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LANDUSE/LANDCOVER OF ISEYIN LOCAL GOVERNMENT AREA, OYO STATE USING GIS AND REMOTELY SENSED SATELLITE IMAGERY

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ABSTRACT

Human activity interacts with the natural environment, particularly the land, which includes plants, rocks, water features, and bare ground. Each of these influences human growth and decision-making in one way or another. The Iseyin Local Government Area has seen remarkable development, growth, and construction of roads, buildings, deforestation, and many other human endeavors. As a result, there has been a gradual increase in land occupation as well as modifications and changes to the status of land use and land cover without a comprehensive assessment of these movements. Thus, the emphasis is on land use change detection. The land cover of Oyo State, Nigeria's Iseyin Local Government Area, Landsat 8 OLI, Landsat 7 ETM+ 2000, Landsat 7 ETM+ 2010 2020, and Landsat 8 OLI 2023 imagery covering the area of interest between 2000 and 2023 were obtained. QGIS, Arc GIS 10.8.1, and TerrSet 2020 software were employed to process and analyze the results. The results obtained show some changes in land use and land cover classes within the period 2000–2023. The built-up area experienced a low increment of 724 ha, representing 0.42%, due to the migration of people from town to settlement, the conversion of the hamlet to agricultural purposes, and the activities of bandits. An increase in bare ground of 27377 ha, representing 15.88%, was observed; water was recorded to be dynamic; this is attributed to natural dry-up resulting in suitable sites for appropriate road construction and urban development purposes; rock was recorded as the prime victim, with 52099 ha, representing 30.23%. However, vegetation and agricultural land increased and decreased due to anthropogenic activities on rock; these changes implied that there was rapid urban development within a twenty-three-year period.

Keywords: *Built-up, Change Detection, Land Absorption Coefficient, Land Use, Land Cover, Urban Growth*

INTRODUCTION

Land is the most valuable natural resource in developing nations like Nigeria, where the agricultural industry is the backbone of the national economy. The physical and biological land resources that are now available are used and altered as part of these countries' developmental efforts, frequently leading to changes in LULC. Such changes have occasionally improved things, but they have also occasionally had detrimental effects on the environment and people's daily lives (Briassoulis, 2019). One of the main causes behind changes in the global environment is thought to be the idea of land use and land cover change, which is central to the issue of sustainable development. To determine the precise causes of land use and land cover change and their effects, the subject has been examined from a variety of angles. One of the major indicators of economic progress has been urban growth, particularly the transfer of commercial and residential land to rural areas on the fringes of urban districts (Sankhala and Singh, 2014). Land use and land cover are fundamentally different concepts but are generally used interchangeably. The first concept, 'land cover' refers to the physical features of the earth's surface, comprising soil, water, the distribution of vegetation, and some other physical features of the earth's surface, including those produced exclusively by human activities such as residential settlements. On the other hand, the term 'land-use' refers to the way in which humans use their lands on the basis of their functions for various social and economic activities. Both natural and socio-economic features of the land are the result of the utilization of the land use and land cover of a given place by man in space and time. Providing vital information regarding land use, land cover, and opportunities for their maximum use is important for the choice, planning, and execution of various land use programs to meet the ever-increasing demands for basic man's welfare and needs. Provision of such information would also help in monitoring the changing aspects of land use, especially the forthcoming demands of population growth.

Land use land cover (LULC) change in any particular region is an outcome of both natural and socio-economic factors and their utilization by man in time and space. Land is becoming a scarce commodity due to its immense agricultural and demographic presence. Therefore, information on land use Landcover is essential for planning purposes to meet the increasing demand for basic human needs. In south-western Nigeria, land resources are changing rapidly at local and national scales. As a result, the ecosystems on which the region depends are showing

signs of stress. A spatially explicit study of land use Landcover changes can lead to a better understanding of the causes of change and their consequences on the environment.

Since its establishment in 1976, during General Murtala Mohammed's administration, Iseyin Local Government Area has experienced impressive expansion, growth, and developmental activities like building, road construction, deforestation, and many other human activities. Due to this, there has been an increase in land consumption, modifications, and changes to the status of land use and land cover over time without any thorough evaluation of these changes through time utilizing GIS and remotely sensed imagery. In order to assist developers and the government in making decisions regarding land use, this project seeks to assess changes, examine, and analyze the driving forces that affect land use and land cover within the local government area.

