

## CLIMATE CHANGE POLICY, INSECURITY AND ENERGY TRANSITION IN NIGERIA

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### Abstract

*Natural resource management in Nigeria remains a subject of significant sustainability concern. With the growing scarcity of key resources, particularly water, land, and minerals which led to competition that trigger intensifying and, in many instances, fuelling conflict. Although Nigeria has made progress in diversifying its energy sector, the industry remains largely dependent on fossil fuels. This dependence persists despite the country's vast renewable energy potential, including solar, wind, hydro, and biomass resources. Energy continues to serve as a critical pillar of economic growth, industrialization, and societal welfare. Without overlooking the urgency of transitioning to cleaner energy systems, Nigeria has implemented a range of policy instruments, institutional frameworks, and regulatory measures. Nonetheless, the interconnections between climate change, energy transition, and national security remain underexplored. This paper examines these linkages, arguing that climate change both exacerbates existing vulnerabilities and shapes patterns of insecurity and energy development. It further evaluates the opportunities and constraints of renewable energy transition in Nigeria within the broader context of sustainable development.*

### Keywords

Climate Change, Climate Governance, Insecurity, Energy Transition, Sustainable Development, Fossil Fuel Dependence, Energy Poverty, Economic Diversification, National Security, Environmental Degradation, Farmer-Herder Conflict, Niger Delta, Renewable Energy

### Introduction

In the policy discussions there is a tendency to view climate change, energy insecurity and violent conflict as three distinct problems, each to be addressed with a distinct solution. The paper suggests that, in the least, this separation is analytically misleading and it is expensive to implement, at least in Nigeria. The three challenges are interlinked and have the following commonalities: They all stem from resource scarcity, institutional weakness and historical neglect; they reinforce one another, and are not effectively addressed through a piecemeal approach based on sectoral responses.

The climate situation in Nigeria isn't hypothetical. For many years, northern parts of the country have been experiencing the effects of unpredictable rainfalls and desertification. By 2018, Lake Chad had reduced its surface area in the 1960s by about ten per cent, displacing millions of farmers and fishermen in Nigeria, Niger, Cameroon and Chad (Okpara et al., 2015). The southward migration of arid conditions in the Middle Belt has made the seasonal movement of pastoralists' herds too short and has forced the cattle to venture into the farmlands of the sedentary agricultural communities which they consider as their own land. The resulting conflicts seldom get sorted out by talking them out. More than 1,300 people lost their lives in the course of the violence between the herders and the farmers in 2018, which is more than twice the Boko Haram toll in 2018 (Kwaja & Ademola-Adelehin, 2018). In the oil-producing south the Niger Delta has some of the worst environmental damage in the world with decades of oil extraction destroying fishing and farming livelihoods and feeding the grievances which have mobilised armed groups. In parallel with these security issues is a stubborn energy problem, a puzzling one for a big oil producer. On average, Nigeria produces approximately 4,000MW of electricity daily and its population demand is estimated to exceed 30,000MW (Energy Commission of Nigeria, 2022). It is compensated for by private diesel generators (where available). In Nigeria, there is lack of reliable electricity access for over 90 million people (World Bank, 2022). The nation with vast oil reserves and which could, in theory, produce solar energy from the bulk of the nation's land area, 24 hours a day, can't maintain light in hospitals or refrigerate vaccinations at rural clinics.

In 2017, it updated its Nationally Determined Contributions, in 2021, it passed a Climate Change Act and in 2022 it published a national Energy Transition Plan. But structural change is a different matter, and this paper addresses that directly, as those pledges are translated in the structure. The analysis unfolds in six substantive sections: climate governance; the climate insecurity nexus; the structure of the energy sector and how the failures affect its development; recommendations for renewable energy in the conclusion.

### **Climate Change Governance and Policy in Nigeria**

Drought does not necessarily create wars and flood does not necessarily create armed groups. What climate pressures do is reduce the choices open to communities, especially to those that are poor and rural, and have less access to state support, by damaging natural resources and disrupting the seasonal cycles around which their economies are structured. The link between environmental stress and violent conflict is often short. Where there are unresolved historical grievances regarding land, ethnicity or political exclusion, and where state institutions are weak or absent, or are not necessarily trusted to resolve conflict, the transition to violent conflict can occur very quickly. Nigeria is such an example in several of the geopolitical zones.

### **Direct Environmental impacts.**

Dryness, irregular rainfall, and the gradual spread of dryness across the northern part of the country have changed the landscape of much of the country's north. The annual average rainfall has been significantly reduced in the north-eastern states of Borno, Yobe and Adamawa over the last 50 years with the dry season increasing in length and the wet season less predictable (Odjugo, 2010). For communities where food security is entirely based on rain-fed smallholder farming, these are not abstract numbers, but the difference between a successful harvest and a failed one. One focus on which special emphasis should be placed is Lake Chad as a case study and symbol. The lake has reduced in size from some 25,000 km<sup>2</sup> in the 1960s to under 2,500 km<sup>2</sup> in recent years, stripping millions of people in the basin of their economic lifeline. For generations, fishing communities have relied on the resources of the lake, and these communities have been forced to move out of their settlements. As the water table has declined, irrigated agriculture has been abandoned.

