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GOVERNANCE AND LEGAL INNOVATION FOR ENVIRONMENTAL SUSTAINABILITY: IMPLEMENTING NIGERIA'S CLIMATE CHANGE ACT

Abdulkareem Ademola Mashood*

&

Sabitu Balarabe Usman**

ABSTRACT

Effective governance and legal innovation are essential for steering nations toward sustainable development in climate-vulnerable countries like Nigeria. This paper critically examines Nigeria's Climate Change Act 2021 as a transformative legal instrument that operationalizes climate governance, introduces novel mechanisms for environmental accountability, and aligns national development with international obligations such as the Paris Agreement and the SDGs. The paper adopts doctrinal research method in exploring the institutional design and mandates established under the Act, including the National Council on Climate Change and the requirement for designated climate officers within the public and private entities. It assesses implementation challenges in regulatory enforcement, inter-agency coordination, and capacity building at subnational levels. The study also highlights the innovative use of Environmental Economic Accounting (EEA) to guide emissions reduction through a data-driven, sustainability-focused budgeting process. A key focus is the intersection of law, governance, and stakeholder management in the petroleum sector and host communities under the Petroleum Industry Act. Mechanisms like the Host Community Development Trust (HCDT) are analyzed for their potential to support decentralized, community-driven climate action and green investment. The paper finds that while legislation is foundational, sustainable development requires interdisciplinary collaboration—blending law, environmental science, finance, and grassroots engagement. It calls for strategic policy innovation and institutional reform to transform Nigeria's climate law into a practical tool for resilient, inclusive, and equitable development.

Keywords: *Environmental Sustainability, Climate Change, Environmental Economic Accounting, Petroleum Industry Act, Host Community Development Trust*

1.0 INTRODUCTION

Nigeria faces significant climate risks that threaten its environment, economy, and population (Erondu, 2025, p.85). As a country with diverse ecological zones comprising of arid northern regions and coastal wetlands in the south, Nigeria is vulnerable to multiple climate-related hazards (Oghenebrozie & Atedhor, 2024, p.e02271). Climate change presents a multifaceted threat to sustainable development

in Nigeria (Okon et al., 2021, p.e07941). These include: Rising temperature and heatwave, Flooding, Drought and desertification, Coastal erosion and salinization, and Biodiversity loss. These risks are compounded by socio-economic vulnerabilities such as poverty, weak infrastructure, limited adaptive capacity, and inadequate enforcement of environmental regulation (Okon et al., 2021).

Effective governance and a robust legal framework are crucial for addressing climate risks and achieving environmental sustainability in Nigeria (Uzoka, 2024, p.211). Given the country's vulnerability to climate-induced challenges, the urgency of addressing climate risk has elevated governance and legal frameworks to the forefront of policy discourse. Nigeria, with its resource-dependent economy and fragile ecosystems, must balance development with environmental sustainability.

This paper investigates the role of governance and legal innovation in enabling this balance, focusing on the Climate Change Act (CCA) 2021. It examines how institutional structures, legal mandates, and interdisciplinary tools like Environmental Economic Accounting can translate sustainability commitments into actionable results. By situating the Act within Nigeria's broader development strategy and international obligations, the paper provides an in-depth assessment of its potential and limitations in achieving environmental justice and low-carbon growth.

2.0 METHODOLOGY

This paper adopts a doctrinal legal research method. The doctrinal method focuses on analysing "the law as it is." It involves the systematic examination, interpretation, and organisation of legal rules, statutes, institutional mandates, and governance instruments relevant to climate change regulation and sustainable development in Nigeria. To achieve this objective, the paper relies on primary and secondary legal sources of data. The primary legal sources include the Constitution of the Federal Republic of Nigeria (CFRN) 1999 (as amended), Climate Change Act 2021, Petroleum Industry Act 2021 (HCDT), NESREA Act 2007, Environmental Impact Assessment Act, UNFCCC (1992), Kyoto Protocol (1997), Paris Agreement (2015), Agenda 2030 (SDGs), Nigeria's NDC (2021) and NASPA-CCN (2011). The secondary legal sources include journal articles on climate law and governance, UNFCCC and UNEP reports, Policy and institutional analyses and Commentaries on environmental enforcement in Nigeria. Information obtained from these sources were subjected to content analysis.

The content analysis revealed that this method is appropriate in analysing the Climate Change Act (CCA) 2021 and assessing its alignment with both domestic environmental governance structures and international climate obligations. This enables the mapping of legal innovations introduced by the

CCA such as Environmental Economic Accounting (EEA), Carbon budgeting obligations, and the institutional empowerment of the National Council on Climate Change (NCCC). It provides a structured basis for evaluating the legal coherence, enforceability, and institutional capacity underlying Nigeria's climate governance regime.

