ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25dec829

Assessing the Role of International Climate Finance in Nigeria's Clean Energy Transition: A Policy Review and Case-Based Appraisal

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Publication Date: 2026/03/12

Abstract: With Nigeria facing increasing energy poverty and the need to shift towards low-carbon development, international climate finance also stands as an important catalyst for clean energy transformation. The paper investigates the contribution of international climate finance to Nigeria's transition toward clean energy, especially in terms of the effectiveness of governance, policy coherence, and equity. Based on a qualitative research design, the study combines an in-depth literature review with case study review of three climate finance funded initiatives: the GCF-supported project of the solar mini-grid, the SEforALL and the REACT Nigeria. Results suggest that while such interventions alleviate access barriers to renewable energy and stimulate community development, long-term potential is constrained by incoherent institutional mandates, weak monitoring systems and partial inclusion of marginalised populations. The paper also finds absence of vertical and horizontal policy coherence, and stresses the urgency of justice-oriented frameworks in shaping climate finance instruments. Utilizing best practice across the globe and lessons from Nigeria, the paper provides strategic policy suggestions for strengthening governance frameworks, mainstreaming energy justice, and fostering strong institutional coordination. In conclusion, the study contributes to a multi-dimensional comprehension of how international climate finance can be more effectively harnessed for a sustainable and inclusive energy transition in Nigeria.

Keywords: *Climate Finance, Clean Energy Transition, Nigeria, Governance, Policy Coherence, Energy Justice.*

How to Cite: Olugbenga Francis Akomolehin; Oluwaremi Joel Bali (2026) Assessing the Role of International Climate Finance in Nigeria's Clean Energy Transition: A Policy Review and Case-Based Appraisal. *International Journal of Innovative Science and Research Technology*, 10(12), 3061-3071. https://doi.org/10.38124/ijisrt/25dec829

I. INTRODUCTION

➢ *Background to the Study*

The global shift toward decarbonization and sustainable energy systems has brought developing countries into sharp focus within international climate finance discussions, with increasing emphasis on equitable access to financing for clean energy transitions (UNFCCC, 2022). Nigeria, as the most populous country in Africa and one of the continent's largest greenhouse gas emitters, represents both a strategic opportunity and a persistent challenge in this transition. Despite its vast renewable energy potential—particularly in solar, hydro, and biomass—the country remains plagued by severe energy poverty and escalating environmental degradation (IRENA, 2023; Adetoye & Adeniran, 2021).

International climate finance, as defined by the United Nations Framework Convention on Climate Change (UNFCCC), refers to the mobilization of public and private capital from developed to developing countries to support climate change mitigation and adaptation efforts (UNFCCC, 2021). Anchored in the Paris Agreement, it includes the commitment to mobilize at least $100 billion annually to assist developing nations in meeting their climate objectives (OECD, 2022). However, in practice, climate finance flows often suffer from inefficiencies, misalignments with local needs, and fragmented delivery mechanisms (Yilla & Beke, 2022; Glemarec et al., 2020).

➢ *Research Problem*

Nigeria's clean energy transition is integral not only for reducing carbon emissions but also for achieving Sustainable Development Goals (SDGs), especially SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action) (United Nations, 2022; NESP, 2023). Yet, access to sufficient, stable, and context-sensitive financing remains a critical barrier. While international climate finance is available through channels such as the Green Climate Fund (GCF), Global Environment Facility (GEF), and multilateral development banks, the volume, predictability, and alignment of these funds with Nigeria's implementation needs remain weak (Adesina & Ibrahim, 2023; Ogunleye & Akinbinu, 2022).

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25dec829

Furthermore, institutional bottlenecks, weak policy coherence, and poor linkages between inflowing climate finance and national energy targets exacerbate implementation gaps (Mahmud et al., 2023). Evidence from donor-led interventions, such as solar mini-grids and rural electrification projects, shows mixed results—some successes in enhancing electricity access, but significant concerns persist over long-term sustainability, local ownership, and policy continuity (Akinlabi et al., 2020; Onyeneke et al., 2023).

➢ *Research Questions*

- *The Study is Guided by the Following Research Questions:*

What are the current trends, volumes, and sources of international climate finance supporting clean energy development in Nigeria?

How aligned are Nigeria's energy and climate policy frameworks with international climate finance architecture?

What policy and institutional lessons can be drawn from case studies of international climate-financed clean energy projects in Nigeria?

➢ *Research Objectives*

- *The Specific Objectives of this Study are to:*

Assess the volume, sources, and trends of international climate finance allocated to Nigeria's clean energy sector.

Evaluate the alignment between Nigeria's national climate and energy policy frameworks with global climate finance mechanisms.

Analyze selected case studies of internationally funded clean energy projects in Nigeria to derive actionable insights and policy recommendations for enhancing future finance effectiveness.

➢ *Scope of the Study*

The study focuses on international climate finance mechanisms as they pertain to clean energy development in Nigeria. It covers both bilateral and multilateral finance flows, institutional and policy frameworks governing such inflows, and case-based evaluations of implemented renewable energy projects from 2015 to 2025. Emphasis is placed on donor-driven initiatives, national policy coherence, and implementation bottlenecks.

➢ *Significance of the Study*

This study is particularly significant in the context of Nigeria's Energy Transition Plan and its commitment to achieving net-zero emissions by 2060. By examining the role of international climate finance, the research will offer evidence-based insights into how global funding can be more effectively aligned with national priorities and local realities. It contributes to policy debates on scaling climate finance, strengthening institutional readiness, and fostering partnerships for equitable clean energy transitions in Nigeria and similar developing economies (Bello et al., 2021; GCF, 2023; Enoh et al., 2024).

II. LITERATURE REVIEW

➢ *Conceptual Review*

- *Global Climate Finance*

The international climate finance involves the flow of funds from the developed to the developing countries and to the emerging economies to help reduce greenhouse gases (GHGs) and to help the country's adaptation to the effects of climate change, in the framework of the UNFCCC (United Nations Framework Convention on Climate Change). It includes financing instruments and their related flows, which can range from grants, concessional loans, and guarantees to private investment that is combined with public capital (UNFCCC 2022; Buchner et al. 2023). Climate finance can broadly be categorized into two typologies: finance for mitigation, to reduce greenhouse gas emissions, and finance for adaptation, to help countries adapt to climate change impacts (Fankhauser & Schmidt-Traub, 2020).

