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Governance and the energy transition in developing nations: Attaining sustainable development

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ABSTRACT

The global shift towards renewable energy is crucial for achieving sustainable development; however, developing nations encounter unique governance challenges in making this transition. This study explores the role of governance in promoting energy transitions in four developing countries: Nigeria, India, Brazil, and Morocco. These countries were selected from their various regions to provide comparative insights from the period 2010 to 2025. By employing a comparative qualitative case study design, the research utilizes governance theory, institutional theory, political economy theory, and perspectives on sustainable development to evaluate how governance structures, policy frameworks, and institutional capacity influence the adoption of renewable energy for sustainable development. Data were collected from policy documents, international agency reports, and peer-reviewed literature, and analyzed using thematic and comparative methods. The findings indicate that governance is a critical factor determining the pace and effectiveness of energy transitions. The comparative analysis demonstrates that while all four countries have articulated ambitious renewable energy policies, their progress has been uneven due to persistent governance and institutional barriers. The study concludes that effective governance is vital for moving from ambitious policies to actual renewable energy transformation. It recommends context-specific governance reforms aimed at enhancing institutional capacity, strengthening regulatory independence, and fostering inclusive stakeholder engagement. By emphasizing governance as the key to energy transition, this study contributes valuable insights for both academics and policymakers in developing contexts.

Keywords:
Governance, Energy Transition, Renewable Energy, Developing Nations, Sustainable Development

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1. INTRODUCTION

The global imperative to mitigate climate change has intensified the need for a rapid transition from fossil fuel-based energy systems to cleaner, renewable sources. The Paris Agreement, adopted in 2015, commits nations to limit the global temperature rise to well below 2°C, with efforts to cap it at 1.5°C above pre-industrial levels (enelgreenpower, 2025; IEA, n.d). Achieving this target requires unprecedented structural changes in the way energy is produced, distributed, and consumed. While many developed and emerging economies are making significant strides toward decarbonisation, developing nations remain at the periphery of this global shift, facing a complex web of economic, technical, and institutional challenges. Referring back to history, human society has experienced two energy transitions, which are from the firewood era to the coal era and eventually to oil. The latest phase of energy transition currently discussed in this paper is marked by a shift from carbon-based energy (coal and oil) to lower-carbon energy based energy such as gas, wind, solar, and hydropower (Solomon and Krishna, 2011). Since the global oil crisis in the 1970s, many countries have started to advance energy transition strategies that seek alternative energy solutions (Huang and Liu, 2021). A clean/renewable energy revolution is needed globally to augment energy security, minimize the devastating impacts on the environment, elevate long-term economic growth, tackle climate change-related risks, and attain the Sustainable Development Goals (SDGs) (Devkota, Bhattarai, Khatri, Marahatta, and Shrestha, 2022). To achieve net-zero emission targets and limit global warming to 1.5 °C by 2050, a sustainable, efficient, competitive, and secure energy system needs to be developed (Potrc, Cucek, Martin, and Kravanja, 2021; Gielen, Boshell, Saygin, Brazilian, Wagner, and Gorini, 2019).

Energy transition in developing nations is not merely an environmental necessity but a critical development imperative. Reliable and affordable clean energy is central to achieving Sustainable Development Goal 7 (SDG 7) and underpins progress toward other goals, including poverty reduction, industrialization, and improved health outcomes. However, despite their vast renewable energy potential, particularly in solar, wind, hydro, and biomass, some developing countries have some of the world's lowest rates of clean energy adoption. The barriers are multifaceted: inadequate infrastructure, limited access to finance, policy instability, and most importantly, weak governance structures. Governance plays a critical and decisive role in shaping the pace and success of energy transitions in these countries. Effective governance ensures transparency, accountability, regulatory coherence, and inclusive decision-making. Conversely, weak governance marked by corruption, policy inconsistency, and poor regulatory frameworks can hinder the adoption of renewable energy technologies and the sustainable management of natural resources. Recent experience demonstrates that countries with coherent governance structures and a more supportive policy framework are more successful in advancing renewable energy. For instance, Kenya has become a leader in geothermal and wind power through clear policies and investment-friendly institutions, while Bangladesh has achieved the world's largest deployment of solar home systems through innovative governance and financing models. These cases underscore the importance of aligning governance with energy objectives to achieve both climate resilience and socioeconomic transformation.

According to Nwosu, Obalum, Ananti, and Nwosu (2025), countries considered by the UN as Least Developed Countries are facing increasing pressure to transition towards more sustainable and resilient energy systems. It is widely recognized that the energy transition incurs significant financial costs for all economies, and nations with greater financial resources tend to transition more readily and quickly (Eicke and Goldthau, 2020). The slow pace of the clean energy transition is largely influenced by challenges in accessing finance, which is essential for innovation, manufacturing, and building consumer infrastructure. There is an urgent need to improve the governance of Africa's abundant natural resources by strengthening institutions and policy frameworks. This can reduce inherent risks and enhance revenue mobilization, providing opportunities to achieve the Sustainable Development Goals (Agenda 2030) through increased investment, job creation, and poverty reduction. It underscores the importance of the state's role in long-term development planning as a tool for effective governance of natural resources. Such governance can

also promote diversification, structural transformation, and reforms that enhance social inclusion, combat corruption, and protect the environment.

African nations must build strong and effective institutions for the proper planning, development, and implementation of strategies to manage their natural resources. These strategies should include industrial policies that encourage regulatory frameworks, such as carbon pricing and subsidies for renewable energy. Moreover, fostering public-private collaborations and partnerships can facilitate cooperation among governments, businesses, and investors. Also, a well-structured governance framework for managing natural resources and directing energy transition is essential for achieving long-term sustainability. However, the global energy transition offers both opportunities and challenges for developing countries as they grapple with phasing out fossil fuels while ensuring economic stability and social equity. This study examines the role of governance in accelerating the energy transitions in developing countries, focusing on how institutional frameworks, regulatory mechanisms, and policy coherence can overcome structural barriers to renewable energy adoption. By exploring comparative experience and lessons from countries that have successfully implemented governance-driven clean energy strategies. The research also seeks to provide evidence-based recommendations tailored to the unique contexts of developing countries. In doing so, it contributes to the discourse on sustainable development, climate action, and the political economy of energy transition.

1.1 Research Objectives

The broad objective of this study is to critically examine how governance influences the acceleration of energy transition in Developing Nations, with a focus on identifying effective governance strategies that can enhance renewable energy adoption and sustainable development.

While the specific objectives are:

- To analyze the institutional architecture, legal framework, and strategies related to energy transition in the chosen developing countries.
- To identify the main barriers to the deployment of renewable energy in these selected countries.
- To provide recommendations for accelerating the energy transition in Nigeria, India, Brazil, and Morocco.

1.2 Scope of the Study

This study focuses on the intersection of governance and energy transition in developing nations, with a special emphasis on how governance frameworks shape the adoption and expansion of renewable energy for sustainable development. The scope is defined along the following dimensions: geographically, the study examines selected developing countries from different regions to provide comparative insights. These countries are: Nigeria (Sub-Saharan Africa), representing a fossil-fuel-dependent state with evolving governance reforms, and India (South Asia), reflecting a large developing economy undertaking rapid renewable energy expansion. Brazil (Latin America), a regional leader with advanced renewable governance mechanisms. Morocco (North Africa/MENA), showcasing strong state-led renewable governance and green hydrogen ambition. These countries were selected because they provide regional diversity (Africa, Asia, Latin America, and MENA). They show contracting governance models and are representatives of major pathways in developing nations' energy transitions. Thematically, the study investigates governance dimensions that influence energy transition, with a temporal scope that covers governance reforms and energy transition efforts from 2010 to 2025, a period during which many developing nations adopted ambitious renewable energy targets, climate commitments (Paris Agreement 2015), and governance reforms.

