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MAPPING THE GAINS, LOSS AND NO CHANGE OF WETLAND AREA IN THE YENAGOA CITY PLANNING AREA

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ABSTRACT
Wetlands are very important resource that provide variety of eco-system services to the urban resident's collective resource and are largely considered as urban commons that should be managed in a sustainable manner for today's use and for future generations to utilize. Yet fewer studies have focused on the gains, loss and no change of wetland that makes it appropriate for spatial management, and policy interventions. This study draws on the concept of urban commons to highlight on the spatial distribution of wetland and spatial change of the loss, gains and no change of wetland in the Yenagoa City Planning area between the study period of 1996 and 2021. The three epoch of 1996 and 2004, 2004 and 2012, and 2012 and 2021 which is based on four time series Landsat satellite imageries of 1996, 2004, 2012 and 2021 of Bayelsa State downloaded from United States Geological Survey website repository. Findings from the study show that the gains, loss and no change of wetland show that between the periods 1996 to 2004, 2004 to 2012, 2012 to 2021, wetland areas were respectively converted to builtup as 5082ha (7.09%), 2460ha (3.43%) and 5999ha (8.36%). The study attributes most of the changes in wetland area to unchecked infrastructural development as result of rapid urbanization. The study recommended amongst others that a geospatial mapping of wetlands should be conducted in Yenagoa to ensure listing and cataloging of wetlands.

Keywords: Wetlands, GIS, Remte Sensing,

INTRODUCTION
Wetlands are very important resource that perform a variety of functions that are beneficial to humans. They provide purification services, groundwater replenishment, stabilization of shorelines and storm protection, water storage and flood control, processing of carbon (carbon fixation, decomposition and sequestration) and so forth.

However, wetland degradation and loss remains one of the most challenging problems in the Niger Delta region as a result of population growth and the demand for urban space due to urbanization, agriculture and industrialization (Ayanlade and Proske, 2015).For example, arising from its siting as the capital city of Bayelsa state, Yenagoa city has been undergoing demand for urban land space for housing and infrastructural development that is attributable to economic development and population increase (Ojile, 2007). These demand for urban land has continued to encroach into wetland areas in an unsustainable manner resulting to decline of wetlands and degradation in the health and functioning of wetlands ecosystems. The ensued changes from these unsustainable human actions threaten long-term survival of many life forms, including human kind. In light of the foregoing, various administrations have developed masterplans to control development within the state capital, Also contained within the regulatory act of the Bayelsa State Physical Planning and Development Board (BPPDB) is the prohibition to carryout construction on wetland areas(Bayelsa State Physical Planning and Development Board, 2015). The situation in Yenagoa city is similar to the situation experienced in other cities across the Niger Delta region. Although, Nigeria is a signatory to the Ramsar convention, urban wetlands are still not managed sustainably. Notwithstanding these and other informal and voluntary measures that are in place to protect wetlands, their degradation and spatial coverage reduction still occurs.

Studies have linked the menace to multiple interrelated problems (McLnnes, 2016; Chen & Lin, 2019; Mensah & Casadevall, 2019). Some studies have framed the problem in relation to lack of knowledge about the interaction between wetland vegetation and morphological dynamics (Li et al., 2018). Other studies have attributed the problem to climate variability; governance and land use failure; policy makers undermining each others effort to establish a network; lack of policy coherence, continuous development, and implementation of comprehensive strategies by policy makers; the perception of wetland as idle lands or waste lands by African urban planners and urban dwellers (Korah & Cobbinah, 2016; Narh et al., 2018; Aghmiuni & Nockrach, 2019; Nhamo, Magidi & Dickens, 2017).

The adverse effects from wetland loss and degradation include modification of local climate in hydrological region, precipitation or change in the volume of seasonal pressure of surface water that supports a conducive environment for the multiplication of various disease carrying vectors, loss of biodiversity, loss of livelihood, lowering of water table and drying of water wells, effect on water turbidity, (flooding) and so forth (). However, akin to the fact that wetlands play a very significant role in sustaining the physical, social and economic environment and well-being of human kind, their continued management in an unsustainable manner clearly portends a great danger to residence of urban residence.

