Drivers of Wetland Conversion in the Tropical Environment

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ABSTRACT

The study identified factors responsible for wetland dynamics and negative marks produced on the environment in the area. It equally suggested efforts aimed at reducing effects of the factors on the environment. The study incorporated both meta-analysis of case studies and questionnaires distribution and administration to the respondents who are mainly members of the Fadama User Group (FUG). The results showed changes in rainfall intensity as the major factor responsible for wetland loss; followed by settlement developments and loss of soil water due to river drainage. The results further revealed the effects of the factors to include siltation of drainages, destruction of ecosystem and loss of wetness, and emergent of heavy flooding. The study concluded by suggesting efforts aimed at reducing the influence of the factors on the environment.

Keywords: *Environment, Meta-analysis, siltation, Water loss, Wetland dynamics*

INTRODUCTION

Wetland occupies six percent of the world's land surface but it's among the most important and threatened ecosystems in the world IPCC (1996). Also about one percent of Africa's total surface area is wetland excluding coral reefs and some of the smaller seasonal wetlands (Kabii 1996). However, in Nigeria wetlands cover an extensive area (13,000 km²) and support a wide range of economic activities (NEST 1991). Each wetland is composed of a number of physical, biological and chemical components such as soil, water, plants and animal species, and nutrients which are of direct benefit to mankind (Tejuoso 2006). Wetlands play a number of roles in the environment, principally water purification, flood control, and shoreline stability. Wetlands are also considered as the most biologically diverse of all ecosystems,

serving as home to a wide range of plant and animal life (UNEP, 2012). It is an important source of water and nutrients necessary for biological productivity and sheer survival of the people (Thompson, 1996). And an exclusive source of natural resources upon which many rural African economies depend. Sustainable management of wetlands is therefore critical to the long-term health, safety and welfare of many African communities (Schuijt, 2002).

However, in spite of all the goods provided by wetlands, they are consistently assaulted globally, their loss and degradation occur worldwide, sometimes at extremely high rates (Moser *et al.*, 1998). According to the findings of the World Resources Institute (2000) half of the world's wetlands have been lost during the twentieth century from land converted to agriculture and urban use. A review of 344 Ramsar sites showed that 84% were either threatened or experiencing ecological changes mostly from drainage, pollution and siltation (Kabii, 1996). Nigeria is not immune from this threat as one of its most important wetlands, the

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Hadejia-Nguru Wetlands in Jigawa and Yobe States have shrunk by as much as two-thirds in the past 30-40 years because of diversions from dams, irrigation developments and drought. Fisheries, farming and wildlife are all impacted by these hydrological changes (Idris, 2008). As people increasingly reclaim wetlands or distort the ecosystem balance, coupled with population increase, such problems are bound to worsen as they may not be aware of the effect of their activities on the agro-ecological values of the wetlands (Ekanade, 2011). However, a direct consequence of unabated utilization and conversion of wetlands is the rising flood incidences being experienced in our major cities and wetlands reclamation agricultural concentration zones.

METHODOLOGY

The dominant feature of the area is the Ogun River which flows in a generally north to south direction. Significant portions are drained by a number of major and minor rivers such as

discovered during the ground truthing exercises, analysis of administered questionnaires and consultation of existing literatures. The factors included; changes in rainfall intensity and soil hydrology due to climate change, reduction in

water body as a result of river/soil drainage, forested wetlands removal for farming, settlements/urban related developments and influx of migrants from neighboring villages and others. From the

Table 1. Factors/Forces Responsible for Wetland Dynamics

Forces of Change	Frequency/ Percentage
Changes in rainfall intensity due to climate change	44
Reduction in water body due to river/soil drainage	21
Forested wetlands removal due to farming	10
Settlements/urban related developments	22
Influx of migrants from neighbouring villages	3
Total	100

Source: Adeleke 2017a

Table 44% of respondents attributed the dynamics in wetlands to changes in the intensity of rainfall as a result of much talked about climate change the world over (Jon Kusler, 2005). The climate change according to Barros and Albernaz, (2013) will affect tropical regions mostly due to changes in temperature and rainfall patterns. There are however, divergent results among scholars on the influence of rainfall intensities and distribution regime on the wetlands (Marengo, 2007; Marengo et al., 2009a, b). In Amazon, for example, some models derived from global models compiled by the IPCC indicated that the loss of wetlands was due to drastic reductions in precipitation, whereas others predict an increase (Barros and Albernaz, 2013).

Therefore, the environments of tropical wetlands are considered highly vulnerable to climate changes and might be affected in four different ways: by changes in the hydrological regime; changes in precipitation patterns; local changes in temperature/humidity and subsequently in patterns of evapotranspiration and increases in the frequency of extreme climate events (Murdiyarso *et al.*, 2012). Added to these, the coastal wetlands, such as

mangroves, might also be influenced by the rising of sea levels (Mitsch *et al.*, 2010). Further, 22% of the respondents adduced the major factor to settlements/urban land related developments. The research findings cannot agree less with this factor as one of the major influencers of changes in the locality, because there seem to be influx of people from Abeokuta the state capital into the area. Most importantly situation of two major government institutions in the axis; The Moshood Abiola Polytechnic located at the outskirts of the town on the road to the area and the new Federal Prison in Oba village a major settlement in the area. As a result of which large parcel of forested lands hitherto dedicated to farming and other primary activities were encroached into to meet the accommodations need of staff and students of the institutions. The location of these institutions as permanent urban structures/influence in the area remains a major developmental challenge exerting great pressure on social, economic and environmental sustainability of the rural areas (Pickett *et al.*, 2001). Also, Cohen (2004) was of the view that in developing countries, urbanization is associated with natural population growth,

rural–urban migration, convergence in rural and urban lifestyles, and the economic and political processes associated with globalization.