Also, this method provides an authoritative basis for evaluating the coherence and transformative potential of the CCA. It aids the interpretation of legal texts and clarifies legislative intent, obligations, and governance mandates; Systematization of legal norms and organizes the thematic areas into governance structures, innovations, compliance, community interventions; Comparative and normative evaluation and benchmarks Nigeria's framework against international standards; Critical assessment of implementation capacity and identifies gaps in coordination, enforcement, technology, and subnational capacity.

3.0 CLIMATE GOVERNANCE FRAMEWORK IN NIGERIA

3.1 International and Regional Convention, Treaties and Protocols

Nigeria's climate policy has evolved through engagement with global environmental governance. In the quest to combat climate change and to promote a sustainable environment in Nigeria, the government signed a plethora of conventions and protocols (Olujobi & Odogbo, 2024, p.2590).

3.1.1 The Intergovernmental Panel on Climate Change (IPCC)

The Intergovernmental Panel on Climate Change (IPCC), created in 1988 by the WMO and UNEP, assesses scientific evidence on human-induced climate change (Paglia & Parker, 2021, p.295). It emphasises that climate impacts will vary across regions depending on the adaptive capacity of natural and human systems (IPCC, 2023, p.4). Because the IPCC's mandate is to review global climate science, Nigeria's climate policies—including the Climate Act 2021, its NDCs, and sector-specific mitigation and adaptation plans—draw heavily on IPCC assessments (Okon et al., 2021).

These reports shape Nigeria's understanding of temperature and sea-level rise, desertification, drought, and extreme weather events across the country (Dioha & Kumar, 2020). They also guide Nigeria's vulnerability analyses, mitigation pathways, and sectoral priorities by providing global methodologies for emissions accounting and adaptation planning (Malley et al., 2021, p.66). This scientific basis informs Nigeria's revised 2021 NDC targets of 20% unconditional and 47% conditional emission reductions by 2030, rooted in the IPCC's carbon budget calculations, 1.5°C/2°C scenarios, and GHG inventory methods (Noah, 2024, p.116).

3.1.2 The United Nations Framework Convention on Climate Change (UNFCCC): Rio Declaration, Kyoto Protocol, Copenhagen Accord and Paris Agreement.

The IPCC report of 1990 led to the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) at the United Nation Conference on Environment and Development (UNCED), Rio de Janeiro in 1992 (Weinger, 2023, p.102669). It was ratified by 50 countries and came into force in March, 1994. The UNFCCC is the most recognized international agreement on Climate Chang (Kuh, 2018, p.505). The main objective of the Convention was to stabilise greenhouse gas emissions at a level that would not interfere with the climate system or food production, but which would still allow sustainable economic development. The UNFCCC established a Conference of Parties (COP), a law-making body that meets annually and is charged with devising ways to implement UNFCCC goals (Kuh, 2018). The foremost conference of parties took place in Kyoto, Tokyo and subsequent COP which held were in Copenhagen and Paris. Every year, the UNFCCC COP provides a forum for the negotiation of new policies and the evaluation of Parties' progress towards the UNFCCC's overarching objective of limiting climate change (Augusto Cançado Trindade, 2017, p.49).

The Kyoto Protocol (KP) was negotiated and came into force in 2005. It sets binding emissions limits on developed countries that have signed it. It was intended that the limitations must be met between 2008 and 2012 (Wewerinke-Singh and Doebbler, 2016, p. 1486). In December 2009, parties to UNFCCC met in Copenhagen, Denmark, for the 15th Conference of the Parties (COP15) (Wewerinke-Singh & Doebbler, 2016). A framework for international climate change mitigation as a successor to the Kyoto protocol after 2012 is to be agreed upon there (Wewerinke-Singh and Doebbler, 2016). This agreement follows the most recent conference of parties on implementation of the UNFCCC, which held in Paris in 2015 (Wewerinke-Singh and Doebbler, 2016). At this conference, nearly every nation on earth committed to actions aimed at shifting away from fossil fuels and towards cleaner, smarter energy options in order to limit global temperature rise to 20c – or 1.50c if possible (Wewerinke-Singh & Doebbler, 2016).

International conventions and agreements such as the UNFCCC, the Kyoto protocol etc. have been ratified by Nigeria, but are not domesticated (Christopher & Achinge, 2022, p.124). As a signatory to the United Nations Framework Convention on Climate Change (UNFCCC) 2015, Nigeria committed to periodic reporting and emissions targets under the Kyoto Protocol 1997 and the Paris Agreement. Its 2021 updated Nationally Determined Contributions (NDCs) include goals to cut emissions by 47% by 2030 with international support (Noah, 2024). The Act reinforces this commitment by aligning national obligations with the SDGs and Paris Agreement. Accordingly, the Act states that the NDCs

should be implemented in line with the climate change obligations under the SDGs, UNFCCC and the Paris Agreement.

