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Spatio-Temporal Analysis of Urban Expansion and Land Use, Land Cover Change in Katsina-Ala Town, Benue State-Nigeria

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ABSTRACT: *The study examines spatio-temporal urban expansion of Katsina-Ala Town in Benue State, Nigeria from1990-2020 using integrated Remote Sensing and Geographic Information System technology in carrying out its analysis. Four epochs of Land Sat images 1990, 2000, 2010 and 2020 were acquired and used for the study. GIS software (ERDAS Imagine 9.6) was used to analyse the imageries. The result shows that between 1990 to 2020, there has been a significant physical expansion in built up area of Katsina-Ala town with an increase from 5.75Km2 (8.60%) in 1990 to 23.52Km2 (35.18%) in 2020 accounting for 409.0% increase within the period. This represent an expansion into additional land of 17.77 Km2 (26.5%) of the study area. The decadal rate of land use, land cover change of the study area shows that within the three decades 1990-2000, 2000-2010 and 2010-2020, built up area is the only land use type with consistent positive growth of 1.70Km2, 6.68Km2, and 9.39Km2 respectively. Every other land use class namely farmland/pasture, forest, wetland and water body had experienced at least one negative epoch of land loss. The expansion of Katsina-Ala town has been induced by several factors but majorly as a result of the changes in status of the town from a farming/fishing community to a produce collection centre with a Riverport during the colonial era, to the seat of local government headquarters in the post-independence era. The rate of expansion of the town has been remarkable throughout all the periods studied. Based on the findings, the study recommends effective development control approaches by relevant agencies/departments to ensure sustainable urban development of the town.*

Key words: *Urban expansion, spatio-temporal, Urbanisation, GIS, Remote Sensing, Katsina-Ala town.*

I. Introduction

Physical urban expansion is a global phenomenon that results from the processes of urban development. The occurrence of urban development and its implications are so wide that it is possible to view much of recent economic and social transformation globally as an attempt to cope with its varying impacts. The rise of great cities and their growing spatial influence initiated a change from largely rural to predominantly urban places, and patterns of living that has affected most countries including Nigeria in the last centuries (Bhatta, Saragwati and Bandyopohyang, 2010; Sudhira, Ramachandra and Jagagish 2005). In an increasing urban world, more than half of the world's total population and nearly three-quarter of all Westerners live in urban areas making humanity a predominantly urban species with 54% of the world's population (WUP, 2014). Cohen (2006) reports that most urban growth over the next 30 years will not take place in mega-cities but will occur in far smaller cities and towns. Today, cities are growing twice as fast in terms of land area as they are in terms of population making physical development to be ahead of planning in most cities (Angel, Sheppard & Civco, 2005). The rapid and unplanned urban growth particularly in developing countries including Nigeria threatens sustainable development. In some cities, unplanned or inadequately managed urban expansion leads to rapid sprawl, pollution, and environmental degradation. These challenges call for urban planners and administrators to address the situation and ensure sustainable urbanisation. This implies that a critical analysis of urban growth of small and medium size towns like Katsina-Ala town will go a long way in helping both urban planners, administrators, and the likes with the needed empirical data to plan how best to accommodate, manage and make the growing urban centres sustainable.

Managing urban growth has increased in both scope and complexity and has become one of the most important challenges of the 21st century. While the notion of sustainable urban development is one that is now firmly established on both scientific and political agenda, addressing these and other urban challenges will at a minimum require accurate and up-to-date data on the rate of growth, pattern of the growth, processes as well as the forces (factors) propelling the growth of these urban centres. This makes studies on urban growth very imperative now than ever. The causes of urban growth vary both within and between regions and countries but in most cases include natural increase and migration. Each town or city has peculiar forces that shape its growth at various points in time. Studying the causes of urban growth of any town therefore is important in understanding the unique forces behind its growth and the associated problems. In the face of these realities and complexities, the need for a city/town-specific scientific study of urban growth with the view to understanding the spatio-temporal pattern in order to plan for sustainable urban growth has never been greater than now.

