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# **Ecosystem Degradation And Endangered Species In The Niger Delta: Understanding The Biodiversity Crisis**

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## **ABSTRACT**

The Niger Delta, Africa's largest delta and one of the continent's most biologically diverse regions, is experiencing an accelerating biodiversity crisis driven by ecosystem degradation and unsustainable resource exploitation. This review synthesises current knowledge on the scale, drivers, and consequences of ecological decline in the region, with particular focus on deforestation, oil exploration and pollution, agricultural expansion, urbanisation, and climate change-induced sea-level rise. Drawing on peer-reviewed literature, policy documents, and institutional reports, the study adopts a qualitative thematic approach to examine patterns of habitat loss, species endangerment, and weakening ecosystem services. Findings indicate that chronic oil spills, gas flaring, mangrove deforestation, wetland reclamation, and land-use conversion have severely fragmented habitats and contaminated soils and waterways, undermining ecological integrity. These pressures have pushed several species toward extinction, including the critically endangered Niger Delta red colobus and the vulnerable West African manatee, while also threatening numerous aquatic and avian species dependent on mangrove and freshwater ecosystems. Beyond ecological impacts, biodiversity loss has eroded ecosystem services such as fisheries productivity, flood regulation, carbon sequestration, and water purification, thereby intensifying poverty, food insecurity, public health risks, and socio-political instability in local communities. Although Nigeria has established national and international conservation commitments, implementation gaps, weak enforcement, and limited institutional capacity continue to hinder effective biodiversity protection. The paper identifies pathways to sustainability, including ecosystem restoration, community-driven conservation, integration of biodiversity safeguards into oil and gas operations, strengthened governance, and climate adaptation strategies. It concludes that safeguarding the Niger Delta's ecosystems is both an environmental imperative and a foundation for sustainable development, resilience, and long-term socio-economic stability in the region.

**Keywords:** Niger Delta, Ecosystem, Biodiversity, Degradation

## 1.0 INTRODUCTION

### 1.1 Background to the Study

The Niger Delta, situated in southern Nigeria, is the largest delta in Africa and the third-largest in the world, spanning an estimated 112,000 km<sup>2</sup> (Oyegun et al., 2023). Globally, it is regarded as a biodiversity hotspot, hosting the largest mangrove forest in Africa, which encompasses vast mangrove forests, freshwater swamps, lowland rainforests, and diverse coastal ecosystems that provide critical habitats for numerous plant and animal species (Akani et al., 2022; Ukpene et al., 2024). Its biodiversity supports millions of people through fisheries, agriculture, forestry, and other ecosystem services. The region is also the economic backbone of Nigeria, producing over 80% of the nation's oil and gas revenues (Abubakar & Onuche, 2022).

Despite its ecological and economic importance, the Niger Delta faces severe environmental degradation caused by oil exploration, deforestation, rapid industrialisation, agricultural expansion, urbanisation, and unsustainable land-use practices have severely threatened its ecological integrity (Angaye & Lelei, 2025). Oil spills and gas flaring have contaminated soils and waterways, while mangrove deforestation has disrupted ecosystem services such as carbon sequestration, fisheries productivity, and flood regulation (Ukpene et al., 2024).

Biodiversity loss in the Niger Delta is driven by multiple anthropogenic pressures. Oil exploration and exploitation remain the most significant, with oil spills, gas flaring, and pipeline leakages contaminating soils, rivers, and wetlands, leading to habitat destruction and species decline (Angaye & Lelei, 2025). In addition, deforestation for timber, agriculture, and urban expansion has fragmented critical habitats, reducing the resilience of ecosystems and pushing many species toward extinction (Akani et al., 2022). Freshwater ecosystems, which are vital for both biodiversity and human livelihoods, are particularly vulnerable to overexploitation, pollution, and invasive species, resulting in declining fish populations and the disruption of ecological balance (Davies et al., 2020).

The consequences of biodiversity loss in the Niger Delta extend beyond ecological impacts. The degradation of mangroves and wetlands undermines ecosystem services such as flood regulation, carbon sequestration, and water purification, while also threatening food security and cultural heritage (Davies et al., 2020). Local communities, whose livelihoods depend heavily on natural resources, face increasing vulnerability as environmental degradation erodes their economic and social resilience. Moreover, the decline of endangered species such as the Niger Delta red colobus monkey (*Ptilocolobusepieni*) and the African manatee (*Trichechus senegalensis*) shows the urgency of conservation interventions (Akani et al., 2022).

