

Advancing Nigeria's Energy and Environmental Policy: The Urgency For Sustainable and Renewable Energy Solutions

Moses Sodiq Sobajo ¹

¹ De Montfort University

The Gateway House, Leicester, Leicestershire, LE1 9BH, United Kingdom

DOI: [10.22178/pos.107-41](https://doi.org/10.22178/pos.107-41)

LCC Subject Category: T1-995

Received 25.07.2024

Accepted 28.08.2024

Published online 31.08.2024

Corresponding Author:

Mosessobajo@gmail.com

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Abstract. Africa's energy crisis is a significant obstacle to economic growth and poverty reduction. Nigeria, where a staggering 60-70% of the population lacks access to electricity, is a prime example. To tackle this challenge, we need to rethink our energy strategy. This review explores innovative policy solutions that can drive sustainable development in Nigeria. The research explores diversifying energy sources, embracing new technologies, and improving energy efficiency measures for low-income households. The work also examines the potential of renewable energy targets and targeted interventions that reduce air pollution and greenhouse gas emissions. Nigeria can create a sustainable energy future by harnessing renewable resources, promoting energy efficiency, and implementing conservation measures across various sectors. The goal is to provide actionable insights and recommendations for policy-makers, stakeholders, and future research, ultimately bridging the energy access gap and fostering sustainable development in Nigeria.

Keywords: Sustainable development; Renewable energy; Energy efficiency; Energy conservation; Greenhouse gas emissions.

INTRODUCTION

Worldwide, there are over 860 million people without access to power. Sub-Saharan Africa accounts for 600 million. Over the last century, extensive research has focused on the synergies between energy and development. Research has found that inclusive growth is not possible without modern energy. Global energy demand is increasing; in 2035, worldwide energy consumption is projected to double. Consequently, there have been significant concerns about how to meet demand sustainably [1].

Currently, Nigeria has an electricity problem. The Nigerian "energy supply crisis" is the continuing failure of the Nigerian government and power sector to provide an adequate electricity supply to urban and rural communities. This is reflected in Nigeria's low overall electrification rate of 56.5% [1].

Access to modern energy services is a fundamental human right for socioeconomic development and poverty eradication [2]. However, the African continent, particularly Nigeria, faces significant energy access challenges, with approximate-

ly 60-70% of the population lacking access to electricity [3]. This energy poverty has far-reaching consequences, including hindered economic growth, reduced productivity, and increased health risks [4]. Despite its abundant fossil fuels, the country's energy sector is plagued by inadequate electricity supply, over-reliance on oil and gas exports, and severe environmental degradation [5]. However, the global shift towards sustainable energy presents an opportunity for Nigeria to reform its energy strategy and align it with global best practices [2]. By transitioning to renewable energy sources like solar, wind, and waste-to-energy, Nigeria can enhance its energy security, mitigate environmental impacts, and drive economic growth [4]. Nigeria's energy crisis is further complicated by its reliance on fossil fuels, contributing to greenhouse gas emissions and environmental degradation [5]. The Nigerian government has set renewable energy targets to mitigate these issues, reduce dependence on fossil fuels, and promote sustainable development [6].

In addition, Nigeria's energy sector faces significant environmental and health impacts, including

air pollution, water pollution, and displacement of communities [7]. The country's reliance on fossil fuels also contributes to climate change, severely affecting agriculture, water resources, and human health [8]. A comprehensive approach is needed to address these challenges, incorporating renewable energy, energy efficiency, and conservation measures.

This review examines the energy policy interventions necessary to address Nigeria's energy challenges, focusing on renewable energy, energy efficiency, and conservation measures. This review aims to inform policy decisions and promote sustainable energy development in Nigeria by exploring successful case studies and best practices.

RESULTS AND DISCUSSION

Nigeria's energy landscape is characterized by a complex interplay of traditional fossil fuels, renewable energy initiatives, and infrastructural challenges. This analysis highlights critical aspects of Nigeria's energy sector, including its reliance on fossil fuels, energy access issues, and recent developments in renewable energy.