Progress in modern remote sensing and geographic information system (GIS) techniques has opened up great opportunities and significant success has already been achieved in analysing, monitoring and managing urban growth. However, in sub-Saharan Africa and Nigeria in particular, most urban settlements including Katsina-Ala town have not been subjected to this scientific analysis to ascertain its physical expansion over time in order to sustainably plan for their future. This study is deliberately set to close this gap. This paper therefore, analysed the spatio-temporal urban growth pattern of Katsina-Ala town using GIS techniques

II. Empirical Review

Cities are rapidly growing into their fringe engulfing former rural lands and transforming them into urban areas. Understanding urban growth and expansion requires understanding a variety of factors that influences the growth in cities. Human settlement expansion especially in urban areas is a phenomenon that has characterised human history. According to Odjugo, Enaruvbe and Isibor (2015), urban expansion is a fundamental component of global environmental change. Rapid urban expansion has been observed to be the leading cause of social, economic and environmental challenges including loss of biodiversity, climate change, declining urban facilities and other issues related to the concentration of human activities (UN-Habitat 2012, Alaci 2017). Urban expansion and the resultant land use/land cover change refer specifically to changes in land use pattern and urban space redistribution due to social and economic pressure (Liu, Kuang, Zhang, Xu, Oin & Jia, 2014). Alaci (2017) Maintained that urban growth is one of the most remarkable developments in the history of modernisation, as never had more human agglomeration been found in one settlement as currently exist. Today, half of the world's population lives in towns and cities. This increase translate to a continuous life style change, the adoption and consumption of new technologies and innovations of various issues, including economic, social, cultural, administrative, political and many more, and the general gradual transformation of the traditional life into modernity, the relinquishing of rural life for the urban are all the phenomena where urban growth live behind foot print on the environment.

Other scholars across the globe have also investigated urban growth focusing on different dimensions and analytical techniques. For instance, Mahmoud, Duker, Conrad, Thiel and Ahmad (2016) analysed settlement expansion and urban growth modelling using geo information in Abuja City, Nigeria. They found that urban areas increased by more than 11% between 1986 and 2001. In contrast, this value rose to 17% between 2001 and 2014. The study identified increase in population and expansion in infrastructure as the major underlying factors for the growth. The study therefore concluded that the reserve green areas within the city could be encroached by buildings and recommends that, control approaches should be facilitated by planners to ensure the suitability of the landscape. Abdelkader (2017) studied urban growth and expansion of Fez in Morocco. Satellite imageries and census figure were employed to collect data. The study revealed that the rate of urban growth has been spectacular in recent times noting that in 1982 Fez had the population of 129,768 inhabitants but has increased to 484,300 inhabitants in 2014 while the built up areas has increased by 121% between 1984-2014 forcing rural lands to decreased to 11% respectively. Hemba, Iortyom, Ropo and Dam (2017) reported similar findings in their assessment of the physical growth and expansion of Makurdi town, Nigeria. The study used four epochs of LandSat images of 1976, 1986, 1996 and 2006.The analysis showed that between 1976 and 2006, Makurdi town experienced significant expansion from the river banks outwards and recommends deliberate control approaches to ensure the sustainability of the landscape.

Lopez, Bocco, Mendoza, Duhau (2001) made observations in their study on Predicting land cover and land use change in the urban fringe in Morelia City, Mexico. They reported that loss of arable agricultural land to urbanisation in Mexican cities is flagged to be a result of prevalent anthropogenic activities. Similarly, the unprecedented transformation of natural landscapes into urban settings significantly affects the natural functioning of ecosystems (Turner, 1994). Hence, urbanisation has been the foremost human-led land-use anthropogenic activity with huge and irreversible impacts. It is a major force that drives changes such as land-use land-cover change (LULCC), biodiversity loss, the biogeochemical cycle, hydrological systems and climate (Grimm, Faeth, Golubiewski, Redman & Wu, 2008). It is in view of this that Jones, (1999) conducted a research on growth with and without scale effects in United States of America. The study maintained that urban areas have grown significantly in the last four decades due largely to the agglomeration of people in urban areas. The study further found that the expansion is continuous, initiated by a lot of dynamic interactions, leading to an increase in proportion of urban population as opposed to rural.