2. LITERATURE REVIEW/ CONCEPTUAL ISSUES

2.1 Governance

Governance is defined by Wikipedia https://en.wikipedia.org/wiki/Governance as the overall complex system or framework of processes, functions, structures, rules, laws, and norms born out of the relationships, interactions, power dynamics, and communication within an organized group of individuals. Nwosu, Obalum & Ananti (2024) argue that the agencies responsible for implementing the wishes of the public play a crucial role in ensuring progress and sustainability. This fosters effective governance, ensuring that resources are utilized sustainably, equitably, and transparently for the benefit of both current and future generations. According to the United Cities and Local Governments Asia-Pacific (2021), governance is a decision-making process that involves determining which policies will be implemented and which will not. In carrying out these responsibilities, the public service serves as the primary machinery of government that strengthens institutions, promotes transparency, and encourages community participation, all of which are vital for fostering good governance (Nwosu & Ananti, 2024). The concept 'governance' can be applied to social, political or economic entities (groups of individuals engaged in some purposeful activity) such as a state and its government (public administration), a governed territory, a society, a community, a social group (like a tribe or a family), a formal or informal organization, a corporation, a non-governmental organization, or a non-profit organization (Wikipedia: https://en.wikipedia.org/wiki/Governance). 'Governance' can also pertain to a specific sector of activities, such as environment, health, internet, security, etc.

The key elements of resource governance depend on strong legal and institutional frameworks, as robust institutions promote compliance and enforcement of regulations. These frameworks are guided by principles of good governance strategies that support sustainability. It is useful to highlight the basic principles that support good governance.

Below are the principles:

Accountability refers to the obligation of an individual, group, or organization to take responsibility for their actions and decisions.
Leadership involves setting a positive example at the highest levels of an organization, which is crucial for encouraging personnel to adopt good governance practices.
Integrity means acting impartially and ethically, in the interest of the public. It is demonstrated through compliance with laws, regulations, and organizational policies, as well as by upholding high standards of professionalism at all levels of the organization.
Stewardship involves the responsible management of resources on behalf of the public. This includes maintaining or enhancing an organization's ability to serve the public interest over time.
Transparency is achieved when decisions and actions are made open to scrutiny, allowing stakeholders—including the public and employees—access to complete, accurate, and clear information about public matters.
Source: Modified from *Public Sector Governance: A Guide to the Principles of Good Practice*, Office of the Auditor General of British Columbia.

2.2 Aligning Energy Governance with Core Principles of Governance

The success of energy transition in developing nations depends on how well governance frameworks integrate universal principles of good governance. Applying these principles to the energy sector strengthens institutional capacity, fosters public trust, and creates an enabling environment for investment and innovation.

Accountability ensures that energy policies, projects, and institutions are held responsible for their actions and outcomes. In energy governance, this means setting clear performance targets for renewable energy deployment, establishing independent regulatory agencies to oversee compliance, and creating mechanisms for citizens to monitor service delivery. For example, accountability in subsidy reforms or electrification programs prevents mismanagement and ensures that resources reach the communities most in need.

Strong leadership is essential in driving political will and mobilizing stakeholders toward energy transition goals. Transformative leadership in the energy sector sets ambitious renewable energy targets, champions investment in clean technologies, and promotes regional cooperation for cross-border energy trade. In developing nations, leadership can inspire both public and private actors to embrace long-term sustainability over short-term economic gains, ensuring a just and inclusive transition.

Integrity in energy governance minimizes corruption, promotes ethical decision-making, and ensures that policies are guided by public interest rather than vested interests. This principle is particularly vital in resource-rich developing countries, where energy sectors are often vulnerable to rent-seeking and elite capture. Embedding integrity in procurement, licensing, and contract management helps build investor confidence and enhances the credibility of renewable energy initiatives.

Stewardship emphasizes the responsible management of energy resources to ensure their sustainability for future generations. In the context of energy transition, stewardship requires governments to balance current development needs with long-term climate and environmental goals. This involves prioritizing renewable energy over fossil fuels, protecting ecosystems during energy projects, and promoting energy efficiency as a way of reducing waste and conserving resources.

Transparency is the foundation of trust in energy governance. Open access to information on energy contracts, financing, tariffs, and policy decisions enables citizens, investors, and civil society to make informed

contributions to the sector. Transparent governance also reduces corruption risks and ensures fair competition in renewable energy markets. By adopting digital platforms and open data initiatives, governments can make energy transition processes more inclusive and participatory. Aligning the governance of energy with accountability, leadership. Integrity, stewardship, and transparency create a solid foundation for accelerating energy transition in developing nations. These principles strengthen institutions, enhance investor confidence, and ensure that the benefits of the transition are equitably distributed, thereby making the shift to sustainable energy both credible and enduring.

2.3 Energy Transition

Energy transition refers to the shift from one dominant energy resource or set of resources to another, switching from low-efficiency energy sources towards high-efficiency ones (UIA Initiative, n.d)**.** Energy transition refers to the global shift from fossil-based energy systems (like coal, oil, and natural gas) to renewable energy sources (such as solar, wind, and hydropower), driven by the need to reduce carbon emissions and combat climate change (UNDP, 2025).

2.4 Renewable Energy/ Clean Energy

Renewable Energy according to the United Nations, is energy derived naturally over time, through continuously replenishing processes like sunlight and wind. This category includes solar power, wind energy, hydroelectricity, and geothermal power, known for their sustainability. Renewable energy is derived from natural processes that are replenished at a rate equal to or faster than the rate at which they are consumed, making them a sustainable alternative to finite fossil fuels (Twidell and Weir, 2015). Renewable energy by REN21 (2022) is an energy that is derived from natural processes that are replenished constantly, such as solar, wind, hydro, geothermal, and modern bioenergy, forming the backbone of a sustainable energy future. While Clean Energy is the generation of energy that does not produce greenhouse gas emissions, it also includes technologies like carbon-capture, which although not renewable, significantly reduce emissions (Nwosu et al, 2025). Clean energy encompasses renewable power, nuclear energy, and technologies that significantly reduce carbon emissions, including energy efficiency and carbon capture, utilization, and storage (CCUS) (IEA, 2021). Clean energy refers to energy produced from renewable resources such as solar, wind, hydro, geothermal, and modern bioenergy, which contribute to a sustainable energy transition by avoiding harmful environmental impacts (IRENA, 2022).

Why Accelerating the Transition to Renewable Energy is the Pathway to a Healthy, Liveable Planet Today and for Generations to Come (UN report, n.d):

2.4.1 Renewable energy sources are all around us

Approximately 80 percent of the global population lives in countries that are net importers of fossil fuels, which amounts to about 6 billion people. This dependency makes them vulnerable to geopolitical shocks and crises. In contrast, renewable energy sources are available in every country, yet their potential remains largely untapped. The International Renewable Energy Agency (IRENA) estimates that by 2050, 90 percent of the world's electricity can and should come from renewable energy. Renewable energy provides a pathway to reduce import dependency, enabling countries to diversify their economies and protect themselves from the unpredictable price fluctuations of fossil fuels. Additionally, it promotes inclusive economic growth, creates new jobs, and helps alleviate poverty.