METHODOLOGY

Study Area Description

Iseyin Local Government Area Oyo State was created in 1976 with its geographical coordinates of 7° 59' 34.35" North, 3° 42' 12.36" East, and 7° 54' 35.37" North, 3° 41' 29.02" East. Oyo State is a town in the country side of Oyo State and is rich in history, culture, and tradition. This richness is evident in the socio-cultural relations displayed by the natives in the commendations used to describe it as "*Iseyin oroomoebedimoko*" and "*Home of Aso-Oke.*". Iseyin is approximately 100 km north of Ibadan, and it is the fourth largest city in Oyo State after Ibadan, Ogbomosho, and Oyo. It is a part of the Oke-Ogun towns, often referred to as the food basket of Oyo State. This city is centrally located and accessible via road networks from Ibadan, Oyo, Abeokuta, and Ogbomosho. The population of the city as estimated in 2011 was 302,990, with an approximation of 1,419 square kilometers as the total land mass. The rise of Iseyin was not arbitrary; however, its geographical endowment was a center of attraction to the earliest farmers and hunters, who saw it as a fertile forestland for both mild and wild games, thereby serving as a pedestal for agriculturists and game hunters to thrive upon.
The city, which hid itself within an expanse of land surrounded by four high hills, namely "*Atamafon, Eyinjue, Oluofi, and Ebedi*," has a link with history.

Iyake suspended lake is said to be the only one in Africa and second in the world. It is located in Ado-Awaye town, Iseyin Local Government Area, Oyo State.

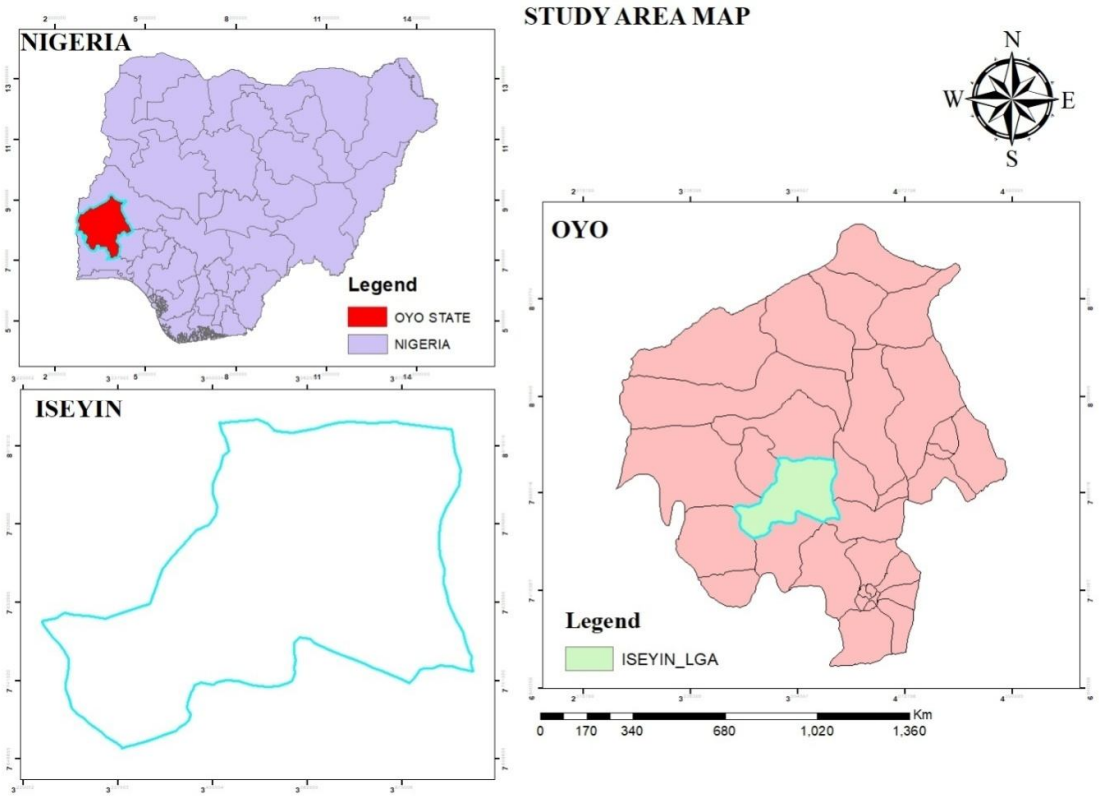


Fig 2.1: Study Area

Method

The method used in this study serves as the foundation for obtaining data on land use dynamics and, subsequently, overall.

