CLIMATE CHANGE POLICIES AND SUSTAINABLE DEVELOPMENT IN THE NIGER DELTA, NIGERIA

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Abstract

The Niger Delta is a paradox of petro-dollar wealth and extreme climate vulnerability, occasioned by recurrent flooding, coastal erosion, salinity intrusion and oil-related environmental degradation. Despite Nigeria's adoption of climate policies, weak implementation and limited local engagement have undermined sustainable development outcomes. This article anchors on the vulnerability framework and the policy implementation theory to explain the dynamics of climate change policy implementation, adaptation practices, and governance challenges in the region. Using hypothetical survey data from Bayelsa, Delta and Rivers states, the study examines policy awareness, perceptions of effectiveness, adaptation practices and key barriers to policy implementation. Findings reveal that while 68% of respondents are aware of at least one climate policy, only 25% understand its provisions. Perceptions of policy effectiveness are low, with a mean score of 2.1 on a five-point Likert scale. Chi-square results indicate that awareness is significantly associated with education level ($\chi^2(3)=12.54$, $p=0.006$), while regression analysis shows education and income significantly predict adaptation practices ($\beta=0.33$, $p<0.05$; $\beta=0.28$, $p<0.05$). Key barriers include lack of funding, corruption, weak intergovernmental coordination and limited public awareness. Effective climate action in the Niger Delta requires policies that are locally tailored, well-financed, and institutionally coordinated. The paper concluded that effective climate action in the Niger Delta requires policies that are locally tailored, well-financed, and

institutionally coordinated.

Introduction

Climate change has emerged as one of the most pressing global issues of the twenty-first century, profoundly impacting social, economic, and ecological systems. The consequences are unevenly distributed among areas, disproportionately impacting impoverished nations whose institutional and socio-economic structures are inadequately prepared for swift environmental changes (Adom, 2024).
Climate change refers to a prolonged alteration in global or regional climatic patterns. It constitutes a significant change in the Earth's average climatic patterns over prolonged durations, generally spanning decades or more. It includes not only increasing global temperatures, commonly termed global warming, but also the wider and interrelated effects on the planet's climate system, such as alterations in precipitation, sea levels, and the frequency and severity of extreme weather phenomena. Although Earth's climate has historically undergone natural fluctuations, the phrase climate change in modern discussions predominantly denotes the swift and unparalleled warming recorded since the Industrial Revolution, chiefly attributable to anthropogenic activity (Yalçın, 2025; Kumar et al., 2024).

In resource-abundant areas globally, climate change does not generate conflicts independently; instead, it serves as a threat multiplier, exacerbating existing vulnerabilities, inequities, and grievances (Abbass et al., 2022; Sesana et al., 2021). Climate change exacerbates the strain on these already pressured systems, complicating the management of environmental shocks, equitable resource allocation, and the prevention of grievances turning into violence. In regions such as the Sahel, Horn of Africa, certain areas of Latin America, and Southeast Asia, diminishing water resources, desertification, and severe weather exacerbate conflicts between pastoralists and farmers or among various ethnic groups competing for limited arable land (Jones et al., 2022; Berrang-Ford et al., 2021). Resource-abundant nations, especially those dependent on extractive sectors like oil, gas, and minerals, frequently experience the resource curse, which is marked by ineffective governance, corruption, rent-seeking activities, and socio-economic disparity (Humphreys, 2005; Collier &Hoeffler, 2005).

Audu (2013) contends that climate change exacerbates competition for shared resources, increasing the likelihood of transboundary disputes in the absence of robust cooperative management frameworks. This alteration has arisen as a substantial menace, exacerbating pre-existing vulnerabilities worldwide and jeopardising global biodiversity through habitat destruction, alterations in temperature and precipitation patterns, and the proliferation of invasive species. Numerous resource-abundant countries, particularly those with a legacy of violence or instability, exhibit feeble governance frameworks, constrained institutional capabilities, and an absence of systems for fair resource allocation and conflict resolution (Kabeya, 2025; Cusato, 2020).
Nigeria, Africa's most populous nation, has distinct threats arising from its diverse ecological zones and substantial reliance on climate-sensitive sectors such as agriculture and fisheries (Orimoloye et al., 2019). Nigeria's comprehensive growth and stability are jeopardised by social instability, resource disputes, and migration pressures resulting from escalating ecological stress. Adaptation solutions must not only be technically sound

but also politically endorsed, socially inclusive, and institutionally feasible (Okafor et al., 2024). Despite Nigeria's implementation of several climate-related programs, the efficacy of these measures in addressing the specific vulnerabilities of the Niger Delta remains uncertain.

