



Nigeria wetlands: Economic and ecological values of these vanishing waters

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Abstract

A wetland is a region where water either permanently covers the soil or is present at least close to the soil's surface during specific times of the year, especially the growing wet season. It is an essential part of Nigeria's floodplain system, which includes both fresh and saltwater. Many plant and animal species make wetlands home, making them renowned for their biodiversity. Many migratory species, including shorebirds, ducks, and geese, rely on wetland ecosystems for food and shelter on their journey; they also serve as vital resting and breeding sites. An essential component of successful ecosystem management is a solid understanding of the services wetland ecosystems provide. Reviewing the economic and ecological values of wetland resources was the purpose of this paper. According to this review, the area possesses a wealth of biodiversity that is highly significant for the country's economic advancement. Still, it has also been seriously threatened by human activity, notably pollution, climate change, and urbanisation, turning it into "vanishing water".

Keywords: Biodiversity, pollution, ecosystem, swamp, floodplain, habitat

Introduction

Wetlands are a vital subsystem of the general ecosystem with diverse functions, such as purifying and sustaining ground and surface water resources on Earth, and numerous services they provide to animals, plants, humans (local communities), and the nation's economy at large (Balwan & Kour, 2021) [7, 8]. Wetlands are complex natural systems with distinct animals and flora growing on their soggy soils (Innocent *et al.*, 2025) [23]. Fagorite *et al.* (2019) [17] described wetlands as special ecosystems where oxygen-free processes predominate and water is permanently or seasonally inundated. Wetlands are recognised as essential parts of the ecosystem and are crucial for soil formation, water treatment, nutrient cycling, and ecosystem services (Adewumi *et al.*, 2025 [2]; Nwankwola & Okujagu, 2021; Fagorite *et al.*, 2019) [17]. In addition, a wetland is described as a body of water-filled land. It is an ecosystem where land and water meet. It may be permanently or seasonally submerged or saturated with water (freshwater, brackishwater, or seawater), where anaerobic processes are standard (Keddy, 2010).

Types of Wetland

There are many types of wetlands, and they can be classified in many ways depending on their hydrology, vegetation, and water chemistry (Davidson *et al.*, 2014; Balwan & Kour, 2021) [7, 8]. The Table below summarises the different types of wetlands based on the classification.

Table 1: Classification of Wetlands

Inland Wetlands		Coastal Wetlands	
Natural	Artificial	Natural	Artificial
Lake	Reservoir/Barrages	Lagoons	Salt pans
Riverine	Tanks/Ponds	Creeks	Aquaculture
Waterlogged	Waterlogged	Sand/Beach	
River/Stream	Salt pans	Intertidal Mud Flats	
		Salt Marsh	
		Mangroves Coral Reef	

Wetlands in Nigeria

The different types of wetlands in Nigeria are listed in the Table below:

Types of Wetlands	Examples
Inland (Freshwater) Wetlands	<ul style="list-style-type: none"> ▪ Imo River ▪ Lake Chad ▪ Ogun-Osun River ▪ Niger Delta ▪ Benue River
Coastal Saline Wetlands	<ul style="list-style-type: none"> ▪ Cross River Estuary ▪ Imo River ▪ Qua Iboec River Estuary ▪ Niger River

(Nwankwola & Okujagu, 2021; Fagorite *et al.*, 2019) [17]

Wetlands in Nigeria cover an extensive land area of over 2,988,000 hectares; the freshwater swamp and mangrove sections of the wetland environment comprise approximately 2,130,000 and 858,000 hectares, respectively (Zaccheaus, 2012) [55]. The Basins of Chad, Niger and Benue contain the majority of these wetlands, while the wetlands of the Niger Delta are among the largest in the world. As you move from the North to the South of the country, there are about fourteen wetlands. These wetlands are: Sokoto-Rima, Komadugu Yobe, Lake Chad, Upper Niger Lake, Kainji Lake, Middle Niger (Lokoja wetlands, Jebba wetlands, Lower Kaduna wetlands), Lower Benue (Makurdi Wetlands), transboundary wetlands of the Upper Benue and the Cross River. The others are the Lagos Lagoon, Yewa Creeks, Badagry Creeks, Ologe Lagoon, Lekki Peninsula, Benin (Owena River and the Okomu River), Lower Niger, Niger Delta, and Lower Ogun River. Some of these wetlands bordering the Upper Benue and the Cross River are included in Ramsar sites (Asibor, 2009 [4]; Nwankwoala, 2012).