In the context of the Niger Delta several studies have tried to lay emphasis in providing socio-economic, socio-cultural, climate change, historical trends, encroachment and rapid depletion as explanation to large scale variation of wetland areas . For example, the study of Ayalande and Proske (2015) highlighted on-going environmental pressure exerted by large-scale oil extraction and illegal timber logging to have a substantial impact on the Niger Delta wetland ecosystem over the last decades. Similarly, other studies have put emphasis on large scale variation such as uncoordinated urban growth ranging from illegal reclamation to conversion of land uses, depletion of habitat for flora and fauna species, development of unplanned settlements, unnecessary incursion into wetland areas, sprawling or urbanization (Ayanlade & Pruske, 2015; Eludoyin, Obafemi & Hardy, 2017; Dappa & Ibama, 2020; Richard & Agnide, 2020; Princewill, Kingdom & Neeka, 2020; Edo & Albrecht, 2021; Weje & Dappa 2018; Phil-Eze, & Etuk, 2021; Odubo, Weje & Eighemheririo, 2022). Characteristic of these earlier studies is the emphasis on the attribution of large scale spatio temporal variation in the distribution of wetland on a specific variable or few variables with little focus on the account for wetland variation at smaller scale. In our view, large scale variation of wetland are based on locations data that summarizes large-scale distributions of wetland based on (a) loss of wetlands, (b) gain of wetland and (c) no change of wetland which are correlated with the actual variety in small scale variables affecting wetland in any particular location. However, many of these earlier studies have ignored the localized variables that lead to the changing dynamics of these areas. This informed the need for empirical analysis of the dynamics of wetlands in Yenagoa City Planning area to inform policies and programmes on their sustainable use and management. Specifically, the spatio temporal dynamics of wetland and identifying characteristics of the dynamics at various locations such as loss, gain or no change and the variables that has given rise to them such as nature of encroachment, identification of encroachers, institutional roles in wetland management, was critically evaluated in this study. It is expected that to sustainably manage wetlands, there is need to properly integrate them into land use plan through the process of mapping. The efficiency in sustainably managing wetlands as a very vital resource for humankind survival will be facilitated if the spatio temporal dynamism of wetland and the small scale variability which constitute variation in wetland is properly understood. This study seeks to map and take inventory of the spatial distribution of wetland and assessing the loss, gains and no change of wetland areas in Yenagoa City planning area and to recommend appropriate measures for sustainable management of these resource. This study further reinforces the need for the integration of all the possible variables that results to large scale wetland variation and to identify probable opportunities to enhance sustainable use of wetlands. Therefore, this study is symbiotically linked to current international and national policy initiatives that are aimed at improving urban wetlands and human existence globally. Thus, it intersects with federal legislative acts of Nigeria and many of the Sustainable Development Goals (SDGs).

Study Area

The study area covers about 15km radius from Yenagao, the Bayelsa State Capital and runs almost parallel to the Mbiama-Yenagoa road and the Epie Creek extending to the Ekole and Taylor Creek tributaries of the Nun Rivers. Also included within the area are the expanse of land along parts of the Kolo creek, the upper reaches of the Otueke creek and the River Nun (Yenagoa Master plan, 2004). The extent of Yenagoa City planning area is described as thus, starting from a point marked A, which is the Yenagoa city centre whose geographical coordinate are 04 deg 56 min 00 sec North Latitude and 06 deg 16 min 30 sec East Longitude and a radius of 15,000.00 meters (15.0km) defines the extent of the capital city where all towns and villages within the defined radius are in the designated capital city (Bayelsa State Laws of Nigeria, 1999). Incidentally, the area cuts across four Local Government Areas (LGAs). These are Yenagoa (YELGA), Kolokuma/Opokuma (KOLGA), Southern Ijaw (SILGA) and Ogbia (OGBALGA) (Yenagoa Master plan, 2004). Located within the area are about (52) fifty – two settlements which are grouped into 3 zones (A, B, C) according to their distances from the city of Yenagoa city centre. Zone A covers all settlements within 5km, Zone B 10 km and Zone C 15km (Yenagoa Master plan, 2004)(Fig 1).

