Salvaging Wetland Ecosystem in Nigeria: Towards Ensuring Sustainable Fish Production

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Abstract: Wetland is one of the resources of high value which has been exposed to indiscriminate use. It is an important ecosystem to fish and loss or degradation of wetland will have a direct consequence on sustainable fisheries. This paper reviewed the term "Wetland", its functions and values, importance to fish production in Nigeria and threats to its sustainability. The term "Wetland" has been defined by various researchers especially based on their profession and their needs but up till today there is no single definition accepted by all users. In Nigeria the most commonly adopted is that of Ramsar convention secretariat. Wetlands have both marketed and non-marketed functions and values. They provide essential link in the life cycle of 75 percent of the fish and shellfish commercially harvested in the world and are vital to fish health. Despite the importance, there have been exceptional losses of wetlands. Lagos state alone has witnessed more than 96% loss. Major threats to wetlands are; Agriculture, Development, Pollution and Climate change. Fish has been a source of cheap protein and there is need for its sustainable production. Therefore proper management of the wetland ecosystem is important in order to ensure continuous fish production.

1.0   Introduction

There are several natural resources of abundant uses and values, these resources have been put to various level of use by man. Emerton et al. (1998) stated that natural resources including; land, water, vegetation and biodiversity are the primary source of people's livelihoods in poor countries. These resources are very vital for poverty reduction and development. Unfortunately the loss and degradation of these natural resources is continuing unabated in most country of the world and it has dire consequences for the rural population's livelihoods especially in the developing countries of the world. Wetland is one of these resources of high value which has been exposed to indiscriminate use. According to USEPA (2001), Wetlands is long regarded as wastelands, they are now recognized as important features in the landscape that provide numerous beneficial services for people and for fish and wildlife.

Fish is one of the most important natural resources to man, it is a cheap source of quality animal protein with varying dependants in different part of the world. In Nigeria 49% of animal protein consumed is from fish (Ajani, 2008) and greater percentage of this is from capture fisheries. Wetland is an important ecosystem to fish production and loss or degradation of wetland will have a direct consequent on sustainable fish production. This paper therefore reviewed the term "Wetland", its functions and values, importance to fish production and threats to its sustainability.

2.0 What are Wetlands

Wetlands are naturally lands perceived to be waste land and needed to be converted to put into use which may range from agriculture to developmental purposes. The use of the term "Wetland" can be traced to the beginning of 20th century. The term wetland has been defined by different people and researchers (Nwankwoala, 2012), especially based on their profession and the needs of this important ecosystem and up till today there is no single definition accepted by all users of wetlands. McCartney et al. (2010) defined Wetlands as sinks into which surface water or groundwater flows from a surrounding catchment. Within landscapes they are "natural harvesters" of rainwater and, by definition, sites where water occurs at or close to the ground surface. According to US EPA (2009), wetlands are land areas covered with water or where water is present at or near the soil surface all year or varying periods of the year. These areas support the prevalence of hydrophytes or aquatic plants that are typically adapted to life in water saturated (hydric) conditions. Nwankwoala (2012), referred to wetlands as those areas, which are capable of supporting water related vegetation. The presence of plants (hydrophytes) that are adapted to life in the soils that form under flooded or saturated conditions, that is, hydric soils can be used to identify wetlands (Asibor,