Key contributors to climate finance are multilateral channels like the Green Climate Fund (GCF), Global Environment Facility (GEF) and Climate Investment Funds (CIF), bilateral aid agencies (e.g., USAID, JICA, KfW) as well as increasingly private investors, who are encouraged using blended finance formats (Falconer & Stadelmann, 2020; Ndulu & Ofoegbu, 2023). Types of instruments span from pure grants to concessional loans and risk-pooling mechanisms, including partial guarantees and insurance mechanisms (Mahmud et al., 2023).

The disbursement of climate finance has been criticized as being slow, excessively complex and not always supportive of recipient countries' thermo-economic priorities (Yilla & Beke, 2022; Pauw et al., 2020). Attached conditions to these funds can also curb national ownership and local flexibility. However, climate finance is crucial for the realisation of NDCs, especially in low-income nations such as Nigeria, where domestic investment has failed to meet ambitious clean energy targets (Ogunleye & Akinbinu, 2022; IRENA, 2023).

➢ *Clean Energy Transition*

The clean energy transition is a systemic transition from conventional, carbon-intensive energy sources to low- or zero-carbon, environmentally friendly sources and is based on three drivers of decarbonization, decentralization and digitalization (IRENA, 2022). This shift is at the core of the efforts for mitigating climate change globally; it especially counts in developing countries where energy poverty still exists and demand for electricity is high (Adetoye & Adeniran, 2021).

Despite holding vast solar and hydro potential – both sources that would be compatible with decentralized and less exploitative energy systems – Nigeria's current energy mix is dominated by fossil fuels with gas and oil contributing over 80% of electricity generation (Federal Government of

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Nigeria, 2022). The Energy Transition Plan (ETP) 2022 maps a path to a 2060 net zero, with an emphasis on mini grids using solar and electrification, plus clean cooking and public service electrification. Nevertheless, technological barriers — grid integration, access to storage solutions, financial restrictions — hinder progress (NESP, 2023; Onyeneke et al., 2023).

The co-benefits of successfully transitioning to clean energy in Nigeria are improved energy access, job creation, reduced air pollution, and strengthened climate resilience. These results flow across several Sustainable Development Goals, particularly Goals 7 (Affordable and Clean Energy) and 13 (Climate Action) (Adesina & Ibrahim, 2023).

- *Governance of Climate Finance*

Climate finance governance is the systems by which climate-relevant money is distributed, controlled, and oversighted. This draft covers both international regimes and national institutions. Major international actors, the GCF, the CIF, the World Bank, administrate substantial portfolios of climate finance, frequently in collaboration with national designated authorities (Glemarec et al., 2020).

Policy and governance issues in Nigeria Nigeria has limited institutional capacity to develop and implement health policy, and weak mechanisms of transparency (Bello et al., 2021; Ogunleye, 2022). "Surprisingly, local off-grid renewable energy projects or businesses have not had unhindered access to the international cargoes and funding opportunities through the various greening windows in the country. "Organisations like the Rural Electrification Agency (REA) and NESP play crucial roles in ensuring that funds find their ways into local renewable projects, yet they are handicapped in engaging global shipments and opportunities in this sector. However the implementation of the strategies are usually undermined by donor conditionalities and bureaucratic red-tapism (Akinlabi et al., 2020; Mahmud et al., 2023).

Sunshine and accountability continue to be essential for making sure that climate funds are used fairly and effectively. New studies have pointed to the necessity of better monitoring and evaluation methodologies and involving stakeholders to make the project more legitimate and impactful (Pauw et al., 2020; Yilla & Beke, 2022).

- *Energy Justice and Fairness*

Energy justice for just transitions Energy justice offers a normative perspective on the fairness of energy policies and finance mechanisms. It has three main dimensions: distributional justice (fair distribution of benefits and burdens), procedural justice (participatory decision-making), and recognition justice (recognition of the needs and voices of those at the margins) (Jenkins et al., 2021).

Rural- and peri-urban-dwelling Nigerians continue to be under-served by the national grid, with clean energy projects financed through climate finance financing not often prioritizing these groups (Onyeneke et al., 2023). There is a lack of Dutch actors in the execution and design of projects that the donors fund. Recognition justice is also violated when global agencies do not resonate with indigenous knowledge systems and cultural backgrounds (Adetoye & Adeniran, 2021).

Incorporating energy justice into climate finance governance can help to ensure that interventions work not only on decarbonization but also social inclusion and development more broadly (Akinlabi et al., 2020; Glemarec et al., 2020).

- *Policy Coherence for Sustainable Development (PCSD)*

Policy coherency is the consistent application of policies between governance tiers and sectors to contribute to sustainable development. For climate finance, coherence means integration among energy, environmental, financial and development policy (OECD, 2022).

Horizontal integration is currently weak in Nigeria and there are overlapping mandates and siloed implementation across ministries, such as the Ministry of Power, Ministry of Environment and Ministry of Finance (Ogunleye & Akinbinu, 2022). Vertical coherence is also poor when connecting global financing frameworks with local development plans.

The mainstreaming of climate finance into Nigeria's national development plans, including Vision 2050 and the Medium-Term National Development Plan, is superficial (Federal Government of Nigeria, 2022). Enhanced PCSD is crucial for ensuring that the development impact of climate finance is maximised and closely aligns with the SDGs (Ndulu & Ofoegbu, 2023).

- *Blended Finance and Risk Mitigation*

There are a variety of ways to mitigate the commercial risks of successful MSME operations in the ACSS and to blend finance to de-risk MSME investment for the private sector.

The approach of "blended finance" is one that uses public funds strategically to leverage private investment in sectors of development including clean energy. It is at risk of losing the opportunity to bridge the risk-return gap, which has prevented commercial investors from investing in emerging markets like Nigeria (Falconer & Stadelmann, 2020).

