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# Mangrove Utilisation and Conservation Constraints in Akwa Ibom State, Nigeria

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**Abstract**

*Mangrove ecosystems in Southern Akwa Ibom State, Nigeria, represent critical ecological and socio-economic assets that support shoreline stability, biodiversity, and coastal livelihoods. However, these systems face rapid degradation from interacting anthropogenic and environmental pressures. While regional studies offer broad overviews, there remains a significant gap in localized, community-level empirical data linking household livelihood structures with specific mangrove conservation constraints. This study adopted a cross-sectional research design integrating field surveys, questionnaires (n = 384), and Key Informant Interviews (KII) across 18 randomly selected coastal communities in Mbo, Ibeno, Oron, Udung Uko, Eastern Obolo, and Ikot Abasi Local Government Areas. The empirical findings reveal a high structural dependency on mangrove resources, with fishing (38.8%) and farming (25.0%) serving as primary income sources. Over 52% of the households derive more than 25% of their income directly from mangrove-related activities, and 44.8% depend on them for over half of their earnings. Large household sizes and high dependency ratios (67%) supporting three or more dependents) act as major drivers of forest exploitation. Anthropogenic utilization is heavily skewed toward small-scale fishing (38.0%), crab/shrimp collection (29.2%), and timber extraction for firewood (33.3%) and domestic building (27.1%). Conservation constraints are highlighted by severe resource depletion (34.9%), land scarcity leading to agricultural encroachment within intertidal zones (56.0%) farming near mangroves regularly or occasionally), and a notable 40.1% decrease in timber availability. Furthermore, traditional top-down state management has historically marginalized local populations, resulting in weak community ownership and poor compliance. The study concludes that sustainable mangrove conservation in Akwa Ibom State cannot be decoupled from rural poverty alleviation. We recommend a paradigm shift toward Community-Based Mangrove Management (CBMM) frameworks that legally integrate indigenous institutions (e.g., Ekpe traditional societies), secure local forest tenure, provide subsidized alternative energy and fishing equipment, and promote economically viable alternative livelihoods such as integrated aquaculture and apiculture.*

***Keywords:*** *Mangrove Conservation, Livelihood Dependency, Resource Depletion, Community-Based Management, Akwa Ibom State, Niger Delta.*

## 1. Introduction

Mangrove ecosystems constitute a critical natural asset that supports shoreline stability, fisheries productivity, carbon sequestration, and the livelihoods of thousands of riverine households. Despite their ecological and socio-economic value, these mangrove forests are experiencing rapid degradation driven by multiple and interacting pressures, including fuelwood harvesting, conversion of mangrove stands to fish ponds and farms, sand mining, pollution, unregulated logging, and the growing impacts of climate variability such as sea-level rise, tidal flooding, and saltwater intrusion (Abraham et al, 2022, 2025; Imikan, et al, 2025). In the wider Niger Delta region, extensive oil

exploration and recurrent oil spills have further exacerbated mangrove loss, altering hydrological regimes and reducing biodiversity. These processes have weakened the resilience of mangrove-dependent communities and increased their vulnerability to poverty, food insecurity, and environmental hazards. Recent empirical studies in the Niger Delta and adjoining coastal zones have documented large-scale mangrove loss, changes in species composition, and declining ecosystem health. For example, regional-scale assessments by Boyle *et al*, (2025) and reports by the United Nations Environment Programme (2023) have mapped patterns of mangrove degradation and highlighted the ecological and economic consequences of habitat loss across the Delta.

There remains a significant gap in localized, community-level research that systematically links the condition of mangrove ecosystems with the everyday livelihood strategies, income structures, and coping mechanisms of specific riverine communities in Southern Akwa Ibom (Jimmy, 2025; Jimmy et al, 2025; Ekpeyong et al, 2025). In particular, there is limited empirical evidence on how different user groups such as artisanal fisher folk, oyster and periwinkle harvesters, fuelwood collectors, canoe carvers, and women engaged in fish processing are being affected by mangrove degradation and how they are adapting to declining resource availability. Moreover, very few studies have attempted to quantify the direct and indirect economic value of mangrove ecosystem services to households in this sub-region, or to assess the effectiveness of emerging alternative livelihood initiatives within the mangrove-dependent communities. Another critical gap relates to participatory and livelihood centered data. Existing literature scarcely integrates indigenous knowledge, gendered resource-use patterns, seasonal livelihood dynamics, and community-based management practices into mangrove valuation and conservation planning for Akwa Ibom South. As a result, current policy interventions are often based on generalized regional data and may not adequately reflect the socio-cultural and economic realities of local communities, leading to weak community ownership, poor compliance, and limited sustainability of conservation programmes. This study is therefore conceived to address these critical gaps by undertaking a detailed, localized assessment of the relationship between mangrove ecosystems utilization and conservation constraints in Southern Akwa Ibom State.

## 2. Literature Review

### *2.1 Mangrove Ecosystem*

The mangrove is a tropical and subtropical coastal forest that includes both red mangrove such as *Rhiz- ophora racemosa*, *Rhizophora mangle, Rhizophora harrisonii* (trees with stilt-shaped roots that descend into the silty mud of estuaries and brackish lagoons) and white mangroves such as *Avicennia germinanas*, *Laguncularia racemosa* (trees with pneumatophore roots). Mangrove is made up of various tree species. It thrives in fine, colloidal muddy and clayey sediments (Sinsin *et al*., 2018). Recent studies has extensively documented the range of resources derived from mangrove ecosystems, employing diverse methods to capture their ecological and socio-economic significance. According to the study of Bimrah (2022), a systematic review using the Millennium Ecosystem Assessment framework revealed that mangroves provide four major categories of resources provisioning, regulating, supporting, and cultural services yet research has disproportionately focused on provisioning resources such as fuelwood, timber, and fisheries. Similarly, Tasneem (2024), through a bibliometric analysis of publications from 1998 to 2023, confirmed that wood products and fish remain the most researched outputs of mangrove ecosystems, while cultural and supporting services such as spiritual values and nutrient cycling remain underexplored. These reviews highlight the methodological reliance on secondary data analysis and synthesis to identify global knowledge gaps. Field-based assessments further underscore the livelihood dependence of coastal populations on mangrove resources.

