



## CLIMATE CHANGE MITIGATION AND ADAPTATION IN NIGERIA: A COMPREHENSIVE REVIEW OF IMPACTS, STRATEGIES, POLICIES, AND LOCALLY-LED RESPONSES

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### ABSTRACT

*Nigeria faces increasing vulnerability to climate change despite contributing minimally to global greenhouse gas emissions. As Africa's most populous nation and a major oil-producing economy, Nigeria is confronted with rising climate-induced disasters, persistent poverty, food insecurity, environmental degradation, and economic instability. This technical paper reviews the evolution of climate change research in Nigeria, synthesizing findings from mitigation and adaptation studies published between 1999 and the present. Using targeted keywords to identify literature in Scopus and Google Scholar, the review shows an exponential increase in publications, with 75.2% focusing on climate change adaptation strategies (CCAS), 19.6% on mitigation strategies (CCMS), and 5.2% addressing both. The findings reveal that agriculture dominates both mitigation and adaptation research, reflecting its centrality to livelihoods and vulnerability. Social adaptation measures (45%) and structural/physical strategies (42%) were the most studied, while institutional responses (13%) were significantly underrepresented, underscoring gaps in policy and governance research. Energy, agriculture, forestry, waste management, and industry were the key mitigation sectors analyzed.*

*The study highlights the growing burden of climate impacts—desertification, coastal erosion, flooding, health risks, displacement, and conflict—and evaluates Nigeria's policy frameworks such as the Climate Change Act (2021), National Adaptation Plan (NAP), Nationally Determined Contributions (NDCs), and large-scale projects including NEWMAP, ACRoSAL, and the Great Green Wall. Despite multiple initiatives, limitations persist in political will, financing, governance coordination, and community integration. The paper stresses the urgent need for Locally Led Adaptation (LLA) to bridge implementation gaps, empower vulnerable communities, and strengthen resilience. Findings demonstrate that education is the strongest determinant influencing the adoption of adaptation strategies in Nigeria. The study concludes that advancing climate action in Nigeria requires enhanced institutional capacity, increased domestic financing, stronger policy coherence, and integrated community-driven approaches. Future research must prioritize institutional adaptation, local resilience strategies, and evidence-based governance to effectively respond to Nigeria's rapidly escalating climate risks.*

## **1. INTRODUCTION**

Nigeria is the most populated nation in Africa, with an expected 211 million inhabitants according to the World Bank in 2021. The country is an oil producer, with crude oil constituting over 80 percent of exports, one-third of banking sector credit, and half of government revenue. Nigeria's debt-to-GDP ratio stands at 23.27% and is escalating each quarter due to increased borrowing and a stagnant economy. It holds a B' sovereign credit risk rating from Fitch Ratings. Economic growth has varied between 0.8% and 3.6% over the past five years, occasionally falling below zero. In 2020, the nation faced its most severe recession in two decades due to the COVID-19 pandemic, which disrupted global trade and caused a decline in oil prices. The GDP was valued at USD 440 billion (EUR 440 billion) or USD 2,085 (EUR 2,085) per capita in 2021. The unemployment rate is estimated at 33.3%, while the inflation rate is recorded at 20.5%. Approximately 54% of the population has access to electricity, leaving over 97 million individuals without it; access to clean energy is at 15%, indicating that nearly 180 million people lack modern and clean cooking technologies.

Nigeria is among the most susceptible nations to the effects of climate change. Therefore, it is essential to reduce emissions and adopt methods to address the effects of climate change. This study reviews publications on climate change mitigation and/or adaptation in Nigeria. The objectives are: to ascertain prevalent climate change adaptation strategies (CCAS) and their causes; and to determine the climate change mitigation methods (CCMS) extensively implemented to decrease emissions in Nigeria. Appropriate keywords were employed to search for publications in Scopus and Google Scholar. Our analysis indicates that from 1999 to the present, there has been exponential development in the volume of publications on CCAS and CCMS. A total of 75.2% of the publications focused on CCAS, 19.6% on CCMS, and 5.2% addressed both CCAS and CCMS. A significant number of the papers on CCMS focused on 'Energy' and 'Agriculture.' Additional sectors found from the included research relevant to mitigation in Nigeria were 'forestry', 'waste management', 'industry', and others. Approximately 80.7% of the CCAS papers pertained to 'Agriculture', indicating the sector in Nigeria where climate change adaptive ability is most critical. A total of 45% of the publications on CCAS addressed 'Social' adaptation, followed by 'Structural measures' at 42%, while 'Institutional' measures constituted the least at 13%. The limited quantity of publications on institutional CCAS underscores the necessity for additional research. Institutional measures, encompassing policies, legal frameworks, and economic assistance, are essential for fostering resilience against the impacts of climate change. The primary factor affecting the adoption of CCAS is 'Education.' The increased volume of publications on 'Agriculture' for both CCMS and CCAS highlights the sector's significance and the necessity to enhance its mitigation and adaptation methods. Our data and findings were compared and discussed in conjunction with analogous studies on CCMS and CCAS in Africa.