De-risking tools, including partial credit guarantees, political risk insurance and first loss capital, have been successfully deployed to attract investment in clean energy development activities in Sub-Saharan Africa (Mahmud et al., 2023). For example, programmes such as the Nigeria Electrification Project and REACT Nigeria have employed blended structures to deploy solar mini-grids and productive-use energy solutions (Adesina & Ibrahim, 2023).

Blended finance in Nigeria as an instrument in financing development is highly promising but underutilized as a result of weak policy backing, low level of financial innovation and poor state of the project pipeline. Creating

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25dec829

investor confidence will entail more transparent rules and regulations, reinforced public-private partnerships and institutional arrangement for the bundling and standardisation of the projects (IRENA, 2023).

➢ *Theoretical Review*

The analysis is informed by three related theoretical perspectives to provide holistic insights into the mechanics of international climate finance as it plays out in Nigeria's clean energy transition. Climate Finance Governance Theory (CFGT) furnishes an underlying knowledge basis relating to the institutional and decision-making framework for allocation, disbursement and tracking of climate finance. It allows for a deep interrogation of how and to what extent financial flows are commensurate with national priorities, transparency and accountability in its governance, and fairness and equity in its distribution (Glemarec et al., 2020; Yilla & Beke, 2022). It is also particularly apt because in Nigeria's climate finance landscape a variety of actors are involved in climate finance in the country – international donors, national agencies, and subnational institutions – whose degrees of coherence and capacity are critical (Falconer & Stadelmann, 2020).

The institutional focus is complemented by the Energy Justice Framework, which adds a normative approach to the analysis, dealing with equity and inclusion in climate finance delivery. This approach is essential in cases such as Nigeria where many rural communities, marginalised groups remain disconnected from energy and the decision-making process (Jenkins et al., 2021). By emphasizing distributional justice, procedural justice, and recognition justice, the framework makes a case for which the study can interrogate if the benefits of climate finance, for example, reach under-privileged communities, if the said communities have a voice in the decisions that concern them, as well as if their system of knowledge is recognized and respected (Adetoye & Adeniran, 2021).

In this context, the Policy Coherence for Sustainable Development (PCSD) logic emphasizes the necessity of sectoral and governance level sturctural coherence. It is most valuable for revealing institutional and policy fragmentation, which is a major concern of Nigeria's climate finance architecture. PCSD offers methods of analysis to evaluate the climate finance is aligned to national development plans and energy policies and international climate offers (OECD, 2022; Ndulu & Ofoegbu, 2023). With the incorporation of this approach, the research would be able to investigate whether Nigeria's multi-level governance style is able to convert international finance into unified, realistic and sustainable results.

Collectively, these three dimensions allow for a multi-dimensional analysis that encompasses institutional, ethical and structural dimensions of international climate finance. Taking cross- lingual multi - genre approaches This paper is based on a hybrid theoretical framework instead of a single lens. This holistic approach adds analytical robustness by considering governance architecture, justice-based assessment, and policy coherence, bestowing a full assessment framework to determine how, and the extent to which, international climate finance can play a role in supporting Nigeria's transition to clean energy.

➢ *Empirical Literature*

The global dialogue on climate finance has grown significantly over the past 10 years, driven by increasing urgency to finance clean energy transitions in developing countries. Climate finance, at the international level, is increasingly viewed as a linchpin to achieving the goals of the Paris Agreement, notably in terms of the Nationally Determined Contributions (NDCs) and the Sustainable Development Goals (SDGs) (UNFCCC, 2022; OECD, 2022). Research has pointed out that, despite growing flows for global climate finance, which surpassed USD 630 billion in 2022, very little of these funds is reaching low-income countries that have the largest financing gaps for investment into clean energy (Buchner et al., 2023; CPI, 2023). The bulk of the finance is located in middle-income countries with higher levels of institutional capacity and institutions, such as Nigeria, find themselves underfunded and forge this way institutionally weak (Glemarec et al., 2020).

In turn, researchers have called for moving beyond financing volumes to address questions of governance, fairness, and policy coherence. Fankhauser and Schmidt-Traub (2020) contend that the effectiveness of climate finance should also be judged not just by disbursement, but by the ability of funds to be a catalyst for more structural change in national energy systems. These concerns are echoed by Falconer and Stadelmann (2020), emphasising the role of disbursement modalities, country absorptive capacity and ownership in shaping long-term outcomes. These observations are confirmed by the Climate Finance Delivery Plan (2021), which highlights the need for predictability, reduced access complexity, and the design of finance instruments to be adapted to context.

There is evidence of underlying poor performance in climate finance uptake and use in Sub-Saharan Africa from the literature. Mahmud et al. (2023) as well as Ndulu and Ofoegbu (2023) demonstrate that disbursements are low, despite increasing commitments, owing to weak governance structures, non-bankable projects, and minimal domestic co-financing. In addition, the region's susceptibility to the impacts of climate means governments will be tasked with a dual challenge: adapting to evolving environmental conditions while weaning their energy systems off carbon. The use of blended finance as an instrument to unlock PPI and de-risk renewable energy projects in risky locations has been emerging as a strategic approach among policy makers (Falconer & Stadelmann, 2020; IRENA, 2023).

Nigeria is at a very sensitive juncture in this regard. As important as this energy transition pathway is to its regional CO2 reduction plans, as the continent's biggest economy and most populous state, Nigeria's energy transition trajectory has trans-regional implications. However, literature review reveals a mixed oneside picture of Nigeria's climate finance readiness and use. Poor institutional coordination, inadequate transparency and incoherent policies feature as

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the main impediments (Ogunleye and Akinbinu 2022). Bello et al. (2021) however argue that donor coordination is frequently suboptimal resulting in redundant activities and inefficient resource use. Further, Rural Electrification Agency (REA) and Nigeria Energy Support Programme (NESP) which play key roles in implementation process which REA has Capacity challenge and depend more on external support (Akinlabi et al., 2020).