Nigeria's forest resources are classified into timber, NTFPs, wildlife, and ecological services. Timber species such as iroko, mahogany, obeche, and afara are economically important; however, many are now listed as threatened due to illegal logging (Ogunjinmi *et al.*, 2021). NTFPs including bush mango, bitter kola, raffia palm, and medicinal plants remain central to rural livelihoods (Ikpa *et al.,* 2022). Wildlife, including primates and antelopes, has declined sharply due to poaching and habitat fragmentation. Nigeria's ecological services especially climate regulation, watershed protection, and soil stabilization have also been affected by deforestation (Atairet *et al.,* 2024).

According to Sulochanan (2020) in a study conducted on Mangrove ecosystem and its impact on fisheries posited that Mangroves are highly productive components of the food web of coastal ecosystem. Detritus of plant material serves as the basis of food web and contributes to the good quality of mangrove habitat, that many commercial finfish and shell fish species depends on mangrove habitat for part of their life cycle. The study went further to take inventory of an analysis of the impact of mangrove plants on marine carbon inventories then suggested that the mangroves account for more than 10% of the terrestrially derived dissolved organic carbon transported to the ocean, while they cover only 0.1% of the continents' surface. Many birds also utilize mangrove habitat for their feeding and

breeding. Mangrove habitats have also become important for the purpose of aquaculture and other aquatic utilization and usage. Mangrove forests have a huge value for coastal communities that derive their livelihoods from them. Additionally, mangroves provide many of their needs, usually complemented with other productive activities such as farming, poultry, bee-farming and so on. Mangrove wood is a multipurpose resource for fish stakes, fish traps, boat building, boat paddles, yam stakes, fencing, carvings, building timber, fuel and many other uses (World Rainforest Movement. 2002).

The mangrove ecosystem provides an indispensable foundation for the livelihoods of millions of people, particularly those in tropical and subtropical coastal regions. According to the study of Mallick (2021), mangrove-dependent communities derive both direct and indirect livelihood benefits from fisheries, timber, non-timber products, and ecological services. These resources sustain not only subsistence needs but also provide avenues for income generation, thus integrating mangroves into local, regional, and even global economic systems. The role of mangroves in livelihood provisioning is especially evident in developing countries, where rural populations exhibit high dependence on natural resources for survival and resilience against poverty. One of the most significant livelihood contributions of mangroves is their support for artisanal and small-scale fisheries. As Owuor (2024) demonstrated through ecological mapping and household surveys, mangrove ecosystems function as nursery grounds for commercially valuable fish species, shrimp, crabs, and mollusks. These resources form the backbone of food security in coastal settlements while also generating marketable surplus for sale in local and regional markets.

In addition, the literature demonstrates that mangrove ecosystems support livelihoods in multidimensional ways, ranging from direct provisioning of fisheries and wood products to indirect benefits through ecological regulation and cultural services. However, as Bimrah (2022) and Tasneem (2024) emphasized, existing livelihood assessments often prioritize material benefits while undervaluing cultural and regulating services. This imbalance creates a research and policy gap, particularly in regions like the Niger Delta, where community survival is closely tied to mangrove resources. Therefore, assessing livelihoods provided by mangrove ecosystems requires an integrated approach that recognizes both tangible and intangible benefits, ensuring that sustainable management strategies adequately capture the full spectrum of contributions to human well-being. Mangroves, tropical intertidal forest habitats, stretch along the Ivorian coast from east to west. They have played, and continue to play, a major role throughout the entire Ivorian coast: the wood is used to construct houses and structures, as well as equipment for making fishing nets and, most critically, as firewood (Alexandre *et al.,* 2019; FAO, 2009; N'Da *et al.,* 2019).

Over the last two decades, Côte d'Ivoire has lost a significant number of mangroves. Indeed, they decreased from 30,200 ha in 1980 to 20,100 ha in 1990, 9940 ha in 2000, and 9900 ha in 2005 (FAO, 2007; Egnankou, 2010). However, Mangrove ecosystem that provide several ecological and socio-economic benefits as captured by the United Nations Environmental Programme (UNEP, 2014) are declining worldwide and therefore require appropriate conservation and management. Besides the ecosystem service such as wood and non-wood products, storm protection, phyto remediation, and sediment trapping (Rogers *et al*., 2019). Mangrove also benefit the local communities as well as people living far beyond through its direct carbon sequestration and climate change regulation. The ecosystems on Côte d'Ivoire's land have been significantly degraded (UNEP, 2007), with the highest annual rate of reduction (4.4%) among African mangroves. Their rapid global decline and the risk of biodiversity loss can be attributed in part to human activities (Bouahim, 2010). Despite the diversity of services they provide, the importance of mangroves is poorly known in Côte d'Ivoire, and this is causing a sharp decline in their area (Alexandre *et al*., 2019; Soro *et al.,* 2014). They do not receive the attention they deserve, according to Égnankou (2009), and are being deteriorated at an alarming rate along the shore.

Mangroves form an important ecosystem along the coastal region of Nigeria, and produces goods and services that are of environmental, ecological and economic importance to human society. Most of these people have strong economic ties with the coastal ecosystems with which they interact and interfere in various ways (Dahdouh-Guebas *et al.,* 2000). Several livelihood activities have been initiated along the Kenyan Coast to complement or replace existing activities. These include integrated fish farming, ecotourism, apiculture, and agro-forestry amongst others. Most of these people living in the coastal zone has strong economic ties with the coastal ecosystems with which they interact and interfere in various ways (Dahdouh-Guebas *et al.,* 2000). Several livelihood activities have been initiated along the Kenyan Coast to complement or replace existing activities. These include integrated fish farming, ecotourism, apiculture, and agro-forestry amongst others.

Some 20 million people rely on mangrove for survival (Spalding *et al,* 2024). This reliance is causing overexploitation of mangrove resources. Apart from the global climate change and its effects such as rise in temperature, sea level, atmospheric carbon dioxide among others, the decline in area of mangroves is mainly related to

anthropogenic activities (Saunders *et al.,* 2006), while some human uses have been sustainable for centuries, recent pressures are intense.