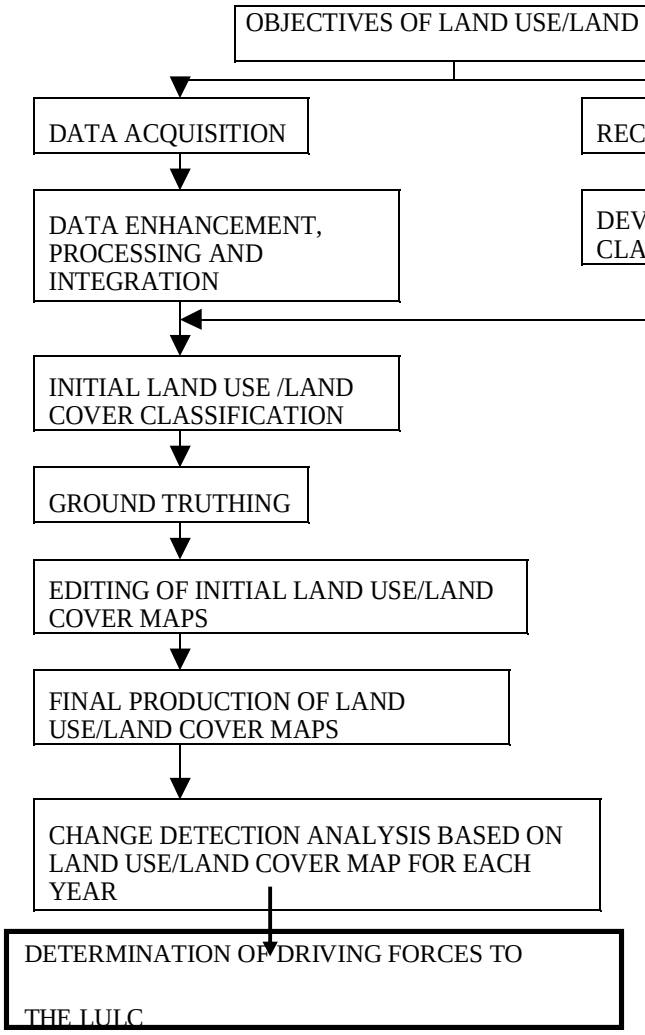


Fig 3.1: Frame work of methodology
Source: Author, 2023

Dataset and Material

· TerrSet2020: This was also used to complement the display and processing of the data.
· ArcGIS 10.8.1: It was used for mosaic and clipping of satellite images.
· QGIS was used for scanline error correction.
· Google Earth was used for ground trotting; it helps in classifying the features in each study year.
· Microsoft Word and Excel were used basically for the presentation by importing the database from TerrSet 2020 and producing the bar graph.

Data/Image Processing

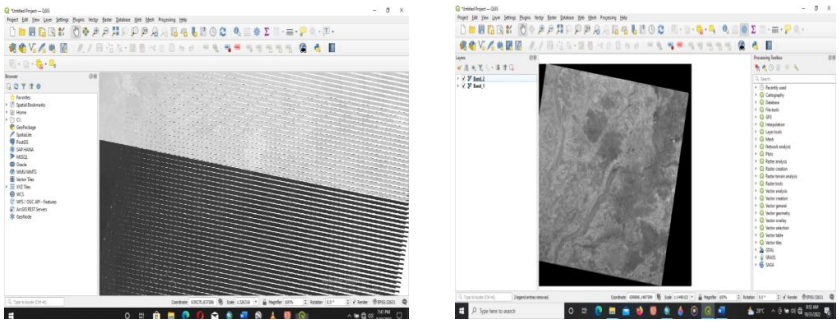
The procedures and methods used are:

a) The satellite images of Iseyin Local Government for the years 2000, 2010, 2020, and 2023 were downloaded online from the https://www.earthexplorer.usgs.gov website.

b) The files were extracted and saved into a folder for easy access in the TerrSet2020 environment for processing.

c) Landsat images from 2000 and 2010 were corrected for scanline error because most of the images of Landsat 7 have scanline. This, if not removed, can affect the results obtained during analysis. QGIS software was used.