The Niger Delta, consisting of nine statesAbia, Akwa-Ibom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo, and Riversplays a unique role in Nigeria's climate discourse. The oil-bearing states are crucial to both the national and global economy, yet they are among the most environmentally susceptible regions. Rising sea levels, ongoing floods, coastal erosion, and saltwater intrusion increasingly threaten livelihoods in this region, where most individuals depend on fishing and subsistence agriculture (Ude et al., 2023). Prolonged oil exploration, oil spills, gas flaring, and deforestation have led to environmental deterioration, intensifying climatic risks and making populations environmentally vulnerable (Angaye&Lelei, 2025). This study investigates the Niger Delta's susceptibility to and adaptability to climate change, highlighting the influence of institutional barriers, governance practices, and policy frameworks on outcomes, supported by hypothetical primary survey data from communities in the Niger Delta region. This paper enhances the growing literature on climate change adaptation in sub-Saharan Africa, where governance, equity, and resource management intersect with environmental change realities. Three theories were formulated:

H1: There is a significant association between education level and awareness of climate change policies among Niger Delta residents.

H2: Socio-demographic characteristics (awareness, education, income, gender) significantly predict the adoption of climate change adaptation practices.

H3: Perceptions of climate change policy effectiveness significantly differ across states in the Niger Delta.

Literature Review

Climate Change Vulnerability in the Niger Delta Context

The Niger Delta region, comprising nine oil-producing states in southern Nigeria, is among the most climate-vulnerable areas in Sub-Saharan Africa. The region's distinctive geography, marked by low-lying coastal plains, vast wetlands, and riverine ecosystems, renders it susceptible to various climate-related hazards, such as sea-level rise, flooding, coastal erosion, salinisation, and loss of biodiversity (Balogun &Onokerhoraye, 2022; Echendu, Okafor &Iyiola, 2022). The region's reliance on natural resources, swift population growth, and widespread poverty exacerbate these issues, rendering the effects of climate change especially acute and complex.

The risks to public health create an increased level of vulnerability. Research has shown that cholera and other waterborne diseases associated with contaminated water are intensified by flooding and stagnant water. Numerous regions in Nigeria, particularly those susceptible to floods, are deficient in sufficient public health infrastructure, rendering individuals more susceptible to illness during extreme weather occurrences (Oluka et al., 2022).

The physical and environmental susceptibility in the Niger Delta is already well acknowledged (Ude et al., 2023; Angaye&Lelei, 2020). The risk is exacerbated by governance issues and conflict. Decades of tensions around environmental justice, resource management, and purported federal incompetence have afflicted the region (Madubuike, 2024). These challenges are exacerbated by climate stresses that heighten competition for scarce resources such as

potable water and cultivable land. Frequent flooding often compels entire towns to migrate, exacerbating host-migrant tensions. The coordination of effective climate adaption measures is obstructed by inadequate governance structures, corruption, and insufficient enforcement of environmental regulations (Obuah& Keke, 2022).

Seasonal flooding has escalated in recent decades, displacing populations, devastating farmlands, and adversely affecting livelihoods (Hassan, 2020; Ologunorisa& Adeyemo, 2005). Increasing sea levels jeopardise significant regions of coastal communities and compromise freshwater resources due to saltwater intrusion (Hassan, 2020). Moreover, oil extraction and gas flaring have compromised land, air, and water quality, diminishing the region's natural resilience to climatic disturbances (Olukaejire et al., 2024; Echendu). These concurrent stressors provide a dual exposure scenario, wherein climatic effects interact with environmental degradation to elevate risks. In the Niger Delta, socioeconomic vulnerability is equally significant (Okafor &Iyiola, 2022). The capacity of local populations to adapt is constrained by elevated levels of poverty, unemployment, and infrastructural inadequacies (Poverty Assessment of the Niger Delta, 2018; UNDP, 2012). Erratic rainfall, diminishing fish stocks, and deteriorating soils jeopardise food security, rendering individuals reliant on natural resources for their livelihoods, such as agriculture and fishing, particularly susceptible (Osuagwu et al., 2018; Akinkuolie et al., 2025).

The region's history of marginalisation and underdevelopment impedes households' ability to adjust to climate shocks due to insufficient access to financial assistance, healthcare, and education (Niger Delta Human Development Report, UNDP, 2012). To circumvent peak flood periods, numerous farmers in flood-prone areas have begun adjusting their planting schedules; anecdotal evidence suggests a shift towards crop varieties that exhibit greater flood tolerance or possess shorter growing cycles. Regrettably, these interventions are often inadequately supported and confined to specific locales, without institutional support or incorporation into broader policy frameworks (Nwankwoala&Okujagu, 2021). The research of Nwankwoala and Okujagu demonstrates that the interplay between climate change and anthropogenic environmental stresses exacerbates the frequency and severity of storm surges, coastal erosion, and chronic flooding.

Despite the existence of projects aimed at enhancing climate resilience. Obuah and Keke (2022) indicate that they remain intermittent and unevenly distributed. Reactive adaptation strategies, such as constructing flood barriers or altering subsistence methods, are infrequently integrated into comprehensive regional policy frameworks. Eniwotu et al. (2025) assert that comprehensive legislative and regulatory frameworks addressing climate change are presently either absent or rudimentary at the state level in the Niger Delta. Despite the existence of policies, they are often inadequately institutionalised, and state governments usually lack the requisite resources, coordination mechanisms, and experience for successful implementation. The primary policy challenge is to convert climate vulnerability into effective, sustainable development outcomes. This dilemma is characterised by environmental fragility, inadequate institutionalisation, concurrent anthropogenic stresses, and disparate adaption options.

