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Clean Energy Transition in Nigeria: Policy Implementation and Socio-economic Potentials

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Abstract

Nigeria, as a developing nation with vast fossil fuel resources, faces a unique challenge in aligning its economic growth aspirations with global climate goals. This paper examines the policy implementation and socio-economic potentials of Nigeria's clean energy transition, focusing on the country's Energy Transition Plan (ETP). While the ETP sets an ambitious target of achieving net-zero emissions by 2060, its implementation is fraught with challenges, including poor planning, weak institutional frameworks, and a heavy reliance on external funding. Data were sourced from Key Informant Interviews (KIIs) from the Ministry of Power, the Ministry of Environment, and the Energy Commission of Nigeria, Civil Society Organizations, experts in the Renewable Energy Sector, and scholars from Nigerian universities—University of Uyo and University of Lagos, with a focus on energy policy, economics, and climate change. Participants were contacted via email and professional networks. The interviews were conducted virtually via video conferencing. All interviews were audio-recorded with the participants' consent and transcribed verbatim for analysis. Thematic analysis was used to analyze the interview transcripts. The study finds that a successful transition hinges on overcoming these obstacles by prioritizing economic diversification, creating a supportive regulatory environment, and fostering public buy-in with a focus on unlocking significant socio-economic benefits, including job creation, enhanced energy access, improved public health, and greater energy security.

Keywords

Clean Energy Transition; Nigeria; Policy Implementation; Socio-Economic; Potentials

1. Introduction

The global literature on clean energy transitions reveals a complex interplay of policy, technology, economics and social factors. Developed nations have largely focused on carbon pricing mechanisms, renewable energy subsidies, and grid modernization [1]. However, the global energy landscape is undergoing a profound transformation, driven by the urgent need to mitigate climate change and transition away from fossil fuels [2]. For developing countries like Nigeria, this transition is not merely an environmental imperative but a complex developmental challenge. Nigeria is Africa's largest economy and a major oil and gas producer, with its fiscal stability heavily reliant on fossil fuel exports. Simultaneously, the country grapples with chronic energy poverty, with a significant portion of its population lacking access to reliable electricity [3]. This dual challenge necessitates a carefully crafted strategy that balances decarbonization with the need for economic growth and universal energy access.

In response to global calls for climate action, Nigeria committed to achieving net-zero emissions by 2060 at the United Nations Climate Change Conference (COP26) in 2021. This commitment was followed by the launch of the Nigeria Energy

Transition Plan (ETP) in August 2022, which outlines a multi-pronged strategy to reduce emissions across key sectors, including power, transport, oil and gas, and cooking. The ETP identifies natural gas as a "transition fuel," leveraging Nigeria's abundant reserves to bridge the gap between its current fossil fuel dependency and a future dominated by renewables. This paper provides a synopsis of this plan, its implementation challenges, and the potential socio-economic benefits that a successful transition could unlock. The research objectives are:

(a) To critically assess the policy frameworks and implementation strategies of Nigeria's Energy Transition Plan (ETP).

(b) To evaluate the socio-economic challenges and opportunities associated with the clean energy transition in Nigeria.

(c) To analyze the potential of renewable energy sources to address energy poverty and drive sustainable development in Nigeria.

(d) To provide data-driven recommendations for policymakers to strengthen the ETP and ensure a just, equitable, and sustainable energy transition.

2. Literature Review

2.1 Policy Frameworks and Implementation Strategies

Nigeria's Energy Transition Plan (ETP) of 2022 represents a significant step towards a sustainable energy future, with the ambitious target of achieving net-zero emissions by 2060 [5]. The plan is multi-sectoral, addressing power, transport, industry, and cooking. A key strategy is the use of natural gas as a "transition fuel," leveraging Nigeria's extensive reserves to provide a stable energy source while scaling up renewables.

More importantly, global case studies highlight several common policy implementation challenges in developing nations that are also evident in Nigeria. A review of policies in countries like India and Brazil demonstrates that while renewable energy targets are set, their effectiveness is often limited by a lack of cohesive, integrated policy frameworks [6, 7]. This is a major issue for Nigeria, where a fragmented policy environment with different institutions managing various energy policies leads to a lack of synergy and a clear, actionable roadmap [3, 8].

Another critical barrier, shared by many developing economies, is the massive financing gap. The International Energy Agency (IEA) and UNDP reports indicate that developing countries attract only a small fraction of global clean energy investment despite accounting for two-thirds of the world's population [9, 15]. The ETP's reliance on over $400 billion in external funding introduces significant uncertainty, a challenge also seen in countries like Kenya, where mini-grid projects have faced delays due to funding issues [10, 16].