## **2. LITERATURE SURVEY**

Human activities worldwide have elevated greenhouse gas emissions in the atmosphere, resulting in climate change. Climate change has induced several physical and biological transformations globally. Such changes pose risks to individuals, impact the food supply chain, and deteriorate the natural environment. African developing nations are more susceptible to climate change and lack the capability to enhance resilience and adjust accordingly. Empirical evidence indicates that Nigeria is currently confronting environmental issues resulting from the impacts of climate change. Approximately 6% of Nigeria's land area is susceptible to extreme weather occurrences, positioning the nation among the top ten countries most affected by climate change. Climate change results in extreme weather phenomena and unpredictable fluctuations in temperature and precipitation. These alterations have resulted in chronic

flooding, displacement of populations and settlements, and food insecurity; escalating desertification and drought across various climatic regions of Nigeria; the erosion of coastlines and fluctuations in water temperatures; the alteration of aquatic ecosystems; and heightened gender disparities and intra-gender inequalities, particularly affecting women. Some have also ascribed these socio-economic effects to a rise in communal tensions and violence Jellason et al, (2019).

Rural and impoverished areas have heightened susceptibility to climate change. This is due to the fact that rural communities predominantly participate in subsistence agriculture. Moreover, because to the inadequate living circumstances, those regions are more susceptible to environmental degradation and natural calamities. Climate change has been attributed to diminished harvests, thereby exacerbating poverty in rural populations. In Nigeria's Sahel region, around 30 hectares of agricultural land are lost each year due to desertification. Individuals in poverty are more vulnerable to climate change and may oppose some mitigation efforts if these endanger their economic stability Ajibade et al, (2014). The incidence of diarrhoea, measles, and malaria is increasing, attributable to climate variability (rising temperatures) and inadequate environmental conditions Oloukoi et al, (2014). Therefore, it is essential to comprehend the causes of climate change to formulate suitable mitigation and adaptation strategies. A significant portion of climate change research in Nigeria predominantly concentrates on assessing the sensitivity of various bio-geophysical system features, while neglecting socio-economic concerns. This has contributed to a fragmented evaluation of climate change impacts, resulting in insufficient understanding of the mechanisms and specifics of existing coping methods (mitigation and adaptation) Enete et al, (2012), Onyimalu et al, (2021).

In 2020, it was estimated that the total greenhouse gas emissions from Nigerian agriculture amounted to approximately 322,000 kilotons of CO<sub>2</sub> equivalent. Livestock constitutes 69.2%, rendering it the predominant source of greenhouse gas emissions in Nigeria's agricultural sector. Greenhouse gas emissions are anticipated to rise by 94% by 2050 (67.7 Mt CO<sub>2</sub>-eq) compared to 2010 levels Diaha et al, (2021). Despite possessing extensive arable territory for crop cultivation, Nigeria imported over NGN 3.35 trillion worth of foodstuffs from 2016 to 2019, while exporting only NGN 803 billion during the same year. This indicates that Nigeria's agricultural imports are quadruple its exports [16]. While other causes contribute to the decrease in agricultural output, climate change is a critical element. Weather variabilities generated by climate change may further diminish the nation's agricultural output, resulting in increased imports and adverse trade balances. A multitude of studies has been undertaken regarding climate change mitigation and adaptation in Nigeria. Okon et al. (2021) performed a systematic review regarding the effects of climate change in Nigeria. Our work concentrates on identifying methods to mitigate and adapt to the impacts of climate change. Numerous research on adaptation in Nigeria appear to concentrate on the agriculture sector. Onyeneke et al. (2019) performed a systematic review regarding climate change adaptation within the Nigerian agriculture sector. Likewise, Ojo et al. (2022), Jellason et al. (2019), Ojo et al. (2022), Tarfa et al. (2019), and Ogunleye et al. (2019) investigated diverse adaptive capacities in agriculture. Nonetheless, our work diverges since it seeks to discover diverse adaptation capacities to climate change. Our analysis similarly utilised the International Panel on Climate Change (IPCC) classification of adaptation strategies (structural/physical, social measures, and institutional measures) (Noble et al., 2014) to delineate the research trajectories of the incorporated CCAS papers. It is essential to identify research gaps and provide guidance for future research and policymaking. Moreover, numerous studies have examined the potential of various sectors for climate change mitigation. Elum and Momodu (2017), Dioha et al. (2020),