The ecological crisis in the Niger Delta thus represents not only a conservation challenge but also a socio-economic and public health concern for millions of people who depend on its ecosystems for survival. Given the scale and complexity of these challenges, understanding the drivers, impacts, and potential solutions to biodiversity loss in the Niger Delta is critical.

### 1.2 Objective and Scope

This review examines current knowledge on ecosystem degradation, endangered species, and conservation challenges in the region by examining the key drivers of ecological decline. It assesses both the ecological consequences and the socio-economic impacts on local communities whose livelihoods depend on fisheries, agriculture, and forest resources. In addition, the review shows the status of endangered and threatened species in the region, drawing attention to those most at risk of extinction. It further evaluates the effectiveness of existing conservation efforts, policy frameworks, and community-based initiatives aimed at mitigating biodiversity loss, while identifying persistent gaps in enforcement and implementation. Lastly, the paper proposes pathways for sustainable biodiversity management, emphasising the need for integrated approaches that combine ecological restoration, policy reform, and community participation to safeguard the Niger Delta's ecosystems for future generations.

### 1.3 Methodology and Sources of Information

This review adopts a qualitative synthesis approach, drawing on peer-reviewed journal articles, technical reports, and policy documents. Sources were identified through academic databases such as SpringerLink,

ScienceDirect, and Google Scholar, as well as institutional publications from the International Union for Conservation of Nature (IUCN) and the United Nations Development Programme (UNDP). Priority was given to studies published within the last two decades to ensure relevance, although seminal works on Niger Delta ecology and oil-related impacts were also included. The methodology involved thematic categorisation of literature into drivers of biodiversity loss, ecosystem impacts, species decline, and conservation responses.

## **2.0 Drivers of Biodiversity Loss**

The Niger Delta, once celebrated as a cradle of ecological abundance, is now gripped by relentless pressures that erode its natural wealth. Human activities and environmental change have converged to dismantle the delicate balance of its ecosystems, leaving forests fragmented, rivers polluted, and wetlands shrinking. From the chainsaws that strip away ancient rainforests to the oil spills that suffocate mangroves, each driver of biodiversity loss carves deep scars into the landscape. Agricultural expansion, unchecked urban growth, and the looming threat of climate change further compound the crisis, pushing species and communities alike toward vulnerability. The following subsections examine these forces in detail, revealing how they collectively unravel the ecological fabric of the Niger Delta.

### **2.1 Deforestation and Logging**

Deforestation and unsustainable logging practices are among the most significant drivers of biodiversity loss in the Niger Delta. The region's forests, once dense and biologically rich, have been subjected to rapid clearance for agriculture, settlement expansion, oil exploration, and timber extraction. Remote sensing studies reveal that forest cover in parts of the Niger Delta has declined drastically over the past three decades, with vegetation cover in Bayelsa State, for example, reducing from 50% in 1987 to just 38.5% by 2013 (Ekwugha et al., 2020). This large-scale forest depletion has fragmented habitats, disrupted ecological connectivity, and reduced the resilience of ecosystems to environmental stressors.

Logging, both legal and illegal, further exacerbates the problem. Commercial timber extraction targets valuable hardwood species, while fuelwood harvesting by local communities' places additional pressure on forest resources. Enaruvbe and Atafo (2014) demonstrated that deforestation in the Niger Delta is strongly linked to human population growth, infrastructure development, and agricultural expansion, with cropland and secondary vegetation increasingly replacing natural forests. The loss of primary forest cover not only diminishes biodiversity but also undermines ecosystem services such as carbon sequestration, soil fertility maintenance, and watershed protection.

The ecological consequences of deforestation are profound. Habitat destruction has led to the decline of numerous species, including primates, forest elephants, and endemic flora, while also threatening the survival of endangered species such as the Niger Delta red colobus (*Piliocolobusepieni*). Moreover, the removal of forest cover accelerates soil erosion, increases vulnerability to flooding, and contributes to climate change through greenhouse gas emissions (Nwachukwu et al., 2025). These impacts extend beyond ecological systems, affecting local livelihoods that depend on forest products, fisheries, and agriculture.

### **2.2 Oil Exploration and Pollution**

Oil exploration and production remain the most pervasive drivers of biodiversity loss in the Niger Delta. Since the discovery of crude oil in Oloibiri in 1956, the region has become the hub of Nigeria's petroleum industry, accounting for over 80% of the nation's export earnings. However, this economic reliance has come at a devastating ecological cost. Oil spills, gas flaring, and pipeline leakages have severely degraded terrestrial and aquatic ecosystems, leading to habitat destruction, species decline, and the disruption of ecosystem services (Bello & Nwaeke, 2023).