The study area is further categorized into the immediate action area (IAA) and the total planning area (TPA). The Immediate Action Area (IAA) which is the territory lying mostly within a 5km radius of present Yenagoa and designated zone A, comprises about 16 settlements, with a combined 1963 population figure of 14,717 persons(Yenagoa Structure Plan Report, 1997). The Total Planning Area (TPA) (15km radius and 10km radius of Yenagoa) comprised of about 55 settlements with a combined 1963 census population of about 73,346 persons (National Bureau of Statistics, 2019). This area is a combination of Zone B (10km radius area) and Zone C (15km radius area),

The population of this area in 1991is recorded as 151,298 persons (NBS, 2019). Using exponential growth model and assuming an average annual growth rate of 2.5 percent between 1963 and 1997, the population estimates for this area for 1997 was recorded as 169,320 (Yenagoa Structure Plan Study Report, 1997). The growth of population of the settlements of the study area can be said to be largely attributed, hitherto, to natural increase (the excess of births over deaths). Also, as a result of the various roles played by Yenagoa over time. It can be surmised that in-migration (from both rural and urban areas) has played some role in its growth so far, although it can safely be assumed that natural increases has the more potent growth factor (Yenagoa Structure Plan Report, 1997).

The climate of the study area is a west equatorial type of climate (Koppen, 1918;Iyorakpo, 2015), and the tropical rain forest climate of Koppen's (1918). The seasons of the state which are wet and dry season is determined by the influence of tropical maritime air mass and the tropical continental air-mass. However, Efe (2010) revealed that there is no clear cut dry season in the area as all months have an average rainfall amount of 0.25mm. The mean temperature range is 25ºC to 31ºC, where the hottest months are December to April (Iyorakpo, 2015).

Development pattern in Yenagoa have majorly been guided by specific government policies that allows, and in some cases promote urban expansion. To ensure developers comply with development control laws and regulations, the Bayelsa State government established the Bayelsa State physical planning and urban development board (Ebipade, 2017).

Weak development control mechanism in Yenagoa as a result of failure of government to enforce and fully implement the Yenagoa Master Plan 2004 and the Yenagoa City Development strategy 2007, has caused willing buyers and sellers wherever land is available. There is no concrete plan to manage and control the level of urbanization in the city to achieve sustainable urban growth and development (Eyenghe, Chikagbum, Nwagwu, & Florence, 2018).

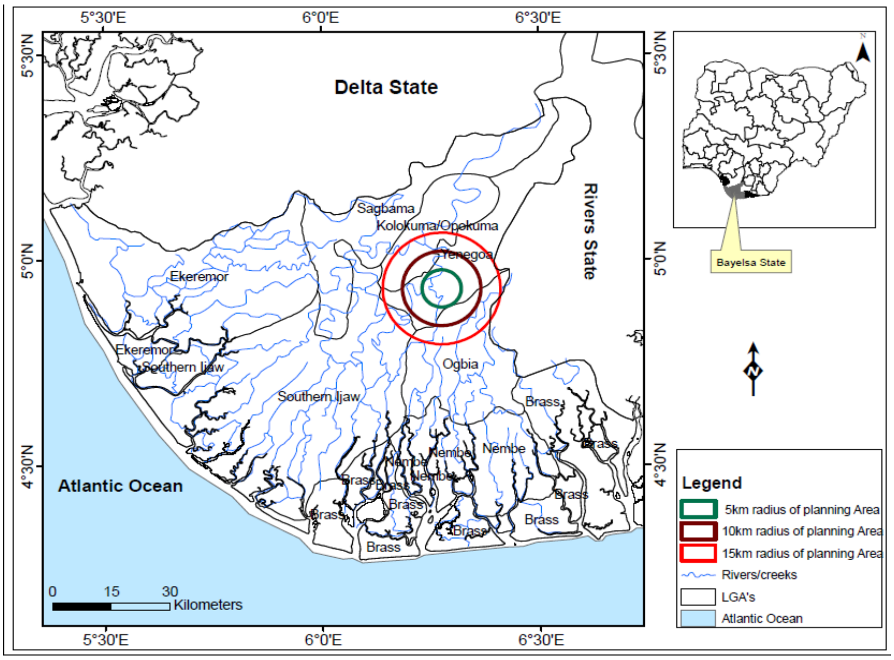

Fig. 1.1: Map of Bayelsa State showing the 15km^2 Radius of Yenagoa City Urban Area

Source: Author's Adaptation from Administrative map of Bayelsa State from Office of the Surveyor General, 2015 and Yenagoa Master Plan, 2004.

Concept of Wetland

Garg (2010) defined wetland as the transitional area between terrestrial and aquatic ecosystems. Furthermore, it is that area of land where the water level remains or above the surface of the ground for most part of the year. Wetlands are unique areas that are eitherpermanently flooded for years or decades or seasonally, for weeks or months (Keddy, 2010). The United States Environmental Protection Agency (2020) referred to wetland as areas where the soil is covered by water, or there is prensence of water at or near the surface of the soil all year or at different time of the year. Though there are many definitions of wetlands, the most widely accepted definition of wetlands is by Ramsar convention, which defines wetlands as areas of marsh, fen, past land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six waters (Ramsar Convention Secretariat, 2016).