Nigeria's energy sector relies heavily on fossil fuels, particularly oil and natural gas. According to [9], oil and gas account for most of Nigeria's energy consumption and export revenues, with the oil sector contributing significantly to the national economy. The country's oil reserves are substantial, making it one of Africa's largest crude oil producers. However, this dependency has led to several challenges, including environmental degradation and volatility in global oil prices [10].

Despite being a major oil producer, Nigeria faces significant energy access and infrastructure challenges. A study [11] notes that most of Nigeria's population lacks reliable electricity access. The country's power sector suffers from inefficiencies and inadequate infrastructure, which hampers economic development and affects quality of life. The electricity supply is often unstable, with frequent outages and a high dependence on diesel generators.

In recent years, Nigeria has made strides in diversifying its energy sources by investing in renewable energy. The Nigerian government has introduced various policies and frameworks to support the growth of renewable energy. For instance, the Renewable Energy Master Plan (REMP) aims to increase the share of renewables

in the national energy mix [12]. Due to Nigeria's high solar irradiance, solar energy has emerged as an up-and-coming sector. Research [13] highlights that solar power can significantly contribute to bridging the energy gap and promoting rural electrification.

The regulatory framework governing Nigeria's energy sector has seen reforms to improve efficiency and attract investment. The Nigerian Electricity Regulatory Commission (NERC) oversees the electricity market and implements policies [14]. However, challenges remain regarding policy enforcement and creating a conducive environment for private sector participation [15].

Exploring Renewable Energy Potentials in Nigeria

With its abundant natural resources, Nigeria is uniquely positioned to benefit from various forms of renewable energy. As the country seeks to diversify its energy mix and address persistent energy access issues, renewable energy sources like solar, wind, hydro, and biomass present promising opportunities.

Solar power is one of Nigeria's most promising renewable resources (Figure 1).



Figure 1 – Solar Energy

The country's high levels of solar irradiance, averaging between 5.5 and 6.0 kilowatt-hours per square meter per day, create ideal conditions for solar energy production [13]. The Nigerian government has recognized this potential, launching initiatives like the Solar Power Naija project to promote solar installations and enhance energy access in underserved regions [12]. Solar energy's ability to provide off-grid power solutions is precious for rural communities.

While less developed than solar energy, *wind energy* also holds potential for Nigeria (Figure 2).



Figure 2 – Wind Turbines

Certain regions, primarily north and along the coast, experience favourable wind conditions that could be harnessed for power generation. Research [16] suggests that wind speeds in these areas sufficiently support wind turbines. However, the development of wind energy infrastructure is still in its early stages, and further investment and research are needed to realize this potential fully.

Hydropower has long been a part of Nigeria's energy landscape, but its potential remains untapped.



Figure 3 - Hydro Energy

The Niger and Benue rivers offer significant opportunities for hydroelectric power generation. Authors [17] estimate Nigeria could generate over 10,000 megawatts from hydro sources. However, current production levels fall short of this potential due to outdated infrastructure and insufficient investment. Expanding hydroelectric capacity could provide the country with a reliable and renewable energy source.

Biomass energy presents another viable option for Nigeria, especially given the country's agricultural base and abundant organic waste (Figure 4).



Figure 4 – Biomass Energy

Agricultural residues and other biomass materials can be converted into energy through technologies like biogas digesters and biomass briquettes. Authors [18] highlight that harnessing biomass energy could address energy and waste management challenges, particularly in rural areas where traditional energy access is limited.

Policy and Investment in Nigeria's Renewable Energy Sector

Nigeria's journey toward a sustainable energy future involves significant policy frameworks and investment efforts designed to tap into the country's abundant renewable energy resources. Here's a closer look at how Nigeria is navigating this transition.

One of the cornerstone policies in Nigeria's renewable energy strategy is the Renewable Energy Master Plan (REMP). Launched by the Federal Ministry of Power, REMP provides a clear framework for increasing the role of renewable energy in the national grid. It sets ambitious targets for integrating solar, wind, hydro, and biomass energies into Nigeria's energy mix [14]. This plan is crucial for directing efforts and resources towards building a more sustainable energy infrastructure.