From literature, urban expansion has a number of implications both on the natural urban environment as well as the socio-cultural components of the built environment. For instance, Jobien **(**2015) examined the effects of urban expansion on temporal variation of surface temperature in Katsina metropolis. Remote sensing and GIS were used to evaluate the effect of urban growth on temporal variation of surface temperature in Katsina Metropolis. Landsat Thematic Mapper (TM), Enhanced Thematic Mapper Plus (ETM+) and Landsat-8 Operational Land Imager (OLI) images of 1986, 1999 and 2014 respectively were utilized. The findings revealed that, urban heat islands and higher temperatures occur in urban areas than in rural areas due to diurnal cycles of solar energy input and heat generation from built⁄ paved physical structures. The study therefore submitted that, urban expansion into the rural lands is equally accompanied by the heat island phenomenon with its attendant implication for physiological comfort of the residents. These increase the frequency and severity of heat- stress events in cities and can affect the economic, health, labour productivity and leisure activities of the urban population. The planting of trees and vegetation in and around the city should be encouraged to minimize the increase in surface temperatures of the land use/cover types.

Furthermore, the effect of urban expansion on peripheral agricultural lands has been examined in Makurdi town by Iorliam & Ortserga (2019), and Semaka (2015). Iorliam & Ortserga (2019) reported that built up land use class expanded significantly in the city from barely 8.73% by 1986 to 64.15% in the year 2016; whereas agricultural land use with 32.6% land in 1986 has decreased to 7.50% by 2016. Semaka (2015) studied the effect of urban expansion on peripheral agricultural lands in Makurdi town of Benue state. Data was collected using remote sensing technology, geographical information system and field verification. The study shows a decline in the total amount of farmlands from 43% -22 % while this decline corresponds with continuous physical growth and expansion of urban activities from 13% - 43% from1999- 2012. The study concludes that uncontrolled, further growth and expansion would lead to the extinction of peripheral farmlands and recommends measures of controlling the observed expansion and farmland protection. From the empirical review, no study has been done on urban growth of Katsina-Ala town of Benue State to empirically and scientifically ascertain it physical expansion over the years. Understanding the extent of physical growth of the town with all the growth characteristics is critical for planning and managing urbanisation sustainably.

III. Materials And Methods

Study Area

Katsina-Ala Township is situated on the loop of River Katsina-Ala and is one among the 12 council wards in Katsina-Ala local government area of Benue states. The town lies between latitude 7° 9′ 0″ N and 7° 11′ 0″ N, longitude 9° 16′ 0″ E and 9° 18′ 30″ E, and covers and an area of about 66.85km^2 and lies on the South-western part of the local government (Figure 1).