### *2.2 Challenges facing Mangrove Conservation*

Conservation of mangrove ecosystems requires a multi-dimensional approach that combines international frameworks, community participation, ecological restoration, technological innovations, and strong policy enforcement. While progress has been made, particularly in integrating local communities into conservation programs, significant gaps remain in enforcement capacity and in the valuation of ecosystem services that could incentivize sustainable conservation. Therefore, investigating conservation measures in regions like Akwa Ibom and the Niger Delta is crucial for identifying both the successes and limitations of existing strategies, and for designing more inclusive and adaptive approaches to mangrove management. Apart from their potential for cultivation, there are many reasons why mangrove swamps should be managed and conserved properly. MEA, (2005) summarize as follows that the unique and valuable range of services and functions provided by mangrove forest ecosystem make them far more valuable than the sum of the products they generate, in fact, Mangrove ecosystem can provide services that are significantly higher in value relative to alternative man made uses of land. Mangroves serve as important habitat and breeding grounds for fish and other fauna. This is in addition to the important role mangrove play in shoreline protection, waste assimilation, and carbon sequestration. The growing awareness on the production, protection and social benefits derived from mangrove ecosystems across the globe informed the sustainable management and conservation of mangrove forest (FAO, 2020).

The overall benefit of the management and conservation of the mangrove forest is to meet day-to-day requirement of the local inhabitants who depends on the forest for livelihood. Before now tiers of Government were seen as the key actors in mangrove conservation but in recent times attention there is a paradigm shift. According to Walter (2004), Government is no longer seen as sole or even primary stewards of forest resources; rather, policies are being formulated where local people are allowed as real partners in forest management and conversation. This action is a reflection of past failings of state management approaches, together, with the growing awareness that local people can be empowered to be effective forest and resource stewards. According to the International Tropical Timber Organization (2002), they formulated a criterion to include good governance, Indigenous rights, and institutional frameworks that foster sustainable forest management. ITTO emphasizes that forest governance should rely on strengthening local institutions and promoting appropriate financial resources, securing forest tenure, and undertaking extensive collaboration with local and Indigenous communities. Findings and assumption being widely acknowledged by researchers, environmental practitioners, policy makers and all stakeholders concerned with the management of mangrove forest. A study conducted by Walter (2014) in the Philippines revealed that some of the local management and conservation strategies for mangrove forests to include cutting down of mangroves trees (from unplanted forest), placement of fine to illegal mangrove cutting, incarceration to repeated offenders as well as local replanting of mangroves (re-afforestation).

The International Society for Mangrove Ecosystems (ISME) has also developed management guidelines specific to mangroves (International Society on Mangrove Ecosystems, and International Tropical Timber Organization (2004). These guidelines have taken a more science and conservation-oriented approach, as ISME identifies mangrove mismanagement as being a direct result of a lack of ecological data on, and monitoring of, mangrove forests (International Society on Mangrove Ecosystems, and International Tropical Timber Organization, 2017). In terms of practical measures and guidelines, ISME recommends instituting strict no-use zones alongside sustainable use zones, supporting community stewardship, and prohibiting the clearing of mangrove areas for commercial and industrial purposes, such as for aquaculture. A study conducted by Bisong *et al.,* (2017) pointed out in an attempt to protect wetland ecosystem (*estuary*) in Cross River State, that the local people used “Ekpe” (The Leopard Society) as a symbol of authority. Also, the use of communal rules and regulations where offenders may have their fishing equipment seized or destroyed. In extreme cases of offence, the offender stands excommunicated from the settlement. These laws were noted to be strongly obeyed not only by the community people but also be resource extractors and buyers as wells.

The mangrove forest in the Akwa Ibom south especially in Ikot Abasi, needs urgent protection due to the adverse impact of human activities, which had resulted in the decimation of their populations in many locations. Unabated destruction of the mangrove forest will result in local extinction of these species. Therefore, to reduce human impact on mangroves, protected areas need to be urgently established to restrict human entry into forest. This can be achieved in three ways: i. by law (public lands) for state or federal level ii. By purchase of private lands iii. By conservation easement, which would restrict developmental rights within mangrove forest. Deeds of property to land owners within and around mangrove

forests should be revoked or restricted to prevent the destruction of mangrove forest for purpose of building or establishing of any kind of developmental project (e.g., resort). Furthermore, persons who own land within this area can be compensated and asked to relinquish ownership for the sake of conserving the forests.

## 3. Materials and Methods

### 3.1 Study Area

The coastal region of southern Akwa Ibom State is situated in the Niger Delta region of Nigeria, extending approximately between 4°30′N and 4°50′N latitude and 7°30′E and 8°15′E longitude (Udo, 2019).

The area is a predominantly low-lying coastal plain and deltaic terrain virtually flat to gently undulating with a general seaward slope. Elevations are low (typically near sea level up to a few tens of metres inland; some interior low hills elsewhere in Akwa Ibom reach higher elevations but southern coastal parts are mostly <100–120 m). The extensive tidal flats, estuaries, lagoons and beach systems (e.g., Ibeno beach), with barrier beaches and spits in places. The coastline is indented by river estuaries and mangrove fringes which influence local sediment dynamics.