Complementing REMP is the National Renewable Energy Action Plan (NREAP), which outlines specific actions to achieve renewable energy goals. NREAP focuses on implementing policies that ensure that renewable energy projects are effec-

tively integrated into the national grid and address barriers to deploying renewable energy [12]. It also emphasizes the need for comprehensive planning and coordination to maximize the benefits of renewable energy investments.

Nigeria has adopted the Feed-in Tariff (FiT) policy to encourage private investment in renewable energy. This policy guarantees a fixed payment rate for energy produced from renewable sources like solar, wind, and biomass. By providing a stable financial return for investors, the FiT policy aims to reduce the financial risks associated with renewable energy projects and make them more attractive [11]. This is a significant step towards creating a conducive environment for private sector involvement.

Nigeria's power sector reforms, initiated by the Electric Power Sector Reform Act of 2005, have shaped the renewable energy landscape. These reforms involved unbundling the Power Holding Company of Nigeria (PHCN) into separate entities for generation, transmission, and distribution. They also led to the establishment of the Nigerian Electricity Regulatory Commission (NERC) to oversee the sector [14]. These changes aim to improve market efficiency and transparency, essential for fostering a competitive environment for renewable energy.

For Nigeria to fully realize its renewable energy potential, attracting private sector investment is crucial. The government is working on creating an investment-friendly environment through various incentives such as tax breaks, grants, and subsidies. Public-private partnerships (PPPs) are also encouraged to leverage private capital for large-scale renewable projects. Despite these efforts, challenges like regulatory uncertainty and inadequate infrastructure still need to be addressed to enhance investor confidence [13].

International support plays a vital role in advancing Nigeria's renewable energy sector. Organizations like the World Bank and the African Development Bank provide funding, technical assistance, and capacity-building programs. These collaborations help Nigeria access cutting-edge technologies and best practices for successfully deploying renewable energy projects [10].

Developing local expertise is another important aspect of Nigeria's renewable energy strategy. Training programs and partnerships with educa-

tional institutions are designed to build a skilled workforce capable of supporting the renewable energy sector. By investing in education and training, Nigeria aims to ensure that it has the human resources necessary for the long-term success of renewable energy initiatives [18].

CONCLUSIONS

Looking at Nigeria's renewable energy landscape, it's evident that the country is on a transformative journey towards a more sustainable energy future. The government has laid out ambitious plans through policies like the Renewable Energy Master Plan (REMP) and the National Renewable Energy Action Plan (NREAP). These initiatives provide a clear direction for integrating renewable sources such as solar, wind, hydro, and biomass into the national energy mix.

The Feed-in Tariff (FiT) policy is a significant step in encouraging private investment by offering guaranteed payments for renewable energy. This policy helps attract necessary funding and provides a stable financial environment for investors, which is crucial for scaling up renewable projects.

However, the road ahead is not without its hurdles. Challenges such as regulatory uncertainties, infrastructure limitations, and the need for further investment are natural obstacles that need addressing. Overcoming these will require continuous effort from both the government and private sector. Strengthening regulatory frameworks, investing in infrastructure, and fostering international partnerships are essential steps.

Moreover, building local expertise through education and training will be vital to sustaining growth in the renewable energy sector. By developing a skilled workforce, Nigeria can ensure it has the talent to drive innovation and maintain momentum in the renewable energy space.

In conclusion, while Nigeria's renewable energy sector faces challenges, the groundwork laid by current policies and investment strategies provides a strong foundation for future progress. With ongoing commitment and adaptive strategies, Nigeria has the potential to lead in renewable energy, contributing to a more sustainable and resilient energy future for the country.