Oil spills are particularly destructive, contaminating soils, rivers, and wetlands with hydrocarbons and heavy metals. These pollutants reduce soil fertility, impair photosynthesis in plants, and cause mass mortality of fish and other aquatic organisms. Dzedzemoon and Ferro (2024) note that oil spills in the Niger Delta have led to the collapse of local fisheries, threatening food security and livelihoods for millions of people. The persistence of crude oil in sediments and mangrove roots further hampers natural

regeneration, leaving ecosystems in a prolonged state of degradation. Mangrove forests, which serve as critical breeding grounds for fish and crustaceans, have been especially vulnerable, with large tracts destroyed by chronic oil contamination.

Gas flaring, another hallmark of oil production in the Niger Delta, compounds the ecological crisis. Nigeria remains one of the world's top gas-flaring nations, releasing vast amounts of carbon dioxide, methane, and other toxic gases into the atmosphere. This practice contributes to climate change, acid rain, and local air pollution, which in turn damage crops, reduce biodiversity, and pose serious health risks to nearby communities (Dzedzemoon & Ferro, 2024). The constant heat and soot from flares also alter microclimates, degrade soil quality, and disrupt nocturnal wildlife behaviour.

The cumulative effects of oil exploration and pollution extend beyond ecological damage to socio-economic destabilisation. Bello and Nwaeke (2023) emphasise that oil-related environmental degradation has displaced communities, eroded traditional livelihoods such as farming and fishing, and fuelled conflicts over resource control. The inability of regulatory frameworks to enforce strict environmental standards has allowed multinational oil companies to operate with limited accountability, perpetuating cycles of ecological destruction and social unrest.

### **2.3 Agricultural Expansion and Land-Use Change**

Agricultural expansion and land-use change have emerged as major drivers of biodiversity loss in the Niger Delta, reshaping landscapes and accelerating ecosystem degradation. Rapid population growth and the demand for food security have intensified the conversion of forests, wetlands, and mangroves into farmland. Between 1986 and 2024, agricultural land in the Niger Delta increased by approximately 6,727 km<sup>2</sup> (a 79% rise), while rainforest and mangrove cover declined by 42% and 54%, respectively (Agumagu et al., 2025). This large-scale transformation has fragmented habitats, reduced ecological connectivity, and placed immense pressure on species that depend on intact ecosystems for survival.

The expansion of subsistence and commercial farming often involves slash-and-burn practices, which not only clear vegetation but also deplete soil nutrients and increase greenhouse gas emissions. In many parts of the Niger Delta, wetlands and floodplains have been drained or converted into rice paddies, cassava farms, and oil palm plantations, leading to the loss of critical breeding grounds for fish, amphibians, and migratory birds (Onwuteaka, 2014). Such land-use changes disrupt hydrological cycles, worsen erosion, and reduce the capacity of ecosystems to buffer against floods and climate variability.

Beyond ecological impacts, agricultural expansion has profound socio-economic consequences. While farming provides livelihoods for millions of rural households, the unsustainable conversion of natural habitats undermines long-term productivity by degrading soils and reducing ecosystem services such as pollination and water purification. Agumagu et al. (2025) emphasise that the decline of mangroves and rainforests not only threatens biodiversity but also weakens the resilience of local communities to climate-related hazards. This trade-off between short-term agricultural gains and long-term ecological sustainability emphasises the urgent need for integrated land-use planning and sustainable agricultural practices in the Niger Delta.

### **2.4 Urbanisation and Infrastructure Development**

Urbanisation and infrastructure development have become increasingly significant drivers of biodiversity loss in the Niger Delta. Rapid population growth, rural-to-urban migration, and oil-driven economic activities have transformed once pristine landscapes into sprawling urban centres. Cities such as Port Harcourt, Warri, and Yenagoa have expanded rapidly, often without adequate urban planning, leading to the encroachment of settlements on wetlands, mangroves, and forested areas (Enwin et al., 2025). This expansion has resulted in widespread habitat fragmentation, deforestation, and the loss of critical breeding grounds for aquatic and terrestrial species.

The construction of roads, bridges, and oil-related infrastructure has further exacerbated ecological degradation. These projects often cut through sensitive ecosystems, disrupting wildlife corridors and altering hydrological systems. For instance, the reclamation of wetlands for housing estates and industrial zones has reduced the natural flood-buffering capacity of the delta, increasing vulnerability to flooding and erosion (Ogbodo, 2024). Moreover, poorly managed waste disposal and inadequate drainage systems

in rapidly urbanising areas contribute to water pollution, eutrophication, and the decline of aquatic biodiversity.