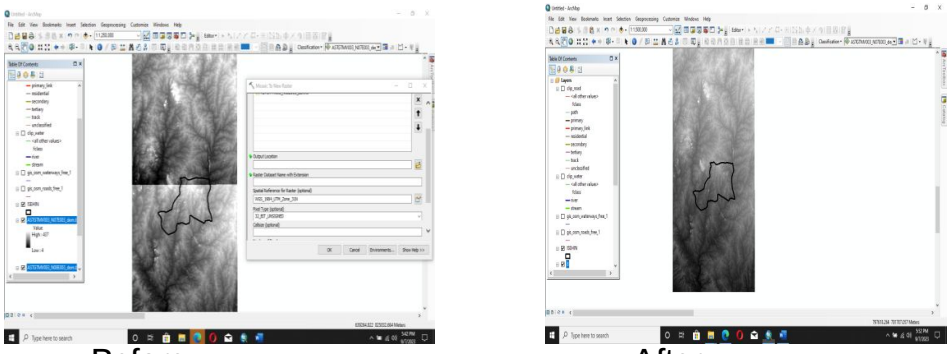
Below is the corrected Landsat image for band 2, and repeat the above process for all the bands.



Before After

Fig. 3.2 Band scanlinecorrection
Source: Author, 2023

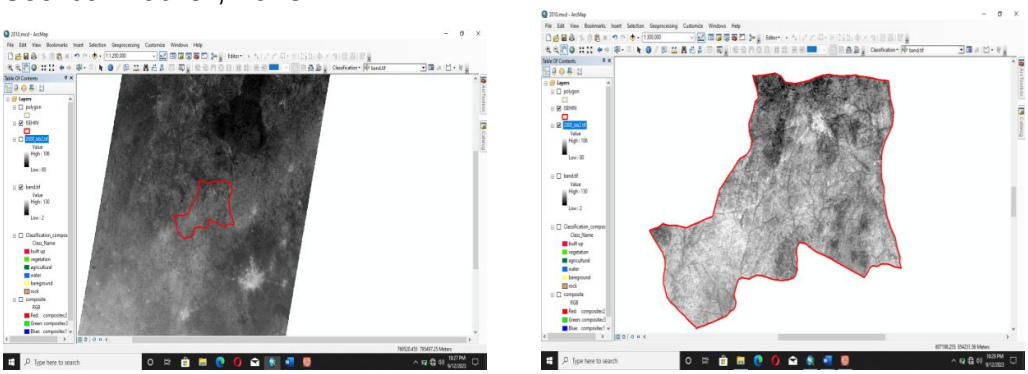
a) The image was mosaic of area of interest in ArcGIS and clipped out