2.4.2 Renewable energy is cheaper

Today, renewable energy is the most affordable source of power in many parts of the world. The prices of renewable energy technologies are decreasing rapidly. Over 90 percent of new renewable projects are now cheaper than fossil fuel alternatives. Additionally, solar energy and offshore wind power are, respectively, 41 percent and 53 percent less expensive than fossil fuels. These declining prices are making renewable energy more appealing globally, especially for low and middle-income countries, which will see most of the future demand for new electricity. This presents a significant opportunity for a substantial portion of new power supply in the coming years to be generated from low-carbon sources. For example, by 2040, Africa could produce ten times more electricity than it requires, entirely from renewable sources. Renewable energy can also address the rising electricity demand driven by artificial intelligence (AI) and data centres. A typical AI data centre consumes as much electricity as 100,000 homes. It is essential for major tech companies to switch to 100 percent renewable energy to power their data centres by 2030. By 2030, cheap electricity from renewable sources could account for 65 percent of the world's total electricity supply. Moreover, it has the potential to decarbonize 90 percent of the power sector by 2050, significantly reducing carbon emissions and helping mitigate climate change.

2.4.3 Renewable energy is healthier

According to the World Health Organization (WHO), approximately 99 percent of people worldwide breathe air that exceeds safety limits and poses a threat to their health. Air pollution is linked to 7 million premature deaths each year. Health hazards from high levels of fine particulate matter and nitrogen dioxide primarily stem from the burning of fossil fuels. The economic damage caused by air pollution is staggering, amounting to $8.1 trillion annually, which is equivalent to 6.1 percent of global GDP. Transitioning to clean energy sources, such as wind and solar power, can help address both climate change and air pollution, ultimately improving public health.

2.4.4 Renewable energy creates jobs

The clean energy sector has already surpassed the fossil fuel industry in terms of job creation, employing nearly 35 million people globally. In 2023, the renewable energy sector employed 16.2 million individuals, an increase from 13.7 million in 2022. For every dollar invested, renewable energy generates three times as many jobs as fossil fuels. The International Energy Agency (IEA) estimates that the transition to net-zero emissions will overall increase job opportunities in the energy sector. While approximately 5 million jobs in fossil fuel production could be lost by 2030, around 14 million new jobs are expected to be created in clean energy. This results in a net gain of 9 million jobs. Additionally, energy-related industries will require 16 million more workers for roles such as manufacturing electric vehicles, creating energy-efficient appliances, and developing innovative technologies like the hydrogen economy. In total, over 30 million jobs could be created in clean energy, energy efficiency, and low-emissions technologies by 2030. It will be essential to ensure a just transition by prioritizing the needs and rights of people throughout the energy transition, so that no one is left behind.

2.4.5 Renewable energy makes economic sense

In 2024, investments in clean energy reached $2 trillion, surpassing fossil fuel expenditures by $800 billion, and marking an increase of nearly 70 percent over the past decade. Notably, in 2023, the clean energy sector contributed 10 percent to global GDP growth. Additionally, energy-related carbon dioxide emissions are rising at a slower rate than the global economy. In 2024, emissions growth decreased to 0.8 percent, while the global economy expanded by over 3 percent. Despite these encouraging trends, the fossil fuel industry continues to receive substantial subsidies, totaling approximately $7 trillion in 2022. This figure encompasses explicit subsidies, tax breaks, and costs associated with health and environmental damages that are not considered in the price of fossil fuels. In contrast, around $4.5 trillion per year must be invested in renewable energy through 2030, covering technology and infrastructure expenses, to achieve net-zero emissions by 2050. The initial financial burden may be daunting for many countries with limited resources, necessitating both financial and technical assistance for a successful transition. However, investment in renewable energy is expected to yield significant returns. Furthermore, reducing pollution and addressing climate impacts could save the world up to $4.2 trillion annually by 2030. Moreover, efficient and reliable renewable technologies can establish a system that is less vulnerable to market shocks, thus enhancing resilience and energy security through a diversified power supply.

2.5 Developing Nations

Developing nations are countries characterized by low levels of living, productivity, and per capita income, alongside challenges such as high population growth, unemployment, and dependence on primary exports (Todaro and Smith, 2015). The World Bank officially classifies countries based on their income levels, categorizing them as low-income, lower-middle-income, and upper-middle-income economies, using GNI per capita as the primary criterion. Developing nations generally fall within these three categories, which are defined as those below the high-income threshold (World Bank, 2024; World Bank Group Data, 2025). Developing nations are those with lower human development outcomes as measured by the Human Development Index (HDI), encompassing income, health, and education indicators (UNDP, 2023).

2.6 Sustainable Development Goals (SDGs)

The Sustainable Development Goals (SDGs) can be a tool to boost renewable energy development (Wang, Sadiq, Bashir, Jain, Ali, and Shabbir, 2022). Goal 7 of the SDGs focuses on ensuring access to affordable, safe, sustainable, and modern energy for all (He, Yang, Liao, Xu, Fang, and Linking, 2022). This means that countries, companies, and individuals are committed to promoting the development of renewable energy, such as solar, wind, and hydropower (Schwerhoff and Sy, 2017). These goals were established in 2015 by the United Nations (UN) and set out an agenda for global action to promote peace, sustainable development, and social justice (Allen, Metternicht, and Wiedmann,

2018). These goals are based on the principles of equality, equity, and shared responsibility, based on respect for human rights, environmental protection, and the fight against climate change (Pizzi, Caputo, Corvino, and Venturelli, 2020). It is important to explore the linkages between the SDGs and renewable energy because this can help countries improve the quality of life of their populations and achieve sustainable development (Boubaker and Omri, 2022). Renewable energy can improve SDGs adherence in several ways. First, it can help reduce levels of greenhouse gas emissions, thereby contributing to SDG 13 to take action to combat climate change and its effects. This will help achieve SDGs 1 and 2 in eradicating poverty and hunger and improving food security. In addition, renewable energy can contribute to SDG 7, to ensure access to modern, affordable, safe, secure, and sustainable energy services for all, facilitating energy access for people in all parts of the world.

2.7 Theoretical framework

The study utilizes a Governance – Institutional – Political Economy – Sustainable Development Framework to analyze how governance arrangements, such as institutions, policies, political interests, and coordination mechanisms, facilitate or hinder transitions to renewable energy. These theoretical perspectives are discussed below:

- Governance Theory (Pierre & Peters, 2000; Kooiman, J. 2003): This perspective focuses on institutional design and coordination, explaining how rules, institutions, and decision-making structures influence policy outcomes.
- Institutional Theory (North, 1990; Ostrom, 2005): This theory examines the strengths and weaknesses of regulatory frameworks, highlighting how formal institutions (such as laws, agencies, and contracts) and informal norms (including political culture, patronage, and vested interests) impact energy governance.
- Political Economy Theory (Cherp & Jewell, 2011; Baker, Newell, & Philips, 2014): This theory explores the influence of vested interests, subsidies, and rent-seeking behaviours. It analyzes how power relations, vested interests (like fossil fuel lobbies, utilities, and donor agencies), and conflicts over resource distribution affect policy adoption.
- Sustainable Development Theories (Hopwood, Mellor, & O'Brien, 2005; Sachs, 2015): These theories connect energy transition governance to broader development goals, such as economic growth, environmental sustainability, and social inclusion, thereby aligning energy transitions with inclusive growth and climate objectives.

Together, these perspectives help explain why some countries, such as Morocco and India, have made greater progress in renewable energy despite facing similar developmental challenges, while others, like Nigeria and Brazil, have lagged.

3. METHODOLOGY

This study employs a comparative qualitative case study design to evaluate the governance structures influencing energy transitions in four developing nations: Nigeria, India, Brazil, and Morocco. This comparative approach is suitable as it allows for a cross-country analysis of institutional arrangements, governance mechanisms, and policy barriers within varying socio-political and economic contexts. The study utilizes secondary qualitative data, which is triangulated from multiple sources.