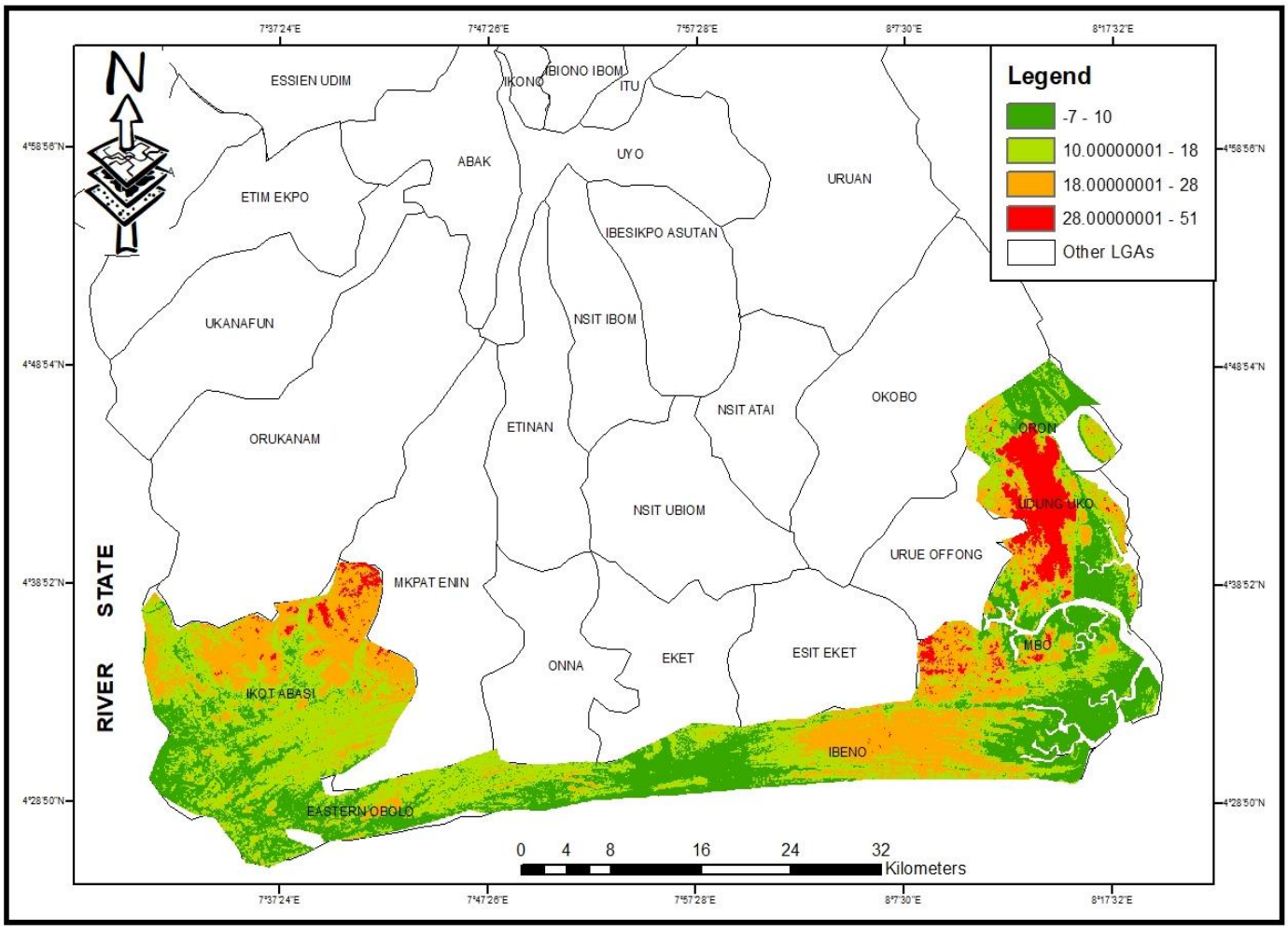


***Figure 1: Relief Map of the Study Area***
***Source: Compiled by Researcher from resources in the GIS Lab - University of Uyo***

### 3.2 Methods

The research adopted cross-sectional design integrating geographic information system (GIS) analysis, field-based surveys, and questionnaires. The study was carried out in Mbo, Ibeno, Oron, Udung Uko, Eastern Obolo and Ikot Abasi, of among 49 communities, 18 communities were randomly selected to carry out the study. Key Informant Interviews (KII) with village council leaders, forest guards, and NTFP harvesters were utilized**.** The KII guide explored deeper issues such as historical changes in mangrove extent, challenges in resource management, livelihood transitions, and conservation measures. The aim was to gather facts, viewpoints, experiences or beliefs, and replies from the participants in order to assess the quality of the data in comparison to empirical evidence. Also personal observation during the field survey was also taken into consideration. This questionnaire was drafted based on the objectives of the study.

Descriptive analysis were used to determine the challenges of mangrove utilization to livelihood. Data collected were summarized and presented in percentage changes, charts and tables.

## 4. Results and Findings

### 4.1 Socioeconomic Livelihood Provided by the Mangrove Ecosystem

*Table 1: Socioeconomic Livelihood of the Study area*

| Questions | Options | Frequency | Percentage (%) |
|---|---|---|---|
| **Household Size** | 1–3 persons | 134 | 34.9 |
| | 4–6 persons | 116 | 30.2 |
| | 7–9 persons | 77 | 20.1 |
| | 10 persons and above | 57 | 14.8 |
| | **Total** | **384** | **100** |
| | | | |
| **Number of Dependents** | 1–2 persons | 141 | 36.7 |
| | 3–5 persons | 118 | 30.7 |
| | 6–8 persons | 74 | 19.3 |
| | More than 8 persons | 51 | 13.3 |
| | **Total** | **384** | **100** |
| **Change in Household Size** | Increased | 143 | 37.2 |
| | Decreased | 98 | 25.5 |
| | Remained stable | 96 | 25 |
| | Don't know | 47 | 12.2 |
| | **Total** | **384** | **100** |
| | | | |
| **Effects of Household size** | Low impact | 82 | 21.4 |
| **on Resource Use** | Moderate impact | 118 | 30.7 |
| | High impact | 108 | 28.1 |
| | Very high impact | 76 | 19.8 |
| | **Total** | **384** | **100** |
| | | | |
| **Main Source of Household** | Farming | 96 | 25 |
| **Income** | Fishing | 149 | 38.8 |
| | Trading/Artisan | 89 | 23.2 |
| | Salary/Business | 50 | 13 |
| | **Total** | **384** | **100** |
| | | | |
| **Proportion of Income from** | None | 64 | 16.7 |
| **Mangrove activities** | Less than 25% | 118 | 30.7 |
| | 25–50% | 121 | 31.5 |
| | More than 50% | 81 | 21.1 |
| | **Total** | **384** | **100** |
| | | | |
| **Change in Mangrove-Based** | Increased | 92 | 24 |
| **Income** | Decreased | 141 | 36.7 |
| | Remained stable | 101 | 26.3 |
| | Don't know | 50 | 13 |
| | **Total** | **384** | **100** |

***Source: Field data (2025)***

Households with 1–6 members (65.1%) dominate the study area, indicating moderate household sizes across mangrove-dependent communities in Table 4.6. Larger households (≥7 persons) still constitute 34.9%, suggesting higher livelihood pressure on mangrove resources in villages such as Idung Assang and Ukpenekang, where questionnaire concentration was highest. The results show that household sizes are generally moderate to large across the study area. About 38.0% of respondents reported household sizes of 4–6 persons, while 32.3% lived in households of 7–9 persons, indicating extended family living arrangements common in coastal communities. Smaller households of 1–3 persons accounted for 18.8%, while very large households of 10 persons and above constituted 10.9%, suggesting varying pressure levels on household resources. The result also showed that, over 67% of households support at least 3 dependents, reinforcing the role of mangrove resources as safety nets for household welfare, especially in fishing-based villages like Ukpenekang, Iko Town, and Esuk Enwang. Regarding dependency, 44.8% of households supported 3–5 dependents, while 30.7% supported 1–2 dependents, reflecting moderate economic burden. However, 16.1% reported 6–8 dependents, and 8.3% supported more than 8 dependents, indicating significant vulnerability in some villages. A notable 37.2% of respondents reported increasing household size, which may intensify dependence on mangrove fisheries, fuelwood, and non-timber products across densely populated villages.

