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Need for Emergency Response to Wetlands Loss Prevention in Southwestern Nigeria: A Review

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Research Article

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ABSTRACT

Southwestern Nigeria's wetlands are assaulted, degraded and loss especially to agricultural development and urban expansions; while the rural wetlands losses are due to agriculture but temporal, loss to urban developments are permanent. To examine the extent, influence, and potentials of the degradation, the review covered the six states of the region, revealing losses due to wetlands in the region between 1965 and 2019. Wetlands in Lagos reduced from 708.96 ha (52.68%) in 1965 to 7.10 ha (0.53%) in 2005, Eleyele Wetland in Oyo State, (Riparian) forest was seen to have lost consistently from (1.25 km^2) in 1984, to (0.98 km^2) 1994, (0.70 km^2) 2004 and finally (0.42 km^2) in 2014. Eriti forested wetlands of Ogun State lost about 45.32% between 1972 and 2015, in Ondo State Akure South Local Government Area Wetlands decreased from 98.90 km2 (30.13%) in 1999, to 90.33 km^2 in 2009 (27.52%); Ilesa wetlands, in Osun State decreased from 258 hectares to 89 hectares between 1986 and 2002.

INTRODUCTION

Wetlands are among the Earths most productive and threatened ecosystems combined accounting for only 6.2-7.6% of the Earth's land surface. Wetlands are an important component of human environment, as they are known to perform key functions in the stability of ecosystems. Such roles include supply of water to minimize the effects of

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in-adequate rainfall; home to diverse species of plant and animals; thus serve as diversity bank among other roles. Importantly, wetlands are cultivated to ensure food production in the time of water scarcity in uplands, most especially at the peak of the dry seasons. Though, in recent decades there is an increase in agricultural use of wetlands, especially in the developing countries. This singular function of wetlands at ameliorating the water supply for the continuous crops' cultivation seems to be the major factor responsible for its loss all over the world. The sustained use of wetlands for agricultural purposes according to Guthrie was due to their great potentials for sustainable increase in food production; possessing inherent high fertility status. And, of course, locations in the flat or near flat landscapes where soil erosion is not a major constraint to crop production.

However, there exists staggering statistics of wetlands degradations and loss capable of undermining their capacity to provide ecological services the world over and has triggered number of researches among scholars. Many of the researches are geared towards unravelling the economic values of wetlands; some considered the fertility status of the wetlands vis-à-vis its loss to crop cultivation and extensions [1]. Accordingly, agricultural incursion into wetlands is the chief destroyer and modifier of wetlands, after which is the issue of urbanization. Conversion of wetland to agricultural land may cause the altercation of soils physio-chemical properties, which in turn may influence the soil fertility status of a given area. Though, the influence of climate changes induced by reduction in rainfall events and prolonged heat spell cannot be overemphasized in this regard, the anthropogenic factor was decisive. Wetlands are found all over the world, most African countries inclusive; of which the largest in the continent include the Okavango Delta, the Sudd in the Upper Nile, Lake Victoria basin and Lake Chad basin, and the floodplains and deltas of the Congo, Niger, and Zambezi rivers. Nigeria is richly endowed, both with coastal and inland wetlands resources, but they are currently being threatened by anthropogenic and bio-geophysical factors; such as increased population pressure, rapid urbanization, mining, and pollution among others.

Even Nigeria's most important wetlands, the Hadejia-Nguru Wetlands in Jigawa and Yobe states respectively, have shrunk by as much as two-thirds in the past 30-40 years as a result of diversions from dams, irrigation developments and drought. This had seriously impacted; fisheries, farming, and wildlife due to changed hydrological morphology of the area, and by extension the livelihood sustenance of the local communities that depend on them. Moreover, uncontrolled oil exploration activities, spillage, and pollution have rendered the Niger-Delta, Nigeria's largest wetlands (third largest RAMSAR designated site in the world) waste and unproductive. In the Southwestern part of the country, there exists many wetlands' area that dotted the six states which formed the region.