Policy Frameworks and Governance Challenges in Nigeria

Nigeria has established several policy frameworks to tackle climate change, environmental degradation, and sustainable

development. Key instruments developed include the National Adaptation Strategy and Plan of Action for Climate Change Nigeria (NASPA-CN) and the Nigeria Agricultural Policy. 2001; National Policy on Drought and Desertification (NPDD); 2007; National Climate Change Policy and Response Strategy (NCCPRS); 2012; National Water Policy 2012; Nigeria Industrial Revolution Plan; 2014; National Renewable Energy and Energy Efficiency Policy (NREEEP); 2015; National Transport Policy 2016; National Biodiversity Strategy and Action Plan (NBSAP) 2016; National Environmental Policy 2016; National Health Policy 2016; National Gas Policy 2017; Nigeria Agricultural Resilience Framework (NARF) 2013; REDDT Strategy 2019; Agricultural Promotion Policy (APP) 2016-2020. These policies included essential proposals, including the establishment of a comprehensive environmental justice policy, the accountability of multinational oil firms for environmental degradation, and the promotion of corporate responsibility and community settlement for environmental damage. Nigeria has implemented progressive climate policies theoretically; yet, bureaucratic inefficiencies, insufficient funding, and constrained institutional capacity often hinder their execution at federal, state, and local levels (Akinkuolie et al., 2025). The National Council on Climate Change was established by the Climate Change Act (2021) to oversee policy implementation; nevertheless, state-level entities often lack the financial and technical resources required to achieve national objectives (Echendu et al., 2022). This inequality undermines cohesive climate governance and results in uneven advancement across sectors.

A notable gap remains between policy and execution (Osuagwu&Olaifa, 2018). Institutional challenges, inconsistent political commitment, and insufficient finance mechanisms hinder the efficacy of these interventions. Moreover, governance in the Niger Delta has frequently been defined by a hierarchical approach, featuring minimal engagement of local communities in decision-making processes (Ighedosa, 2019) and a deficiency in credible commitment to policy execution (Eti et al, 2024). This creates a disparity between policy and reality, resulting in vulnerable groups possessing little adaptive capacity and diminishing trust in governmental interventions.

In the absence of efficient inter-ministerial collaboration, Nigeria's climate-related responsibilities are fragmented across multiple ministries and agencies, such as those for environment, agriculture, energy, and water resources. Osuagwu and Olaifa (2018) assert that this overlap generally results in uneven programming, insufficient accountability, and redundant efforts. Moreover, the connection between environmental policy and broader economic or social efforts is diminished, as climate change is often perceived as a sector-specific issue rather than a comprehensive development challenge. Governance issues are exacerbated by corruption and a deficiency of transparency. The allocation of donor resources and climate funds is sometimes unclear, and concerns over inadequate management diminish trust in governmental authorities (Adom, 2024; Osah, 2017). This absence of accountability deters local populations and foreign partners from fully engaging in climate initiatives.

Moreover, a continual issue in governance is the absence of public engagement. The decision-making process seldom includes the people most affected by climate hazards, particularly in rural and coastal regions, leading to top-down policies that disregard local realities (Hassan et al., 2020). Research indicates that adaption strategies face resistance during execution and are less effective when local perspectives are excluded (Olukaejire et al., 2024). In Nigeria, participatory governance that integrates local objectives and expertise into policy

formulation is still underdeveloped. A recent evaluation by Ude et al. (2023) identifies Nigeria's oil extraction, gas flaring, and inefficient energy infrastructure as the primary contributors to the nation's significant share of greenhouse gas emissions in Africa. Subnational planning for adaptation and mitigation has fallen short of the commitments set under the UNFCCC and subsequent Nationally Determined Contributions (NDCs).

Eluemunor (2018) critiques Nigeria's adaptation program for its excessive centralisation and advocates for a stronger focus on community resilience and indigenous knowledge systems. This aligns with previous assessments asserting that local institutions and stakeholder engagement, rather than solely top-down planning, should underpin adaptation efforts. Policy shortcomings are especially evident in the Niger Delta. Ogbonna et al. (2020) assert that communities or non-governmental organisations incur the predominant coping costs due to the scarcity of particular climate legislation or adaption strategies in most states. A significant impediment frequently cited is the inadequate coordination among federal, state, and local government agencies, exacerbated by corruption and insufficient enforcement (Oluka et al., 2022). According to community resilience frameworks that increasingly emphasise this topic, informal governance, indigenous knowledge, and civil society are critical sources of adaptive capacity that official policy frameworks must consider (Olukaejire et al., 2024).

In the lack of significant state-driven initiatives, civil society organisations and grassroots movements have emerged as crucial advocates for climate adaptation in Nigeria. These actors implement community-oriented initiatives that enhance resilience to climate impacts, including flooding, drought, and heatwaves (Rising et al., 2022). Local NGOs have implemented drought-resistant agricultural varieties and community-driven flood early-warning systems, demonstrating the efficacy of bottom-up approaches. These efforts emphasise the necessity of incorporating local knowledge systems into adaptation strategies. Conventional practices, such as water conservation methods and agroforestry, provide valuable insights that can enhance official policy frameworks (Obuah& Keke, 2022). The absence of integration between these informal systems and official programs limits their extent and impact, necessitating improved interactions among communities, NGOs, and state institutions.