The environmental consequences of unchecked urbanisation are profound. Enwin et al. (2025) documented that urban expansion in Yenagoa has led to deforestation, wetland degradation, air and water pollution, and biodiversity loss, alongside increased waste generation and the urban heat island effect. These changes not only threaten ecological integrity but also undermine human well-being by reducing access to clean water, increasing health risks, and eroding ecosystem services that sustain livelihoods. Similarly, Ogbodo (2024) highlights how infrastructure projects implemented by the Niger Delta Development Commission (NDDC) often fail to integrate environmental safeguards, thereby accelerating land degradation and biodiversity decline.

### **2.5 Climate Change and Sea-Level Rise**

Climate change and sea-level rise represent some of the most pressing threats to biodiversity in the Niger Delta, a region already vulnerable due to its low-lying terrain and extensive wetlands. The delta's average elevation is less than three meters above sea level, making it highly susceptible to tidal surges, flooding, and coastal erosion (Emejiri&Ikebude, 2025). Recent geospatial analyses have shown that shoreline retreat in parts of the Niger Delta is occurring at alarming rates, with erosion averaging nearly 4 meters per year over the past three decades. This steady coastal retreat has resulted in the loss of mangrove forests, wetlands, and agricultural lands, directly undermining the habitats of numerous species and threatening the livelihoods of local communities.

The ecological consequences of sea-level rise are profound. Mangrove ecosystems, which serve as nurseries for fish and crustaceans, are being drowned by saline intrusion and erosion, while freshwater swamps are increasingly inundated, altering their ecological balance (Ibe, 2023). Rising sea levels also accelerate the salinisation of rivers and aquifers, reducing the availability of freshwater for both biodiversity and human use. These changes disrupt the delicate balance of deltaic ecosystems, leading to declines in fish populations, amphibians, and migratory bird species that depend on wetlands for breeding and feeding.

Beyond ecological impacts, climate change and sea-level rise exacerbate socio-economic vulnerabilities in the Niger Delta. Flooding and land loss displace communities, destroy farmlands, and erode cultural heritage sites. Fasinu et al. (2024) emphasise that climate-induced environmental degradation has intensified resource conflicts in the region, as shrinking arable land and declining fisheries fuel competition among local populations. The combined pressures of ecological loss and social instability further weaken the adaptive capacity of communities, leaving them more exposed to future climate shocks.

### **3.0 Ecosystem Degradation in the Niger Delta**

The Niger Delta's ecosystems, once vibrant and teeming with life, are now bearing the scars of relentless human and industrial pressures. Mangrove forests that once shielded coastlines and nurtured fisheries are shrinking, wetlands that regulated floods and sustained biodiversity are fragmenting, and soils and waters are poisoned by oil spills and industrial effluents. As these natural systems unravel, the vital services they provide, such as food security, clean water, climate regulation, and cultural heritage, are steadily eroded. The following subsections explore the dimensions of this degradation, revealing how ecological decline is reshaping both the environment and the lives of those who depend on it.

#### **3.1 Mangrove Forest Decline**

The Niger Delta hosts the largest mangrove forest in Africa, covering nearly 1,900 km<sup>2</sup>, yet this critical ecosystem has been severely degraded by oil pollution, deforestation, and coastal erosion. Chronic oil spills have coated mangrove roots with crude oil, suffocating pneumatophores and preventing natural regeneration (Chima, 2016). Ogbeibu and Oribhabor (2023) emphasise that mangrove decline has cascading ecological effects, including the collapse of fisheries, loss of shoreline protection, and reduced carbon sequestration capacity. Remote sensing studies further reveal that mangrove cover has declined significantly over the past three decades, with many areas converted into bare mudflats or degraded swamps (Ayanlade et al., 2020).

### **3.2 Wetland Loss and Fragmentation**

The Niger Delta's wetlands, which constitute one of the most extensive freshwater ecosystems in West Africa, are rapidly disappearing due to land reclamation, agriculture, and infrastructure development. Ayanlade and Proske (2016) documented that between 1984 and 2011, wetlands in the region experienced significant fragmentation, reducing their ecological integrity and capacity to provide ecosystem services. These wetlands are vital for flood regulation, nutrient cycling, and as habitats for migratory birds, yet their degradation has led to declining biodiversity and increased vulnerability of local communities to flooding and erosion (Ayanlade et al., 2020).