The Ramsar convention is an international treaty for the conservation and sustainable utilization of wetlands, recognizing the fundamental ecological function of wetlands and their economic, cultural, scientific and recreational value (Wildlife Institute of India, 2021). The convention derived its name from the city of Ramsar in Iran where the convention was held in February 1971 and later come into force on 21st December 1975 (Australian Wader Study Group, 2021). There are several types of wetlands. The major types of wetlands include; Bogs; marshes; and swamps (Garg, 2010). However, irrespective of the type of wetland found in a particular location, they contribute to a number of functions that benefit people. These services include: purification, groundwater replenishment, stabilization of shorelines and storm protection, water storage and flood control, processing of carbon (Carbon fixation, decomposition and sequestration), other nutrients and pollutants and support plants and animals (USDA, 2020).

However, an underestimation of the economic and other value of wetland ecosystem services contributes to their continuing deterioration and inevitable loss (Assefa, Eneyew &Wondie, 2019). Dapa& Brown (2020) acknowledge that limited supply of land to meet the infrastructural development and housing needs of surging urban population in Port Harcourt is responsible for encroachment on existing wetlands by developers.

Examining Locations of Loss, Gains and No Change in Wetland

The spatiotemporal changes in wetland is highly influenced by the nature and locations of changes in other land use/land cover. Adeniyi & Omojola (1999) referred to the nature of landuse and landcover changes as to "what is changing and to what"?. According to them, the knowledge about the nature of change does not only help in bringing to the fore feedback of the resource base to management decision but it also exhibit changes that are not desirable. By investigating the nature of change, it is also possible to establish the spatial or locational instability of land use and land cover overtime (Adeniyi & Omojola, 1999).

Landuse landcover changes are majorly outcome of rapid urbanization which is normally followed by the dual effect of structural and demographic transformation of the area concerned leading to transition from primary to industrial means of livelihood and rapid population growth (Alam, 2011). Transformation in the urban structure results to pressure on demand for land space for various land uses (Weje & Dappa, 2021). However, considering the fixed nature of land resource, one of the means for increasing the supply of land to meet up other landuses is usually through the conversion of wetland landuse to other land uses. Based on the foregoing, wetland landuse change can be investigated with relation to the nature of other landuselandcover change by examining with respect to (i) wetland stability (i.e. areas of wetland classes with no change); (ii) areas of wetland classes lost to other classes; and (iii) areas of wetlands gained by other classes (Adeniyi & Omojola, 1999). The losses of wetland class to another class reveals an encroachment of other land classes on wetland class at time t_1 by other class(es) at time t_2. In the same vein, the gain to a class is an emergence of that particular class on other class(es) at a later time. The no change areas indicate the locational or spatially consistent or unchanged nature of a particular wetland class. Wetland changes in different locations, are precipitated by different factors such as climate change and severe weather, geological events, agriculture and aquaculture, urbanization, and human intrusions and disturbances (Gemechu, Rui& Lu, 2021). These various factors account for loss, gains, and stability of wetland in various locations. Weje and Dapa (2018) demonstrated the loss, gain and stability of wetland in Port-Harcourt municipality. Their study show that between 2000 to 2018, 1743.3ha of wetland was lost to reclamation activities, while 18.74ha of wetland is converted annually to other landuses to accommodate rapid urban growth in Port-Harcourt municipality. Also, Xu et al. (2019) show that China's wetland had a total net gain of 1548km^2 in 2010 to 2015 due to wetland restoration project, climate change, down-construction in the regions of Qinghai Tibet Plateau, the northwest and the southwest of China. While information on the nature of changes are represented in tables, the locations of change are presented on maps. However, the spatial locations where the changes have occurred are equally important to aid in decision making. Kwesaba et al. (2014) utilised Remote sensing and GIS to determine change matrix among the landuse/landcover types in Jalingo Metropolis, Nigeria. The study found out that Built-up land lost 11.64 km2 and gain 27.26km2 from 1988 to 2006 with the highest contribution of 19.22km2 (71%) from cultivated land.

