MAPPING OF OPEN SPACES IN URBAN SOKOTO USING REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS

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ABSTRACT

Urban Sokoto in the North West of Nigeria has being loosing Open Spaces to residential land uses due to laisser-faire, perhaps on the part of politicians or the planners who could not convince the former. In this paper, attempt has been made to map the Open Spaces within Urban Sokoto using Remote Sensing and GIS techniques. The result of the work revealed that the rapid increase in the rate of urbanization, have led to uncontrolled and consequently unplanned expansion of Urban Sokoto. This problem has also resulted into the gradual loss of open spaces for recreation and aesthetics due to quest for built up areas. A rapid growth in built-up land was observed from the analysis of the existing land use Map of 1992 and Quick Bird images of 2005 and 2010. It was found that the loss of open spaces increased from 48.32% in 1992 to 27.26% in 2010, and this trend may continue in 2020 leading to loss of more open spaces to residential land. This therefore, calls for the gentrification of the open spaces of the inner city of Sokoto.

KEYWORDS: Urban Sokoto. Open Spaces. land uses. Remote Sensing and GIS.

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1.00 INTRODUCTION

It has been observed that green belts are continually being converted to built-up areas largely due to pressure from increase population and in most cases occasioned by political and economic conditions (Alabi and Ufuah, 2007). Areas originally planned as open spaces are being systematically replaced deliberately by other land uses .The Environmental costs of lack of preservation of open space are leading to pollution and a frightening degradation of air, water, land/soil, and the entire environment. Visibly, Urban Sokoto is one of the many cities of the world experiencing the manifestations of global warming and the proliferations of red woods and hydro carbons and the indiscipline in the use of urban space which cannot be ignored. Sokoto has witnessed remarkable expansion, growth and developmental activities since its creation in 1967 as north western state capital. However, vandalism, assaults and the use of areas to gain access to properties are some problems associated with open spaces and it is important to have regard to these matters in designing any layout scheme. Despite the provision for open spaces by planners, the Government and residents give no regard for these open spaces and went ahead to build on these spaces in a bid to make use of the available spaces to cater for the high demand on land. This calls for rational utilization of the available land and hence the study of its importance and study of the trend of loss of open spaces for planning sustainable development. Therefore, one of the research questions that emanates is that what is the trend of open spaces since 1992 in Urban Sokoto till date?

In the light of the foregoing the following aim and objectives are pursued;

The aim of this paper is to map the Open Spaces of Urban Sokoto towards urban renewal for a healthy city. To achieve this aim, the objectives are; to examine the nature, location, and dimension of Open Spaces; to assess the trend and magnitude of the Open Spaces; to evaluate implications of the converted Open Spaces and forecast the future pattern of land use /land cover in the area for sustainable development.

Against this background, this paper is divided into five sections; section one is the introduction followed by section two that contains justification and the conceptual clarification. The third section is the Study area and Methods. In the fourth section is the Discussion and Results which

include the trend and magnitude of the open spaces, the implication of the converted open spaces has also been evaluated and forecasted. The concluding remarks is presented in the fifth section.

2.0 JUSTIFICATON OF THE STUDY AND THE CONCEPTUAL CLARIFICATION OF OPEN SPACE.

2.1 **Justification**

Studies have shown that there are only few landscapes on the Earth that are still in their natural state, (Nigel, 2002). The Earth surface is being significantly altered in several ways. Man's presence on the Earth and his use of land has had a profound effect upon the natural environment, thus resulting in changes in the pattern of land use over time. This is especially because of the increase in human Population and their demand on land. The unparalleled increase in population growth in recent times has resulted in the demands for food and shelter resources with attendant demand on land. United States Geological Survey has estimated that globally 6,000 acres of open space are lost each day, a rate of 4.166 acres per minute, (Nelson, 2004). Many studies carried out in some urban centers confirmed the influence of the people on the maintenance and conservation of the environment. In studies carried out by Olokesusi (1991), Anozie (1994), and Fadamiro (2000) the results emphasized that the rapid growth of urban centers generated management problems, such as encroachment of open spaces amongst others. Thus, urbanization according to Osiyi (1989) has resulted in uncontrolled use and development of land thereby creating chaos and blighted conditions in the city. Global warming is also manifesting in many cities of the world other than the proliferation of redwoods and hydro carbons, which makes the lack of regard for open spaces in the urban environment inconsiderable.

The conventional methods for the study of land use involves extensive field study which is time consuming and cumbersome. Land use changes are equipped due to the natural and human activities, it can be observed using current and archived through remotely sensed data (Jaiwal et. al, 1999). The information on land use patterns, their spatial distribution and changes over a timescale are perquisite for making development plans. Remote sensing using satellite imageries, the latest advancement in space technology has the capabilities to overcome the shortcomings of the conventional methods of aerial photography (Jaiwal et. al, 1999).. It makes a major

technological breakthrough in the method of acquiring information on land resources, agriculture, forestry, ocean resources and other studies.

The Consequences of lack of Open spaces is grievous; the environment is an interactive, indispensable medium, within and through which man's life performance is carried out. Man's life in his present nature is unimaginable without the environment to supply him with his needs such as air (to breathe), water (to drink and wash with), food (to eat), and solid materials for fashioning weapons, building shelters and clothing (Atolagbe 2002). Most major metropolitan areas face the growing problems of urban sprawl, loss of natural vegetation and Open space, and a general decline in the extent and connectivity of wetlands and wildlife habitat. The public identifies with these problems when they see residential and commercial development replacing undeveloped land around them (Alabi, 2009). Urban growth rates show no signs of slowing, especially when viewed at the global scale, since these problems can be generally frightening. This is in the face of evidence of uncontrolled urban growth, leading to environmental degradation, deformation and depletion of man supportive resources and increase in man antagonistic ones. In all these processes, wastes are generated leading to pollution and a frightening degradation of air, water, soil, and the entire environment (Fadamiro, 2006).

Although, Aerial photographs have been long in existence but there has been a decline in its use because the Aerial capture has drastically reduced while satellite images have continuously grown in size, number and their quality has improved over time. Now, satellite imageries are the alternative base map for giving accurate perimeters of areas. In time past, attempts have been made to study open spaces in Sokoto using aerial photography but in recent times, the dynamics of the study of Land use like Open spaces requires more powerful and sophisticated systems as Geographic Information Systems and the use of Remote Sensing data which provides a general extensive synoptic coverage of large areas than aerial photography for data gathering for sustainable environment.

2.2The Conceptual Clarification of open space

Open space plays an important role in the landscape of human environment. It reflects the patterns of development, economy, culture, environment and well-being of people in a particular region. A suitable starting point for conceptualising open space is to attempt the definition of the

essential concept 'land'. Land has been defined by the Concise Oxford Dictionary (2009) as a delineable area encompassing all attributes of the biosphere immediately above or below the earth's terrestrial surface, including the soil, terrain, surface hydrology, the near-surface climate, sediments and associated groundwater reserve, the biological resources, and the human settlement pattern and infrastructure resulting from human activity. Several literatures have provided definitions to open space depending on the context to which it has been used in different studies.