### **3.3 Soil and Water Contamination**

Soil and water contamination from oil spills and industrial effluents represent another major dimension of ecosystem degradation. Hydrocarbon pollution alters soil chemistry, reduces fertility, and renders large tracts of farmland unproductive (Ewim et al., 2023). Similarly, crude oil contamination of rivers and creeks has led to widespread fish kills, bioaccumulation of toxins in aquatic organisms, and long-term ecological damage (EjikeEwim et al., 2023). A recent review by World Scientific News (2024) highlights that over three decades of oil spillage have left persistent hydrocarbon residues in sediments, making natural recovery extremely slow. This contamination not only undermines biodiversity but also poses severe risks to human health through polluted drinking water and contaminated food chains.

### **3.4 Decline in Ecosystem Services**

The combined effects of mangrove loss, wetland degradation, and pollution have eroded the ecosystem services that sustain both biodiversity and human livelihoods. Fisheries productivity has plummeted, agricultural yields have declined due to soil infertility, and the natural flood-buffering capacity of wetlands has been compromised. These losses exacerbate poverty, food insecurity, and displacement in local communities, while also weakening the region's resilience to climate change (Ogbeibu & Oribhabor, 2023).

## **4.0 Endangered and Threatened Species in the Niger Delta**

The following subsections highlight terrestrial, aquatic, and avian species whose decline reflects the broader ecological crisis engulfing the Niger Delta.

### **4.1 Terrestrial Species**

The Niger Delta is home to several terrestrial species that are now critically endangered due to habitat destruction, hunting, and deforestation. One of the most notable is the *Niger Delta red colobus* (*Ptilocolobusepieni*), a primate endemic to the region and listed as *Critically Endangered* by the IUCN. Its population has been decimated by logging, agricultural expansion, and hunting pressures, with fewer than 500 individuals estimated to remain in fragmented forest patches (Izah & Aigberua, 2023). Other terrestrial mammals such as the African forest elephant (*Loxodonta cyclotis*) and the Nigeria-Cameroon chimpanzee (*Pan troglodytes ellioti*) are also under severe threat, primarily from habitat loss and poaching (Ogbeibu & Oribhabor, 2023).

### **4.2 Aquatic and Marine Species**

Aquatic ecosystems in the Niger Delta are equally imperilled. The West African manatee (*Trichechus senegalensis*), a gentle herbivorous mammal, is threatened by habitat degradation, boat collisions, and entanglement in fishing gear. Oil pollution and illegal artisanal refining ("kpo-fire") have further degraded aquatic habitats, leading to mass fish kills and the decline of commercially important species (Davies et al., 2020; Eze & Nwankwo, 2023). Freshwater fish diversity has been particularly affected, with several species experiencing population declines due to eutrophication, oil contamination, and overfishing. Sea turtles, including the olive ridley (*Lepidochelys olivacea*), which nest along the Niger Delta's beaches, face threats from coastal erosion, poaching, and light pollution (Onu, 2025).

### **4.3 Avian Species**

The Niger Delta wetlands and mangroves provide critical habitats for both resident and migratory bird species. However, avian biodiversity is declining due to wetland reclamation, oil spills, and hunting. Species such as the grey parrot (*Psittacus erithacus*), once abundant in the region, have suffered sharp

population declines due to habitat loss and the illegal pet trade (Izah, 2018). Migratory waterbirds that rely on the delta as a stopover site along the East Atlantic Flyway are also increasingly vulnerable as wetlands shrink and pollution intensifies (Izah & Aigberua, 2023). The loss of avian diversity not only threatens ecological balance but also undermines cultural and economic values tied to birdlife in local communities.

## **5.0 Ecological and Socioeconomic Impacts**

### **5.1 Loss of Ecosystem Services**

The degradation of forests, wetlands, and mangroves in the Niger Delta has led to a severe decline in ecosystem services that sustain both biodiversity and human communities. Mangroves, for instance, once acted as natural buffers against coastal erosion and storm surges, but their destruction has left communities increasingly vulnerable to flooding and shoreline retreat (Nwachukwu et al., 2025). Similarly, the loss of wetlands has reduced the region's capacity for water purification, nutrient cycling, and carbon sequestration, undermining ecological resilience in the face of climate change (Ibe et al., 2020).

### **5.2 Impacts on Local Livelihoods**

Biodiversity loss directly threatens the livelihoods of millions of people in the Niger Delta who depend on fishing, farming, and forest resources. Oil spills and gas flaring have decimated fish populations, leading to declining catches and food insecurity among fishing communities (Angaye & Lelei, 2025). Agricultural productivity has also been compromised by soil contamination and deforestation, forcing many households into poverty. According to Nwachukwu et al. (2025), the collapse of ecosystem services has intensified rural poverty, unemployment, and migration, further straining the region's socio-economic fabric.