4. DISCUSSION OF FINDINGS

This report compares how Nigeria, India, Brazil, and Morocco have structured and reformed their energy governance to support energy transitions (largely renewable integration) from 2010 to 2025. We examine each country's institutional architecture (ministries, agencies, regulators), legal frameworks (laws, policies, targets), and major strategies, integrating the theoretical perspectives to show how they all align in the progress to renewable energy in these countries. Key barriers to renewable energy were identified, and deployment in each context. Finally, in a comparative assessment, we compare regulatory coherence, institutional coordination, investment de-risking measures, and implementation capacity across the four countries.

5. NIGERIA

Nigeria has committed to achieving net-zero emissions by 2060 as part of its Climate Commitment and Global Standing. This energy transition aligns with the country's climate commitments under the Paris Agreement and bolsters its global reputation in sustainable and green finance. In May 2015, the Nigerian government established the National Renewable Energy and Energy Efficiency Policy (NREEP) to promote the adoption of renewable energy and enhance energy efficiency across the nation. This policy is in line with regional commitments, particularly the ECOWAS Renewable Energy Policy (EREP) and the ECOWAS Energy Efficiency Policy (EEEP). According to a report by Energy Market and Rates Consultants (EMRC) in 2024, Nigeria's energy transition is an effort to shift towards more sustainable and cleaner energy sources, aiming for carbon neutrality by 2060.

Following the Paris Agreement, Nigeria submitted its first Nationally Determined Contribution (NDC) in 2015, which was revised in 2021. An NDC outlines a country's targets for reducing emissions and adapting to climate change, with updates required every five years. The World Economic Forum ranks Nigeria 108th out of 120 nations on the Energy Transition Index (ETI), a tool used to evaluate the performance of energy systems at the national level over recent decades. Although Nigeria's overall ETI score has improved by three percent, its system performance scores have declined by one percent. In August 2022, the Federal Government of Nigeria released its Energy Transition Plan (ETP) in line with the Paris Agreement. This plan aims to address both energy poverty and climate change. According to the EMRC report (2024), the ETP outlines pathways for the energy transition in major economic sectors that contribute to 65 percent of total emissions. The ETP focuses on several key objectives:

- To tackle the dual crises of energy poverty and climate change and deliver SDG7 by 2030 and Net Zero by 2060.
- To provide energy for development, industrialization, and economic growth.
- The plan details pathways for significant low-carbon development of energy systems across 5 key sectors: Power, Cooking, Transport, Industry, and Oil and Gas.
- Mobilizing investments and encouraging private sector participation by creating significant market opportunities in the energy transition process.

The Government of Nigeria and SEforALL developed the plan with support from Global Energy Alliance for People and Planet (GEAPP). According to Nwosu et al. (2025), Nigeria can significantly reduce its greenhouse gas emissions and accelerate the transition to a low-carbon economy by strengthening its climate governance and policy framework. Integrating sustainable practices into industries such as agriculture and transportation can further support Nigeria's climate goals. Additionally, investing in clean energy technologies will attract foreign investments and promote sustainable economic growth, positioning Nigeria as a global leader in the green energy market. An examination of the policy framework and climate governance implemented by the Nigerian government in its transition to a low-carbon economy shows progress toward the proposed goal of achieving net-zero emissions by 2060. Several factors influence this scenario and expedite the transition, including the unavailability of funding for renewable energy projects and the lack of education and training programs for a skilled workforce in the green sector (Nwokolo, Singh, Khan, Kumar, & Luthra, 2023). The Energy Transition Plan (ETP) established a robust framework that acts as a catalyst for attracting funding and investment into Nigeria's Energy transition sectors. Key sectoral developments have occurred since the launch of the Energy Transition Plan (ETP) for 2022-2024 in Nigeria (SEforALL, 2024).

5.1 The Power Sector

In 2023, the Electricity Act was passed, giving Nigerian states the authority to independently govern and regulate their electricity sectors, including grid-connected areas. This legislation enables states to set local tariffs, influence their energy mix, diminish reliance on diesel generators, and tackle supply shortages. The ETP and the Energy Transition Office are designed to coordinate federal policies across various ministries (Power, Petroleum, Environment, Finance) and to collaborate with states, civil society, and the private sector (Ibrahim & Zeydler, 2023).

In December 2023, the World Bank approved the Nigeria Distributed Access through Renewable Energy Scale-up (DARES) project, which is recognized as the largest single distributed energy initiative by the World Bank globally. The Nigeria Integrated Energy Planning tool played a vital role in developing DARES, building on the successes of the Nigerian Electrification Project (NEP). The project aims to provide electricity to 17.5 million Nigerians by 2029 by deploying a total of 465 Megawatts (MW) of power, thus significantly enhancing Nigeria's energy infrastructure. The new Electricity Act of 2023, which replaces the 2005 Act, explicitly prioritizes renewable energy. It strengthens the mandate of the Nigerian Electricity Regulatory Commission (NERC) to promote renewables and requires licenses to ensure compliance with specific renewable energy quotas (Omokhudu and Oloaigbe, 2025).

5.2 The Industry

Government policies and public-private partnerships are supporting the decarbonization of Nigeria's cement industry. Companies such as Lafarge Africa PLC, Dangote Cement, and BAU Cement are leading efforts

to utilize alternative fuels, launch low-carbon cement products, and improve energy efficiency.

5.3 The Transport Sector

Since 2022, Nigeria has implemented policies aimed at advancing sustainability in the transport sector, aligning with the ETP and net-zero emission goals by 2060. Key measures include funding for infrastructure development, tax and tariff reductions on Electric Vehicle (EV) imports, and updates to the National Automotive Industry Development Plan (NAIDP) to support local EV manufacturing. The government is developing an EV charging infrastructure program emphasizing renewable energy and is establishing stricter vehicle emission standards. Partnerships have been formed to provide affordable EV financing options. The Federal Government plans to deploy 100 electric buses to major cities, including Lagos, Abuja, and Ibadan. While the ETP primarily focuses on electric vehicle adoption, the government is also promoting the use of Compressed Natural Gas (CNG) as a more accessible alternative. These initiatives represent significant steps towards decarbonizing Nigeria's transport sector and enhancing its sustainability.

5.4 Buildings (Cooking)

In April 2024, the National Clean Cooking Policy was approved by the Federal Executive Council (FEC). This significant milestone demonstrates Nigeria's commitment to providing access to clean cooking solutions. The policy outlines targets aimed at achieving universal access by 2030 and includes a long-term vision for a carbon-neutral clean cooking future by 2060, in line with the ETP.

5.5 Oil and Gas Sector

To reduce emissions and support decarbonization, Nigeria introduced several measures at COP28. The Nigerian Upstream Petroleum Regulatory Commission (NUPRC) launched a regulatory framework focused on energy transition, neutral gas use, zero routine flaring, and methane reduction. Additionally, the Nigeria Gas Flare Commercialization Programme (NGFCP) has begun allocating flare sites to private investors for the conversion and utilization of flare gas.

5.6 Barriers faced by Nigeria

Despite having significant oil, gas, and solar potential, Nigeria faces substantial challenges in its energy sector. Approximately 71% of Nigerians lack access to electricity (Ibrahim & Zeydler, 2023). The country suffers from chronic underinvestment in training and development, infrastructure, and a fragmented regulatory environment that hinders the scaling up of energy projects (Ibrahim & Zeydler, 2023). Currently, risks and limited financing make many projects unbankable. Financial institutions and subsidies are primarily focused on oil and gas rather than renewable energy sources. Stakeholders emphasize that the government must de-risk renewable opportunities to attract investments, as the sector is struggling with low global funding and a limited private appetite (Ibrahim & Zeydler, 2023). The initial costs of electric vehicles are high, and there is an issue of inadequate charging infrastructure, a skill gap in EV technology, and limited job opportunities in green industries (SEforALL, 2024). Moreover, overlapping mandates between federal and state agencies, as well as between different departments (such as the Power Ministry and the Ministries of Petroleum and Environment), create coordination challenges. Additionally, the enforcement of policies, such as renewable purchase obligations, is weak. However, recent institutional reforms, including the Energy Transition Plan (ETP), new legislation, and rural solar programs, indicate an improvement in Nigeria's governance framework, even though it remains complex (Omokhudu and Oloaigbe, 2025).