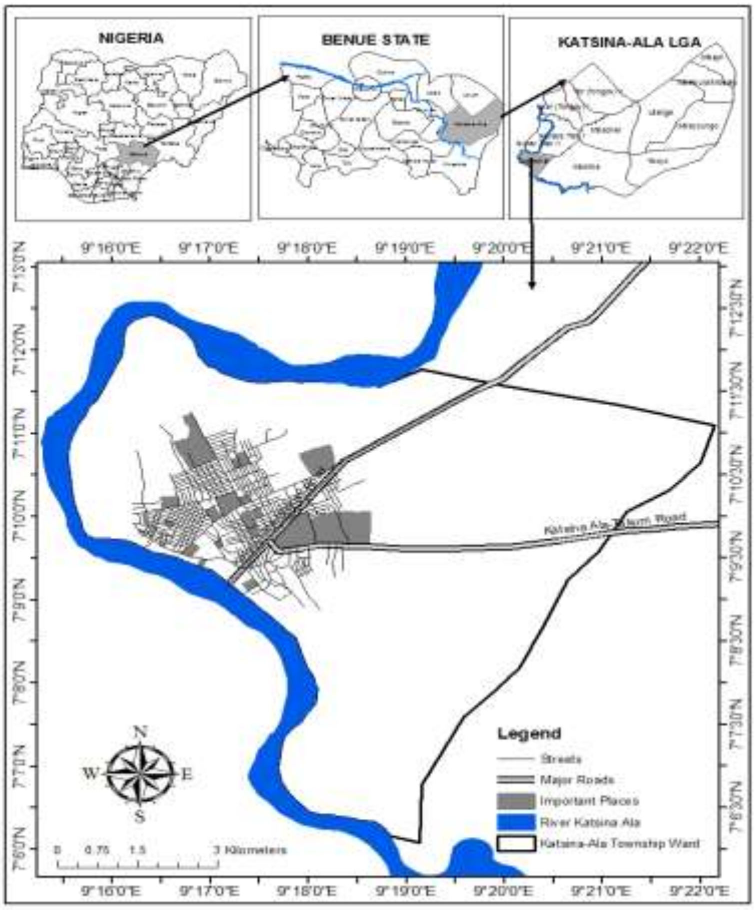

Fig 1: Map of Katsina-Ala Township

Source: GIS Laboratory, Benue State University, Makurdi, 2021

The town fall within the tropical humid and mega thermal climate with wet and dry winter (Aw) according to Koppen`s classification. The climatic condition in is influenced by two air masses: the warm, moist south-westerly air mass, and the warm, dry north-easterly air mass. The south-westerly air mass is a rain-bearing wind that brings about rainfall from the months of March/April to October. The dry north-easterly air mass blows over the region from November to April, thereby bringing about seasonal dryness. The annual rainfall in Katsina-Ala is between 1,500-2000mm. Temperatures are mostly high throughout the year with average range between 23^0C – 28^oC a peak of 38^oC.

Katsina-Ala town is drained by River Katsina-Ala being the most important tributary of the Benue River. The town is thus situated on undulating plains which fall between 109m – 150m above mean sea level. River Katsina-Ala from which the town derived its name is the most important and prominent physical feature. Along the river are lowlands of highly deposited alluvial soils which are flooded during the rainy season. The river banks are dotted by extensive flood plain which is the characteristic of all mature rivers especially those passing through lowlands area. Apart from River Katsina-Ala, a number of smaller streams also traverse the town. These include ‘Gbor-ya’, ‘Gbor-Atim’, ‘Ibuan’, Iborgambe’ and ‘Akur’. While the volume of river Katsina-Ala fluctuates with seasons, the other streams are seasonal and thus dry up completely during the dry season. When full to extensive deposition, it attracts all year round cultivation of rice, cane-sugar and vegetables especially on the western bank of the river. Another important feature within Katsina-Ala town worth mentioning is Lake ‘Akata’ which is situated at the extreme northwestern part of the town.

Katsina-Ala town started as a small farming/fishing settlement with a few houses around the river bank in the early 1920s during the pre-colonial era as one of the colonial administration’s produce collection centre along River Katsina-Ala with a Riverport. It serves as the market place where cash crops in the region were assembled and marketed to the Europeans for onward transportation via waterways to the seaport. The town has grown to become headquarter of Katsina-Ala Local government area that was created in 1976. The status of LG headquartre brought about increased expansion of its boundaries and infrastructure due to attraction of population for various administrative and other purposes. Since then, the town has been experiencing physical expansion however; no empirical studies have been conducted on Katsina-Ala town to determine its spatio-temporal urban growth over the years.

Katsina-Ala town has a projected population of 49,053 as at 2020 (projected from the 1991 census figure of 23,801 at growth rate of 2.5%). The population of the town is primarily engaged in civil service, trading, transport business, fishing, brick making and sand harvest, carpentry and farming. It is these activities that hold and sustain the town.

IV. Methods

Date Used

Two types of data were collected and used for the purpose of this research; remote sensing data and topographic map. Satellite data comprising of Four-year multi-temporal imageries: Landsat TM (1990); Landsat ETM+ (2000, 2010); and Operational Land Imager (OLI) (2020) were used. The Landsat imagery dataset was sourced from the Earthexplorer platform from United States Geological Surveys (USGS). A topographic map of the local government was used as a guiding map for extraction of study area from satellite images for processing. Changes in land cover were measured using time series of remotely sensed data (Landsat TM, ETM and OLI). Table 1 gives a summary of the image characteristics for the dataset used while table 2 described the land use/cover classes. Dry season images of the four data sets were acquired from January to March in order to reduce the effects of clouds that are prevalent during the rainy season. Ancillary data included the ground truth data for the LU/LC classes. The ground truth data was in the form of reference points collected using Geographical Positioning System (GPS). High resolution Google earth images were also used to aid in classification and overall accuracy assessment of the classification results.