Abiodun et al. (2012), Adeoti et al. (2014), Okoroh et al. (2016), Chenge et al. (2018), and Arimi et al. (2014) investigated agricultural potential for climate change mitigation, whereas Ukoba et al. (2020), Enongene et al. (2019), Elum et al. (2017), and Giwa et al. (2017) examined the potential of renewable energy for climate change mitigation in Nigeria. Etermire (2021) concentrated on the significance of legal mechanisms in the implementation of mitigations. Our analysis amalgamated findings from the included research to present a comprehensive collection of instruments for climate change mitigation in Nigeria, facilitating evidence-based decision-making and policymaking. The studies included (for mitigation and/or adaptation) utilised either primary or secondary research methods; our study, which is secondary research, produced both quantitative and qualitative data to synthesise from the existing body of knowledge and contribute to climate change development in Nigeria.

Given the exponential population growth alongside diminishing resources, an escalation in poverty, food insecurity, and ecological disasters is unavoidable. Consequently, it is essential to reassess the existing mitigation, adaptation, and coping measures to develop resilient and effective responses to the impacts of climate change. Consequently, this study seeks to examine the subsequent enquiries:

- a. What are the factors and frequently utilised CCAS in Nigeria?
- b. What mitigating actions are being implemented to decrease GHG emissions in Nigeria?

This study is significant as it assesses prior and contemporary research methodologies, which are informed by knowledge and data, to identify the principal factors influencing mechanisms for mitigating, adapting to, and coping with climate change.

### **3. EFFECTS OF CLIMATE CHANGE AND SUSCEPTIBILITY**

Climate change is perceived to disproportionately impact Africa, with the rate of temperature increase and its associated consequences, including desertification, coastal erosion, biodiversity loss, and saltwater intrusion, escalating more rapidly than the global average. In 2016, Verisk Maplecroft designated Nigeria as the seventh most vulnerable country worldwide. Likewise, in 2021, Nigeria's susceptibility to climate disasters and its adaptive capabilities were ranked 161 out of 182 countries evaluated by the Notre Dame Global Adaptation Initiative (ND-GAIN). Nigeria is especially vulnerable to climate impacts due to its substantial population, extensive coastline, insufficient resources for effective climate financing from both public and commercial sectors, and a deficiency in adaptation knowledge.

The nation is presently confronting issues characterised by intricate direct and indirect effects, including food insecurity, forced relocation, violence, adverse health consequences, and additional factors, which collectively impede climate action and economic development. Droughts and desertification in the dry and semi-arid regions of northern Nigeria have adversely impacted local people reliant on rain-fed agriculture. Droughts and desertification are causing nomadic pastoral populations to migrate from north to south, leading to conflicts with indigenous agricultural communities over dwindling resources. These nomadic cattle herders also introduce zoonotic infections that may be intensified by climate change.