METHODOLOGY

This study dwells on positivism research paradigm that relies on the hypothetic-deductive method to verify a priori hypotheses that are often stated quantitatively. The study adopted a longitudinal survey design. Data was collected through primary and secondary sources. Four time series Landsat Imageries of Bayelsa state were downloaded from the website repository of the United States geological survey (www.earthexplorer.com), of the year 1996, 2004, 2012, and 2021. The

Images were thereafter stacked together to create a false composite of the study area using the band combination button under the Image Analysis tools, Band 4, Band 3, and Band 2 were stacked into one image. The false colour Image was thereafter classified by picking respective training polygon as training samples for different classes of the analysis(wetland, Built-up, Vegetation and Waterbody). The Training sites were identified as clusters of landcover classes in the study area through ground truthing of various sites in the city. A signature file was created to assign signature for each classes and a classifier algorithm (maximum likelihood) was chosen to classify the image. The result of this classification was that each pixel belonging to different classes were properly indicated and detected.

The area and percentage of each classified class was computed using this formula

Area = Cellsize * count/10,000

Cellsize: The cellsize represent the dimension of the area covered by individual pixel in the image(resolution), and for the images used in this analysis, the cellsize is 30m*30m pixel resolution.

Count: Count represent the the numbers of pixels in each classes after classification.

The percentage of each classified class was computed using this formula

Percent = Area /total * 100

Area: This is area covered by individual class as calculated above while total is the sum of the areas divided by 100.

For the change detection analysis, the intersection tool in the ArcGIS geoprocessing tools was used.

This was done after the already classified images were converted into polygon using the Raster to Polygon tool under the conversion tools in AcrGIS toolbox.

The converted polygons were overlaid on one another using the intersection tool, to know the difference and detect the changes that have occurred in each time period.

Areas and percentages were also subsequently calculated.

The areas were calculated using the calculated geometry tool under the attribute table.

The percent were calculated as follows

Percent = Area /total * 100

Area: This is area covered by individual class as calculated above while total is the sum of the areas divided by 100.

RESULTS AND DISCUSSION

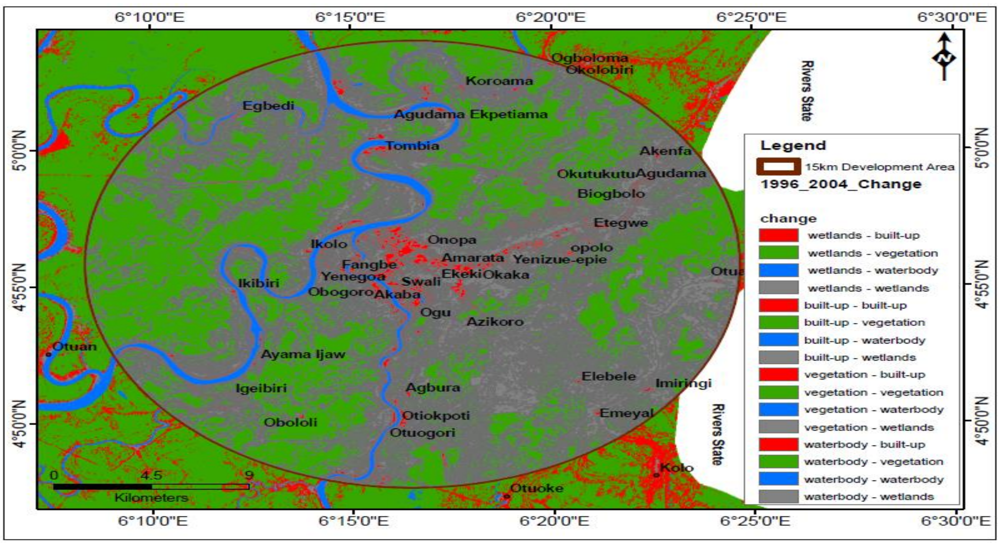

Fig. 3.1: Locations of Loss, Gains, and No change of Wetland and Other Land Uses between 1996 – 2004 in the Study Area

Source: Researcher's Fieldwork and Analysis, 2021

Table 3.1:Areas in Hectares of Loss, Gains, and No change of Wetland and Other Land Uses between 1996 – 2004 in the Study Area