### **5.3 Cultural and Indigenous Knowledge Erosion**

The biodiversity crisis also erodes cultural heritage and indigenous ecological knowledge. Many communities in the Niger Delta hold deep spiritual and cultural ties to forests, rivers, and wildlife, which are integral to their identity and traditional practices. As habitats disappear and species decline, these cultural connections weaken, leading to the loss of traditional ecological knowledge that has historically guided sustainable resource use (CBD, 2015).

### **5.4 Public Health Implications**

Environmental degradation in the Niger Delta has significant public health consequences. Oil-contaminated water sources expose communities to carcinogens and heavy metals, while gas flaring contributes to respiratory illnesses and other chronic health conditions (Angaye & Lelei, 2025). The decline in ecosystem services such as clean water and air purification further exacerbates health risks, disproportionately affecting vulnerable populations such as children and the elderly.

### **5.5 Socio-Political Instability**

Finally, biodiversity loss and ecosystem degradation contribute to socio-political instability in the Niger Delta. Competition over shrinking natural resources has fueled conflicts, protests, and militancy, undermining peace and security in the region (Nwachukwu et al., 2025). The ecological crisis thus intersects with governance challenges, making biodiversity conservation not only an environmental imperative but also a socio-political necessity.

## **6.0 Conservation Efforts and Policy Frameworks**

### **6.1 National and Regional Conservation Policies**

Nigeria has established several policies and legal frameworks aimed at conserving biodiversity in the Niger Delta. The National Biodiversity Strategy and Action Plan (NBSAP), developed in line with the Convention on Biological Diversity (CBD), outlines strategies for protecting ecosystems, species, and genetic resources (Federal Ministry of Environment, 2016). Additionally, the Endangered Species (Control of International Trade and Traffic) Act provides legal protection for threatened species, while the Environmental Impact Assessment (EIA) Act mandates environmental reviews for major development

projects. Despite these frameworks, enforcement remains weak, with limited institutional capacity and political will undermining their effectiveness (Akinlabi, 2023).

### **6.2 Role of NGOs and Community-Based Initiatives**

Non-governmental organisations (NGOs) and local communities play a critical role in biodiversity conservation in the Niger Delta. Community-based forest management initiatives have emerged in areas such as Bayelsa and Cross River states, where local people are directly involved in protecting mangroves and wetlands (Awuchi, Nwosu, & Ochia, 2023). NGOs such as the Niger Delta Wetlands Centre and Environmental Rights Action (ERA) have also been instrumental in raising awareness, advocating for policy reforms, and implementing grassroots conservation projects. However, these initiatives often face challenges such as inadequate funding, weak government support, and conflicts with oil companies.

### **6.3 International Conventions and Agreements**

Nigeria is a signatory to several international agreements that support biodiversity conservation, including the Convention on Biological Diversity (CBD), the Ramsar Convention on Wetlands, and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). These agreements commit the country to global standards of biodiversity protection and sustainable resource use. For example, under the Ramsar Convention, Nigeria has designated several wetlands of international importance, including parts of the Niger Delta (Ramsar, 2022). Yet, implementation of these commitments at the local level remains inconsistent, with many wetlands still facing degradation due to oil pollution and land reclamation.

### **6.4 Gaps and Challenges in Enforcement**

Despite the existence of policies and international commitments, biodiversity conservation in the Niger Delta is hindered by weak enforcement, corruption, and overlapping institutional mandates. Akinlabi (2023) notes that environmental laws are often poorly implemented, with oil companies frequently escaping accountability for spills and habitat destruction. Furthermore, the lack of reliable biodiversity data and monitoring systems makes it difficult to track progress or design evidence-based interventions. Without stronger governance, adequate funding, and community participation, conservation efforts risk being symbolic rather than transformative.

## **7.0 Pathways to Sustainability**

### **7.1 Restoration and Reforestation Strategies**

Restoration of degraded ecosystems, particularly mangroves and rainforests, is central to biodiversity recovery in the Niger Delta. Mangrove restoration projects led by local NGOs such as the Centre for Environment, Human Rights and Development (CEHRD) have demonstrated that community-led planting can revive degraded wetlands, enhance fisheries productivity, and strengthen coastal protection (FairPlanet, 2024). Similarly, the Southwest/Niger Delta Forest Project has pioneered habitat restoration and reforestation programs targeting endemic species such as the Niger Delta red colobus, combining conservation research with community engagement (SW Niger Delta Forest Project, 2024).

