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Journal of Geographical Research
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ARTICLE

Impact of Land Reclamation on the Vegetal Cover of Bayelsa State, Nigeria

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ARTICLE INFO

Article history
Received: 01 April 2021
Accepted: 23 April 2021
Published Online: 30 April 2021

Keywords:
Land reclamation
Vegetal cover
Bayelsa state
Vegetal cover changes

ABSTRACT

The study examined the impact of land reclamation on vegetal cover in Bayelsa State. For the purpose of this study, both quantitative and qualitative research methods were adopted. Field observations, questionnaire survey and landsat imagery of land cover changes in the year 1986 and 2018 were generated from the global ground cover facility stream. The time series study design and supervised classification of the image processing were adopted to determine the impact of land reclamation on vegetal cover of the study area. It was therefore recommended that recovery of land will make strategic urban planning initiatives sustainable in overcrowded areas and institutions should also put in place laws and strategies to regulate reclamation activities across the region and also geo-spatial skills should be put in place to help quantify the dynamics, trends and rate of reclamation induced land cover change in the environment. Educational institute should inculcate environmental knowledge in the local environment.

1. Introduction

Due to the challenge of finding space in geographically restricted and densely populated areas, Bayelsa State in the Niger Delta have in time past and recently struggled to accommodate development [6]. Technologies of dredging implemented in recent decades have allowed land to be retrieved under favorable capital outflows [7]. Bayelsa State has a great deal to benefit from the more competitive recovery costs in response to pressing urbanization patterns. Recovery of land will make strategic urban planning initiatives sustainable in overcrowded areas in order to satisfy the need for new homes, transport and infrastructure. To 'reclaim land' means to recover the land for a particular purpose and use. Land reclamation can be classified as a process of acquiring land from wetlands coast or sea [9]. In other words, the reconstruction of distressed land into an improved condition may be called land reclamation [10]. Another concept of this could be termed as an additional trait base on the conversion of desert fields into fertile land and rural settlements [1]. Furthermore, different freshwater water sources, such as channels, canals and dams, are being rebuilt. The technologies utilized are the principal distinctions between the several processes for reclamation. For instance, land reclamation in some mainland uses substantially different methods from coastal land reclamation and vice versa [11], however the detrimental effects of extensive land reclamation are stronger from the environmental standpoint than the beneficial effects [12]. Although there's not a single unanimous uniform definition, but the notion of land conservation has been around for decades. The definitions of land reclamation are not just general. The terminology for suggesting these meanings often differs in connection with the region in the country. In addition to the western definition for land reclamation, there is a vast variety of literature

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on coastal development and sea containment from the east of the country. Reclamation in many regions of the world has been an integral part of the urban planning process, including in Nigeria, China, Great Britain, Japan, the Netherlands, Korea and the United States of America [5]. Lagos State has benefited from reclaiming land for infrastructural and industrial development. Banana Island in Lagos, Nigeria is one good example and it was reclaimed from the seashore. We are also faced with Eko Atlantic, a new coastal town on 10 million meters inland on Victoria Island, which is covered by an 8.5 km long. There are still sites in Lagos Island under recycling operations, one being the Dangote oil refinery, and more than half of Lagos Island has been restored. The place is bigger than the Victoria Island. It is 2,135 hectares of land, and dredgers recovered 30 million cubic meters of land in Lagos between November 2016 and 2018. The punch newspaper 11th Oct. 2012 claimed that local residents living nearby blamed Eko Atlantic for persistent building practices that contributed to coastal destruction and ocean surge as ocean waters washed through residential areas that overwhelmed access highways pushed down power poles and forced people to evacuate. The influence of land reclaiming activities on north coasts of Bantam was investigated by [2]. He found that land recovery induces flooding and degradation, decreased seawater content, caused fish and marine biota death. In general, there are environmental, physical and chemical consequences on the remediation and dredging site [8].

