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The Nigerian Mangroves: A Systematic Review

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Abstract: *Nigerian mangroves, concentrated predominantly in the Niger Delta, constitute the largest mangrove ecosystem in Africa and the third largest in the world. This systematic review synthesises evidence from peer-reviewed literature and institutional reports to examine the ecology, biodiversity, ecosystem services, anthropogenic threats, and conservation and restoration strategies pertaining to Nigerian mangroves. The dominant species: Rhizophora racemosa, Avicennia germinans, Laguncularia racemosa and Conocarpus erectus exhibit distinct zonation patterns shaped by soil type, tidal influence, salinity, and nutrient gradients. Mangroves in Nigeria provide a wide range of ecosystem services including blue carbon sequestration, coastal protection, nursery habitat for fish, and support for the livelihoods of millions of coastal inhabitants. However, these ecosystems are under severe and multifaceted threat: oil exploration and recurrent spills since the 1950s have contaminated soil and water across the delta, deforestation for fuelwood and urban expansion continues unabated, and the invasive Nypa palm (Nypa fruticans) has displaced native mangroves at alarming rates. Remote sensing data indicate a mangrove mortality rate of approximately 5,644 hectares per year between 2016 and 2024. Conservation and restoration efforts — including community-led planting programmes, the $1 billion government-initiated Hydrocarbon Pollution Remediation Project (HYPREP), and NGO-driven interventions — show promise but remain constrained by governance deficits, funding gaps, and inadequate monitoring. The review concludes with recommendations for integrated, policy-driven conservation frameworks and highlights critical gaps warranting future research.*

Keywords: Nigerian mangroves, mangrove ecology, oil pollution, blue carbon, ecosystem services, mangrove restoration, biodiversity, conservation, Niger Delta

Introduction

Mangroves are intertidal forest ecosystems occupying the interface between terrestrial and marine environments in tropical and subtropical regions of the world. They are recognised as among the most productive and ecologically significant coastal ecosystems on Earth, providing a diverse array of services that span carbon sequestration, coastal stabilisation, water quality regulation, and the sustenance of coastal fisheries (Alongi, 2014; Friess et al., 2019). Beyond their ecological value, mangrove forests are deeply embedded in the socio-economic fabric of coastal communities, supplying timber, fuelwood, medicinal resources, and the ecological foundations for artisanal fishing and aquaculture.

Nigeria occupies a strategically important position in the global mangrove landscape. It hosts the largest mangrove stand in Africa and is consistently ranked among the top three countries globally by mangrove area, alongside India and Indonesia (Numbere, 2018; Onyena & Kabari, 2020). The Nigerian mangrove biome is concentrated primarily in the Niger Delta — a vast, low-lying deltaic system where the River Niger splinters into numerous distributaries before discharging into the Gulf of Guinea. This region encompasses approximately 7.5 million hectares of wetland vegetation, including extensive mangrove forests, brackish swamp forests, and freshwater rainforest zones (Ana, 2011).

Despite their ecological and economic importance, Nigerian mangroves face an acute convergence of threats. Decades of oil and gas extraction, originating with commercial oil production in 1958, have resulted in an estimated cumulative spillage of over 13 million barrels of crude oil across the delta (Federal Ministry of Environment, cited in Wikipedia, 2026; O'Farrell et al., 2025). Concomitantly, deforestation for fuelwood, urban encroachment, dredging of navigation canals, and the proliferation of the invasive Nypa palm (Nypa fruticans) have compounded the trajectory of decline (Numbere, 2019; Onyena & Sam, 2020; Barenblitt et al., 2023). Estimates of mangrove loss vary, but studies converge on a significant reduction of forest cover: one analysis found a 12% decline in mangrove cover between 2007 and 2017, while Nypa palm expanded by 694% over the same period (Adegoke et al., 2020).

Notwithstanding the severity of these pressures, Nigerian mangroves remain data-poor by international standards and are frequently underrepresented in global mangrove assessments (Numbere, 2018). This systematic review addresses that gap by synthesising published evidence on the ecology, biodiversity, ecosystem services, threats, and management of Nigerian mangroves. The specific objectives of this review are to: (i) characterise the distribution,

species composition, and ecological zonation of Nigerian mangroves; (ii) review the ecosystem services they provide; (iii) evaluate the principal anthropogenic threats driving their decline;
(iv) assess current conservation and restoration initiatives; and (v) identify knowledge gaps and priorities for future research and policy.