Though urban areas currently account for about 3% of the earth's surface, the ecological footprint associated with urban expansion has important environmental consequences especially on wetland ecosystems (Ajibola *et al*, 2012). Relating to the influence of urban growth on wetlands loss is reduction in water body due to river/soil drainage and influx of migrants from neighbouring villages into the area to engage in wetland farming. Still from Table 1, 21% and 3% of the respondents respectively advanced the influence of reduction in water body due to river/soil drainage and influx of people all for the purpose of engaging in wetland farming. The effects of reduction in water body as a result of drainage for agriculture and other purposes are serious both in the short and long term as it has been predicted. In a short period of time, some species of freshwater aquatic biota will not be able to survive and reproduce under the new hydrological conditions and emergent increased salinity (Nielsen and Brock, 2009). This conforms to the observation of loss of wetland structures of the vegetation during the ground truthing exercise in the study area as many of the biota could not withstand and reproduce effectively in the altered ecosystem. The influence of influx of people into the area for wetland farming (3%) as posited by the respondent was to say the least underestimated as population is known to influence land use in a number of ways more than any other factors put together (Fanani *et al.*, 2011). The growth of most Nigerian cities such as Kano, Ibadan, Enugu, Port-Harcourt, Kaduna, Calabar, and others are attributed mainly to rural-urban migration (Aliyu and Amadu 2017). This urbanization process has outpaced the existing

urban management system. Even 1996 World Bank reports on Nigeria indicated that the growth rate of urban areas increased from 20% in 1970 to 33% in 1993 and projected that by the year 2025, estimated 75% of Nigeria's population of about 245 million persons would live in towns and cities (Ajibola *et al.* 2012).

Influence of Wetland Dynamic on the Environments

Table 2 summarized the visible marks produced in the environment as expressed by respondents who are mainly members of FUG due to negative effects of wetland loss in the area. About 20% of the respondents confirmed that there was emergent of annual destructive flood incidences in the area due to loss of wetlands which would have served as buffer and flood abatement/control (Odine *et al.* 2011). The annual flooding has resulted in the loss of several farmland and crops to floods in the area on many occasions and constitute a serious economic and man hour loss. The evidence of flood is equally glaring in the forms of erosion channels and gullies in the area, most especially on farmlands that are closer to the bank of rivers and other water bodies. The primary cause of wetland loss in Lagos Metropolis has been explained by Adeleke (2017). Loss of water in the drainages is equally glaring in most of the rivers and water bodies in the area as expressed by 26% of the respondents; siltation of drainages was rampant and noticeable in the area which according to 28% of the respondents, most of the shallow water bodies in the area was once deep and full with water. Such disturbances as draining for agriculture and sand filling for developmental purposes like road constructions, which directly change the structure of wetlands, can be so severe that the wetland was destroyed. Filling or

Table 2. Features of Wetland Dynamics

Features of wetland dynamics	Frequency/Percentage
Emergent of heavy flooding in the area	20
Loss of water	26
Siltation of drainages	28
Destruction of wetland ecosystem	26
Total	100

Source: Adeleke 2017

draining a wetland can so alter the water regime that the land can no longer support the wetland vegetation and maintain hydric soils which may resulted in the loss of wetlands and most if not all its functions (Ajibola *et al.*, 2012). Another feature of wetlands destruction produced by the forces of change was the destruction of wetland ecosystem for farming through forests removal, river drainages, and application of chemicals. This singular feature has led to the loss of wetland related life forms of both fauna and flora according to 26% of the respondents, which are now very scarce in the area unlike in the past (Andrew Ker 1995). According to Ehrenfeld and Schneider (1991) wetlands commonly occur in human-dominated landscapes such as agricultural and urban regions. Or put correctly there is always population concentration in wetlands area for agricultural related purposes and in the event of

land scarcity for further developments, wetlands area provides the ready alternative for filling. Studies have, however established that negative effect on wetland species and ecosystem functioning can be expected in such areas due to human activities (Ehrenfeld and Schneider, 1991; Morris, 1991).

Suggestions for Wetlands Restoration in the Study Area

Table 3, however proffered some restoration efforts as suggested by the respondents to include preservation of uncultivated forested wetlands (57%), 22% suggested improvement in farming systems which to them will prevent incursion into more uncultivated forested lands. while 14% of the respondent suggested deliberate re-forestation of already destroyed forests so as to bring back the natural wetland forest earlier removed from the area.

Table 3. Wetlands Suggested Restoration Efforts by the Inhabitants

Restoration Efforts	Frequency/ Percentage
Deliberate re-forestation	14
De-siltation of river channels	7
Preservation of uncultivated forested wetlands	57
Improved farming systems	22
Total	100

Source: Adeleke 2017a

CONCLUSIONS

The study identified factors bringing about changes in the wetland coverage of the study area and demonstrates the influence of these factors on the area through the negative marks produced on the environment. The study further made a number of suggestions aiming at ameliorating the effects of the factors on the environment so as to ensure the preservation and sustainable use of wetlands to continue the provision of wetlands goods and services to mankind.

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