



Impact of Land-Use Change from 2000-2020 on Environmental Resources in Bayelsa State, Nigeria

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ABSTRACT: Land cover data documents how much of a region is covered by forests, wetlands, impervious surfaces, agriculture, and other land and water types. Water types include wetlands or open water. Land-use shows how people use the landscape – whether for development, conservation, or mixed uses hence, the objective of this paper was to evaluate the impact of land-use change from 2000 – 2020 on environmental resources in Bayelsa State, Nigeria. A sample frame of two broad epochs (spanning from 2000 – 2020) was used for the study. This was to allow detailed image capturing and interpretation of land-use land cover (LULC) change of the study area. The result of the analysis shows that water bodies occupies 291.31km² (3.11%) of the total land cover of the area (9372.72km²), riparian vegetation 1245.2km² (13.29%), mangrove swamp – 2959.86km² (31.57%), fresh water – 3976.86km² (42.43%) and built up area 899.95km² (9.60%). The study recommends for the implementation of existing environmental laws in order to take care of current trend of environmental resources decline, there should be public enlightenment and environmental education in order to alert the general public on the danger of human activities on the environment.

DOI: <https://dx.doi.org/10.4314/jasem.v28i5.24>

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Cite this Article as: MARINE, A. T. A; BISONG, A. E. (2024). Impact of Land-Use Change from 2000-2020 on Environmental Resources in Bayelsa State, Nigeria. *J. Appl. Sci. Environ. Manage.* 28 (5) 1519-1525

Dates: Received: 21 February 2024; Revised: 22 March 2024; Accepted: 20 April 2024 Published: 19 May 2024

Keywords: Landuse; Change; Environmental Resources; land-use-land-cover

Challenges that are linked with the decline in environmental resources are oftentimes associated with the process of development and thus, have negative effects both on local as well as global levels. These effects which are the result of human activities have adverse consequences on the environment and so are toxic to human beings, fauna and flora and can be transferred to future generations. (Danish International Development Agency, 2000; Kjellstrom and Mercado, 2008 cited by Ogboru, 2015). In the face of global economic recession, environmental degradation poses a great challenge to sustainable development. Thus, the desperate search for self, family or organisational

improvement is no longer a future threat but real threat for the future. To look up to the future with optimism, depends to some reasonable extent on how we are able to set the stage for tackling environmental degradation problems of today. This requires an intelligent and well-co-ordinated balance system. (Ishmael and Rosemary, 2015). During the period from the 1970s to the 1990s, the ecosystem changed greatly in the Heihe River Basin because of over-exploitation of water and land resources for agricultural and economic development, leading to changes in the eco-circle level structure, with decreased ecosystem stability and serious eco environmental problems (Chen, 2004 cited

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by Sha *et al*, 2015). No form of government over the years, whether colonial, military, as well as civilian administrations in Nigeria have given the required attention needed to environmental issues. As a result of the afore-mentioned environmental resources and their harmonious relations with nature have suffered dire consequences for decades and this remains one of the most intricate problems in Nigeria. Examples of these environmental hazards which have suffered neglect include the gully erosion in the east, the seemingly devastating effect of solid mineral mining on the plateau and the encroaching of desertification in the north, ocean collapse in the south to mention a few. The effects of this neglect can be further seen in the Niger Delta geopolitical zone of Nigeria where gas flaring and oil spillage in the Niger Delta has wrecked tremendous damage on the ecosystem, health and livelihood of the people. Thus, exploitation of finite and renewable resources of the environment which was meant for sustainable economic growth and development has turned out to be a curse. (Ishmael and Rosemary, 2015). At inception, intense exploration, exploitation and consumption of these resources were effectively contained within the carrying capacity of the environment and its renewable potential. However, with passage of time, teeming population, sophisticated technical progress and their overall impact and pressure on the environment, a rethink began to emerge. The challenge in the contemporary situation remained that of a clear need for regulated control of the living environment based on principles of sustainability. The pressure of demands made on living and finite resources has risen to a height where the former development styles, processes and their products are now inappropriate and incapable of coping with long-term human demands. Essentially therefore, sustainable development has become the enigma for one common future. Pressure placed on the carrying capacity of the earth and its resources is reaching an alarming proportion and now at the front burner of development and environmental issues.