A few case studies: the Nigeria Electrification Project, and the project financed by Solar Nigeria demonstrate what we we learned. Although these initiatives have increased off-grid deployment, and have increased access to energy in rural areas, their sustainability is questionable, because local ownership and sustainability frameworks are weak (Onyeneke et al. 2023; Adesina and Ibrahim,2023). Donor conditionality also complicates project delivery, especially if the performance targets are strictly enforced and inflexible that they do not correspond to local social-economic conditions (Pauw et al., 2020; Yilla & Beke, 2022). Policy has taken a turn for the better more recently. The 2022 Energy Transition Plan provides a pathway of USD 1.9 trillion of investments towards net-zero by 2060, focusing on solar, hydrogen and electric mobility (Federal Government of Nigeria, 2022). But as Ndulu and Ofoegbu (2023) have argued, the efficacy of these plans hinges not only on the mobilization of capital, but also on reform of governance, measures to streamline the regulatory environment, and greater accountability. Jenkins et al. (2021) emphasize the importance of energy justice in understanding who gets to reap the rewards of these transformations. Rural women and poor people in Nigeria are significantly marginalised, further demonstrating the importance of inclusive policy formulation.

In general, the literature highlights a multi-dimensional challenge. Existing international climate finance structures have, however, continued to struggle with implementation in Nigeria, due to governance lapses, inequality and limited policy alignment. The resolution of these challenges require twin approach toward institutional development and justice-oriented considerations, if the goal of transforming international climate finance into just, inclusive and sustainable energy transition is to be realized in Nigeria.

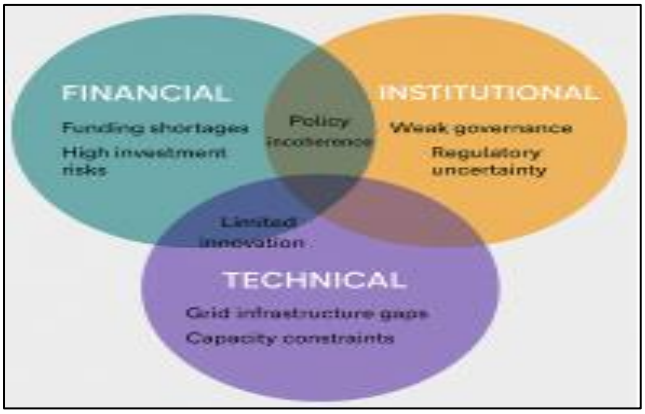

Fig 1 Thematic Map of Barriers to Nigeria's Clean Energy Transition

This thematic map visualizes key financial, institutional, and technical barriers to Nigeria's clean energy transition. Financial constraints include funding shortages and high investment risks, while institutional issues involve weak governance and regulatory uncertainty. Technical barriers such as grid infrastructure gaps and capacity limitations intersect with others at points like policy incoherence and limited innovation, revealing the compounded nature of transition challenges.

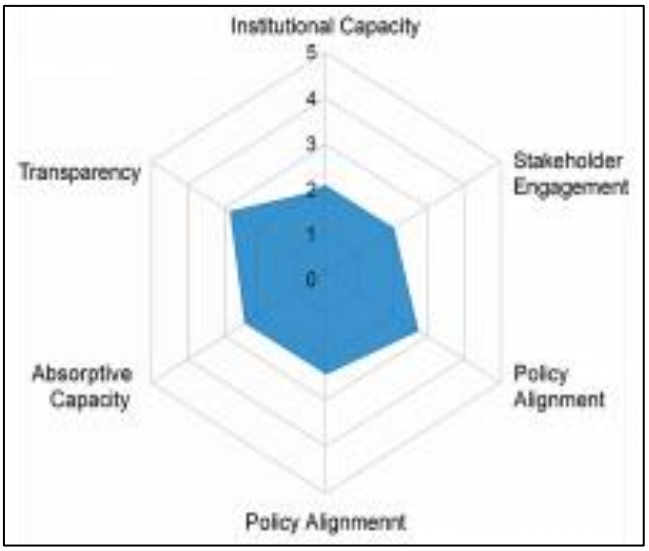

Fig 2 Gantt-style Climate Finance Disbursement Timeline

This timeline visualizes the chronological flow of major climate finance initiatives in Nigeria, tracking key milestones in project approval, fund release, and implementation for programs such as GCF solar mini-grids, REA-driven projects, and NESP support. It identifies bottlenecks and overlaps that constrain project efficiency, emphasizing the need for improved coordination, planning, and performance monitoring across climate finance actors.

➢ *Conceptual Framework*

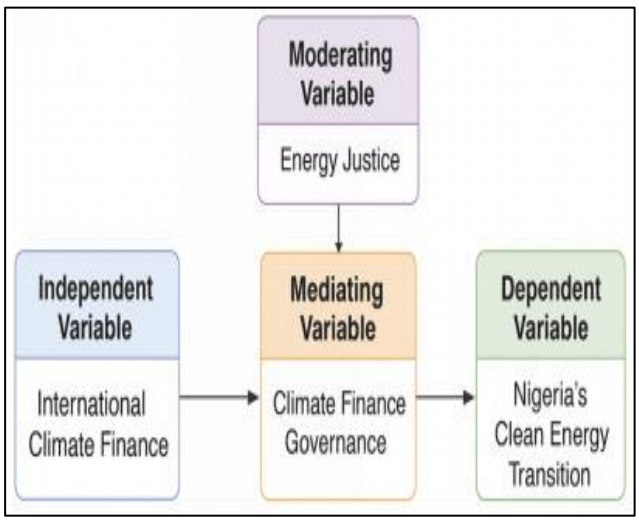

Fig 3 Conceptual Framework

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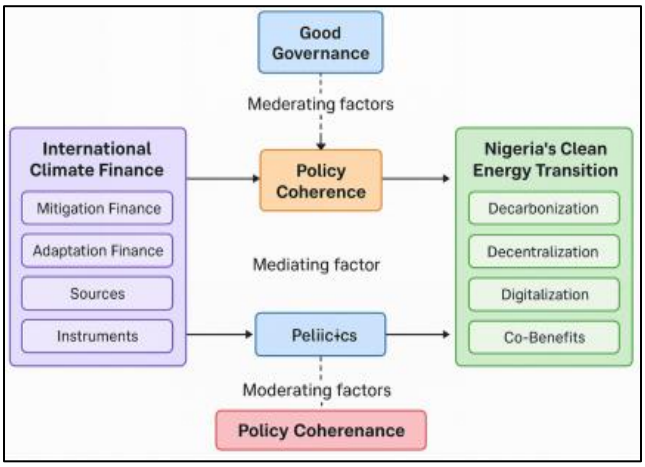