Open space is defined as an area of land or water that either remains in its natural state or is used for agriculture, free from intensive development for residential, commercial, industrial or institutional use (Alabi and Ufuah, 2007). This can be publicly or privately owned which includes agricultural and forest land, undeveloped coastal and estuarine lands, undeveloped scenic lands, public parks, preserves and water bodies such as lakes and bays (Alabi, 2009). According to the Open Space Conservation Plan 2009, a vacant lot or a small marsh can be an open space in a big city, a small park or a narrow corridor for walking or bicycling is open space, though it may be surrounded by developed areas. Cultural and historic resources are part of Africa's heritage and are often protected along with open space in some countries (Alabi, 2009).

Dunnett et-al,(2002) defined open space as that part of the urban area which contributes to its amenity, either visually by contributing positively to the urban landscape, or by virtue of public access. It is therefore defined as combining urban green spaces and civic spaces. According to Bay (2010), Open Space refers to undeveloped land or water area. Specific definitions vary by jurisdiction, so local laws should be consulted for applicable requirements. Thompson (2002) sees open spaces in cities as places to celebrate cultural diversity, to engage with natural processes and to conserve memories. An open space in an urban setting had been described as a vacant land, either built upon or developed as gardens and recreations grounds or underdeveloped land which has value for recreational purposes, amenity, conservation and other natural resources, historic or scenic land scapes or areas of outstanding natural beauty such as water bodies, valleys, hills, maintains, .

It is pertinent to note that the definition of open space in this study is very broad and ranges from areas that are active in nature, such as parks and fields, to areas that are passive in nature such as

wetlands preserves including agricultural land use, which is prevalent in some part of the study area. Open space lands may be preserved, enhanced and restored in order to maintain or improve the natural, scenic, ecological, cultural, hydrological, or geological values of the property. For the purpose of this study, Open space will be defined as land zoned for open space, land still in its natural state, forests and wildlife preserves, farm and agricultural land, as well as Airfields and lawns.

3.0 THE STUDY AREA AND METHODS.

3.1 The Study area

3.1.1 Location

Sokoto, the capital of Sokoto State in Nigeria, is located about 8 kilometers north west of the confluence of the Sokoto and Rima Rivers lying on longitude 13^0 2'N and Latitude 5^0 16'E. It covers an urban planning area of 97,000 hectares. It is protected by escarpments on the east and north-west; small valleys on the west and south- west. Sokoto is the Seat of the Sultan of Sokoto, hence called the seat of the caliphate.

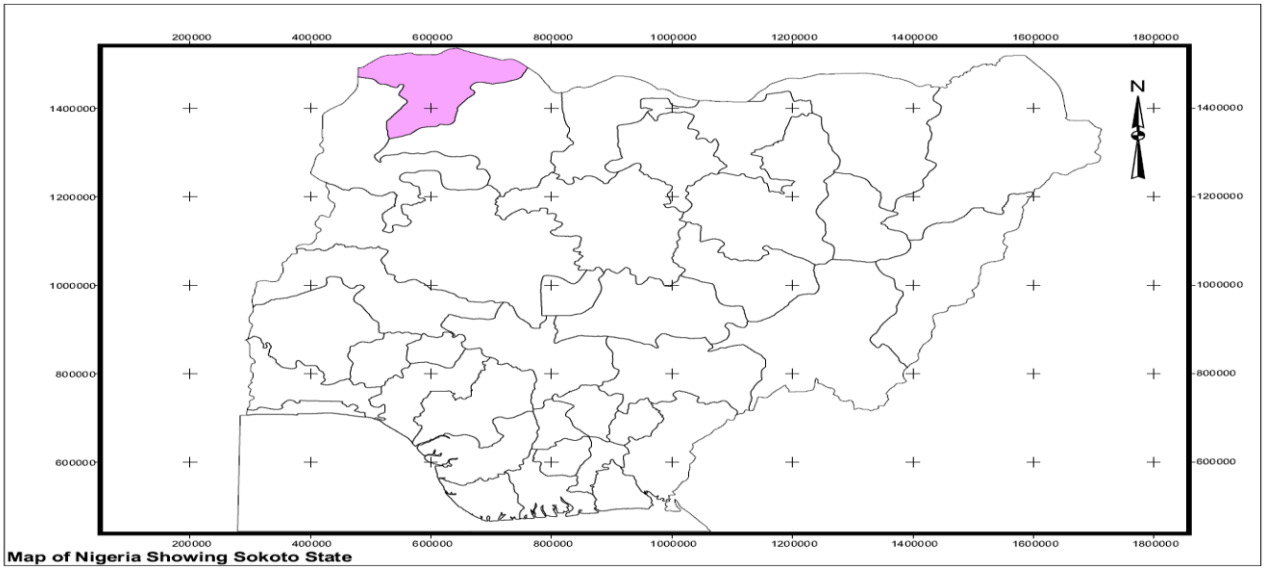


Figure 1: Map of Nigeria showing Sokoto State.

3.1.2 Climate

The climate of Sokoto is of the hot type characterized by relatively wide and rapid changes in lowest mean monthly temperature occurs in December or January at about 15^0c or lower. With an average annual temperature of 28.3° C (82.9° F), Sokoto is one of the world's hottest cities. The mean annual rainfall of the region is about 733mm mainly between July and September, the highest in August which is usually about 244mm.

3.1.3 Population

Sokoto as at 2006 had an estimated population of 370,000 with more females than males. Having a high dependency ratio, Sokoto however has about 40% as its labour force.

3.1.4 Land use pattern

The study area constitutes the predominant land use and next to that are the educational institutions. The direction of the city growth goes outwards but the seasonally flooded areas (fadama lands) have restricted expansion towards the northern part hence growth is towards the southern part along the Sokoto-Gusau, Sokoto-Birnin-Kebbi, Sokoto–Kalambaina and Sokoto Gagi roads.(See Fig 2)