2. Methodology

2.1 Search Strategy and Databases

This review was conducted following systematic review principles. A comprehensive literature search was undertaken using Web of Science, Scopus, Google Scholar, PubMed, and institutional repositories including IntechOpen and ResearchGate. The search was restricted to publications in English and focused exclusively on literature pertaining to Nigerian mangroves. The following search terms were used in varying combinations: "Nigerian mangroves," "Niger Delta mangroves," "mangrove ecology Nigeria," "mangrove species composition Nigeria," "oil spill mangrove Nigeria," "Nypa fruticans Niger Delta," "mangrove ecosystem services Nigeria," "mangrove restoration Nigeria," and "mangrove conservation Nigeria."

2.2 Inclusion and Exclusion Criteria

Studies were included if they: (i) were published in peer-reviewed journals, edited book chapters, or reputable institutional reports; (ii) specifically addressed Nigerian or Niger Delta mangroves; (iii) covered any of the review themes — ecology, species composition, ecosystem services, threats, or restoration; and (iv) were published between 1988 and 2025. Studies were excluded if they were purely global analyses without specific Nigerian data, if they focused primarily on non-mangrove ecosystems, or if they lacked sufficient methodological detail.

Data Extraction and Synthesis

Data were extracted thematically and synthesised narratively under the headings of ecological characterisation, ecosystem services, anthropogenic threats, and conservation and restoration. Where quantitative data were available, these were reported with original units and attributed to primary sources. No meta-analysis was conducted given the heterogeneity of study designs and reporting metrics across included studies.

3. Ecological Characterisation of Nigerian Mangroves

3.1 Geographical Distribution and Extent

Nigerian mangroves are overwhelmingly concentrated in the Niger Delta, which spans parts of Bayelsa, Delta, Rivers, Cross River, and Akwa Ibom States. The delta constitutes the largest river delta in Africa and hosts the country's most extensive mangrove formations. Estimates of total mangrove area in Nigeria vDaary considerably across sources, reflecting differences in satellite imagery resolution, classification methodologies, and dates of assessment. Jackson and Lewis (2000) placed total Nigerian mangrove extent at approximately 10,000 km², while the Mangrove Atlas of the World reported 11,134 km² (cited in Numbere, 2018). More recent analyses applying remote sensing approaches estimated the current area at approximately 7,386 km², representing a 26% decline since 1980 (Numbere, 2018). The Niger Delta alone harbours mangroves described as covering approximately 5% of the world's total mangrove forest area (Nababa et al., cited in Onyena & Kabari, 2020).

Beyond the Niger Delta, mangrove patches occur along the coastlines of Lagos, Ondo, and other states in southwestern Nigeria, though these are considerably smaller and more fragmented. Mangrove stands are also documented in Cross River and Akwa Ibom States in the southeast (Asuk et al., 2018). Regional studies, such as Ufuoma and Gbadegesin (2021) in the western Niger Delta, have provided localised accounts of species composition and distribution patterns using systematic vegetation transect methods.

3.2 Species Composition and Floristic Diversity

The floristic composition of Nigerian mangroves is characterised by a relatively low number of true mangrove species, consistent with the broader pattern of West African mangroves. The principal true mangrove species documented across Nigerian forests include Rhizophora racemosa, Rhizophora harrisonii, Avicennia germinans (also reported as Avicennia africana in some studies), Laguncularia racemosa, Conocarpus erectus, and the mangrove fern Acrostichum aureum (Numbere, 2018; Asuk et al., 2018; Ukpong, 2000). Additional associates encountered in mangrove swamp forests include Nypa fruticans (now invasive), Raphia hookeri, Drepanocarpus lanatus, Hibiscus tiliaceus, and Pandanus candelabrum (Asuk et al., 2018).