Fig 4 Extended Conceptual Framework

➢ *Explanatory Note on the Conceptual Framework*

Theoretical frameworks constructed in this study depict the analytic causal link by which international climate finance was assumed to impact on Nigeria's clean energy transition. At the heart of the framework is the recognition that the presence of money as a source of finance does not automatically lead to progress towards energy sustainability, but that the influence of financial capital is contingent on both institutional processes and on the socio-political context. The independent variable, international climate finance, is a continuum of external financial transfers to mitigation and adaptation efforts. These encompass, inter alia, grants, concessional loans, guarantees and blended finance instruments, which are leveraged from multilateral and bilateral institutions including the Green Climate Fund, Global Environmental Facility and Climate Investment Funds. The financing is intended to back decarbonization and renewable energy deployment, as well as to enhance resilience in Nigeria's energy infrastructure.

But financial flows do not translate directly into development. Climate finance governance, as the mediating variable, is crucial for shaping the allocation, control and flows of international resources to cleaner energy infrastructure. These governance aspects cover the institutional capacity, transparency, accountability, inter-agency coordination and the policy coherence between climate, energy and development goals. Strong governance systems will be in place to provide oversight so climate finance is not only spent well, but also steered towards projects that are consistent with national objectives and long term development goals.

Further complicating the relationship is the lens of energy justice, which is posited to be a moderator in this research. Energy justice incorporates a normative element that considers the fairness of distribution of climate finance outcomes, who participates in decision-making processes and whose interests are recognized in energy transition strategies. In a country such as Nigeria, where access to energy is still significantly uneven and many rural communities are not connected to the grid, achieving climate justice through climate finance interventions is indispensable. Distributive justice requires that benefits are realized by the disadvantaged; procedural justice requires that the policy process be inclusive; and recognition justice requires the recognition of local ways of knowing and needs. These elements can build up the governance-to-clean energy outcome pathway or break it up, depending on whether they exist or are lacking.

The dependent variable—Nigeria's clean energy transition—is the net outcome of this linkage. They include the solar mini-grids deployment levels, the penetration of energy access in underserved areas, the reduction increments in terms of fossil fuels substitution, and the corresponding socio-economic co-benefits such as jobs and public health." The framework therefore emphasises that international climate finance, which-when intermediated by good governance and applied under the guidelines of energy justice, has the potential to propel the journey of the country towards a sustainable energy future.

This conceptual rationale is built upon an amalgamation of theories, Climate Finance Governance Theory; The Energy Justice Framework and The Policy Coherence for Sustainable Development (PCSD) approach. Together, these perspectives offer a multilayered lens for examining how financial, institutional, and social forces converge to influence policy efficacy. In applying this model, the research goes beyond a linear trajectory of cause-and-effect to highlight the layered and interconnected dynamics governing the real-world effects of climate finance on Nigeria's clean energy transition.

III. METHODOLOGY

The research is a qualitative study, based on the interpretivist paradigm investigating the policy, governance, and justice dimensions of international climate finance in Nigeria's clean energy transition. To the extent that the research questions are complex and contingent, these are seen as best addressed through a qualitative research design, which aim to explore not simply the form that financial flows take and the dynamics of change, but also the institutional, procedural and normative process through which change emerges.

For this purpose, an integrative review of literature is merged with the analysis of an explorative case study. Synthesis of the Integrative Review The integrative review synthesizes the academic and policy literature, both grey literature and peer-reviewed journal articles. Major sources include reports and databases from well known organizations like the United Nations Framework Convention on Climate Change (UNFCCC), Green Climate Fund (GCF), International Renewable Energy Agency (IRENA) and the Nigeria, International Energy Agency (IEA, African Development Bank (AfDB) and Nigerian Energy Transition Plan (2022). This broad framework also allows us to unpack the country's dynamics, while anchoring it to global trends in climate finance.

The review is augmented by a purposive case study of a sample of climate finance-backed, clean energy initiatives

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25dec829

in Nigeria. These are solar mini grids funded by GCF, the SEforALL projects and the REACT Nigeria programme. These initiatives were chosen according to their applicability to the research objectives, variety of financing mechanisms, and evidence of effects on clean energy access and governance. The cases of the three countries reveal at what level international finance is realized on the ground, which institutional challenges are met and what may be learnt from the experiences to further improve the policy.

Thematic content analysis is applied to literature-based and case study data. A coding schema is organised on the basis of higher level categories namely governance and institutional capability, policy coherence, energy justice, financial disbursal mechanisms and stakeholder involvement, and project sustainability. This coding practice allows recognition of themes that are common to the sample, as well as gaps that are particular to the setting. Special emphasis is given to the alignment of project objectives with Nigeria's national energy transition targets and more general sustainable development objectives.

The study also includes a policy synergy scan to determine how international climate financing mechanisms are aligned with Nigeria's climate policy instruments and strategy for development. Gap identification is also used to expose disconnects between policy rhetoric and practice, and between donor requirements and local realities.

In general, this methodological approach: enables a multi-dimensional investigation of the research problem. By integrating literature synthesis with real world project evidence, the study seeks to provide a fine grained and policy-relevant assessment of the impact of international climate finance on Nigeria's clean energy transition.