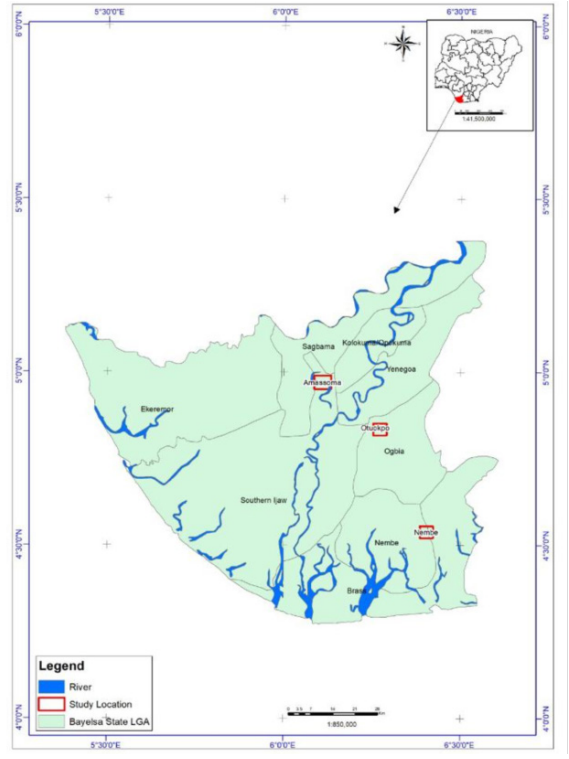

Figure 1. MAP OF BAYELSA STATE

The study area is located in Niger Delta region, Southern Nigeria. The area is located geographically within latitude 4^0 12' 30.892" N and 4^0 50' 10,7" N and longitude 4^0 56' 15' E and 9^0 40' 2.654" E. [4] Described the region of southern Nigeria which is bordered on the south by the Atlantic, East by the Republic of Cameroon and other Federal States of Nigeria which includes Abia State, Edo State, Imo State, Anambra State and Ondo State on the north and west. The Niger Delta encompasses the areas from Benin River to Imo East and covers oil-producing regions in Nigeria. This oil producing area is basically in total deprivations, for example, housing, environmental deterioration and pollution problems. Therefore, encouraging land reclamation with a view to creating more land for urbanization. Thus, such efforts to commensurate land reclamation developments with quality environment and no impact in oil producing regions is most desirable.

2. Methodology

The research design adopted for this study is time – series design of the study sequence as adapted by [3, 13]. Time-series sample design is retrospective and participants do not interact with their subjects/variables by encouraging the researcher to analyse changes in the dependent variable over time. Observations have been performed on individuals over a period of time, often lasting several years, to track trends or improvements in the characteristics of the target population at both the group and individual levels. Time-series analysis is more likely to show the degree of transition and pattern due to its scale. 1986 and 2018 Landsat imagery of land cover changes for the study area, complemented by data from the Federal and State Departments of the Environment respectively. Landsat imagery of land covers change was taken from the U.S. Shuttle radar imagery, National Geospatial-Intelligence Agency (NGA) and multinational ground cover installations owned by the United States (Administration of National Aeronautics and Space, NASA). Several studies/observations of Bayelsa State ecosystems on the subject have been carried out in this study over a period of time spanning years. As a result, the time-series for the study design adopted allowed the researcher to consider the changes that have taken place in these phenomena between 1986 and 2018. It was necessary because the measurement of the phenomenon in question (i.e. the lack of plant cover over the sample field) goes beyond a single moment in time. This is quite fitting as the time-series observation of land cover changes over time made it possible to carry out a proper evaluation of the effect of urbanisa-

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tion on land over time in the research field. In the case of this study, the ground cover picture of the study area was imported into the GIS environment where the data was evaluated to analyze land reclaimed and its impact on vegetal cover.

The sampling technique utilised for this research is the supervised classification of the image processing. This approach helped the researcher to gather data from the sampling region within the imagery in a polygon format and the device using GIS software on the highest chance platform or extension, and has been instructed to recognise features in the imagery that have identical reflections to those sampled using the guidance order method. Features with identical reflections as sampled have been identified and added to the attribute outlined for this phenomenon. After that all functional groups with the same reflection were classified as the same and labelled under the same context. The data were processed and the bands 1, 3, 5 and 7 collapsed in the composite band in the GIS environment, which were processed and categorised using the supervised classification to distinguish the region covered by the vegetation and reclaimed land in the study field, this process was also applied to analyze objective one and two. Under the supervised classification polygons for features have been glued together and labelled to reflect the different features. Polygon was analysed in order to gather data for characteristics groups of identical reflection in the research field using the highest probability analysis.