The CCA operationalizes these goals at the national level. Section 3 of the Act establishes the National Council on Climate Change (NCCC) as a high-level oversight body, chaired by the President and supported by a Secretariat. The NCCC is mandated to coordinate cross-sectoral climate action, formulate national policies, and ensure alignment with international commitments (CCA 2021, S. 32 (b)). Section 11(5) man dates rotational appointments for Zonal Coordinators and State Directors; a measure to align with Nigeria's diverse ethnic makeup.

3.2 National Legislation

3.2.1 The Constitution of the Federal Republic of Nigeria (CFRN) 1999

The Constitution of the Federal Republic of Nigeria (CFRN) 1999 is the *grundnorm* from which other laws derive their powers and validity (CFRN 1999, S. 1.). The protection and preservation of the land, air, water, forests, and wildlife as well as the human environment are guaranteed by the Constitution. Although Chapter II of the same constitution renders it non-justiciable, it is nevertheless one of the fundamental objectives and directive principles of the state policy for Nigerians (CFRN 1999, S. 20). From the foregoing, it would appear that the lack of enforceable provisions pertaining to environmental protection is understandable. Fortunately, Nigeria has ratified and is now a party to numerous international laws, conventions, accords, treaties, and protocols as a member of the United Nations (UN) (Christopher & Achinge). Climate change and the environment are closely related to some of these international conventions and agreements. Notwithstanding the ratification of these international agreements, they however do not immediately become law until the National Assembly domesticates them in line with the provision of Section 12 of the CFRN 1999 (as amended).

3.2.2 Other Environmental Legislations

The National Environment Standard and Regulations Enforcement Agency (NESREA) Act became operational in 2007. It replaced the defunct Federal Environmental Protection Agency (FEPA) Act (Cap. F10, Laws of the Federation of Nigeria, 2004). Section 7(a) of the Act mandates the Agency to enforce compliance with Laws, guidelines and standards on environmental matters The above provisions validate the enforcement of the aforementioned International Convention on climate change i.e. The UNFCCC in Nigeria. Also, the Agency is mandated to enforce compliance with guidelines and legislation on sustainable management of the ecosystem, biodiversity conservation and the development of Nigeria's natural resources.

The Environmental Impacts Assessment (EIA) Act is another legislation that is of relevance to the regulation of climate change in Nigeria. its enforcement is under the purview of NESREA. The Act is designed to ensure that Environmental Impact Assessment is conducted with respect to any project which is likely to have significant effect on the environment.

The *EIA Act* and *NESREA Act* provide a legal basis for coordinated action on climate resilience and emissions reduction These environmental laws and regulations are essential guides to sustainable land use, water management, pollution control, and climate adaptation.

3.2.3 Climate Change Act (CCA) 2021

The CCA 2021 was enacted into law in August 2021, heralding a new dawn and an unprecedented history in Nigeria and West Africa in general (Olujobi & Odogbo, 2024). It is the first comprehensive law to address the devastating effects of climate change in Nigeria. The Act aims to regulate climate change activities for environmental sustainability and preservation of the ecosystem. It is legal framework for reducing the emission of gas into the atmosphere to protect the Green House Gas. Also, it allows for the implementation of policies and programs in accordance with the Net Zero program for 2050–2070 and the Nationally Determined Contribution (NDC) goals (Olujobi & Odogbo, 2024). Accordingly, the Act recognises the value of public involvement and requires MDAs and CSOs to implement some kind of mitigation policy in accordance with sections 22, 23, and 25 of the Act.

3.3 Institutional Framework

3.3.1 National Council on Climate Change

The National Council on Climate Change (NCCC) is the central coordinating body established under the Nigerian CCA 2021 to steer the country's climate governance efforts (National Council on Climate Change (2024, p.iv). It represents a high-level institutional response to the growing climate crisis and the need for coherent, multisectoral policy implementation. The NCCC is chaired by the President of Nigeria, reflecting the political priority accorded to climate action. The diverse composition ensures broad representation and integration of climate concerns across various sectors of governance.

3.3.2 National Environmental Standards and Regulations Enforcement Agency (NESREA)

The National Environmental Standards and Regulations Enforcement Agency (NESREA) is Nigeria's foremost environmental regulatory agency, established under the NESREA Act of 2007 (Jean de Dieu & Lakube, 2024, p.237). It plays a central role in enforcing environmental laws, regulations, and standards across the country.

