Climate Variability, Livelihood Vulnerability and Indigenous Adaptation Strategies among Artisanal Fishing and Farming Communities in Bayelsa State, Nigeria

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ABSTRACT

This study investigated the impact of climate variability on fishing activities and the livelihoods of fishermen in Bayelsa State, Nigeria, corresponding to the second objective of the primary research work. Adopting a qualitative phenomenological research design, data were gathered through In-Depth Interviews (IDIs), Key Informant Interviews (KIIs), and Focus Group Discussions (FGDs) across Southern Ijaw, Ogbia, and Sagbama Local Government Areas. Findings reveal that rising water temperatures, irregular rainfall, and severe flooding have altered hydrological regimes, triggering the migration and depletion of native fish species such as catfish, tilapia, and bonga. Consequently, artisanal fishers face declining catch volumes, altered fishing routes, and heightened operational hazards. Indigenous adaptive responses include seasonal mobility, flexible deployment of traditional gear and traps (gura and ikara), brush parks, and mangrove-wood smoke-drying preservation. The study concludes that while traditional knowledge provides critical coping mechanisms, sustainable fisheries resilience requires integrating local practices with institutional support and early warning systems.

KEYWORDS

Climate variability, fishing livelihoods, indigenous adaptation, fish migration, Niger Delta, Bayelsa State

I. INTRODUCTION

Climate change and variability represent critical contemporary challenges affecting ecosystems, human well-being, and resource-dependent economies across the globe (IPCC, 2021). In low-lying coastal and riverine regions such as Bayelsa State in Nigeria's Niger Delta, climatic fluctuations interact directly with aquatic and terrestrial ecosystems, exerting profound pressures on artisanal fisheries and traditional livelihoods. Fishing constitutes a foundational economic, nutritional, and cultural pillar for indigenous communities in the region, supporting thousands of households through direct employment, income generation, and vital protein supply.

However, mounting empirical evidence indicates that rising water temperatures, irregular rainfall regimes, severe flooding, and salinity intrusion are disrupting aquatic habitats and destabilizing artisanal fishing systems. Although indigenous communities have historically relied on localized knowledge systems and traditional adaptive practices to navigate

environmental shifts, the accelerating pace and intensity of climate variability pose unprecedented threats to livelihood sustainability. Addressing this empirical and sociological reality, this paper specifically investigates the second objective of the parent research: examining how climate variability has impacted fishing activities and the livelihoods of fishermen in Bayelsa State, alongside evaluating the indigenous adaptive strategies employed by local fishers.

II. LITERATURE REVIEW / THEORETICAL FRAMEWORK

Scholarship on coastal vulnerability emphasizes that artisanal fishing communities are exceptionally sensitive to climatic anomalies due to their heavy dependence on stable hydrological conditions and open aquatic access (Allison et al., 2009; Nicholls et al., 2007). In the Niger Delta, water temperature increases directly alter dissolved oxygen levels and metabolic rates in fish, prompting species migration toward deeper, more thermally stable marine environments. Furthermore, extreme hydrological events and recurrent flooding alter estuarine salinity gradients and destroy vital mangrove breeding nurseries.

The theoretical framework underpinning this study integrates Vulnerability Theory (Adger, 2006) and Resilience Theory (Folke et al., 2002). Vulnerability Theory explains how biophysical exposure to climate variability interacts with socioeconomic marginalization and resource dependence to produce heightened susceptibility among artisanal fishers. Conversely, Resilience Theory focuses on the capacity of local communities to absorb environmental shocks, reorganize their practices, and sustain essential livelihood functions through traditional ecological knowledge (TEK) and social networks.

III. STUDIES AND METHODS

This study adopted a qualitative phenomenological research design, which is well-suited for capturing the lived experiences, perceptions, and adaptive responses of indigenous populations (Creswell, 2013). Geographically, the research was conducted across three purposefully selected Local Government Areas (LGAs) representing the three senatorial districts of Bayelsa State: Southern Ijaw (Bayelsa Central), Ogbia (Bayelsa East), and Sagbama (Bayelsa West).

A. Data Collection and Sampling

Primary data were collected through a combination of In-Depth Interviews (IDIs), Key Informant Interviews (KIIs), and Focus Group Discussions (FGDs). A total of 30 participants comprising experienced fishermen, fisherwomen, community elders, and agricultural/fisheries experts were purposively sampled across six communities (Amasoma, Onyoma, Epebu, Otuasega, Ogobiri, and Sagbama). Qualitative data were transcribed verbatim and subjected to thematic content analysis.