### **7.2 Community-Driven Conservation Approaches**

Community participation is increasingly recognised as a cornerstone of effective biodiversity conservation. Awuchi et al. (2023) argue that empowering local communities through environmental governance, education, and sustainable livelihood programs enhances conservation outcomes while reducing dependence on destructive practices. Examples include community-managed mangrove forests and participatory monitoring of endangered species. By aligning conservation with socio-economic benefits, these approaches foster local ownership and resilience.

### **7.3 Integrating Biodiversity into Oil and Gas Sector Practices**

Given the dominance of oil and gas in the Niger Delta, integrating biodiversity safeguards into extractive industry practices is essential. The IUCN-Niger Delta Biodiversity Project has recommended biodiversity action plans for oil companies, including habitat offsets, improved spill response, and ecological monitoring throughout the project lifecycle (IUCN, 2018). Ecological modernisation frameworks suggest that oil companies can adopt cleaner technologies, reduce gas flaring, and invest in habitat restoration as

part of corporate social responsibility (African Leadership Magazine, 2025). Such integration not only mitigates ecological damage but also enhances corporate accountability.

#### **7.4 Climate Adaptation and Resilience Measures**

Climate change adaptation is critical for safeguarding biodiversity and human livelihoods in the Niger Delta. Strategies include mangrove restoration to buffer against sea-level rise, construction of climate-resilient infrastructure, and strengthening institutional frameworks for disaster risk management (Ogbonna et al., 2021). Building resilience also requires diversifying local economies away from oil dependence, promoting sustainable aquaculture, and enhancing early warning systems for floods and coastal erosion (Ogbonna et al., 2020). These measures ensure that conservation efforts are not undermined by climate-induced shocks.

### **8.0 Future Directions and Research Needs**

#### **8.1 Emerging Threats and Uncertainties**

While oil pollution, deforestation, and land-use change remain dominant drivers of biodiversity loss, new threats are emerging. Climate change is intensifying flooding, salinisation, and coastal erosion, while illegal artisanal refining (“kpo-fire”) continues to devastate aquatic ecosystems (Eze & Nwankwo, 2023). Invasive species, such as water hyacinth (*Eichhornia crassipes*), are spreading rapidly across rivers and wetlands, choking waterways and disrupting fisheries (Izah&Aigberua, 2023). These evolving pressures demand adaptive conservation strategies that can respond to dynamic ecological and socio-economic conditions.

#### **8.2 Priority Areas for Biodiversity Monitoring**

Effective conservation requires robust biodiversity monitoring systems, yet data gaps remain a major challenge in the Niger Delta. Many endangered species, including the Niger Delta red colobus and West African manatee, lack updated population assessments, making it difficult to design targeted interventions (Izah&Aigberua, 2023). Establishing long-term ecological monitoring programs, supported by remote sensing and community-based data collection, is critical for tracking habitat changes, species populations, and the effectiveness of conservation measures (Ayanlade et al., 2020).

#### **8.3 Opportunities for Interdisciplinary Research**

Future research must adopt interdisciplinary approaches that integrate ecology, socio-economics, and governance. Studies that link biodiversity loss to public health, food security, and conflict dynamics can provide holistic insights into the cascading impacts of ecosystem degradation (Nwachukwu et al., 2025). Furthermore, research on climate adaptation, ecological restoration, and sustainable livelihoods can inform policies that balance conservation with development. Collaborative efforts between universities, NGOs, and local communities will be essential for generating actionable knowledge and building resilience.

#### **8.4 Policy and Governance Innovations**

Strengthening governance frameworks is a key research priority. Investigating mechanisms for improving environmental law enforcement, enhancing transparency in oil sector operations, and integrating biodiversity safeguards into infrastructure planning can help bridge existing policy gaps (Akinlabi, 2023). Research into community-driven governance models, where local people play a central role in decision-making, offers promising pathways for sustainable biodiversity management.

### **9.0 CONCLUSION AND RECOMMENDATIONS**

#### **9.1 Conclusion**

The Niger Delta stands as both a cradle of biodiversity and a symbol of ecological fragility. Its mangroves, wetlands, rainforests, and freshwater ecosystems once flourished as some of the richest habitats in Africa, sustaining countless species and millions of human lives. Yet, decades of oil exploration, deforestation, agricultural expansion, urbanisation, and climate change have relentlessly eroded this natural heritage. The consequences are stark: endangered species pushed to the brink of

extinction, ecosystem services diminished, and local communities left vulnerable to poverty, food insecurity, and environmental hazards.

This review has shown that biodiversity loss in the Niger Delta is not merely an ecological concern but a multidimensional crisis with profound socio-economic and cultural implications. The decline of species such as the Niger Delta red colobus, African manatee, and migratory waterbirds reflects the broader unravelling of ecological networks that once sustained resilience in the region. At the same time, the degradation of mangroves and wetlands undermines livelihoods, erodes indigenous knowledge, and intensifies conflicts over shrinking resources.