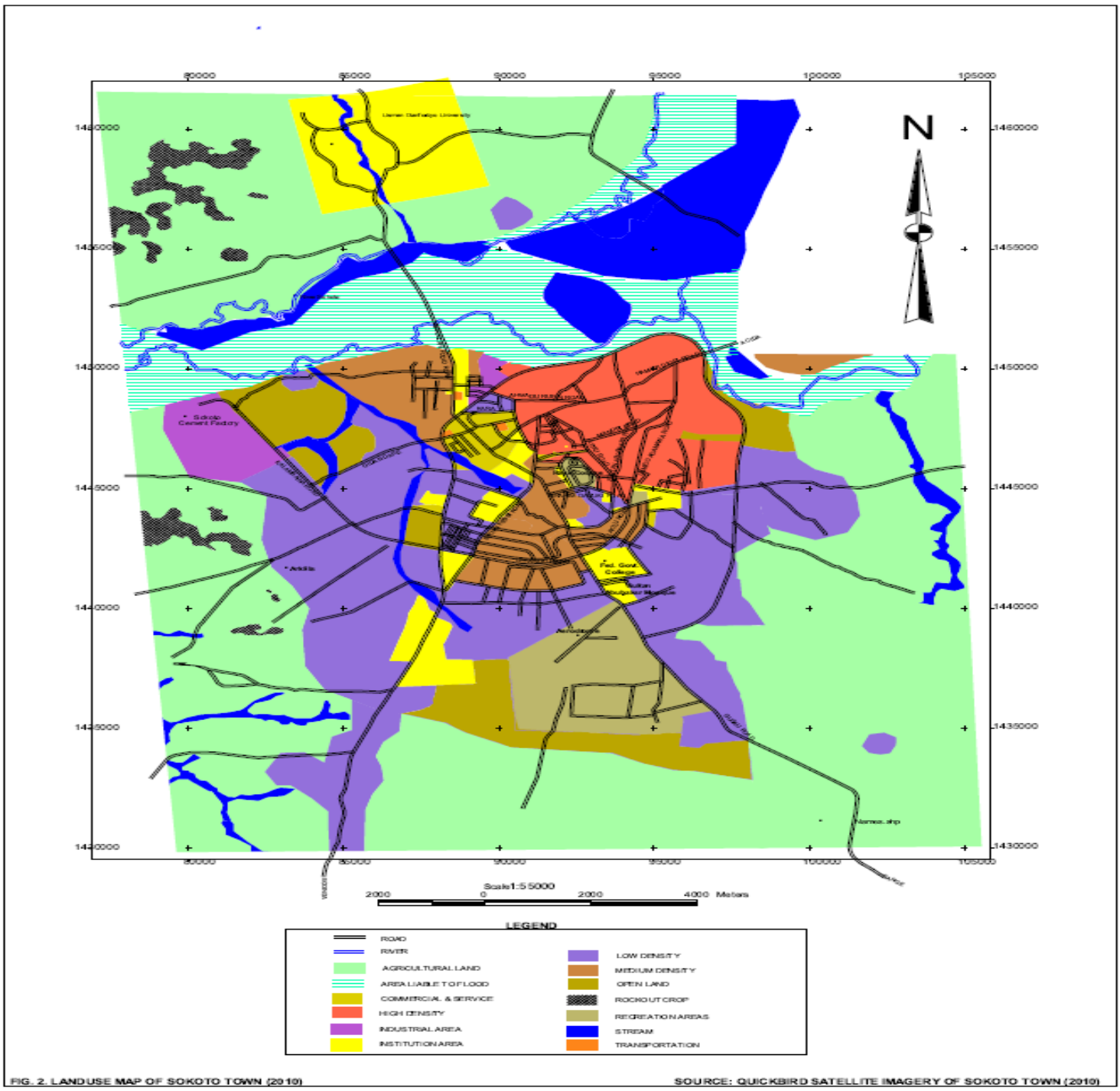


Fig 2: Study Area: Land use Map of Sokoto

3.2.0 Methods

3.2.1 Flow Chart

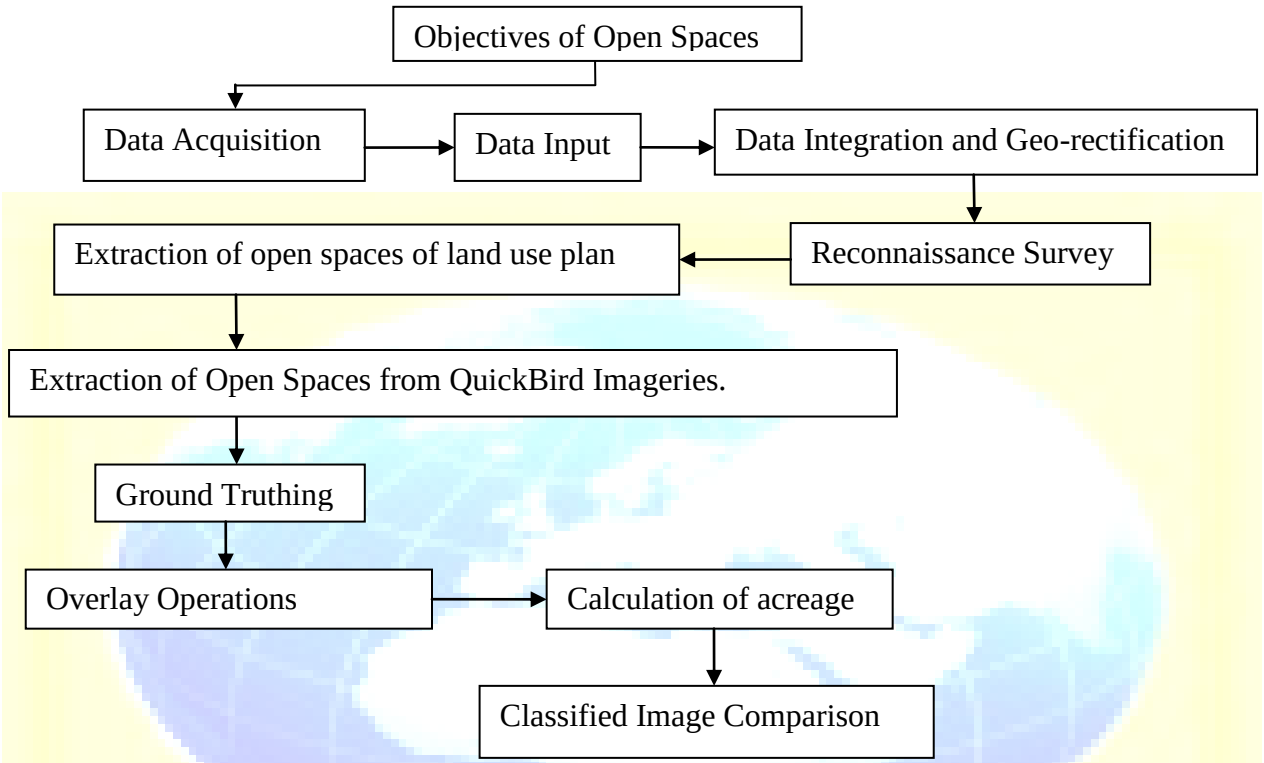


Figure 3: Sequence of the Methods.

3.2.2 Stages of Methodology

Pre-field Study

This phase involved the development of the statement of problem, the articulation of the aim and objectives, formation of literature review. Next is the collection of data and its integration before being further used for the study.

Field Study

This involved a reconnaissance survey to get acquainted with the study area, There after a ground truthing exercise was done to get ground control points for geo-referencing and then the global positioning systems was used to map out areas of recent development that were not on the land use map.

Post- field Survey

After the data from the field had been collected, the data was processed and analysed using ArcGIS9.2, ERDAS Imagine8.3, and win Zip 14.5.softwares .

3.2.3 Data Collection

For this study, remotely sensed data made up of two images of the study area was used. They are the Quick Bird imagery of Sokoto for 2005 and 2010 and the land use Map of Sokoto for 1992.

The remote sensed imageries were acquired through downloads from the Digital Globe website (www.digitalglobe.com).The QuickBird images usually are in Tagged Image File Format (TIFF) and stored using winzip. Thus, after downloading the images, they were then unzipped and imported to Erdas Imagine 8.3 software for data intergration and georectification. Geo-rectification was done to Universal Transverse Mercator (UTM) projection system, zone 31, World Geodetic System (WGS) 84 Datum. The essence of this was to correct all forms of geometric and radiometric errors for data source. These imageries acquired have been used to produce Land Use map for year 2005 and 2010.