According to Musede, (2009), Living in the environment today is associated with opportunities, problems and challenges. The earth as the base of all human activities is undergoing a siege from all aspects of human activities that cuts across misuse, abuse and degradation of the environment. Some of these activities have negatively impacted on the climate and has thus led to global warming and its negative effects such as desertification. Environmental resources decline occurs when uncontrolled extraction of natural resources takes place incessantly in the environment (Barun, 2014). Environmental decline can take place naturally or can be caused by human beings or both, but the fast growing trend of industrialization,

population, economic development and unrestrained growth in urbanization is a major concern for environmental resources degradation to loss. When resources get depleted or lost in biodiversity and habitats, it leads to environmental degradation. Environmental degradation usually takes place due to the excessive exploitation of environmental resources which are known as the basic means for development (Bisong *et al* 2024). Ogbonu and Anga (2015) also linked problems of environmental degradation with the process of development. Kjellstrom and Mercado, (2008) said the negative effects that are the results of anthropogenic activities have lasting devastating consequences on the environment and so are harmful on human beings, animals and plants and can be transferred on to future generations.

Ahmed, (2011) noted that, Nigeria as a nation is undergoing development as well as the world generally, development issues will continue to dominate sustainable development agenda. As urban population continue to increase in number, the problem of inadequate supply of basic infrastructures such as housing, schools, hospitals, road networks will continue to be overstretched, resulting in an unhealthy environment characterized by improper waste disposal, and other poor sanitary habits which further pollute the air, water and soil in Nigeria. Among the impacts of environmental resources is degradation and loss of bio-diversity and endangering of plant and animal species. The intensification of urban land use has caused serious and extensive deforestation. The ecological consequences of deforestation can be seen in erosions, floods, environmental degradation and instability. From the forest to the oceans, environmental resources are being depleted with vigour. Attitudes of people towards the non-human world have become so predatory that we are beginning soon to live as endangered species when the very basis of our survival is in jeopardy (Ogboru and Anga, 2015). Ishmael and Anga (2015) examined environmental degradation and sustainable economic development in Nigeria: A theoretical approach. Their work adopted the theoretical approach in the evaluation of the effects of environmental degradation in Nigeria. The study discovered high number of cases of diseases like cancer, tuberculosis (TB), and viral diseases etc as consequences of environmental degradation. However, Ishmael and Anga (2015) carried out their study since six (6) years ago in Jos, Plateau state, northern Nigeria. The present study was in Bayelsa state, southern Nigeria. These among others are the gaps this current study hope to fill by examining the land use changes and environmental resources decline in Bayelsa state.

Suleman (2017) worked on spatio temporal analysis of forest cover change in Falgore game reserve in Kano, Nigeria; using multi-temporal land sat imagery. Their study showed that dense woodland, moderate woodland and very open woodland decreased at annual average rate of 3%, 1% and 0.4%. Open woodland had expanded from 21,127 hectares in 1985 to 53,392 hectares in 2015. Their study location is a very small area in Kano, using multi-temporal land sat imagery. Hence, location and scope are the gaps this current study wish to fill by examining the impacts of land use (anthropogenic activities) on environmental resources in Bayelsa state. West and Wodike (2019) did a research on the ‘environmental degradation arising from the effects of urbanization in Port Harcourt, Rivers state. The study discovered that urbanization is the physical growth of urban areas due to rural - urban migration and sub-urban concentration into cities because of uncontrollable urbanization in Rivers state which is taking off most of rural lands, resulting to environmental degradation and its associated problems. However, West and Wodike (2019) in their study did not use any statistical tool for analysis, also that their study area is small. Notwithstanding, the objective of this paper was to evaluate the impact of land-use change from 2000 –

2020 on environmental resources in Bayelsa State, Nigeria

MATERIALS AND METHODS

The Study Area: Bayelsa state is located within latitude 5°25¹ and 6°40¹ north of the Equator. It is also found within longitudes 4°25¹ and 5°15¹ east of the Greenwich Meridian (See Fig. 1 below). The State is bounded by Delta State at the North, Rivers State at the East and the Atlantic Ocean at the Western and Southern Parts.