Landuse/Landcover Change	Area (hectares)	Area (hectares) %
built-up - built-up	3862	5.38
built-up – vegetation	693	0.97
built-up – waterbody	642	0.89
built-up – wetlands	2460	3.43
vegetation - built-up	5723	7.98
vegetation – vegetation	7067	9.90
vegetation – waterbody	36	0.05
vegetation – wetlands	15528	21.65
waterbody - built-up	526	0.73
waterbody – vegetation	325	0.45
waterbody – waterbody	103	0.14
waterbody – wetlands	242	0.34
wetlands - built-up	5083	7.09
wetlands – vegetation	15994	22.30
wetlands – waterbody	113	0.16
wetlands – wetlands	13326	18.58
Grand Total	**71724**	**100**

Source: Researcher's Fieldwork and Landsat Image Analysis, 2021

Table 3.1 shows the nature of change of wetland and other land uses relating to loss, gains, and areas with no change in the year 2004 to 2012. Analysis of the table show that 5999 ha (8.36%) of wetland was converted to built-up and 4107 ha (5.73%) of builtup was converted to wetland. In other words, more infrastructure were built within the period of review. This goes to show that there was an increase in the urbanization of Yenagao City, this creating an increase in residential and commercial land use demand. However, locations where wetland do not experience any change is recorded as 11233 ha (15.64%), while, 3939 ha (5.50%) is recorded as the locations where there is no change in built-up. Fig 3.1 shows map of the locations of wetland and other land use changes as it relates to gains, loss and areas having n change. Analysis from the map, revealed that in addition to Onopa, Yenagoa, Amarata, Ekeki, and Okaka where built-up remained unchanged to other landuses, other communities such as Yenizue-epie, Etegwe, Opolo, Agudama, Biogbolo, and Akenfa have started experiencing built-up landuse development and they have remained unchanged within the period of review.

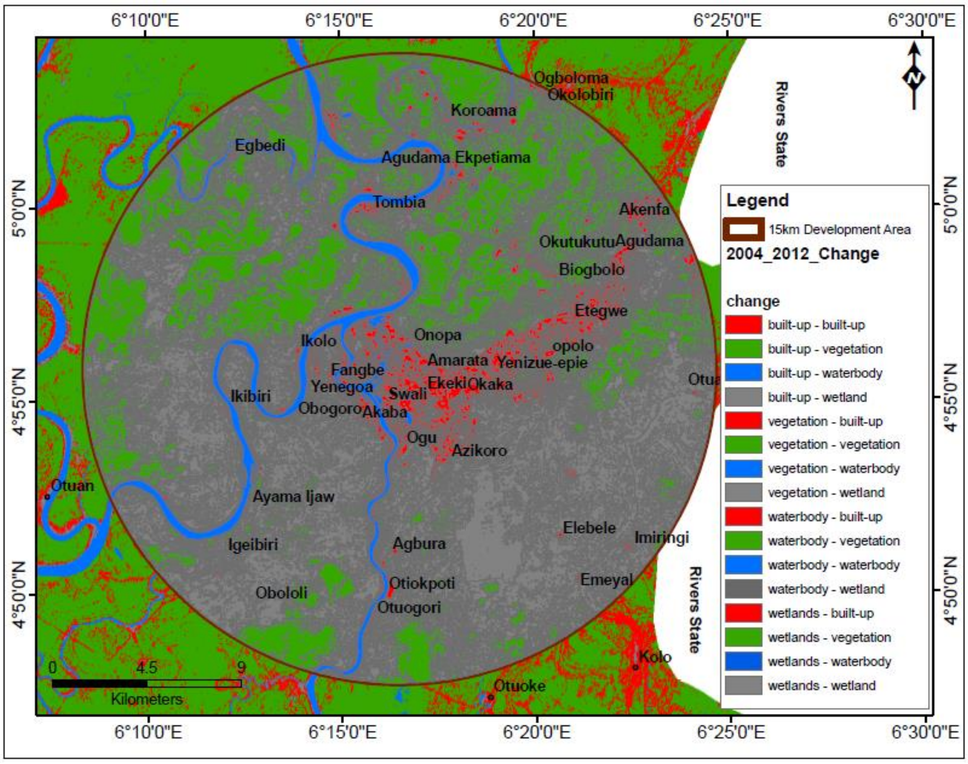

Fig. 3.2:Locations of Loss, Gains, and No change of Wetland and Other Land Uses between 2004 – 2012 in the Study Area
Source: Researcher's Fieldwork and Analysis, 2021

Table 3.2: Areas in Hectares of Loss, Gains, and No change of Wetland and Other Land Uses between 2004 – 2012 in the Study Area