6. INDIA

India's energy transition governance is characterized by a robust central framework that works alongside state utilities. Until 2022, there were separate ministries for conventional and renewable energy, the Ministry of Power and the Ministry of New & Renewable Energy, which have now been merged. The Planning Commission (now NITI Aayog) provides overarching targets. Key legislation includes the Electricity Act of 2003 and the Energy Conservation Act of 2001. At the Regulatory level, the Central Electricity Regulatory Commission (CERC) and State Electricity Regulatory Commissions (SERCs) oversee grid tariffs and market rules, while the Central Electricity Authority (CEA) formulates long-term plans. India established statutory renewable energy targets early on, such as reaching 175 GW by 2022 and now aiming for 500 GW of non-fossil energy by 2030 (Michael, 2025). Implementation tools have included nationwide competitive auctions conducted by the Solar Energy Corporation of India (SECI), Renewable Purchase Obligations (RPOs), and fiscal incentives like accelerated depreciation and viability gap funding have been included. The International Solar Alliance (ISA) is also involved in the development of the Green Energy Corridor for grid expansion. There is a significant federal-state split in responsibilities; states manage distribution (through Distribution Companies or DISCOMs) and local land and permits, which requires effective coordination.

Historical reforms include the launch of the ambitious Solar Mission in the 2010s as part of the National Action Plan on Climate Change. The UDAY scheme in 2015-16 restructured DISCOM debts, though the introduction of the Goods and Services Tax (GST) in 2017 raised solar costs. In 2022, the government increased the 2030 renewable energy target to 500 GW and merged the Ministry of New & Renewable Energy into the Ministry of Power to streamline governance. In 2023, India issued new tenders to achieve 450 GW by 2030 and extended grid-charge waivers (ISTS waivers) to mid-2025, including provisions for hydrogen and ammonia (Michael, 2025). India, recognized as the fastest-growing large economy, is actively advancing its energy transition to achieve net-zero emissions by 2070. The country also targets meeting 50% of its electricity needs from non-fossil fuel sources by 2030. Solar energy is a key player in this transition, having experienced a compound annual growth rate (CAGR) of 36.5%. Furthermore, investments in electric vehicles (EVs), wind energy, and battery energy storage systems (BESS) amount to billions of dollars each year (Bansal, 2024). To attract green finance, companies must innovate and integrate sustainability into their core strategies. This includes leveraging green technologies and enhancing climate disclosures. With strong policies, substantial investments, and international collaboration, India is making significant strides toward sustainable development and its climate goals (Bansal, 2024).

6.1 Barriers faced by India

Despite India having more than doubled its wind and solar capacity since 2016 (Kay, 2021), several institutional barriers remain. The primary challenge is the financially troubled state distribution companies (DISCOMs). Their mounting losses and tariff shortfalls prevent them from honoring Power Purchase Agreements (PPAs), which leads to project delays and unpaid contracts (Michael, 2025). Additionally, land acquisition and lengthy environmental and forestry clearances slow down large projects. Regulatory uncertainty has increased as well, with recent court rulings overturning elements of the Green Open Access rules, and procurement auctions facing renegotiation. There is also often weak coordination among various ministries, such as Power, Coal, Petroleum, and Railways. For instance, coal requirements and fossil fuel subsidies still skew the energy supply in favor of traditional energy sources. On a positive note, central policies like the Inter-State Transmission System (ISTS) waiver, which eliminates transmission charges, and the Green Open Access initiative have reduced investment risks and created new opportunities for commercial and industrial consumers (Michael, 2025). However, overall coherence is compromised by state-specific policies and political dynamics. Analysts emphasize that substantial structural reforms of DISCOMs and enhanced integration of the interstate grid are essential for India to maintain its rapid growth in renewable energy (Kay, 2021).

7. BRAZIL

Brazil's governance of energy is characterized by federal control over major policies and electricity markets, along with a history of state-owned enterprises. The Ministry of Mines and Energy (MME) is responsible for setting policies, including those related to renewable energy, while the National Council of Energy Policy (CNPE) advises on the national energy strategy. The National Agency of Electric Energy (ANEEL) regulates power generation and transmission, and the National Electric System Operator (ONS) manages grid dispatch. Historically, the state-owned utility Eletrobras (which was recently privatized in 2023) and the oil company Petrobras have dominated the sector. However, private Independent Power Producers (IPPs) are now responsible for building most new plants through competitive auctions. The Brazilian constitution assigns subsoil resources to the federal government, indicating a strong central oversight (Chequer, Belchior, Galante, Leite, & Macedo, 2025). Key legislation includes the Electricity Sector Legislation, which encompasses the concessions law, as well as laws governing biofuels, such as the ethanol mandate. In 2015, Brazil's Nationally Determined Contribution (NDC) committed the country to achieving a 45% share of renewables in its energy mix by 2030. Recently, in 2024, the CNPE approved the Política Nacional de Transição Energética (PNTE), which includes a four-year action plan (PLANTE) and a consultative forum (FONTE) to better align energy, climate, and industrial policies. This initiative promotes coordination among various ministries, including the MME, Environment (MMA), Finance, and others. Under President Lula's administration, new incentives, such as a hydrogen strategy, are emerging (FCA, 2025).

7.1 Barriers faced by Brazil

Brazil has one of the cleanest power grids in the world, with 83% of its electricity generation coming from renewable sources, primarily hydropower (De Abreu, 2025). However, the expansion of wind and solar energy faces several challenges. The governance structure is fragmented,

with multiple ministries and agencies involved (such as MME, MMA, Finance, MDIC, and MCTI), which can lead to inconsistencies. Until recently, these entities lacked a unified low-carbon strategy (FCA, 2025).

Policy changes under recent administrations have compromised consistency. For example, the rollback of environmental licensing under Bolsonaro and the slowed auctions for renewable energy projects have created uncertainty. Additionally, financing is imbalanced, with public investments disproportionately favoring fossil fuels—approximately R$4 in subsidies for coal and oil for every R$1 allocated to renewables (FCA, 2025). Long permitting times for grid lines and dams also delay project development. At the regional level, individual states sometimes promote their own energy generators, which can complicate national planning efforts. While Brazil excels in absolute terms—leading Latin America in wind and solar capacity—peak demand growth has slowed, and some planned projects, such as wind auction targets, have not met expectations.

In summary, Brazil's regulatory framework is relatively well-developed, featuring auction-based markets and partial liberalization. However, policy coherence has been inconsistent. The recent PNTE/PLANTE initiative, in conjunction with President Lula's emphasis on low-carbon growth, seeks to enhance coherence and coordination within the energy sector.

