Afropolitan Journals

ISSN: 3027-2114 www.afropolitanjournals.com

Policy Challenges and Opportunities for Renewable Energy Development in Nigeria: A Systematic Review

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***DOI**: https://doi.org/10.62154/ajesre.2025.018.010660*

Abstract

This article examines the challenges and opportunities associated with effective policy decision-making for advancing Nigeria's renewable energy system through a systematic scoping review. Secondary data were collected from peer-reviewed journal articles, books, and other online sources, encompassing quantitative, qualitative, and review studies spanning the period from 2000 to 2025. The search process utilized academic databases and search engines, including Google Scholar and RefSeek, among others. Retrieved data were subjected to content and thematic analysis. The findings indicate that Nigeria possesses abundant renewable energy resources, including solar, wind, and hydroelectric power, with significant opportunities for legislative reforms, institutional strengthening, technological innovation, and infrastructure development. Several policy frameworks, such as the Renewable Energy Master Plan (REMP), the National Renewable Energy and Energy Efficiency Policy (NREEEP), and the Electric Power Sector Reform Act (EPSRA) of 2005, have been introduced to promote renewable energy utilization. However, these policies have largely failed to achieve their intended impact due to persistent challenges, including the absence of a comprehensive and coherent energy policy, regulatory burdens, legal inconsistencies, and institutional inefficiencies. To address these issues, the article recommends that the Nigerian government and policymakers establish a clear and robust regulatory framework that supports the sustainable development and utilization of renewable energy sources, including solar, wind, hydro, and geothermal energy. Strengthening policy implementation mechanisms and ensuring institutional coordination are also critical to overcoming existing barriers and fostering a resilient renewable energy sector in Nigeria.

Keywords: Renewable Energy System in Nigeria, Challenges and Opportunities, Policy Decision Making, Nigeria.

Introduction

Nigeria's energy sector relies heavily on fossil fuels, particularly oil and gas, which account for more than 80% of the nation's primary energy supply (SAO Admin, 2024). The critical role of uninterrupted access to affordable energy in driving economic growth cannot be overemphasized. Energy is a fundamental input for economic growth and development, as it is essential for providing basic social services such as lighting homes and schools, ensuring comfort and mobility, pumping water, and contributing to the health and well-being of the population. Additionally, energy is crucial for industrialization and the overall sustainability of national economic development (Nalule, 2019).

Numerous studies, including those by Emodi and Boo (2015), Somorin et al. (2017), Adesola & Brennan (2019), Akinbami et al. (2001), and the International Energy Agency (2023), have affirmed that providing uninterrupted access to affordable energy has a significant positive impact on a nation's economy in both the short and long term. Energy not only plays a key role in economic development but also significantly influences social development, extending its impact to both local and global environments (FAO, 2001). Furthermore, access to energy is essential for fostering human and technological development, which is necessary for achieving the Sustainable Development Goals (SDGs) (Uyigue, 2008; Nalule, 2019). A prevailing theoretical perspective in development policy asserts that without the provision of appropriate and effective energy services, true economic development cannot be achieved (FAO, 2001).

Energy sources can be categorized into conventional and non-conventional (renewable) resources. Conventional energy resources include oil, natural gas, coal, and nuclear energy, while renewable resources comprise solar, wind, geothermal, hydropower, ocean, and bioenergy (IEA, 2019). Energy usage can be divided into household, rural, urban, and industrial levels. According to FAO (2001), increased household access to energy services can help reduce poverty and unemployment. At the rural and industrial levels, enhanced energy access can foster rural development and reduce urbanization pressures on cities. In the industrial sector, energy is essential for production across all economic sectors. A lack of affordable energy supplies can hinder industrial productivity, negatively impacting national Gross Domestic Product (GDP) and, by extension, national development (Moss & Kincer, 2023).

Moss and Kincer (2023) further emphasize that the provision of reliable, low-cost energy for firms has positive effects on productivity, profitability, job creation, and macroeconomic growth. For instance, firms in Africa have identified poor infrastructure, particularly power supply, as a major challenge affecting business productivity and expansion. Power outages have had significant negative impacts on Zambia's economy, increased production costs in Ethiopia, reduced the sales of SMEs in Senegal, and negatively affected revenues and producer surpluses in India. Furthermore, electricity shortages have been found to reduce the likelihood of employment for high-skilled jobs by nearly 41% and decrease the probability of self-employment by approximately 47%.

However, Guler et al. (2021) noted that energy performance in OECD countries, including Nigeria, ranges from moderate to high. Additionally, global research suggests that investment in energy enhances economic elasticity and generates cumulative macroeconomic effects on GDP and human capital. At the global level, FAO (2001) reported that approximately 2 billion people lack effective access to energy, which impairs both social and economic development. In many developing nations, particularly in sub-Saharan Africa, energy-driven economies remain underdeveloped despite the presence of abundant natural energy resources. The sub-Saharan Africa region is endowed with various conventional and renewable energy resources, including solar, hydro, wind, and biomass,

which could significantly contribute to robust and rapid economic growth and development (Akinbami & Momodu, 2011). Nevertheless, government efforts in these regions to expand energy access remain inadequate, leading to persistent energy crises (Rai, 2004).

As Africa's largest economy and most populous country, Nigeria has made various efforts to promote renewable energy development through policymaking. Over the years, Nigerian policymakers have formulated and enacted several energy policies aimed at diversifying the energy mix and increasing energy supplies nationwide (Olowosejeje et al., 2019). Despite these strategies, Nigeria's energy policies, regulations, and management structures still fail to meet the required energy demand and supply levels (Adesanya et al., 2021). For instance, Oyedepo (2012) noted that 60% to 70% of the Nigerian population lacks access to affordable energy. Additionally, Olowosejeje et al. (2019) observed that the increasing demand for electricity, coupled with limited supply, has hindered Nigeria's socio-economic development. Electricity infrastructure projects have been sidelined, power outages remain common, and grid unreliability forces industries to incur substantial costs to secure the necessary power supply, ultimately affecting individual, industrial, and national development.

The National Renewable Energy and Energy Efficiency Policy (NREEEP) serves as a key framework guiding renewable energy development in Nigeria (Adeyemi, 2024). Nigeria has several opportunities to advance renewable energy policymaking, including abundant renewable resources, growing energy demand, international support, and job creation potential. Adeyemi (2024) highlights Nigeria's vast renewable resources, such as solar, wind, and hydropower, which can contribute significantly to economic development. Oyedepo et al. (2019) further note that Nigeria's increasing population and expanding business sector are driving energy demand, which could be met through renewable energy sources. The International Energy Agency (2024) asserts that Nigeria stands to benefit from international support in the form of funding, technology, and expertise for renewable energy development. Moreover, Akinbami et al. (2001) emphasize that the renewable energy sector has significant potential to generate employment and stimulate economic growth, particularly in rural areas.

Despite these opportunities, Nigeria faces significant challenges in achieving its renewable energy goals. Many African nations struggle to secure sufficient energy services for their growing populations, a condition described as 'energy precarity' (Bouzarovski & Simcock, 2017). This concept encompasses energy deprivation, vulnerability (Petrova, 2018), and difficulties in obtaining adequate energy for basic needs (Legendre & Ricci, 2015). Energy precarity is prevalent in sub-Saharan Africa, where low daily energy consumption forces many to rely on polluting fuels or allocate excessive resources to energy procurement (Emodi & Boo, 2015). These alternative energy sources often exacerbate climate challenges (IEA, 2011; Baker et al., 2011; Oyedepo, 2012; Zerrahn et al., 2018; Ochoa et al., 2019; IEA,

2019). Although there are global efforts to transition from fossil fuels to renewable energy, such transitions remain a significant challenge worldwide (Wood, 2018).