Landuse/Landcover	Area (hectares)	Area (hectares) %
built-up - built-up	3939	5.50
built-up – vegetation	3985	5.56
built-up – waterbody	882	1.23
built-up – wetland	4107	5.73
vegetation - built-up	8330	11.61
vegetation – vegetation	10166	14.17
vegetation – waterbody	151	0.21
vegetation – wetland	11035	15.39
waterbody - built-up	401	0.56
waterbody – vegetation	86	0.12
waterbody – waterbody	114	0.16
waterbody – wetland	12	0.01
wetlands - built-up	5999	8.36
wetlands – vegetation	10931	15.24
wetlands – waterbody	363	0.51
wetlands – wetland	11223	15.64
Grand Total	**71724**	**100**

Source: Researcher's Fieldwork and Analysis, 2021

Tabel 3.2 shows the area in hectares of loss, gains and no change of wetland and other landuses. Analysis from table 4.7 show that 6531 ha (9.11%) of wetland was converted to built-up within the period of 2012 to 2021 in the study area. Also 4469 ha (6.23%) of built-up landuse was converted to wetland. However, 8646 ha (12.05%) of built-up areas did not experience change to any other landuses, while also, 9068 ha (12.64%) of wetland landuse remained unchanged.

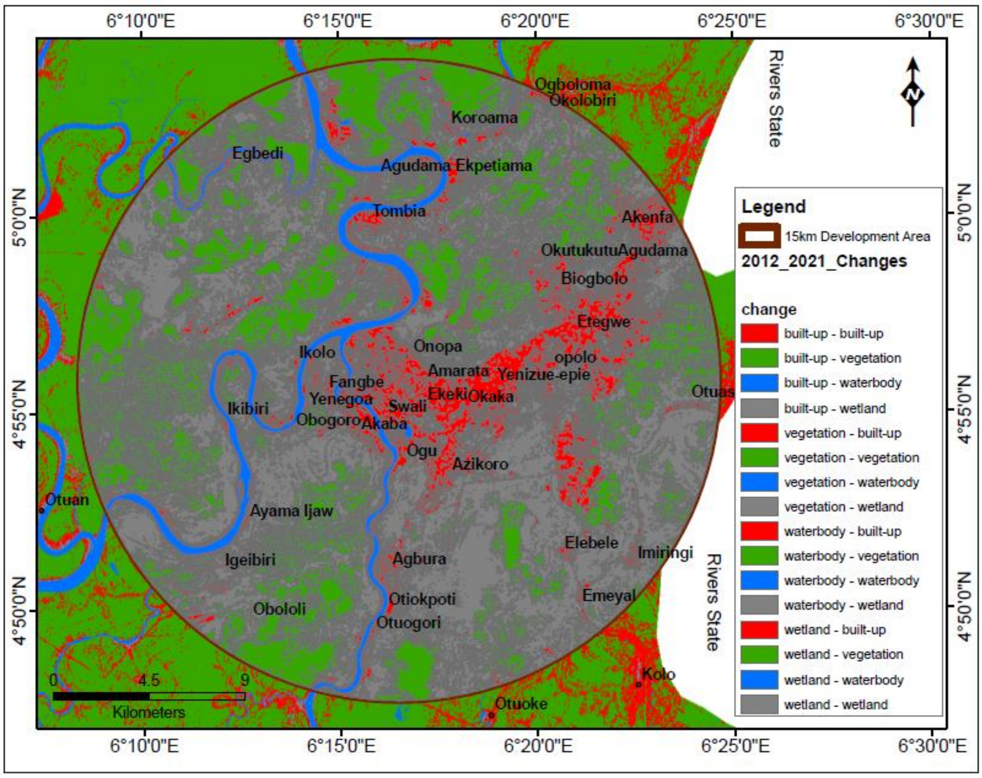

Fig. 3.3:Locations of Loss, Gains, and No change of Wetland and Other Land Uses between 2012 – 2021 in the Study Area

Source: Researcher's Fieldwork and Analysis, 2021

Table 3.3: Areas in Hectares of Loss, Gains, and No change of Wetland and Other Land Uses between 2012 – 2021 in the Study Area