The Niger Delta, spanning 10,767 square kilometres, has three wetlands: Apoi Creek, Oguta Lake, and Orashi Forest. These wetlands are among the 11 locations now recognised as internationally significant wetlands in Nigeria (Figure 1).

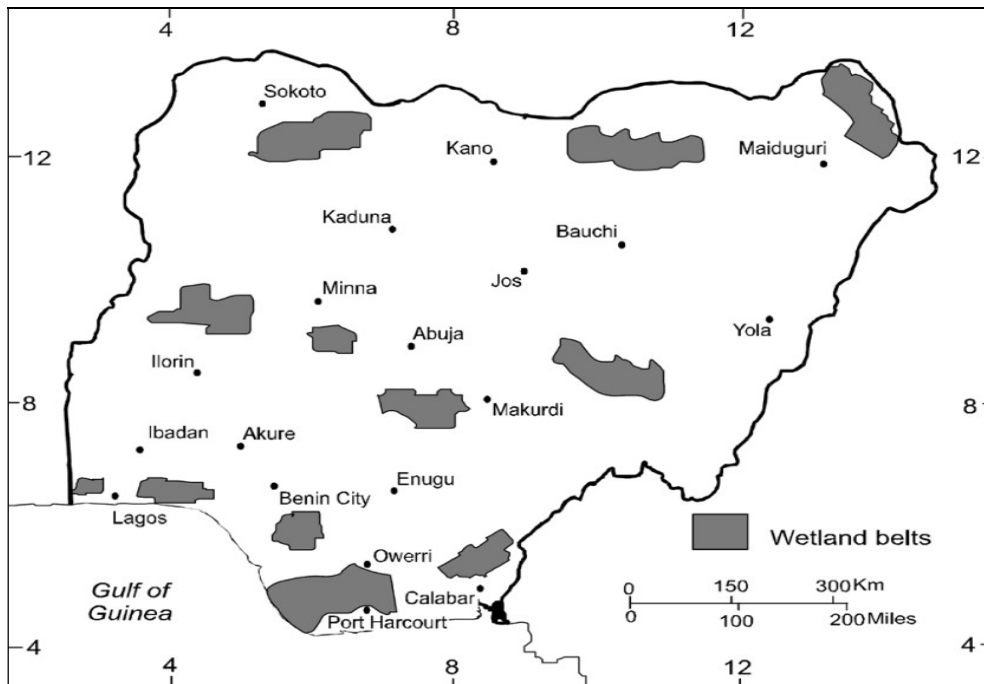


Fig 1: Distribution of the wetland regions in Nigeria (Fagorite *et al.* 2019) [17]

Characteristics of Wetlands

There is an array of wetland habitats, including lakes and rivers, coastal regions, and inland depressions (Mitsch & Gosselink, 2015). The unique characteristics of wetlands are attributed to the presence of water-loving plants (or hydrophytes). These plants have, over time, evolved to thrive in the wetland environment, developing specialised features such as floating leaves, wet stems, and oxygen transport systems (Tiner, 2017) [51]. According to Davidson *et al.* (2018) [15], wetlands' plants offer various ecological services, including carbon sequestration, nitrogen cycling, and wildlife habitat.

A vital characteristic that distinguishes wetlands is their hydric soils, characterised by extensive saturation or flooding and anaerobic conditions that accelerate the growth of microorganisms, such as fungi and bacteria, necessary for breaking down organic matter (Mitsch & Gosselink, 2015). Consequently, these soils can hold and release water over time, making wetlands more stable and supporting the establishment of wetland vegetation and controlling the water balance of wetlands (Xu *et al.*, 2019 [54]; Tiner, 2017) [51].