Table 1: Satellite Data Used

S/No	Data type	Date	Resolution	Source
1	Landsat TM imagery	January, 1990	30m	USSG Earth Explorer
2	Landsat ETM imagery	March, 2000	30m	USSG Earth Explorer
5	Landsat ETM imagery	November, 2010	30m	USSG Earth Explorer
7	Landsat 8 OLI imagery	November, 2020	30m	USSG Earth Explorer

Table 2: Land Cover Types used in the Classification of Satellite Derived Land Cover Types

Code	Land Cover	Description
1	Built-up Area	This comprise of urban and rural built-up including homestead area such as residential, commercial, industrial areas, villages, roads network, pavement and man-made structures.
2	Farmland and Pasture	Environment dominated by grasses and herbaceous plants typically, spear grass and elephant grass *(Andropogan gayanun)* often used for grazing livestock. It is used here collectively to also include agricultural land or mixed farming area that describes land that constantly shifts between farm and fallow land. Typically, the vegetation cover has been removed or modified and replaced by other types of vegetation cover of anthropogenic origin
3	Forest	High density of trees with little or no undergrowth. Dominated by tropical trees such as *Kyaya senegalensis, Magnifera indica, Daniella olivera, Isoberlina doka* and *parkia biglobosa*
4	Wetland	Marshy area, and Fadama land
5	Water body	Areas persistently covered by water typically lakes, dams and rivers

Image Pre-Processing and Classification

Data were preprocessed in ERDAS imagine for band combination and sub-setting of the image on the basis of Area of Interest (AOI). Image classification was done in order to assign different spectral signatures from the LANDSAT datasets to different land use land cover. This was done on the basis of reflectance characteristics of the different land use land cover types. Different color composites were used to improve visualization of different objects on the imagery. Infrared color composite NIR (4), SWIR (5) and Red (3) was applied in the identification of varied levels of vegetation growth and in separating different shades of vegetation. Other color composites such as Short Wave Infra-red (7), Near Infra-red (4) and Red (2) combination which are sensitive to variations in moisture content were applied in identifying the built-up areas and bare soils. This was supplemented by a number of field visits and use of Google earth software that made it possible to establish the main land use land cover types. For each of the predetermined land use land cover type, 20 training samples were selected by delineating polygons around representative sites. Spectral signatures for the respective land use land cover types derived from the satellite imagery were recorded by using the pixels enclosed by these polygons. Maximum Likelihood classifier algorithm with decision rule was used for supervised classification by taking 100 training sites for five major land use land cover classes.

Accuracy Assessment

This study adopted the Error Matrix approach (ERRMAT in ArcGIS) to assess the accuracy of the classification. The error matrix assesses accuracy using four parameters which include overall accuracy, user's accuracy, producer's accuracy and the Kappa Index of Agreement (KIA). All accuracy parameters have index values between 0 and 1, where 0 symbolizes poor and 1 symbolizes very good accuracy/agreement.

The Kappa value interpretation ranges taken after Borana and Yadav (2017) and adopted in this study shows that <0.20 (poor), 0.21-0.40 (fair), 0.41-0.60 (moderate), 0.61-0.80 (good) while 0.81-100 (very good).

V. RESULTS AND DISCUSSION

Classification Accuracy Assessment

The classification accuracy and Kappa index agreement for the four periods of 1990, 2000, 2010 and 2020 for Katsina-Ala Township were calculated and the result is presented in table 4.