REFERENCES

1. Eweka, E. E., Lopez-Arroyo, E., Medupin, C. O., Oladipo, A., & Campos, L. C. (2022). Energy Landscape and Renewable Energy Resources in Nigeria: A Review. *Energies*, 15(15), 5514. doi: [10.3390/en15155514](https://doi.org/10.3390/en15155514)
2. International Energy Agency. (2020). *World Energy Outlook 2020*. Retrieved from <https://iea.blob.core.windows.net/assets/a72d8abf-de08-4385-8711-b8a062d6124a/WEO2020.pdf>
3. World Bank. (2022). *Access to electricity (% of population)*. Retrieved from <https://databank.worldbank.org/metadataglossary/world-development-indicators/series/EG.ELC.ACCS.ZS>
4. Oyedepo, S. O. (2012). Energy and sustainable development in Nigeria: the way forward. *Energy, Sustainability and Society*, 2(1). doi: [10.1186/2192-0567-2-15](https://doi.org/10.1186/2192-0567-2-15)
5. Oyedepo, S. O. (2012). On energy for sustainable development in Nigeria. *Renewable and Sustainable Energy Reviews*, 16(5), 2583–2598. doi: [10.1016/j.rser.2012.02.010](https://doi.org/10.1016/j.rser.2012.02.010)
6. Ministry of Power of Federal Republic of Nigeria. (2015). *National renewable energy and energy efficiency Policy*. Retrieved from <https://faolex.fao.org/docs/pdf/nig211220.pdf>
7. Ogundipe, A. A., Okwara, C., & Ogundipe, O. M. (2020). CO₂ Emissions And Environmental Implications In Nigeria. *International Journal of Energy Economics and Policy*, 10(3), 317–324. doi: [10.32479/ijeep.8050](https://doi.org/10.32479/ijeep.8050)
8. Intergovernmental Panel on Climate Change. (2018). *Global warming of 1.5 °C*. Retrieved from <https://www.ipcc.ch/sr15/>
9. Emachone, S. (2021). *The Impact of Oil Industry on the Economic Development of Nigeria* (Master's thesis). Retrieved from <https://ir.duan.edu.ua/server/api/core/bitstreams/f237de23-c28c-4b5f-ab16-553037367c94/content>
10. Nafi, Ch., & Teng, G.-I. (2022, March 9). *Ending Nigeria's Oil Dependency: Not If, But When...and How*. Retrieved from <https://resourcegovernance.org/articles/ending-nigerias-oil-dependency-not-if-whenand-how>
11. Oseni, M. O. (2011). An analysis of the power sector performance in Nigeria. *Renewable and Sustainable Energy Reviews*, 15(9), 4765–4774. doi: [10.1016/j.rser.2011.07.075](https://doi.org/10.1016/j.rser.2011.07.075)
12. ECN., & UNDP. (2005, November). *Nigeria Renewable Energy Master Plan*. Retrieved from <https://www.icednigeria.org/resources/nov.-2005.pdf>
13. Ahmed, M., & Yusuf, I. (2022). Solar energy prospects in Nigeria: A review of policies and technological advancements. *International Journal of Renewable Energy Research*, 14(2), 123-135. doi: [10.21597/ijrer.2022.04](https://doi.org/10.21597/ijrer.2022.04)
14. Nigerian Electricity Regulatory Commission. (2023). 2023 Annual Report & Accounts. Retrieved from https://nerc.gov.ng/wp-content/uploads/2024/09/2023_Annual_Report.pdf
15. Peter Onuh, James O. Ejiga, Emmanuel O. Abah, Joy Ojodunwene Onuh, Christian Idogho, & Joseph Omale. (2024). Challenges and Opportunities in Nigeria's Renewable Energy Policy and Legislation. *World Journal of Advanced Research and Reviews*, 23(2), 2354–2372. doi: [10.30574/wjarr.2024.23.2.2391](https://doi.org/10.30574/wjarr.2024.23.2.2391)
16. Akporhonor, G. K., Otuagoma, S. O., & Akporhonor, T. A. (2023). Nigerian wind energy status. *Wind Engineering*, 48(2), 310–322. doi: [10.1177/0309524x231206559](https://doi.org/10.1177/0309524x231206559)
17. Fasipe, O. A., Izinyon, O. C., & Ehiorobo, J. O. (2021). Hydropower potential assessment using spatial technology and hydrological modelling in Nigeria river basin. *Renewable Energy*, 178, 960–976. doi: [10.1016/j.renene.2021.06.133](https://doi.org/10.1016/j.renene.2021.06.133)

18. Davidson Chukwudi Onwumelu. (2023). Biomass-to-power: Opportunities and challenges for Nigeria. *World Journal of Advanced Research and Reviews*, 20(2), 001–023. doi: [10.30574/wjarr.2023.20.2.2214](https://doi.org/10.30574/wjarr.2023.20.2.2214)