Household size trends reveal that 38.5% of respondents experienced an increase in household size in recent years, likely due to population growth and rural household consolidation. Meanwhile, 34.9% reported that household size had remained stable, while 18.2% observed a decrease, and 8.3% were uncertain. About 78.6% of respondent's perceived moderate to very high impact, confirming that household size is a strong driver of mangrove resource exploitation at village level. On the impact of household size on resource use, a high impact was reported by 38.0% of respondents, while 32.3% perceived a moderate impact, indicating that larger households intensify dependence on mangrove resources. Only 18.8% perceived a low impact, and 10.9% reported a very high impact, underscoring pressure on local ecosystems. From the table, Fishing remains the dominant livelihood (38.8%), particularly in coastal villages such as Ukpenekang, Ibaka, Iko Town, and Udesi, highlighting strong livelihood–mangrove linkages.

Fishing emerged as the dominant livelihood, with 43.8% of respondents relying primarily on fishing activities. Farming accounted for 24.0%, trading and artisan work for 19.3%, while salary or formal business income was reported by only 13.0%, highlighting limited diversification. Over 52.6% of households derive at least 25% of income from mangrove-related activities, confirming high economic dependence across the study villages. Mangrove-related activities contributed significantly to household income, as 44.8% of respondents derived more than 50% of their income from mangrove resources. A further 30.7% obtained 25–50%, while 16.1% earned less than 25%. Only 8.3% reported no income from mangrove-related activities, emphasizing strong livelihood dependence. A larger proportion (36.7%) reported declining income, suggesting increasing pressure, resource depletion, and regulatory constraints within the mangrove ecosystem. Income trends indicate vulnerability, as 35.4% of respondents reported a decline in mangrove-related income in recent years. In contrast, 27.1% experienced an increase, 22.4% reported stability, and 15.1% were unsure, suggesting mixed livelihood trajectories influenced by

***Table 2: Farm Size***

| Farm size | Frequency | Percentage (%) |
|---|---|---|
| Less than 1 ha | 152 | 39.6 |
| 1–2 ha | 118 | 30.7 |
| 3–5 ha | 69 | 18 |
| More than 5 ha | 45 | 11.7 |
| **Total** | **384** | **100** |

***Source: Field data (2025).***

Farm sizes revealed in Table 2 were generally small, with 38.0% cultivating less than 1 hectare and 32.3% managing 1–2 hectares. Medium-sized farms of 3–5 hectares accounted for 18.8%, while only 10.9% operated farms larger than 5 hectares, reflecting land scarcity in coastal zones.

*Table 3 Cultivation near Mangrove Areas*

| Response | Frequency | Percentage (%) |
|---|---|---|
| Yes, regularly | 94 | 24.5 |
| Occasionally | 121 | 31.5 |
| Rarely | 98 | 25.5 |
| Never | 71 | 18.5 |
| **Total** | **384** | **100** |

***Source: Field data (2025).***

Cultivation near mangrove areas was common, as 44.8% reported cultivating crops regularly within or near mangroves in Table 3, while 30.7% did so occasionally. 16.1% cultivated rarely, and 8.3% never farmed near mangroves, indicating ongoing interaction between agriculture and mangrove ecosystems.

*Table 4: Challenges to Mangrove Utilization*

| Questions | Response | Frequency | Percentage (%) |
|---|---|---|---|
| Participation in Fishing or Seafood Collection | Yes, regularly | 151 | 39.3 |
| | Occasionally | 118 | 30.7 |
| | Rarely | 73 | 19 |
| | Never | 42 | 10.9 |
| | **Total** | **384** | **100** |
| | | | |
| Type of fishing/seafood | Small-scale fishing | 146 | 38 |
| activities | Crab/shrimp collection | 112 | 29.2 |
| | Fish farming | 78 | 20.3 |
| | Other activities | 48 | 12.5 |
| | **Total** | **384** | **100** |
| | | | |
| Challenges Affecting Fishing/Seafood Activities | Resource depletion | 134 | 34.9 |
| | Market demand | 98 | 25.5 |
| | Equipment shortage | 87 | 22.7 |
| | Regulatory restrictions | 65 | 16.9 |
| | **Total** | **384** | **100** |
| | | | |
| Use of Timber from Mangrove Areas | Yes, for building | 104 | 27.1 |
| | Yes, for firewood | 128 | 33.3 |
| | Yes, for sale | 92 | 24 |
| | No | 60 | 15.6 |
| | **Total** | **384** | **100** |
| | | | |
| Frequency of Timber Harvesting | Regularly | 98 | 25.5 |
| | Occasionally | 121 | 31.5 |
| | Rarely | 94 | 24.5 |
| | Never | 71 | 18.5 |
| | **Total** | **384** | **100** |
| | | | |
| Change in Timber Availability | Increased | 62 | 16.1 |
| | Decreased | 154 | 40.1 |
| | Remained stable | 104 | 27.1 |
| | Don’t know | 64 | 16.7 |
| | **Total** | **384** | **100** |

