PHILOSOPHICAL FRAMING AND QUANTITATIVE EVALUATION OF NIGERIA'S CARBON EMISSION REDUCTION POLICIES BASED ON THE PMC INDEX MODEL: SECTORAL EVIDENCE FROM ENERGY, AGRICULTURE, AND WASTE MANAGEMENT

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Abstract
This study presents a thorough philosophical and quantitative assessment of Nigeria's carbon emission reduction strategies, focusing on three critical sectors: energy, agriculture, and waste management. Given Nigeria's commitments under international frameworks such as the Paris Agreement, the need for effective, coherent, and actionable climate policies has become paramount. The paper adopts the Policy Management Consistency (PMC) index model to analyze 13 foundational climate-related policies. By evaluating the design, objectives, and implementation guarantees of each policy, the research identifies inconsistencies and strengths that shape Nigeria's climate governance framework. The findings indicate that while some policies demonstrate a commendable level of coherence and alignment with national and international goals, others fall short due to fragmented frameworks and implementation gaps. The analysis concludes that targeted policy reforms are essential for fostering robust climate action, enhancing policy synergies, and promoting sustainable development in Nigeria.
Keywords: Philosophical framing; Quantitative evaluation; Carbon reduction; Policy effectiveness; Consistency

INTRODUCTION

Nigeria stands at a critical juncture in its developmental trajectory, facing the twin challenges of economic growth and environmental sustainability. As Africa's most populous country and one of its largest economies, Nigeria's developmental ambitions are often in tension with the imperative to mitigate climate change. The country's dependence on fossil fuels for energy, the dominance of subsistence and commercial agriculture, and the growing urbanization without adequate waste management infrastructure all contribute to the country's significant greenhouse gas (GHG) emissions (Climate Policy Initiative, 2024). Consequently, Nigeria's participation in international climate agreements, such as the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement, underscores a formal commitment to curbing emissions and enhancing climate resilience. However, translating these global commitments into actionable and effective domestic policies remains a formidable challenge.

The problem of climate change in Nigeria is multifaceted, touching every aspect of national life—from food security to public health, economic stability, and geopolitical security. Despite the proliferation of policies across different sectors, the outcomes have often been disjointed and ineffective (Emegha et al., 2025; Okon et al., 2021). This reality highlights the need for robust evaluation tools that can assess the internal logic, coherence, and alignment of policies with stated climate goals. The Policy Management Consistency (PMC) index model serves as an analytical framework in this study, offering a systematic method to

evaluate the content, objectives, and guarantees embedded in national policies. Through this model, the study seeks to bridge the gap between policy formulation and effective implementation.

The energy, agriculture, and waste management sectors were selected for this evaluation due to their substantial contributions to national emissions and their strategic importance in Nigeria's socio-economic landscape. The energy sector, heavily reliant on fossil fuels, accounts for a large proportion of Nigeria's GHG emissions. Agriculture, while central to livelihoods and national GDP, is characterized by outdated practices and land-use changes that exacerbate emissions. Waste management, though often overlooked, is a critical nexus for emission control, especially given the rise in urban waste and its contribution to methane emissions (Shao et al., 2025; John, Onwuagbu & Chigozie, 2025; Adeyanju et al., 2020). A sectoral approach enables a granular understanding of policy effectiveness and the identification of unique challenges and opportunities within each domain.

This paper also recognizes the importance of integrating philosophical perspectives into climate policy evaluation. A purely technical analysis may overlook the normative dimensions of policy-making, such as equity, justice, and intergenerational responsibility. By situating the PMC index model within a philosophical framework, the study not only quantifies policy coherence but also interrogates the ethical foundations upon which these policies are built. This dual lens—empirical and philosophical—offers a richer, more nuanced understanding of Nigeria's climate policy landscape.

Moreover, the study acknowledges that policy effectiveness is not solely a function of design but also of institutional capacity, political will, and stakeholder engagement. The dynamic interplay between these factors can either amplify or undermine the potential impact of even the most well-designed policies. Therefore, this paper contributes to the broader discourse on climate governance by emphasizing the need for holistic and context-sensitive approaches to policy evaluation.