There are the Eleyele wetland area in Oyo State, Eriti watershed in Ogun State; Lagos Wetlands in Lagos State; Akure Wetlands of Ondo State; Ilesa in Osun State, Wetlands of Ekiti State Ado- Ekiti among others in the region. Whereas; for this review, one wetland research journal pertaining to each state was selected for the region, so that the outcome of the review was adequate to represent the zone [2]. Like every other regions of the world, wetlands in the study area, have suffered tremendous degradations, conversion, modification, and loss in areal coverage. Although some past conversions, according to Turner, et al. might have been in society best interests, nonetheless, wetlands have frequently been lost to activities resulting in limited benefits or costs to society. Loss and

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degradation of wetlands not only affect the existence and health of an individual wetland and cause local suffering, but also affects the ecosystem as a whole and can contribute to regional and even global environmental problems. While some modifications such as farming/earth ponds for fishing are temporal. Modifications for human settlements, constructions of bridges and embankments and drainages are permanent in nature with serious consequences both in the immediate and in the future. In the immediate it may include the distortion of natural direction of water flows and incidence of floods; and in the future distortion in the water feeding the wetlands. This may result in the loss of wetness and in-ability of the wetlands to perform the natural roles of flood abatements and supply of wetlands goods and services. In-ability to perform, these roles may constitute a great loss in economic terms to the surrounding populace who depend solely on the wetlands for their survival and severe consequence on the natural pools.

The effects on the natural pools include loss of natural nursery ground and breeding sphere for many plant and animal species, and survival ground during acute water shortage. When wetlands are lost, significant amounts of greenhouse gases are released and the landscapes' ability to store carbon is reduced. The ecological goods and services that are critical to our health and economic well-being are continually being deteriorated. However, with all the importance attributed to wetlands they are modified, converted and drained for other uses, not minding the consequences; though many of the users don't know the effects on the environments, but they are driven by the economic prospects. Whereas those who should know; the government do not come up with enforceable policy statement to curb the indiscriminate conversion and modification of this important ecosystem. If only the policymakers could apply the same zeal deployed for the protection of forests ecosystems in the protection of this endangered land use, much would have been achieved in the area of wetlands protection

MATERIALS AND METHODS

This review was based on data obtained from existing studies in various selected wetlands in the six states across the Southwestern region of Nigeria. Studies pertaining to wetlands dynamics, changes or uses in the region were searched from the internet, while ensuring that each state was duly represented by at least one published research paper on wetlands utilizations. Though several research papers were downloaded but for this review finding from one paper each were used to analyse and cross-examined the loss due to wetlands across the entire region of Southwestern Nigeria [3,4]. The Wetlands were selected in Lagos, Ogun Oyo, Ondo, Osun and Ekiti State the six states of the region. The wetlands selected were Lagos Lagoon, Eriti in Ogun; Eleyele in Oyo; Ilesha in Osun State and Akure in Ondo state respectively. Lagos was included based on the extensive wetland surface area in the state. Eriti Wetland was included because of its use for agricultural purposes and its consequent involvement in FADAMA programmes. Eleyele Wetland is a major source of potable water distributed for household use upon treatment in Ibadan and its environs. Akure too was included due to its fast urbanization status and rapid increase in its population, likewise for other locations.

The study area wetlands in the southwestern Nigeria

The study area is Southwestern Nigeria (also referred to as the southwest geopolitical zone/region). The zone is made up of six states extending over a surface area of about 76,851 km^2, with an estimated population of about

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27,581,993 and population density of 359 people/km^2. The choice of southwestern region for this review was because of the serious dynamics of its land use, rapid urbanization and population growth, rapid socio-economic development and diversity of agricultural practices. Whereas, various sites were purposively selected among the states for the review, as they are still being modified and converted to both temporal and permanent uses at an alarming rate. The push most of the time are economic in nature, due to lack of jobs among the teaming youth population, and ready and available market for wetland products such as vegetables. All the sites are known to have been sources of enormous economic benefits to the various states over the years because of their fertile soil, wetness all year round, rich log gable woods and non-wood resources such as leaves and barks for medicinal purposes, wild fruits and their wild animal biodiversity store.