Table 4: Accuracy assessment result of LULC classification

	Classification Accuracy							
LULC Type	**1990**		**2000**		**2010**		**2020**	
	Producer (%)	User (%)	Producer (%)	User (%)	Producer (%)	User (%)	Producer (%)	User (%)
Built up Area	100.00	100.00	61.22	100.00	83.33	83.33	76.32	96.67
Farm land & Pasture	93.33	100.00	88.89	26.67	75.00	70.00	83.33	50.00
Forest	100.00	95.24	76.19	80.00	82.61	95.00	81.82	90.00
Wetland	100.00	90.91	36.36	40.00	100.00	90.00	83.33	100.00
Water body	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Overall Accuracy	**98%**		**68%**		**84%**		**82%**	
Kappa Index	**0.97**		**0.58**		**0.79**		**0.77**	

Source: Authors' Analysis, 2021

Based on the result in table 4, the classification accuracy showed an overall accuracy of 98%, 68%, 84% and 82% for 1990, 2000, 2010 and 2020 respectively. This was also considered an acceptable overall accuracy for the subsequent analysis and change detection of the study area. The overall Kappa index agreement was also calculated for each classified map to determine the fitness for use of the classified land use maps. The results showed Kappa statistics of 0.97, 0.58, 0.79 and 0.77 1990, 2000, 2010 and 2020 respectively. The Kappa coefficient for classification ranges from good to very good agreement on the kappa scale which confirm fitness for use of the classified images (Table 4).

Physical Expansion of Katsina-Ala Town

The physical growth of Katsina-Ala town was analysed based on a Land Use Land Cover Change (LULCC) analysis. The result of LULCC analysis is presented in table 5.

TABLE 5: Land Use Lands Cover Detection Statistics

LULC Class	**1990**		**2000**		**2010**		**2020**	
	Area (Km2)	Area (%)	Area (Km2)	Area (%)	Area (Km2)	Area (%)	Area (Km2)	Area (%)
Built up Area	5.75	8.60	7.44	11.13	14.12	21.13	23.52	35.18
Farmland & Pasture	24.30	36.35	27.07	40.49	39.95	59.75	34.06	50.95
Forest	28.94	43.30	25.74	38.51	7.90	11.82	5.53	8.27
Wetland	6.79	10.15	5.38	8.05	3.79	5.66	2.61	3.90
Water Body	1.07	1.60	1.22	1.82	1.09	1.64	1.14	1.71
Total	**66.84**	**100.00**	**66.86**	**100.00**	**66.86**	**100.00**	**66.85**	**100.00**

Source: Authors' Analysis, 2021

Based on the result as presented in table 5, the town had undergone land use conversion to built up land use resulting to its growth and expansion. As at 1990 which is used in this study as the base year, the total built up area of the town was only 5.75Km2 accounting for 8.6% of the total land use. Other land use classes with the highest land consumption in the base year were forest and farmland/pasture accounting for 28.94Km2 (43.30%) and 24.30Km2 (24.30%) respectively.

The result of the analysis within the study period has shown that there is significant Physical expansion in built up area of the town with an increase from 5.75Km2 (8.60%) in 1990 to 23.52Km2 in 2020 (35.18%) accounting 409.0% increase within the period. This represent an expansion into additional land of 17.77 Km2 (26.5%) of the study area. Figure 2 shows pictorial representation of the various land uses in the study based on image classification between 1990 -2020.