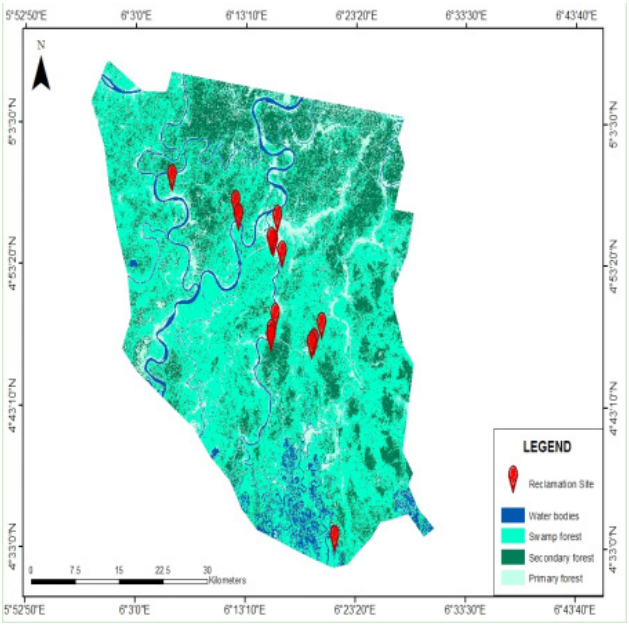

Figure 2. 1986 Landsat Band for Bayelsa

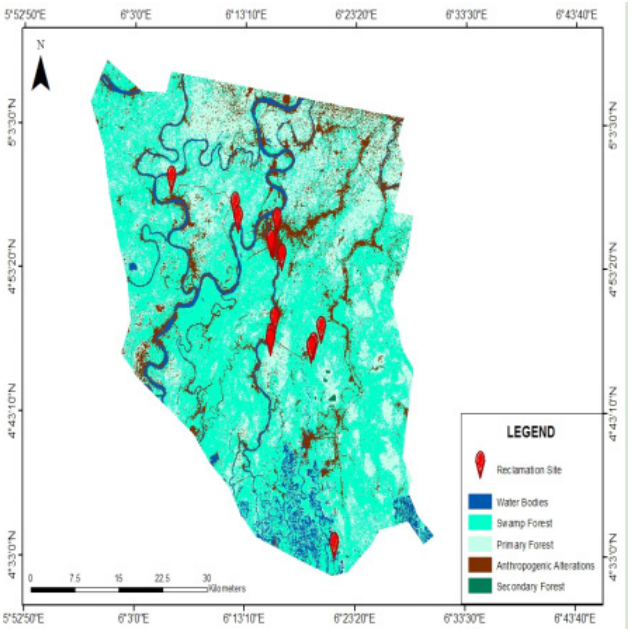

Figure 3. 2018 Landsat Band for Bayelsa

The analysis as shown in Figure 2 revealed that as at 1986 the level of anthropogenic alteration within the study area is not very visible. Swamp forest lies across most parts of the study area while secondary forest occupies the northern part of the study area. As at 2018 the level of anthropogenic alteration represented by the brown color is spatially distributed in the study area with low level of secondary forest cover as shown by the dark green color. Swamp forest lies in the southern part of the study area with pockets of primary forest across the study area.

Table 1. the dimension of different Land cover types in parts of Bayelsa State

Land cover type	1986 area in sq.m	2018 area in sq.m
Swamp Forest	58,734,753	37,691,068
Water Bodies	4,875,915	1,258,626
Primary Forest	5,316,648	39,103,234
New land created	1,876,242	47,436,846
Secondary Forest	80,678,627	25,992,411

Analysis as shown in Table 2 revealed that there is a reduction in the area covered by swamp forest, primary forest, and secondary forest with an increase in area of anthropogenic alterations, and water bodies across the study area. From the analysis it is noticed that there is very little noticeable area affected by anthropogenic activities on the surface coverage of the study area which could be tied to the very little activity in the region before the creation of Bayelsa State.

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Table 2. Extent of land reclamation in Bayelsa State

STATE	EXTENT OF LAND RECLAIMED
Bayelsa	5,816,309sq.m

The total area of reclaimed land in Bayelsa state is 5,816,309 sq. m.

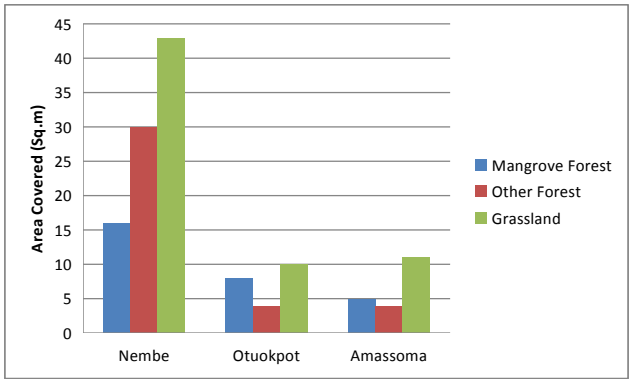

Figure 4. Nature of forest covers before reclamation

Source: Fieldwork, 2018

Before the reclamation was begun Figure 4 demonstrated the nature of the timber cover. The research revealed that mangrove forests and secondary (grazed) forests dominate the entire study region, with Nembe leading in all levels.

