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Status of Mangroves in Nigeria: A Review

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ABSTRACT

The mangrove ecosystem is of high economic importance to the local dwellers and the nation in general. The region is rich in both aquatic and terrestrial biodiversity and serves as a main source of livelihood for rural dwellers as well as stabilizing the ecosystem. Tremendous changes have occurred recently due to anthropogenic activities, thus raising awareness on the need for effective monitoring, protection and conservation of the mangrove ecosystem. A good knowledge of the services provided by mangrove ecosystems is an important key for effective management. The sustainable management of mangrove ecosystems in Nigeria will be an essential contribution to the proposed new target for the Millennium Development Goals to "Reduce biodiversity loss, achieving a significant reduction in the rate of loss by 2020". The aim of this paper therefore is to review the status of mangrove resources drawn from the prospective of livelihood development. This review shows that the region is rich in biodiversity of high economic importance to national development and therefore requires effective monitoring in the conservation and management of this important ecosystem.

Introduction

Mangroves are unique plants that have evolved to survive in the interface between land and ocean in the humid climate of the tropics and subtropics. They are variously described as coastal woodland, tidal forest and mangrove forest and grow as trees up to 40 metres high or as shrubs below the high-water level of spring tides. They have evolved clever mechanisms to enable them to cope with the high concentrations of salt and regular inundation of their root systems by incoming tides. Mangroves require freshwater inflow and do not thrive in stagnant water, which brings silt with it as substrate for support and nutrients from upstream (FAO, 1994; Kathiresan, 2001; AFROL, 2002). The mangrove forests of Nigeria are the largest in Africa and are the third largest in the world after India and Indonesia (Macintosh and Ashton, 2003). Mangrove forests provide habitat to a variety of flora and fauna. Mangroves in the region are considered very rich in biodiversity. The excess organic production of mangroves is exploited by many marine species, especially fishes and crustaceans that enter the mangrove environment as juveniles and return to the sea as adults for reproductive purposes (John and Lawson, 1990).

Mangrove swamps in Nigeria stretch along the entire coast and are found in nine of the 36 states. The largest extent of mangroves is found in the Niger Delta between the region of the Benin River in the west and the Calabar, Rio del Rey estuary in the east. A maximum width of 30 to 40 kilometres of mangroves is found on the flanks of the Niger Delta, which is a highly dynamic system. The lagoons of Lagos and Lekki dominate the coastal systems in the west. Both lagoons are fringed by mangroves and backed by swamp forests. In the far east of the country there is a second major delta/estuary system associated with the Cross River, which has a considerable mangrove area extending in a belt of 7–8 kilometres on both sides of the estuary and up to 26 kilometres in the deltaic zone at the head of the estuary. Nigeria contains the most extensive mangrove ecosystems, which comprise nearly 35 per cent of the total cover for the region (UNEP-WCMC, 2006b). Area estimates do suggest however that mangrove cover is declining, and has reduced by 26 per cent since 1980, although some authors indicate the decline started with the oil boom of the early 1970s (Ohimain, 2006a). Macintosh and Aston (2003) consider mangrove resources to be underutilized but also poorly managed.

Main Uses of Mangroves and Associated Economic Activity

Twenty per cent of the population and most of the country's economic activities exist in the coastal states of Nigeria. Mangrove ecosystems support industrial and subsistence activities in Nigeria, and are critical for food security for many living in abject poverty in the coastal zone. Key economically exploited resources in the mangrove regions include:

Fisheries – fish are a major source of dietary protein in sub-Saharan Africa. More than five million people in the region are dependent on small-scale fisheries for their livelihoods. Fishing is an important activity in most mangrove areas in Nigeria (FAO, 2006). For example, the inhabitants of historical settlements in the Niger Delta depend on fish (up to 100 per cent of dietary protein) (Macintosh and Ashton, 2003). Industrial shrimp farming is a growing industry in Nigeria sponsored by the International Finance Corporation (IFC), a branch of the World Bank, the Shell Petroleum Company of Nigeria Contractors received funds to develop this activity with the support of the then Nigerian President (Carrere, 2002). However, it has also been reported that the soil characteristics of mangrove swamps are not suitable for aquaculture, because of high acidity (Macintosh and Ashton, 2003).

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Gleaning – of shellfish and other aquatic species; for example, oysters and crabs. Hunting and harvesting of non-aquatic animals inhabiting mangrove forests and harvesting of edible components of mangrove and non-mangrove plants.

Non-use value – mangroves in the region have rich cultural and spiritual value, they provide environments for many rare and endangered species and are nursery habitats for many fish species.