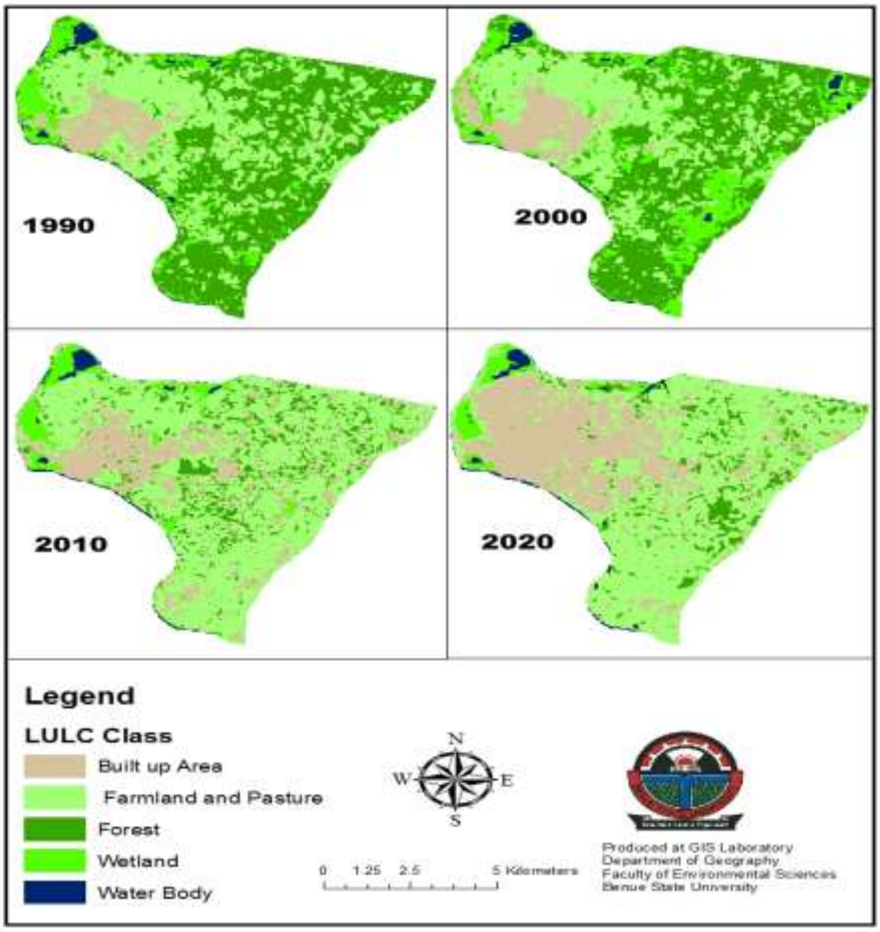

Fig.2: Pictorial Presentation of Land use, Land cover Change of the Study Area from 1990-2020

The expansion of Katsina-Ala town has been induced by several factors but majorly as a result of the changes in status of the town from a farming/fishing community to a produce collection centre with a river port during the colonial era, to the seat of government in the post-independence era. Before this period, it can be said that, Katsina-Ala town had very low urban presence. However with the elevation of town to the status of a the local government headquarter, it attracted more civil servants, businessmen and provisions of social amenities which brought about socio-economic growth which increased the demand for land and has continued to exert pressure on rural lands and eventually converting them to urban land use as its evident in the physical expansion of the town today. This study tends to agree with Hemba, Iortyom, Rope & Dam (2017), Iorliam, & Dam (2017), that the change in function of emerging urban centres to administrative seat of government attracts further population which increase the demand for land and exert pressure on rural lands and eventually convert them to urban. Another factor that also account for the physical expansion of the town is the presence of a tertiary institution (College of Education). This institution has served as a major pull factor for both population growth and physical expansion of the town. At presence, rural lands around the institution have been converted to urban built environment.

Table 6: Decadal Rate of Land Use Land Cover Change

LULC Class	1990-2000		2000-2010		2010-2020	
	Area(Km2)	Area(%)	Area(Km2)	Area(%)	Area(Km2)	Area(%)
Built up Area	1.70	29.52	6.68	89.74	9.39	66.49
Farmland & Pasture	2.77	11.41	12.88	47.58	-5.89	-14.73
Forest	-3.20	-11.04	-17.84	-69.30	-2.38	-30.09
Wetland	-1.40	-20.68	-1.60	-29.67	-1.18	-31.15
Water Body	0.15	14.02	-0.12	-10.06	0.05	4.34

Source: Authors' Analysis, 2021

Based on the information in table 6, the decadal rate of land use, land cover change of the study area shows that within the three decades 1990-2000, 2000-2010 and 2010-2020, built up area is the only land use type with consistent positive growth of 1.70Km2, 6.68Km2, and 9.39Km2 respectively. Every other land use class namely farmland/pasture, forest, wetland and water body had experienced at least one negative epoch of land loss. The land use classes with consistent and highest losses were forest and wetlands. This is not surprising considering the fact that urbanisation process is always the displacer/destroyer of other land uses. Studies including Iorliam & Ortserga (2019), Iorliam, & Dam (2017), Hemba, Iortyom, Rope & Dam (2017), Abdelkader (2017), Semaka (2015), Grimm, Faeth, Golubiewski, Redman & Wu (2008) and Lopez, Bocco, Mendoza, Duhau (2001) have demonstrated that urban growth is a major force that drives land-use land-cover change.