Among true mangrove species, Rhizophora racemosa consistently emerges as the dominant taxon across most surveys of the Niger Delta, with importance value indices (IVI) reaching
52.02 in some sites (Numbere, 2018). In the western Niger Delta, Ufuoma and Gbadegesin (2021) recorded Rhizophora spp. as dominant in four of five study sites, with IVI values ranging from 177.28 to 300, while Avicennia germinans was dominant at one coastal site with an IVI of 183.03. Rhizophora racemosa and Nypa fruticans were reported as the most frequent species in mangrove swamp forests of the Cross River State coastline (Asuk et al., 2018).

Rhizophora species are ecologically well adapted to seaward, permanently inundated zones characterised by muddy, reducing soils. Avicennia germinans tends to dominate at slightly elevated positions or in areas with higher calcium concentrations, while Laguncularia racemosa and Conocarpus erectus are typically found in the more landward and sandy zones (Numbere, 2018; Ukpong, 2000). This zonation pattern reflects a gradient of species tolerance to tidal inundation, salinity and soil characteristics.

3.3 Ecological Zonation and Soil-Vegetation Relationships

The spatial arrangement of mangrove species across the intertidal gradient follows a recognisable zonation pattern in the Niger Delta, shaped by tidal amplitude, soil texture, salinity, and nutrient dynamics. Numbere (2018) identified a transition from sandy inland areas dominated by Conocarpus erectus and grasses, through core mangrove zones dominated by Rhizophora racemosa on muddy reducing soils, to seaward margins also inhabited by Avicennia germinans and Laguncularia racemosa.

Ukpong (2000) conducted a pioneering direct gradient analysis of Nigerian mangrove communities in relation to soil nutrient gradients, finding that calcium was the primary determinant of species distribution in the upper canopy stratum, while a calcium-to-potassium ratio defined the mid-canopy stratum and magnesium controlled the understorey stratum. Avicennia africana and Nypa fruticans occurred predominantly in soils with the highest calcium concentrations, while Rhizophora spp. favoured soils of moderate calcium values. Organic carbon in the alluvial soils was characteristically high, ranging from 3.5% to 10.4%, and all soil nutrients exhibited marked seasonality in response to wet-dry climate cycles (Ukpong, 2000).

Four broad ecological zones have been delineated in the Niger Delta region based on landmass position and tidal influence: a coastal inland zone, a middle mangrove swamp forest zone, a freshwater swamp zone, and a landward mangrove zone (Ugbomeh et al., 2020, cited in Onyena & Kabari, 2020). Each zone hosts a distinct assemblage of species and experiences different degrees of tidal flushing, salinity, and anthropogenic disturbance.

3.4 Faunal Diversity and Ecological Interactions

The Nigerian mangrove ecosystem supports a remarkable diversity of fauna, including commercially important fish species, shrimps, crabs, molluscs, reptiles (particularly crocodiles and monitor lizards), primates, and waterbirds (Numbere, 2018; Onyena & Kabari, 2020). The mangroves function as critical nursery and feeding grounds for juvenile fish and invertebrates, many of which form the basis of artisanal coastal fisheries. Mudskippers (Periophthalmus modestus) and fiddler crabs (Uca pugilator) are characteristically associated with the mangrove intertidal zone, where crab burrows play an important role in aerating reducing soils (Numbere, 2018).

Benthic macro-invertebrate communities in Nigerian mangroves have been shown to vary significantly between native mangrove stands and areas colonised by Nypa fruticans, with the latter supporting markedly lower benthic diversity, indicating that the ecosystem functions underpinning faunal diversity are compromised in Nypa-invaded areas (Numbere, 2018). The interdependence of the mangrove forest structure, leaf litter dynamics, and faunal communities underscores the integrated nature of this ecosystem.

4. ECOSYSTEM SERVICES

4.1 Blue Carbon Sequestration

Mangroves rank among the most carbon-dense ecosystems per unit area on Earth, storing large quantities of organic carbon in both aboveground biomass and, more significantly, in their waterlogged, anaerobic soils where decomposition rates are suppressed (McLeod et al., 2011; Howard et al., 2017). Average annual carbon sequestration rates in mangroves are estimated at 6 to 8 Mg CO_2 equivalents per hectare — two to four times higher than rates in mature tropical forests (Blue Carbon Initiative, n.d.). This carbon stored in coastal ecosystems has been termed "blue carbon," and the Nigerian mangrove system represents one of the most significant blue carbon repositories in Africa.