Oil exploration and production – Ninety per cent of foreign exchange earnings are from petroleum and natural gas over the last 15 years (Macintosh and Ashton, 2003). More than 90 per cent of oil-related activities take place in the Niger Delta as it is the area of the West African coastline richest in mineral resources, attracting significant international investment. In 2006, the state-owned China National Offshore Oil Corporation paid US$ 2.3 billion for a stake in a Niger Delta oilfield, an area rich in mangroves. This is China's largest single investment in Africa to date (Ekweozor, 1989; CNN, 2006). Exploration for new oil fields continues throughout the region, and is likely to be an increasing issue.

Timber usage – the timber of mangroves is used widely in the region, and markets for its trade are well developed. As mangroves are the main forest trees in many of the coastal zones in which they occur, they are exploited for domestic fuel, fish-processing, salt production, construction of boats, houses and fences as well as production of tools. Commercial exploitation of wood for poles, pulp and paper in 1988 was estimated at 10 to 750 million cubic metres (Macintosh and Ashton, 2003). At a subsistence level, mangrove wood is used for fish stakes, fish traps, boat building, boat paddles, yam stakes, fencing, carvings, building timber and fuel (Carrere, 2002).

Medicinal uses – mangroves are used for a number of medicinal purposes. Some examples are provided in Table 1, below.

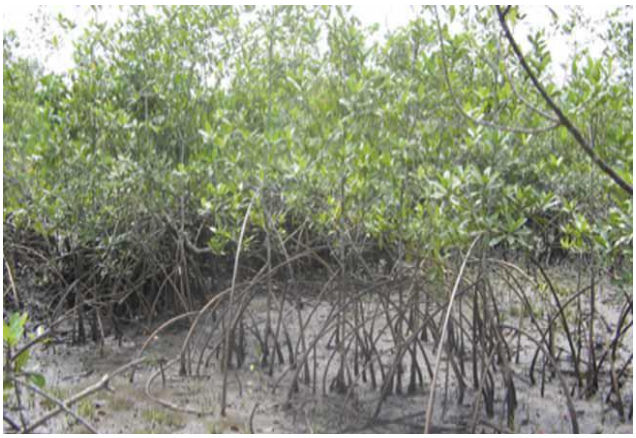
Tourism: not currently well developed in Nigeria, however, there are places where mangrove areas are being reclaimed for development of tourist infrastructure (Macintosh and Ashton, 2003).

Other uses: these include clearance of mangroves for cash crops (palm oil, coconut), the use of mangrove peaty soil for the embankment of eroding shorelines/creek banks, and the use of periwinkle shells in place of stones/chippings for mixing concrete for production of concrete. Use of oyster shells for the production of native chalk and lime for the treatment of acidic mangrove soils for crop production (Ohimain, 2006a).

Biodiversity: all of the eight mangrove species found in West Africa are found in Nigeria viz-a-viz: *Acrostichum aureum*, *Avicennia germinans*, *Conocarpus erectus*, *Laguncularia racemosa*, *Rhizophora mangle*, *Rhizophora harrisonii*, *Rhizophora racemosa* and *Nypa fruticans*. In the lagoons and deltas, *Rhizophora racemosa* is the dominant species. It is the pioneer at the edge of the alluvial salt swamp; *R. harrisonii* dominate in the middle zone and *R. mangle* are most common on the inner edge, while *Avicennia germinans* is mostly restricted to relatively higher salinity zones, especially at the river mounts opening into the ocean and mangrove forests adjacent to coastal beach ridges bordering the Atlantic Ocean (Ohimain, 2006b). In the estuaries, the species composition may be different. Here, *Nypa fruticans*, an introduced species, becomes more abundant. Mangroves in Nigeria generally do not exceed 10–12 metres in height, but extreme specimens may reach more than 40 metres, in particular at the creek edges and other areas containing recently deposited alluvium (Ohimain, 2006b). *Conocarpus erectus* and other woody species that grow at the edge of the swamps may be associated with the main species, predominantly near the sea (FAO, 2006). It is estimated that over 60 per cent of fish caught between the Gulf of Guinea and Angola breed in the mangrove belt of the Niger Delta.

Table 1. Examples of medicinal uses of mangrove and Mangrove extracts in Nigeria

Species	Use
Rhizophora racemosa	Roots:used with palm oil as an ointment for boils. Bark:extract used for fungal infections of the skin; treatment of diarrhoea and dysentery in children; leprosy; sore throat.
Avicennia germinans	Leaves:ashes used as a salt substitute. Bark: powdered bark mixed with palm oil for treatment of lice, ringworm and mange. Seeds:germinating seeds used as a poison.
Conocarpus erectus	Leaves:decoction used as a febrifuge. Latex:applied to cuts to stop bleeding. Roots:ground and boiled as a cure for catarrh. Bark:used in the treatment of gonorrhoea.