Table 3.1:Remotelly Sensed Data and Map

S/N	DATA TYPE	ACQUISITION DATE	SCENE SIZE	PIXEL RESOLUTION	SOURCE
1	QuickBird Imagery	11/12/2005	18km×18km	60cm	DigitalGlobe
2	QuickBird Imagery	20/01/2010	18km×18km	60cm	DigitalGlobe

3	ExistingLand Use Map	1992		1:15,140,906 (view scale)	Ministry of land and survey

Source : www.digitalglobe.com and Ministry of Lands and Survey Sokoto (2012)

3.2.3 Data Processing

The data processing was done using the following soft wares: ArcGIS9.2, ERDAS Imagine8.3, and win Zip 14.5. The data acquired was imported and all the bands integrated into one image. Thereafter the image was geo referenced and a reconnaissance survey conducted. After this was done, the Open Spaces were extracted from the images by digitization using ArcGIS 9.2. The Open Spaces on the Land use Plan were also extracted, and divided into different types of Open Spaces. They are bare land, agricultural land, river/streams, and areas liable to flooding, forest lands, and recreational areas. This classification was done using ERDAS imagine 8.3.

3.2.4 Data Analysis

The method adopted for the digital data analysis of the maps gotten from the satellite images are:

i. Calculating the acreage of the types of open spaces for the years in question and comparing the results.

ii. Overlay analysis were carried out to establish the areas of changes and the percentage of change.

iii. The calculation of percentage change were done to determine the trend of changes by the formula given below:

Trend (% change) = (Observed Change/Sum of Change) ×100.

iv. Times series analysis werer used to for further analysis and forecast future changes in the study area. The equation for forecast in linear regression for time series is a+bx, where:

$$a = \bar{y} - b\bar{x}$$

$$b = \frac{\sum (x-\bar{x})(y-\bar{y})}{\sum (x-\bar{x})^2}$$

Where x and y are the sample means AVERAGE (known x's) and AVERAGE (known y's).

Highlighted below are the different types of Open spaces that were considered in the Study based on the land cover classification done:

1. Rivers/Stream. 2Areas liable to flooding. 3. Agricultural land. 4. Bare land/soil
5. Recreational areas and 6.Built-up Area.

4.00 RESULTS AND DISCUSSIONS.

4.1 Land Cover Distribution

The land cover distribution for each study year derived from the maps is presented in the table below as follows:

Land Use	1992		2005		2010	
	Area (Hectares)	%	Area (Hectares)	%	Area (Hectares)	%
Recreational	213.97	2.41	38.72	0.69	33.26	0.37
Bare Land	2262.17	25.47	1833.06	20.64	1136.76	12.80
River	34.91	0.39	18.35	0.21	47.16	0.53
Agricultural Land	626.26	7.05	459.31	5.17	138.20	1.56
Areas liable to flood	1155.06	13.00	889.42	10.01	977.18	11.00
Built up area	4590.70	51.68	5644.21	63.54	6550.51	73.74
TOTAL	**8883.072**	**100.00**	**8883.072**	**100.25**	**8883.072**	100.00

Table 4.1 Land Cover Distribution for Sokoto town in 1992, 2005, and 2010.

Source:Authors' analysis of land use map of 1992 and Quick Bird imageries of 2005 & 2010

The data presented in table 4.1 above represents the static area of each land use land cover category for each study year.

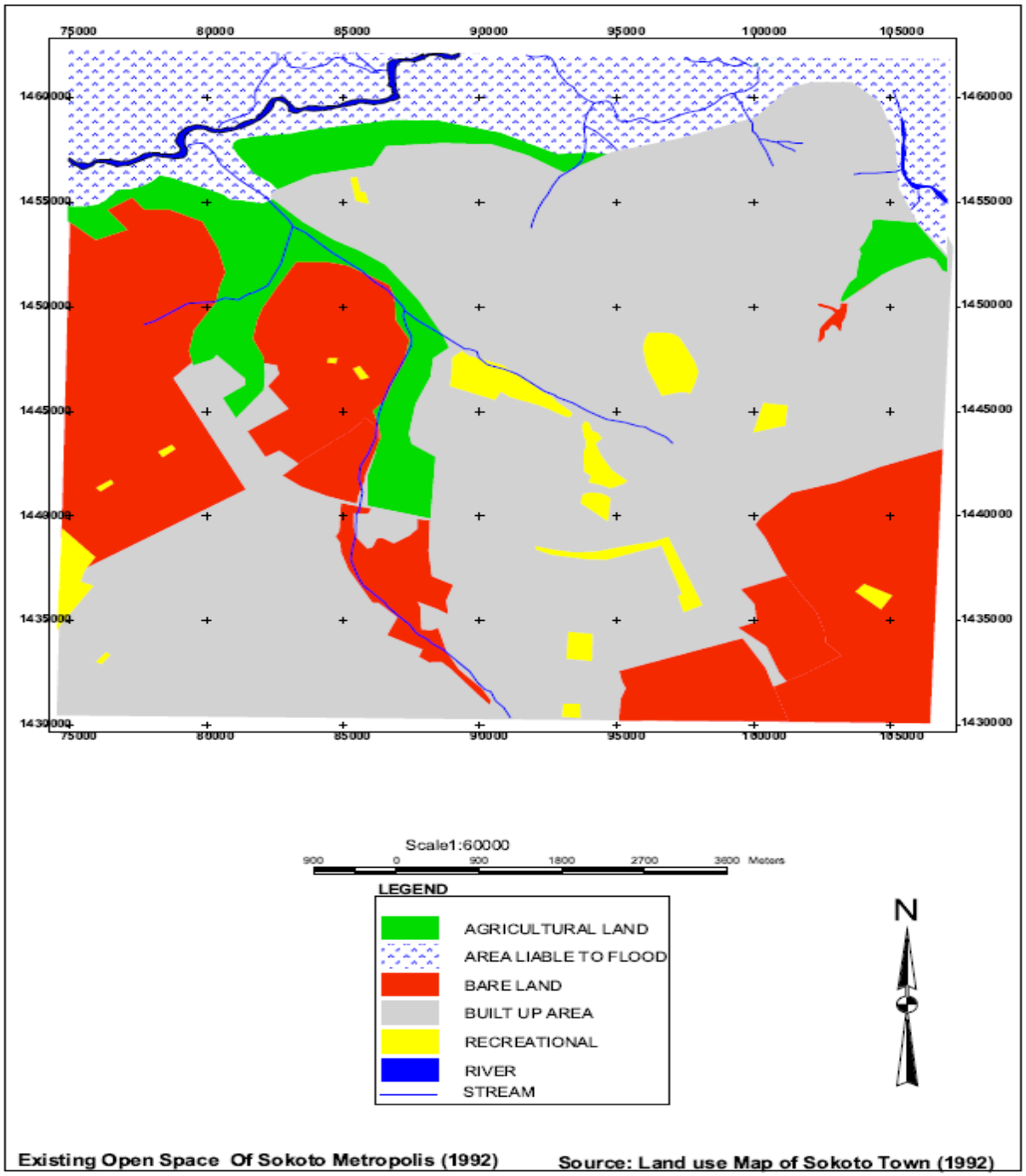


Figure 4: Sokoto Land Use Map, 1992

The analysis of the land cover in the study area in 1992 shows that River/Streams occupies the least class with just 0.39% of the total land area with areas meant for recreation occupying 2.41%. Agricultural lands and area liable to flooding also known as the Fadama lands occupy 7.05% and 13%. Bare land covers an area of 25.47% while built –up land dominates the land cover types with 51.68.