Akure wetlands of Ondo state

Wetlands are scattered across Akure along rivers Ala and Elegbin, the two major rivers passing through the city. Being an administrative city and the seat for many governmental organizations and industries in Ondo state, it is fast becoming urbanized and has experienced rapid increase in its population from 71,106 in 1963 to 360, 268 in 2006 as recorded in the 1963 and 2006 Population Census Reports of the National Population Commission (NPC) respectively. This increasing population puts tremendous pressure on land availability as well as food and other social amenities in the city with priority given to developers for buildings rather than for conservation or for agriculture thereby leading to encroachment of the wetlands and consequently degradation.

Ilesa study area Osun state

The study area lies within latitude of Ilesa urban area is made up of two local government areas, namely Ilesa West and Ilesa East. Both Council areas are bounded in the North, West and South by Obokun, Atakunmosa and Oriade Local Government areas respectively. The town covers a total area of about 73.6 square kilometers. It is about 32 Kilometres Northeast of Ile-Ife and about 30 kilometres Southwest of Osogbo, the Osun State Capital. The population of Ilesa has been put at 210,141 in 2006. The climate is humid tropical type with a mean annual temperature of about 28^{o}C and a mean annual rainfall of over 1600 mm. the underlying geology is mainly fine-grained biotite gneiss and schists although quartzite and quartz-schist rocks are common especially on slopes and ridges [5]. The soils are mainly the well-drained Egbeda series known as alfisols which has been classified as one of the most fertile soils in the Nigeria cocoa belt. The whole area is drained by tributaries of Osun, Sasa and Oora Rivers which flow south ward and southwest ward directions. The natural vegetation is the Tropical Rain Forest which could only be found in patches all over the district but mainly on hills.

Major threats to wetlands

The world has lost more than half of its wetlands as far back as 1900. As reported in FAO, about 25% of the world's wetlands have already been lost, largely due to conversion to agriculture or diversion of water for agriculture and aquaculture. Most of these disappearances have occurred during the twentieth and early twenty-first century. The wetland losses are generally due to the public nature of many wetlands products and services; user externalities imposed on other stakeholders; and policy intervention failures due to a lack of consistency by governments.

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p-ISSN: 2347-7822

Literatures are a washed with staggering statistics of loss due to wetlands all over the world: In the United States, it is estimated that 54% of its original wetlands has been lost, of which 87% to agricultural development and 8% to urban development. In France, 67% of its wetlands have been lost in the period 1900 to 1993, estimates on wetland loss indicate that up to 70 percent of wetlands has been lost or degraded in settled areas of Canada [6].

While the Netherlands has lost 55% of its wetlands in only 35 years between 1950 and 1985; In China, over half the wetlands have declined over the past 50 years; and between 1990 and 2000, nearly 30% of Chinas natural wetlands have disappeared regarding the status of tropical wetlands, such data though lacking, but it is expected that the pattern of wetland conversion is similar to that of the United States (54%). In Africa, the Niger Republic for example has lost more than 80% of its freshwater wetlands over the past two decades. The pressures that threaten the existence of the wetland consist of drought and upstream and downstream water developments. While upstream, dams alter the timing and size of flood flows and divert surface or groundwater for irrigation. Downstream, increasing demand for irrigated agriculture leads to diversion of water past wetlands through bypass channels. Threats to wetland also include reduced flows caused by droughts and water abstractions, aquatic weed infestation, pesticides (especially DDT), infrastructure development like dams, overuse of resources due to human pressures, uncontrolled fires, pollution, and deforestation. While the potential threats for the future include poverty, population increase, soil erosion and siltation, destruction of breeding grounds and sanctuaries for fish increased use of agrochemicals affecting the aquatic environment and invasion by exotic plant species. In addition, human-mediated activities such as mismanagement and misuse also subject wetlands to damage and degradation, particularly in regions with low or irregular precipitation because these areas experience significant conflicts between water use and wetland maintenance [7].