The ultimate aim of this research is to provide actionable insights that can inform policy reforms and strategic interventions. By identifying strengths and weaknesses within Nigeria's current policy framework, the study offers a roadmap for enhancing coherence, fostering innovation, and building resilience. It is hoped that the findings will serve as a valuable resource for policymakers, development partners, and civil society actors committed to advancing Nigeria's climate objectives.

In sum, this paper positions itself at the intersection of theory and practice, ethics and empiricism, offering a comprehensive evaluation of Nigeria's carbon emission reduction policies. The findings and recommendations presented here are intended not just as critiques but as constructive contributions to the ongoing efforts to align Nigeria's development agenda with the imperatives of climate sustainability.

Literature review

The existing body of literature on climate policy evaluation in Nigeria reveals a growing concern with the effectiveness and coherence of sectoral interventions. Scholars such as Atedhor (2023), Abiodun et al. (2020) have argued that while Nigeria has made commendable efforts in developing national policies, the lack of coordination among government ministries and agencies hampers their implementation. Others, like Adeyanju *et al.* (2023), Nzeadibe and Ajaero (2018), have emphasized the role of local governments and non-state actors in achieving climate goals, suggesting that

top-down approaches have limited efficacy in the Nigerian context.

Research by Olujobi *et al.* (2023), Adepoju et al. (2019) on the energy sector highlights the promise of renewable energy policies, but notes the absence of robust infrastructure and investment as significant barriers. In the agricultural domain, studies by Adeshina *et al.* (2024), Akinyemi and Salami (2021) point to the slow adoption of climate-smart agricultural practices, despite policy incentives. Waste management has received comparatively less attention in scholarly work, although recent studies by UNFCCC (2025), Abdulkarim & Salihu (2025), ISPI (2023), Eze and Onyekuru (2022) suggest that integrated waste policies could yield significant emission reductions.

A common theme in the literature is the fragmentation of policy frameworks. According to Ayayia (2024), Olanrewaju (2020), Nigeria's climate policies often exist in silos, with little cross-sectoral integration. This observation is supported by empirical analyses that reveal duplicative efforts and inconsistent policy objectives across different ministries. The literature also underscores the importance of stakeholder participation. As noted by UNFCCC (2025), Abdulkarim & Salihu (2025), Okonkwo (2021), the exclusion of local communities in policy formulation leads to poor buy-in and ineffective implementation.

Despite these critiques, the literature acknowledges positive developments. The issuance of Green Bonds and the formulation of the Nationally Determined Contributions (NDCs) are often cited as examples of innovative policy tools that align with international standards. Scholars such as UNFCCC (2025), Aluko *et al.* (2024), Ministry of Budget and Economic Planning (2023), Ministry of Budget and Economic Planning (2021), Ibrahim (2021), Adeyanju *et al.* (2020), Oyedepo (2012) have lauded these initiatives for their potential to attract climate finance and catalyze green investments.

This study builds on these insights by adopting a more integrative and evaluative approach. Unlike most existing studies that focus on single sectors or policies, this research examines a cross-section of policies spanning energy, agriculture, and waste management. Furthermore, it introduces a philosophical dimension to the evaluation, thereby addressing the normative gaps identified in the current literature.

In doing so, the study seeks to contribute to a more holistic understanding of Nigeria's climate policy landscape. It not only highlights existing challenges but also identifies pathways for reform and innovation. By synthesizing empirical data with philosophical insights, the paper offers a more robust framework for evaluating and improving climate policies in Nigeria.

Theoretical foundation

The theoretical foundation of this study is anchored in two principal frameworks: the Policy Management Consistency (PMC) index model and normative theories of environmental justice. The PMC model, developed by the Chinese scholar Jiang (2014), is designed to assess the internal logic and coherence of policy instruments. It operates on the premise that well-structured policies should exhibit alignment between their design, objectives, and implementation guarantees. This model provides a systematic method for evaluating the quality and consistency of public policies across various dimensions.

In applying the PMC model to Nigeria's carbon emission reduction

policies, the study assesses 13 policies across three sectors. The model is particularly useful for identifying gaps between policy intentions and operational mechanisms. For instance, a policy may articulate ambitious goals but lack the institutional or financial guarantees needed for implementation. The PMC index quantifies these discrepancies, offering a nuanced measure of policy effectiveness.