Since 2012, the nation has experienced climate variability and intense rainfall in its central and southern regions, resulting in recurrent flood disasters with total losses and damages approximating USD 16.9 billion (EUR 16.9 billion). Presently, floods (both riverine and urban) and other climate-change-related calamities are contributing to a rise in disease prevalence, predominantly vector-borne diseases like malaria, which accounted for 200,000 fatalities in

2021, representing 32% of global malaria deaths, and impacted approximately 60 million Nigerians. Additionally, there is an escalating threat of waterborne diseases such as cholera. In several regions of the country, a confluence of droughts, saltwater intrusion, and sea level rise has negatively impacted agricultural production and urban infrastructure, resulting in increased food prices, development costs, and other associated consequences. Crop yields are highly susceptible to fluctuations and climatic variations due to numerous influencing factors, with agriculture predominantly reliant on rainfall; merely 1% of arable land is irrigated nationwide, while over 70% of farmers participate in subsistence agriculture, contributing nearly 23% to GDP. Econometric assessments project that Nigeria could incur losses ranging from USD 100 billion (EUR 100 billion) to USD 460 billion (EUR 460 billion) if it does not sufficiently adapt to climate change by 2050.

These vulnerabilities persist, adversely affecting the lives and livelihoods of Nigerians, despite Nigeria's status as a signatory to the Sendai Framework for Disaster Risk Reduction 2015 – 2030 (SFDRR). The Sendai Framework aims to substantially mitigate disaster risks and losses in lives and livelihoods, enhance community and national health, and foster resilience to disasters by prioritising the understanding of disaster risk and the fortification and investment in disaster risk governance. This initiative aims to diminish mortality, direct economic losses, and damage to critical infrastructure while significantly improving global collaboration and access to early warning systems. The discrepancy between ongoing vulnerabilities and adherence to the Sendai Framework suggests a disconnect between signed agreements and the adequacy of projects executed nationwide.

Nigeria's climate change adaptation methods encompass a multi-tiered strategy, incorporating national regulations such as the Climate Change Act 2021 and the National Adaptation Plan (NAP), with a current focus on locally-led adaptation (LLA) to incorporate community-based activities. Initiatives encompass the advancement of ecosystem-based adaptation, the promotion of sustainable agriculture and land utilisation, the enhancement of water management, and the transition to renewable energy sources. Essential strategies are being formulated to mitigate specific effects such as desertification, coastal erosion, and flooding through initiatives including erosion-resistant afforestation, water conservation, and enhanced irrigation and water storage techniques.

#### **4. NATIONAL STRATEGIES AND POLICIES**

The Climate Change Act 2021 establishes a legal foundation for climate action, in conjunction with other policies such as the National Adaptation Plan (NAP) Framework. The national policy emphasises critical sectors such as agriculture, forestry, land utilisation, food security, health, energy, transportation, waste management, and water and sanitation. *"Whole-of-Society" Approach:* The revised Nationally Determined Contributions (NDCs) implement a collaborative strategy, engaging government ministries, the commercial sector, civil society, and local governments.

#### **5. PRINCIPAL INITIATIVES AND PRACTICES**

Ecosystem-Based Adaptation encompasses nature-based solutions such as the cultivation of erosion-resistant trees on slopes and gullies, and the implementation of sustainable land management practices.

*Sustainable Agriculture:* Advocating for measures like conservation agriculture to enhance resilience to fluctuating climatic conditions.

*Water Resource Management:* Strategies encompass deepening boreholes, conserving groundwater, and instituting steps to avert flood inundation.

*Renewable Energy:* There is an initiative to augment the utilisation of renewable energy sources such as solar and wind power, along with enhancing energy efficiency.

*Waste Management:* Improving waste management systems is a crucial component of the national strategy.

### **5.1 Concentrate on Locally-Driven Adaptation (LLA)**

*Community Integration:* A primary objective is to transcend a "top-down" methodology by incorporating community insights and objectives into national strategies and execution.

*Empowering Local Communities:* LLA seeks to enhance the autonomy of local communities in the formulation, oversight, and assessment of adaptation strategies pertinent to their unique needs and difficulties.

*Illustration of Community Practices:* In Anambra State, smallholder farmers are employing techniques like as planting erosion-resistant trees and erecting ridges to mitigate flood effects.

### **5.2 Challenges and Prospects**

*Implementation Deficiencies:* Although national plans are established, there are deficiencies in execution, especially in incorporating local community demands and expertise comprehensively.

*Requirement for study:* There exists a continual necessity for study to comprehensively assess the status and efficacy of adaption initiatives and to improve forthcoming measures.