***Source: Field data (2025).***

Participation in fishing or seafood collection was high, with 39.3% engaging regularly and 30.7% occasionally in Table 4. Only 19.0% participated rarely, while 10.9% did not participate at all. Nearly 70% of respondents engage regularly or occasionally in fishing and seafood collection, highlighting the dominance of aquatic livelihoods within mangrove communities. Result also shows that small-scale fishing dominated activities (38.0%), followed by crab and shrimp collection (29.2%), fish farming (20.3%), and other activities (12.5%). This means, small-scale fishing is the predominant activity, followed by shellfish collection, reflecting the productive role of mangroves as nursery and feeding grounds. The table also shows that challenges included resource depletion (34.9%), market demand fluctuations (25.5%), equipment shortages (22.7%), and regulatory restrictions (16.9%), reflecting structural constraints on fisheries livelihoods. Challenges included resource depletion (34.9%), market demand fluctuations (25.5%), equipment shortages (22.7%), and regulatory restrictions (16.9%), reflecting structural constraints on fisheries livelihoods. This implies that resource depletion was identified as the major challenge, suggesting overexploitation and declining stock levels across the mangrove ecosystem. Result indicate that Mangrove timber use remained common, with 38.0% using timber for building, 29.2% for firewood, 20.3% for sale, while 12.5% reported no timber use. Mangrove timber is widely used, primarily for domestic energy and construction purposes, indicating continued pressure on forest resources. Also, harvesting frequency showed that 32.3% harvested timber occasionally, 27.1% rarely, 22.4% regularly, and 18.2% never harvested timber. And a substantial proportion of respondents perceived a decline in timber availability, reflecting increasing exploitation and inadequate regeneration. Thus timber availability trends were negative, as 44.8% reported a decrease, 30.7% reported stability, 16.1% observed an increase, and 8.3% were unsure.

***Table 5: Frequency of Reliance on Mangrove Resources***

| Questions | Response | Frequency | Percentage (%) |
|---|---|---|---|
| Frequency of Reliance on | Daily | 146 | 38 |
| Mangrove Resources | Weekly | 124 | 32.3 |
| | Monthly | 72 | 18.8 |
| | Rarely | 42 | 10.9 |
| | **Total** | **384** | **100** |
| | | | |
| Mangrove Resources Used Most | Fish/Seafood | 168 | 43.8 |
| | Timber | 92 | 24 |
| | Medicinal plants | 74 | 19.3 |
| | Other resources | 50 | 13 |
| | **Total** | **384** | **100** |
| | | | |
| Type of Employment in | Fishing/Seafood collection | 154 | 40.1 |
| Mangrove-Related Activities | Timber harvesting | 101 | 26.3 |
| | Eco-tourism | 52 | 13.5 |
| | Other employment | 77 | 20.1 |
| | **Total** | **384** | **100** |
| | | | |
| Change in Mangrove-Related | Increased | 88 | 22.9 |
| Employment | Decreased | 147 | 38.3 |
| | Remained stable | 103 | 26.8 |

| | | | |
|---|---|---|---|
| | Don't know | 46 | 12 |
| | **Total** | **384** | **100** |
| Purpose of Using Mangrove Herbs | Treat illness | 162 | 42.2 |
| | Rituals/cultural use | 96 | 25 |
| | Sale/profit | 78 | 20.3 |
| | Other uses | 48 | 12.5 |
| | **Total** | **384** | **100** |
| Overexploitation of | Yes, severely | 124 | 32.3 |
| Mangrove Resources | Yes, moderately | 138 | 35.9 |
| | Slightly | 72 | 18.8 |
| | No | 50 | 13 |
| | **Total** | **384** | **100** |
| Most Overexploited | Fish/Seafood | 146 | 38 |
| Mangrove Resources | Timber | 112 | 29.2 |
| | Medicinal plants | 78 | 20.3 |
| | Other resources | 48 | 12.5 |
| | **Total** | **384** | **100** |
| | | | |
| Trend in Overexploitation | Yes, significantly | 118 | 30.7 |
| | Yes, moderately | 124 | 32.3 |
| | Slightly | 82 | 21.4 |
| | No | 60 | 15.6 |
| | **Total** | **384** | **100** |
| Measures to Reduce | Community rules | 114 | 29.7 |
| Overexploitation | Government regulation | 128 | 33.3 |
| | Awareness campaigns | 92 | 24 |
| | None | 50 | 13 |
| | **Total** | **384** | **100** |

***Source: Field data (2025).***

Dependence on mangrove resources shown in Table 5 was frequent, with 38.0% relying on them daily and 32.3% weekly. Monthly reliance was reported by 18.8%, while 10.9% relied on them occasionally. This means that, about 70.3% of respondents rely on mangrove resources on a daily or weekly basis, confirming the critical livelihood role of mangrove ecosystems in the study area. Also, Fish and seafood were the most used resources (43.8%), followed by timber (24.0%), medicinal plants (19.3%), and other resources (13.0%). This indicate that, Fish and seafood constitute the most frequently used mangrove resources, reinforcing the importance of mangrove-supported fisheries for income and food security across villages. The table shows that, Fishing and seafood collection dominate mangrove-based employment, while eco-tourism remains relatively underdeveloped despite its sustainability potential. While, employment was dominated by fishing and seafood collection (38.0%), followed by timber harvesting (29.2%), eco-tourism (20.3%), and other activities (12.5%). But, a larger proportion of respondents reported declining employment opportunities in mangrove-related activities, reflecting environmental degradation and regulatory pressures. Employment trends showed decline, with 35.4% reporting reduced employment, 27.1% reporting increases, 22.4% stability, and 15.1% uncertain.

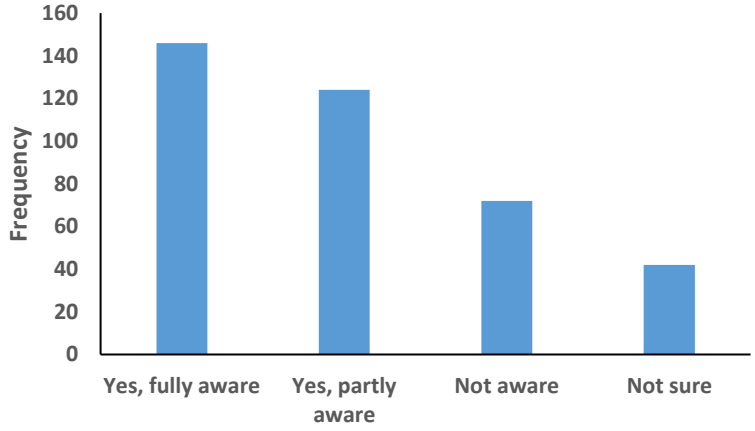


***Figure 2: Awareness of Mangrove Conservation Measures***

***Source: Field data (2025).***

Figure 2 presents the graph for the level of awareness of mangrove conservation activities. It shows that about 70.3% of respondents have some level of awareness of mangrove conservation activities, indicating moderate information penetration across communities. Results reveal that awareness of mangrove conservation measures is moderately high across the study area. A combined 70.3% of respondents reported being either *fully aware (38.0%)* or *partly aware (32.3%)* of conservation measures, while 18.8% indicated they were *not aware* and 10.9% were *unsure*. This suggests that although conservation information is circulating within communities, a notable proportion of residents still lack adequate awareness, which may limit effective participation in conservation initiatives.