In a study conducted on the geospatial mapping of wetland potential in Ilesa, Osun State, Nigeria, Orimoogunje, Oyinloye and Soumah identify urbanization and agricultural activities as constituting major threats to wetlands in the area. Accordingly, urbanization and agro-economic activities put pressure on wetland resources in the area. Urbanization, over-cultivation and encroachment of wetland resources due to increased population pressure and the suitability of the areas for the production of arable crops increased the stress on wetland resources. As a result of these factors, areas that were initially regarded as wetlands have been converted to agricultural sites and settlements. The same influence was discovered by Adeleke in a study entitled drivers of wetlands conversion in the tropical environment. In a similar vein Tijani, examining the impact of urbanization on wetland degradation in Eleyele, Ibadan, South West Nigeria, highlighting the environmental impacts of urbanization and land-use and the role both factors played in the degradation of Eleyele wetland in Ibadan. The authors concluded that Nigeria is richly blessed with both coastal and inland wetlands, many of which are threatened by anthropogenic drivers and human motivated factors such as land use activities, urbanization and agricultural activities in addition to the emerging threats of climate change.

Similarly, Ajibole examined the effects of urbanization on Lagos wetlands and were able to establish that the primary causes of wetland loss in Lagos metropolis are majorly human motivated. Such human activities listed by the researchers included incessant sand-filling and conversion of wetlands environment for economic uses, high rural-urban migration and increased dredging of wetland sites within Lagos State [8]. Moreover, the study identified

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that perennial flooding which is a common occurrence in Lagos environ has a part in the depletion and loss of the ecosystems. The authors were able to identify several effects of economic activities on wetlands in Lagos and the impacts that urbanization had on wetlands located within the region. Direct habitat loss, suspended solid additions, hydrologic changes, altered water quality, increase run off volumes, diminished infiltration, reduced stream-based flows and groundwater supply, and lengthy dry periods according to this study are the resultant effects of urbanization in Lagos.

Ajibola ranked that urbanization is the first major factor causing the degradation, depletion and subsequent loss of wetland ecosystems in Lagos. Sand-filling of wetland site for construction was ranked second, while conversion of wetlands for housing and infrastructural development was both ranked third. Toxic chemicals and industrial wastes emptied into wetland ranked fourth, while the disposal of non-biodegradable wastes into wetlands is ranked fifth. Dredging of wetlands, climate change and the unsustainable conversion of wetlands were ranked sixth, seventh, and eight respectively. It could thus be deduced that urbanization is the major factor causing the degradation, depletion, and loss of the wetland resources in Lagos. Siltation and improper handling of solid wastes are other activities causing stress to wetland resources. Over cultivation and farming that do not take care of soil conservation in the respective hilly and mountainous areas have resulted into flooding during the rainfalls. The floods bring silts from the head streams which cause siltation to the wetlands downstream threatens the existence of the wetland resources. Solid waste has also been regarded as one of the factors causing stress to the wetland resources, has been associated with the blockage of water source in stream and rivers.

Wetland dynamics

Various studies had shown continuous and consistent loss of wetlands in Nigeria in general and southwestern part of Nigeria in particular, common to all the studies in the area from the year 1965 to 2019 was depletion of wetlands in all the states of the region as shown in the various research findings; In the study carried out by Lagos wetlands, due to conversion to other economic uses, was reduced from 708.96 ha (52.68%) in 1965 to 7.10 ha (0.53%), urbanization (Built-up Area) gained tremendously taken as much as 91.46% of the total land area in 2005 from initial 166.88% of 1965 (Table 1).

Table 1. Static Land Use/Land Cover distribution in Lagos, 1965, 1975, 1987 and 2005.

Landuse	1965		1975		1987		2005	
	Area (ha)	% of total	Area (ha)	% of total	Area (ha)	% of total	Area (ha)	% of total
Agriculture	38.09	2.83	18.57	1.38	10.90	0.81	3.86	0.29
Built up Area	166.88	12.40	1045.54	77.69	1195.99	88.87	1231.00	91.46
Open Surfaces	-	-	23.15	1.72	14.94	1.11	6.03	0.46
Transportation			40.78	3.03	55.04	4.09	66.70	4.96