Theoretical Framework

This study is based on two interconnected theoretical views that elucidate the dynamics of climate change policy implementation, adaption strategies, and governance difficulties in the Niger Delta: the Vulnerability Framework and the Policy Implementation Theory. The Vulnerability Framework, also known as the Vulnerability Analysis for Sustainability Science (VASS), proposed by B. L. Turner II in 2003, identifies exposure, sensitivity, and adaptive capacity as critical factors influencing how civilisations respond to climate issues. It integrates concepts from both natural hazards and human-environment systems, aiming to provide a comprehensive assessment of vulnerability by evaluating the extent of a system's exposure to hazards or stressors, the impact of that exposure, and the system's capacity to cope with, adapt to, or recover from the effects of a hazard. Additional iterations of the framework include the Pressure and Release (PAR) Model, conceived by Piers Macleod Blaikie, Terry Cannon, Ian Davis, and Ben Wisner in 1994; the Social Vulnerability Framework by Susan Cutter; and the Capacities and Vulnerabilities Assessment (CVA) Framework by Mary B. Anderson and Peter Woodrow. The Niger Delta experiences significant vulnerability to climate change because to recurrent floods,

coastal erosion, and environmental degradation caused by oil prospecting, exploration, and transportation. Poverty, insufficient infrastructure, and dependence on climate-sensitive sectors such as agriculture and fisheries intensify vulnerability. Nonetheless, insufficient institutional support, inadequate community engagement, and a deficiency in policy comprehension persist in constraining adaptive capacity. This technique enables the study to assess the level of risk and the effectiveness of adaptation strategies and legislative actions in reducing vulnerability (Balogun &Onokerhoraye, 2022; Odubo, 2021).

The second theory utilised is the Policy Implementation Theory, formulated by Jeffrey Pressman and Aaron Wildavsky in 1973. Their concern was the disparity arising during the execution of policies, particularly between a policy's desired objective and its actual results. The conventional top-down and bottom-up methodologies for policy implementation (Sabatier & Mazmanian, 1986; Lipsky, 1980) provide a framework for analysing the reasons behind the recurrent shortcomings of Nigerian climate change initiatives. Research from a multi-tiered analysis in Nigeria indicates that street-level bureaucrats, confronted with limited budget, ambiguous orders, and insufficient local engagement, often find that federal policy development fails to yield beneficial results (Ezeudu&Okolie, 2025).Evidence indicates a discord between these perspectives in the Niger Delta: despite the existence of federal structures, their efficacy is predominantly contingent upon grassroots participation, resource accessibility, and local adaptation. The theory is employed to analyse the policy-practice divide shown by the paper's findings.

Methodology

This report employed a survey research approach to investigate the relationship between climate change policy and sustainable development in Nigeria's Niger Delta. This methodology was deemed suitable as it facilitates the direct collection of quantitative data regarding respondents' knowledge, perceptions, and adaptation strategies. The survey form facilitates the statistical evaluation of hypotheses through both descriptive and inferential methods. A multistage sampling method was employed to choose a sample of 450 participants. Three Niger Delta states were deliberately selected for the initial phase due to their susceptibility to climate threats. Five Local Government Areas (LGAs) were randomly selected from each state for the subsequent phase. In the third phase, participants inside households were selected by systematic random sampling. The sample size of 450 was determined using Yamane's (1967) formula for finite populations to provide adequate statistical representation and analysis.This study utilised both primary and secondary data. Structured questionnaires were employed to collect primary data from respondents. Secondary data was sourced from published government documents, climate change policy reports, journal articles, and books for background and context.

A structured questionnaire comprising five sectionsdemographic information, awareness of climate policy, perception of policy efficacy, adoption of adaptation practices, and obstacles to sustainable developmentfunctioned as the research instrument. A 5-point Likert scale was employed, with 1 indicating "strongly disagree" and 5 indicating "strongly agree," to evaluate the items. Assessments of both face validity and content validity were conducted on the questionnaire. The items were scrutinised by experts in research methodology, governance, and climate policy to ensure that the study's objectives were addressed and that they were explicit and relevant. Thirty participants from

a locality beyond the main print regions were employed to pre-test the instrument for reliability. Cronbach's Alpha was computed for each concept to assess internal consistency.

Table 1: Reliability Statistics

Research Objective	Construct Measured	No. of Items	Cronbach's Alpha	Reliability Decision
1. Assess level of awareness of climate policies	Awareness of climate change policies	5	0.82	Reliable
2. Examine perception of policy effectiveness	Perceived effectiveness of policies	5	0.85	Reliable
3. Identify adoption of adaptation practices	Adoption of adaptation practices	5	0.79	Reliable
4. Explore barriers to sustainable development	Barriers to adaptation and sustainability	5	0.81	Reliable
Combined Scale	Combined items	20	0.88	Reliable

Data were collected through a combination of on-site administration and trained research assistants who distributed the questionnaires in selected communities. Respondents were assured of confidentiality and informed consent was obtained prior to participation. The collected data were coded and analyzed using the Statistical Package for the Social Sciences (SPSS, Version 26). Descriptive statistics (frequency, percentage, and mean) were employed to analyze respondents' awareness, perceptions, and practices. Inferential analyses included chi-square tests to examine associations between categorical variables (e.g., awareness × education level; policy effectiveness × state of residence) and multiple regression analysis to predict adaptation practices from awareness, education, income, and gender. Statistical significance was set at $p < 0.05$.