Before After

Fig. 3.3Band mosaic

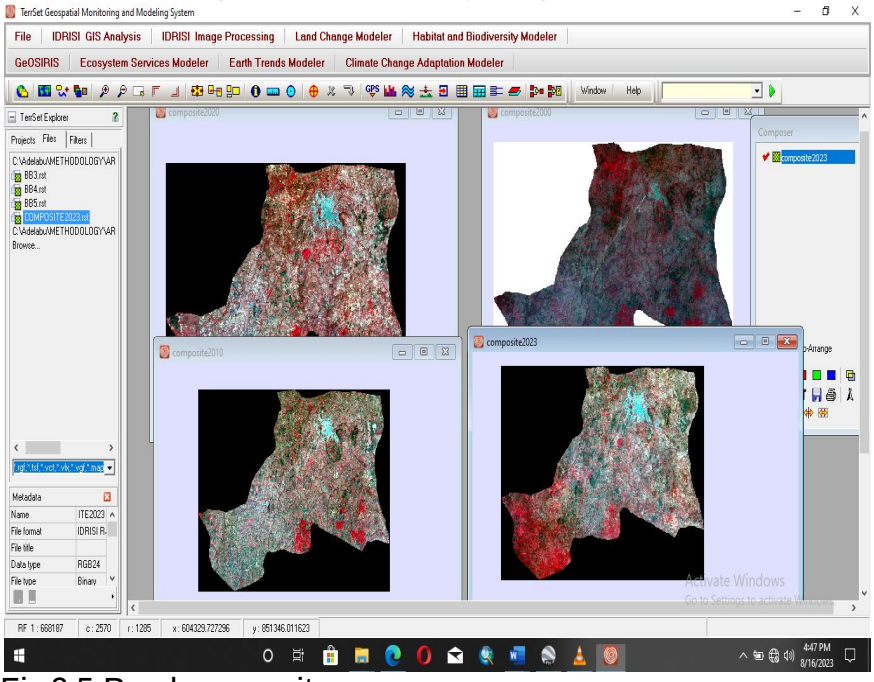
Source: Author, 2023



Before clipping After clipping

Fig. 3.4 Clipping of area of interest
Source: Author, 2023

b) Open TerrSet2020 software from Desktop and expand TerrSet2020 explorer and training sample



a)

Fig 3.5:Band composite
Source: Author, 2023.

f). The image was classified into six categories: built environment, vegetation, agricultural land, water bodies, barren ground, and rocks.

RESULTS AND DISCUSION

Maximum Likelihood Classification

The method above was used for identifying changes in land use types. The comparison of the land use and land cover statistics assisted in identifying the percentage change, trend, and rate of change between 2000 and 2023. In achieving this, the first task was to develop a table showing the area in hectares and the percentage change for each year (2000, 2010, 2020, and 2023) measured against each land use and land cover type.

Landuse/land Cover Categories	2000		2010		2020		2023		Magnitude of Change Detection Analysis		
	Area (ha.)	Area (%)	Area (ha.)	Area (%)	Area (ha.)	Area (%)	Area (ha.)	Area (%)	Area (ha.)	Area (%)	Remark
BUILT UP	362.13	0.27	602.35	0.45	1,044.28	0.78	6,085.93	4.52	2,024	1.50	Increase
VEGETATION	10,674.88	7.93	10,341.01	7.69	18,997.40	14.12	24,082.05	17.90	16,024	11.91	Dynamic
AGRIC. LAND	19,552.72	14.53	72,727.94	54.06	65,739.11	48.87	50,144.24	37.27	52,034	38.68	Dynamic
WATER	25,226.28	18.75	11,443.13	8.51	6,318.59	4.70	10,225.97	7.60	13,303	9.89	Dynamic
BAREGROUND	30,308.42	22.53	18,314.15	13.61	22,780.10	16.93	27,684.61	20.58	24,772	18.41	Increase
ROCK	48,407.53	35.98	21,103.39	15.69	19,652.48	14.61	16,309.16	12.12	26,368	19.60	Decrease
Grand Total	134,531.96	100	134,531.96	100	134,531.96	100	134,531.96	100	**134,532**	100	Increase

Table 4.1 Land Use Land Cover Distribution (2000, 2010, 2020 and 2023)