2.1.1 Socio-economic Challenges and Opportunities

The clean energy transition is not merely a technical challenge but a profound socio-economic one. For Nigeria, a successful transition can unlock significant benefits, but it must first navigate several hurdles.

The most profound hurdle is the potential fiscal instability from the phasing out of fossil fuels. As a major oil and gas producer, Nigeria's economy and national budget are highly dependent on fossil fuel exports. A rapid transition without effective economic diversification could pose a significant threat to fiscal stability [11]. This is a common concern among fossil fuel-dependent nations, with countries like Mexico and Saudi Arabia also exploring ways to diversify their economies and reduce reliance on oil and gas revenues [12].

Conversely, the opportunities are substantial. The ETP projects the creation of up to 840,000 jobs by 2060, particularly in the renewable energy, cooking, and transport sectors [13]. Global case studies support this potential. For instance, India's renewable energy sector has created a significant number of jobs in manufacturing and installation [14]. A transition to clean cooking fuels, like LPG and biogas, also has a direct and positive impact on public health, a benefit seen in countries like Bangladesh and Kenya, where clean cooking initiatives have reduced respiratory diseases [15]. The transition also enhances energy security by reducing reliance on volatile international fossil fuel markets, a major goal for nations across Sub-Saharan Africa [16].

Several studies have examined the clean energy transition in other developing countries, offering valuable insights for Nigeria. For instance, research on India and Brazil found that while renewable energy adoption can reduce CO2 emissions, its effectiveness is often limited without broader policy frameworks and technological innovation [16]. Another study in Kenya and Bangladesh noted that for a successful transition, policymakers must consider not only the technical and economic viability of clean energy technologies but also the social and political factors that influence their adoption at the household level, particularly in rural areas [17]. Public acceptance and support are crucial, as policies that increase energy

costs can face significant resistance, as seen with the "Yellow Vests" protests in France [18].

In the context of Nigeria, existing literature points to several critical barriers to a successful energy transition. A recent study identified a lack of a stable policy environment, limited access to finance, and inadequate infrastructure as major hindrances to renewable energy penetration [19]. The study concluded that a disconnect exists between Nigeria's green energy transition targets and their actual realization, largely due to an inadequate influx of private investment. While Nigeria has abundant renewable energy resources, including solar, hydro, and wind, leveraging them requires a robust and transparent regulatory framework to inspire investor confidence [20].

The socio-economic implications are also a central theme. The ETP aims to lift 100 million Nigerians out of poverty and create significant jobs in the clean energy sector [21]. However, a comprehensive review of Nigeria's economic transition found that while new industries could be created, the decline in fossil fuel revenues poses a significant threat to fiscal stability (20). The transition must therefore be a "just transition," with inclusive policies that ensure the benefits are distributed equitably and that vulnerable communities are not left behind.

2.1.2 Potential of Renewable Energy to Address Energy Poverty

Nigeria's energy poverty, with a large portion of the population lacking reliable electricity, can be effectively addressed by leveraging its abundant renewable energy resources. The decentralized nature of solar and mini-grid technologies makes them ideal for reaching the country's rural and underserved communities, bypassing the limitations of the centralized national grid.

This approach has been successfully implemented in other developing countries. In Rwanda, for instance, government policies have enabled the rapid deployment of solar home systems through "pay-as-you-go" models, significantly expanding energy access [18, 21]. The same model has been promoted in Ghana, where a community solar microgrid provides electricity to over 400 households, a school, and a health clinic [19, 22]. This demonstrates that off-grid solutions, while requiring different policy support, can deliver immediate and tangible benefits, driving economic activity and improving quality of life at the local level.

2.2 Theoretical Framework

2.2.1 The Multi-level Perspective (MLP)

The Multi-Level Perspective (MLP) on socio-technical transitions is a widely used theoretical framework that is particularly well-suited to analyzing the complex process of a clean energy transition in a country like Nigeria. It helps to understand how a new, clean energy system can emerge and eventually replace the dominant, fossil-fuel-based system. The MLP posits that transitions are not linear but are the result of interactions between three distinct levels: the niche, the regime, and the landscape.