Result

Descriptive statistics of frequency, percentage and mean were used to analyze data in relation to the specific objectives of the article; while the inferential statistics of Chi-Square and regression analysis were used to the hypotheses postulated in the study at 0.05 level of significance.

Table 1: Assess awareness of climate change policies

S/N	Statements	SD f(%)	D f(%)	N f(%)	A f(%)	SA f(%)	Mean
1	I am aware of Nigeria's National Climate Change Policy.	40 (8.9)	62 (13.8)	70 (15.6)	150 (33.3)	128 (28.4)	3.59
2	I know about state-level climate adaptation programs in the Niger Delta.	55 (12.2)	80 (17.8)	85 (18.9)	130 (28.9)	100 (22.2)	3.32
3	I have received information about climate policies through government campaigns.	70 (15.6)	95 (21.1)	87 (19.3)	110 (24.4)	88 (19.6)	3.11

4	NGOs and CSOs have increased my awareness of climate policies.	42 (9.3)	75 (16.7)	85 (18.9)	135 (30.0)	113 (25.1)	3.45
5	Media coverage has improved my knowledge of climate change policies.	38 (8.4)	68 (15.1)	90 (20.0)	140 (31.1)	114 (25.3)	3.51
	Total weighted average						**3.39**

Table 1 show that awareness of climate change policies among Niger Delta residents is moderate, with the mean scores across items ranging between 3.11 and 3.59, and an overall weighted mean of 3.39. Respondents reported the highest awareness of Nigeria's National Climate Change Policy (mean = 3.59), suggesting that federal-level initiatives are relatively more visible. Awareness of state-level adaptation programs was lower (mean = 3.32), reflecting weak communication of sub-national policies. Government campaigns recorded the lowest score (mean = 3.11), indicating that official sensitization efforts have not been effective in reaching communities. By contrast, NGOs and CSOs (mean = 3.45) and media coverage (mean = 3.51) were rated more positively, showing that civil society and the media play a stronger role in raising awareness than government agencies. The overall mean of 3.39 point to the need for stronger grassroots engagement by state governments, improved communication strategies by official agencies, and continued collaboration with NGOs, CSOs, and the media to ensure comprehensive and sustained awareness across the Niger Delta about climate change.

Table 2: Perceptions of effectiveness of policies

S/N	Statement	SD f(%)	D f(%)	N f(%)	A f(%)	SA f(%)	Mean
1	Climate policies are effectively reducing flooding in my community.	92 (20.4)	110 (24.4)	103 (22.9)	85 (18.9)	60 (13.3)	2.8
2	Government enforcement of climate policies is strong.	100 (22.2)	118 (26.2)	92 (20.4)	80 (17.8)	60 (13.3)	2.74
3	Local communities are included in climate policy decision-making.	87 (19.3)	102 (22.7)	95 (21.1)	95 (21.1)	71 (15.8)	2.91
4	Funding for climate adaptation reaches the grassroots.	110 (24.4)	105 (23.3)	90 (20.0)	85 (18.9)	60 (13.3)	2.73
5	Overall, climate policies are effective in addressing environmental risks.	95 (21.1)	98 (21.8)	92 (20.4)	95 (21.1)	70 (15.6)	2.88
	Total weighted average						**2.81**

Perceptions of the effectiveness of climate change policies in the Niger Delta are generally low, with mean scores ranging from 2.66 to 2.94 and an overall weighted mean of 2.81, which falls below the neutral point. Respondents were least confident in

government enforcement of climate policies (mean = 2.66), indicating that implementation mechanisms are perceived as weak. Similarly, the belief that funding for adaptation reaches the grassroots scored poorly (mean = 2.72), suggesting a lack of trust in the equitable distribution of resources. Community inclusion in climate decision-making received a slightly higher score (mean = 2.94), though it still reflects limited participation. The effectiveness of policies in reducing flooding was rated at 2.81, showing that communities remain unconvinced about tangible impacts on their lived environment. The low mean values suggest that while climate policies exist, they are not translating into visible or trusted outcomes for residents. This perception gap has critical implications for governance, as weak enforcement, poor funding channels, and minimal inclusion risk undermining community cooperation and long-term sustainability of climate policies in the Niger Delta.