A 2018 report on energy supplies indicated that only 55% of Nigeria's population has access to a stable power supply. Renewable energy policymaking in Nigeria faces several obstacles, including inadequate infrastructure, limited access to financing, insufficient technical capacity, and weak regulatory frameworks. Adeyemi (2024) identifies an inadequate policy framework as a major challenge, noting that the NREEEP lacks clear implementation strategies. The World Bank (2024) similarly highlights Nigeria's weak regulatory environment, which creates uncertainty for investors and developers. Additionally, Oyedepo et al. (2019) point to a lack of policy coordination and consistency, leading to inefficiencies in policy implementation. Akinbami et al. (2001) further note that inadequate funding and investment hinder renewable energy development, while the International Energy Agency (2024) stresses the need for greater public awareness and education to promote renewable energy adoption.

Addressing these challenges and leveraging available opportunities are critical for advancing renewable energy development in Nigeria (Irani et al., 2017). This study aims to explore the challenges hindering Nigeria's renewable energy sector and policy landscape while examining the opportunities for sustainable energy provision and economic growth through a systematic scoping review.

Statement of the Problem

Ayokunle (2021) and Adesanya et al. (2021) revealed that Nigeria's energy policies, regulations, and management of operations have failed to meet the increasing demands of the population and the required energy supply. Additionally, Guler et al. (2021) revealed that energy performance across OECD countries, including Nigeria, was insufficient for their growing populations. According to Oyedepo (2012), between 60% and 70% of the population in Nigeria lacks effective access to affordable energy. Furthermore, energy-related projects are often sidelined, and there is a prevalence of power outages and grid unreliability, coupled with the rising cost of securing an effective electricity supply to meet production demands, sustainability, and profitability (Olowosejeje et al., 2019), which could have significant elastic effects on industrial and national development. Hence, Nigeria's renewable energy sector still faces significant challenges in achieving its sustainable renewable energy goals.

The country's low daily energy consumption forces a considerable portion of the population to rely on polluting fuels to meet their energy needs (Emodi and Boo, 2015), posing severe climatic challenges to the environment, as argued by Oyedepo (2012); Zerrahn et al. (2018); Ochoa et al. (2019); IEA (2019); and others. The World Bank (2024) noted that Nigeria's policy and regulatory frameworks for renewable energy are inadequate in addressing these major challenges. In the long run, this creates uncertainty and confusion for investors and could have significant negative effects on the nation's development. Therefore, it is crucial

to address these challenges while leveraging necessary opportunities to enhance Nigeria's energy sector to meet the increasing population demand. To this end, this article examines the various challenges and opportunities associated with renewable energy policy-making in Nigeria using a systematic scoping review method.

Research Questions

The article focuses on addressing the following research questions:

i. What opportunities can policy decision-making provide for achieving an effective renewable energy system in Nigeria?
ii. What major challenges can policy decision-making pose to the development of an effective renewable energy system in Nigeria?

Literature Review

Access to energy is a fundamental prerequisite for addressing major global challenges and has garnered significant attention, particularly following the adoption of the Sustainable Development Goals (SDGs), which aim to achieve global development by 2030 (UNEP, 2017; Nalule, 2019). Specifically, SDG 7, which focuses on ensuring access to affordable, reliable, sustainable, and modern energy for all, underscores the importance of universal energy access (UNEP, 2017; Nalule, 2019). According to a joint report by the Inter-American Development Bank (IDB) and the Latin American Energy Organization (2018), access to energy for productive uses plays a crucial role in driving developmental activities.

Studies have affirmed that nearly a quarter of the world's population still lacks access to affordable energy (UNEP, 2017). Globally, 789 million people—approximately one in ten—do not have access to energy. In Sub-Saharan Africa and Asia, 20 countries account for the largest gaps in energy access and are among the 80 percent of countries worldwide that lack adequate energy infrastructure (SEforALL, 2017).

From Figure 1, Nigeria is one of the nations experiencing an energy access deficit, indicating that achieving sustainable development by 2030 could be a significant challenge for Nigerian society. Despite the country's abundant renewable energy resources, including solar, wind, and hydropower, Adeyemi (2024) reported that Nigeria faces a limited energy supply. Olowosejeje et al. (2019) attributed this to Nigeria's ever-increasing population, which continuously raises energy demand while supply remains limited, resulting in an unmet demand for energy.

Another major challenge facing Nigeria's renewable energy sector is the inadequate policy framework. The National Renewable Energy and Energy Efficiency Policy (NREEEP) has been criticized for being insufficient and lacking clear implementation strategies (Adeyemi, 2024). Regarding the lack of an effective renewable energy policy, the World Bank (2024) warns that Nigeria's renewable energy policies and regulatory frameworks are often

inadequate, leading to widespread uncertainty and confusion in the sector, which negatively impacts the effectiveness of energy supply.

Gbakon and Ojaraida (2020) express concern that Nigeria's energy sector policies and frameworks are predominantly skewed toward exports at the expense of domestic utilization, creating an imbalance in the national economy. Consequently, the production and supply of both conventional and non-conventional energy have garnered increasing attention over the years, as reflected in various policy initiatives aimed at addressing these challenges (Gbakon and Ojaraida, 2020).

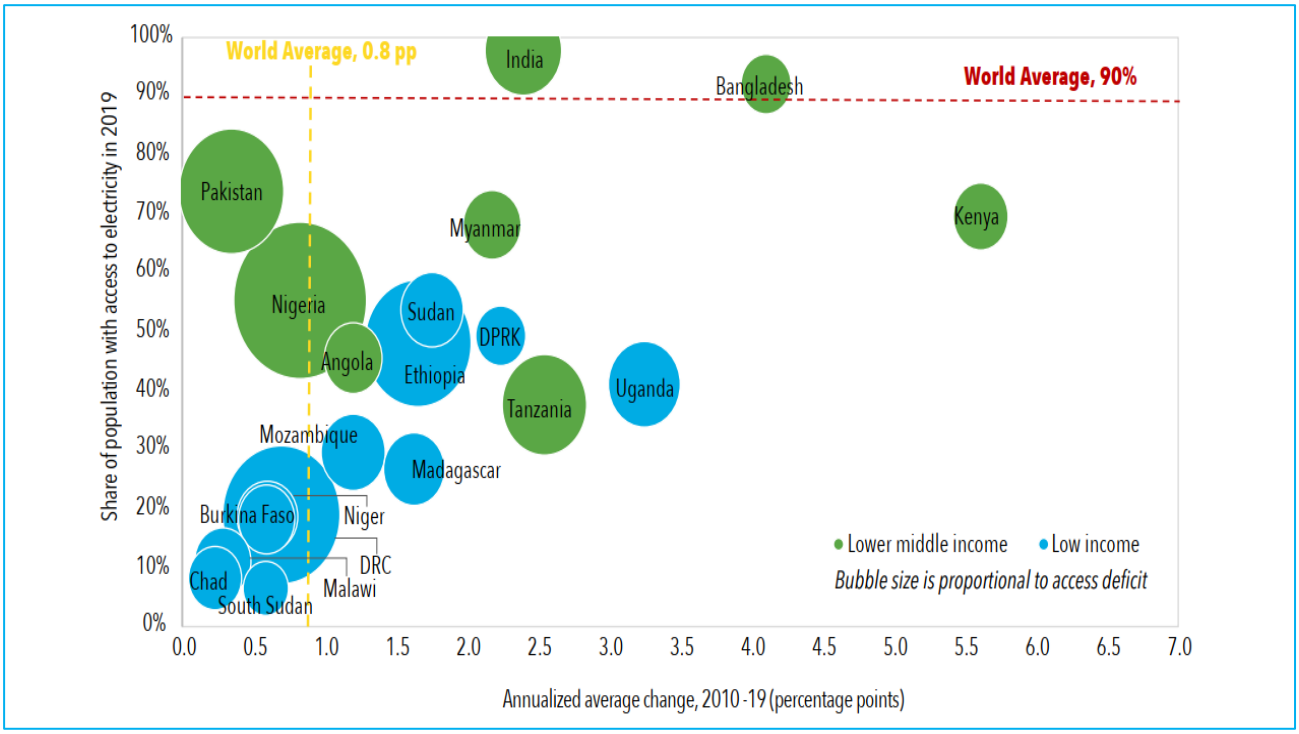

Figure 1: Electricity Access in the top 20 Access-Deficit Countries, 2010 - 2019

Source: World Bank 2021

Table 1 outlines the evolution of Nigeria's gas policy framework, from its inception to the present. Each iteration of the gas policy has targeted different aspects of the gas value chain, including upstream production, market development, pricing, off-take agreements, and downstream utilization.