NESREA operates under the supervision of the Federal Ministry of Environment (Matemilola & Elegbede, 2017). NESREA's primary mandate is to ensure compliance with environmental laws, regulations, and standards to promote a clean and healthy environment. NESREA serves as a critical institution in Nigeria's environmental governance architecture. It supports the goals of the CCA 2021 by enforcing environmental compliance and promoting sustainable development.

3.3.3 The National Oil Spill Detection and Response Agency (NOSDRA) Act 2006

NOSDRA is a major climate change legislation in Nigeria. The major objectives of the Agency are to co-ordinate and implement the National Oil spill contingency plan for Nigeria and establish a viable national operational organisation that ensures a safe, timely, effective and appropriate response to major or disastrous oil pollution. NOSDRA's activities strengthen Nigeria's environmental governance architecture through enforcement of spill contingency plans, monitoring of oil infrastructure, data collection and environmental assessment and collaboration with federal ministry of environment, National Emergency Management Agency (MEMA), Nigerian National Petroleum Corporation (NNPCL) and state bodies. NOSDRA contributes to climate action and environmental sustainability in respect of implementation and enforcement.

Although NOSDRA is not primarily a climate change agency, its statutory mandate under the Act directly supports Nigeria's environmental sustainability goals and intersects significantly with climate mitigation and adaptation. It helps in reducing greenhouse gas (ghg) emission through oil spill prevention and response. This supports Nigeria's mitigation commitments under its nationally determined contribution (NDC). This is evident Nigeria's Niger Delta mangroves, one of the largest in Africa, that have been impacted by major carbon sinks from oil spills. NOSDRA's mandate ensures pollution control, remediation, and ecosystem restoration. This helps protect natural carbon sequestration systems, restore damaged mangrove forests and preserve biodiversity that supports ecological resilience. It also indirectly enhances climate mitigation from oil pollution directly affecting climate-sensitive areas such as fisheries, agriculture and water resources.

4.0 LEGAL INNOVATION UNDER THE CLIMATE CHANGE ACT

4.1 Justiciable Climate Obligations

The Act establishes legally enforceable obligations for public institutions and certain private entities to implement climate action plans and reduce greenhouse gas (ghg) emissions (CCA 2021, S. 2). This marks a significant departure from Nigeria's prior climate framework, which relied heavily on

voluntary commitments (Rigaud, et al., 2021, p.15). The creation of legal duties ensures greater accountability in meeting national and international climate targets.

4.2 Creation of the National Council on Climate Change (NCCC)

The establishment of the NCCC as the highest policy-making and coordinating body for climate change governance is a major legal innovation (CCA 2021, S. 3). Unlike previous ad hoc or ministerial committees, the NCCC is chaired by the President and includes multi-sectoral representation. It has statutory powers to set a carbon budget, monitor implementation, enforce sectoral emissions limits and coordinate Nigeria's position in international climate negotiations.

4.3 Mandatory Roles for Public and Private Sectors

The CCA introduces a range of novel legal tools to institutionalize climate responsibility. The public and private entities employing 50 or more persons are required to designate climate change officers and submit annual reports detailing mitigation and adaptation strategies (CCA 2021, S. 23 & S. 24). This measure ensures that climate accountability is embedded in organizational management structures.

4.4 Climate Change Officers, Annual Emissions/Adaptation Reporting

For the first time in legal history, the Act mandates all Ministries, Departments and Agencies (MDAs) and large private sector entities to prepare and submit annual emissions and adaptation reports. Also, it mandates the appointment of climate Change Officers in the public and private entities to oversee internal compliance (CCA 2021, S. 24 (1) b). Consequently, the Act mandates development of sectoral carbon budgets to align national GHG emissions with the long-term net-zero goal by 2060 (Olayande, 2022, p.2). MDAs shall also adhere to the annual carbon emission reduction targets, in accordance with the Action Plan and carbon budget made under the CCA. Where an MDA fails to meet its carbon emission reduction target, it shall be subjected to a review, and if found liable, its principal officers shall be sanctioned and may be fined as determined by the Council (CCA 2021, S. 22 (6).

4.5 Environmental Economic Accounting (EEA)

A standout innovation is the introduction of Environmental Economic Accounting (EEA), which mandates the integration of ecological costs into national budgeting and economic planning (CCA 2021, S. 19). EEA enables policymakers to evaluate trade-offs, track environmental degradation, and prioritize low-carbon investments. It marks a significant shift from reactive environmental policy to data-driven governance.