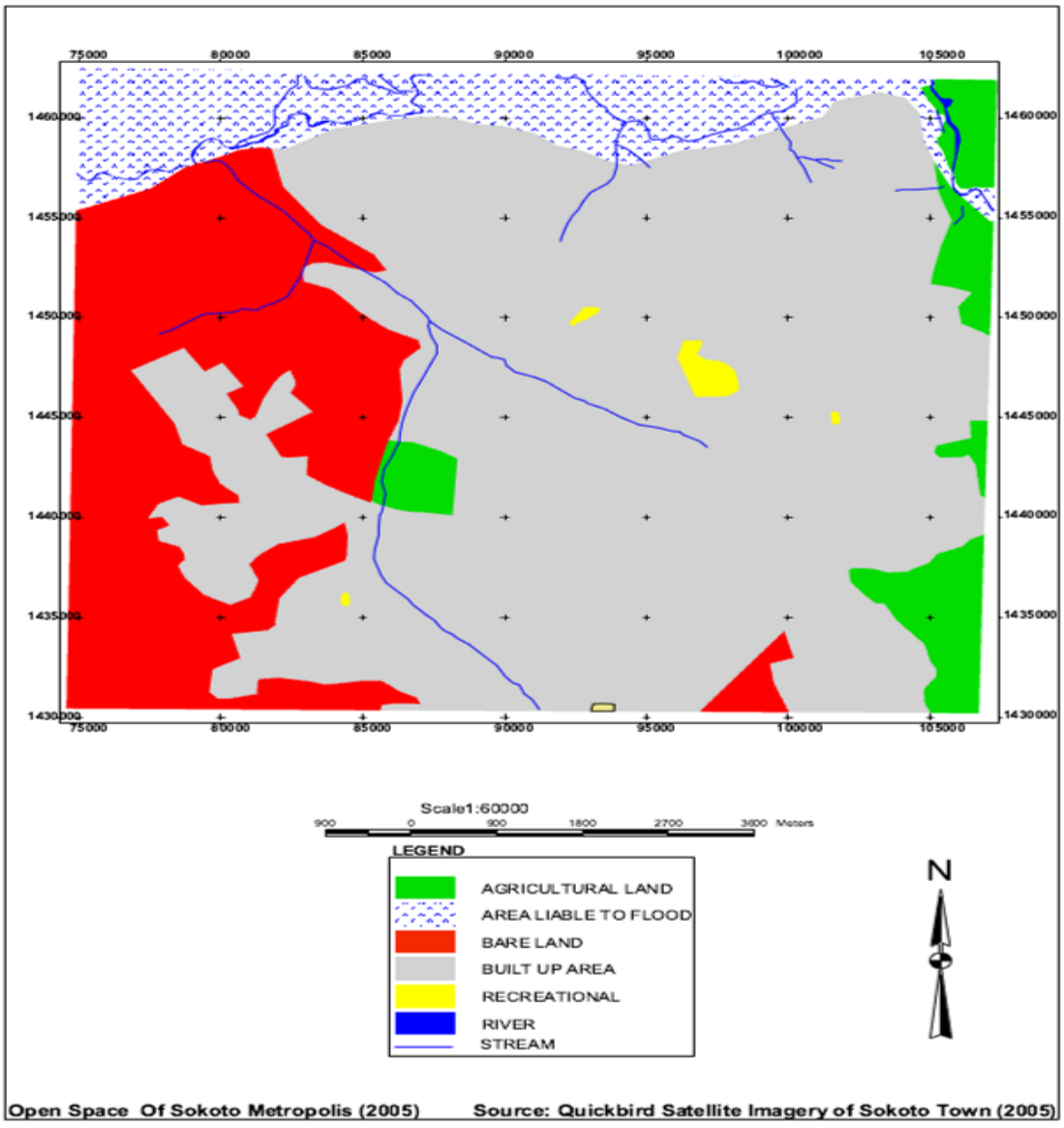


Figure: 5. Open Spaces within Sokoto in 2005

In 2005, built-up land still occupies the highest class with 63.54% of the total area while Water body takes up the least area as 0.21% decreasing from 1992. There is also a decrease in the area for recreational and agricultural land accounting for 0.69% and 5.17%. Still, areas liable to flooding and bare lands are also on the decrease occupying 10.01% and 20.69%.