Niche Level: This is the breeding ground for radical innovations. In the context of Nigeria's clean energy transition, the niche level includes small-scale renewable energy projects like solar home systems, mini-grids, and biomass projects, often supported by pilot programs, non-governmental organizations, and international development partners. These initiatives operate on a small scale, are often protected from the dominant market, and provide an environment for new technologies and business models to be developed and refined. They represent the "seeds" of the new energy system.

Regime Level: This is the established, dominant system. For Nigeria, this is the current fossil-fuel-based energy system. It includes the formal and informal rules, institutions, infrastructure, policies, and entrenched interests that maintain the status quo. This includes the national grid, large-scale gas-fired power plants, and the influential oil and gas industry. The regime is generally resistant to change due to institutional inertia, existing infrastructure, and powerful actors who benefit from the current system.

Landscape Level: This refers to the broad, macro-level factors that influence the regime and the niches. These are external, slow-moving trends that are largely beyond the control of the actors within the energy sector. For Nigeria, the landscape includes global climate change concerns, international pressure to reduce emissions, the volatility of global oil prices, and the broader socio-economic context of poverty, population growth, and urbanization. These factors create the external pressures that can destabilize the existing regime and provide opportunities for niche innovations to grow.

The MLP framework can be applied to analyze the challenges and opportunities for policy implementation in Nigeria's clean energy transition. Policies can act as a crucial link between the niche and the regime. Effective policy implementation can create pathways for niche innovations to scale up and challenge the dominance of the regime. Examples include feed-in tariffs, tax incentives for renewable energy projects, and rural electrification policies that prioritize decentralized renewable energy. However, challenges like inconsistent policy, regulatory bottlenecks, and a lack of political will can hinder

this process, as has been observed in Nigeria. The socio-economic potentials of a clean energy transition are not just outcomes but also drivers of the transition itself. As niche innovations like solar mini-grids provide reliable and affordable power to underserved communities, they create new economic opportunities, improve livelihoods, and build public support for clean energy. This, in turn, can create a bottom-up pressure that complements top-down policy efforts. The socio-economic benefits, such as job creation in the renewable energy sector, improved health outcomes from reduced pollution, and enhanced energy security, can provide the necessary political and social momentum to overcome the resistance of the existing fossil-fuel regime.