Taillardat et al. (2018) demonstrated that in 2014, Nigerian mangroves contributed to mitigating more than 1% of national fossil fuel emissions, highlighting the relevance of mangrove blue carbon at the national policy scale under the Paris Agreement framework. The loss of Nigerian mangrove cover, therefore, translates directly into greenhouse gas emissions: experts estimate that degradation of coastal ecosystems globally releases up to 1.02 billion tonnes of CO_2 annually (Blue Carbon Initiative, n.d.), and Nigeria's ongoing mangrove loss is a material contributor to this global carbon release.

4.2 Coastal Protection

Mangrove forests provide structural coastal protection through their complex root systems, which attenuate wave energy, stabilise sediments, and reduce the penetration of tidal surges and storm impacts into adjacent communities (Numbere, 2018; Onyena & Kabari, 2020). In the Niger Delta, where sea level rise driven by climate change is increasingly amplifying the risk of coastal flooding, the structural role of mangroves as natural buffers is of direct socio-economic importance. The disappearance of mangrove cover is documented to leave coastal communities of the delta more vulnerable to tidal inundation and extreme weather events (Onyena & Kabari, 2020).

4.3 Fisheries and Food Security

Mangroves function as critical nursery habitats for numerous commercially and recreationally important species of fish, shrimp, and crab, thereby underpinning the artisanal fishing economies of millions of coastal dwellers in southern Nigeria (Numbere, 2018; Onyena & Kabari, 2020). Estimates indicate that fish catch per unit effort is substantially higher in mangrove-adjacent waters than in areas lacking mangrove cover, with one global study estimating a differential of up to 70% (WRI, n.d.). In the Niger Delta context, where fishing is the primary livelihood for the majority of communities, the decline of mangrove nursery habitats represents a direct food security threat.

4.4 Provisioning Services

Nigerian coastal communities derive extensive provisioning services from mangroves, including timber for construction, fuelwood (which is simultaneously a major cause of deforestation), thatch and fronds for roofing, bark extracts for traditional medicines and dyes, and food from associated fauna (Asuk et al., 2018; Numbere, 2018). The multiple-use character of mangroves means that their loss has compounding effects on community welfare across nutritional, economic, and cultural dimensions.

5. Anthropogenic Threats to Nigerian Mangroves

5.1 Oil Exploration and Pollution

Historically oil exploration has been the most severe threat to Nigerian mangroves. Since commercial oil production began in 1958 in Niger Delta, the region has experienced chronic and pervasive petroleum contamination. According to the Federal Ministry of Environment, approximately 13 million barrels of oil were spilled during extraction processes over the following decades (Wikipedia, 2026). A mangrove mortality rate of 5,644 hectares per year

between 2016 – 2024 within the Niger Delta was ascertained using synthetic aperture radar (SAR) satellite imagery during a study, which is approximately about losing the forest area size of 17 Central parks annually (O’farrell et ai., 2025). Wikipedia, 2026 also reports an annual oil spill incident rate within the region to have increased from 250 per year as at 1958 to about 500 per year in recent decades. The ecological process of oil damage to mangroves is multifaceted and dynamic. When crude oil adheres to pneumatophores and prop roots, it blocks the exchange of gas, thereby suffocates the tissues of the roots, while oil contamination of soils lingers for decades because of waterlogged, anaerobic conditions of mangrove sediments critically retarding biodegradation (Onyema &Kabari, 2020). With oil pollution, the topsoil is degraded, resulting to poor soil fertility and elimination of organic horizons that supports mangrove recruitment and regeneration (Onyema & Kabari, 2020).

Areas affected by oil spills become susceptible to invasion by Nypa fruticans, whose seedlings outperform mangrove seedlings in most soil types including polluted substrates (Adegoke et al., 2020; Numbere, 2019).