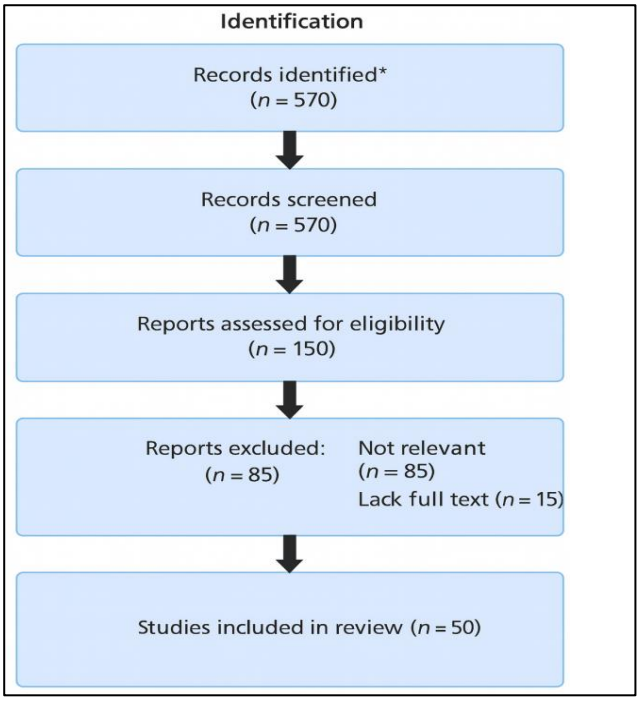

Fig 5 PRISMA 2020 Flow Diagram Illustrating Literature Screening and Inclusion Process

This PRISMA 2020 diagram provides a transparent overview of the literature review process. It details the number of records identified (570), screened, excluded (420), assessed for eligibility (150), and finally included in the review (50). The structured flow helps ensure replicability and methodological rigor in systematic literature reviews.

IV. CASE STUDY ANALYSIS

In this section, we provide a case-based learning on how international financing for climate is invested in clean energy projects in Nigeria with particular consideration for the nuances of the implementation, governance structure and policy implications. GCF-financed solar mini-grids, SEforALL initiative and the landscape on the REACT Nigeria programme have been chosen as case studies to offer the necessary variation in financing schemes, institutional agents and geographic areas they cover.

The first instance -GCF-financed Solar Mini-Grid Project- was carried out through Nigeria's Rural Electrification Agency (REA) in association with independent power providers (IPPs) and community-based organizations. Leveraging a concessional financing facility from the Green Climate Fund, the project sought the utilisation of more than 100 off-grid solar mini-grids in rural, off-grid towns in Northern Nigeria. The project successfully increased electricity access for over 250,000 people, decreased dependence on diesel generators and kerosene lamps and induced local economic activities (GCF, 2021; REA, 2022). But its efficiency was attenuated by governance issues, especially community involvement, post-installation maintenance, and synergy between federal and local levels of government. Although the project was consistent with the Nigeria Energy Transition Plan and SDG 7, stakeholder interviews identified a lack of structured inclusion of decisions and slow responding to local energy usage (Onyeneke et al., 2023).

The second case, the Sustainable Energy for All (SEforALL) Initiative, is an example of a multilateral programmatic initiative to energy access. Via collaboration with organizations such as the World Bank, AfDB, and development agencies like UKAID and GIZ, SEforALL helps national governments establish nationally integrated energy access plans. In Nigeria, it has supported the development of policy frameworks, increased access to finance for off-grid entrepreneurs, and encouraged the adoption of gender-inclusive approaches for energy transition (SEforALL, 2022). Significantly, the initiative informed the design of the Nigeria Electrification Project (NEP), which mobilises World Bank funding, private capital and GCF co-sponsoring. However, critical analysis note lack of bureaucracy, disjointed management of regulations, and weak monitoring and evaluation mechanism (Mahmud et al., 2023; Ogunleye & Akinbinu, 2022).

The third example is the REACT Nigeria Programme (Renewable Energy and Adaptation to Climate Technologies), which is being delivered by the Africa

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25dec829

Enterprise Challenge Fund (AECF) and funded by the Swedish International Development Agency (Sida). REACT Nigeria has a narrow focus on providing results-based financing and technical assistance to private sector players throughout the clean energy ecosystem, particularly those developing solutions targeting lowincome, female clients. The program has scaled the adoption of solar home systems, clean cookstoves and productive-use energy technologies in under-served markets (AECF, 2021). An interesting aspect of REACT Nigeria is its focus on gender justice and energy justice; this has been said to allow minority groups' and women's voices to be more heard in framings and undertakings of projects (Adetoye & Adeniran, 2021). Scalability is still an issue due to constraints in domestic financing, poor enforcement of consumer protection laws and exposure to currency risks related to equipment importation.

Taken together, these cases highlight the catalytic role that international climate finance can play in Nigeria's clean energy transformation. They also exhibit structures and challenges that repeat including institutional fragmentation, limited local capacity, procedural exclusion and a mismatch between donor priorities and national development imperatives. The results further underscore the importance of more context-responsive, justice-informed and institutionally coherent approaches to facilitate climate finance delivery for sustainable and inclusive energy outcomes in Nigeria.

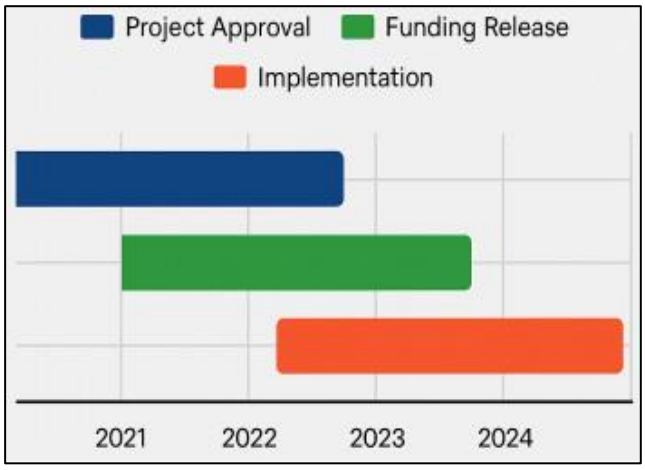

Fig 6 Climate Finance Disbursement Timeline

This Gantt-style timeline traces the sequence of project approvals, fund disbursements, and implementation milestones for major climate finance initiatives in Nigeria, including GCF solar mini-grids, REA electrification programs, and NESP technical support. It highlights periods of delay, funding bottlenecks, and overlapping schedules, offering insights into the timing and coordination efficiency of Nigeria's clean energy finance.