2009). It was noted that sequel to continuous gradation of wetland characteristics from aquatic to terrestrial, any definition is to some extent arbitrary, and therefore no single definition of wetland is universally acceptable. As a result of the foregoing a committee charged with investigating wetland definitions provided a reference definition for wetland as "an ecosystem that depends on constant or recurrent, shallow inundation or saturation at or near the surface of the substrate. The minimum essential characteristics of a wetland are recurrent, sustained inundation or saturation at or near the surface and the presence of physical, chemical, and biological features reflective of the recurrent, sustained inundation or saturation. Common diagnostic features of wetlands are hydric soils and hydrophytic vegetation. These features will be present except where specific physicochemical, biotic, or anthropogenic factors have removed them or prevented their development (NRC 2001). Despite the effort, scientists, policymakers, landowners and conservationist are still not deterred from making inputs into the definition. Keddy (2010) also defined a wetland as an ecosystem that arises when inundation by water produces soils dominated by anaerobic processes and forces the biota, particularly rooted plants, to exhibit adaptation to tolerate flooding. However, the most common definition adopted in Nigeria is that provided by the Ramsar Convention Secretariat (RCS) in 2007. The Convention defines wetlands as ; "areas of marsh, fen, peat-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 meters". It broadens the area of wetland coverage by adding that wetlands may incorporate; "riparian and coastal zones adjacent to the wetlands and island bodies of marine water deeper than 6 m at low tide lying within the wetland" (Oyebande et al., 2003). Wetlands are the link between the land and the water. They are transition zones where the flow of water, the cycling of nutrients, and the energy of the sun meet to produce a unique ecosystem characterized by hydrology, soils, and vegetation (Hassan et al., 2014). Wetlands, also referred to as nurseries of life, and are among the most productive ecosystems in the world, comparable to rain forests and coral reefs.

3.0 Wetlands in Nigeria
        Rebelo et al. (2009) stated that, there is great uncertainty about the number and extent of wetlands globally. This uncertainty is due, in part, to differences in definitions and in part, to differences in methods of mapping and approaches to inventory

(McCartney et al., 2010). However, there is scientific consensus that wetlands cover at least 6% of the Earth's surface and that even the most recent estimates of wetland extent are underestimates; significant gaps remain in some regions and for various wetland types (Finlayson and D'Cruz, 2005). There are two recent global estimates, the first was derived from multiple geospatial data sets and the estimates was 917(Mha) (Lehner and Döll, 2004) whilst the second, derived from national inventories, produced an estimate of 1,280Mha globally (Finlayson et al., 1999). In Nigeria, wetlands (Fig. 1) are estimated to cover about 28,000 km^2 which is about 3 % of the 923,768 km^2 land surface area of the country (Uluocha and Okeke, 2004).

        Fourteen major wetland belts has been identified in Nigeria (Oyebande, et al., 2003 and Asibor, 2009) and these includes: Sokoto-Rima, Komadugu Yobe, Lake Chad, Upper Niger and Kainji Lake, Middle Niger – Lokoja - Jebba – Lower Kaduna, Lower Benue – Makurdi, Cross River, Lower Niger, Niger Delta, Benin – Owena and Okomu, Lagos Lagoon and Lekki Peninsula, Lower Ogun River, Ologe Lagoon, Badagry and Yewa Creeks and the transboundary wetlands of the Upper Benue. Nigerian wetlands can be divided into five categories. The most extensive are the coastal wetlands found in the southern region bordering the Atlantic Ocean (Nwankwoala 2012), these include the Lagos and Lekki lagoons wetlands, the Niger Delta wetlands, and wetlands of the Cross Rivers. Further inland and scattered across the country are the riverine wetlands, these include the floodplains of the Niger/Benue, Ogun/Osun, Anambra/Imo, Sokoto/Rima, Komadugu Yobe, Ngadda, Yedseram, and ElBeid Rivers, which are extensively used for livestock grazing, farming, and fishing. The third category comprises of Lake Chad wetlands, which are very important due to the proximity to the edge of the Sahara desert and provision of water for more than 20 million people living in the region comprising Nigeria, Chad, Cameroon, and Niger (Gophen, 2008) and are also important for fisheries (Bene et al., 2003). The fourth categories are the interior wetlands which are not associated with any major river system. They are seasonal but support a wide variety of livelihood activities including material collection, fishing and farming. The fifth category is artificial impoundments, which includes Kainji lake wetlands which is very important for fisheries and irrigation. All the wetland in Nigeria can be classified into three categories in line with Oyebande et al. (2003) who grouped wetland ecosystems into three broad categories, namely: freshwater, man-made and saltwater wetland ecosystems. However, Akujuru (2005) preferred the