Pre-field Survey: This study used quasi experimental research design based on the fact that main data used was sourced from Google Earth using Arc GIS 10.5. On the other hand, secondary data was sourced from previous works on the subject matter and other related literatures from journals, periodicals, text books, newspapers and maps. A sample frame of two broad epochs (spanning from 2000 – 2020) was used for the study. This was to allow detail image capturing and interpretation of land use land cover (LULC) of the study area. This is in line with the study of the Danish International Development Agency (DIDA, 2000) as adopted by Eludoyin, (2020). Data on land use change was analysed using percentages, maps and graphs.

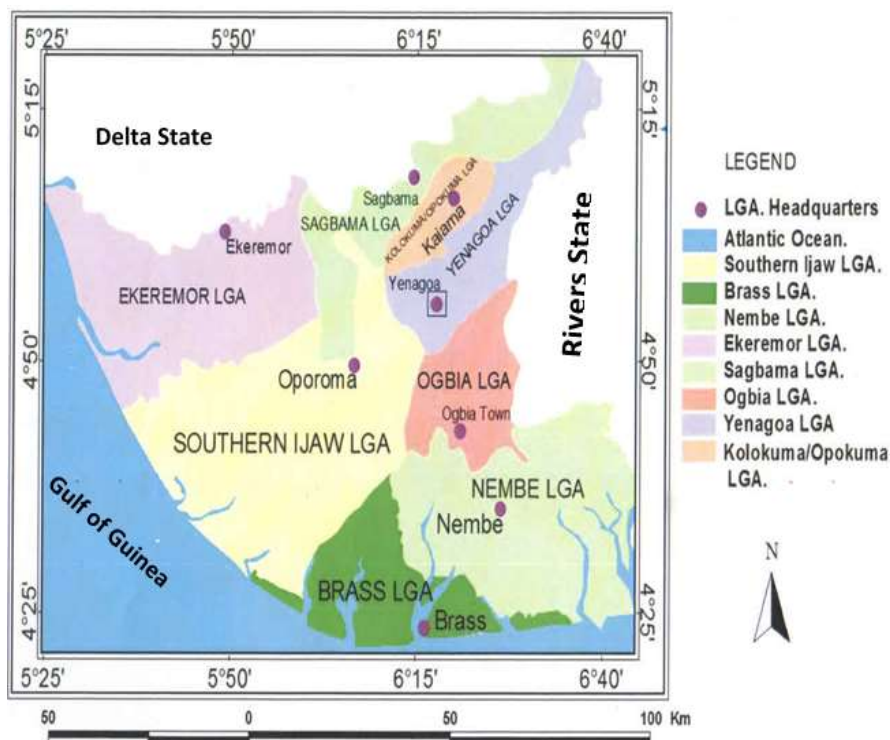


Fig. 1: Bayelsa State showing study locations/LGAs
 Source: Adapted from Marine, 2024

According to Enaruvbe, (2014), Bayelsa state is a lowland state characterised by tidal flats and coastal beaches, beach ridge barriers and flood plains with much of alluvia deposits along the flood plain. The next features such as cliffs and lagoons are the dominant relief features of the State. The fact that the State lies between the upper and lower Delta plain of the Niger Delta suggests a low-lying relief. The broad plain is gentle-sloping. The height or elevation decreases downstream. There are numerous streams of varying volumes and velocities in the States. Some of them include; Rivers Forcados, Nun, Ekoli, Brass, Koluama etc.