The study sought to establish the annual rate of growth of Katsina-Ala town within each decade and the result is presented in table 7.

Table 7: Annual Rate of Land Use Land Cover Change

LULC Class	1990-2000		2000-2010		2010-2020	
	Area(Km2)	Area(%)	Area(Km2)	Area(%)	Area(Km2)	Area(%)
Built up Area	0.17	2.95	0.67	8.97	0.94	6.65
Farmland & Pasture	0.28	1.14	1.29	4.76	-0.59	-1.47
Forest	-0.32	-1.10	-1.78	-6.93	-0.24	-3.01
Wetland	-0.14	-2.07	-0.16	-2.97	-0.12	-3.12
Water Body	0.01	1.40	-0.01	-1.01	0.00	0.43

Source: Authors' Analysis, 2021

Based on the result in table 7, the annual rate of land use land cover change in the first decade (1990-2000) was found to be 0.17Km2; second decade (2000-2010) was 0.67Km2 while the last decade (2010-2020) was 0.94Km2. This implies that there was gradual but consistent increase in built up area of the town every year in the last 30 years. Other land uses also had experienced changes in their sizes yearly although mostly negatively (loss) as shown in figure 3

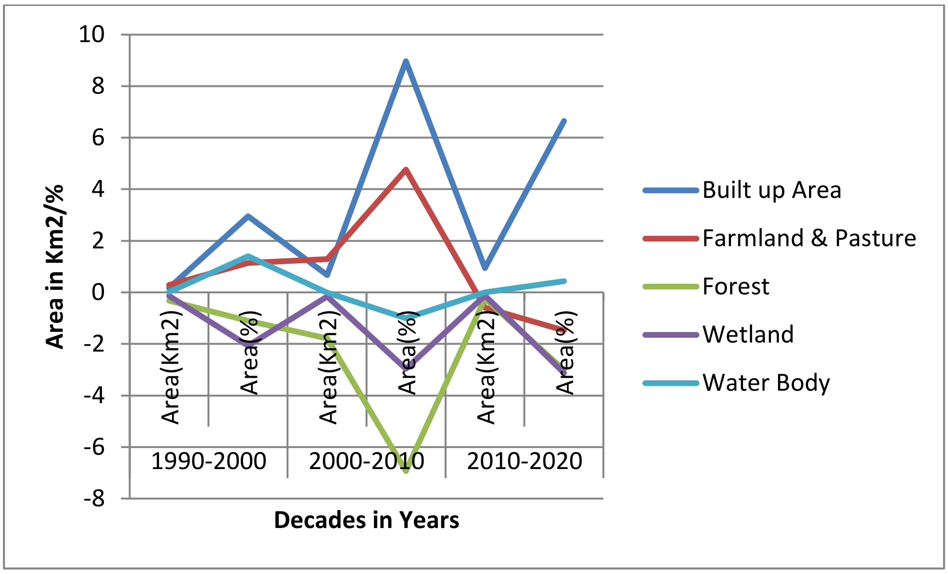

Fig. 3: A graph showing annual rate of land use land cover change in the study area

VI. Conclusion And Recommendations

Katsina-Ala town is experiencing continuous growth and expansion induced by the transformation of the town's function from a farming/fishing settlement to a small produce collection centre; to an administrative headquarter of Katsina-Ala LGA with its accompanied socio-economic development. This has resulted to invasion of more rural land by urban expansion over the years. Much of this growth is spontaneous and outspans the physical planning for the area. The result of this uncontrolled growth is sustained pressure on the natural environment. Resources worst affected are wetlands and forests. Considering the significance of a balanced ecosystem, the uncontrolled expansion of builtup areas, if not checked, will have long term negative consequences. Based on the findings, the study recommends effective development control approaches by relevant agencies/departments to ensure sustainable urban development of the town.

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