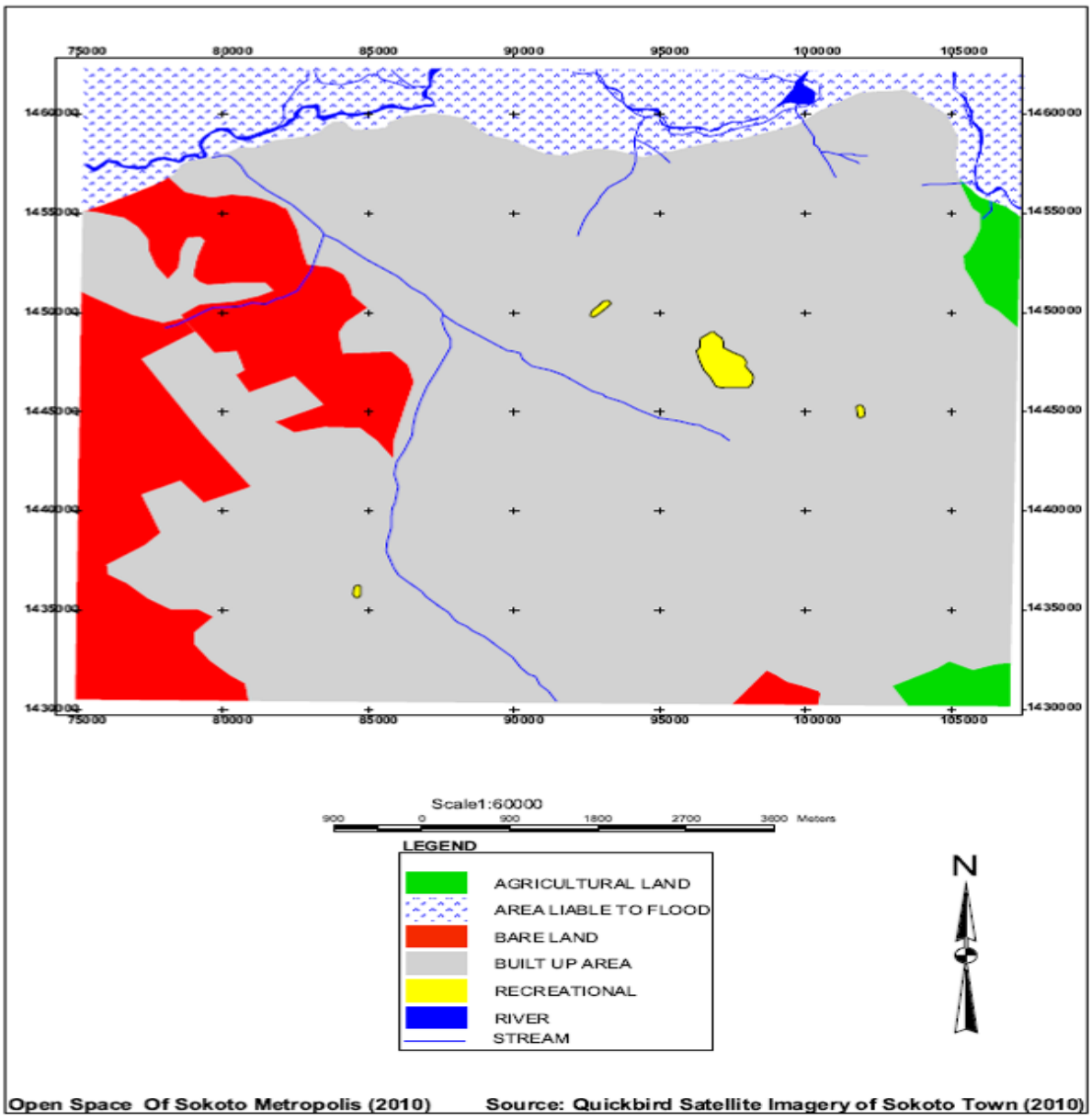


Fig. 6 Open Spaces within Urban Sokoto in 2010

The result of the analysis in 2010 from the Quick Bird image of the study area shows a continuous increase in the built up area between 2005 and 2010 from 63.54% to 73.74%. The river/Streams and areas liable to flooding have increased contrary to the decrease in the previous from 0.21% to 0.53% and 10.01% to 11% respectively. This is due to the flooding and increases in water level of Sokoto in the year in question. Bare land has decreased from 20.69% in 2005 to 12.80% in 2010. There is also a drastic reduction in the area used for agriculture from 5.17% to 1.56% in 2010. The breakdown on tables shows the conversion of designated open lands into other uses different from the original intended uses because of the constant decrease in open lands.

4.2 Open Space in Sokoto Town: Trend, Rate and Magnitude

The main focus of this study is the Open spaces which comprises of bare land, Agricultural land, Areas liable to flooding, recreational areas, and water bodies which has to do with the change in the study area between 1992 and 2010.

Table 4.2 Land Cover Change of Urban Sokoto and environ in 1992, 2005 and 2010.

	1992-2005		2005-2010		Annual Rate of Change	
Land Use	**Area (Hectares)**	**%**	**Area (Hectares)**	**%**	**1992-2005**	**2005-2010**
Recreational	-175.25	-1.97	-5.47	-0.06	-0.26	0.00
Bare Land	-429.11	-4.83	-696.30	-7.84	-0.63	-0.39
River	-16.57	-0.19	28.82	0.32	-0.02	0.00
Agricultural Land	-166.95	-1.88	-321.10	-3.61	-0.24	-0.01
Areas liable to flood	-265.64	-2.99	87.75	0.99	-0.39	-0.02
Built up area	1053.51	11.86	906.30	10.20	1.54	0.08

Source: Researcher's analysis of landuse map and imagries of the study area in 1992, 2005 and 2010.

Table 4.2 shows the rate of change of land use in Sokoto town between 1992 to 2005 and 2005 to 2010. There was a decrease in recreational area to -1.97% between 1992 and 2005, while between 2005 and 2010 the reduction was -0.06%. Similarly, bare land reduced by -4.83% between 1992 and 2005 while between 2005 and 2010 there was a decrease of -7.84%. The river body in Sokoto town also decreased by -0.19 between the period 1992 and 2005, however, there was a slight increase of 0.32% between the period of 2005 and 2010.

Agricultural land decreased by -1.88% and -3.61% between the periods 1992 to 2005 and 2005 to 2010 respectively. Areas liable to flood also decreased by -2.99% between 1992 and 2005 with a slight increase between the period of 2005 and 2010. The table showed that there was; 11.86% increase in built up areas between the period of 1992 and 2005, 10.20% between 2005 and 2010.

According to the table 4.2, the annual rate in change between the period 1992 and 2005 decreased for recreational land, bare land, river, agricultural land and areas liable to flood; -0.2%, -0.63%, -0.02%, -0.24% and -0.39% respectively. There was however an annual increase of 1.54% in built up area in Sokoto town. Similarly, between the period 2005 and 2010, the annual rate of change increased by 0.08%. On the other hand, there was a decrease of -0.39%, -0.1% and -0.2% in bare land, agricultural land and areas liable to flood respectively.

4.3 Changes in Open Space In Urban Sokoto Between 1992 And 2005

Information from satellite remote sensing plays a useful role in understanding the nature of changes in land cover/land use and projecting possible future changes. Such information is essential for future urban development plans. While encroachments into the original acquisitions have been discovered, there is widespread conversion of open spaces in the already developed area. The Land cover of the study area had undergone significant changes over time. The classification and quantification of the images of the study area aided the detection of changes in the various land cover that took place over the study period. The process involves a comparison of the study area images for the years in question using Boolean Overlay methods.