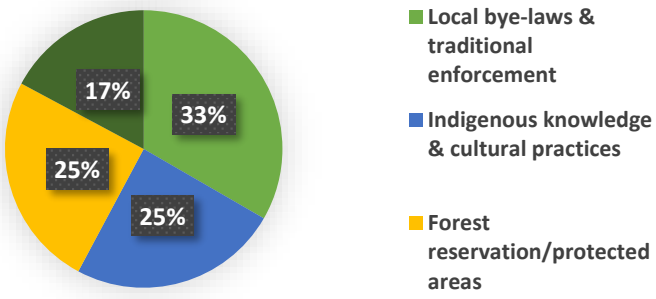


***Figure 3: Existing Conservation Measures in the Community***

***Source: Field data (2025).***

Regarding existing conservation measures shown in Figure 3, respondents identified local by-laws and traditional authority enforcement as the most prevalent approach (33.3%), followed by forest reservation, protected areas, and anti-deforestation measures (25.0%). Indigenous knowledge and cultural protection practices accounted for 24.5%, while awareness and educational programmes were least reported (17.2%). This indicates that conservation efforts in the area are largely community-driven, with formal education-based interventions still limited. Perception of Conservation (Likert)

***Table 6: Perception of Conservation***

| S/N | Item | Strongly agree | (%) | Agree | (%) | Undecided | (%) | Disagree | (%) | Strongly disagree | (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Mangrove resources are enough to support livelihoods. | 102 | 26.6 | 134 | 34.9 | 64 | 16.7 | 52 | 13.5 | 32 | 8.3 |
| 2 | The mangrove ecosystem can be managed using indigenous practices. | 118 | 30.7 | 146 | 38 | 56 | 14.6 | 40 | 10.4 | 24 | 6.3 |
| 3 | Mangrove trees can be replanted successfully in this community. | 126 | 32.8 | 138 | 35.9 | 54 | 14.1 | 38 | 9.9 | 28 | 7.3 |
| 4 | Community leaders are taking active conservation measures. | 88 | 22.9 | 126 | 32.8 | 82 | 21.4 | 54 | 14.1 | 34 | 8.9 |
| 5 | Government policies help in conserving mangroves in this community. | 72 | 18.8 | 104 | 27.1 | 98 | 25.5 | 66 | 17.2 | 44 | 11.5 |

***Source: Field data (2025).***

Perceptions of conservation effectiveness revealed in Table 6 further reinforce this relationship. For the statement *"Mangrove resources are enough to support livelihoods,"* 61.5% of respondents either *strongly agreed (26.6%)* or *agreed (34.9%)*, while 21.8% disagreed to varying degrees. This indicates cautious optimism, tempered by concerns over sustainability. Similarly, 68.7% of respondents agreed that *mangroves can be managed using indigenous practices* (30.7% strongly agree; 38.0% agree), demonstrating strong confidence in traditional ecological knowledge. On mangrove replanting, an even higher 68.7% agreed that *mangrove trees can be replanted successfully*, suggesting community openness to restoration initiatives. However, confidence declines when leadership and governance are considered. Only 55.7% agreed that *community leaders are taking active conservation measures*, while 23.0% disagreed. Even more striking, just 45.9% agreed that *government policies help conserve mangroves*, while 28.7% disagreed and 25.5% remained undecided, reflecting weak trust in formal policy effectiveness.

***Table 7: Sustainable Practices Followed During Harvesting***

| Questions | Options | Frequency | Percentage (%) |
|---|---|---|---|
| **Sustainable Practices Followed** | Selective harvesting | 118 | 30.7 |
| **During Harvesting** | Cultural rules/taboos | 92 | 24 |
| | Approved fishing methods | 104 | 27.1 |
| | No sustainable practice | 70 | 18.2 |
| | **Total** | **384** | **100** |
| | | | |
| **Existence of Community Rules** | Yes, well enforced | 98 | 25.5 |
| **Regulating Mangrove Use** | Yes, but not enforced | 146 | 38 |
| | No rules | 82 | 21.4 |
| | Don't know | 58 | 15.1 |
| | **Total** | **384** | **100** |
| | | | |
| **Benefits of Mangrove Conservation** | Improved fish stocks & livelihoods | 146 | 38 |
| | Flood/erosion protection | 102 | 26.6 |
| | Climate/environmental stability | 92 | 24 |
| | Tourism & cultural preservation | 44 | 11.5 |
| | **Total** | **384** | **100** |
| | | | |
| **Effectiveness of Cultural Restrictions** | Very helpful | 118 | 30.7 |
| | Somewhat helpful | 146 | 38 |
| | Not helpful | 62 | 16.1 |
| | Not practiced | 58 | 15.1 |
| | **Total** | **384** | **100** |
| | | | |