Despite these challenges, pathways to sustainability remain within reach. Restoration and reforestation initiatives, community-driven conservation, integration of biodiversity safeguards into oil and gas practices, and climate adaptation strategies offer practical solutions. However, their success depends on strong governance, effective policy enforcement, and genuine collaboration between government, industry, NGOs, and local communities.

In conclusion, the biodiversity crisis in the Niger Delta is both urgent and solvable. Protecting its ecosystems and species is not only a moral and ecological imperative but also a foundation for sustainable development, peace, and resilience in Nigeria. The future of the Niger Delta depends on immediate, coordinated action, one that values biodiversity as a shared heritage and invests in its preservation for generations to come.

## 9.2 Recommendations and Call to Action

The findings of this review show the urgent need for decisive action to halt and reverse biodiversity loss in the Niger Delta. The region's ecosystems, once resilient and abundant, are now under severe strain from oil pollution, deforestation, agricultural expansion, urbanisation, and climate change. These pressures have not only endangered species but also eroded the ecological foundations that sustain livelihoods, cultural heritage, and human well-being. Addressing this crisis requires a multi-dimensional approach that combines strong governance, community participation, ecological restoration, and climate resilience. The following recommendations are therefore proposed as practical pathways to safeguard biodiversity and promote sustainable development in the Niger Delta.

- i. **Strengthen Environmental Governance and Enforcement:** Effective biodiversity conservation in the Niger Delta requires stronger enforcement of existing environmental laws and policies. Regulatory agencies such as the Federal Ministry of Environment and the National Oil Spill Detection and Response Agency (NOSDRA) must be empowered with adequate resources, technical capacity, and political independence to monitor oil companies, enforce penalties for environmental violations, and ensure compliance with international conventions. Transparent reporting and accountability mechanisms should be institutionalised to reduce corruption and enhance public trust.
- ii. **Promote Community-Based Conservation Initiatives.** Local communities should be at the centre of biodiversity conservation. Community-driven forest and mangrove management programs can foster ownership, reduce illegal logging, and enhance ecological restoration. Training and capacity-building initiatives should be provided to empower communities with sustainable livelihood alternatives such as aquaculture, eco-tourism, and non-timber forest product harvesting. Integrating indigenous ecological knowledge into conservation planning will also strengthen cultural ties to biodiversity and improve long-term sustainability.
- iii. **Invest in Ecosystem Restoration and Reforestation** Large-scale restoration of degraded mangroves, wetlands, and rainforests is critical to reversing biodiversity loss. Government agencies, NGOs, and oil companies should collaborate on reforestation projects that prioritise native species and restore ecological connectivity. Restoration programs should also integrate climate adaptation strategies, such as mangrove planting to buffer against sea-level rise and erosion.
- iv. **Integrate Biodiversity Safeguards into Oil and Gas Operations:** Oil companies operating in the Niger Delta must adopt biodiversity-sensitive practices, including improved spill response

mechanisms, reduction of gas flaring, and ecological offsets for habitat destruction. Corporate social responsibility (CSR) programs should prioritise biodiversity conservation and community development, ensuring that extractive activities do not undermine ecological integrity. Independent monitoring systems should be established to track compliance.

- v. **Enhance Research, Data Collection, and Monitoring Systems:** There is an urgent need for comprehensive biodiversity data to guide conservation efforts. Universities, research institutes, and NGOs should collaborate to establish long-term ecological monitoring programs using remote sensing, GIS, and community-based data collection. Priority should be given to updating population assessments of critically endangered species such as the Niger Delta red colobus and West African manatee. Research should also explore the links between biodiversity loss, public health, and socio-economic stability.
- vi. **Promote Climate Adaptation and Resilience Strategies:** Climate change adaptation must be mainstreamed into biodiversity conservation. Policies should support climate-resilient infrastructure, flood management systems, and mangrove restoration to mitigate sea-level rise. Diversifying local economies away from oil dependence through sustainable agriculture and renewable energy initiatives will also enhance resilience and reduce ecological pressures.
- vii. **Foster International Collaboration and Funding Support:** Nigeria should leverage its commitments under the Convention on Biological Diversity (CBD), Ramsar Convention, and CITES to attract international funding and technical support for biodiversity conservation. Partnerships with global organisations such as IUCN, UNEP, and WWF can provide expertise, resources, and innovative approaches to ecosystem restoration and species protection.

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