The Act introduces a tool to measure the environmental costs of economic activities and the value of natural resources. This innovation embeds sustainability into national development planning and budgeting, supporting the integration of environmental priorities into fiscal and economic decision-making. The Act also empowers the Council to impose penalties on entities that fail to comply with emissions targets, further reinforcing regulatory authority. Nevertheless, the success of the legal framework depends on effective enforcement and institutional willingness to act against violators.

4.6 Reducing Emissions from Deforestation and Forest Degradation (REDD+) Registry

The REDD+ refers to reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests, and the enhancement of forest carbon stocks (CCA 2021, S. 28 (2)). The CCA empowers the Federal Ministry of Environment to set up a registry with sub-national nodes for capturing REDD+ activities in Nigeria, including updates on Forest Reference Emission Level (FREL) (CCA 2021, S. 28 (1). The CCA also empowers the Council to provide fiscal support for REDD+ activities.

4.7 Establishment of the Climate Change Fund

The Act creates a dedicated Climate Change Fund to finance mitigation, adaptation, and resilience-building efforts (CCA 2021, S. 15). It mandates contributions from public revenues, climate-related levies or taxes, grants, donations, and international climate finance (Matthias & Deepal, 2022, p.102450). This fund is legally backed and can support long-term, equitable, and decentralized climate investments in vulnerable communities.

4.8 Inclusion and Equity Provisions

The Act emphasizes the principles of climate justice, intergenerational equity, and gender inclusiveness (CCA 2021, S. 25). It mandates the representation of youth, women, and vulnerable groups in decision-making processes (CCA 2021, S. 5), aligning climate action with Nigeria's constitutional and human rights obligations.

5.0 INTERFACING LAW WITH STAKEHOLDER MANAGEMENT

5.1 Empowering Host Communities: Climate Justice and the HCDT

The Act explicitly promotes public participation and inclusivity, aligning with principles of climate justice and intergenerational equity (Ikeanibe, 2022, p.8). This opens up opportunities for Niger Delta host communities to participate in decision-making through representation in the National Council on Climate Change (NCCC), engage in the design and implementation of local adaptation and mitigation strategies, and influence environmental policies that affect their health, livelihoods, and ecosystems.

The creation of Climate Change Fund strengthens support for mitigation and adaptation of host communities in the Niger Delta to access funding for community-based climate initiatives, and develop renewable energy projects, green jobs, and ecosystem restoration activities, and use the fund to build resilience against sea level rise, coastal erosion, and pollution.

The CCA does not explicitly single out host communities in the Niger Delta for inclusiveness, environmental accountability, and participatory governance. The Act empowers citizens and civil society, including host communities, to demand accountability from polluting industries and government agencies in partnership with NESREA, state environmental agencies, and NGOs for monitoring and reporting violations (Aigbokhae, 2023, p.73). Given the historical environmental degradation in the Niger Delta, it enables the host communities to use legal mechanisms to enforce compliance with environmental and climate standards. Consequently, the host communities can use the CCA to advocate for climate justice by pressing for remedial actions and equitable distribution of climate finance and insist on the phased elimination of gas flaring, in line with Nigeria's net-zero goals and Paris Agreement obligations.

The Host Communities Development Trust (HCDT) is also central to the key innovation introduced by the Petroleum Industry Act (PIA) 2021 to promote sustainable development, environmental protection, and socio-economic inclusion in Nigeria's oil-producing regions (Ugochukwu & Samson, 2024, p.38). While not a climate-specific instrument, the HCDT complements Nigeria's climate goals by enabling community-led environmental protection projects, such as reforestation, erosion control, clean energy access, and waste management, supporting climate adaptation measures that strengthen the resilience of oil-producing communities to floods, sea level rise, and pollution, and encouraging oil companies to act responsibly in host communities under statutory scrutiny, thereby reinforcing environmental compliance and emission reduction efforts.

The HCDT framework, when effectively implemented, supports the CCA's objectives of decentralized climate action, inclusion of vulnerable communities, and local ownership of mitigation and adaptation strategies.

5.2 Green Finance and Community-Led Adaptation Strategies

Sustainability requires inclusive governance that engages communities most affected by climate impacts. The CCA intersects with the Petroleum Industry Act (PIA) 2021, which creates the Host Community Development Trust (HCDT) to support oil-producing areas (Ugochukwu & Samson,

2024) By allocating 3% of oil companies' operational expenses to local development, the HCDT provides a funding mechanism for community-led environmental action (Brisibe, 2024, p.359).

This overlap presents an opportunity to integrate climate adaptation into grassroots governance. Local communities can leverage HCDT funds to develop green infrastructure, restore ecosystems, and build resilience against extreme weather events. Moreover, its success hinges on transparency, participatory planning, and the incorporation of indigenous knowledge.