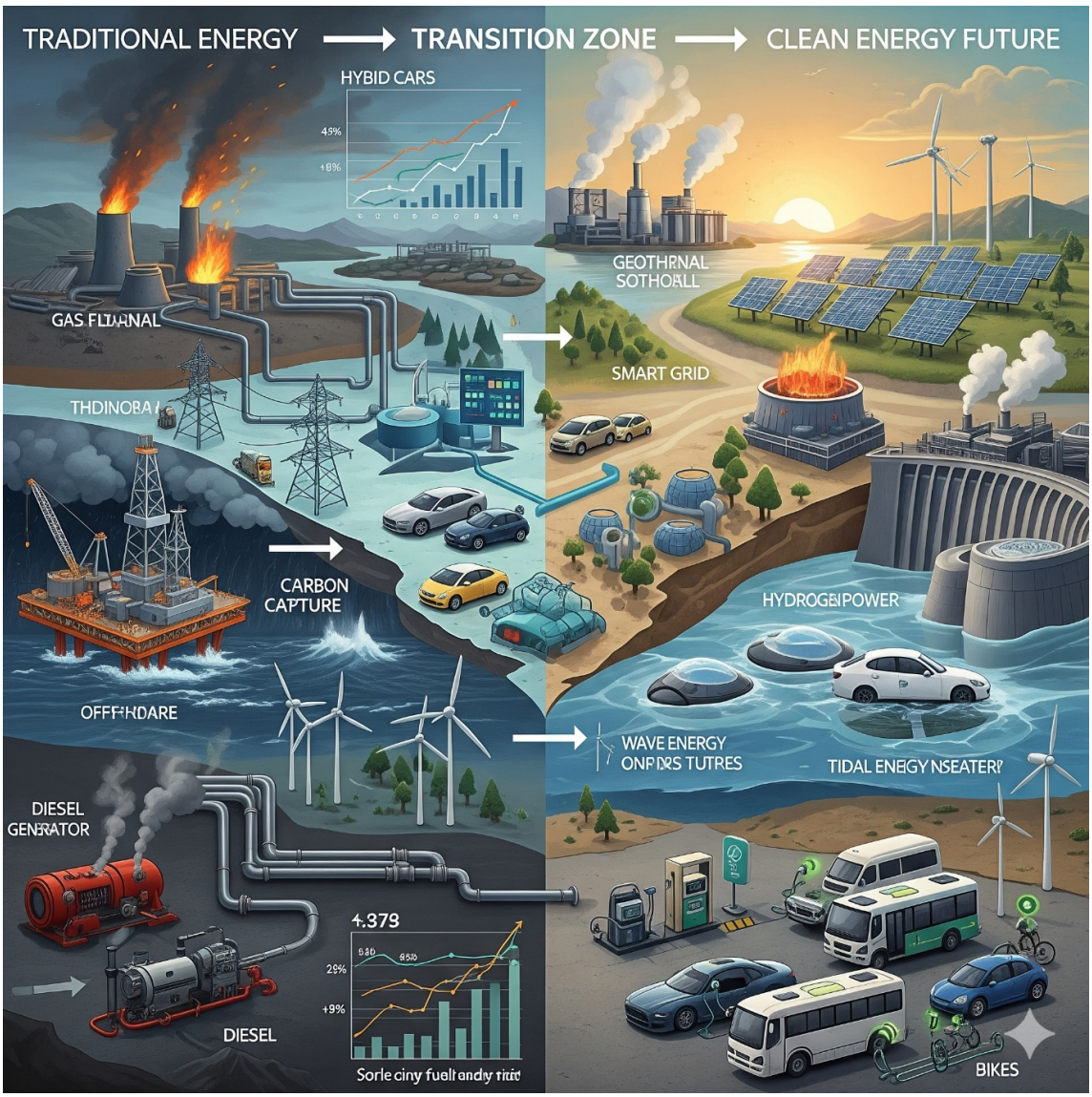

Figure 1. Model showcasing Clean Energy Transition Process for Nigeria.

The transition is a co-evolutionary process where the three levels interact. Landscape pressures create a "window of opportunity" for policy changes, which then allow niches to grow. As the niches gain momentum and market share, they put pressure on the regime to adapt, eventually leading to a complete transformation of the energy system. In Nigeria, the need to address persistent power shortages and the global push for decarbonization are landscape pressures that create an imperative for change. The success of pilot projects at the niche level could, with the right policy support, lead to a larger-scale shift that fundamentally reshapes the country's energy landscape, moving away from a reliance on finite fossil fuels to a more sustainable and equitable system

3. Methodology

This study employed a qualitative research methodology to provide an in-depth, nuanced understanding of Nigeria's clean energy transition. The primary data collection method was the Key Informant Interview (KII). This approach was chosen to capture the diverse perspectives and rich insights of individuals with direct knowledge and experience in the subject matter.

3.1 Sampling and Participant Selection

A purposive sampling strategy was used to select a total of 40 key informants. The selection criteria focused on individuals with direct professional involvement and expertise in Nigeria's energy sector. The participants were drawn from four key stakeholder groups:

(a) Government Officials (10 participants): Representatives from the Ministry of Power, the Ministry of Environment, and the Energy Commission of Nigeria, involved in policy formulation and implementation of the Energy Transition Plan (ETP).
(b) Renewable Energy Sector Practitioners (12 participants): CEOs, project managers, and technical experts from private companies specializing in solar, hydro, and mini-grid solutions.
(c) Academics and Researchers (10 participants): Scholars from Nigerian universities- University of Uyo and University of Lagos, with a focus on energy policy, economics, and climate change.
(d) Civil Society Organizations (CSOs) (8 participants): Representatives from non-governmental organizations advocating for clean energy, climate justice, and community development.

Participants were contacted via email and professional networks. The interviews were conducted virtually (via video conferencing) and in-person between June and August 2025.

3.2 Data Collection

Semi-structured interviews were conducted to allow for flexibility and the exploration of new themes as they emerged. A detailed interview guide was developed based on the study's research objectives. Key themes explored included: Perceptions of the ETP's strengths and weaknesses, experiences with policy implementation and regulatory hurdles, socio-economic impacts observed in the field (e.g., job creation, energy access), barriers and enablers for private sector investment, and recommendations for a more effective and equitable energy transition.

Each interview lasted approximately 45-60 minutes. All interviews were audio-recorded with the participants' consent and transcribed verbatim for analysis. Thematic analysis was used to analyze the interview transcripts.

4. Results and Findings

The qualitative data from the key informant interviews provided a deep and nuanced understanding of Nigeria's clean energy transition, revealing key themes that align with and expand upon the literature review. The findings are discussed below, supported by direct quotes.