8. MOROCCO

Morocco's energy governance operates in a top-down manner, characterized by strong state leadership and specialized agencies. The Ministry of Energy Transition and Sustainable Development, established in 2021, outlines the high-level energy strategy for the country. Under this ministry, the Moroccan Agency for Sustainable Energy (MASEN), founded in 2009 initially for solar energy, is responsible for developing large renewable projects through public-private partnerships (MEPC, 2024; GreenClimateFund, 2021). Another agency, the Moroccan Agency for Energy Efficiency (AMEE), formerly known as ADEREE, focuses on promoting energy efficiency and rural solar initiatives. The Office National de l'Électricité et de l'Eau (ONEE) serves as the vertically integrated utility responsible for electricity generation and distribution. Research efforts are supported by IRESEN and various academic institutions (MEPC, 2024). Legislation-wise, Morocco's Dahir 2010-13 (Law 13-09) established the framework for permitting renewable projects, allowing independent power producers (IPPs) to operate projects up to 50 MW and encouraging self-generation. Notable strategies include the 2009 Solar Plan, which encompasses the Noor CSP projects, and the Integrated Energy Strategy for 2010-2030, which aimed for 42% of electricity generation to come from renewable sources by 2020 (including 12% solar, 20% wind, and 10% hydro). In 2021, Morocco submitted a Long-Term Strategy that commits to achieving 52% renewable electricity by 2030 and 80% by 2050 (GreenClimateFund, 2021).

8.1 Barriers faced by Morocco

Morocco's strong political commitment, driven by royal vision, has helped the country overcome many challenges in energy governance, though some barriers still exist. Financial constraints, such as subsidies for imported fossil fuels (which peaked at 5% of GDP), have diminished the cost-competitiveness of renewable energy (Leidreiter & Boselli, 2015). The power sector is still dominated by ONEE, limiting opportunities for new entrants despite Law 13-09. This dominance, along with bureaucratic hurdles and financing gaps, particularly affects smaller renewable projects, as most capital flows toward larger utility-scale plants (Leidreiter & Boselli, 2015). While Morocco's institutional coordination is relatively coherent with fewer agencies and clear mandates, sectoral silos remain, particularly between rural electrification and utility planning. Although Morocco largely achieved its early renewable energy targets, there were delays; for example, renewable capacity reached only 30% in 2020, compared to the 42% goal. Issues with grid integration have also emerged, especially concerning the transmission infrastructure needed to connect new projects. In recent years, Morocco has intensified its investment in renewable energy and emerging sectors, including green hydrogen, under its Green Generation Strategy for 2020-2030. However, the government has paradoxically expanded some fossil fuel infrastructure, such as a new gas pipeline and coal plant extensions. This raises concerns about a potential high-carbon lock-in if fossil fuel subsidies are not addressed.

8.2 Comparative Assessment

Across all four countries, the institutional architectures share some features (energy ministries, regulators) but differ markedly in coherence:

Regulatory Coherence: Morocco and India have established clear, long-term renewable energy targets and dedicated agencies, contributing to consistent policy frameworks. Morocco aims for 52% of its energy to come from renewable sources by 2030, which has facilitated stable policies (GreenClimateField, 2021). India has also set ambitious targets and mechanisms, such as Renewable Purchase Obligations (RPOs) and competitive auctions, which have persisted across different administrations. In contrast, Nigeria's policy landscape has been fragmented due to overlapping jurisdictions and delayed reforms, which have only recently begun to align under the Energy Transition Plan (ETP) and the new Electricity Act (Ibrahim & Zeydler, 2023). Although Brazil once had a coherent auction system for renewable energy, political fluctuations, including environmental rollbacks and shifting climate goals, have introduced uncertainty. Regulatory consistency in Brazil has been compromised by changing subsidy structures, offering R$4 for fossil fuels compared to R$1 for renewable sources, and increased reliance on presidential decrees (PNTE) for policy coordination (FCA, 2025).

Institutional Coordination: Nigeria's federal structure creates multiple layers of governance (federal, state, local), resulting in weak coordination. A dedicated Energy Transition Office and policy framework were only established in 2022–2024 to integrate various stakeholders. In India, the division of responsibilities between the central and state governments requires continuous interaction: while the central government issues broad mandates and financing, states handle distribution. Initiatives like Distribution Company (DISCOM) reform schemes and interstate power pooling (ISTS, POSOCO) aim to improve coordination, though implementation remains inconsistent. Brazil's governance involves numerous ministries such as Energy, Environment, Finance, Industry, and an advisory council (CNPE). Coordination has historically been weak but is currently being strengthened through the PNTE/PLANTE mechanisms. In contrast, Morocco exhibits strong coordination, with a single ministry supported by several agencies and royal backing, enabling swift decision-making. Its consultative forums, including informal discussions at COP meetings, facilitate government-private sector dialogue, and Public-Private Partnership (PPP) structures clearly delineate roles (Ibrahim & Zeydler, 2023).

Investment De-risking: India and Morocco have taken the lead in de-risking renewable energy investments. India's long-term waivers (e.g., ISTS) and competitive auctions provide transparent returns (iiefa.org). Open-access rules (GEOA) and support for domestic manufacturing (PLI schemes) further encourage investment. Similarly, Morocco has implemented attractive feed-in tariffs—particularly for early solar Concentrated Solar Power (CSP) projects—and utilized concessional financing (from sources such as the World Bank and African Development Bank) through MASEN to ensure project bankability (MEPC 2024; GreenClimateFund 2021). Brazil has also employed auctions with guaranteed off-take agreements, local content requirements (until recently), and BNDES loans to mitigate risks associated with projects. However, policy uncertainty has increased risk premiums in recent years. Nigeria has made the least progress in formal de-risking measures, lacking guarantees or domestic financing schemes for renewables, thereby leaving projects vulnerable to currency fluctuations, policy changes, and payment risks (Ibrahim & Zeydler, 2023).

Implementation Capacity: India and Brazil have well-established engineering sectors and manufacturing bases, which support the rapid development of capacity. India's strong project developers, such as ReNew and Tata, along with its growing domestic solar manufacturing sector, enable quick scaling; however, challenges with grid integration remain. In Brazil, utilities and equipment manufacturers possess extensive expertise, particularly in hydro and biomass energy. The country's auction systems have successfully attracted investments, even during challenging times. Nevertheless, Brazil faces issues like a grid that loses 15-20% of electricity and environmental licensing delays that can hinder construction.

Morocco, although smaller, has made significant strides in implementation. By 2024, it has developed world-class solar and wind farms, such as Noor and Tarfaya, with government support, although the expansion of rooftop and decentralized renewable energy (RE) has been slow. Nigeria has the weakest implementation capacity due to limited local industry, frequent policy changes, and budget constraints. As of 2022, Nigeria was still grappling with basic electrification rates, making rapid deployment of renewables a challenge. Since 2010, each country's governance has evolved. India and Morocco have advanced, coherent, goal-driven frameworks, supported by strong political commitment and robust institutions, helping to overcome various barriers. Brazil's frameworks are technically sound, featuring actions like auctions and targets; however, political instability has led to policy inconsistency. Nigeria is in the process of catching up, with new legal reforms and a transition office that recently centralized planning. Still, it faces significant hurdles due to decades of underinvestment in infrastructure and fragmented institutions. All four countries acknowledge the need for improved coordination and risk management. Examples include India's grid reforms, Brazil's National Energy Transition Plan (PNTE), Morocco's integrated strategy, and Nigeria's Energy Transition Plan (ETP). As of 2025, India and Morocco

demonstrate the highest regulatory coherence and implementation momentum. Brazil shows considerable renewable energy capacity but with mixed governance signals, while Nigeria is still in the early stages of reform. Each country's unique blend of policies, institutions, and obstacles reflects its distinct political landscape and development priorities, highlighting that governance for energy transition is a complex and country-specific challenge.

