# Effects of Population Increase on Peri-Urban Land Growth in Asa Local Government Area, Kwara State

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The rapid growth of world population and its agglomeration in cities and towns around the world is affecting the long-term outlook for humanity, in such that the process of urban growth and the effect at the peri-urban areas are universal, occurring all over the world. This study aimed at assessing the effects of population increase on the growth of peri-urban land in Asa local government area, Kwara State. Secondary data, via satellite imageries covering 2000, 2010 and 2021 were mainly used in analyzing the changes that occurred within twenty years. Remote sensing and GIS approaches to satellite imagery processing were adopted using ILWIS and ERDAS IMAGINE 9.2 software to subset the imageries, as well used for classification resampling. The result on built-up area reveals a consistence increase of over 80% between 2000 and 2021. The vegetation cover suffered a serious loss of vegetal land to the tune over 100 hectares due to various degree of development and expansion of the town. The water body also affected with loss in space covered with 80 hectares within the period under study. With a tremendous population increase, the study indicates a high demand for land and vegetal resources, which in turns possess a serious threat to food production. The study concludes that population increase remains the most significant determinant of peri-urban changes with a resultant effect on the wellbeing of peri-urban residents and rural dwellers. It therefore, recommends the adoption and application of strategic physical planning approach in the development of the peri-urban areas.
**Keywords:** Agricultural land, food security, peri-urban, urban growth

## INTRODUCTION

The growing populations of cities across the world invariably promotes the changes being experienced in the urban environment, as well as the land requires for food production. As asserted by different authors, expansion of urban areas, unprecedently influences the changes in the peri-urban land, with serious effects on land availability for agricultural purposes (Bloch *et al.,* 2015; Wang, 2019; Idowu *et al.,* 2020). Several factors are responsible for the changes experienced in most of the cities: non-implementation of planning and zoning laws, these may include high cost of landed property at the urban centres and invariably, the low cost of land in the peri-urban areas. With regard to population drift, scholars have admitted certain issues, such as high cost of living, lack of space, increase in social status, as parts of the factors influencing the mass movement in urban population into the peri-urban areas (Lasisi *et al.,* 2017; Cahya *et al.,* 2018; Morenikeji *et al.,* 2021).

Furthermore, the development of the peri urban area across the world is one of the encouraging features of the contemporary research in urban studies. The rate at which people migrate from one location to another increases the level of urbanization, urban agglomeration, and peri urban development. Factors which have led to the rapid expansion of the peri urban areas in Nigeria ranges from physical, economic, social, and political factors and how they have influenced urban growth. (Idowu *et al.,* 2020). Apart from this physical manifestation of implications of urban growth on city's expansion, other serious implications of such phenomenal have been serious on food security and urban resilience.

Several comments have been raised by different authors. Satterthwaite *et al.* (2010), Sulaiman *et al.* (2015) and Hatab *et al.* (2019) among other authors, have raised important issues concerning the implications of population increase, on food production and urban resilience. Importantly, these authors have admitted that the fast expansion of the global economy, the share of the GDP that goes to industrial and service industries, and the number of employees employed in these sectors have all contributed to urbanization. However, the increasingly growth and urbanized of world settlements have caused a rapid declining ratio of food production, promoting urban insecurity and resilience.

Steel (2008) asserted that placing food in its proper perspective is the first step in filling this gap in the literature and understanding urban changes and city dynamism. It is crucial to comprehend how the urban

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food security functions and how its many components are related in strengthening connections between the food system and urban setting. Therefore, since cities now play crucial role in the paradigm of food insecurity, scholars and decision-makers are becoming more aware of the need to systematically address the problems by the discussing the implications of urban transformation on food system by considering the demand for urban land, at the expense of space for agricultural purposes (FAO, 2017).