The causes of oil spills in the Delta are diverse: pipeline corrosion, equipment failure, unenforced regulatory standards, oil bunkering, pipeline vandalism by armed groups, and accidental operational releases all contribute (Wikipedia, 2026; Babatunde, 2025). This complexity of causation renders preventive governance extraordinarily challenging.

5.2 Deforestation

Unregulated logging is a major growing threat to Nigerian mangroves, particularly for the purpose of fuelwood used in fish smoking and domestic cooking. According to FairPlanet, n,d, Nigeria as a subregion in West Africa had a significant loss of approximately 432 km^2 of its mangroves between 1975 and 2013.

Population growth in the Niger Delta, which has an annual growth rate of approximately 3.5%, is driving increased demand for mangrove timber as an energy resource (Numbere, 2018). The economic marginalisation of coastal communities and high youth unemployment exacerbate the dependence on mangrove fuelwood, as documented communities whose fishing livelihoods have been destroyed by oil spills turn to logging as a fallback (Mongabay, 2022).

Deforestation is further accelerated by the conversion of mangrove land for agricultural purposes, urban expansion, the construction of oil workers' housing, and the development of navigational canals and transport infrastructure associated with the oil industry (Onyena & Kabari, 2020; Wikipedia, 2026). Sand filling of mangrove swamps — a practice documented in multiple Niger Delta communities — results in permanent, irreversible loss of mangrove habitat, as sand-filled areas have never been observed to regenerate natural mangrove vegetation (Numbere, 2018).

5.3 Invasion by Nypa fruticans

The Nypa palm (Nypa fruticans) — a mangrove associate native to the Indo-Pacific region — was deliberately introduced into the Niger Delta in 1906 as a measure to control riverbank erosion (Numbere, 2019; Onyena & Sam, 2020). Approximately three decades ago, the species began to expand aggressively and has since become one of the most consequential invasive species affecting Nigerian mangroves. A remote sensing study by Adegoke et al. (2020) found that Nypa palm coverage in the Niger Delta increased by 694% between 2007 and 2017, a period during which mangrove cover declined by 12%.

The competitive advantage of Nypa fruticans over native mangroves in disturbed environments is attributable to several biological characteristics: its superior root system enables efficient nutrient uptake in diverse soil types, including polluted soils; its seeds are tough and buoyant, facilitating wide tidal dispersal; and it exhibits rapid colonisation of bare substrate following disturbance events such as oil spills, logging, and dredging (Numbere, 2019; Onyena & Sam, 2020). Unlike in its native Southeast Asian range — where Nypa fronds are used for thatch, the sap is processed into sugar and alcoholic beverages, and the fruits are consumed — the species has negligible economic utilisation in Nigeria, further removing any community-level incentive for its management (Adegoke et al., 2020).

Barenblitt et al. (2023) applied machine learning classification of multisensor satellite data to quantify Nypa extent in Nigeria, concluding that the species had expanded substantially between 2015 and 2020. Their analysis emphasised that because Nypa's spectral characteristics overlap significantly with those of native mangroves in satellite imagery, estimates of mangrove loss in Nigeria that fail to distinguish the two cover types are likely to substantially underestimate the true extent of native mangrove decline. Numbere (2019) warned that Nigerian mangroves could disappear entirely from the Niger Delta within 50 years if Nypa encroachment continues unchecked.

5.4 Dredging and Urbanisation

Extensive dredging of navigation canals to support oil infrastructure has fundamentally altered the hydrology, sediment dynamics, and landscape architecture of the Niger Delta, fragmenting mangrove forests and creating artificial waterways that facilitate the spread of Nypa fruticans (Ohimain, 2004; Onyena & Kabari, 2020). Dredged material is frequently deposited in adjacent mangrove forests, burying root systems and eliminating habitat. Urbanisation in delta communities has accelerated the conversion of mangrove swamps to residential and commercial land uses, with population migration into delta areas increasing significantly over the past two decades (Numbere, 2018).