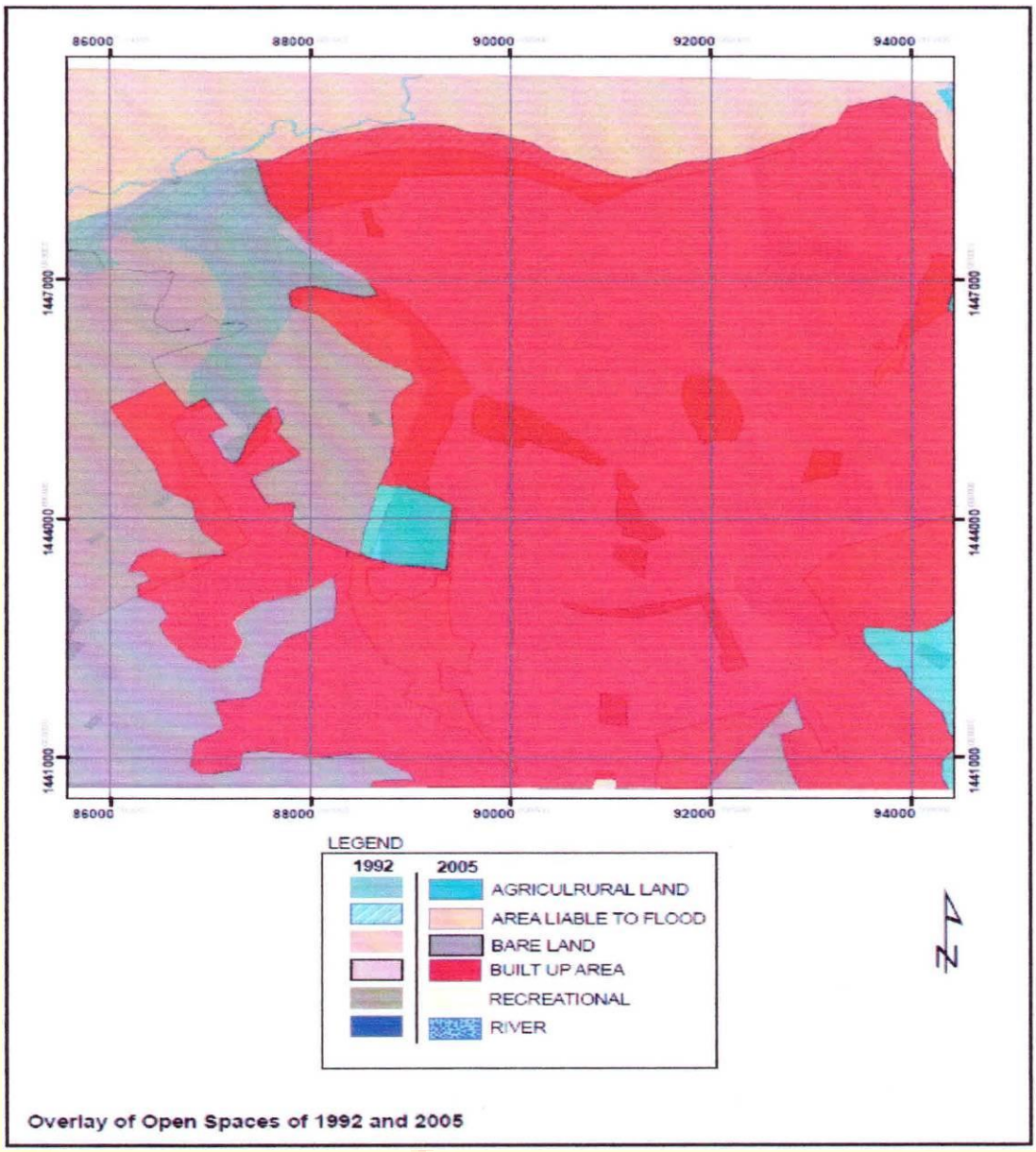
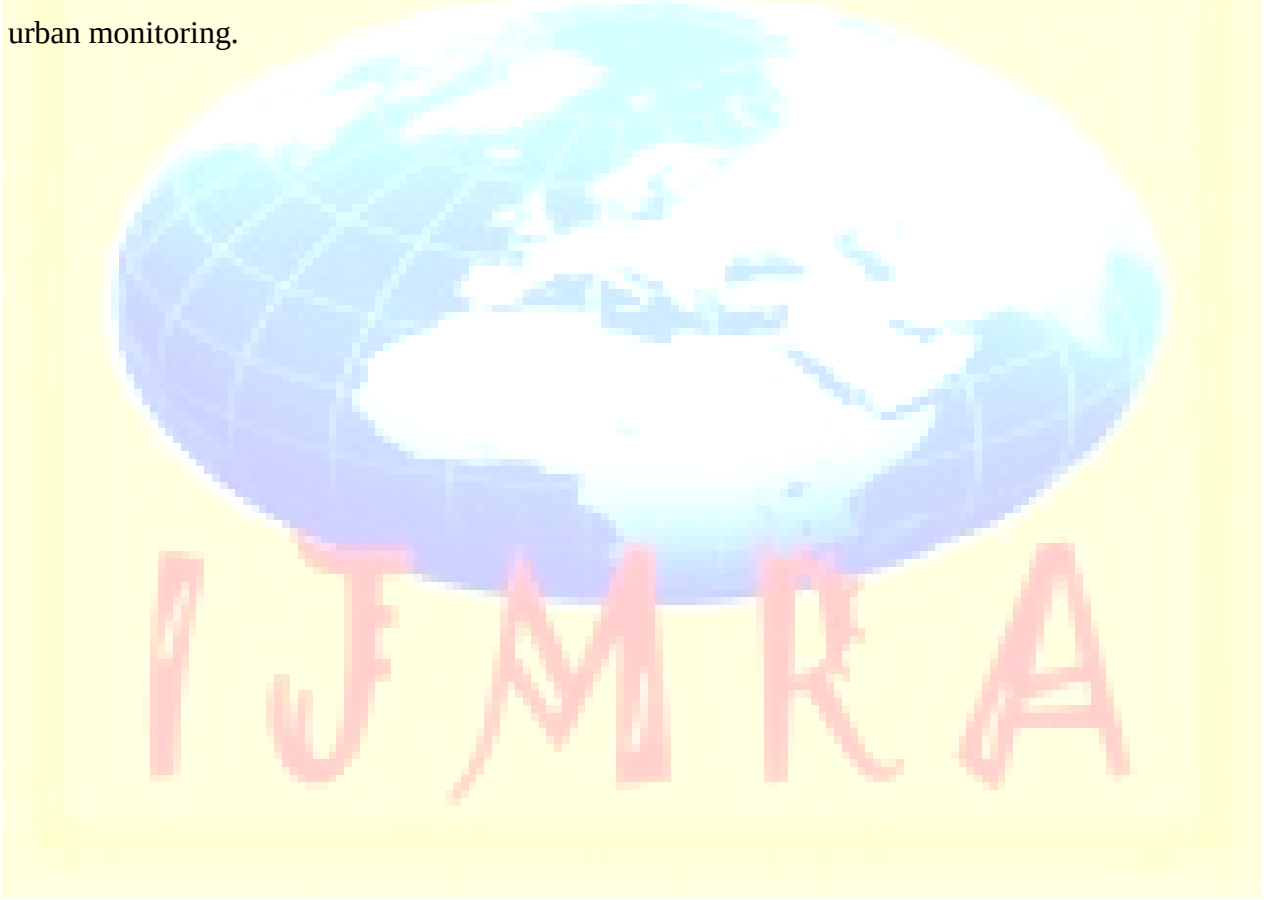


Figure 7: Overlay Map of open Spaces in Urban Sokoto between 1992 and 2005.

In determining the location and nature of change in the study area, emphasis is laid more on the open spaces. The Result of the overlay between 1992 and 2005 shows that the town expanded so much and has encroached so much into the open spaces. The trend of open spaces is definitely on the decrease.

The overlay of the open spaces in 2005 and 2010 reveals that there was further decline in the quantity of open spaces revealing more conversion of open spaces and spatial expansion of the town in all directions as shown in figure 8.

This trend may likely have resulted from increased migration of people to Sokoto town, but it however portends dangers for aesthetics, beauty and liveability of Sokoto town. It shows Neglect of the city and lack of monitoring on part of city administrators and planners. This is true more so since planners in our own part of the world still lack adequate application knowledge of the necessary tools of GIS and remote sensing to carry out their jobs of development control and urban monitoring.