Complementing the PMC model are normative theories of environmental justice, particularly those advanced by scholars such as John Rawls and Amartya Sen. These theories emphasize fairness, equity, and the moral obligations of governments to protect both current and future generations. Environmental justice theory provides the ethical underpinning for evaluating not just what policies say or do, but what they mean in the broader context of human rights and social equity (Bristol University, 2023; Hammen and Settele, 2011).

By integrating these two frameworks, the study adopts a dual-lens approach—empirical and philosophical. This integration allows for a more comprehensive evaluation of climate policies, capturing both their technical robustness and ethical implications. It also facilitates a critical interrogation of policy gaps that may not be immediately apparent through empirical analysis alone.

The theoretical framework also draws on systems thinking, which views policies as components of larger socio-political and ecological systems. This perspective helps in understanding how policies interact, overlap, or conflict within the broader governance ecosystem. Systems thinking underscores the importance of policy coherence and integration, both of which are essential for effective climate governance (OECD, 2025; Ramirez & Lizarazo, 2025; Sperling, 2020; Verhoeff *et al.*, 2018; Cumming, 2014; Pocock, Williams & Skinner, 2012).

In essence, the theoretical foundation of this study provides the tools and concepts needed to evaluate the complexity of Nigeria's climate policies. It bridges the gap between empirical rigor and ethical reflection, thereby enriching the policy discourse and offering more grounded recommendations.

METHODOLOGY

The study employs the Policy Management Consistency (PMC) index model, an analytical tool that offers a structured framework for evaluating public policies based on their coherence, internal alignment, and potential effectiveness. The PMC model operates through a matrix that incorporates three principal dimensions (Jiang, 2014): policy design, policy objectives, and policy guarantees.

- *Policy design* involves assessing the comprehensiveness, clarity, and structural logic of the policy document.
- *Policy objectives* measure the alignment of stated goals with broader climate and development priorities, both nationally and internationally.
- *Policy guarantees* evaluate mechanisms for implementation, including regulatory frameworks, financial incentives, monitoring systems, and institutional responsibilities.

Each policy is analyzed and assigned scores based on these dimensions, leading to a composite PMC index score. The higher the index score, the more internally consistent

and practically viable the policy is presumed to be.

The study evaluates 13 key Nigerian policies spanning climate change, agriculture, energy, and waste management domains. These policies are selected based on their relevance to emission reduction, recentness, and influence on sectoral strategies. A qualitative content analysis precedes the scoring process to contextualize the evaluation within Nigeria's unique political economy and environmental landscape.

Table 1 presents the variable setting for the qualitative content analysis of agricultural carbon emission reduction policies in Nigeria. The ten first-order variables – majorly components of the variable setting for the qualitative content analysis are: policy type (X1); policy issuing agency (X2); policy implementation agency (X3); policy function (X4); policy timeliness (X5); policy design (X6); policy instrument (X7); policy objective (X8); policy safeguards (X9); and policy disclosure (X10). In addition, some second-order variables, mechanisms for implementation (for emphasis) including: regulatory frameworks and financial incentives (X11), monitoring systems (X12), and institutional responsibilities (X13) were other components of the variable setting for the qualitative content analysis.

To ensure equal weights per variables, each variable was represented by a binary number "0" or "1". Specifically, "1" if the description in the policy can be matched to the corresponding variable; otherwise "0". Thus, ensure equal importance and same implication on multiple variables per policy.

Table 1: Variable setting of agricultural carbon emission reduction policies

S/N	First-order variables	Second-order variables
1.	Policy type (X_1)	Laws ($X_{1,1}$); temporary regulations, ordinances ($X_{1,2}$); measures, opinions ($X_{1,3}$); plans, programs ($X_{1,4}$); circulars ($X_{1,5}$)
2.	Policy issuing agency (X_2)	State government ($X_{2,1}$); Ministry of Agriculture ($X_{2,2}$); Local government ($X_{2,3}$); other national ministries (commissions) ($X_{2,4}$); other national agencies, departments ($X_{2,5}$)
3.	Policy implementation agency (X_3)	Ministry of Agriculture ($X_{3,1}$); Departments directly under the Ministry of Agriculture ($X_{3,2}$); Local government ($X_{3,3}$); State government ($X_{3,4}$); Federal government ($X_{3,5}$)
4.	Policy function (X_4)	Technological progress ($X_{4,1}$); industrial development ($X_{4,2}$); mechanism innovation ($X_{4,3}$);