Table 1: Nigeria's Gas Policies from 1979 to 2024

THE OLD ORDER (1979 – 2008)		
Year	**Policy**	**Goal**
1979	Associated Gas Reinjection Act	This Act was promulgated to compel International Oil Companies to submit a plan on their gas utilisation and re-injection programme
1992	The Associated Gas Framework Agreement	The Framework Agreement introduced a package of fiscal incentives for the utilisation of natural gas, which was subsequently incorporated into the Petroleum Profit Tax Act of 2004 (PPTA).
2008	National Domestic Gas Supply and Pricing Regulations	The Regulation segmented the domestic gas market into three divisions, namely; gas-to-power, gas-as-feedstock, and gas-as alternative fuel
	The Nigerian Gas Master Plan	The Nigerian Gas Master Plan ("Plan") was devised as a major interventionist concept to move the gas sector from its essentially dormant status in 2006 to a market-based system with willing sellers and willing buyers, realizing the full potential of the sector for the benefit of all Nigerians.
FAIRLY RECENT POLICIES, PROGRAMMES AND LAWS (2008 – 2018)		
2016	The Nigerian Gas Flare Commercialization Programme	This programme was designed to eliminate gas flaring through technically and commercially sustainable gas utilization projects developed by competent third-party investors.
2017	National Gas Policy	The NGP seeks to unlock a new policy direction and introduce an institutional and governance framework for the country, geared towards driving industrial growth through utilization strategies.
2018	Gas Flare Regulation	Support the government's plan to reduce greenhouse gas (GHG) emissions through the flaring of gas. (Prevention of Control)
CURRENT GAS POLICIES, LAWS AND REGULATIONS (2020 – 2024)		
2020	The Nigerian Gas Transportation Network Code	The Code ensures fair and non-discriminatory access to the gas transportation infrastructure; promote gas trading; and deepens domestic gas penetration in the country
2021	The Petroleum Industry Act	The PIA seeks to provide legal, governance, regulatory and fiscal framework for the Nigerian oil & gas industry.
2022	Domestic Gas Delivery Obligation Regulation	Mandates gas producers to allocate a percentage of their total gas production for sale to the domestic market.
2023	Gas Flaring, Venting and Methane Emission Regulations	Reduce environmental and social impact associated with gas flaring and venting of natural gas and fugitive methane emissions into the atmosphere. (Prevention of Waste and Pollution)
2023	Gas Distribution Systems Regulations	Grant of a gas distribution license for a gas distribution system in a local distribution zone; and to provide sanctions, penalties and administrative fines for failure to comply with the provisions of the Regulation.

2023	Gas Trading and Settlement Regulations	To regulate the establishment and operations of gas trading and settlement exchange platforms
2023	Natural Gas Pipeline Tariff Regulations	Provide a regulatory framework to determine, a sustainable gas transportation pipeline tariff regime in accordance with the PIA; and to establish a tariff methodology for the transportation and transmission of natural gas through gas transportation pipelines, and gas transportation networks.
2023	Gas Pricing and Domestic Demand Regulations	To regulate the process of marketable natural gas of the strategic sectors under the PIA and to identify the unregulated markets and make provisions for such market.
2023	Gas for Growth Initiative - Presidential CNG Initiative	The Initiative prescribes 0% import duty rate on importation of all equipment related to CNG and LPG.
2024	Nigerian Gas Domestic Base Price	Determined the Domestic Base Price for the year 2024 to be USD2.42/MMBTU.
2024	The Oil & Gas Companies Order	To encourage Non-Associated Gas (NAG) greenfield projects for onshore and shallow waters. (Tax Incentives, Exemption, Remission, ETC)

Source: Oke et al., 2024

To address these challenges, the Nigerian government has demonstrated its commitment to leveraging the country's abundant gas resources to drive industrial growth and stimulate economic development by expanding three critical gas infrastructure projects: the AHL Gas Processing Plant, the ANOH Gas Processing Plant, and the 23.3 km ANOH to Obiafu-Obrikom-Oben (OB3) Custody Transfer Metering Station Gas Pipeline. These expansions are expected to increase domestic gas supply by approximately 500 million standard cubic feet (MMSCF), representing over a 25% increase in aggregate gas supply for power generation, industrial use, household consumption, and other key sectors of the economy (NNPC, 2024).

Additionally, other challenges facing Nigeria's renewable energy sector include a lack of coordination and consistency, inadequate funding and investment, poor adoption of technologies, and low public awareness, among others. These challenges could have significant negative effects on households, industries, and national development. However, if effectively harnessed, Akinbami et al. (2001) noted that Nigeria's renewable energy resources—including solar, wind, and hydropower—hold great potential for economic growth, job creation, and national development.

The United Nations Industrial Development Organization (UNIDO, 2009) examined policymakers and regulators in several developing countries, including African nations, and emphasized the need to strengthen the capacity of energy regulatory and policymaking bodies. It highlighted the importance of establishing policies and regulatory frameworks that effectively support and promote sustainable energy development. Thus, it can be

argued that efficient and well-structured renewable energy policymaking in Nigeria could significantly enhance energy provision to meet the country's growing population demands. The development and utilization of renewable energy resources have the potential to reduce poverty, improve quality of life, increase income generation, and ensure sustainable development, thereby addressing the current energy crisis in Nigeria (Gungah et al., 2019; Anthony et al., 2019). However, as emphasized by Gungah et al. (2019), effective policy instruments are crucial for realizing these benefits.

Furthermore, Moss and Kincer (2023) asserted that a low-energy future is a jobless future, indicating that inadequate energy supply could have severe economic and social consequences. Therefore, it is imperative for policymakers and regulatory institutions in Nigeria's energy sector to develop and implement policies that drive the effective utilization of renewable energy resources (Edomah et al., 2016; Ata, 2015). However, given the various challenges hindering renewable energy policymaking, achieving sustainable energy in Nigeria remains a significant challenge. Consequently, this study aims to examine the key challenges affecting renewable energy policymaking in Nigeria and explore potential opportunities for meeting the country's growing energy demands while ensuring sustainable energy development.

Theoretical Underpinning

Several challenges exist in managing the reliability, operation, control, and administration of energy resources and systems (Sao & Lehn, 2008; Barghi Latran et al., 2015). The application of game theory has gained significant attention as a means of addressing these challenges by providing effective solutions for decision-making and control processes, particularly in the energy sector (Singh, 2006; Mannini, Eynard, & Grieu, 2022). Game theory serves as a crucial analytical tool for studying and understanding strategic interactions, particularly in the context of rational decision-making (Yarar, Yoldas, Bahceci, Onen, & Jung, 2024). According to this theory, all participants and actors are assumed to be rational, with their decisions influenced by the choices of others. Game theory contributes to the development of systematic approaches to logical decision-making, particularly in the energy sector (Yarar et al., 2024).

The application of game theory in energy and power systems dates back to the 1970s, and its use has since expanded, particularly for analyzing and understanding energy systems (Yarar et al., 2024). Haitao (2022) emphasized that game theory plays a crucial role in understanding effective policy decision-making in the renewable energy sector, as it aids in protecting the natural environment, improving human living standards, and generating economic benefits in various ways.

Furthermore, the Ecology of Games Theory (EGT) conceptualizes policy processes as complex adaptive systems (Folke et al., 2005; Levin, 1998; Lavin et al., 2002) and serves as a theoretical framework for analyzing polycentric governance systems (Berardo & Lubell,

2016). EGT builds on sociological policy process theories to explain how networks of policy actors—such as those involved in ensuring sustainability within Nigeria's energy system—shape policy strategies (Lubell, 2013). This approach provides a method for analyzing the design, outputs, and outcomes of collaborative policymaking in domains with overlapping stakeholders and issues (Ruseva et al., 2019), making it particularly relevant for achieving a sustainable energy system in Nigeria.