Furthermore, wetlands are rich in biodiversity because they serve as homes to diverse plant and animal species, many of which have evolved to thrive in the particular conditions of wetlands (Nwankwola & Okujagu, 2021; Izah *et al.*, 2018) [24, 25, 28]. In addition, wetlands play a crucial role as rest stops and breeding grounds for migratory birds, including shorebirds, ducks, and geese, which depend on wetland ecosystems for food and shelter while travelling (Davidson *et al.*, 2018) [15].

Benefits of Wetlands

Wetlands offer numerous ecological and economic benefits. They also provide environmental and social benefits, making them one of the most valuable resources in the world. The irony is that, despite their relative significance to the whole ecosystem, they are still deteriorating rapidly on a global scale.

Wetlands have the capacity to absorb and break down pollutants, making them sinks for pollutants (Overton *et al.*, 2023; Oberg *et al.*, 2019). Wetland resources are essential because they are used for lumber, fuel, and other purposes. For construction and artistic endeavours, habitats for migratory birds, spawning sites for a range of fish, and breeding grounds for a variety of wild animals and flora, including plants with insecticidal and antibacterial properties (Verma *et al.*, 2023 [52]; Izah *et al.*, 2017) [27].

Numerous plants, animals, birds, reptiles, and amphibians have been reported to be endemic to the region (Izah, 2022). Food, firewood, and protein sources such as fish, prawns, periwinkles, snails, green lobsters, crabs, and other raw materials are all examples of ecosystem forest products found in wetlands (Izah, 2022 [27]; Izah *et al.*, 2018) [24, 25, 28].

Several plants and animals found in wetlands provide medicinal benefits, as their fats, oils, and skin can be used to treat specific human ailments, in addition to providing food. For instance, according to Costa-Neto (2005) [11], the fat taken from the manatee (*Trichechus senegalensis*) can be used to treat back pain and arthritis, and its ivory (*Amphibious hippopotamus*) can be used as an aphrodisiac. Joint and dental discomfort can be reduced by using *Pseudomonas* ants. The anatomical components of rats (*Crotalus sp.*) are utilised to treat a variety of conditions, including bronchitis and skin stiffness.

Traditional medicine uses a variety of animal parts. The fat of the spotted hyena (*Crocuta crocuta*) is used to cure skin disorders, rheumatism, and stomachache (Izah & Seiyaboh, 2018) [24, 25, 28]. According to Costa-Neto (2005) [11], the majority of mammals possess skin, feathers, bones, ivory, and hooves that possess strong therapeutic properties. There have been several reports of the medicinal uses of several plants found in the Niger Delta. Bassey & Izah (2017) [10, 27] reported that some of these plants are effective against mosquitoes at different developmental stages.

Some plants, such as *Alchornea cordifolia*, *Vitex grandifolia*, *Alstonia boonei*, *Musanga cecropioides*, and

numerous other species, are reported to possess antibacterial properties (Kigigha & Atuzie, 2012; Kigigha *et al.*, 2016; Epedi *et al.*, 2016) [16]. Several of these plants serve as reliable sources of new synthetic pharmaceuticals (Izah *et al.*, 2018 [24, 25, 28]; Izah & Seiyaboh, 2018).

Wetlands support cultural services such as spirituality and inspiration, entertainment/ecotourism (Ramsar website), and educational functions. Some delta communities worship the crocodiles and turtles found in the delta (Ogorode *et al.*, 2024). Forests act as a barrier to underground water, especially when natural factors such as heavy rains, high temperatures, destructive winds, and erosion are present. Wetlands act as buffers against waves, helping to filter water resources and serve as carbon sinks, thereby minimising the effects of global warming, protecting cultivated land and coastal areas, and reducing erosion.