Source: (Author) ArcGIS 10.8.1 processes in Microsoft Excel 201

DISCUSSION

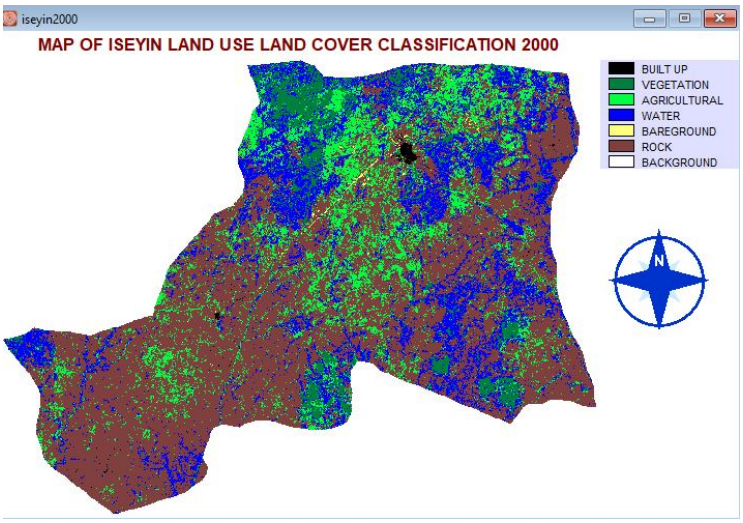


Fig 4.1: Land use land cover classification 2000

Source: Author, 2023

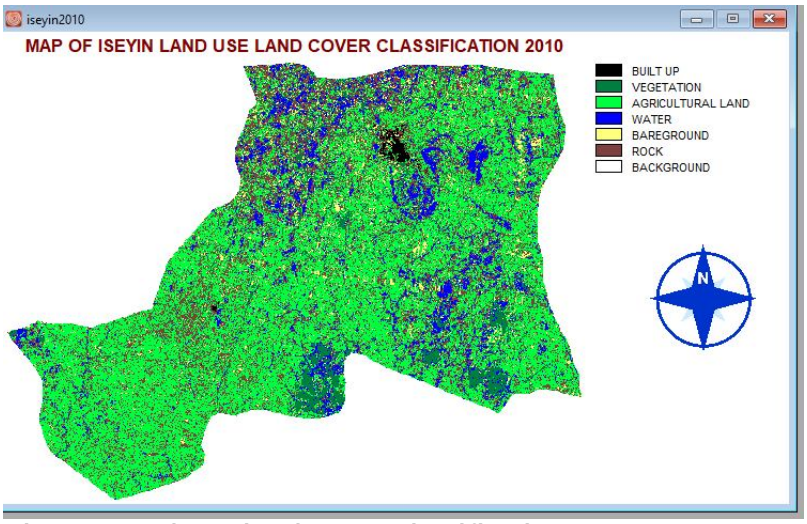


Fig4.2: Land use land cover classification 2010
Source: Author, 2023

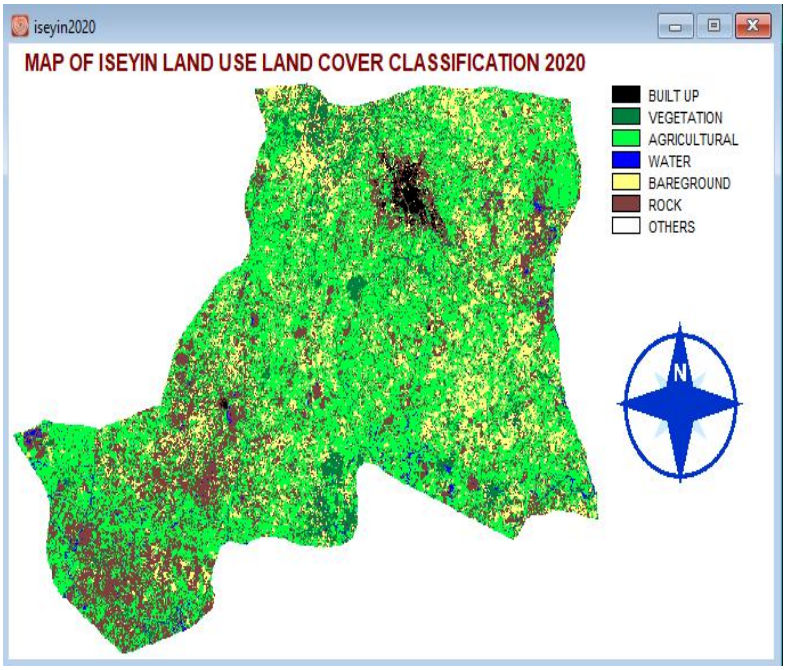


Fig 4.3: Land use land cover classification 2020
Source: Author, 2023

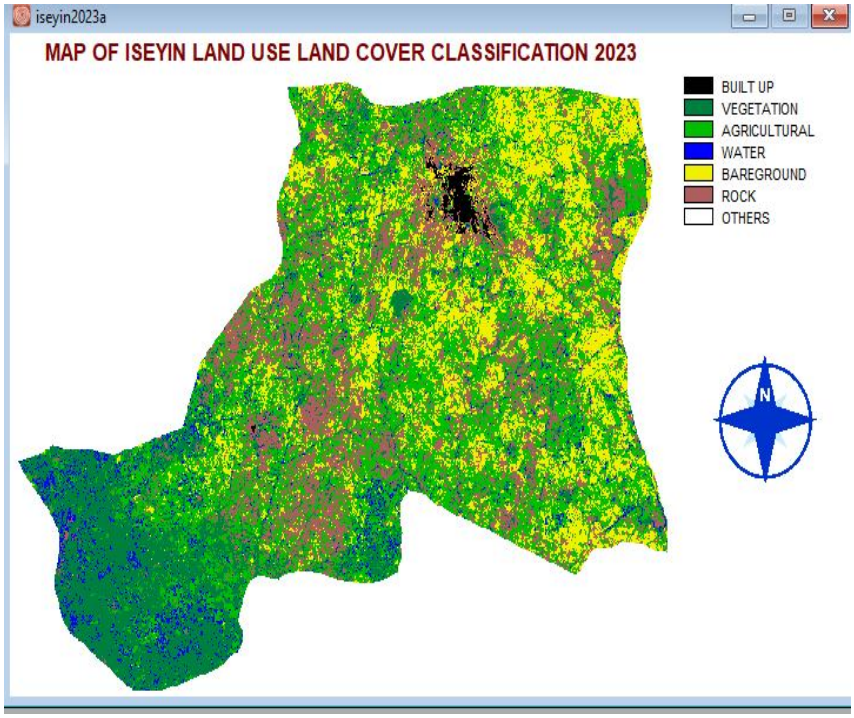


Fig 4.4: Land use land cover classification 2023
Source: Author, 2023

1. Built-up **area**

This category, represented in black, is comprised of areas developed for residential, educational, commercial, industrial, and cultural uses. It was observed that the built-up area covered 362.13ha (0.27%) in 2000 and 602.35ha (0.45%) in 2010. Besides, the land use category increased to 1044.28ha (0.78%) in 2020 and further to 6,085.93ha (4.52%) in 2023. This increase is attributed to an increase in demand for housing and other related urban land uses for sustainable growth and development. The built-up area recorded the lowest increase, with 2,024 ha, representing 1.50%, due to the migration of people from town to settlement or hamlet for agricultural purposes and the activities of bandits.

2. **Vegetation**

This land cover, represented in deep green, is comprised of areas covered by forests. It was observed to be unstable because, from 2000 to 2020, it decreased gradually from 10675ha (7.93%) in 2000 to 10,341.01ha (7.69%) in 2020. It further increased to 24,082.05ha (17.90%) in 2023. The observed total increase of 16,024ha in vegetation cover, representing 11.91%, recorded a small increment in this class if compared to that of

the built environment, and it is attributed to anthropogenic activities for commercial, agricultural, and socio-economic development.

3. Agricultural **land**