Thus, in examining the challenges and opportunities associated with renewable energy systems for effective policymaking in Nigeria, game theory offers valuable insights into how policy actors can influence policymaking strategies. This, in turn, can facilitate the development of policies that enhance energy resource efficiency, boost economic growth, reduce poverty, and improve overall well-being in the country.

Methodology

This article employs a systematic review methodology, with data and materials obtained from secondary sources, including journal articles, books, and other online resources. The study considers publications and materials that utilize empirical methods, including both quantitative and qualitative studies, as well as various review approaches such as systematic reviews and meta-analyses. Additionally, it incorporates information from news articles, magazines, and other relevant sources that address the subject matter of this study.

The selected articles and materials cover the period from 2000 to 2025, ensuring a comprehensive analysis that enables the study to effectively address the research questions and achieve its objectives. Furthermore, the review process adopts the Cochrane review style, a widely recognized approach in systematic review research. The study also utilizes the PICOS framework (Richardson et al., 1995) to guide the selection and evaluation of relevant literature:

P (Population/Problem of Interest): The focus of this study is on the challenges of renewable energy policy-making in Nigeria.

I (Intervention): The study examines policy measures that could mitigate these challenges and enhance opportunities for renewable energy policy-making in Nigeria.

C (Control): Not applicable in this study.

O (Outcome): The expected outcome includes the effective provision of renewable energy in Nigeria, which could have positive economic implications.

S (Study Type): The study incorporates quantitative, qualitative, and review-based research. Additionally, it considers relevant information from news articles, magazines, and organizational websites.

Information and materials were retrieved using search engines and academic databases, including Google, Google Scholar, Semantic Scholar, and RefSeek, yielding several results based on input queries. However, to maintain a focus on quality and ensure that the study's

objectives are met, only a limited number of articles were selected for analysis. Additionally, the PRISMA Flow Diagram was utilized to guide the search strategy, as illustrated in Figure 2.

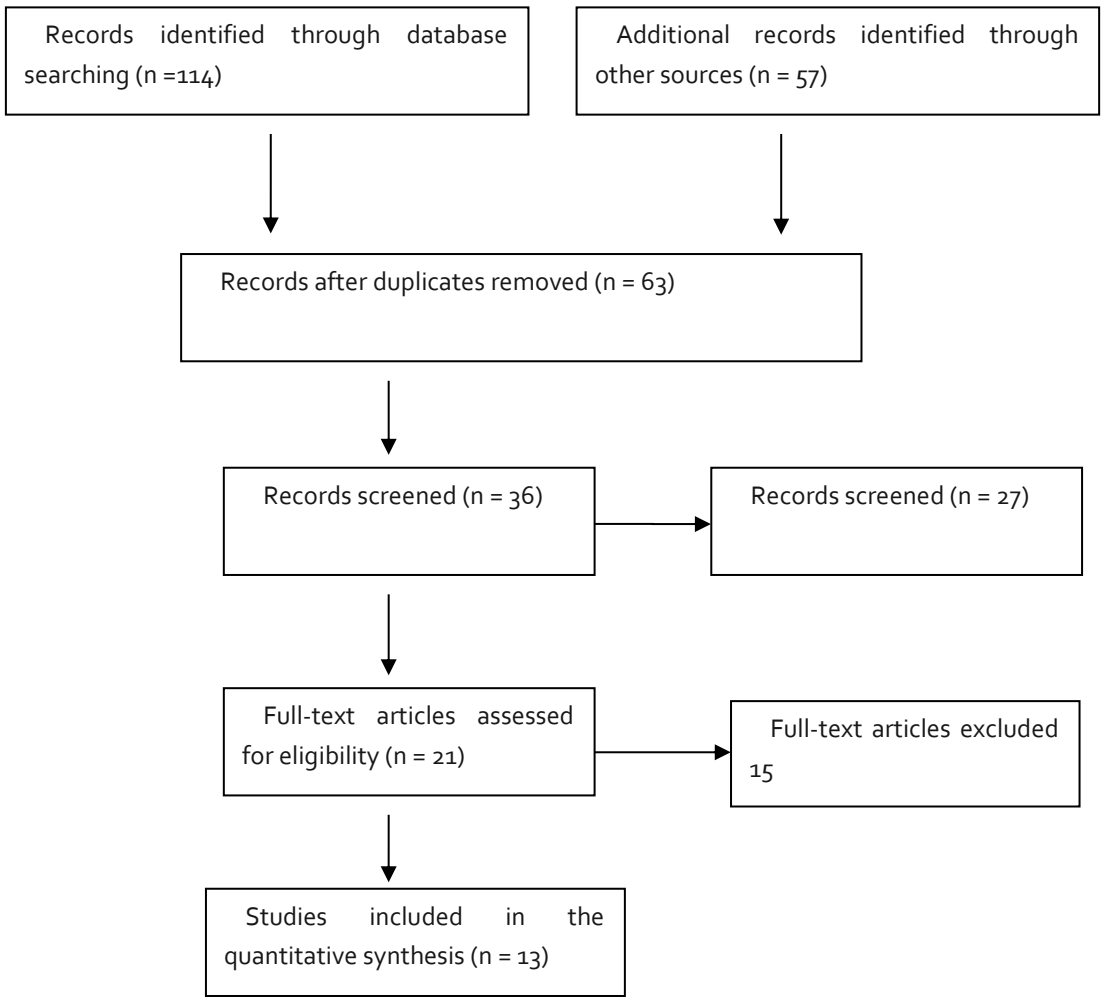

Figure 2: PRISMA Flow Diagram
Source: Page et al., 2021

The articles selected for this study include works by Oyedepo (2012), Ata (2015), the Federal Republic of Nigeria (2015), Edomah et al. (2016), Bamgbopa et al. (2019), Wang et al. (2019), IRENA (2023), the Energy Commission of Nigeria (2022), Olujobi et al. (2023), Peter (2023), Onuh et al. (2024), SAO Admin (2024), and Energypedia (2025).

The decision to include only thirteen articles in this study is based on the need to ensure relevance and quality. Among the numerous materials and articles retrieved, many contained redundancies, repetitions, or lacked relevance to the study's focus. Consequently, a rigorous selection process was undertaken to eliminate redundant studies

and low-quality sources, including those without identifiable authors, publication dates, or other essential details. This screening process resulted in a final selection of thirteen high-quality articles for analysis.

Furthermore, the study employs content analysis to systematically examine the retrieved information. The selected materials were categorized into major themes based on the study's key aims, research objectives, and questions. A thematic analysis was then conducted to derive meaningful insights and effectively address the core focus of this research.

Results

The article utilized thirteen (13) studies from the total downloaded articles, and the results section is divided into two parts based on the research questions being addressed.

Opportunities Offered by Policy Decision-Making for Achieving an Effective Renewable Energy System

Peter (2023) investigated the barriers to renewable energy adoption in Nigeria and highlighted the country's abundant renewable energy resources, including solar, wind, and hydroelectric power. Energypedia (2025) reviewed key challenges and opportunities in Nigeria's energy sector and emphasized the need for policies that enhance investment opportunities to increase the effectiveness of the country's renewable energy system.

Onuh et al. (2024) examined the challenges and opportunities in Nigeria's renewable energy policy and legislation, noting that potential legislative reforms, institutional strengthening, financial incentives, and the promotion of technological innovation and infrastructure development present major opportunities for enhancing renewable energy policies. These factors, in turn, contribute to a more effective energy system in Nigeria. According to Onuh et al. (2024), several policies have been established to promote the adoption and expansion of renewable energy in Nigeria, including the Renewable Energy Master Plan (REMP), the National Renewable Energy and Energy Efficiency Policy (NREEEP), the Electric Power Sector Reform Act (EPSRA) of 2005, the National Energy Policy of 2003, and the Petroleum Industry Act (PIA) of 2021.