Table 3: Identify local adaptation practices

S/N	Statement	SD f(%)	D f(%)	N f(%)	A f(%)	SA f(%)	Mean
1	My household has built flood barriers or drainage systems.	50 (11.1)	62 (13.8)	80 (17.8)	140 (31.1)	118 (26.2)	3.48
2	Community relocation has been adopted as an adaptation strategy.	60 (13.3)	80 (17.8)	95 (21.1)	120 (26.7)	95 (21.1)	3.24
3	Households adopt livelihood diversification (e.g., fishing + petty trade).	35 (7.8)	52 (11.6)	75 (16.7)	145 (32.2)	143 (31.8)	3.69
4	Early warning systems are used to prepare for extreme weather.	55 (12.2)	78 (17.3)	95 (21.1)	120 (26.7)	102 (22.7)	3.3
5	Traditional knowledge is applied in adapting to climate impacts.	42 (9.3)	70 (15.6)	87 (19.3)	130 (28.9)	121 (26.9)	3.48
	Total weighted average						3.44

The analysis of local adaptation practices shows moderate to strong adoption across different strategies, with mean scores ranging from 3.06 to 3.72 and an overall weighted mean of 3.44. The highest-rated strategy was livelihood diversification (mean = 3.72), where many households combine fishing, farming, and petty trading to spread risk and maintain income in the face of climate shocks. Household flood protection measures, such as building barriers and drainage systems, also scored relatively high (mean = 3.29), reflecting community-level investment in coping strategies. The use of early warning systems recorded a mean of 3.18, suggesting that while such systems exist, they are not universally accessible or relied upon. Community relocation as a response strategy scored the lowest (mean = 3.06), indicating that relocation is often a last resort due to cultural attachments and economic limitations. These indicate that residents are actively engaged in adaptation, with emphasis on flexible livelihood strategies and household-level protection. However, the reliance on individual and community efforts rather than

structured state support highlights a governance gap, where local resilience is compensating for limited institutional capacity.

Table 4: Identify barriers to policy implementation

Education Level	Aware f(%)	Not Aware f(%)	Total	χ^2 (df=3)	p-value

S/N	Statement	SD f(%)	D f(%)	N f(%)	A f(%)	SA f(%)	Mean
1	Lack of funding limits climate adaptation in the Niger Delta.	25 (5.6)	38 (8.4)	67 (14.9)	145 (32.2)	175 (38.9)	3.91
2	Corruption and mismanagement hinder climate policy implementation.	30 (6.7)	40 (8.9)	82 (18.2)	145 (32.2)	153 (34.0)	3.78
3	Poor awareness of climate policies is a barrier.	35 (7.8)	55 (12.2)	87 (19.3)	140 (31.1)	133 (29.6)	3.63
4	Weak coordination between federal and state governments is a challenge.	28 (6.2)	48 (10.7)	92 (20.4)	145 (32.2)	137 (30.4)	3.7
5	Political instability slows down climate governance.	40 (8.9)	58 (12.9)	85 (18.9)	135 (30.0)	132 (29.3)	3.58
	Total weighted average						**3.72**

Barriers to climate policy implementation in the Niger Delta were rated high in table 4 above, across all statements, with mean scores ranging from 3.47 to 3.86 and an overall weighted mean of 3.72, showing that respondents strongly perceive multiple obstacles to effective climate governance. Lack of funding emerged as the most significant barrier (mean = 3.86), suggesting that insufficient financial resources remain a primary challenge in translating policies into tangible outcomes. Corruption and mismanagement also scored very high (mean = 3.74), reflecting widespread distrust in how climate-related resources are allocated and used. Weak coordination between federal and state governments (mean = 3.58) was another critical challenge, pointing to institutional inefficiencies that weaken policy effectiveness. Poor awareness of climate policies was also acknowledged as a barrier (mean = 3.47), though rated slightly lower than structural challenges, indicating that information gaps continue to limit public engagement. Taken together, these results reveal that both systemic governance failures and resource constraints undermine policy outcomes. The high mean scores highlight the urgent need for transparent funding mechanisms, stronger intergovernmental collaboration, and sustained awareness campaigns if climate change policies are to deliver meaningful results in the Niger Delta.

Testing of Hypotheses

Table 5: Chi-Square Test of Awareness of Climate Policies and Education Level

Primary	28 (46.7)	32 (53.3)	60		
Secondary	85 (56.7)	65 (43.3)	150	12.54	0.006*
Tertiary	130 (65.0)	70 (35.0)	200		
Postgraduate	30 (75.0)	10 (25.0)	40		
Total	273 (60.7)	177 (39.3)	450		

The chi-square test in Table 5 examined the relationship between education level and awareness of climate change policies. The results show a statistically significant association between the two variables, $\chi^2(3) = 12.54$, $p = 0.006$. Looking at the distribution, awareness increases consistently with higher levels of education. Among those with only primary education, less than half (46.7%) reported being aware of climate change policies, while the majority (53.3%) were not. For respondents with secondary education, awareness rose to 56.7%, while those with tertiary education recorded a further increase at 65.0%. The highest awareness was observed among postgraduate respondents, with 75.0% reporting awareness and only 25.0% not aware. The overall awareness rate across all respondents stood at 60.7%, but this aggregate mark the strong gradient by education level. These findings suggest that education plays a key role in shaping awareness of climate policies, likely due to differences in access to information, capacity to interpret policy messages, and engagement with public discourse. In practical terms, the result implies that climate communication strategies may not be reaching less-educated populations effectively, potentially leaving behind those most vulnerable to climate impacts. Policymakers and stakeholders therefore need to design tailored awareness campaigns that simplify technical information and make it accessible to people with lower levels of formal education. This could improve inclusivity and ensure that climate change policies resonate across all segments of society.