		normative guidance ($X_{4,4}$); exchange and learning ($X_{4,5}$); R&D guidance ($X_{4,6}$); market information ($X_{4,7}$)
5.	Policy timeliness (X_5)	Short term ($X_{5,1}$); medium term ($X_{5,2}$); long term ($X_{5,3}$)
6.	Policy design (X_6)	Basic principles ($X_{6,1}$); guiding ideology ($X_{6,2}$); main objectives ($X_{6,3}$); key tasks ($X_{6,4}$); organization and leadership ($X_{6,5}$); international cooperation ($X_{6,6}$); publicity and education ($X_{6,7}$); assessment and supervision ($X_{6,8}$)
7.	Policy instrument (X_7)	Command-and-control ($X_{7,1}$); motivational ($X_{7,2}$); guided ($X_{7,3}$); voluntary participation ($X_{7,4}$); informational ($X_{7,5}$)
8.	Policy objective (X_8)	Low-carbon and green ($X_{8,1}$); food security ($X_{8,2}$); technological progress ($X_{8,3}$); economic development ($X_{8,4}$); social civilization ($X_{8,5}$); increased resilience ($X_{8,6}$); nutritional and healthy ($X_{8,7}$)
9.	Policy safeguards (X_9)	Legal guarantees ($X_{9,1}$); technical guidance ($X_{9,2}$); financial support ($X_{9,3}$); tax relief ($X_{9,4}$); investment subsidies ($X_{9,5}$); talent training ($X_{9,6}$)
10.	Policy disclosure（X_{10}）	Current ($X_{10,1}$); repealed ($X_{10,2}$)

Results

The results of the PMC index assessment provide nuanced insights into the strengths and weaknesses of Nigeria's policy architecture for carbon emission reduction. The index scores reveal substantial variation in consistency and potential effectiveness among the 13 evaluated policies.

Table 2: PMC index assessment

Policy name	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13
Nigeria Climate Change	1	1	1	0	1	1	0	1	0	1	1	0	0

Policy (2012)													
Nigeria Agriculture Promotion Policy (2016)	1	1	1	0	1	1	0	0	0	1	1	1	0
Nigeria Green Bond Framework (2019)	1	1	0	1	1	0	1	1	1	0	1	1	1
NASPA-CCN (2011)	1	1	1	0	0	1	0	1	0	1	1	0	0
NDC Nigeria (2021)	1	1	1	1	1	1	1	1	1	1	1	1	0
Agri Climate Resilience Strategy (2020 Draft)	1	1	1	1	1	1	1	1	1	1	1	0	0
National Agricultural Seed Policy (2012)	1	0	0	1	0	0	0	0	0	0	1	0	0
National Bio-Economy Strategy (2020)	1	1	1	1	1	1	1	1	1	0	1	1	0
National Renewable Energy Action Plan (2015)	1	1	0	1	1	0	1	0	1	0	1	1	1
Nigeria Agroforestry Policy (2018)	1	1	1	1	1	1	0	1	0	1	0	0	0
National Policy on Climate Change and Agriculture (2023 Draft)	1	1	1	1	1	1	1	1	1	1	1	1	0

Nigeria National Agricultural Extension Policy (2018)	1	1	0	0	0	0	0	0	0	1	1	0	0
Nigeria Tax Incentives for Renewable and Clean Energy (2021)	1	0	0	1	1	0	1	0	1	0	0	1	1