When everyone, at all times, have access to food that is safe, nourishing, and maintains a healthy, active lifestyle, there is food security (Idachaba, 2006). For people, having access to enough food at all times and being able to use it to satisfy their nutritional needs are the fundamental objectives of food security. The impacts of household food insecurity, unemployment, and poverty, in Nigeria's metropolitan areas can be mitigated through agriculture. But in the situation where the agricultural land has been taken over by physical development and urban expansion, the resulting effect in food insecurity and by extension, urban resilience.

Practically, most of urban centres in Nigeria are experiencing tremendous changes that are unplanned and uncontrolled due to the rate at which people migrating from one location to another into the urban areas. In the case of Asa Local Government in Ilorin, Kwara State, the most visible evidence of uncontrolled development are the large and rapid development of slum and squatter settlements in both the core and fringe of the towns. The evidence of the changes in land uses from agricultural land to other uses, especially the built-up areas, reveals the trends of changes at the peri urban areas, couple with transformation in socio-economic characteristics of peri-urban dwellers. Hence, it is on this premise that this study set, to examine the implications of urban transformation on agricultural land, food security and urban resilience in Asa local government, Ilorin, Kwara State.

## LITERATURE REVIEW

The rapid growth of world population and its agglomeration in cities and towns around the world is affecting the long-term outlook for humanity (UN-Habitat, 2001). The current phase of globalization and urbanization of the world has been attributed to the industrial revolution in the late 18th century and the increased population growth of the world in the 19th century after the World War II, (Huff & Angeles, 2011). Prior to the 19th century, few percentages of the world population reside in cities, until later in the 19$^{th}$ and 20$^{th}$ centuries, when the higher percentage of the world population strife to reside in the city (Idowu, 2017).

Faniran and Megbolugbe (1987) and WHO-UN-Habitat (2010) among other scholars have admitted to the huge consequences of interaction of high population growth rate and unprecedented rapid urbanization currently going on in the world. This observation has received much attention globally, in particular, is the contributions of the academicians. Urbanization has been blamed for the changes and catastrophic incident that had occurred within in the world. Many have seen urbanization as undesirable because, of its major developmental challenges, which exerts an awesome pressure on social, economic, and environmental sustainability. A global report on urbanization trends has emphasized that cities will remain the focal point for global economic, social, cultural, and political activities (UN-Habitat, 2001).

The process of urban growth is a universal phenomenon occurring all over the world. Pacione (2005) has acknowledged the result of a combination of natural increase of the urban population and net in-migration of people to urban areas as the cause of the increasing levels of urbanization and urban agglomeration. Demographic change by many scholars is the most prevailing factor that determines the spatial transformation in any region of the world, while other factors observed to be responsible include the social, economic, and political activities, which has led to the competition for land for various uses (Laraba & Shola, 2013; Popoola, 2015). Similarly, Sadia (2000) indicated that there are basically two categories of factors responsible for shaping and determining the urban growth pattern and process in any cities. These factors are classified as spatial and non-spatial factors. The spatial factors include land price surface, road accessibility, land elevation of the topography, private housing scheme, while the non-spatial factors are comprised of demographic, social, economic, and political factors.

According to Sanusi (2010), the peri-urban area constitutes an important interface in settlement continuum and development, serving as a buffer for the unexpected population. This is the area which reflects the pressure exerted by city in the surrounding neighboring space. Peri-urban in some instances is the open space where rural and urban features co-exist, in environmental, socioeconomic, and institutional terms (Allen, *et al.,* 2006). Basically, the argument of several scholars, including Dutta (2012) on peri-urban interface is based on the interaction of rural and urban forces, resulting in the exchange of their individual resources. However, the boundaries between rural and urban are getting blurred, as the benefits and bane of city growth extends far into the urban fringe. The interface between the rural and urban areas is gradually phasing out due to rapid urban growth. City periphery is subjected to multiple transformations like, physical, morphological, socio-demographic, cultural, economic, and functional, (Mondal *et al*., 2021). Dutta (2012) advocated that the peri-urban boundary is forever shifting, followed by


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extending urban areas engulfing the interface route into the agricultural land threatening the land available for farming and production of foods.