Table 1 Case Study Comparative Matrix

Project	Fund Size	Source	Location	Delivery Model	Outcome	Challenges
GCF Solar Mini-Grids	USD 30M+	Green Climate Fund	Northern rural Nigeria	Public-private partnerships via REA	250,000+ people electrified, diesel displacement	Weak local ownership, M&E gaps, limited engagement
SEforALL Initiative	USD 200M (pooled)	World Bank, AfDB, UKAID, GIZ	National, with off-grid focus	Multilateral coordination with national government	Policy support, market stimulation, gender mainstreaming	Bureaucratic delays, fragmented regulation
REACT Nigeria Programme	USD 25M	Sida via AECF	Rural/low-income communities	Results-based financing to private actors	Clean cooking, productive-use tech, enterprise support	Scalability, import costs, weak consumer protections

V. DISCUSSION

The evidence from the literature and case studies alike converges on a fundamental point: although international climate finance has scaled up considerably as a means to leverage clean energy transitions in developing countries, the transformative engagement of this climate finance in Nigeria is being impeded by deep-seated institutional, policy and justice impairments. Climate finance, at the international level, has transitioned from a heavily mitigation-oriented mechanism, to a more complex'server instrument for the integration of adaptation, social inclusion, co-benefits, among others. Yet making these global movements translate into national advances that matter requires not just money

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25dec829

inflows, but also sound governance, alignment with domestic policy and a commitment to a justice-oriented development model (Fankhauser & Schmidt-Traub, 2020; Buchner et al., 2023).

In Nigeria, while there is the clarity of the Energy Transition Plan and initiatives like the Nigeria Electrification Project which provides a pathway to deliver net-zero emissions by 2060, climate finance delivery is still held back by bureaucratic bottlenecks, fragmented institutional roles, and inconsistent regulatory oversight. The evidence presented from the cases examined, GCF-funded mini-grids, SEforALL and REACT Nigeria, supports this observation. Each project, even when linked in design to national development priorities, met with process-related inconsistencies of participation, such as minimal local involvement, monitoring and evaluation or post proiect sustainability. These results are congruent with those of Ogunleye and Akinbinu (2022) and Mahmud et al. (2023), who stress that technical design is insufficient unless accompanied by investment in institutional reform and capacity.

A second key theme is that energy justice has been insufficiently integrated into climate finance governance. While attention to gender and social inclusion continues to gain momentum within dominant global narratives, this has not been adequately reflected at national and local levels. For example, REACT Nigeria had a focus on gender equity in clean energy access, but faced difficulties in taking that beyond pilot interventions. Likewise, while procedural justice, in terms of community consultation and participative governance, were not consistently addressed between the projects reviewed. These revelations are also consistent with Jenkins (methodPointerTypeImplOptions=PM13Study). (2021) and Adetoye and Adeniran (2021) that justice-focused frameworks need to be integrated in the development process rather than be considered as an afterthought.

Another key factor of success, policy coherence, comes to light. Overlapping and competing mandates between Ministries of Power, Environment and Finance often leads into duplication rather than co-creation. This horizontal discrepancy is exacerbated by its vertical counterpart – without a strong link to national strategies, or undue resource access for the local bodies. Additionally, the literature also points to how donor agencies may impose mirror reporting and evaluation systems that put pressure on local capacities and restrict the building of a harmonious climate finance governance architecture (Ndulu & Ofoegbu, 2023; Pauw et al., 2020).

Significantly, the study also points out the strategic possibilities. International partners, such as the GCF and World Bank, have indicated readiness to invest in blended finance models and performance-based financing and encourage greater accountability while attracting private sector investment. In addition, the new national energy policies provide a good point of entry for donor programmes to get in line with the long-term goals of sustainability. Rigorous monitoring of spending, mainstreaming of inclusivity, and coordinated policy and practice across levels and sectors of government, could make a significant difference to the development impact of climate finance.

Overall, this analysis confirms that international climate finance can be a transformative enabler for Nigeria's clean energy transition. But unlocking that potential will require a recalibration of institutional practices, a more sincere embrace of the principles of equity and justice, and conscious attempts to align external financing with domestic development frameworks. In the absence of these reforms, climate finance runs the risk of perpetuating current inequalities and inefficiencies rather than helping to drive this systemic shift.

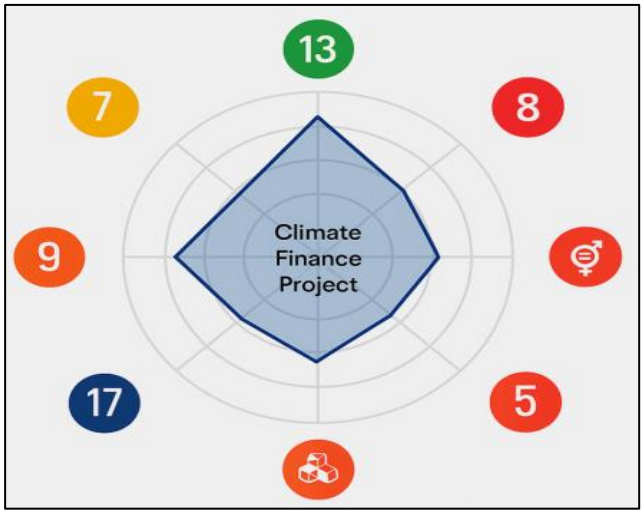

Fig 7 SDG Alignment Dashboard

This spider chart illustrates how climate finance-supported clean energy projects in Nigeria align with key Sustainable Development Goals (SDGs), particularly SDG 7 (Affordable and Clean Energy), SDG 13 (Climate Action), SDG 8 (Decent Work), and SDG 5 (Gender Equality). The varying strength of alignment reflects the need to integrate social, environmental, and economic objectives into project design and delivery.