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Vegetation	396.60	29.47	60.02	4.46	33.24	2.47	24.93	1.85
Water Body	35.26	2.62	25.84	1.92	6.86	0.51	6.16	0.46
Wetland	708.96	52.68	131.89	9.80	28.80	2.14	7.10	0.53
Total	1345.78	100.00	1345.78	100.00	1345.78	100.00	1345.78	100.00

In the same vein, conducted another study on the implications of urban land uses on hydrological processes and ecological services in Lagos. Around the drainage channel that traverses Agidingbi, Obafemi Awolowo Way, Oregun Link Road and Ogudu Bridge, focusing on the extent of built-up and wetland areas. While the analysis showed a consistent increase in the built-up areas since 1965 (331.06 ha, 7.57%), 2008, the extent of imperviousness had increased to 3356.20 ha (79%) and finally in 2014 it has increased to 3405.23 ha (80.39%). Meanwhile, inland and coastal wetlands were decreasing 1840.41 ha (43.45%) and 2074.22 ha (48.97%) respectively in 1965, reduced to 222.37 ha (5.25%) and 667.12 ha (15.75%) in 2008, and was as low as 203.9 ha (4.82%) and 626.56 (14.79%) by 2014. The increase in the extent of imperviousness is indicative of the conversion of wetlands in the study area to other uses, especially built up.

RESULTS AND DISCUSSION

GIS-based estimated and projected temporal changes in the spatial extent of land use types (in km^2) within the Catchment of Eleyele Wetland. The experience was not different at the Eleyele Wetland in Oyo State, Riparian (wetland) forest was seen to have lost consistently from (1.25 km^2) in 1984, to (0.98 km^2) in 1994, (0.70 km^2) 2004 and finally (0.42 km^2) in 2014. Whereas, urbanization represented by Built-up Area kept growing consistently in the area during the period. Specifically, study by Ibadan using satellite data, it was revealed that the built-up area within the catchment of Eleyele wetland increased by almost 70% between 1984 and 2004. This has resulted in a reduction or loss of forest and agricultural areas around the wetland to be more than 60%. They argued that while this increased in urbanization may not have resulted into loss or degradation of wetland soils; there are clear influence of urban catchment activities on water and bottom sediments of the feeding stream and the main wetland lake. Consequently, in the work, degradation, and loss of wetlands and their biodiversity imposes major economic and social losses and costs on the ecosystem. The size of the built-up area around the wetland increased from 4.47 km^2 in 1984 to 7.52 km^2 in 2004. It was projected to reach 9.04 km^2 in 2014. This shows a consistent increase in the size of the built-up area over four decades. The overall implication of the study is that there is need to control the increasing urban encroachment on the wetlands to avoid removal of the vegetation and degradation of the ecosystem within buffer zones. Also, findings in a study of Land Use Change of Eriti Watershed in Obafemi-Owode Local Government of Ogun State between 1972 and 2015 revealed the wetland status at the end of the study epoch [9]. About wetlands in Eriti study area of Ogun state was not different to every other location in the southwestern part of the country, here on, forested wetlands lost about 45.32% between 1972 and 2015. Non forested wetlands also lost a significant portion of its land area all through the period of the study between 1972

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and 2015, attesting to the influence of other land uses, most especially farmlands and built up or open space on the wetlands in the area.

Spatial Changes in Wetland Configuration of Akure South Local Government Area of Ondo State, 1986 to 2019. Wetlands in the study area had a land area of 98.90 km^2 representing 30.13% of the total land area, in 1999, wetlands configuration increased to 120.32 km^2 (36.65%) and decreased to 90.33 km^2 in 2009 (27.52%); in 2019, there was an increase to 106.16 km^2 representing 32.34%. The sustained increases in the wetlands' area as shown in the study is suspicious and could only be attributed to the seasonal changes of the multispectral satellite imageries used for the analyses. Most importantly, satellite imageries taken during the wet seasons tend to have seemingly more wetlands (temporary wetlands) than those taken during the dry seasons of the year. As wetlands are expected to reduce in status from period to periods as a result of growth in agricultural and urban usage, as the review of studies conducted in different parts of Southwestern Nigeria, have shown. For instance geospatial Mapping of Wetlands Potential in Ilesa, Southwestern Nigeria, in Osun State it was revealed that between 1986 and 1991, the total land area of wetlands decreased from 258 hectares to 148 hectares, there was further decrease in wetland areas as at 2002 to 89 hectares while other land uses such as agricultural activities and settlement within this period increased. In the same Osun State, observed human modification in terms of the reduction in the size of the original wetlands in Ile Ife. So, also was the work of, land use area and percentage of land use area in Osun State between 1986 and 2016. Wetlands also experienced loss of ground from 1986 the base year to 2016 covered by the study. Though there was slight increase in the areal coverage of wetlands in 2006, which could only be due to seasonal variation of the satellite imageries used as earlier stated.