According to the Energy Commission of Nigeria (2022), REMP aims to increase the share of renewable energy in Nigeria's total energy mix from 13% in 2015 to 23% by 2025 and 36% by 2030. To achieve this, specific strategies have been put in place to develop and integrate renewable energy sources—including solar, wind, biomass, and hydropower—into the national grid. Similarly, the Federal Republic of Nigeria (2015) noted that the NREEEP provides a comprehensive framework for the development, utilization, and efficient management of renewable energy resources. The policy emphasizes creating a conducive environment for private sector investment by implementing regulatory frameworks that attract investors and providing financial mechanisms to support renewable energy projects in Nigeria.

The Federal Ministry of Power highlights that the Electric Power Sector Reform Act (2005) significantly impacts the renewable energy sector in Nigeria by liberalizing the power sector and encouraging private sector participation and investment in power generation, transmission, and distribution. Although the Act primarily focuses on the power sector, it also facilitates the growth of renewable energy projects by enabling independent power producers and fostering competition in the energy sector. Successful implementation of this policy could contribute at least 1,000 MW of renewable energy to Nigeria's total power generation capacity (ECN, 2022).

Additionally, the National Energy Policy of 2003 was designed to ensure a sufficient, reliable, and affordable energy supply that would drive Nigeria's economic development. The policy promotes the utilization of alternative energy sources to protect the environment and achieve sustainable energy provision. It also addresses the importance of regulatory frameworks in fostering growth in the energy sector, highlighting that effective regulatory policies can significantly enhance Nigeria's energy sector.

The Petroleum Industry Act (PIA) of 2021 aims to introduce transformative legal, administrative, and budgetary reforms in Nigeria's oil and gas sector while encouraging companies to invest in more sustainable energy sources. Olujobi et al. (2023) noted that the implementation of the PIA is expected to attract substantial investments into Nigeria's energy sector, further boosting renewable energy development.

SAO Admin (2024) projected that by 2040, Nigeria has the potential to generate up to 427 GW of renewable electricity from solar, wind, hydro, and biomass sources—more than ten times the current installed capacity. Such a transition could provide reliable, affordable, and clean power to households and industries, particularly those currently lacking access to electricity or relying on expensive and polluting diesel generators. Additionally, expanding renewable energy infrastructure has the potential to create jobs, stimulate economic growth, and reduce greenhouse gas emissions, contributing to Nigeria's long-term sustainable development.

Challenges of Policy Decision on Effective Renewable Energy System

Despite the various benefits and opportunities that an effective renewable energy system could provide to Nigeria, as well as the positive impact of policy decision-making on enhancing renewable energy efficiency, Onah et al. (2024) highlighted several challenges that hinder effective policy decisions and, by extension, the development of the renewable energy sector.

Oyedepo (2012) explored a set of energy policy interventions that could contribute significantly to the sustainable economic, environmental, and social development of Nigeria, Africa's most populous country. His study identified four key economic growth factors as essential energy requirements for ensuring a sustainable energy supply, which in turn would support the country's long-term economic development. Furthermore,

Oyedepo (2012) concluded that a comprehensive and coherent energy policy is crucial for the efficient utilization of Nigeria's energy resources. His study emphasized that policy decision-making significantly influences the effectiveness of renewable energy systems. Additionally, it stressed the need for the Nigerian government to intensify the implementation of energy efficiency programs, integrate energy efficiency measures into existing policies, and develop new regulatory frameworks. This underscores the fact that the absence of robust energy efficiency programs poses a major challenge to achieving an effective renewable energy system in Nigeria. Furthermore, ineffective policy development also negatively impacts the sector.

Ata (2015) examined the impact of policy decision-making processes on renewable energy investment decisions, using qualitative analysis to explore the structural factors that influence investors' choices and the link between renewable energy policies and investment. The findings revealed that renewable energy policies play a crucial role in mitigating investment risks and facilitating large-scale deployment mechanisms. However, the effectiveness of these policy instruments depends on various factors, including investor perceptions, understanding of policy implications, regulatory burdens, and prior investment experiences. This suggests that while policy decision-making is fundamental to an effective renewable energy system, challenges such as regulatory burdens, policy perception, and investor uncertainty could impede its success.

Edomah et al. (2016) investigated the linkages between policy decision-making and energy governance in Nigeria, particularly in the management of energy infrastructure. Using a combination of semi-structured interviews and documentary analysis, the study identified three critical areas where policy interventions could improve energy infrastructure provision: access to historical data, regulatory oversight, and licensing/permit issuance. However, the findings also highlighted three major unintended consequences of Nigeria's energy policy decision-making process: government-financed corruption within the energy sector, economic mismanagement, and uncontrolled energy demand growth—primarily driven by exports rather than domestic consumption. The study concluded that the Nigerian government must clearly define the relationship between energy infrastructure governance and policy to mitigate these unintended consequences. The authors recommended a decentralized, polycentric governance model that would allow different tiers of government to make independent decisions regarding energy infrastructure development and implementation.

Wang et al. (2019) assessed Nigeria's energy policies and investments in renewable energy resources, distinguishing between energy policy development and energy investment as two separate but interconnected factors. Their findings revealed that wind and solar energy represent the most viable renewable energy investment alternatives in Nigeria. The study further concluded that the country's poor energy system is largely due to ineffective energy policies and insufficient investment in the sector. Addressing these deficiencies through

well-structured policies and increased financial commitment would enhance the effectiveness of renewable energy systems in Nigeria.

Bamgbopa et al. (2019) critically evaluated Nigeria's energy policy framework, noting that it is currently housed within two primary national energy policy documents: the National Energy Policy (Energy Commission of Nigeria, 2003) and the National Renewable Energy and Energy Efficiency Policy (NREEEP). While these policies cover essential aspects of the energy sector, the authors argued that further amendments are required to address critical challenges. These include expanding Nigeria's electric generation capacity, increasing the share of renewable energy sources, improving local oil refining capacity, enhancing gas collection and management, and eliminating gas flaring. The study concluded that inefficiencies in local oil refining, poor gas management, and persistent gas flaring are major obstacles to the effective implementation of renewable energy policies in Nigeria.

Peter (2023) investigated the barriers to renewable energy adoption in Nigeria and identified several economic, technical, regulatory, and social obstacles that hinder the widespread adoption and scaling of renewable energy technologies. His findings emphasized that regulatory challenges remain a significant barrier to the development of an effective renewable energy system in Nigeria.

Onuh et al. (2024) examined Nigeria's renewable energy policy and legislative landscape, identifying legal and regulatory inconsistencies, institutional inefficiencies, financial constraints, and technical challenges as key obstacles to progress in the sector. Similarly, Energypedia (2025) reviewed key challenges and opportunities within Nigeria's energy sector and outlined the primary challenges that impede effective policy decision-making and the development of renewable energy systems. These challenges include:

i. Funding constraints, as the renewable energy sector is solely financed by the Federal Government, which lacks adequate resources to meet all policy and investment needs.
ii. Inadequate geographical coverage, as current policies fail to address energy needs in many parts of the country.
iii. Outdated policies with inadequate provisions for redundancy and flexibility.
iv. Insufficient financial resources to expand, modernize, and maintain energy infrastructure.
v. Inadequate policy frameworks for integrating new technologies to enhance energy delivery.
vi. Failure to prioritize urgent maintenance of energy systems when needed.
vii. Delays in the implementation of new policies and renewable energy projects.
viii. A lack of sustained and effective collaboration between the Federal Government and external stakeholders, including Independent Power Producers (IPP) and joint venture (JV) international oil companies.