VI. CONCLUSIONS AND RECOMMENDATIONS

➢ *Conclusion*

This article sought to investigate how international climate finance is helping Nigeria in its clean energy transition, considering governance instruments, policy coherence and the aspects of justice. Informed by a strong integrative literature review and case study analysis, the results offer a complex but tractable terrain in which international financial assistance can help strengthen national pathways to sustainable energy transitions. But for that finance to be genuinely catalytic, it also must sit within strong, well-aligned policy frameworks; be governed with transparency and accountability; and be delivered in ways that support procedural, distributive, and recognition-based equity.

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25dec829

This global trend mirrors growing interest in fair and inclusive transitions – and changes in priorities of the multilateral climate finance institutions. The challenge, however, is that in Nigeria, institutional balkanization, bureaucratic leakages and underdevelopment of mechanisms for stakeholder engagement of climate finance continue to stymie effectiveness in the deployment of climate finance. The case studies reviewed show that while initiatives such as GCF-supported mini-grids, SEforALL and REACT Nigeria have increased energy access and generated local commercial activity, they tend to suffer from inadequate levels of local ownership, regulatory bottlenecks and limited monitoring ability.

One of the lessons learned is that just energy transition cannot be reached through financial flows." Rather, there is a need for a deliberate approach to how governance institutions can be strengthened, inter-ministry and multi-level policy coherence promoted and inclusive practices mainstreamed to ensure access of climate finance to the poorest and most marginalized communities. This requires redefining what we consider to be success, not just in the hard numbers of megawatts installed and dollars disbursed, but in a tally of how climate finance contributes to social equity more broadly, environmental integrity and long-term sustainability.

And, in the end, international climate finance is a valuable, though still largely underutilized, lever in Nigeria's clean energy transition. For the interventions of the future to reach their fullest potential, we cannot continue to focus on transactional funding models, but need to shift to transformation models that ensure local capacity, streamline rules, and ensure a governance structure that is inclusive and participatory. By adopting such a multifaceted approach, Nigeria can both improve the effectiveness of climate finance and ensure that its energy ambitions are in line with global climate objectives and with the principles of a just, inclusive, and sustainable development pathway.

- *Policy Recommendations*

Policy recommendations Based on the results of this study, a range of targeted policy recommendations are suggested to promote the effectiveness, inclusivity and sustainability of ICF in Nigeria's clean energy transition. These suggestions are based on the need for systemic reform and have incorporated the best practice from the literature and case-related evidence.

To start with, Nigeria needs to with dispatch put in place a central climate finance coordination unit under the office of the president or some high-level inter-ministerial body as a matter of priority! This programme should be compelled to simplify the climate finance applications, coherence of the sectoral plans and act as a bridge between the donors and local bodies. This would minimize duplication while better aligning policy and the country's absorptive capacity.

Second, there is a fundamental need to build institutional and technical capacity within core institutions such as the Rural Electrification Agency (REA), Nigeria Energy Support Programme (NESP) and state energy directorates. Funds for staff training, monitoring and evaluation tools and digital infrastructure could help improve transparency, accountability and performance monitoring over the project cycle.

Third, in order to solidify equity and justice, energy access policies and climate finance programmes should incorporate gender sensitive and socially inclusive planning frameworks. This includes obligatory stakeholder engagement procedures, quotas for women-owned businesses and inclusive requirements assessments in underserved communities. Development partners should be encouraged to adopt co-design approaches and support capacity building for local actors.

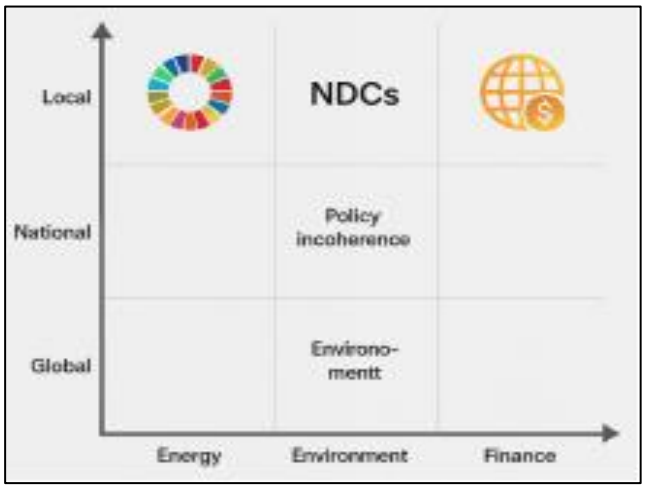

Fig 8 Policy Coherence Mapping Grid

This Policy Coherence Mapping Grid visualizes the alignment between Nigeria's energy, environment, and finance policies across local, national, and global levels. It identifies coherence gaps where sectoral policies diverge or fail to synchronize with SDG targets, NDCs, and international finance objectives. The framework highlights where harmonization efforts are most needed to enhance climate finance effectiveness.

Fourth, policy coherence should be fostered through the development of a national Climate Finance Strategy that aligns donor contributions with Nigeria's long-term energy and development objectives. The strategy should incorporate mechanisms for inter-ministerial collaboration, integrated data systems for tracking fund flows and project outcomes, and periodic multi-stakeholder policy dialogues.

Fifth, regulatory reforms are essential to de-risk investments and attract blended finance. This includes simplifying licensing procedures for renewable energy enterprises, improving contract enforcement, and ensuring currency risk mitigation mechanisms. A dedicated clean energy investment fund, supported by public-private partnerships, could also be established to co-finance priority projects with high development impact.

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25dec829

Lastly, Nigeria should advocate for increased concessional financing and loss-and-damage support through multilateral forums such as the UNFCCC and African Climate Summit. Negotiations should emphasize the importance of adaptation finance, direct access modalities, and equitable distribution of global climate funds to historically underserved regions.

Collectively, these policy measures aim to reposition Nigeria as a leader in leveraging international climate finance for transformative energy development. By addressing structural bottlenecks and embedding equity into climate finance governance, the country can make significant strides toward a just, resilient, and sustainable energy future.

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