What to do available options at curtailing the loss of wetland recommendation

Lagos being the economic hub of Nigeria and other major cities in the southwest are daily receiving influx of people. As a result of which there is always increasing demand for housing and commerce, infrastructure will naturally continue to encroach on the available wetland ecosystem. It is therefore pertinent that enlightenment programmes be carried out to sensitize the public on the benefits of these wetlands and the consequences of their loss. Furthermore, it is advisable that wetland restoration and preservation programmes and revitalization activities be carried out to restore lost wetlands and likewise revitalize degraded ones. In addition, the creation of artificial wetlands where they did not exist before should be encouraged. Nevertheless, wetlands can be sustainably exploited; if the dynamics of the local institutions that influence accumulation and consumption of livelihood assets are well understood; and harnessed appropriately. Hence, society needs to realize that the root cause for this continued loss is that agricultural producers are faced with market forces, policy signals and economic incentives to drain wetlands rather than to conserve them. Integrated wetland policies are needed now to protect and restore wetlands across the world. Wetlands need to be made a public policy issue with the objective of developing an integrated and comprehensive wetland policy that effectively stops wetland loss. The life support systems that are inherent within the wetland ecosystems can provide a wide range of valuable functions to society if they are used sustainably, for example, by incorporating the primary users in the management of the wetlands within the context of societal livelihoods and local institutions as well as balancing the different use options to ensure sustainability of the resource. To achieve this opined that decentralization of management to the lowest appropriate level of all

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stakeholders will help achieve greater efficiency, effectiveness, and equity. Reviewing several projects in Malawi, has observed that an understanding of the immediate Wetland community dweller's perception of its benefits is significant. According to them, it allows interventions to be targeted to specific groups for whom the problem is most acute. Furthermore, they opined that motivation for participation is strongly influenced by the relevance of the research focus and intervention strategy to stakeholders priorities, roles, and expectations of benefit. Therefore, express knowledge of the values they associate with the Wetlands will be the fundamental step upon which correction in their values and the eventual sustainability programme hinges on. Moreover, more explicit understanding of this relationship has the potential to encourage the greater involvement of specific groups in monitoring and evaluation. Among the wetlands restoration and conservation efforts suggested and include deliberate preservation of uncultivated forested wetlands, improvement in farming systems, such as adequate supply of farm inputs including fertilizer to prevent incursion into more uncultivated forested lands due to degradation. Suggestions also included re-forestation of already destroyed forests to bring back the natural wetland forests earlier removed.

CONCLUSION

The damage done to wetlands in the southwestern part of Nigeria is so enormous as it is the region of the country that is developing in every facet at alarming rate, most especially Lagos, the commercial hub of the country. There is unchecked influx of people into the region from every other part of the country, thus stressing the available infrastructures and facilities as they are being utilized by more populations than for which they were meant. As a result, available spaces are shrinking, accommodation and transportation becoming inadequate, whereas available lands for expansion are infinite. Therefore, wetlands which were considered as wastelands in the past are feeling the brunt of land scarcity as they are now being massively converted for agricultural and settlements purposes. In Lagos for example major estate development outlays are taken advantage of oceanic wetlands by industrial dredging and sand-fillings, so are wetlands in the other major towns in the zone experiencing onslaught. Therefore, there is need for this kind of review to bring once again to the front burner various scholastic findings as regards wetlands degradation to serve as reminder and to encourage safe utilization of wetlands in the region.

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