This land cover, represented in light green, is comprised of areas covered by growing crops and plants. It was observed to have increased gradually from 19,552.72ha (14.53%) in 2000 to 72,727.94ha (54.06%) in 2010. It further decreased to 65,739.11ha (48.87%) in 2020 and decreased to 50,144.24ha (37.27%) in 2023. The observed total increase of 53175ha in agricultural land cover, representing 30.85%, is recorded to be dynamic and is attributed to degradation of rock due to anthropogenic activities for mining and agricultural and socio-economic development.

4. Water Body

This category, represented in blue, stands for streams and rivers. It covered 25226.28ha (18.75%) in 2000 and decreased to 11443.13ha (8.51%) in 2010. The water body further drastically decreased to 6,318.59ha (4.70%) in 2020 due to road rehabilitation, which led to the blocking of some streams and rivers, and gradually increased to 10,225.97ha (7.60%) in 2023. The observed decrease of 13,303 ha, representing 9.89% of total change, is attributed to natural drying up, resulting in suitable sites for appropriate road construction and urban development purposes.

5. Bare ground

This land cover is represented in yellow and occupied an area of 30,308.42ha (22.53%) in 2000. It decreased to 18,314.15ha (13.61%) and increased to 22780.10ha (16.93%) in 2010 and 2020, respectively. There was an increase of 27684.61ha (20.58%) in 2023. The observed total rate of change of 27377 ha, representing 15.88%, is attributed to rock conversion for agricultural and sustainable socio-economic development.

6. Rock

This is represented in brown, which is comprised of areas covered by rock. It was observed to have decreased gradually from 48,407.53ha (35.98%) in 2000 to 21,103.39ha (15.69%) in 2010. It further decreased to 19,652.48ha (14.61%) in 2020 and decreased to 16,309.16ha (12.12%) in 2023. The observed total decrease of 52099ha in rock cover, representing 19.60%, is recorded as a prime victim and is attributed to anthropogenic activities for agricultural and commercial purposes.