5.0 IMPLEMENTATION CHALLENGES AND INTERDISCIPLINARY GAPS

5.1 Capacity Constraints at National/Subnational Levels

Despite progressive legal frameworks such as the CCA 2021 and the Petroleum Industry Act 2021, Nigeria faces several capacity constraints, implementation challenges, and interdisciplinary gaps that undermine effective environmental and climate governance at national and subnational levels (Vahyala & Emmanuel, 2024, p.133).

5.1.1 Capacity Constraints

a. **Institutional Weakness**: Many Ministries, Departments, and Agencies (MDAs) at both federal and state levels lack the technical expertise, infrastructure, and coordination mechanisms to implement climate policies effectively (Danhassan et al., 2023, p.2392). The National Council on Climate Change (NCCC), though well-structured, remains in early stages of operationalization, with challenges in fully integrating its mandate across ministries and states.

b. **Human Resource Deficits**: There is shortage of trained personnel such as climate officers, data analysts, environmental scientists, and legal experts limits capacity for planning, monitoring, and enforcement (Olujobi et al., 2023, p.e17912). At the state and local levels, environmental and climate-related agencies often suffer from inadequate staffing and poor remuneration, leading to low retention of skilled professionals.

c. **Financial Constraints**: There are often limited and unpredictable budgetary allocations to climate and environmental initiatives hamper implementation (Olujobi & Odogbo, 2024). There are also common challenges in accessing and managing climate finance, including funds from the Climate Change Fund and international donors.

5.1.2 Implementation Challenges

a. **Overlapping Mandates and Poor Coordination:** Institutional fragmentation persists among agencies such as NESREA, the Federal Ministry of Environment, State Ministries of

Environment, and the NCCC (Jomachewu & Okeokwo, 2024, p.64). This has resulted in overlapping roles, duplication, conflict, and inefficient use of resources.

b. **Weak Enforcement Mechanisms:** Environmental laws and emissions regulations are often poorly enforced in the oil and gas sector (Audu & Umana, 2024, p.36). Nigeria recorded 4,486 oil-spill cases between 2015 and 2021, amounting to some 242, 193 barrels of crude lost. The persistence of such large spill numbers suggests that existing laws and regulations are not translating into effective prevention or consistent clean-up and remediation (Haruna, 2025, p.236). This is worsened by Corruption, political interference, and lack of judicial engagement which further weakens accountability.

c. **Inadequate Public Awareness and Engagement:** Climate change remains abstract or misunderstood by many local communities due to limited public engagement in the development and execution of climate action plans, including Host Community Development Trust (HCDT) activities (Ogah, 2021, p.32).

5.1.3 Interdisciplinary Gaps

a. **Poor Integration of Science, Law, and Policy:** Climate policy design is often siloed from scientific and technical research, resulting in laws that are either too generic or difficult to implement (Olabomi et al., p.141). This has led to a disconnect between climate scientists, legal experts, and development planners, leading to fragmented interventions.

b. **Lack of Harmonized Data and Monitoring Tools**: The absence of standardized emissions data, environmental indicators, and climate vulnerability assessments at national and state levels impairs evidence-based policymaking (Okon et al., 2021). Also, data systems are not interoperable across agencies, creating inefficiencies and delays.

c. **Limited Local Research and Innovation**: Nigeria relies heavily on external knowledge and funding for climate initiatives that has led to limited local research and development in areas such as renewable energy, carbon accounting, or ecosystem valuation (Okafor et al., 2025, p.3995). Also, academic institutions are often underfunded and disconnected from practical policy needs.

5.2 Enforcement Limitations

5.2.1 Weak Institutional Capacity for Enforcement

Regulatory bodies such as the National Environmental Standards and Regulations Enforcement Agency (NESREA) and subnational environmental agencies often lack the manpower, equipment,

and logistical support to monitor and enforce compliance with environmental and emissions laws (Okechukwu, 2024, p.10). Enforcement is further hampered by insufficient training and poor inter-agency coordination in states with weak governance structures.

5.2.2 Inadequate Legal Sanctions and Judicial Engagement

Many environmental offences committed by multinational corporations are met with light penalties or resolved through informal settlements without deterrent consequences (Igwe & Onyi-Ogelle, 2024, p.12). Therefore, Courts and legal practitioners are not consistently equipped or proactive in adjudicating climate and environmental violations. Moreover, there is a limited history of climate litigation in Nigeria, and affected communities often lack access to legal redress mechanisms.

5.2.3 Political Interference and Regulatory Capture

In the oil-producing Niger Delta, enforcement actions are frequently undermined by political influence and the economic power of oil companies (Onuchukwu & Okafor, 2024, p.177). Enforcement agencies are influenced or co-opted by the industries they are meant to regulate and thereby limiting the independence and integrity of environmental oversight.