## **6.0 CURRENT STATUS AND TRENDS IN CLIMATE ACTION: POLICIES, STRATEGIES, AND IMPLEMENTATION FRAMEWORKS FOR ADDRESSING CLIMATE CHANGE.**

In Nigeria, climate change adaptation is gradually becoming a significant area for intervention, with the capacity to enhance livelihoods, health, and foster resilient communities. The adaptation policies, laws, frameworks, and strategies of the Federal Government encompass Nigeria's revised Nationally Determined Contributions 2021 (NDCs), the 2021 Climate Change Act, the National Climate Change Policy, the National Adaptation Plan (NAP), the Long-Term Vision (LTV), the Medium-Term National Development Plan (MTNDP), the Biennial Update Report (BUR), along with additional national and sub-national plans. The NAP Framework serves as a precursor to the government's primary adaptation agenda, delineating its objectives to synchronise the nation's adaptation efforts with the Cancun Adaptation Framework. Additionally, the Framework offers guidance for developing adaptation practices that are consistent with Nigeria's economic objectives and context. The Framework encompasses other subsequent co-benefits and essential considerations, including community-based adaptation, ecosystem-based adaptation, a gender-responsive National Adaptation Plan process, and the acknowledgement of climate change as a pervasive issue with potential trade-offs. The Nigerian government has established a NAP framework, although there is no documentation regarding its application and implementation to mitigate vulnerability at the community level. Efficient adaptation delivery is crucial for Nigeria due to its vulnerability to climate extremes, and its minimal greenhouse gas emissions suggest that reduction, while significant, is a lower national priority than adaptation.

### **Governance of Climate Change**

The government of Nigeria is structured into three levels: federal, state, and local governments. Local governments, as indicated by their designation, represent the most localised tier of

governance, engaging directly with grassroots communities. These local entities, together with their corresponding state governments, own ministries tasked with advancing pertinent development goals. Although these agendas may incorporate climate adaptation strategies via existing extension services, they frequently lack alignment with National Adaptation Plans (NAPs), suffer from inadequate funding, and are deficient in competent personnel.

The limited implementation of adaptation frameworks and instruments at the sub-national level results in the Federal Ministry of Environment overseeing the majority of projects, including those related to climate change adaptation and other environmental issues, even at the local level. Governance at the ministerial level is directed by a politically appointed cabinet minister, who is responsible for leading and collaborating with public workers in the Nigerian civil service at the Directorate level. The staff at that level encompasses inter-ministerial positions, diplomatic and climate negotiating duties, along with committees established at various national and sub-national tiers to address specific initiatives.

### **Climate Adaptation Initiatives in Nigeria**

Nigeria is executing many climate adaptation efforts, encompassing extensive activities such as The Great Green Wall and the World Bank-supported Nigeria Erosion and Watershed Management Project (NEWMAP). Other initiatives concentrate on particular sectors, such as the Yobe State Environmental and Climate Change Action Project, which advocates for resilient agriculture and alternative energy, and the Sokoto State healthcare effort aimed at constructing climate-resilient infrastructure. State-level initiatives are underway, such as the Lagos State Climate Adaptation and Resilience Plan (LCARP), alongside community-based programs and collaborations with the commercial sector.

Recent years have witnessed the most extensive adaptation projects in Nigeria, which include:

- a) The World Bank supported the Nigeria Erosion and Watershed Management Project (NEWMAP), developed in conjunction with the Federal Ministry of Environment, to address the issue of gully erosion in southeastern Nigeria and other types of land degradation in northern Nigeria. The project received approval in 2012, with the World Bank pledging around USD 500 million (EUR 500 million) to it. It consisted of three primary components: Gully Rapid Action and Slope Stabilisation (GRASS), (b) Integrated Watershed Management, and (c) Adaptive Livelihoods, and was executed in nineteen (19) states of Nigeria.
- a. The Building Nigeria's Response to Climate Change (BNRCC) project was a five-year initiative that commenced in 2007, focussing on research about vulnerability—both existing and future—alongside awareness and pilot programs, while integrating gender considerations throughout the project lifecycle. The BNRCC, costing USD 4.9 million (EUR 4.9 million), was financed by the Canadian International Development Agency (CIDA) and led to the formulation of the National Adaptation Strategy and Plan of Action on Climate Change for Nigeria (NASPA-CCN) in partnership with the Federal Ministry of Environment. The pilot projects were designed with the following objectives: employing enhanced varieties to bolster food security, supplying fuel-efficient wood stoves, introducing aquaculture as an alternative income source, reducing community reliance on forest products, enhancing access to water sources, and rehabilitating ecosystems through tree planting.
- b. The Great Green Wall is presently being executed throughout twenty-two nations, encompassing elements of forestry, water management, and energy. The primary objective is to cultivate 8,000 kilometres of forest across 100 million hectares of degraded land by 2030 to address ongoing droughts, food shortages, migration, and war. Initiated by the