It is said to bring happiness and is considered a symbol of

peace or the son of a rich man, as well as other cultural practices of the wetland, including the use of autumn ceremonies. Wetlands are also known for the support services they provide; that is, they support other ecosystem services. These measures include nutrient cycling, oxygen production and soil formation. These activities can support delta biodiversity; nitrogen enrichment to promote carbon sequestration and climate control, as wetlands provide fast transportation routes in rugged terrain and essential support for the establishment of wetlands, so this service is often overlooked (Innocent *et al.*, 2025 [23]; Edo & Albrecht, 2021; Fagorite *et al.*, 2019) [17]. Many urban and rural settlements can only be accessed through wetlands (Nwankwoala & Okujagu, 2021).

The Table below summarises some of the functions/services of wetlands

Table 2: Functions/services rendered by Wetlands

1	Food, e.g. bushmeat, fish	Wetlands provide diverse sources of food and protein for humans. For example, the Nypa palm's (<i>Nypa fruticans</i>) sap is harvested in mangrove forests to produce sugar, vinegar, and alcohol, while its fruits are used both raw and cooked (Friess <i>et al.</i> , 2021 [20]; Babaniyi <i>et al.</i> , 2025; Atiim <i>et al.</i> , 2021) [5]
2	Nutrient cycling	Wetlands work just like natural filters! Wetlands' ability to maintain biodiversity, purify water, and maintain ecological stability depends on nutrient cycling. Wetlands aid in the digestion of nutrients, such as phosphorus and nitrogen, absorbed from runoff by bacteria and plants (Jisha & Puthur, 2021; King, 2018).
3	Flood /Erosion Regulation	Wetland vegetation reduces erosion in both inland and coastal regions by stabilising soil, absorbing wave energy, and slowing water flow (Friess <i>et al.</i> , 2021) [20]. Because they can absorb and retain floodwaters, wetlands are essential for preventing flooding. Wetlands function as natural sponges, reducing erosion and flood levels by gradually releasing and slowing down surface water, precipitation, snowmelt, and groundwater (Hernández-Romero <i>et al.</i> , 2022 [22]; Nayak & Bhushan, 2022); Sharma & Singh (2021) [49].
4	Recreation / Aesthetics	Wetlands offer individuals a variety of ways to enjoy the natural world. It is an ideal spot for recreational activities such as hunting, fishing, birdwatching, biking, hiking, kayaking, and photography (Alikhani <i>et al.</i> , 2021 [3]; Lee, 2019).
5	Fibre and Fuel	Some mangrove species are valued for their high-calorie content and as sources of charcoal and fuelwood, especially those in the <i>Rhizophora</i> genus. Anaerobic digesters can convert common reed (<i>Phragmites australis</i>) into fuel pellets or biogas, or burn it directly as a fuel (Pandey <i>et al.</i> , 2023 [47]; Maithya <i>et al.</i> , 2022; Czubaszek <i>et al.</i> , 2021) [13].
6	Carbon Sink	Wetlands can sequester carbon and are therefore vital for interactions between terrestrial and atmospheric ecosystems (Finlayson <i>et al.</i> , 2018). Since wetland soils retain carbon for long periods, they are essential for reducing the effects of climate change. To control greenhouse gas emissions and affect global carbon cycles, this capacity for carbon sequestration is essential (Mitsch & Gosselink, 2015).
7	Fertile farmland	Wetlands' nutrient-rich soils support agriculture worldwide. Rice grows well in wetland habitats and is a staple food for half of the world's population. Aquatic plants and commercially important fish species are also cultivated in wetlands (Ghosh <i>et al.</i> , 2024) [21].
8	Climate Regulation	This natural ability to steadily retain and release water contributes to the development of localised microclimates that control regional weather patterns, such as rainfall distribution and temperature stability (Finlayson <i>et al.</i> , 2017) [18, 19]. Wetlands serve as a buffer against severe temperatures by collecting solar radiation and releasing moisture into the atmosphere, helping to lower local heat levels and promoting more stable climate patterns (Taillardat <i>et al.</i> , 2020 [50]; Seifollahi-Aghmiuni <i>et al.</i> , 2019 [48]; Moomaw <i>et al.</i> , 2018).