Discussion

This article highlights the challenges and opportunities associated with effective policy decision-making for improving Nigeria's renewable energy system using a systematic scoping review method. The study finds that Nigeria possesses abundant and promising renewable energy resources, including solar, wind, and hydroelectric power. It also emphasizes the significance of investment opportunities in increasing the effectiveness of Nigeria's renewable energy system. Additionally, potential legislative reforms, institutional strengthening, financial incentives, and the promotion of technological innovation and infrastructure development are major opportunities that could be leveraged to enhance renewable energy policy and legislation. In turn, these factors would contribute to the broader adoption of an effective energy system in Nigeria.

Moreover, several policies are already in place in Nigeria to support the adoption and utilization of renewable energy, including the Renewable Energy Master Plan (REMP), the National Renewable Energy and Energy Efficiency Policy (NREEEP), the Electric Power Sector Reform Act (EPSRA) of 2005, the National Energy Policy (2003), and the Petroleum Industry Act (PIA) of 2021, among others. These findings align with the works of Adeyemi (2024), Oyedepo et al. (2019), the International Energy Agency (2024), Akinbami et al. (2001), and others, who have identified numerous opportunities for effective policy decision-making to improve Nigeria's renewable energy system.

The findings of this study further support Adeyemi's (2024) assertion that Nigeria has abundant renewable energy resources—such as solar, wind, and hydropower—which, if effectively harnessed, could have a significant positive impact on national development. Similarly, the results corroborate the conclusions of Akinbami et al. (2001), who noted that Nigeria's renewable energy sector has a promising future in terms of job creation and economic growth stimulation.

Despite these opportunities and the potential for policy decision-making to enhance the effectiveness of Nigeria's renewable energy system, numerous challenges persist. These include the absence of a comprehensive and coherent energy policy, the lack of energy efficiency programs, ineffective policy implementation, regulatory burdens, investor uncertainty, legal and regulatory inconsistencies, institutional inefficiencies, financial constraints, and technical challenges. Additionally, other issues such as government-supported corruption in the energy sector, economic mismanagement, uncontrolled energy demand growth (driven more by exports than by local consumption), inadequate local oil refining capacity, inefficient gas gathering and management, and persistent gas flaring further hinder progress.

These findings are consistent with the works of Legendre and Ricci (2015), Bouzarovski and Simcock (2017), Petrova (2018), Olowosejeje et al. (2019), Adesanya et al. (2021), and Oyedepo (2012), who have all identified various challenges that impede effective policy decision-making for a more efficient renewable energy system in Nigeria.

This study also aligns with Adeyemi (2024), who identified inadequate policy frameworks as a major barrier to effective renewable energy policymaking in Nigeria, which in turn affects energy utilization. Similarly, the findings support the World Bank (2024), which has noted that Nigeria's renewable energy policy and regulatory frameworks are often inadequate, leading to uncertainty and confusion for investors and developers. The results also corroborate Oyedepo et al. (2024), who identified policy inconsistency and lack of coordination as significant obstacles to Nigeria's renewable energy sector. Additionally, the study concurs with the International Energy Agency (2024), which emphasized that the lack of public awareness and education is a crucial barrier to the widespread adoption of renewable energy technologies in Nigeria.

Furthermore, this study supports the findings of Gbakon and Ojaraida (2020), who argue that Nigeria's energy policies tend to prioritize exports over domestic consumption, creating significant imbalances in both the energy sector and the broader economy.

Drawing from previous studies such as Emodi and Boo (2015), UNEP (2017), Nalule (2019), Somorin et al. (2017), Adesola and Brennan (2019), Akinbami et al. (2001), Moss and Kincer (2023), and the International Energy Agency (2023), this article affirms that a well-designed and comprehensive energy policy could significantly contribute to achieving sustainable development. However, the challenges identified in this study, if not addressed, may create long-term economic setbacks for Nigeria.

Applying game theory, as outlined by Singh (2006), Mannini et al. (2022), Yarar et al. (2024), and others, this study suggests that strategic energy policies and decision-making processes play a crucial role in enhancing policy effectiveness and control mechanisms, particularly in the energy sector. Well-structured policies could provide a significant boost to Nigeria's renewable energy system, increasing its potential to drive sustainable development.

Additionally, drawing from the Ecology of Games Theory (EGT), which views policy processes as complex adaptive systems (Folke et al., 2005; Levin, 1998; Lavin et al., 2002), the findings of this study could contribute to simplifying the application of EGT in the Nigerian renewable energy sector. Integrating game theory principles into Nigeria's energy policymaking framework could enhance decision-making processes, ultimately supporting the transition to a sustainable renewable energy system.

Conclusion

This article highlights the challenges and opportunities associated with effective policy decision-making for improving Nigeria's renewable energy system using a systematic scoping review method.

In conclusion, Nigeria possesses abundant and promising renewable energy resources, including solar, wind, and hydroelectric power. Additionally, several opportunities exist for enhancing the country's renewable energy sector, such as potential legislative reforms,

institutional strengthening, financial incentives, and the promotion of technological innovation and infrastructure development. Furthermore, various policies have been established to support the effective utilization of renewable energy in Nigeria, including the Renewable Energy Master Plan (REMP), the National Renewable Energy and Energy Efficiency Policy (NREEEP), the Electric Power Sector Reform Act (EPSRA) of 2005, the National Energy Policy (2003), and the Petroleum Industry Act (PIA) of 2021, among others. Nevertheless, several challenges continue to hinder progress in the sector. These include the absence of a comprehensive and coherent energy policy, the lack of energy efficiency programs, ineffective policy implementation, regulatory burdens, investor uncertainty, legal and regulatory inconsistencies, institutional inefficiencies, financial constraints, and technical challenges.

Addressing these challenges through the establishment of a well-structured and enhanced policy framework is essential for advancing Nigeria's renewable energy sector. Given the country's abundant renewable energy resources, the implementation of effective policies is crucial to ensuring the development of a sustainable and efficient renewable energy system in Nigeria.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

i. The government and policymakers should establish a clear and comprehensive policy and regulatory framework to support the development of renewable energy sources, including solar, wind, hydro, and geothermal energy.
ii. The government should increase Nigeria's renewable energy targets and ambitions to unlock low-carbon growth and align with global climate and sustainable development objectives.
iii. There is a need to invest in renewable energy infrastructure, including transmission and distribution networks, to facilitate the integration of renewable energy sources into the national grid.
iv. The government and policymakers should enhance public awareness and education on the benefits of renewable energy to promote adoption and increase support for renewable energy policies.
v. The government should implement fiscal policies such as tax incentives and carbon pricing mechanisms to provide financial incentives for transitioning to renewable energy sources.
vi. The government and policymakers should introduce regulatory policies such as: Renewable Portfolio Standards (RPS), requiring utilities to generate a specified percentage of electricity from renewable energy sources. Net Metering, enabling households and businesses to generate their own renewable energy and sell excess energy to the grid. Grid Connection Policies, streamlining the process of connecting

renewable energy projects to the grid by reducing bureaucratic hurdles and associated costs.

vii. The establishment of a dedicated renewable energy agency is recommended to oversee the sector's development and provide support to stakeholders.

viii. The creation of an inter-ministerial committee should be considered to coordinate renewable energy policy across different government ministries and agencies. Additionally, stakeholder engagement and participation should be prioritized through regular consultations and workshops, incorporating strategic decision-making approaches such as game theory.

ix. The government should introduce education and training programs for renewable energy professionals, including technicians, engineers, and project developers. Public awareness campaigns should be launched to educate citizens on the benefits of renewable energy and promote adoption. Moreover, renewable energy concepts should be integrated into school curricula to prepare the next generation of professionals and leaders.

x. The government should foster international collaborations, climate change agreements, and regional cooperation. Partnering with organizations such as the Economic Community of West African States (ECOWAS) can enhance regional renewable energy development and knowledge sharing.

Recommended Research Areas

This systematic review also identifies several key research areas that warrant further investigation:

i. Investigating the effectiveness of Nigeria's renewable energy policy framework and identifying areas for improvement.

ii. Examining the financing mechanisms available for renewable energy projects in Nigeria and exploring innovative financing solutions.

iii. Assessing the current state of renewable energy infrastructure in Nigeria, including transmission and distribution networks, and identifying areas for improvement.

iv. Investigating the level of public awareness and education on renewable energy in Nigeria and identifying effective strategies for increasing adoption.

v. Examining the impact of renewable energy on economic development in Nigeria, with a focus on job creation and local economic stimulation.