9. RECOMMENDATIONS FOR ACCELERATING RENEWABLE ENERGY TRANSITION

9.1 Nigeria

Nigeria has established formal renewable energy targets, such as the National Renewable Energy and Energy Efficiency Policy, but still faces significant governance challenges. Studies indicate that weak coordination among agencies, inconsistent enforcement of regulations, and bureaucratic delays are hindering progress. To overcome these issues, policymakers should create a dedicated renewable energy regulatory body to streamline oversight and expedite the approval process. Additionally, long-term investment incentives, including tax breaks, feed-in tariffs, and guaranteed Power Purchase Agreements (PPAs), are essential to attract private capital. Implementing de-risking mechanisms, such as green bonds, concessional financing, and carbon pricing, can help stabilize returns for investors. Moreover, upgrading the national grid and supporting decentralized mini-grids, particularly in underserved areas, will enhance access to energy. This should be complemented by clear stakeholder engagement processes, such as local consultative councils and transparent tendering, to build trust and promote social acceptance. There should be improvement in the utilization of existing power plants, development of the national Green Hydrogen mission, and policies that will encourage private sector participation in renewable energy projects. The Nigerian government should introduce tax deductions or exemptions for companies that invest in developing electric vehicles, EV charging stations, and related infrastructures. Also, foster partnerships with technical institutes and universities to create specialized certification programs for EV technology, renewable energy systems, and green infrastructure development.

9.2 India

India's governance framework, which includes strong institutions like the Central Electricity Authority, the Solar Energy Corporation of India (SECI), and active state regulators, has facilitated rapid growth in renewable energy. Competitive auctions and mandates have supported this progress. However, challenges such as policy instability at the state level and difficulties with grid integration persist. Recent analyses highlight the necessity for a stable, long-term strategy. For instance, developing a 10 to 15-year Clean Energy Roadmap and enhancing coordination between the central and state governments will provide much-needed policy certainty. Furthermore, market-based tools should be strengthened, including enforceable Renewable Purchase Obligations, nationwide Renewable Energy Certificates, and a phased introduction of carbon pricing to ensure consistent demand. Improvements can also be made in auction design by incorporating hybrid (renewable and storage) tenders, establishing risk-sharing clauses, and expanding Viability Gap Funding and Production-Linked Incentives to promote domestic manufacturing of renewables. Additionally, engaging all stakeholders from distribution companies (DISCOMs) and industry to local communities, through public consultations and clear benefit-sharing guidelines, will help reinforce policy stability and encourage broader support.

9.3 Brazil

Brazil has a historically clean energy matrix, with 80% of its energy coming from renewable sources. The country also benefits from well-established auction mechanisms and public financing, particularly through the National Bank for Economic and Social Development (BNDES). However, political changes and regulatory complexities have sometimes weakened investor confidence. To accelerate the energy transition, Brazil should focus on reinforcing long-term policy stability, such as by establishing multi-decade energy strategies and streamlining regulations for emerging technologies. Diversifying auction designs is also essential; for example, hosting dedicated auctions for offshore wind and energy storage, along with appropriate local-content waivers, can help tap into new energy resources. It is crucial to maintain robust coordination among key institutions, including the National Electric Energy Agency (ANEEL), the National Council for Energy Policy (CNPE), state regulators, and operators. Additionally, deploying market incentives, such as firm renewable obligations and a credible carbon pricing scheme, can help reduce investment risks. Brazil's dynamic development bank should be utilized to de-risk projects through subsidized loans or guarantees. Expanding regional cooperation, such as through South American grid interconnections and power trading, will enhance supply security and create economies of scale.

9.4 Morocco

Morocco has set ambitious targets for renewable energy, aiming for 52% of its energy mix to come from renewables by 2030. The country has established specialized agencies, such as MASEN, which have successfully implemented large-scale solar and wind projects. However, recent analyses indicate gaps in implementation and issues with institutional fragmentation. A leading think tank report recommends structural reforms, particularly the establishment of an independent energy regulator, a complete overhaul of the national utility (ONEE), and the implementation of cost-reflective tariffs to align governance with policy goals. Additionally, the report calls for an accelerated roll-out of decentralized generation solutions, like rooftop solar panels and mini-grids, to reduce dependency on costly energy imports and to engage rural communities. Morocco can also leverage its geographic position by enhancing regional integration and strengthening grid connections with Europe to facilitate green power trading. The IMAL report suggests reassessing long-term coal contracts and setting strong sectoral targets. These actions, combined with a more strategic and less technocratic approach, as well as increased transparency, will help build investor confidence. Overall, Morocco's energy transition will benefit from clearer multi-year plans, empowered institutions, and proactive participation of stakeholders in the deployment of renewable energy.

10. CONCLUSION

This study has examined the role of governance structures in shaping energy transitions in four developing nations, Nigeria, India, Brazil, and Morocco, between 2010 and 2025. The comparative analysis demonstrates that while all four countries have articulated ambitious renewable energy policies, their progress has been uneven due to persistent governance and institutional barriers. Nigeria continues to struggle with weak regulatory enforcement, fragmented institutions, and a political economy dominated by fossil fuel interests. India has made significant advances in renewable energy deployment, yet challenges remain in policy coordination across states, grid integration, and subsidy distortions. Brazil, despite its long tradition of renewable energy, particularly hydropower and biofuels, faces governance constraints linked to political instability, inconsistent regulatory frameworks, and fiscal pressures. Morocco stands out as a relative success story, with strong centralized governance and long-term strategic planning, though questions of inclusiveness and overreliance on external financing remain. The findings reveal that effective governance is not merely about policy ambition but about institutional capacity, policy coherence, and regulatory stability. Countries that have succeeded in accelerating energy transitions, such as Morocco and, to an extent, India, have combined political will with institutional innovation and stable regulatory frameworks. Conversely, governance fragility in Nigeria and Brazil illustrates how entrenched fossil fuel interests, weak institutional enforcement, and political volatility can hinder renewable adoption despite favorable natural endowments. Overall, the comparative evidence suggests that governance remains the decisive factor in determining whether developing nations can move from policy ambition to actual renewable energy transformation. Achieving sustainable development through energy transition will therefore require not only technological and financial solutions but also profound reforms in governance, institutions, and political economy structures.

10.1 Suggestions for Future Study

Future studies should broaden their focus to include subnational governance, informal institutions, longitudinal impacts, quantitative governance indices, international climate finance, and energy justice. Exploring these areas will enhance our theoretical and policy understanding of how governance can facilitate energy transitions in developing countries.

REFERENCES

Allen, C., Metternicht, G., & Wiedmann, T. (2018). Initial progress in implementing the Sustainable Development Goals (SDGs): A review of evidence from countries. *Sustainability Science, 13*, 1453–1467. https://doi.org/10.1007/s11625-018-0572-3

Baker, L., Newell, P., & Phillips, J. (2014). The political economy of energy transitions: The case of South Africa. *New Political Economy, 19*(6), 791–818.