classification system of Corwadin and Golet, which specify five major types of wetlands: palustrine (marshes and swamps), riverine (wetlands associated with rivers and streams), lacustrine (wetlands associated with lakes), marine wetlands (salt-water inter-tidal areas associated with the ocean), and estuarine wetlands (brackish water areas where freshwater streams enter the sea).
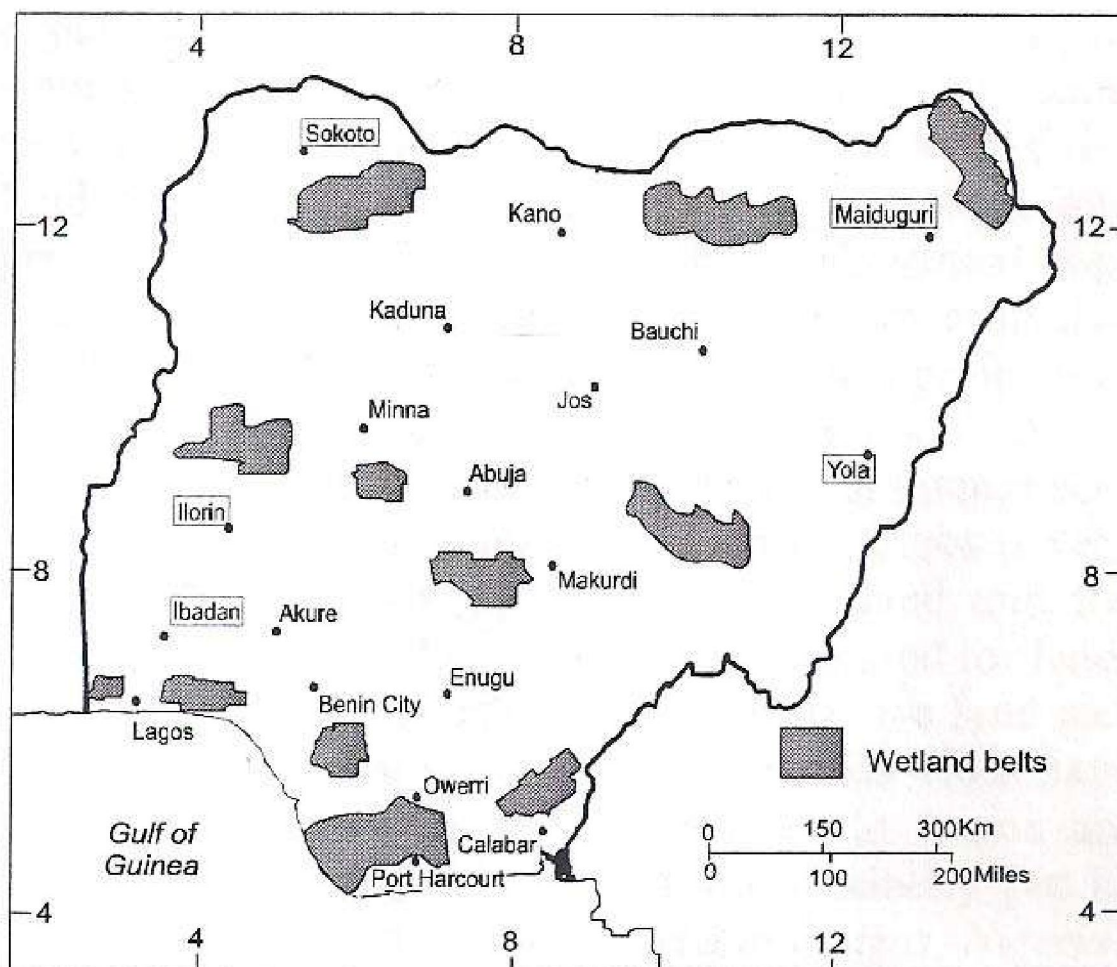

Figure 1: Map of Nigeria Showing Wetland Belts
Source: Uluocha and Okeke (2004).