Globally, rural residents were greater than urban residents by 6.7 times in 1900; this ratio is currently less than one, and predictions indicate that by 2025, the ratio will be close to three to two (Satterthwaite *et al*., 2010) This has been supported by the fast expansion of the global economy, the fraction of the economically active people employed in industry, and the gross world output (since most industrial and service enterprises are in urban areas) (Satterthwaite *et al*., 2010). Agricultural production on a global scale has not been able to fulfil demand despite a sharp increase in the workforce that is not engaged in food production and shifts in consumer preferences toward foods that need more energy and emit more greenhouse gases. Currently, hundreds of millions of urban residents are malnourished, even though this is more likely due to their lack of wealth than a lack of ability to create food. As was demonstrated by the rising rates of hunger among urban populations following the increases in food prices in 2007 and the first half of 2008, there is a sizable urban population around the world whose incomes are so low that any rise in the price of staple foods puts their health and nutritional status at risk (Cohen & Garrett 2009).

Urbanization and the resulting population shift in developing nations have provided never-before-seen problems with hunger, food insecurity, and malnutrition. As a result of urbanization taking place on some of the most productive agricultural land in the world, food systems in emerging nations especially in Africa and Asia, where it is occurring most quickly is experiencing serious adjustment pressures. Urbanization and demographic issues are increasingly being acknowledged on a national and international level as essential elements of resilient and sustainable development (UN-FAO, 2017). According to Smit (2016), the complexity of food systems and the landscape have indeed been significantly altered by the growth of cities' spatial extent (henceforth referred to as urban sprawl) and other, occasionally related environmental concerns (Battersby, 2013).

In Nigeria, Ola (2020) on building a food-resilient city through urban agriculture in Ilorin admitted that urban agriculture's applicability in solving the issues of food insecurity in urban centers has come under discussion because of the growth in urban population, which has been accompanied by rising poverty and hunger. This has been attributed to the fact that the present urban planning system seems to favour other land uses over agricultural land in cities across the country. This, however, has made the nation's cities more susceptible to ~~a~~ food supply crisis.

Nigeria, according to the Global Food Security Index (GFSI) of 2018, the nation’s performance was considered to be poor, based on the fact that the nation's score decreased by 1.1 points across the three main pillars of food security (availability, access, and utilization) from the previous year to 38 points, which is significantly lower than the global average of 58.4 points among the 113 countries considered, placing Nigeria in 94th place. Nigeria is ranked 77th in terms of quality and security and 101st in terms of price and availability. As a result, Nigeria's overall performance in the GFSI, 2018 was graded "weak," in spite of the been “very good" in nutritional standards and volatile agricultural production (Economist Intelligence Unit, 2018).

Methodically, scholars have used Geographic Information System (GIS) tools to assess the relationship between population changes, land consumption, and food security. The application of this technique does not only give percentage of changes in land consumed or absorbed, but capable of showing graphical illustrations of every change that occurred within different periods. For instance, Radwan, *et al,* (2019) used Cellular Automata-Markov (CA-Markov) integrated model to analyse the dramatic loss of agricultural land due to urban expansion on food security in the Nile Delta, Egypt. In a similar study by WA Municipality in Ghana, GIS technique was used to analyse urban expansion and agricultural land use change and its implications on peri-urban farmer household and food security. In this study, the GIS tool will be used to assess the effects of population increase on the growth of peri-urban land in Asa local Government Area, Kwara State.