(3.11%) of total areal of Bayelsa State, riparian vegetation had 1245.20 km² (13.29%), mangrove had 2959.40 km² (31.57%) while built up area had 899.95 km² (9.60%) and freshwater swamp had 3976.86 km² (42.43%) . In 2010, the analysis revealed that water bodies reduced to 277.33 km² (2.96%) while riparian vegetation, mangrove and freshwater swamp had 1116.20 km² (11.91%), 2773.42 km² (29.59%) and 3660.38 km² (39.05%) respectively while the built up area had 1545.39 km² (16.49 %). In 2020, water bodies had 497.33 km² (5.31%), riparian vegetation had 1246.20 km² (13.30%), mangrove had 2702.25 km² (28.83%), and fresh water swamp had 3292.68 km² (35.13%) while built up area had 1634.26 km² (17.44%). From the analysis, it is therefore shown that the extent of water bodies and riparian vegetation were fluctuating from 2000 to 2020 while mangrove and freshwater swamp continued to decrease. However, built up area increased from 2000 to 2020.

RESULTS AND DISCUSSION

Satellite Imagery of Land use Pattern between 2000 and 2020: Table 1 below shows the land use change of Bayelsa State between 2000 and 2020. In 2000, it is presented that the water bodies had 291.31 km²

Table 1 Land use pattern of Bayelsa state between 2000 and 2020

Land use/Environmental resources	2000		2010		2020	
	Areal coverage (km ²)	Percentage (%)	Areal coverage (km ²)	Percentage (%)	Areal coverage (km ²)	Percentage (%)
Water body	291.31	3.11	277.33	2.96	497.33	5.31
Riparian Vegetation	1245.2	13.29	1116.2	11.91	1246.2	13.30
Mangrove	2959.4	31.57	2773.42	29.59	2702.25	28.83
Freshwater Swamp/Farmland	3976.86	42.43	3660.38	39.05	3292.68	35.13
Built Up Area	899.95	9.60	1545.39	16.49	1634.26	17.44
Total	9372.72	100	9372.72	100	9372.72	100

Source: Researcher's analysis, 2022

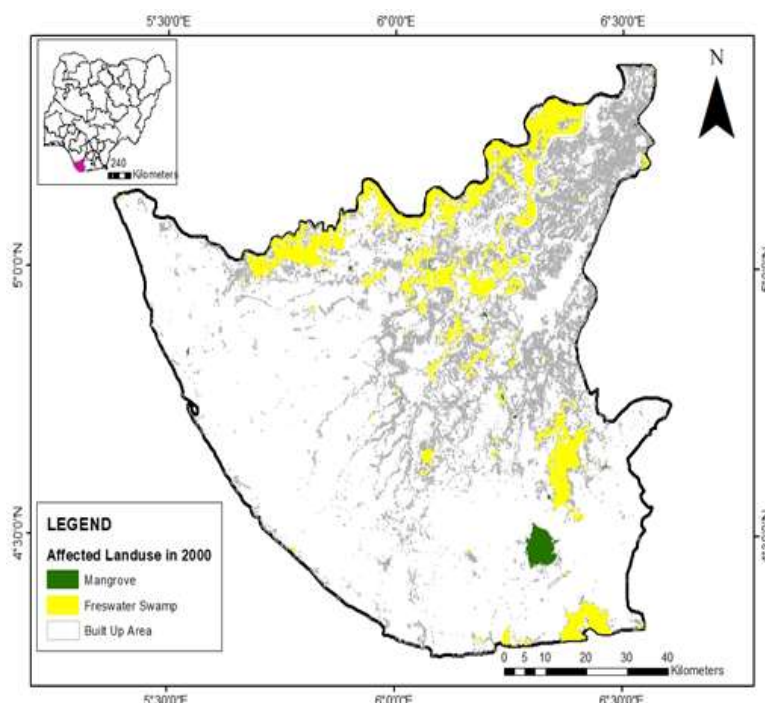


Fig 2: Affected Land use by urbanization between 2000 and 2010

Source: Eludoyin, 2022

Land use change arising from anthropogenic impact on other land use in Bayelsa state: Figures 2 and 3 present the affected land use captured by built up areas in Bayelsa State between 2000 and 2020 while figure 4 is a divergent graph showing what is captured in figures 2 and 3. It was discovered that between 2000 and 2010, built up area captured 53.15 km² (7.25%) of mangrove and 680.17 km² (92.75%) of freshwater swamp. Although there was spatial extent changes in water bodies and riparian vegetation, but the present analysis showed that they were not affected by the

built up area. That means they may be affected by other land use. However, 54.21 km² (18.72%) of mangrove and 235.33 km² (81.28 %) of freshwater swamp were lost to built up area between 2010 and 2020. Thus, the total spatial extent of other land use lost to built up area between 2000 and 2010 was 733.32 km² while it was 289.54 km² between 2010 and 2020. Thus, much effect of anthropogenic activities was felt in the freshwater swamp than any other land use.