Landuse/Landcover	Area (hectares)	Area (hectares) %
built-up - built-up	8,646	12.05
built-up – vegetation	4254	5.93
built-up – waterbody	748	1.04
built-up – wetland	4469	6.23
vegetation - built-up	9217	12.85
vegetation – vegetation	7747	10.80
vegetation – waterbody	230	0.32
vegetation – wetland	10990	15.32
waterbody - built-up	906	1.26
waterbody – vegetation	43	0.06
waterbody – waterbody	88	0.12
waterbody – wetland	177	0.25
wetland - built-up	6531	9.11
wetland – vegetation	8553	11.92
wetland – waterbody	57	0.08
wetland – wetland	9068	12.64
Grand Total	**71724**	**100**

Source: Researcher's Analysis From Landsat Image, 2021

The data analysis presented in fig. 3.3 shows the different locations in the study area between the period 2012 and 2021, where there are specific conversions of one land use class to another, and also locations where changes in landuse remain the same.

The data analysis presented in table 4.7 shows the extent of change of various landuse classes occurring in any specific location in the study area within the period 2012 – 2021 as presented in fig. 3.3.
Findings from the three epochs, 1996 to 2004, 2004 to 2012, 2012 to 2021, in Table 3.1, 3.2, 3.3 show that more wetland was lost to built-up areas. Table 3.1shows that from 1996 to 2004, 5082 ha (7.09%) of wetland was converted to built-up, whereas 2460 ha (3.43%) of built-up was converted to wetland. From 2004 to 2012 in Table 3.2, 5999 ha (8.36%) of wetland was converted to built-up, while within the same period, 4107 ha (5.73%) of built-up was converted to wetland. From 2012 to 2021, in Table 3.3, 6531 ha (9.11%) of wetland was converted to built-up, while 4469 ha (6.23%) of built-up was converted to wetland. From the foregoing, the findings suggest that there is increase in urbanization in the study area, prompting encroachment of built-up land use on wetlands. This finding agrees with Gemechu, Rui and Lu (2021),who asserted that urbanization, human intrusions and disturbances precipitate changes in different locations of wetland. In the same vein, overlay of the built-up areas on wetland from 1996 to 2004, 2004 to 2012, and 2012 to 2021 respectively on Fig. 3.1, 3.2, and 3.3, show that areas such as Onopa, Yenagoa, Amarata, Ekeki, Okaka, Yenizue-epie, Etegwe, Opolo, Agudama, Biogbolo and Akenfa indicates large areas of encroachment on wetland. These communities form the core of the state's capital, and they are observably rapidly urbanizing.

CONCLUSION AND RECOMMENDATION

Conclusions

Based on the findings of the study, the following conclusions were drawn.
The study found out that there is a progressive increase in built-up areas all through the study period of 1996 to 2021, and concurrently through the same period there was a decrease in wetland and vegetation. This indicates that there was a consistent degradation of wetland all through the study period in a bid to create land for development.
The study also found out that for the three epochs of study between 1996 to 2004, 2004 to 2012, and 2012 to 2021, Yenagoa city experienced a rapid decrease in wetland and a rapid increase in built-up areas. Furthermore, results in the study suggest that a reduction in coastal wetlands could possibly result to flooding problems. However, the occurrence of annual flooding problem in Yenagoa, may possibly be traced to the rapid decrease in wetland in Yenagoa city. The implication here is that, if urbanization is left uncontrolled, there is a tendency that Yenagoa may continue to experience flooding that could possibly lead to destruction of lives and properties in the future.
Furthermore, the study also revealed that wetland loss was most experienced in Yenagoa City between the period 2004 to 2012. This was attributed to the massive infrastructural activities that took place between this period.

Recommendation

In the light of the findings of the study, the following are recommended.

1. The government should after due consultation with stakeholders such as community leadership, land speculators, MDA's(ministries , departments and agencies) with their activities related to the environment , promulgate an act to prevent the indiscriminate acquisition, reclamation, draining and (or) conversion of wetlands.
2. A geospatial mapping of wetlands should be carried out, to ensure the listing and cataloging of the wetlands, and the inherent flora and fauna for the preservation of these species and exploitation of the same for tourism development.
3. Government should declare some of the wetlands areas as heritage and ecotourism sites, thereby, ensuing that livelihoods are preserved, as well as the inherent ecosystems.
4. The extant development control framework should be strengthened, to cater for the provision of more professionally trained and equipped manpower, to ensure internationally acceptable best practices.

5. There is need for the government to carry out an urban renewal programme within the study area, so already prepared masterplans which were not implemented, adequate roads, drains, green and open spaces such as wetland areas and other infrastructure should be provided

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