## THE STUDY AREA

Asa local government area is located in Kwara state, Northcentral Nigeria. Ilorin is located on Latitude 80 3’ North and Longitude 40 35’ east, (See Figure 1). It is about 300 kilometers from Lagos, the former Nigerian Capital city and the economic hub of the country (GCA Travel 1994). It is also the last emirate to the south of Northern Nigeria, where the success of the 19 Century Jihad, led by Shehu Uthman Danfodio, had evolved an emirate political system that covers major parts of the present-day Northern Nigeria. Being a frontier that is dominated by the Southwestern Nigerian culture of the Yoruba, its sustenance of the emirate political structure keeps alive, its historical relations with the northern Nigeria, that is dominated by Hausa/Fulani groups (City Population, 2022).

Asa LGA has the city of Afon as its headquarters. Asa LGA comprises several towns and villages which include Ogbondoroko, Afon, Laduba, Aboto, Balah, Eyenkonn, Pampo, Ogele, and Olowokere, ethnic groups such as the Yoruba, Hausa, and Fulani are represented in the area. Asa LGA is home to a number of festivals such as the Awon festival and the Egungun


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festival. It has an area of 1,286 km$^2$. Asa local government area covers a total area of 1,286 square kilometres and a population of 126,435 at the 2006 census. *Asa* features two distinct seasons which are the rainy and dry seasons. The average temperature of the area is estimated at 30 degrees centigrade with the humidity levels estimated at 63 percent. Asa LGA is known for the cultivation of a wide range of crops such as rice, corn, coconut, and vegetables. Cloth weaving and dyeing are other key economic enterprises in the area. Trade is also popular amongst dwellers of Asa LGA with markets such as the Alapa market and the Ogbondoroko main market attracting thousands of buyers and sellers of various commodities (Ministry of Lands, Ilorin, Kwara State, 2018).

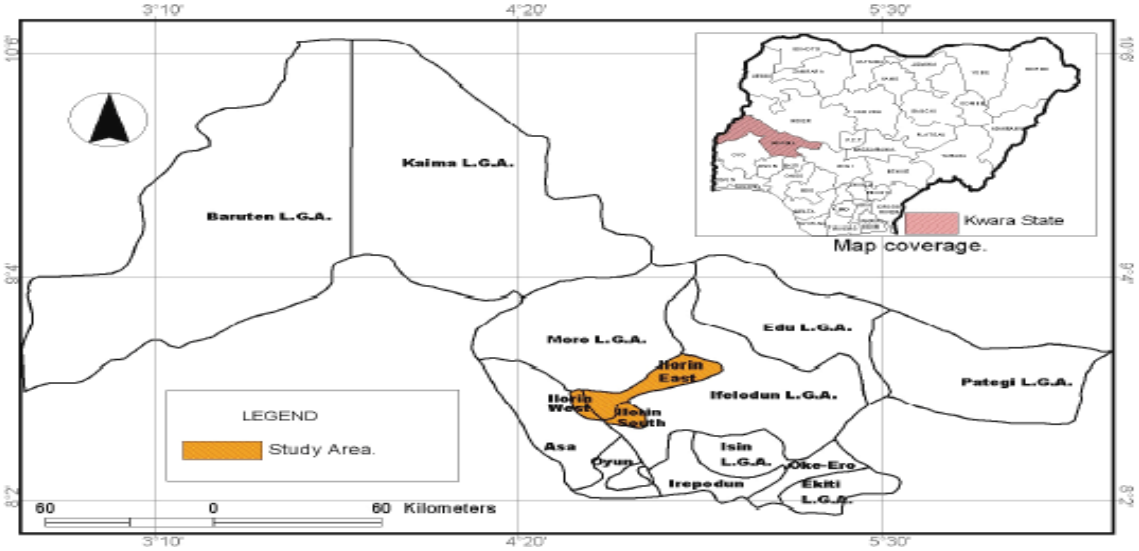


Figure 1: Map of Asa local government
Source: Ministry of Lands, Ilorin, Kwara State, Nigeria (2018).