Most key informants acknowledged the ETP as a well-intentioned and comprehensive document. However, there was a unanimous consensus that a significant implementation gap exists. The primary issue identified was a lack of a clear, actionable roadmap and weak institutional coordination.

A senior government official lamented, *"The plan is fantastic on paper, but the different ministries and agencies are still working in silos. There is no central coordinating body with the authority to drive the transition across all sectors."* This quote highlights the systemic issue of fragmented governance, which hinders the swift and effective execution of policy.

Renewable energy practitioners identified bureaucratic hurdles and regulatory uncertainty as major deterrents for private investment. One CEO of a mini-grid company stated, *"We spend months just trying to get permits. The process is not streamlined. Every state, every local government has its own requirements, and this adds significant cost and time to projects."* This finding underscores the need for a simplified, transparent, and harmonized regulatory environment to attract both local and foreign capital.

The interviews strongly supported the ETP's potential for job creation and poverty reduction. However, a key finding was the emphasis on the qualitative socio-economic benefits beyond sheer numbers.

Academics and CSOs highlighted that the clean energy transition is not just about producing power; it's about improving livelihoods. One academic remarked, *"The solar mini-grid in a rural community doesn't just provide light; it enables a*

carpenter to work at night, a woman to power her sewing machine, and a health clinic to store vaccines. It's a fundamental shift in economic potential." This insight links energy access directly to economic empowerment and social development, making the case for a "just transition" centered on community-level impact.

However, participants from the oil and gas sector expressed concern about job displacement and the need for structured reskilling programs. *"We have highly skilled engineers and technicians in the fossil fuel industry,"* a representative noted. *"The ETP needs a clear plan to transition these people into the new energy economy. Otherwise, we risk creating a new social problem."* This finding reinforces the need for a just transition strategy that includes human capital development.

The interviews confirmed that renewable energy, particularly decentralized solar solutions, is seen as the most viable path to addressing energy poverty in Nigeria. The participants lauded the modularity and scalability of these technologies.

A CSO representative working in remote communities explained, *"The national grid will likely never reach many of these villages. But with a small solar mini-grid, a whole community can have reliable power for the first time. It is a game-changer for people who have been living in darkness."* This observation highlights the strategic importance of off-grid solutions in a country with vast geographic disparities.

However, participants also identified sustainability challenges for many renewable energy projects. These challenges include a lack of local technical expertise for maintenance, difficulty in securing affordable financing, and a lack of supportive policy for smaller-scale projects.

5. Conclusion and Policy Recommendations

Nigeria's clean energy transition is a multifaceted journey fraught with significant challenges but also brimming with enormous socio-economic potential. While the Energy Transition Plan sets an ambitious and necessary course, its successful implementation is not guaranteed. The fragmented policy environment, weak institutional frameworks, and dependence on external finance are major obstacles that must be addressed.

For the transition to be a success, Nigeria's government must:

(a) Harmonize its policies to create a cohesive and predictable regulatory environment.

(b) Prioritize local and private sector investment by simplifying regulations and offering targeted incentives.

(c) Focus on a "just transition" strategy that ensures the benefits of clean energy reach all Nigerians, particularly those in rural and marginalized communities, through decentralized solutions.

(d) The government must harmonize its various energy policies to create a single, clean, and predictable regulatory environment. Countries like Denmark have successfully used multi-criteria decision-making models to integrate diverse policies and ensure all stakeholders are aligned on the transition pathway

(e) Attracting the massive private investment needed for the ETP requires providing transparent and verifiable data on energy demand, resource potential, and project viability. This can be achieved by investing in real-time data analytics and machine learning algorithms to provide actionable insights for financiers and investors

(f) While a robust national grid is a long-term goal, data from other African nations show that focusing on decentralized, off-grid solutions can more rapidly address energy poverty. Policymakers should implement targeted programs and simplified regulations that support private sector-led development of mini-grids and solar home systems.

(g) To ensure an equitable transition, Nigeria should adopt a strategy that protects vulnerable populations. This includes retraining programs for workers in the fossil fuel sector and implementing policies to ensure that the benefits of clean energy, such as improved public health and job creation, are distributed fairly across all regions and social classes. This approach aligns with the "just transition" policies being pursued in countries like South Africa, where the government is actively planning for the socio-economic impacts on its coal-dependent regions. Ultimately, by leveraging its abundant renewable energy resources and implementing a robust, inclusive, and well-funded strategy, Nigeria can not only meet its international climate commitments but also unlock a new era of sustainable development, economic diversification, and energy security.

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