6. CONSERVATION AND RESTORATION

6.1 Government Initiatives

The most prominent governmental conservation intervention in the Nigerian mangrove context is the Hydrocarbon Pollution Remediation Project (HYPREP), launched in 2017 with a budget of US$1 billion following the recommendations of the United Nations Environment Programme (UNEP), whose 2011 Environmental Assessment of Ogoniland documented extensive soil, groundwater, and mangrove contamination in Ogoni communities (UNEP, 2011). HYPREP is mandated to remediate oil-contaminated sites and restore approximately 1,000 hectares of mangroves in Ogoniland, a historically and politically significant sub-region of the Niger Delta. However, the project has faced sustained criticism: independent observers have documented delays, allegations of fraud, and a lack of transparency in the governance of remediation activities (Mongabay, 2022). The United Nations concluded in 2011 that reversing the accumulated damage to Ogoniland would require a minimum of 30 years (UNEP, 2011).

The Niger Delta Development Commission (NDDC), established by the Nigerian federal government in 2000, was charged with suppressing the environmental and ecological impacts of petroleum exploitation across the delta (Wikipedia, 2026). Despite its mandate, the Commission's conservation outcomes have been limited, and governance challenges have undermined its effectiveness.

6.2 Community and NGO-Led Restoration

Community-level and NGO-led restoration initiatives have demonstrated significant promise in the Nigerian mangrove context, frequently achieving measurable ecological outcomes in the absence of sustained government support. The Centre for Environment, Human Rights and Development (CEHRD) has provided training in mangrove nursery establishment and transplanting to community members, including fisherfolk in Rivers State, who have subsequently grown and planted hundreds to thousands of mangrove seedlings in degraded sites (FairPlanet, n.d.). The Association of Community Environment and Agricultural Resources Development (ACEARD) has planted over 500,000 mangrove seedlings since its programme began, incorporating invasive Nypa palm management by training local communities to produce income-generating products — baskets and mats — from Nypa fronds, thereby creating an economic incentive for Nypa removal (FairPlanet, n.d.).

Women-led reforestation efforts in Ogoniland, documented by Sam et al. (2023) and Mongabay (2025), have attained high seedling survival rates by prioritising site quality, clearing invasive Nypa before planting, and positioning structurally robust red mangroves (Rhizophora spp.) in wave-exposed seaward positions to shelter more vulnerable black and white mangroves further inland. The Nigerian Conservation Foundation (NCF), funded by the Aspire Coronation Trust Foundation, planted over 15,000 mangroves across three hectares in Andoni Local Government Area, Rivers State, targeting areas affected by Nypa invasion (SweetCrude Reports, 2024).

Sam et al. (2023) proposed a systematic framework for mangrove restoration and conservation in Nigeria, emphasising the need for integrated approaches that combine ecological restoration with sustainable livelihoods, policy enforcement, community engagement, and long-term monitoring. The lack of post-planting monitoring mechanisms has been identified as a critical vulnerability in current restoration efforts: without monitoring, communities may resume mangrove felling once initial planting activities conclude (FairPlanet, n.d.).

6.3 Remote Sensing and Monitoring

Advances in satellite remote sensing and machine learning have substantially enhanced the capacity to monitor mangrove dynamics in the Niger Delta. Adegoke et al. (2020) used ALOS PALSAR, Landsat imagery, and Support Vector Machine classification to estimate Nypa and mangrove extents in 2007 and 2017. Barenblitt et al. (2023) applied random forest classification of multisensor Landsat data to map Nypa expansion from 2015 to 2020. O'Farrell et al. (2025) deployed Sentinel-1 synthetic aperture radar data and machine learning to map oil pipeline networks in a 9,000 km² study area, precisely identifying pipeline sections causing greatest mangrove damage and identifying unreported spill sites — a major advance given the systematic under-reporting of oil spills in the region.

Remote sensing tools represent a critical component of any effective monitoring framework, given the inaccessibility of much of the Niger Delta and the limitations of ground-based surveys. However, Adegoke et al. (2020) cautioned that improved classification precision isrequired to differentiate native mangroves from Nypa palm cover, as conflation of the two cover types leads to systematic underestimation of native mangrove decline.