5.2.4 Poor Data and Monitoring Systems

Enforcement is hindered by the lack of real-time, accurate emissions and environmental data at the state and local levels (Raimi et al., 2025, p.62). In the absence of standardized monitoring and transparent reporting systems, it is difficult to detect violations or prove non-compliance with emissions targets or adaptation obligations.

5.2.5 Limited Community Empowerment and Participation

Host communities often lack the legal and technical capacity to hold polluters accountable. Whistleblower mechanisms, community-based monitoring, and public interest litigation are underdeveloped, leaving many violations unreported or unaddressed.

5.2.6 Funding and Operational Challenges

The Climate Change Fund established under the Act is not fully operational or accessible for enforcement support (Onyimadu & Uche, 2021, p.100261). Many enforcement agencies depend on limited and irregular government funding, which affects their ability to carry out inspections, prosecute offenders, or invest in technology.

5.3 Weak Integration of Science, Data, and Grassroots Insight

Despite the promises of the legal advancements in Nigeria's climate governance framework, the effective integration of scientific evidence, data analytics, and grassroots/local knowledge into policy

design and enforcement remains weak (Ekhator & Okumagba, 2025, p.247). This disconnect undermines evidence-based decision-making, adaptive planning, and community-driven climate action. This is attributed to several implementation barriers.

5.3.1 Fragmented Institutional Architecture

Agencies responsible for environment, science, planning, and rural development often operate in silos, with little inter-agency data sharing or collaboration (Adelani, 2024, p.460). Therefore, there is no centralized platform to harmonize climate-related research, satellite data, indigenous knowledge, and grassroots reports. Also, Duplication of roles between NESREA, NIMET, NIHSA, NCCC, and state environmental agencies leads to inconsistent use of data and divergent planning assumptions.

5.3.2 Weak Research-to-Policy Linkages

Many scientific and academic institutions in Nigeria conduct valuable environmental and climate research, but their output are rarely translated into policy due to (Akanmu et al., 2021, p.302):

a. Lack of institutional engagement with government agencies,
b. Poor accessibility or communication of scientific findings,
c. Absence of policy briefs, knowledge intermediaries, or translational tools.
d. Climate change policymaking remains dominated by legal and political actors**,** with limited uptake of cutting-edge climate science and risk modelling.

5.3.3 Inadequate Climate Data Infrastructure

Nigeria lacks robust national climate databases, real-time emissions inventories, and integrated environmental-economic accounting systems (Atedhor, 2023, p.e01705). Most states do not have localized climate vulnerability maps, flood risk assessments, or adaptation baselines to guide decision-making. Even where data exists (e.g., through NIMET or remote sensing), it is often underutilized due to technical constraints or limited access at the subnational level

5.3.4 Marginalization of Grassroots Knowledge

Climate policies are often top-down, with minimal engagement from local communities, traditional leaders, and civil society. Indigenous and local ecological knowledge on rainfall patterns, biodiversity loss, or land degradation—is not systematically collected, validated, or integrated into national planning. Language, literacy, and cultural gaps between rural communities and policymakers further weaken participatory science.

5.3.5 Funding and Capacity Constraints

There is chronic underfunding for:

a. Environmental research and development
b. Capacity-building for data interpretation and policy translation,
c. Platforms for community-driven environmental monitoring.
d. Most states lack climate desks with skilled staff capable of interpreting data and linking it to local realities.

5.3.6 Absence of Legal Requirements for Science Integration

While the CCA calls for evidence-based planning, there are no binding legal provisions requiring policymakers to use scientific forecasts, climate models, or local knowledge as part of emissions reporting or adaptation strategies (Abbass et al., 2022, p.42559). The voluntary nature of such integration leads to ad hoc and inconsistent application across sectors and states. Many subnational governments lack the capacity, resources, or technical expertise to comply with its provisions. Data availability for EEA remains limited, and sectoral coordination is weak. There is also insufficient integration of scientific research, economic modeling, and social policy in national climate planning.

In response to the challenges identified in the enforcement and integration, innovative and interdisciplinary approaches are necessary to translate legal frameworks into effective action

6.0 INNOVATIVE AND INTERDISCIPLINARY APPROACHES

6.1 Blending Legal Instruments with Environmental Science and Technology

To effectively respond to climate change, Nigeria must move beyond siloed governance and adopt innovative and interdisciplinary approaches that integrate legal frameworks, environmental science, and technology into a cohesive, action-oriented system. The aim is to enhance the practical enforceability of climate laws while leveraging scientific data and technological tools for evidence-based planning, monitoring, and accountability.