Fig. 1: PMC Index chart

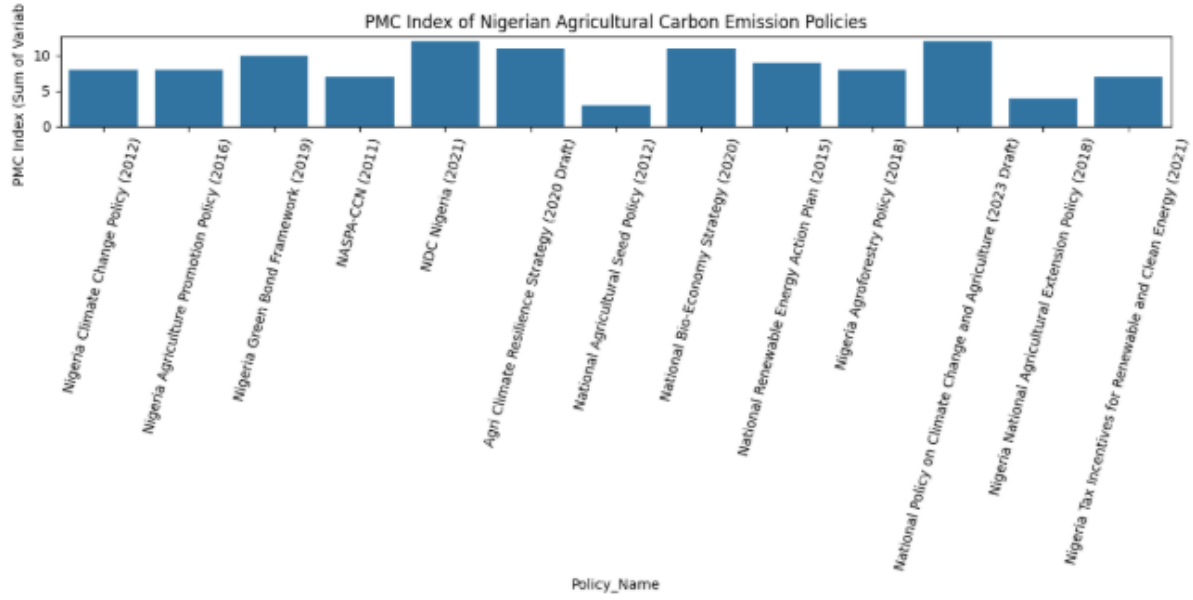

Table 3: The PMC index and consistency rating

Policy Name	**PMC Index**	**Consistency Rating**
Nigeria Climate Change Policy (2012)	8	Acceptable
Nigeria Agriculture Promotion Policy (2016)	8	Acceptable
Nigeria Green Bond Framework (2019)	10	Good
NASPA-CCN (2011)	7	Acceptable
NDC Nigeria (2021)	12	Good
Agri Climate Resilience Strategy (2020 Draft)	11	Good
National Agricultural Seed Policy (2012)	3	Needs Improvement
National Bio-Economy Strategy (2020)	11	Good

National Renewable Energy Action Plan (2015)	9	Acceptable
Nigeria Agroforestry Policy (2018)	8	Acceptable
National Policy on Climate Change and Agriculture (2023 Draft)	12	Good
Nigeria National Agricultural Extension Policy (2018)	4	Needs Improvement
Nigeria Tax Incentives for Renewable and Clean Energy (2021)	7	Acceptable

Policies like the NDC Nigeria and the National Policy on Climate Change and Agriculture scored highly due to their detailed frameworks, measurable targets, and clear institutional responsibilities. In contrast, policies such as the National Agricultural Seed Policy and the Agricultural Extension Policy scored poorly due to vague objectives and weak implementation mechanisms. This disparity suggests a need for harmonized and evidence-based policy reform that prioritizes operational clarity and cross-sectoral coherence.

Discussion

Energy sector

Energy-related emissions in Nigeria are predominantly driven by fossil fuel use, electricity generation, and transportation (Energy Commission of Nigeria, 2025; Debt Management Office Nigeria, 2025; Nigeria Energy Transition Plan, 2025; Nkalo, 2025; UNFCCC, 2024). The Nigeria Green Bond Framework and the National Renewable Energy Action Plan demonstrate commendable efforts to mobilize financial instruments and strategic plans for renewable energy development. The Green Bond Framework, in particular, has attracted both domestic and international investment toward solar, wind, and hydroelectric projects. However, infrastructural deficits, bureaucratic delays, and policy fragmentation limit the scalability and impact of these initiatives. To maximize benefits, there is a pressing need for integrated financing strategies, technical partnerships, and regulatory harmonization that can ensure policy implementation is as effective as its design.