References

Adesola, S., & Brennan, F. (2018). Energy in Africa. In *Springer eBooks*. https://doi.org/10.1007/978-3-319-91301-8

Adeyemi, A. (2024). Promoting Renewable Energy through a Decentralised Electricity Regulatory Framework – An Analysis of Nigeria's Electricity Act 2023. *Journal of Sustainable Development Law and Policy (The)*, *15*(3), 399–421. https://doi.org/10.4314/jsdlp.v15i3.15

Akinbami, J. K., & Momodu, A. S. (2011). Electrical energy production pathway for sustainable development in Nigeria: a case study of energy recovery from agro-forestry wastes. *International Journal of Sustainable Energy*, *31*(3), 155–173. https://doi.org/10.1080/1478646x.2011.554982

Anthony Jnr, B., Petersen, S. A., Ahlers, D., & Krogstie, J. (2019). API deployment for big data management towards sustainable energy prosumption in smart cities-a layered architecture perspective. *International Journal of Sustainable Energy*, *39*(3), 263–289. https://doi.org/10.1080/14786451.2019.1684287

Ata N.K. 2015. The Impact of Government Policies in the Renewable Energy Investment: Developing a Conceptual Framework and Qualitative Analysis. *Global Advanced Research Journal of Management and Business Studies*. 4(2), 067-081. https://beta.garj.org/garjmbs/pdf/2015/February/Nurcan.pdf

Akinbami, J.F.K., M.O.Ilori, I.O.Akinwumi, & O. Adoti. (2001). Biogas energy use in Nigeria: current status, future prospects and policy implications,' *Renewable and Sustainable Energy Reviews*, 5(1), 97–112. https://doi.org/10.1016/s1364-0321(00)00005-8

Adesanya, A., Misra, S., Maskeliunas, R., & Damasevicius, R. (2020). Prospects of ocean-based renewable energy for West Africa's sustainable energy future. *Smart and Sustainable Built Environment*, *ahead-of-print*(ahead-of-print). https://doi.org/10.1108/sasbe-05-2019-0066

Baker, K., Griffiths, P. Teedon, O & Thomson, C (2011). Delivering climate change through behaviour change: the work of civil society organisations. *Paper presented at 10th Nordic Environmental Social Science Conference*, Stockholm, Sweden, 14-16 June. https://researchonline.gcu.ac.uk/ws/portalfiles/portal/58475/online-published-full-text

Bamgbopa, M., Musabadeen, O., Dindi, A., Alabi, A., Sodiq, A., Yusuf, A., Brimmo, A., Adeyemi, I., Kolo, I., Pikuda, O., & Sanusi, W. 2019. A review of Nigerian energy policy implementation and impact. . https://doi.org/10.13140/RG.2.2.10422.14408.

Barghi Latran, M., Teke, A., & Yoldaş, Y. (2015). Mitigation of power quality problems using distribution static synchronous compensator: a comprehensive review. *IET Power Electronics*, *8*(7), 1312–1328. https://doi.org/10.1049/iet-pel.2014.0531

Berardo, R., & Lubell, M. (2016). Understanding What Shapes a Polycentric Governance System. *Public Administration Review*, *76*(5), 738–751. https://doi.org/10.1111/puar.12532

Bouzarovski, S., & Simcock, N. (2017). Spatializing Energy Justice. *Energy Policy*, *107*(107), 640–648. https://doi.org/10.1016/j.enpol.2017.03.064

Edomah, N., Foulds, C., & Jones, A. (2016). The Role of Policy Makers and Institutions in the Energy Sector: The Case of Energy Infrastructure Governance in Nigeria. *Sustainability*, *8*(8), 829. https://doi.org/10.3390/su8080829

Emodi, N.V., & Boo, K.-J. (2015). Sustainable Energy Development in Nigeria: Overcoming Energy Poverty. *International Journal of Energy Economics and Policy*, *5*(2), 580–597. http://econjournals.com/index.php/ijeep/article/view/1121

Energy Commission of Nigeria. (2022). Energy.gov.ng. https://www.energy.gov.ng/index.php?option=com_docman&task=doc_download&gid=41&Itemid=49

Energypedia (2025). Key Challenges and Opportunities in the Nigeria Energy Secto, https://energypedia.info/wiki/Key_Challenges_and_Opportunities_in_the_Nigeria_Energy_Sector

Food and Agriculture Organisation (FAO) (2001). The links between energy and agriculture. The report was prepared as a contribution by FAO to the work of the ninth session of the United Nations Commission on Sustainable Development (CSD-9), held in April. https://www.fao.org/4/x8054e/x8054e01.htm#TopOfPage

IRENA (2023) Renewable Energy Roadmap: Nigeria. International Renewable Energy Agency, Abu Dhabi. https://energy.gov.ng/reports/IRENA_REMap_Nigeria_2023.pdf

Folke, C.T., P.O., Hahn, & J. Norberg. (2005). Adaptive Governance of Social Ecological Systems. *Annual Review of Environment and Resources,* 30, 441–73

Gbakon K., & Ojaraida, L. (2020). The Nigeria Gas Landscape: Implications for Economic Development. Paper presented at the SPE Nigeria Annual International Conference and Exhibition, Virtual, August. doi: https://doi.org/10.2118/203634-MS

Guler, E., Yerel Kandemir, S., Acikkalp, E., & Ahmadi, M. H. (2021). Evaluation of sustainable energy performance for OECD countries. *Energy Sources, Part B: Economics, Planning, and Policy*, *16*(6), 491–514. https://doi.org/10.1080/15567249.2021.1909673

Gungah, A., Emodi, N. V., & Dioha, M. O. (2019). Improving Nigeria's renewable energy policy design: A case study approach. *Energy Policy*, *130*, 89–100. https://doi.org/10.1016/j.enpol.2019.03.059

Haitao, Q. (2022). Application of Game Theory to Decision Making in Green Energy Promotion. *Journal of Physics: Conference Series*, *2213*(1), 012008. https://doi.org/10.1088/1742-6596/2213/1/012008

IEA (2011). Energy for All, IEA, Paris. Licence: CC BY 4.0. Available at: https://www.iea.org/reports/energy-for-all,

IEA (2019). Defining energy access: 2019 Methodology–Analysis. https://www.iea.org/articles/defining-energy-access-2019-methodology.

IEA (2024). Renewables 2023 – Analysis. https://www.iea.org/reports/renewables-2023.

IEA (2023). Hydroelectricity. https://www.iea.org/energy-system/renewables/hydroelectricity#overview

Irani, Z., Kamal, M. M., Sharif, A., & Love, P. E. D. (2017). Enabling sustainable energy futures: factors influencing green supply chain collaboration. *Production Planning & Control*, *28*(6-8), 684–705. https://doi.org/10.1080/09537287.2017.1309710

Legendre, B., & Ricci, O. (2015). Measuring fuel poverty in France: Which households are the most fuel vulnerable? *Energy Economics*, *49*, 620–628. https://doi.org/10.1016/j.eneco.2015.01.022

LEVIN, S. A. (1998). Anticipating environmental disasters. *Environment and Development Economics*, *3*(4), 491–537. https://doi.org/10.1017/s1355770x98290255

Levin, A., Lin, C.-F., & James Chu, C.-S. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. *Journal of Econometrics*, *108*(1), 1–24. https://doi.org/10.1016/s0304-4076(01)00098-7

Lubell, M. (2013). Governing Institutional Complexity: The Ecology of Games Framework. *Policy Studies Journal*, *41*(3), 537–559. https://doi.org/10.1111/psj.12028

Mannini, R., Eynard, J., & Grieu, S. (2022). A Survey of Recent Advances in the Smart Management of Microgrids and Networked Microgrids. *Energies*, *15*(19), 7009. https://doi.org/10.3390/en15197009