## RESEARCH METHODOLOGY

Satellite image processing techniques was used in analyzing the changes that occurred in the study area between year 2000 and 2021. The satellite imageries for year 2000; 2010 and 2021 were acquired and used for the study. Table 1 shows the characteristics of the satellite imageries, revealing the path/row and the platform. The bands of these imageries were stacked together to develop the false colour composite image used for the study.

Table 1: Characteristics of the Satellite Imageries used in the study

| Year | Path/row | Date Acquired | Sensor |
|---|---|---|---|
| 2000 | 190_054 | 13/11/2000 | Enhance Thematic Mapper (ETM) |
| 2010 | 190_054 | 22/11/2010 | Enhance Thematic Mapper plus (ETM$^+$) |
| 2021 | 190_054 | 15/01/2021 | Operational Land Imager (OLI) |

The land use /land cover classification adopted four classes of features as the training set: the built-up area; undisturbed vegetation; disturbed vegetation; and water body (Table 3.5). These training sets were subjected to the conventional supervised Maximum Likelihood Classification Algorithm using Integrated Land Water Information System (ILWIS), ERDAS IMAGINE 9.2 software, Microsoft Excel and Microsoft Word. (a) Integrated Land Water Information System (ILWIS) used to conduct image classification (b) ERDAS IMAGINE 9.2 software was used for subset of images and image classification resampling. (c) Microsoft Excel was used in the preparation of bar graph. (d) Microsoft Word was used for presentation of research result.

## RESULTS AND DISCUSSION

The classes and the descriptions of features in the LU/LC the built-up area comprises of residential, commercial, and industrial structures, village settlements and transportation infrastructure; the undisturbed vegetation are those portions of land that are not affected by human activities, of which the forest canopy is still maintained, and the water comprises of rivers permanent open water, streams, ponds and water canal or drainages. The total area for the land use/land cover classification between the period is shown in Table 2; the graphical illustrations of the classified satellite imageries, also are shown in Figures 2 – 5, while Figure 6 reveal the overlay map.


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**The Land Use /Land Cover of Asa between 2000 – 2021**

According to Table 2, in the year 2000, the built-up area was estimated at over 5000 hectares which was just 4.4% of the total entire land mass, while the vegetation area covered above 10,000 hectares (over 90%) of the total land and water body just less than 1% of the total land coverage. In the year 2010, the built-up areas accounted for over 7000 hectares (5.8%): vegetation, 116,261 hectares (93.9%); and the water body 410.9 hectares (0.3%). In 2021, the built-up area 9,839.2 hectares (about 8%); vegetation, 113,654 hectares (91.8%); and water body, 303 hectares (0.24%).

By implication, between the year 2000 and 2010, the built-up area got increase from 4% to almost 6% and by 2021, further increased by another 2%. This analysis revealed the constant changes in the built-up area for residential purpose, construction of roads and other developmental projects embarked upon by the state government in the area. On the vegetation land in the study area, there have been rapid reduction in the vegetation covers as over 100 hectares was lost to built-up area and other development, such as deforestation, farming, bush burning and animal grazing. On the assessment of the water body, there have been a drastic decease in the expanse of land cover by water body, a situation traceable to the effect of urbanization and population increase.

**Table 2: Summary of change in Asa land use for 2000, 2010 and 2021**

| Classes | 2000 Coverage (Hectares) | % | 2010 Coverage (Hectares) | % | 2021 Coverage (Hectares) | % |
|---|---|---|---|---|---|---|
| Built-up | 5441.59 | 4.4 | 7124.4 | 5.75 | 9839.16 | 7.95 |
| Vegetation | 11790.8 | 95.29 | 116261 | 93.91 | 113654.11 | 91.81 |
| Water body | 383.87 | 0.31 | 410.85 | 0.33 | 303.03 | 0.24 |
| Total | 123796.3 | 100 | 123796.3 | 100 | 123796.3 | 100 |