| | | | |
|---|---|---|---|
| **Belief that Conservation** | Strongly believe | 142 | 37 |
| **Improves Long-term Livelihoods** | Believe | 156 | 40.6 |
| | Not sure | 54 | 14.1 |
| | Do not believe | 32 | 8.3 |
| | **Total** | **384** | **100** |
| | | | |
| **Conservation Actions Personally** | Replanting mangroves | 126 | 32.8 |
| **Supported** | Reporting illegal activities | 88 | 22.9 |
| | Environmental education | 94 | 24.5 |
| | Obeying community bye-laws | 76 | 19.8 |
| | **Total** | **384** | **100** |
| | | | |
| **Support Most Needed to** | Funding & equipment | 112 | 29.2 |
| **Strengthen Conservation** | Government enforcement | 98 | 25.5 |
| | Training & awareness | 104 | 27.1 |
| | Stronger community leadership | 70 | 18.2 |
| | **Total** | **384** | **100** |
| | | | |
| **Would Alternative Livelihoods** | Yes, greatly | 162 | 42.2 |
| **Reduce Pressure?** | Yes, slightly | 118 | 30.7 |
| | No | 58 | 15.1 |
| | Not sure | 46 | 12 |
| | **Total** | **384** | **100** |
| | | | |
| **Preferred Alternative Livelihood** | Aquaculture/fish farming | 136 | 35.4 |
| | Small businesses/trading | 102 | 26.6 |
| | Eco-tourism | 64 | 16.7 |
| | Agriculture (non-mangrove) | 82 | 21.4 |
| | **Total** | **384** | **100** |
| | | | |
| **Penalties for Violating** | Strongly agree | 154 | 40.1 |
| **Conservation Rules** | Agree | 142 | 37 |
| | Disagree | 56 | 14.6 |
| | Strongly disagree | 32 | 8.3 |

| | | | |
|---|---|---|---|
| | **Total** | **384** | **100** |
| | | | |
| **Motivation to Support** | Protection of livelihoods | 148 | 38.5 |
| **Mangrove Conservation** | Cultural/traditional values | 96 | 25 |
| | Environmental benefits | 104 | 27.1 |
| | Pressure from authorities | 36 | 9.4 |
| | **Total** | **384** | **100** |

**Source: Field Data (2025).**

Responses from Table 7 regarding harvesting shows that 81.8% of respondents practice some form of sustainability. Selective harvesting was reported by 30.7%, use of approved fishing methods by 27.1%, and observance of cultural rules and taboos by 24.0%. Nonetheless, 18.2% admitted to following no sustainable practice, posing a risk to long-term ecosystem health. In terms of regulation, 63.5% acknowledged the existence of community rules governing mangrove use. However, only 25.5% stated that these rules are well enforced, while 38.0% noted they are poorly enforced. This enforcement gap may explain continued overexploitation despite awareness of conservation needs. The perceived benefits of mangrove conservation are dominated by livelihood considerations. 38.0% identified improved fish stocks and livelihoods as the primary benefit, followed by flood and erosion protection 26.6% and climate and environmental stability 4.0%. Tourism and cultural preservation was least cited 11.5%, indicating that economic and environmental services outweigh cultural benefits in local perception.

Cultural restrictions were considered helpful by most respondents, with 30.7% rating them very helpful and *38.0% somewhat helpful. However, 31.2% either viewed them as not helpful or not practiced, highlighting variability among villages. Belief in conservation as a pathway to improved livelihoods was notably strong. 77.6% either strongly believed 37.0% or believed 40.6% that conservation can improve long-term livelihoods, reinforcing the potential for conservation-livelihood synergy if properly managed. Support for specific conservation actions was highest for replanting mangrove trees 32.8%, followed by environmental education 24.5% and reporting illegal activities 22.9%. Support for obeying community bye-laws stood at 19.8%, again reflecting enforcement challenges.

Respondents identified funding and equipment 29.2% as the most needed support for conservation, closely followed by training and awareness 27.1% and government enforcement 25.5%. This confirms that both financial and institutional support are required. On alternative livelihoods, a strong 72.9% agreed that alternative livelihoods would reduce pressure on mangroves 42.2% greatly; 30.7% slightly. Preferred alternatives were aquaculture/fish farming 35.4%, small businesses or trading 26.6%, and non-mangrove agriculture 21.4%, indicating practical livelihood diversification options. Support for stricter penalties was overwhelming, with 77.1% either strongly agreeing 40.1% or agreeing 37.0% that penalties for violating conservation rules should be increased. Finally, motivation for conservation was driven mainly by protection of livelihoods 38.5%, followed by environmental benefits 27.1% and cultural values 25.0%. Pressure from authorities motivated only 9.4%, emphasizing that intrinsic and livelihood-based motivations outweigh coercive enforcement. Based on these, results indicate that mangrove conservation in the study area is strongly linked to livelihood security, community-based governance, and indigenous practices, while weak enforcement and limited government presence remain major constraints. The high support for alternative livelihoods, stricter penalties, and replanting initiatives suggests a clear pathway toward sustainable mangrove management if socio-economic realities are adequately addressed.

## 5. Conclusion and Policy Recommendations

This study demonstrates that mangrove forests in Southern Akwa Ibom State are indispensable to the survival of coastal communities, functioning simultaneously as a primary economic engine, a food safety net, and a source of domestic energy. The high level of household dependence—exacerbated by expanding family sizes and low economic diversification—has placed immense pressure on both provisioning and regulating ecosystem services. The empirical data establishes a troubling feedback loop: escalating local poverty drives the overexploitation of mangrove timber and fisheries, which in turn causes rapid habitat degradation, acute resource depletion ($34.9\%$), and a subsequent decline in household incomes ($36.7\%$).

Furthermore, the conservation constraints in the study area are dualistic, comprising both structural environmental challenges and institutional failures. Environmentally, land scarcity has pushed agricultural activities directly into vulnerable intertidal zones. Institutionally, conventional top-down regulatory frameworks have failed to curb degradation due to weak enforcement capacity, lack of localized ecological data, and the exclusion of resource users from governance structures.

The findings indicate that strict "no-use" preservation zones are socially and economically unviable in isolation. Ultimately, achieving a balance between mangrove utilization and ecological conservation requires an integrated approach that positions local resource users as central partners in governance, aligns conservation with livelihood security, and replaces open-access exploitation with regulated, community-led stewardship.

To mitigate mangrove degradation and alleviate conservation constraints in Akwa Ibom State, the following multi-stakeholder policy actions are recommended:

i. Legalize Community-Based Mangrove Management (CBMM) using traditional societies (e.g., *Ekpe*) for local enforcement.
ii. Establish distinct spatial zoning (No-Take Core Zones vs. Sustainable-Use Buffer Zones).
iii. Subsidize alternative energy (clean cookstoves/LPG) and finance alternative income streams like apiculture and crab farming.
iv. Provide micro-credits for deep-sea fishing gear to reduce overexploitation in sensitive nearshore mangrove nurseries.

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