Bansel, K. (2024). *Powering the future: India's role in global energy transition*. Ernst & Young. https://www.ey.com/en_in/insights/energy-resources/powering-the-future-india-s-role-in-global-energy-transition

Chequer, A., Belchior, B., Galante, V., & Leite, B. E., & Macedo, T. (2025). *Oil, gas, and the transition to renewable energy*. Chambers Practice

Guides. https://practiceguides.chambers.com/practice-guides/oil-gas-and-the-transition-to-renewables-2025/brazil

De Abreu. (2025). *The energy sector in Brazil: In-depth analysis, challenges, and future perspectives*. Energy Central. https://www.energycentral.com/renewables/post/energy-sector-brazil-depth-analysis-challenges-and-future-perspectives

Devkota, L. P., Bhattarai, U., Khatri, P., Marahatta, S., & Shrestha, D. (2022). Resilience of hydropower plants to flow variation through the concept of flow electricity of power: Theoretical development. *Renewable Energy, 184*, 920–932. https://doi.org/10.1016/j.renene.2021.11.051

Eicke, L., & Goldthau, A. (2021). Are we at risk of an uneven low-carbon transition? Assessing evidence from a mixed-method elite study. *Environmental Science & Policy, 124*, 370–379. https://doi.org/10.1016/j.envsci.2021.07.009

Enel Green Power. (n.d.). *The energy transition*. https://www.enelgreenpower.com/learning-hub/energy-transition

Energy Market & Rates Consultants. (2024). *EMRC report*. https://www.energymrc.ng/

Federal Court of Accounts (FCA). (2025). *Maturity of public policies for energy transition in Brazil*. https://sites.tcu.gov.br/recursos/transicao-energetica/media/Maturity_of_public_policies_energy_transition_brazil.pdf

Gielen, D., Boshell, F., Saygin, D., Brazilian, M. D., Wagner, N., & Gorini, R. (2019). The role of renewable energy in the global energy transformation. *Energy Strategy Reviews*, 38–50. https://doi.org/10.1016/j.esr.2019.01.006

Green Climate Fund. (2021). *Moroccan Agency for Sustainable Energy (MASEN)*. https://www.greenclimate.fund/ae/masen

He, J., Yang, Y., Liao, Z., Xu, A., & Fang, K. (2022). Linking SDG 7 to assess the renewable energy footprint of nations by 2030. *Applied Energy*. https://doi.org/10.1016/j.apenergy.2022.119167

Hopwood, B., Mellor, M., & O'Brien, G. (2005). Sustainable development: Mapping different approaches. *Sustainable Development, 13*(10), 38–52.

Huang, P., & Liu, Y. (2021). Towards just energy transitions in authoritarian regimes: Indirect participation and adaptive governance. *Journal of Environmental Planning and Management, 64*(1), 1–21. https://doi.org/10.1080/09640568.2020.1743245

Ibrahim, A., & Zeydler, O. (2023). *Here's how Nigeria is tackling the barriers to its green energy transition*. World Economic Forum. https://www.weforum.org/stories/2023/05/how-nigeria-is-tackling-barriers-to-its-green-energy-transition

International Energy Agency (IEA). (2021). *Net zero 2050: A roadmap for the global energy sector*. IEA.

International Renewable Energy Agency (IRENA). (2022). *World energy transition outlook 2022*. IRENA.

Kay, K. (2021). *Tangled wires: Preparing India's power sector for the clean energy transition*. Carnegie Endowment. https://carnegieendowment.org/research/2021/08/tangled-wires-preparing-indias-power-sector-for-the-clean-energy-transition

Kooiman, J. (2003). *Governing as governance*. SAGE Publications.

Leidreiter, A., & Boselli, F. (2015). *100% renewable energy: Boosting development in Morocco*. World Future Council. https://www.worldfuturecouncil.org/wp-content/uploads/2016/01/WFC_2015_100_Renewable_Energy_boosting_Development_in_Morocco.pdf

Michael, S. S. (2025). *What's holding India back in its renewable energy transition?* Institute for Energy Economics and Financial Analysis. https://ieefa.org/resources/whats-holding-india-back-its-renewable-energy-transition

Middle East Policy Council (MEPC). (2024). *Renewable energy in Morocco*. https://mepc.org/commentaries/renewable-energy-morocco

North, D. C. (1990). *Institutions, institutional change, and economic performance*. Cambridge University Press.

Nwokolo, S. C., Singh, R., Khan, S., Kumar, A., & Luthra, S. (2023). *Africa's path to net-zero: Exploring scenarios for a sustainable energy transition*. Springer Nature.

Nwosu, C. C., Obalum, D. C., Ananti, M. O., & Nwosu, C. C. (2025). Governance of natural resources and energy transition in least developed countries (LDCs): Lessons for Nigeria. *African Journal of Environment and Sustainable Development, 3*(1), 61–74. https://doi.org/10.5281/zenodo.15704258

Nwosu, C. C., & Ananti, M. O. (2024). Public sector innovation and service delivery in Nigeria: A paradigm shift from traditional public administration to new public management. *International Journal of General Studies, 4*(1), 48–64.

Nwosu, C. C., Obalum, D. C., & Ananti, M. O. (2024). Artificial intelligence in public service and governance in Nigeria. *Journal of Governance and Accountability Studies, 4*(2), 109–120. https://doi.org/10.35912/jgas.v4i2.2425

Omokhudu, D. S., & Oloaigbe, I. S. (2025). Navigating Nigeria's renewable energy law: An overview of the legal framework for sustainable development. *Grassroot Journals, 8*(2), 1–24.

Ostrom, E. (2005). *Understanding institutional diversity*. Princeton University Press.

Pierre, J., & Peters, B. G. (2000). *Governance, politics and the state*. Palgrave Macmillan.

Pizzi, S., Caputo, A., Corvino, A., & Venturelli, A. (2020). Management research and the UN sustainable development goals (SDGs): A bibliometric investigation and systematic review. *Journal of Cleaner Production*. https://doi.org/10.1016/j.jclepro.2020.124033

Potrc, S., Cucek, L., Martin, M., & Kravanja, Z. (2021). Sustainable renewable energy supply networks optimization: Gradual transition to a renewable energy system within the European Union by 2050. *Renewable and Sustainable Energy Reviews, 146*, 111186. https://doi.org/10.1016/j.rser.2021.111186

REN21. (2022). *Renewables 2022: Global status report*. REN21 Secretariat.

Sachs, J. D. (2015). *The age of sustainable development*. Columbia University Press.

Schwerhoff, G., & Sy, M. (2017). Financing renewable energy in Africa—Key challenge of the Sustainable Development Goals. *Renewable and Sustainable Energy Reviews, 75*, 393–401. https://doi.org/10.1016/j.rser.2016.11.004

Solomon, B. D., & Krishna, K. (2011). The coming sustainable energy transitions: History, strategies, and outlook. *Energy Policy, 39*(11), 7422–7431. https://doi.org/10.1016/j.enpol.2011.09.009

Sustainable Energy for All. (2024). *Nigeria energy transition and investment plan*. https://www.seforall.org/our-work/initiatives-projects/energy-transition-plans/nigeria

Todaro, M. P., & Smith, S. C. (2015). *Economic development* (12th ed.). Pearson.

Twidell, J., & Weir, T. (2015). *Renewable energy resources*. Routledge.

UIA Initiative. (n.d.). *Energy transition: Connotations, mechanisms, and effects*. https://www.uia-initiative.eu/en/

United Cities and Local Governments Asia-Pacific (UCLG ASPAC). (2021). *Good governance: Definition and characteristics*. https://uclg-aspac.org/good-governance-definition-and-characteristics/

United Nations Development Programme (UNDP). (2023). *Human development report 2023/2024*. https://hdr.undp.org/system/files/documents/global-report-document/hdr2023-24reporten.pdf

United Nations Development Programme (UNDP). (n.d.). *What is the sustainable energy transition, and why is it key to tackling climate change?* https://climatepromise.undp.org/news-and-stories/what-sustainable-energy-transition-and-why-it-key-tackling-climate-change

United Nations. (n.d.). *Renewable energy: Powering a safer and prosperous future*. https://www.un.org/en/climatechange/raising-ambition/renewable-energy

Wang, G., Sadiq, M., Bashir, T., Jain, V., Ali, S. A., & Shabbir, M. S. (2022). The dynamic association between different strategies of renewable energy sources and sustainable economic growth under SDGs. *Energy Strategy Reviews*. https://doi.org/10.1016/j.esr.2022.100886

World Bank. (2024). *World development indicators*. https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups

World Bank Group. (2025). *Countries and economies*. https://data.worldbank.org/country