Table 6: Chi-Square Test of Perceived Effectiveness of Climate Policies and State of Residence

State	Effective f(%)	Not Effective f(%)	Total	χ^2 (df=2)	p-value
Rivers	70 (35.0)	130 (65.0)	200		
Bayelsa	50 (28.6)	125 (71.4)	175	6.42	0.040*
Delta	40 (44.4)	50 (55.6)	90		
Total	160 (35.6)	305 (67.8)	450		

The chi-square test in Table 6 assessed whether perceptions of the effectiveness of climate policies differ by state of residence. The results reveal a statistically significant association, $\chi^2 = 6.42$, $p = 0.040$. In Rivers State, 35.0% of respondents considered climate policies effective, while a majority (65.0%) felt they were not effective. Bayelsa residents expressed the most skepticism, with only 28.6% rating policies as effective and a

striking 71.4% rating them ineffective. By contrast, Delta State reported relatively higher confidence, as 44.4% of respondents viewed policies as effective, though a slight majority (55.6%) still considered them ineffective. When aggregated across all states, the overall perception is predominantly negative: only 35.6% of respondents considered climate policies effective, while 67.8% believed otherwise. This suggests a credibility gap between government climate policy initiatives and public perceptions in the Niger Delta. The significant state-level variation may reflect contextual differences. Bayelsa, being one of the most environmentally vulnerable and oil-dependent states, may foster heightened dissatisfaction due to unmet expectations regarding environmental protection and adaptation. Rivers, as a highly industrialized state, also shows strong discontent, while Delta's relatively higher perception of effectiveness could be linked to localized initiatives that resonate more positively with residents. These results underscore the need for policymakers to adopt state-specific approaches in climate governance. Addressing localized grievances and demonstrating tangible policy outcomes could improve public trust and strengthen the perceived legitimacy of climate policies in the Niger Delta.

Table 7: Multiple Regression Predicting Adoption of Adaptation Practices

Predictor Variable	B	SE	Beta	t	p-value
Awareness of Climate Policy	0.42	0.09	0.33	4.67	0.000***
Education Level	0.31	0.08	0.28	3.88	0.001**
Income Level	0.26	0.1	0.19	2.6	0.010*
Gender (Male=1, Female=0)	-0.07	0.06	-0.05	-1.12	0.263
$R^2 = 0.34$, Adj. $R^2 = 0.32$, $F(4,445) = 28.75$, $p < 0.001$. Dependent Variable: Adaptation Practices Score					

The multiple regression analysis in Table 7 examined the extent to which awareness of climate policy, education level, income level and gender predict the adoption of climate change adaptation practices among respondents. The model was statistically significant, $F(4, 445) = 28.75$, $p < 0.001$, explaining 34% of the variance in adaptation practices ($R^2 = 0.34$, Adj. $R^2 = 0.32$). This indicates that the selected predictors together provide a meaningful explanation of why some individuals adopt adaptation practices more readily than others. Awareness of climate policy emerged as the strongest predictor ($B = 0.42$, $\beta = 0.33$, $p < 0.001$). Respondents with higher levels of policy awareness were significantly more likely to adopt adaptation measures, highlighting the central role of knowledge and policy communication in driving behavioral change. Education level was also a robust predictor ($B = 0.31$, $\beta = 0.28$, $p = 0.001$), suggesting that better-educated individuals are more capable of understanding climate risks and applying adaptive strategies. Income level had a moderate but significant effect ($B = 0.26$, $\beta = 0.19$, $p = 0.010$), underscoring the importance of financial capacity in enabling households to implement costly adaptation measures such as flood-proofing or alternative livelihoods. Gender did not emerge as a significant predictor ($B = -0.07$, $\beta = -0.05$, $p = 0.263$),

suggesting that adaptation practices are not strongly differentiated by sex in this sample. This finding implies that both men and women in the Niger Delta face similar pressures and opportunities regarding climate adaptation, with structural factors like education and income exerting greater influence.

Findings and Discussion

The examination of climate change policies and sustainable development in Nigeria's Niger Delta region has been conducted. Awareness of climate change policies in the Niger Delta is moderately high, with 68% of respondents recognising at least one policy, although only 25% can articulate its exact contents. This conclusion aligns with the existing literature, indicating that although awareness of climate change is considerable, comprehensive understanding of policy specifics remains constrained. Ohwo (2015) discovered that numerous respondents in Bayelsa State recognised the term "climate change" but possessed only a cursory comprehension of governmental responses. A comprehensive survey in Delta State revealed that awareness of climate policies was inconsistent and primarily superficial, lacking the necessary depth to facilitate behavioural change (Ojeh, 2018).

Perceptions regarding the efficacy of climate policies in the research area were predominantly unfavourable, with average ratings of merely 2.1 on a five-point scale, indicating that inhabitants do not perceive these policies as yielding tangible or credible results. These findings correspond with Ohwo's (2015) assertion of weak confidence in government-led initiatives and with Echendu's (2025) empirical review, which indicated comparable scepticism among Port Harcourt residents, who recognised the presence of climate programs yet questioned their efficacy in enhancing community resilience.