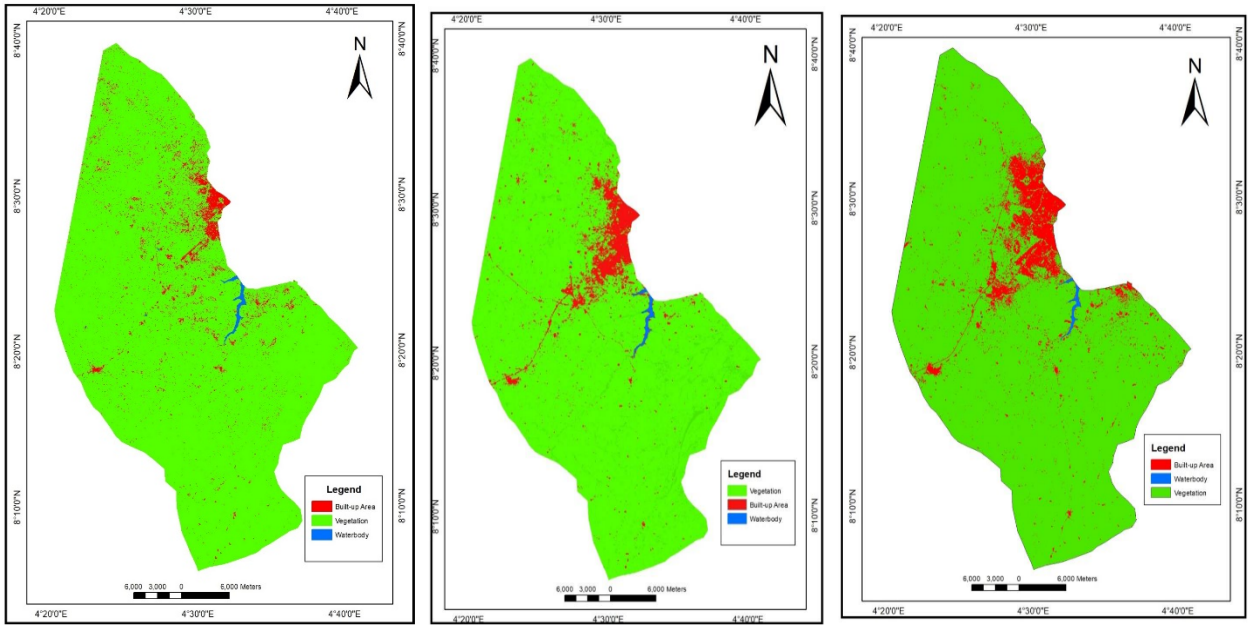


Figure 2 - 4: Classified image for Asa 2000; 2010; and 2021

**The Trends of Changes and the Overlay of Built-up Areas**

Figures 6 – 9 show the summary of the changes that occurred in Asa between 2000-2021. The Built-up areas (Figure 6) increases from 4.4%, 5.57% and 7.95% between the period of 2000, 2010 and 2021. Vegetation cover (Figure 7) decreases by 95.29%, 93.91% and 91.81% between the period of 2000, 2010, and 2021. Water body (Figure 8) decreases and increase in respect to season but as at the time this data was collected the water body increased by 0.31% in 2000, 0.33% in 2010 and 0.24% in the year 2021. Figure 9 presents the


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overlay of the changes within the period cover by the study.