4.0 Impotrance of Wetland/ Functions and Values

Wetlands contribute to the national and local economies by producing resources (fish, fibre and water), enabling recreational activities and providing other benefits, such as, climate regulation, water purification, pollution control and flood protection (U.S. EPA, 2006). They also serve as sites for scientific research and education, and benefit commercial fishing (U.S.EPA, 2004). Wetlands provide mammals, plants, amphibians, reptiles, birds and fish with food, habitat, breeding grounds and shelter. Wetlands have also played important roles in the development of Nigeria (Olomukoro and Ezemonye, 2007). Economic valuation can provide a powerful tool for placing wetlands on the agendas of conservation and development decision-makers

(U.S.EPA, 2006). The concept of total economic value has now become one of the most widely used frameworks for identifying and quantifying the contribution of ecosystem services to human well-being (Pittock et al., 2012). Wetlands are considered as economically productive systems considering her environmental services, alongside other possible uses of land, resources, and funds. When both the marketed and non-marketed economic benefits of wetlands are included, the total economic value of unconverted wetlands is often greater than that of converted wetlands (MEA, 2005). For instance, Costanza et al., (1997) in a study on assessment of natural ecosystems, estimated the dollar value of wetlands worldwide as a whopping $14.9 trillion.

5.0 Importance of Wetland to Fisheries Development

Wetlands provide an essential link in the life cycle of 75 percent of the fish and shellfish commercially harvested in the world (Ramsar Convention Secretariat, 2007).Wetlands are vital to fish health and thus to the global multibillion dollar fishing industry (U.S.EPA, 2006). Inland fisheries are of particular importance in developing countries, and they are sometimes the primary source of animal protein to which rural communities have access (Keddy et al., 2009). Wetland-related fisheries also make important contributions to local and national economies. Capture fisheries in coastal waters alone contribute $34 billion to gross world product annually (FAO, 2012). Two thirds or more of all fish consumed by humans depend upon coastal wetlands, such as mangroves and estuaries; these coastal wetlands are in turn reliant on a range of interdependent inland wetlands, including lakes which connect via rivers and streams to the coast. Falaye (2013) also noted that over one-half of Africa's fish production comes from coastal and marine fisheries (wetlands inclusive). Furthermore, U.S.EPA (2006) stated that wetlands provide a consistent food supply; shelter and nursery grounds for both marine and freshwater species with landings of crab, shrimp and salmon were valued at $1,167 billion in 2004. These species are dependent on wetlands for at least part of their life cycles. Also in Africa, there are extensive inland waters (wetlands) which support over 3000 species of fish that form a major source of protein for a large part of continent's population (Falaye, 2013). For example, the fishery sub-sector in Nigeria supplies 49% of animal protein consumed in the country (Ajani, 2008), yields about US$55 million annually (FAO, 2012) and provides direct and secondary employment to more than 18 million Nigerians (FDF, 2008; Falaye, 2008).

6.0 Threats to Wetlands Sustainability

Despite this enormous importance and value, wetlands have been misunderstood for many years, often viewed as wastelands to be drained and converted to other uses. As a result, there have been exceptional losses of wetlands during the last two centuries. Estimates of wetland loss exceed 50% for the conterminous United States and for Europe (Dahl, 2006). More extreme cases include losses of 80% of Pacific Coast estuarine wetlands in Canada; 88% of the Cauca River system in Colombia; 90% (or more) of wetland areas in New Zealand; and 94.3 per cent of the peat and marshlands in Macedonia and over one third of all lakes were drained (Watson et al., 2000). In Nigeria, Lagos State also recorded colossal wetland loss of more than 96 per cent between 1962