Moss, T., & Kincer, J. (2023, March 7). *How Does Energy Impact Economic growth? an Overview of the Evidence*. Energy for Growth Hub. https://energyforgrowth.org/article/how-does-energy-impact-economic-growth-an-overview-of-the-evidence/

Nalule, V. R. (2019). *Energy Poverty and Access Challenges in Sub-Saharan Africa*. https://doi.org/10.1007/978-3-319-95402-8

Nigerian National Petroleum Corporation (NNPC), (2024). FG Reiterates Commitments to Utilise Gas for Economic Growth, Prosperity. https://www.nnpcgroup.com/insights/fg-reiterates-commitment-to-utilise-gas-for-economic-growth-prosperity-as-tinubu-lauds-nnpc-ltd-partners-over-three-commissioned-gas-projects-1

Ochoa G.V, J.N. Alvarez, J.N. & Acevedo, C. (2019). Research Evolution on Renewable Energies Resources from 2007 to 2017: A Comparative Study on Solar, Geothermal, Wind and Biomass Energy. *International Journal of Energy Economics and Policy*, *9*(6), 242–253. https://ideas.repec.org/a/eco/journ2/2019-06-29.html#download

Oke O., Akpeji,D., & Akibu, O. (2024). Current Gas Policies Challenges and Prospects. AO2LAW [online]. Available at: https://ao2law.com/wp-content/uploads/2024/06/CURRENT-GAS-POLICIES-CHALLENGES-AND-PROSPECT-ARITCLE.pdf

Olowosejeje, S., Leahy, P., & Morrison, A. (2019). The economic cost of unreliable grid power in Nigeria. *African Journal of Science, Technology, Innovation and Development*, *11*(2), 149–159. https://doi.org/10.1080/20421338.2018.1550931

Olujobi, O. J., Okorie, U. E., Olarinde, E. S., & Aina, A. D. (2023). Legal responses to energy security and sustainability in Nigeria's power sector amidst fossil fuel disruptions and low carbon energy transition. *Heliyon*, *9*(7), e17912–e17912. https://doi.org/10.1016/j.heliyon.2023.e17912

Onuh, P., 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. https://doi.org/10.30574/wjarr.2024.23.2.2391

Oyedepo, S. O. (2019). Energy and sustainable development in Nigeria: the way forward. *Energy, Sustainability and Society*, *2*(1), 15. https://doi.org/10.1186/2192-0567-2-15

Oyedepo, S. O., Dunmade, I. S., Adekeye, T., Attabo, A. A., Olawole, O. C., Babalola, P. O., Oyebanji, J. A., Udo, M. O., Kilanko, O., & Leramo, R. O. (2019). Bioenergy technology development in Nigeria - pathway to sustainable energy development. *International Journal of Environment and Sustainable Development*, *18*(2), 175. https://doi.org/10.1504/ijesd.2019.099513

Page, M.J., McKenzie, J.E., Bossuyt, P.M., Boutron, I., Hoffmann, T.C., Mulrow, C.D., et al. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *PLoS Med* 18(3), e1003583. https://doi.org/10.1371/journal.pmed.1003583

Peter, M. (2023). Barriers to Renewable Energy Adoption in Nigeria, https://www.linkedin.com/pulse/barriers-renewable-energy-adoption-nigeria-michael-peter

Petrova, S. (2017). Encountering energy precarity: Geographies of fuel poverty among young adults in the UK. *Transactions of the Institute of British Geographers*, *43*(1), 17–30. https://doi.org/10.1111/tran.12196

Rai, G.D. (2004). Non-conventional Energy Source. Delhi: Khanna Publishers.

Richardson, W., Wilson, M., Nishikawa, J., & Hayward, R. (1995). The well-built clinical question: a key to evidence-based decisions. *APC Journal club*. 123(3), A12-3. PMID: 7582737

Ruseva, T., Foster, M., Arnold, G., Siddiki, S., York, A., Pudney, R., & Chen, Z. (2019). Applying Policy Process Theories to Environmental Governance Research: Themes and New Directions. *Policy Studies Journal*, *47*(S1), S66–S95. https://doi.org/10.1111/psj.12317

Sao, C., & Lehn, P. W. (2008). Control and Power Management of Converter Fed Microgrids. *IEEE Transactions on Power Systems*, *23*(3), 1088–1098. https://doi.org/10.1109/tpwrs.2008.922232

SAO Admin. (2024, May 14). *Opportunities and Challenges in Navigating Nigeria's Energy Transition - SAO Energy*. SAO Energy. https://saoenergy.com/opportunities-and-challenges-in-navigating-nigerias-energy-transition/

Sustainable Energy for All (SEforALL), (2017) .Missing the Mark: Gaps and Lags in Disbursement of Development Finance for Energy Access. Energizing Finance Report Series. https://www.seforall.org/sites/default/files/2017_SEforALL_FR1.pdf

Slngh, H. (2006). Introduction to Game Theory and Evolutionary Games. In Adaptation and Evolution in Collective Systems. *World Scientific Publishing: Singapore*, 31–64. https://doi.org/10.1142/9789812773227_0002

Somorin, T. O., Adesola, S., & Kolawole, A. (2017). State-level assessment of the waste-to-energy potential (via incineration) of municipal solid wastes in Nigeria. *Journal of Cleaner Production*, *164*, 804–815. https://doi.org/10.1016/j.jclepro.2017.06.228

UN Environment Programme (UNEP), (2017). Renewable Energy and Energy Efficiency in Developing Countries: Contributions to Reducing Global Emissions. https://www.unenvironment.org/resources/report/renewable-energy-and-energy-efficiency-developing-countries-contributions-0.

United Nation Industrial Development Organization, (2009). Sustainable energy regulation and policymaking in Africa: Training Manual.https://www.unido.org/sites/default/files/2009-04/training_manual_on_sustainable_energy_regulation_and_policymaking_for_Africa_0.pdf

Uyigue, E., (2008). Strategies to Scale-up Renewable Energy Market in Africa. *A position paper developed by NGOs and other stakeholders for the International Conference on Renewable Energy in Africa*. Dakar, Senegal. 16-18 April. https://credcent.org/wp-content/uploads/2017/07/NGO_Position_paper_Daka_Conference.pdf

Wang, S., Li, W., Hasan Dinçer, & Serhat Yüksel. (2019). Recognitive Approach to the Energy Policies and Investments in Renewable Energy Resources via the Fuzzy Hybrid Models. *Energies*, *12*(23), 4536–4536. https://doi.org/10.3390/en12234536

Wood G. (2018). Policy risk, politics and low carbon energy. In: Considine, J.L. and Paik, K- W. (eds.). *The Handbook of Energy Politics*. Edward Elgar Publishing: Northampton, MA 01060, USA.

World Bank, (2024). Global Gas Flaring Tracker Report. International Bank for Reconstruction and Development/World Bank. https://powerlibrary.theelectricityhub.com/wp-content/plugins/download-attachments/includes/download.php?id=2818

World Bank (2021). Report: Universal Access to Sustainable Energy Will Remain Elusive Without Addressing Inequalities. Press Release: 2021/159/Eex, June 7. https://www.worldbank.org/en/news/press-release/2021/06/07/report-universal-access-to-sustainable-energy-will-remain-elusive-without-addressing-inequalities#:~:text=Nigeria%2C%20the%20Democratic%20Republic%20of,to%20759%20million%20in%202019.

Yarar N., Yoldas, Y., Bahceci, S., Onen, A. & Jung, J. (2024). A Comprehensive Review Based on the Game Theory with Energy Management and Trading. *Energies*, *17*(15), 3749–3749. https://doi.org/10.3390/en17153749

Zerrahn, A., Schill, W.-P., & Kemfert, C. (2018). On the economics of electrical storage for variable renewable energy sources. *European Economic Review*, *108*, 259–279. https://doi.org/10.1016/j.euroecorev.2018.07.004