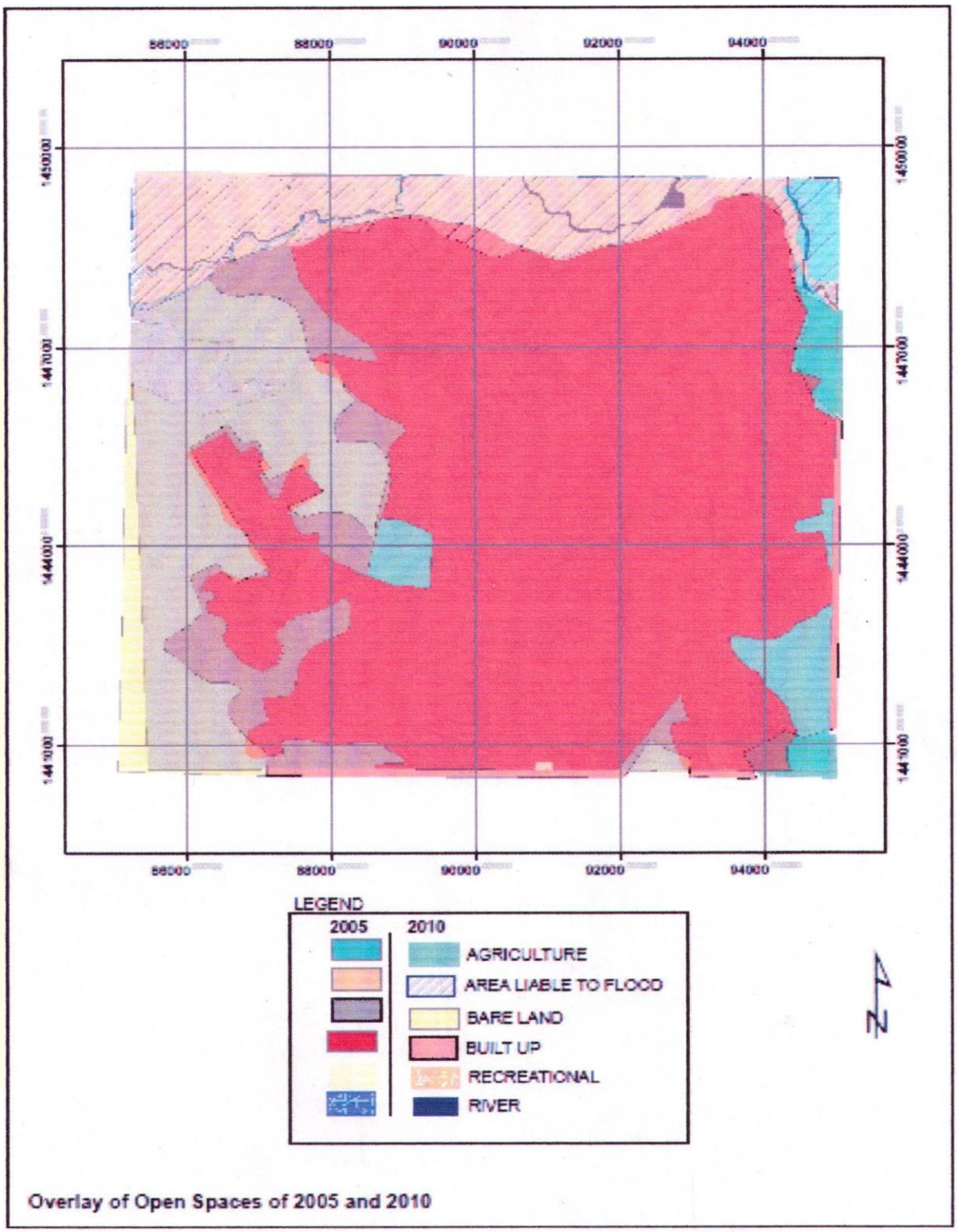


Figure 8: Overlay Map of open Spaces in Urban Sokoto between 2005 and 2010 below.

4.4 LAND USE PROJECTION 2020

Table 4.3 Projected land use for year 2020 and land use change from 2010 to 2020

	2010		2020		Change Area (2010-2020)	
Land Use	Area (Hectares)	%	Area (Hectares)	%	Area (Hectares)	%
Recreational	33.26	0.37	-94.26	-1.06	-127.51	-1.44
Bare Land	1136.76	12.80	744.11	8.38	-392.65	-4.42
River	47.16	0.53	38.56	0.43	-8.60	-0.10
Agricultural Land	138.20	1.56	-20.47	-0.23	-158.67	-1.79
Areas liable to flood	977.18	11.00	795.20	8.95	-181.97	-2.05
Built up area	6550.51	73.74	7419.92	83.53	869.40	9.79

The table 4.3 above shows the statistics of land use projection for Sokoto town in 2020 using the time series analysis method. According to the analysis there will be a decrease in recreational area by 1.44% between year 2010 and 2020, similarly, the area of bare land, river, agricultural land, and areas liable to flood will decrease by 4.42%, 0.10%, 1.79% and 2.05% respectively. However, built up area will increase by 9.79% between year 2010 and 2020. This out rightly shows no future for open spaces in Urban Sokoto. At this rate of change, by 2020, there will be no more open spaces in Sokoto and town will begin to expand to the fringes and encroach further into the agricultural lands of the rurals.

5.0 SUMMARY OF THE FINDINGS AND IMPLICATIONS.

Land use of the study area

The land use of Sokoto town in this study was classified into; recreational, bare land, river, agricultural land, areas liable to flood and built up area. Built up area occupied more than halve of the study area, this could be attributed to the fact that the study centered on the metropolitan area of Sokoto. This is followed by bare land which occupied a quarter of the study location. This creates more room for expansions of the built up area in the future.

The river body of the study area is quite small; this is not surprising because of the tributaries of river sokoto that flows through part of the metropolis. The percentage of agricultural land is quite small because there is less farming activities within Sokoto town as compared to the rural areas of the state. In addition, part of the agricultural land in the study area might eventually be converted to built up areas.

The data and information generated in this study using GIS and remote sensing techniques has demonstrated the deterioration of the study area. While encroachments into the original acquisitions have been discovered, there is widespread conversion of open spaces in the already developed area. The implications of this on the liveability of Sokoto town cannot be over-emphasized. A major problem now is that city planners and administrators in Nigeria still have inadequate knowledge of the tools of GIS and Remote Sensing to enhance their efficiency at work. The gradual training will eliminate this problem ultimately to ensure designing healthier cities and for sustainable development.

Trend and magnitude of land use

Due to population increase over the years there is a progressive increment in built up area in Sokoto town with attendant decrease in open spaces. This might lead to depletion in oxygen, resulting in increase in air pollutions and other environmental hazards.

The increase in built up area will eventually cause a total depletion in agricultural land, because of the increase in infrastructural development there will be demand for land at all means. This

might result into people building housing on water ways. Recreational land might eventually be lost if the demand for infrastructural development increases.

Future pattern of land use.

Based on statistical projections made for year 2020 during the study, built up area will eventually cover up over 80% of the study area. This will result in drastic reduction in bare land, complete elimination of recreational land and agricultural land. This implies that by year 2020 there might be no recreational area and agricultural land for farming activities within Sokoto town.

5.2 Conclusions

This study highlighted the land use pattern, trend and magnitude of land use and future pattern of land use in Sokoto town. It revealed a progressive reduction in the area of recreational land, bare land and agricultural land. The findings of this study also showed an increase in built up area in Sokoto town over time. Urban open spaces are invaluable assets in maintaining ecological health in a highly developed urban matrix. Unfortunately, habitat values and ecological quality of these areas are often challenged by urbanization. The assessment of changing structure and function of an urban open space system is crucial in maintaining livable cities.

The recommendations made based on the findings of the study are as follows:

i. There should be a clear policy by the Government of Nigeria on the preservation of open space such as recreational areas and agricultural lands in Nigerian cities.
ii. There is need for focused rural development in order to depopulate the urban areas through provision of employment.
iii. Enforcement of the implementation of town planning laws through improved and specialized programs and effective policing. This will help in revitalizing open spaces, which will in turn improve the quality of life of the urban dwellers; it will also control urban expansion, where loss of biodiversity will also be minimized.
iv. The conservation of green open spaces is important not only for the sustainability of natural environment, but also for the continuance of cultural and religious traditions of the Sokoto. Its focus should not just be on quantitative goals of adding the stock of green open spaces, but also on participation of the communities at various levels as the guardians of their living cultural environment.

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