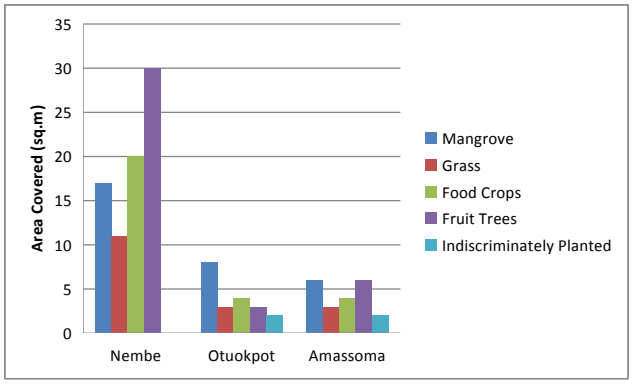

Figure 5. Re-vegetation of surface after reclamation

Source: Fieldwork, 2018

After remedial operation, Figure 5 showed the degree of vegetation in the field of research. The analyses showed that the speed of re-vegetation was sluggish to follow the surface, recovering from the river bed. The study found that people do not even see the growth rate of vegetation across space. The response is thus a win-win because some agreed to while some negated re-vegetation.

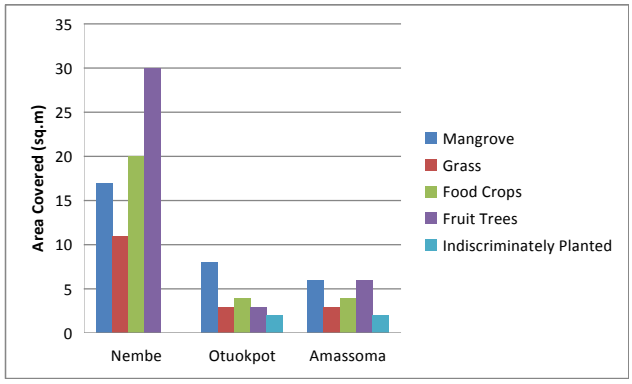

Figure 6. Composition of forest after re-vegetation

Source: Fieldwork, 2018

Figure 6 showed that in most reclaimed sites where re-vegetation is taking place, vegetal covers are indiscriminately growing, making the vegetal cover across space diverse in species and buttressed by the deliberate cultivation of food and fruit crops which resulted in anthropogenic induced greenness across the study area.

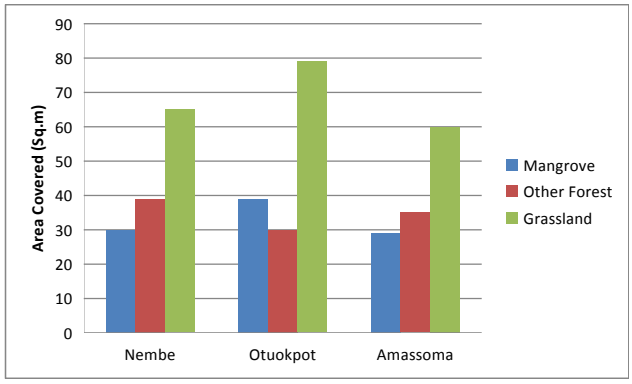

Figure 7. Types of forest resources impacted by reclamation activities in Bayelsa State

Source: Fieldwork, 2018

Until reclamation was started, the respondents' answers to the natural environment suggest that some forest properties were impacted or most affected by the regeneration of the soil.

3. Conclusions

The Niger Delta is the largest in Africa and the third largest in the world, one of the most essential wetlands in Nigeria, and Bayelsa is one of the states in the Niger Delta. As a result of land reclamation in Bayelsa State, green areas were destroyed. Habitat for different species and organisms were impacted on and the organisms were displaced. The study therefore recommends that the institutions such as Bayelsa State ministry of lands, housing and urban development should put in place laws, strategies and geo-spatial capacities to lead and quantify changes in the study area in terms of

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DOI: https://doi.org/10.30564/jgr.v4i2.3041

the dynamics, patterns and pace of reclamation. Educational organizations should consider environmental awareness and perception of the environment, part of their duty.

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