Rhizophora racemosa, Nigeria

Threats and Drivers of Change

Population growth and economic development: While fragmentation itself does not greatly affect mangrove biodiversity, of greater concern is the total amount of mangrove area lost to urbanization, industrialization and agriculture, as well as impacts from timber and petroleum exploitation (Diop, 1993).

Petroleum and gas exploration and production; Case Study: Oil and beyond in the Niger Delta: Exporting oil from coastal areas is an economically important activity in Nigeria, but there are significant associated environmental threats such as oil spill, gas flaring and installation of infrastructure (Isebor and Awosika, 1993; NDES, 1997). The impact of oil exploration in the Niger Delta is not restricted to oil pollution alone. The development of oilfield infrastructure requires extensive land clearance, dredging and sand filling in the mangrove areas. During dredging, the soil, sediment and vegetation along the route of the proposed site are removed and in most cases deposited on the mangroves fringing the banks. The abandonment of the resulting dredged material has caused a number of impacts including smothering of fringing mangroves, alteration of the surface topography and hydrology, acidification and water contamination, all of which can result in vegetation damage and fish kills. Consequently, former mangrove areas have been converted to either bare land, grassland, or, eventually freshwater forest after several years of natural weathering. The impact of dredging on mangrove is far reaching, because it affects many components of the ecosystem including mangrove vegetation, benthic invertebrates, fisheries, plankton, wildlife, soil, sediment and water quality and therefore the well-being of the communities that live in the area and who depend directly on the rich biodiversity of the mangrove ecosystem for their livelihoods (Ohimain, 2001; 2003; 2004; Ohimain et al., 2002; 2005).

Deforestation: Some mangrove loss has occurred as a result of coastal erosion and deforestation for commercial timber trade and subsistence-level use of wood products such as fuel wood, fish processing and construction timber.

Urban development: Disposal of municipal solid wastes into the waterways is threatening the peri-urban mangroves especially in major cities/towns like Lagos, Port Harcourt, Warri and Yenagoa. Non-biodegradable wastes, particularly plastic and nylons that are carried into the mangroves during high tides are often stranded on the mangrove pneumatophores as the tide recedes (Ohimain, 2006b).

Other threats include:

• Lack of data and information, poor coordination by responsible government departments and poor collaboration between stakeholders (Macintosh and Ashton, 2003).

• The use of poison and dynamite for fishing, siltation, erosion, construction of embankments, and growing population pressure in the coastal zone (Isebor and Awosika, 1993).

Conclusion

There is an international consensus, expressed in the Convention on Biological Diversity, World Summit on Sustainable Development, and Millennium Ecosystem Assessment, that biodiversity at all levels – genetic, species and ecosystem – have a critical role in sustaining livelihoods and human development. They underpin and make possible all forms of economic activity. Damage to components of biodiversity has economic consequences, the impacts of which fall most heavily on the poor. The first global attempt to document the status of the mangrove resource, the World Mangrove Atlas, was published in 1997 by the International Society for Mangrove Ecosystems (ISME), financed by ITTO and in partnership with UNEP-WCMC. This review provides a profile for the Nigeria presenting information on the distribution of these habitats and highlights the importance of mangroves in the regional context. It serves to illustrate the benefits human communities derive from the wide range of goods and services provided by mangroves. There are still significant gaps in information and a need for continued efforts to improve assessment of mangrove habitats. The data produced and presented here represents the best data available today. For this reason, it is critical that it is accessible by stakeholders in the region, and can contribute to informing decisions regarding the use of mangrove ecosystems. Policy-makers have some difficult choices ahead as to how to manage their natural resources. It is vital that they can be provided with the most up-to-date information available. It is hoped that this review can contribute to fulfilling their information needs for considering the future management of mangrove ecosystems in Nigeria.

References

AFROL (2002**).** Mangroves of Western Africa threatened by Global Warming. In: Afrol News. Available at http://www.afrol.com/Categories/Environment/env019_mangroves_threatened.htm.

Carrere, R. (2002). Mangroves: Local Livelihoods vs. Corporate Profits. World Rainforest Movement.

CNN (2006).China's African Safari. In CNN Money News. Available at http://money.cnn.com/magazines/fortune/fortune_archive/2006/02/20/8369153/index.htm.