It has been observed that the study area has witnessed rapid growth in the built-up area, representing 0.42% of the magnitude of change between 2000 and 2023. However, vegetation and agricultural land increased and decreased due to anthropogenic activities on rock; these changes implied that there was rapid urban development within the twenty-three-year period.

Land Use Land Cover Distribution

The static land use land cover distribution for each study year as derived from the maps are presented in the table below.

Categories	Legend	2000(%)	2010(%)	2020(%)	2023(%)	Remark
1	BUILT UP	0.27	0.45	0.78	4.52	Increase
2	VEGETATION	7.93	7.69	14.12	17.90	Dynamic
3	AGRIC. LAND	14.53	54.06	48.87	37.27	Dynamic
4	WATER	18.75	8.51	4.70	7.60	Dynamic
5	BAREGROUND	22.53	18.61	16.93	20.58	Increase
6	ROCK	35.98	15.69	14.61	12.12	Decrease

Table 4.2 Land Use Land Cover Distribution
Source: Author, 2023

The above table shows the percentage of land useland cover which is also use in designing the final graph of classified map.

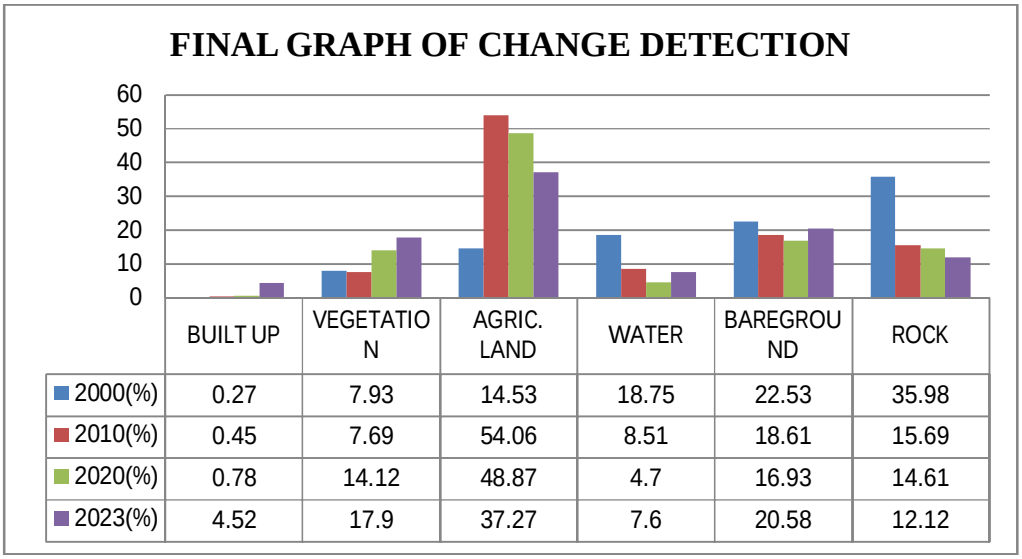


Fig 4.5:Change detection graph
Source:Author, 2023

CONCLUSION AND RECOMMENDATION

The built-up land use in Iseyin Local Government Area, Oyo State, increased by 1.50%, and it was observed that there is a decreased trend in rock, which affects all the other classes. The causes of changes in land use and land cover in Iseyin Local Government are mainly socio-economic pressures, which include the land tenure system, livelihood, and rapid industrialization and urbanization. Thus, if the rate of increase in built-up land remains unchecked, in the near future, livelihood as well as rapid industrialization and urbanization would be a serious challenge, and rural livelihood would negatively be impacted due to migration of people from town to settlement or hamlet for agricultural purposes.

Based on the strength of the findings in this study, the following recommendations are made:

i. The local communities are presently implementing the only adjustment mechanism they know, which is to move away from degraded land use and land cover. But local ingenuity, indigenous technology and know-how, and local community-centered efforts should be made and supported to restore the environment.
ii. TerrSet software is the easiest to use for processing Landsat images to produce land use land cover maps and to predict the land use land cover map, but ArcGIS software is the best software for finishing the map. Therefore, it is recommended that TerrSet software be used for processing Landsat images to produce land use land cover maps, predict the land use land cover map, and do finishing in ArcGIS.

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