6.4 Policy and Legislative Framework

Nigeria currently lacks a dedicated mangrove conservation law. The Nigerian Oil Spill Detection and Response Agency (NOSDRA) and the National Oil Spill Contingency Plan provide regulatory frameworks for oil spill response, but enforcement has historically been weak (Wikipedia, 2026). The UNEP (2011) assessment found that institutional control measures in both the oil industry and the government were not implemented adequately, a systemic governance failure. Sam et al. (2023) recommended the development of a Nigeria-specific mangrove conservation framework incorporating zoning regulations, integrated coastal zone management plans, and sustained monitoring systems. Engagement with international climate financing mechanisms, including REDD+ and blue carbon voluntary carbon markets, has been identified as a potential avenue for generating resources for conservation (Taillardat et al., 2018; Friess et al., 2019).

7. KNOWLEDGE GAPS AND FUTURE RESEARCH DIRECTIONS

This review has identified several important gaps in the existing knowledge base that warrant targeted research investment. First, despite being the largest mangrove system in Africa, Nigerian mangroves remain significantly under-represented in the peer-reviewed literature relative to their ecological importance, and many studies lack the spatial and temporal coverage needed to support robust policy conclusions (Numbere, 2018). Second, there is a critical need for nationally consistent, high-resolution baseline mapping of mangrove extent that can reliably distinguish native mangrove species from invasive Nypa palm — a distinction upon which accurate carbon stock accounting and loss estimation depend (Barenblitt et al., 2023; Adegoke et al., 2020).

Third, the blue carbon stocks of Nigerian mangroves have not been systematically quantified at a scale commensurate with their potential contribution to national and international climate mitigation frameworks. Detailed soil carbon assessments across representative sites in the Niger Delta would strengthen Nigeria's position in blue carbon financing negotiations. Fourth, the long-term ecological outcomes of existing restoration programmes remain poorly documented, with anecdotal evidence of recovery in fish stocks but no published independent ecological assessments (Mongabay, 2025). Longitudinal monitoring studies with standardised protocols are urgently needed to evaluate the effectiveness of different restoration approaches under varying disturbance regimes.

Fifth, the socio-economic drivers of mangrove deforestation — including the role of energy poverty, food insecurity, and livelihood alternatives in shaping community behaviour towards mangrove resources — deserve systematic investigation to inform interventions that address root causes rather than symptoms. Finally, research on the effects of climate change — particularly sea level rise, changing rainfall regimes, and increased storm intensity — on Nigerian mangrove dynamics is conspicuously absent and represents a critical gap in the evidence base for long-term conservation planning.

8. CONCLUSIONS

Nigerian mangroves, centred in the Niger Delta, constitute an ecosystem of extraordinary ecological, economic, and social importance, yet they are among the most threatened mangrove systems in the world. This systematic review has documented their ecological structure — characterised by Rhizophora racemosa-dominated communities zoned according to tidal and soil nutrient gradients — and their extensive provisioning, regulating, and cultural services, including blue carbon sequestration, coastal protection, and the sustenance of artisanal fisheries for millions of coastal Nigerians. At the same time, the review has catalogued a severe and interlocking set of threats: chronic oil pollution dating to the 1950s, accelerating deforestation driven by energy poverty and population growth, the unchecked spread of invasive Nypa fruticans, and governance failures that have allowed these pressures to compound over decades.

The available evidence is unambiguous: Nigerian mangroves are in a state of accelerating decline, with recent analyses documenting mangrove mortality rates of nearly 5,644 hectares per year. Reversing this trajectory will require a paradigm shift in the governance of the Niger Delta environment — one that places conservation and community welfare alongside the petroleum industry's interests. The practical tools — remote sensing monitoring, community-based restoration, integrated coastal zone management, and access to blue carbon finance — exist. What is required is the political will, institutional capacity, and sustained financial commitment to deploy them at scale.

The convergence of Nigeria's obligations under international climate agreements, its vulnerability to sea level rise and coastal flooding, and the demonstrated benefits of mangrove restoration for local livelihoods provides a compelling basis for urgent and sustained action. This review calls for the development of a dedicated national mangrove conservation framework, increased transparency and accountability in existing remediation programmes, and a sustained programme of scientific research to fill the knowledge gaps identified herein.

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