B. Analytical Rigor and Ethical Compliance

To ensure trustworthiness, data triangulation was achieved by cross-verifying IDI narratives with FGD sessions and expert KII insights. Informed consent was secured from all participants, ensuring confidentiality, anonymity, and full respect for local cultural norms.

IV. FINDINGS AND RESULTS

The findings are structured around the core thematic dimensions of climate impacts on fishing livelihoods and the corresponding indigenous adaptive strategies identified in the study area.

A. Impact of Climate Variability on Fishing and Fishermen's Livelihoods

Participants across all study locations reported a severe decline in fish availability within local rivers, creeks, and estuaries. Key findings include:

- Reduction and Migration of Fish Populations: Fishers observed that staple species such as catfish, tilapia, and bonga have become increasingly scarce. Rising water temperatures and altered salinity have forced fish stocks to migrate to deeper offshore waters beyond the reach of traditional dugout canoes and artisanal gear (IDI/Male/Fisherman/Ogbia/2025).
- Disruption of Fishing Seasons and Routes: Irregular rainfall and stronger tidal currents have destabilized traditional fishing calendars. Peak fishing seasons are no longer predictable, exposing fishers to heightened occupational hazards and navigational risks on turbulent waterways (IDI/Male/Fisherman/Southern Ijaw/2025).
- Economic Strain and Food Insecurity: Declining catch volumes have directly translated into reduced household incomes, increased operational costs (particularly for fuel and gear), and compromised nutritional security for fishing-dependent families (FGD II/Male/Fisherman/Ogbia/2025).

Table 1. Summary of Climate Impacts and Indigenous Adaptive Strategies in Artisanal Fisheries

Livelihood Domain	Identified Climate Impact	Indigenous Adaptive Strategy
Fishing & Aquatic Resources	Migration and depletion of native fish species (catfish, tilapia, bonga) due to warming waters.	Seasonal mobility, relocating fishing camps to stable creek networks, and sharing spatial intelligence.
Fishing Operations	Unpredictable seasonal patterns, turbulent tides, and destruction of traditional fishing gear.	Flexible deployment of traditional traps (gura, ingo, ikara) and timing trips for early morning or night hours.
Ecosystem & Habitats	Flooding and degradation of mangrove spawning and breeding grounds.	Clearing flooded vegetation lines and constructing brush parks/fish aggregation structures.
Post-Harvest Processing	Income volatility and high perishability during prolonged wet spells.	Traditional mangrove-wood smoke-drying racks and preservation techniques for economic buffering.

B. Indigenous Adaptive Strategies among Fishermen

Despite significant biophysical constraints, artisanal fishers have deployed robust traditional coping and adaptation mechanisms rooted in ecological knowledge:

- Spatial Mobility and Relocation: Fishers frequently relocate temporary fishing camps to alternative creek networks and deeper river channels where fish concentrations remain viable (IDI/Male/Fisherman/Southern Ijaw/2025).
- Traditional Trap Innovation: Communities utilize specialized, locally crafted basket traps (known locally as gura, ingo, and ikara) placed strategically along flooded margins and vegetation lines to capture fish during high water periods (FGD IV/Female/Farmer/Southern Ijaw/2025).
- Brush Parks and Habitat Enhancement: Fishers construct brush parks (acadjas) and clear specific flooded vegetation lines to attract fish seeking shelter and breeding cover, thereby optimizing catch efficiency (IDI/Male/Fisherman/Ogbia/2025).
- Post-Harvest Processing: To mitigate income loss during low-yield periods, households utilize traditional mangrove-wood smoke-drying racks to preserve catches for extended market distribution (FGD V/Male/Fisherman/Southern Ijaw/2025).

V. CONCLUSION

This study demonstrates that climate variability exerts profound adverse impacts on artisanal fishing activities and fishermen's livelihoods in Bayelsa State. Rising water temperatures, hydrological instability, and severe flooding have disrupted fish habitats, diminished catch quantities, and heightened economic vulnerability. Nevertheless, indigenous fishing community's exhibit remarkable resilience through spatial mobility, traditional gear innovation, and resource management practices. The findings underscore that while local knowledge provides vital immediate coping mechanisms, long-term livelihood sustainability requires synergistic policy frameworks that integrate indigenous practices with modern fisheries management, financial support, and hydrological early warning systems.

ACKNOWLEDGEMENT

The author expresses profound gratitude to the dissertation supervisors, Prof. Lawrence Udisi and Prof. Undutimi J. Dudafa, for their invaluable mentorship, as well as the traditional leaders, key informants, and community participants across Southern Ijaw, Ogbia, and Sagbama Local Government Areas who generously shared their time and ecological knowledge during the fieldwork.

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