to date (Obiefuna et al., 2013) and this is majorly due to population growth and development. Tejuosho (2006) also reported a continuous trend in wetland loss in Nigeria between 1986 and 2000 especially for the forested wetlands where crop cultivation is a major threat. The construction of the Bakolori Dam on the Sokoto River, a tributary of the Niger River, resulted in decreased downstream wetland inundation and the loss of 12,000 ha (out of 17,000 ha) and this leads to fish populations declined, with lower catches and smaller sizes forcing more and more households to abandon fishing (McCartney et al., 2010). There are several threats to wetlands but of major importance among them are Agriculture, Development, Pollution, Climate change etc. Millennium Ecosystem Assessment (2005) observed that the primary indirect drivers of degradation and loss of rivers, lakes, freshwater marshes, and other inland wetlands (including loss of species or reductions of populations in these systems) have been population growth and increasing economic development. The primary direct drivers of degradation and loss include infrastructure development, land conversion, water withdrawal, pollution, overharvesting and overexploitation, and the introduction of invasive alien species (Adegoke, 2005). Other direct drivers affecting wetlands include diversion of freshwater flows, nitrogen loading, siltation, and changes in water temperature (MEA, 2005). Clearing and drainage, often for agricultural expansion, and increased withdrawal of fresh water are the main reasons for the loss and degradation of inland wetlands such as swamps marshes, rivers, and associated floodplain water bodies (Mironga, 2005). By 1985, an estimated 56−65% of inland and coastal marshes (including small lakes and ponds) had been drained for intensive agriculture in Europe and North America, 27% in Asia, 6% in South America, and 2% in Africa (Keddy et al., 2009). Nearly half of the world's major cities are located within 50 kilometers of the coast, and coastal population densities are 2.6 times larger than that of inland areas. Lagos is one of such cities in Africa. Ajibola et al. (2011) noted that this population pressure leads to conversion of coastal wetlands as a result of urban and suburban expansion and increasing agricultural demand (such as the clearing of mangroves for aquaculture). Given the extensive changes in land use and cover that have occurred in many coastal areas, it is unlikely that many of the observed changes in habitat and species loss will be readily reversed. Bruce et al. (1998) submitted that global climate change could also affect wetlands through increased air temperature; shifts in precipitation; increased frequency of storms, droughts, and floods; increased atmospheric carbon dioxide concentration; and sea level rise. All of these

impacts could affect species composition and wetland functions.

7.0 Salvaging the Wetlands in Nigeria

As stated by USEPA 2001, that Seventy-five percent of commercially harvested fish are wetland-dependent and with shellfish species the number jumps to 95 percent, therefore salvaging wetland from further degradation will directly translate into ensuring sustainable fish production. As stated by McCartney et al. (2010) Currently, in Africa, very few governments have specific wetland policies and few national strategies/policies pertaining to either water or agriculture that make explicit reference to wetland agriculture, this include Nigeria. A number of policy documents governing the management of the environment and its biodiversity in Nigeria, none specifically and comprehensively deal with wetlands by addressing wetlands in their own right (Obiefuna et al., 2013). Rather, wetland management is merely covered in general forestry laws and nature conservation laws (Agrawal, 2007). There is a need to even re-examine some aspects of existing laws such as Environmental Impact Assessment (EIA) law that allows the draining of wetlands of less than 100 hectares. This is inimical to environment and development, as many studies have shown that small wetlands are very important to national development (Adekola et al., 2008). The Federal ministry of environment had one time established National wetland unit but this was later scrapped or merged with other units. This might have affected the process of developing a national wetland policy. Despite being a signatory to the Ramsar Convention, there is as yet no specific document or legislation addressing wetlands management in Nigeria (Ebeku, 2004).

It is therefore required to develop appropriate policy for sustainability of wetlands this may include among others

- Removing the existing pressures on wetlands and improving their resilience in order to cope with the adverse effects of climate change.
- Regulating wetland agricultural practices to prevent use of chemicals and materials that may constitute nuisance to fish and other aquatic species through practicing eco-friendly agriculture.
- Regulating human settlement pressure on wetland and coastal environments.
- Discouraging the government at all level for land reclamation for any form of developmental project
- Regulating the discharge of industries and domestic waste into the into the wetland ecosystem
- Regulating coastal aquacultural practices, through ensuring eco-friendly approaches.

8.0 Conclusion

It is no doubt that wetlands are important ecosystem to man and that the several essential ecosystem services that wetlands perform will, no doubt, be lost when wetlands disappear; water will not be as clean, fish and bird populations will suffer, and the frequency and severity of floods will increase, there will be losses of recreational opportunities and aesthetic benefits as well as sites for scientific research and education. Fish has been a source of cheap quality protein to man and there is a great need to ensure sustainable fish production. Therefore there is need for proper management of the wetland ecosystem in order to ensure continuous fish production. This can be achieved through formulation of policy that will ensure eco-friendly use of the important ecosystem.

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