For Nigeria to address its climate challenges meaningfully, law must not only regulate but also facilitate innovation. By embedding environmental science and technology into legal instruments and ensuring institutions are structured for interdisciplinary collaboration to build a governance system that is proactive, inclusive, and resilient. This integrated approach is essential for achieving sustainability, climate justice, and a green economic transition.

6.2 Opportunities for Policy Coherence and Participatory Governance

In Nigeria's evolving climate governance landscape under the framework of the CCA 2021 is anchored on Nationally Determined Contributions (NDCs), and frameworks like the Petroleum Industry Act (PIA) 2021. What remains are the gaps in achieving policy coherence across sectors and tiers of government, and in ensuring participatory governance that is inclusive and equitable. Innovative and interdisciplinary approaches offer strategic pathways to bridge these opportunities by aligning laws, policies, science, and community-driven action in an integrated, accountable, and adaptive manner.

Innovative and interdisciplinary approaches are not only tools for technical efficiency, they are transformative levers for policy alignment, democratic engagement, and systemic resilience. In Nigeria, they offer an unprecedented opportunity to unify fragmented laws and institutions, empower communities, and ensure that climate governance is both coherent and inclusive. The key lies in building platforms, processes, and institutions that legally mandate and structurally support this integration.

6.3 Building Resilient Climate Institutions

In the face of intensifying climate risks and governance complexity, resilient climate institutions in Nigeria must evolve to be adaptive, inclusive, knowledge-driven, and technologically responsive. Innovative and interdisciplinary approaches are essential for climate institutions from policy design to implementation so that they can withstand environmental shocks, navigate institutional fragmentation, and deliver long-term sustainability outcomes.

Resilient climate institutions in Nigeria will not emerge solely through legal mandates—they must be designed for complexity, uncertainty, and inclusivity. By adopting interdisciplinary approaches that link law, science, technology, and participatory governance, Nigeria can create climate institutions that are not only structurally sound, but also agile, transparent, and trusted by the communities they serve. This resilience is the backbone of sustainable climate action in a fragile and rapidly changing environment.

7.0 CONCLUSION AND RECOMMENDATIONS

7.1.1 Conclusion

This paper has shown that the CCA 2021 provides a legal foundation for environmental sustainability and that its transformative potential depends on robust enforcement, inclusive governance, and interdisciplinary innovation. Law alone cannot drive the climate transition, it must be supported by science, technology, and grassroots participation. For Nigeria to achieve climate justice and low-carbon growth, it must build resilient institutions, harmonize sectoral policies, and empower

communities. Legal reform is only meaningful when translated into tangible, equitable outcomes for people and the planet

7.2 Recommendation

To strengthen the impact of the CCA and related environmental legislation, the following strategic and actionable recommendations are proposed:

1. Harmonise inter-agency collaboration on key environmental laws such as the CCA, NESREA Act, EIA Act, PIA to eliminate duplication, clarify institutional mandates, and enhance coherence.
2. Enshrine environmental rights and climate justice as justiciable provisions in the Constitution or stand-alone climate legislation. Or in the alternative, the use of item 60 (a) under the second schedule to the CFRN 1999 to enhance climate change justiciability in Nigeria.
3. Mandate periodic review of climate and environmental laws to reflect scientific advances, emerging risks, and international best practices.
4. Domesticate international environmental treaties and align national legal frameworks with Nigeria's SDGs and Nationally Determined Contributions (NDCs).
5. Equip enforcement bodies such as NESREA, NCCC, and State Ministries of Environment with sufficient funding, operational autonomy, and technical infrastructure.
6. Establish specialized environmental courts or tribunals and promote climate law training for judges, lawyers, and prosecutors.
7. Introduce performance-based incentives and compliance scorecards to hold institutions accountable for meeting climate targets.
8. Institutionalize Free, Prior and Informed Consent (FPIC) in all major environmental and climate decisions in extractive regions like the Niger Delta.
9. Strengthen community grievance mechanisms and platforms for participatory planning under the HCDT framework.
10. Mandate the use of scientific assessments, EEA tools, and vulnerability data in emissions planning, budgeting, and impact evaluation.
11. Foster collaboration between legal experts, scientists, economists, and technologists in drafting and reviewing environmental legislation.
12. Build interoperable national climate data systems to support evidence-based planning, real-time monitoring, and public accountability.

13. Encourage local research and innovation by funding climate-focused Research and D hubs and linking universities to public institutions and community projects.

By implementing these reforms, Nigeria can transform its progressive legal frameworks into effective, inclusive, and future-proof climate governance systems. Law, when combined with innovation, equity, and institutional commitment, can serve as a powerful enabler of just and sustainable development.

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