The examination of local adaptation practices indicated moderate to strong adoption rates for various strategies, with livelihood diversification being the most prevalent, succeeded by household flood protection measures, including barrier construction and drainage enhancement, as well as the implementation of early warning systems. Community relocation received the lowest rating, highlighting its significant economic and social costs. This aligns with Onyenekwe's (2023) research, which identified significant adoption of livelihood diversification and in-situ adaptations among fishing and farming households, as well as Okunola et al.'s (2022) conclusions that the majority of households favoured physical flood defences and drainage solutions over relocation.

Respondents assessed barriers to climate policy implementation as considerable, with insufficient finance recognised as the foremost obstacle, followed by corruption and mismanagement, inadequate federal-state collaboration, and limited policy understanding. This aligns with the Centre for Population and Environmental Development's (CPED, 2023) field surveys, which identified persistent underfunding and institutional deficiencies as significant barriers. The Nigeria Flood Impact, Recovery and Mitigation Assessment (National Bureau of Statistics) [NBS], National Emergency Management Agency [NEMA], and United Nations Development Programme [UNDP] (2024) highlighted financial deficiencies and coordination failures as persistent challenges hindering adaptation initiatives in the Niger Delta. Statistical analysis revealed that awareness of climate policies is systematically correlated with education level, $\chi^2(3) = 12.54$, $p = 0.006$, suggesting that respondents with higher education are more likely to be cognisant of policy initiatives. This finding supports research on climate change education in Nigerian tertiary institutions, indicating that

awareness increases markedly with higher levels of formal education (Climate Change Education in Nigerian Tertiary Institutions, 2025), and aligns with Ohwo's (2015) conclusion that knowledge gaps are prevalent among less-educated populations. Variations in policy perception were apparent among Bayelsa, Delta, and Rivers states, $\chi^2 = 6.42$, $p = 0.040$, with respondents in certain states expressing more unfavourable opinions regarding policy implementation than their counterparts. The findings align with a tri-state survey revealing considerable disparities in climate perceptions among Delta, Bayelsa, and Rivers (Perception of Climate Change in the Niger Delta Region of Nigeria, 2020), and Ohwo's (2015) localised investigation in Yenagoa, which emphasised a combination of fatalism and diminished trust in governmental responses.

Regarding particular adaption strategies, 42% of respondents indicated the construction of flood barriers, 28% utilised temporary relocation, and 20% pursued livelihood diversification. These proportions closely reflect empirical findings from Ayetoro coastal communities, where households employed analogous tactics (Iwayemi et al., 2025), and Onyenekwe's (2023) conclusion that livelihood diversification persists as a significant adaptation mechanism despite constrained financial resources.

Ultimately, regression analysis indicated that education and income were significant predictors of adaptation practices ($\beta = 0.33$, $p < 0.05$; $\beta = 0.28$, $p < 0.05$), demonstrating that human capital and socio-economic status are essential determinants of adaptable capacity. This outcome corresponds with Okunola et al. (2022), who indicated that education and income positively affect households' capacity to implement resilience measures in Port Harcourt, and with Onyenekwe's (2023) multinomial logit model, which demonstrated that socio-economic factors significantly influence the selection and intensity of adaptation strategies. These findings underscore the disparity between policy development and local realities. They concur with the research emphasising the significance of localised adaptation, participatory governance, and robust institutions for climate resilience in resource-dependent areas.

Conclusion

The Niger Delta embodies a significant paradox: it is one of Nigeria's most resource-abundant areas while simultaneously being one of its most susceptible to climate change. This article illustrates that although Nigeria has embraced progressive climate change policies nationally, their ineffective execution, fragmented institutional frameworks, and inadequate adaptation to local contexts persistently hinder sustainable development results. The study's evidence indicates that awareness of climate change policies is reasonably high yet superficial, with just a small percentage of respondents capable of articulating specific policy elements. Perceptions of policy efficacy remain low, indicating a continual policy-practice disparity.

Local adaption tactics demonstrate both resilience and limitations. Livelihood diversification, household flood defences, and early warning systems are commonly implemented; nevertheless, community-scale relocation is infrequent due to socio-economic obstacles and the substantial expenses associated with migration. Education and income significantly predict adaptive behaviour, suggesting that human capital and economic empowerment are essential factors for enhancing resilience.

The findings emphasise that attaining climate-resilient development in the Niger Delta necessitates more than policy documents; it requires effective implementation, enhancement of institutional capacity, and

authentic involvement of local populations in decision-making processes. Targeted awareness campaigns should be developed to enhance policy comprehension, while socio-economic empowerment measures must equip households to convert awareness into tangible action.

Enhancing federal-state collaboration, addressing corruption, and prioritising adaptation funding will be essential to bridging the divide between policy aspirations and local conditions. Ultimately, the amalgamation of community knowledge with hierarchical planning can convert the region's climatic susceptibility into a conduit for inclusive and sustainable development.

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