African Union (AU), it is presently executed through a collaboration involving the United Nations Convention to Combat Desertification (UNCCD), the Food and Agriculture Organisation (FAO), the World Bank, the Global Environment Facility (GEF), the International Union for Conservation of Nature (IUCN), the Green Climate Fund (GCF), and various other entities. The project is projected to have accomplished 15% of its objectives and, once completion, will have resulted in the largest living system on Earth.

Additional projects and initiatives encompass the following:

- a. The African Development Bank (AfDB) has initiated the Africa Adaptation Acceleration Program (AAAP), a USD 25 billion (EUR 25 billion) initiative in partnership with the Global Centre on Adaptation (GCA). The AAAP will ultimately get funding from African governments, investors, foundations, resilience bonds, and debt-for-climate-adaptation swaps.
- b. Adaptation to climate change in the Lake Chad Basin, financed by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). The initiative aims to deliver adaptation solutions and optimal practices to 1,100 villages within the region and other nations. The five-year project conducted from 2013 to 2018 especially aimed at enhancing food security.
- c. The UK Foreign, Commonwealth and Development Office (FCDO) and the United States Agency for International Development (USAID) have contributed to the creation of knowledge products, country reports, climate risk resources, and research throughout Nigeria.
- d. In 2021, the World Bank initiated a successor to NEWMAP called the Agro-Climatic Resilience in Semi-Arid Landscapes (ACReSAL): This initiative is a \$700 million (EUR 700 million) endeavour aimed at enhancing landscape management in northern Nigeria. The project consists of four sequential components designed to tackle the issues of extensive watershed degradation in northern Nigeria, enhance community climate resilience, bolster institutional capacity, and establish a foundational framework for multisectoral integrated landscape management and climate resilience. Additionally, it aims to implement a financing mechanism accessible to borrowers in investment project financing operations, thereby facilitating the rapid allocation of uncommitted funds to address eligible crises or emergencies.
- e. *Sokoto State Climate-Resilient Healthcare Initiative*: A project aimed at establishing climate-resilient healthcare infrastructure, encompassing new medical faculties, a teaching hospital, and enhanced pharmaceutical supply chains.
- f. *National Adaptation Plan Framework (NAPF)*: A framework that directs the nation's adaptation initiatives, serving as the foundation for the government's primary adaptation agenda.
- g. The Bank of Industry (BOI) has received accreditation from the Adaptation Fund as a National Implementing Entity, allowing it to access and administer money for projects in areas impacted by climate change.

Projects tailored to certain sectors and communities:

- a. *Sustainable Agriculture for Climate Adaptation (SACA)*: Enhances the adaptive potential of children and youth in marginalised areas using sustainable agricultural methods.
- b. *Yobe State Environmental and Climate Change Action Project*: Facilitates resilient agricultural, alternative energy, and reforestation activities in Yobe State.
- c. *Kaduna State Climate Action Plan*: Encompasses initiatives to initiate renewable energy pilot projects, including solar mini-grids, and to execute waste management reforms.

- d. *Community-Centric Initiatives*: Programs emphasising local strategies, such as educating women in community monitoring and creating cost-effective clean cooking solutions.
- e. *Southern Niger Connectivity and Integration Project*: A transnational initiative featuring elements in northern Nigeria, designed to enhance infrastructure and foster resilience.