Agriculture sector

Agriculture remains the backbone of Nigeria's rural economy and a significant contributor to emissions through deforestation, land degradation, and methane release from livestock (Food and Agriculture Organization, 2025a; Food and Agriculture Organization, 2025b; World Bank, 2025; Ihugba, Ihugba & Eches, 2025; Sustainable Development, 2025; Adamaagashi & Musah, 2024; Climate Policy Initiative, 2024; Speranza *et al.*, 2018. Policies such as the Nigeria Agriculture Promotion Policy and the Agricultural Climate Resilience Strategy offer pathways for sustainable farming and climate-smart agriculture. However, the National Agricultural Seed Policy and Agricultural Extension Policy are poorly rated due to lack of institutional coordination, inadequate funding, and limited capacity building at the grassroots level. Bridging these gaps requires targeted investments in agricultural R&D, extension services, and the promotion of indigenous knowledge systems for climate resilience.

Waste management sector

Although waste management is critical to emission mitigation, it remains the most underdeveloped among the evaluated sectors (Aminu, 2025; Africa Policy

Research Institute (APRI), 2025); Sahoo *et al.*, 2024; Okorie & Rufai, 2010). The absence of a standalone national waste management policy dilutes efforts and creates redundancies across ministries. Policies like the National Policy on Climate Change and Agriculture attempt to integrate waste into broader climate planning, but lack specificity in waste-related goals and strategies. An integrated waste management policy—incorporating recycling, circular economy models, and methane capture—would significantly enhance Nigeria's carbon mitigation architecture and improve public health outcomes.

Philosophical framing

At the heart of climate policy is a philosophical commitment to justice, sustainability, and intergenerational responsibility (Stanford Encyclopedia of Philosophy, 2025; U.S. Department of Education, 2025; Halsband, 2022; Caney, 2020). This section interprets the PMC model not just as a technical tool, but as a lens to examine the ethical underpinnings of policy design and implementation. Policies that score low on coherence often reflect systemic neglect of marginalized voices, a lack of foresight, and short-term political priorities over long-term environmental needs. Conversely, well-aligned policies embody ethical imperatives such as fairness in resource distribution, transparency in governance, and the right of future generations to a liveable environment.

The philosophical framing thus calls for a shift in Nigeria's climate policy discourse—from reactive and fragmented interventions to anticipatory and values-driven policymaking. Embedding philosophical principles such as procedural justice (inclusive decision-making), distributive justice (equitable benefits), and environmental stewardship could fundamentally transform Nigeria's climate governance landscape.

Conclusion

This paper has presented a detailed philosophical and empirical evaluation of Nigeria's carbon emission reduction policies using the PMC index model. The findings underscore the uneven quality of policy design and implementation across the energy, agriculture, and waste management sectors. While certain policies exhibit high internal consistency and alignment with climate goals, others lag significantly, reflecting systemic inefficiencies and governance deficits.

To achieve its climate ambitions and contribute meaningfully to global emission reduction efforts, Nigeria must embrace an integrated policy approach that is both ethically grounded and empirically validated. Strengthening institutional coordination, deepening stakeholder engagement, and fostering a culture of continuous evaluation will be essential for building a climate-resilient future.

Recommendation

- Policy reform: Immediate attention should be given to reforming policies with low PMC index scores, particularly those in the agriculture sector. These reforms must address content clarity, establish clear implementation roles, and enhance accountability mechanisms.
- Infrastructure development: Renewable energy and waste management systems are critically underdeveloped. Strategic investment in energy grids, off-grid solutions, and waste recycling infrastructure would enhance the functional impact of policies already in place.

- Stakeholder engagement: Sustainable policy outcomes hinge on grassroots ownership. Involving civil society organizations, local governments, and traditional institutions in both policy design and implementation would ensure policies are contextually relevant and broadly supported.
- Monitoring and Evaluation: Establishing real-time monitoring dashboards and independent evaluation bodies could ensure timely feedback loops and adaptive policy management. These frameworks should be data-driven and integrated with national statistical systems.

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