Diop, E.D. (ed.) (1993). Conservation and Sustainable Utilization of Mangrove Forests in Latin America and Africa Regions. Part II – Africa. International Society for Mangrove Ecosystems and Coastal marine Project of UNESCO. Mangrove Ecosystems Technical Reports 3.

Ekweozor, I.K.E (1989). A review of the effects of oil pollution in a West African environment. Discovery and Innovation: Nairobi 1(3): 27–37.

FAO (1994). Mangrove forest management guidelines. FAO Forestry Paper 117. Rome.

FAO. (2006). Conserving Cameroon's mangroves. FAO Newsroom. Available at www.fao.org/newsroom/en/field/2006/1000260/index.html).

Gordon, C. (2005). Principles for a code of conduct for the sustainable management of Mangrove Ecosystems. Centre for African Wetlands. Available at http://mit.biology.au.dk/cenTER/MCB_Files/Ramsar/2005_Ramsar_Arusha_V2pdf.

Isebor, C.E. and Awosika, L.F (1993). Nigerian Mangrove Resources, Status and Management. In: Diop, E.D. (ed.) Conservation and Sustainable Utilization of Mangrove Forests in Latin America and Africa Regions. Part II – Africa. International Society for Mangrove Ecosystems and Coastal Marine Project of UNESCO. Mangrove Ecosystems Technical Reports 3.

ISME, Center Aarhus (2003). Draft Code of Conduct for the Sustainable Management of Mangrove Ecosystems. CenTER Aarhus, Denmark.

John, D.M. and Lawson, G.W. (1990). A review of mangrove and coastal ecosystems in West African and their possible relationships. Estuarine, Coastal and Shelf Science. 31(5):505–518.

Kathiresan, K. and Bingham, B.L. (2001). Biology of mangroves and mangrove ecosystems. Advances in MarineBiology, 40:81–251.

Macintosh, D.J. and Ashton, E.C (eds). (2003). Report on the Africa Regional Workshop on the sustainable management of mangrove forest ecosystems. ISME/cenTER/CAW.

Niger Delta Environment Survey (1997). Niger Delta Environmental Survey: final report. I-IV. Environmental Resources Manager, Lagos.

NOAA/NOS (2002). Filling Critical Gaps and Promoting Multi-Site Approaches to New Nominations of Tropical Coastal, Marine and Small Island Ecosystems: West Africa. World Heritage Biodiversity Workshop; Regional Papers: West Africa. Available at http://international.nos.noaa.gov/heritag e/pdfs/wes_africa.pdf.

Ohimain E.I (2001). Bioremediation of heavy metal contaminated dredged spoil from a mangrove ecosystem in the Niger Delta. PhD thesis submitted to school of postgraduate studies, University of Benin (UNIBEN), Nigeria.

Ohimain, E.I., Imoobe, T.O.T. and Benka-Coker, M.O (2002). Impacts of dredging on zooplankton communities of Warri River, Niger Delta. African Journal of Environmental Pollution and Health, 1:37-45.

Ohimain, E.I (2003). Preservation of Niger Delta Wetland Resources Through Proper Handling and Rehabilitation of Abandoned Waste Sulfidic Dredge Spoils. In: Uzochukwu, G.A., Schimmel, K., Reddy, G.B., Chang, S.Y. and Kabadi, V. (eds). Proceedings of the 2002 National Conference on Environmental Science and Technology. Battelle Press, Ohio, USA. 3–12.

Ohimain, E. I (2004). Environmental impacts of dredging in the Niger Delta; options for sediment relocation that will mitigate acidification and enhance natural mangrove restoration. Terra et Aqua, 97: 9-19.

Ohimain, E.I., Benka-Coker, M.O. and Imoobe, T.O.T (2005). The impacts of dredging on macrobenthic invertebrates in a tributary of the Warri River, Niger Delta. African Journal of Aquatic Science 30: 49-53.

Ohimain, E.I. (2006a). Personal communication via email re: West African Mangrove Report. 28 July 2006.

Ohimain, E.I. (2006b). Oil and gas exploration, poverty and environmental unsustainability in the Niger Delta. A paper presented at the International Association for Impact Assessment conference in Stavanger, Norway.

UNEP-WCMC (2006b). Spatial data layer of Mangrove distribution derived through Landsat image classification, UNEPWCMC, Cambridge, UK. Data analysis, July 2006. Cambridge, UK.

Said, A.R (2007). Personal communication via email through the Abidjan Convention Secretariat. Re: Review of Report – Mangroves of West Africa. 5 March 2007.