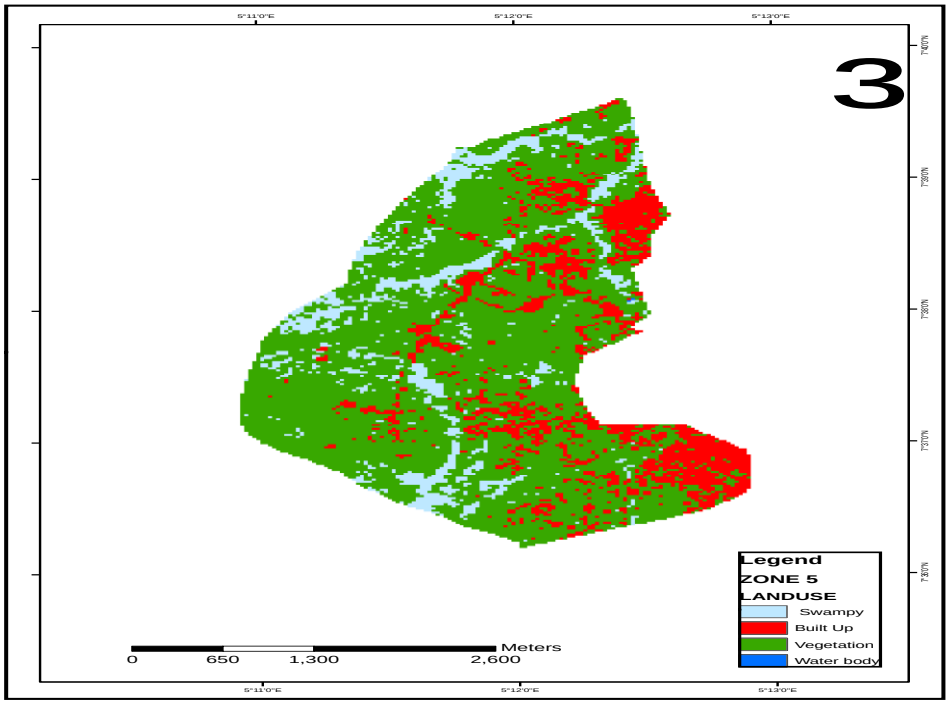

Fig. 6. Zone 5 Land Use

Zone 5 had the least built-up area of 17.2% and highest vegetation cover (71.1%). (Table 1 and Fig. 6). The topography of these area dictates the pattern of development, for example, due to the influence of Ayoba hills, Falegan hills and the swampy area along Ilawe road, the settlement pattern here is linear along the main road. It is only Elekute, Omisanjana area and Irona that had an accommodating topography for development. Apart from the topography, the zone had the highest swampy area of 11.8% (Fig. 6). The high percentage of vegetation cover in the zone was influenced by scores of trees around Ile Abiye area, Ola Oluwa Muslim Grammar School premises, Baptist and C.A.C. Grammar School etc.

CONCLUSION

Generally, in the study area and with reference to Table 2, the area had a cumulative total vegetable cover of 64.7% and a cumulative total of built-up area of 25.1%. This gave a picture that the whole area had an adequate vegetative cover. But in the real sense, the vegetative cover was not well distributed within the built-up areas. From Fig. 2, 4, 5 and 6, it was noted that the green bands used to denote vegetation cover were few within the red band (built up area). More of the green bands were seen at the periphery of all the zones and where we had them within the red bands, it was either concentrated in an area or dotted. This shows that there were some areas where we had abundant vegetative cover and there were many areas where there was less vegetation.

The total water body in the area was 0.36% while was the total swampy area was 9.8%. This shows that Ado-Ekiti is well drained and had less than 10% of the total area as either water body or swampy area. Some of the swampy areas had been taken over by development within the town. For example, the Ajilosun swampy area had been taken over by Fayose Market, Eateries and Banks.

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