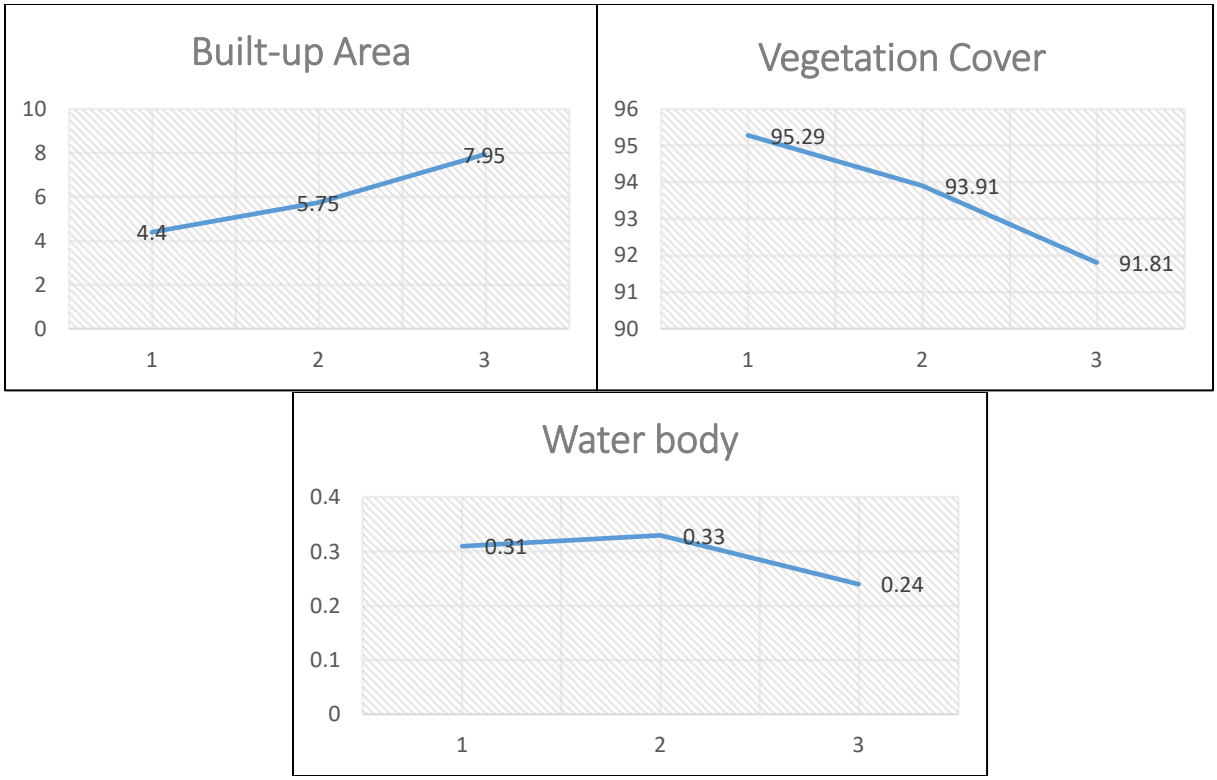


Figure 6 – 8: Trends of Changes in Land use/Land Cover in Asa

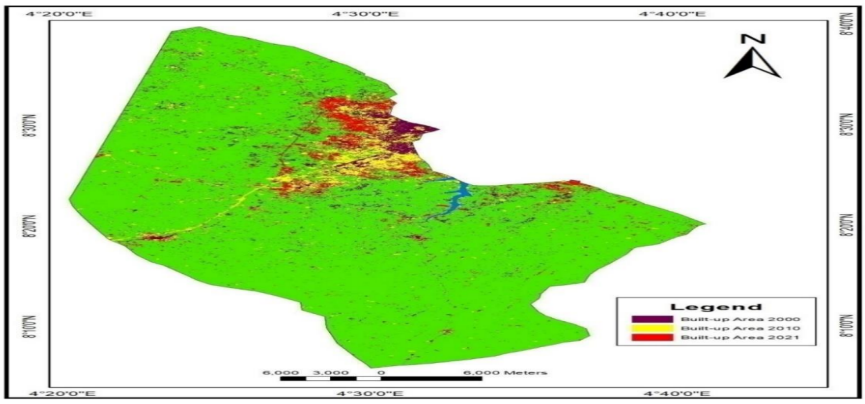


Figure 9: Overlay Map of Asa between 2000 and 2021

**Relationship between Population Growth and Land Use Change**

The population of Asa local government in Ilorin, Kwara State increases from 100933 in 2000 to 140,315 in 2010 and to 189,423 in 2021. However, population growth is one of the main factors of urbanization, as seen in the study area, increase in urban coverage will bring about reduction in vegetation cover. According to Table 3, there was an increase in population in the built-up area leads to 18.1% increase in the built-up area and 281.01% reduction in vegetation, which shows that the trend of population in the study area will continue to grow and the level of vegetation in the study area will reduce and subsequently disappeared. According to Agenda 2030 which focuses on the essence and provision of agricultural land. Hereafter, the possibility of having sufficient agricultural land for farming and provision of food which is a secondary need of man in the nearest future has been threatened by express development of land (Residential and Commercial) which makes the possibility of having sufficient agricultural land in the future a mirage.


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Table 3: Population of Asa Local Government

| Year | Population | Built up areas | Agricultural land |
|---|---|---|---|
| 2000 | 100,933 | 4.4 | 95.29 |
| 2010 | 140,315 | 5.75 | 93.91 |
| 2021 | 189,423 | 7.95 | 91.81 |

***Source:*** *National Population Commission (2000, 2010. 2021); Image analysis, (2023)*

**Forecast for the Study Area**

Table 4 shows the land use forecasts of the study area till 2030. This table also contains the percentage change in column A and B, the predicted probability in 2030, it can be seen that the built-up area increases by 31,05%, and water body also decreases by 9.36% while vegetation decreases by 1.62%. This means that the study area will be covered by built up area by the year 2030. The implication is that, if effective policy is not introduced to control the level of development in the study area, there is the eminent risk of severe damage to the vegetation and source of food.

Table 4: Study area forecast to 2030

| | (A) | (B) | | | |
|---|---|---|---|---|---|