#### **4. TRENDS AND ANALYSIS OF CLIMATE FINANCE**

Financing adaptation is a paramount worldwide concern, and Nigeria is no exception. Climate adaptation initiatives in Nigeria have primarily received funding from foreign agencies, although being executed at both national and sub-national levels. Similar to many countries in Sub-Saharan Africa, Nigeria depends on external loans, assistance, and grants to fund over 50% of its climate adaptation and mitigation initiatives. A considerable portion of the project expenses is covered by multilateral financial institutions (MFIs), primarily the World Bank and, to a lesser degree, the African Development Bank (AfDB). Other significant international contributors to adaptation initiatives in Nigeria comprise GIZ, FCDO, and USAID. The financial contributions for adaptation from the Nigerian government and the business sector have not yet reached the necessary level to address the funding deficit related to enhancing resilience.

#### **5. DEFICIENCIES AND LIMITATIONS OF EXISTING CLIMATE INITIATIVES**

The primary obstacle to implementing climate change adaptation in Nigeria is the absence of the topic in the public discourse. The essential frameworks necessary for offering guidance and systematic support in the planning, implementation, and administration of adaptation practices are now in the early stages of development. In the lack of a widely recognised, if not universal, adaptation process, adaptation practices are marked by autonomous efforts from local communities, international groups, and governmental agencies.

A prevalent issue associated with climate adaptation in Nigeria is the insufficient political will to address it as a significant national priority, resulting in inadequate funding for such initiatives. Investment for adaptation from both public and private sectors is significantly inadequate to address the escalating risks of a climate emergency, even disregarding the fact that such investment is potentially unsustainable without the earlier construction of a robust framework. The lack of citizen advocacy for enhanced environmental governance is a constraining element. As previously mentioned, these demands have increased alongside heightened climate change knowledge nationwide, both of which are predecessors to the escalation of national political debates on adaptation.

Consequently, collaboration among ministries and government agencies with distinct responsibilities in climate change management is constrained, and science-based targets have not yet been sufficiently integrated to effectively guide planning and legislation. Moreover, communities typically lack access to financial resources (credit, insurance, and consulting services), sufficient environmental governance (an enabling policy framework, political commitment, subsidies, and incentives), enhanced agricultural inputs, energy, and equitable legal recourse. This absence of access represents a considerable limitation. The problems indicate the necessity for an alternative strategy regarding climate action, particularly climate adaptations, that corresponds with the needs and ambitions of Nigerians and influences overarching national policy priorities.

#### **6. POSSIBLE FUNCTION OF LOCALLY DRIVEN ADAPTATION IN NIGERIA**

The acknowledged constraints in resource distribution, along with Nigeria's significant susceptibility, underscore the necessity for effective comprehension and management of

climate adaptation. In summary, without a strong adaptation strategy for climate change, Nigeria's economic growth will achieve negligible progress, if any, and the nation will face several external challenges that may escalate into intricate social problems, affecting both regional and local spheres. Although numerous actors have formulated adaptation policies and implementation strategies, the sufficiency and efficacy of these measures remain unassessed in a manner that yields evidence for enhancement and comprehensive climate action, encompassing the acknowledgement, documentation, and incorporation of local perspectives and ongoing adaptation strategies and practices. The bottom-up methodology of Locally Led Adaptation (LLA) presents a tremendous opportunity to harness the potential and advantages of climate action in Nigeria, particularly at the local level, where such initiatives are critically required. Local Level Adaptation (LLA), characterised as community-driven adaptation aimed at achieving fair, efficient, and transparent outcomes, comprises eight principles established by the Global Commission on Adaptation in 2021, which serve as guidelines for its advancement. Fundamentally, these principles embody the notions of inclusivity for local stakeholders and marginalised groups, enhanced comprehension of climate risk, substantial and consistent funding, transparency, and collaboration. Nonetheless, it is imperative to comprehend the needs, priorities, and values of the local community to ensure alignment of these principles with the realities and aspirations of the target population.

The effects of climate change on the Nigerian economy and the anticipated escalation of adverse impacts on lives and livelihoods indicate that LLA offers the greatest potential for comprehensive and enduring solutions. LLAs offer numerous benefits, including enhancing lives and livelihood prospects, fostering resilient communities, and equipping them with the necessary tools and resources to thrive in a warming climate. An appropriately adjusted economy can recover more swiftly and yield greater returns for each dollar invested, perhaps reaching six dollars for dollar invested, as stated by the UN. These savings are crucial for financially limited countries like Nigeria. A well-adapted nation fosters a dynamic ecosystem for community prosperity by establishing businesses and livelihoods, implementing clean energy systems, addressing social issues and their root causes, promoting cleaner and safer environmental policies and regulations, thereby enhancing the overall wellbeing and life expectancy of the population.