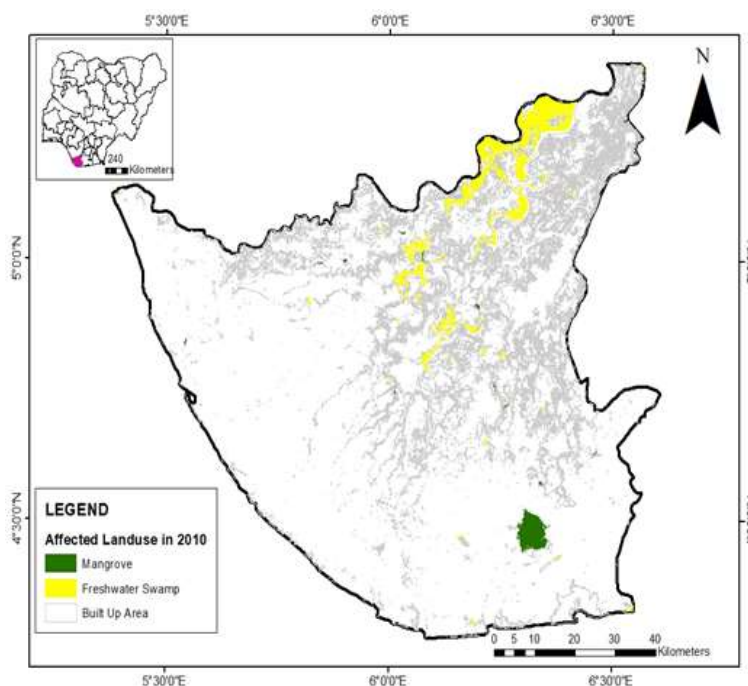


Fig 3: Affected Land use by urbanization between 2010 and 2020
Source: Eludoyin, 2022

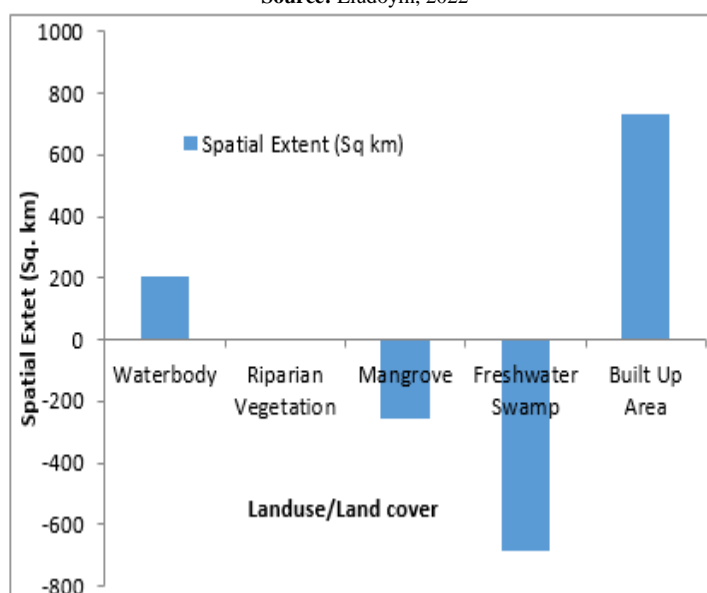


Fig 4: Rate of Change of Land use between 2000 and 2020

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Conclusion: The study investigated the impact of land-use change on environmental resources in Bayelsa state from 2000 - 2020. The investigation shows that the loss or eventual decline in forest or environmental resources were due to the indiscriminate harvesting of these resources owing to the rising human population which have increased human activities in the environment to the detriment of man's sustainability in the Bayelsa environment.

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