| **Classes** | **Percentage of change 2000-2010** | **Percentage of change 2010-2021** | **Summation of A+B** | **Average percentage of change A+B/20** | **Probability of growth to 2030** |
| Built up area | 30.7% | 38.3% | 69% | 3.45% | 31.05% |
| Vegetation | -1.4% | -2.2% | -3.6 | -0.18 | -1.62 |
| Water body | 6.5% | -27.3% | -20.8 | -1.04 | -9.36 |

Asa is among the most peaceful and serene section of the city of Ilorin, Kwara state and the area is subjugated by all kinds of ethnic groups like Yoruba, Fulani, and Tapa.

## CONCLUSION AND RECOMMENDATIONS

This study identified the effect of urbanization on peri urban land use change in Asa, Ilorin Kwara State and asserted that increase in size of inhabitation will impact the peri urban change in the use of land in the area. The result of the research shows that the increment in population will result in a favourable impact on the urban section and an unfavorable impact on the section of vegetation land. The municipal section of Asa is growing step-by-step, and the extent of urbanization indicates the grade of social changes and alterations in the economy. The study area (Asa) proposes a coverage area for several uses of land from 2000 – 2010 - 2020. The built-up area increases from 5441.59 in year 2000 to 7124.40 in the year 2010 and 9839.16 in 2020.which shows increase in the level of structural development in the area. However, the study finds out that built-up area increased from 4.40% in the year 2000 and to 7.9% in 2020. At this rate of increase, the study area will require urgent intervention by the planning and development control authorities in order to protect the vegetation land in the study area. This study also finds out that there is a positive relationship between population growth and the built-up area of the study area. Finally, the study shows the land use projection model of built-up area to be 31.05% in 2030.

The study therefore recommends policy action by the Government that will be geared towards land use control in the study area. Also, Government ministries that are saddled with the responsibilities of development should ensure the improvement of the peri urban areas so that citizens do not have to move to cities or towns hence reducing rural-urban migration. Similarly, the National Development Council of Ilorin, Kwara State needs to observe and regulate the model of development in Asa LGA in order to regulate the conversion of agricultural land into other uses.

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