9	Spiritual and Inspirational	Wetlands provide enormous spiritual and inspirational significance for many civilisations. Some communities view wetlands as sacred sites, connected to traditions, beliefs, and a sense of unity with nature. Some wetlands are connected to local traditions, religious beliefs, or folklore. Individuals may experience spiritual renewal, cultural heritage, or simply a deep appreciation of nature's beauty through the wetlands. (Das 2024 [14]; Adesina <i>et al.</i> , 2024) [1]
10	Water purification and waste treatment	Wetlands can help minimise water contamination from xenobiotics, heavy metals, excess sediments, and faecal microorganisms, among other contaminants. Additionally, they maintain water quality at levels that protect biodiversity, human health, and the water's potential for agricultural and other uses. Wetlands can effectively remove heavy metals from water through physical, chemical, and biological processes (Isaac <i>et al.</i> , 2025).
11	Storm Buffer	Coastal wetland ecosystems are essential for mitigating damage from hurricanes and large waves. Salt marshes and mangrove forests shield coastlines by releasing and reflecting wave energy (Costanza <i>et al.</i> , 2021) [12]. The protective significance of healthy wetlands is demonstrated by studies indicating they may significantly reduce storm surge heights by every three miles (Balwan & Kour, 2021).
12	Habitat for Nursery	Wetlands are essential to commercial fisheries because they provide food, shelter, and refuge for both resident and migratory fish and invertebrates. Wetlands' complex root and stem systems offer habitat to young fish, shielding them from larger predators and sustaining high juvenile populations. Mangrove forests and other coastal wetlands are exceptionally well known for serving as nurseries for tropical reef fish (Maithya <i>et al.</i> , 2022; Sharma and Singh, 2021) [49].
13	Natural medicines / Drugs	In Nigeria, both traditional and modern medicine extensively use chemicals derived from organisms found in coastal wetlands. These drugs address a variety of illnesses, including diabetes, skin conditions, asthma, and infections. For instance, bioactive chemicals found in mangrove vegetation can be used to treat diseases like smallpox and leprosy (Izah & Seiyaboh, 2018 [24, 25, 28]; Bassey & Izah, 2017) [10, 27]
14	Water purification	Wetlands act as natural filters, intercepting pollutants and organic waste from surface water runoff. They improve water quality, reduce sedimentation, and support aquatic life by removing excess nutrients (Hammer & Bastian, 2020; Muduli <i>et al.</i> , 2023).
15	Pollination	Wetland ecosystems support pollination by providing habitats for various pollinators. Wetland edges are rich in undisturbed habitats that support nesting by native bees and attract hoverfly species. Specific wetland plant species, like nude yellow loosestrife (<i>Lycimachia ciliata</i> L.) and the loosestrife bee (<i>Macropis nuda</i>), are essential pollen and nectar sources for specific pollinators (Vickruck <i>et al.</i> , 2019) [53].

Conclusion

Wetlands are important habitats that offer numerous ecological and economic benefits, as shown by research worldwide. The interdependence of all system components characterises the unique biodiversity of wetlands. The decline or extinction of one species can lead to the loss or overgrowth of others, undermining the wetlands' overall ecology. Nigerian wetlands provide essential ecological, social, cultural, economic, medical, and other support functions. This paper has reviewed the economic and environmental benefits of wetlands, thereby highlighting their invaluable value to man and his environment. Wetlands, often referred to as "vanishing waters," are disappearing rapidly despite their enormous significance. Human activities such as pollution, deforestation, urbanisation, agricultural expansion, and unsustainable resource extraction have severely degraded and destroyed these ecosystems. This loss has been accelerated by climate change, which has caused sea levels to rise, rainfall patterns to become unpredictable, and temperatures to rise. The rapid disappearance of wetlands does not pose a serious threat to biological diversity, but it also affects human livelihoods, resilience against natural hazards, and food security. A good understanding of the causes, implications, and possible solutions to wetland loss is thus vital to protecting these irreplaceable ecosystems for the present and future generations.

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