## **7. PROSPECTIVE FUNCTION AND SIGNIFICANCE OF NOVEL RESEARCH TO AUGMENT ADAPTATION INITIATIVES IN THE NATION**

Although LLAs may play a beneficial role for Nigerians, further research is essential to comprehend the existing adaptation policies and strategies within national and regional frameworks, as well as their execution at the local level. Understanding how local communities perceive and address the current effects of climate change is essential, as this knowledge can enhance, advance, and bolster existing local initiatives. Furthermore, this knowledge can serve as a catalyst to expedite national climate adaptation efforts by aligning policies with the needs and interests of the majority of Nigerians.

The current research underpinning this working paper aims to produce insights that enhance policy coherence and integrate climate adaptation measures by:

- a. Assisting both established and emerging participants in the Nigerian adaptation sector;
- b. Assisting Nigeria in reconciling climate initiatives with objectives of economic advancement, employment generation, and sustainable economic growth.

Ultimately, all of the aforementioned factors play a crucial part in national development and economic success. Effective adaptation can diminish government expenditures, conserving

essential fiscal resources. For communities enduring severe conditions, beset by poverty and the looming threat of climate change, the implementation of efficient adaptation solutions with multifaceted objectives is exceedingly urgent. This study will serve as a reference for future initiatives to enhance LLA activities and inform subsequent research and actions on the subject.

## **8. CONCLUSION**

This study reviewed and synthesized two decades of climate change mitigation and adaptation research in Nigeria, revealing both significant progress and substantial gaps in national climate action. The evidence shows that Nigeria is experiencing intensifying climate impacts—ranging from flooding, drought, coastal erosion, health crises, biodiversity loss, and food insecurity to conflict and displacement—while lacking adequate institutional, financial, and governance structures to address these challenges at scale. Although national frameworks such as the Climate Change Act (2021), the National Adaptation Plan (NAP), updated NDCs, and a suite of large-scale adaptation projects demonstrate the government’s recognition of climate risks, the translation of policies into effective local action remains limited.

The dominance of agricultural-focused studies reflects the sector’s heightened vulnerability and importance to livelihoods, yet the relatively low number of institutional adaptation studies signals a significant research and governance gap. Institutional actions—policies, regulatory mechanisms, planning frameworks, financing systems, and cross-sector coordination—are essential for long-term resilience but remain weak or insufficiently explored. The review further establishes that education is the strongest determinant influencing the adoption of adaptation strategies, highlighting the need for targeted awareness, capacity-building, and knowledge dissemination at the grassroots level.

The analysis also reveals that climate finance in Nigeria is overwhelmingly donor-dependent, with limited domestic resource mobilization and low private sector participation. This financing imbalance hinders sustainability, reduces national ownership of adaptation processes, and perpetuates implementation gaps. Climate adaptation governance at the federal, state, and local levels suffers from fragmentation, weak coordination, and inadequate political prioritization, further limiting the reach and effectiveness of climate initiatives.

Given these realities, the paper underscores the transformative potential of Locally Led Adaptation (LLA) as a pathway to achieving equitable, context-specific, and resilient outcomes. LLA offers an opportunity to elevate community knowledge, integrate indigenous coping mechanisms, improve project sustainability, and ensure that adaptation aligns with the priorities and realities of Nigeria’s most vulnerable populations. It also strengthens transparency, accountability, gender inclusion, and climate justice—core principles needed to operationalize effective adaptation at scale.

Ultimately, strengthening climate resilience in Nigeria requires a multi-pronged approach: enhancing institutional capacity, aligning national policies with local realities, increasing domestic climate financing, fostering stronger intergovernmental collaboration, and scaling nature-based and ecosystem-based solutions. Additionally, expanding research into underexplored sectors—particularly institutional adaptation, urban climate risks, and the socio-economic drivers of vulnerability—is essential. With coherent policies, targeted investments, empowered communities, and robust research, Nigeria can build a climate-resilient future that safeguards livelihoods, supports sustainable development, and ensures long-term national stability in the face of accelerating global climate change.

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## **Conflicts of Interest**

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

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