These displaced populations are not a vacuum and they go to places already under stress that create additional resource competition. The Nigerian Government itself has attributed the reduction of the lake as a background element in the circumstances that facilitated the rise of Boko Haram in the area around the lake (IPCC, 2022). The academic literature does not agree, and most scientists are hard at work opposing the idea of climate as a major stress on people, and instead are trying to argue for it being just a contributing stress, though the link is still serious enough to be taken into account. The other side of this climate picture is flooding, which is often not the topic of the day in analyses focused on the north, and which is also a subject of less discussion in the south. There are more and more extreme flood events in much of the south and in parts of the Middle Belt. In 2012, the flooding was the worst in decades, displacing more than two million Nigerians and resulting in significant harm to agriculture. Rising sea levels and increasing coastal erosion are slowly eroding away land from longstanding communities in coastal regions, threatening to take away what they have gained over generations of farming and habitation. The Niger Delta, already one of the most environmentally degraded areas of the world as a result of oil production, is also vulnerable to these coastal changes, causing additional stress. Indirect and Cascading Effects.

### **Indirect and Cascading Effects.**

In addition to the physical impacts, climate stress triggers cascades of social and economic disruption, which although more difficult to identify, can be just as significant for security. The Nigerian farmer-herder conflict is most pronounced. The drying of the Sahel has forced Fulani pastoralists deeper south than usual onto their migratory routes, placing their cattle in farming areas of Benue, Plateau, Nasarawa and Kaduna state, where farming communities either have written or customary rights to land and are less tolerant of crops being damaged. The conflict over land, water and livestock has proved very lethal. Rather than the result of climate change, these conflicts are not new and the result of decades of poor land administration, the breakdown of traditional dispute resolution structures, deliberate politicisation of ethnic and religious identities, and the growing availability of small arms. However, the loss of productive land and disturbances to established grazing corridors are tangible drivers and increase existing tensions significantly.

Security is also part of the economic ramifications from climate change-driven disruption. If harvests are lost or interrupted by conflict, prices of food go up, household incomes go down and the opportunity cost of joining an armed group goes down. These youths who could otherwise get jobs in the farms or small businesses are recruited by violent groups, such as Boko Haram in the northeast, bandits in the northwest and militant groups in the Niger Delta. The relationship is not one-to-one and it wouldn't make sense to equate any young man living in a climate stressed region as a potential recruit. However, there is empirical support from a number of cross-national studies that suggest that livelihood collapse, which is often associated with environmental degradation, increases the risk of conflict in settings where other structural factors are also in place (Hsiang, Burke, & Miguel, 2013). A health consequence is added, too. The incidence of malnutrition increases as agricultural production decreases. There are diseases that are transmitted via water after a flood. The transmission of malaria varies throughout the country because of variations in temperatures and humidity. They place a strain on household budgets and on already

constrained public services, depriving them of funds they could be spending on development or security services. These cumulative pressures can be overwhelming for communities experiencing both violence and displacement and an adverse health environment.

### **Nigeria's Energy Sector: Structure and Development Challenges**

country is a large producer and exporter of crude oil and natural gas but has been unable to keep the lights on for its own people. The installed generating capacity of about 13,000 MW, however, can rarely exceed 4,000MW to 5,000MW on a daily basis due to the poor transmission network as well as the weakness of the natural gas supply to thermal power plants (Energy Commission of Nigeria, 2022). This is a huge shortfall against the conservatively estimated national demand of more than 30,000 MW. Private generators are used in factories and cost a lot. Hospitals are powered by diesel. There are frequent breakdowns in food and medicine cold chains. According to the World Bank (2022), the losses attributable to power shortages to Nigerian businesses are estimated at the cost of 2 to 5 per cent of annual profits, which has implications for jobs and investment. Energy poverty is worse in rural areas. Nigerian is among the largest contributors to the global energy access deficit, with about 90 million people having no access to electricity. This is not an even distribution of numbers throughout the country. The communities that are most under-served are also the most vulnerable to climate stress and affected by insecurity, and those are the communities in the rural northeast, northwest and Middle Belt regions. Access to a reliable electricity supply is not just a matter of comfort, it also makes it difficult to obtain information, store food and medicines under temperature control, run a business, and provide youth with an investment opportunity that enables them to be meaningfully engaged in the stability of their community. Nigeria, by contrast, has a very rich renewable energy endowment. Average solar irradiation levels throughout the country range from 3.5 to 7.0 kWh/m<sup>2</sup> per day with the highest levels in the north which happens to be the least well served part of the country. The theoretical PV potential has been estimated up to 427GW of installed capacity (Ohunakin et al., 2014). The wind energy potential is limited to Jos Plateau and northeastern highlands, and is thus commercially viable in some locations. The Niger and Benue river systems are already the sites of several hydroelectric power plants, and there is significant remaining potential in the country. The agricultural residue of rice, cassava, sugarcane and other crops is a distributed biomass source that is largely underutilized for energy applications. But, all this suggests is that the Nigerian energy policy has been slow to fully internalise the following conclusion: the energy poverty of the country is not essentially a resource problem. Resources are readily available. The issue is how to govern and invest in these resources to generate delivered power, and that governance/investment system has been faulty for many decades.

### **Renewable Energy Prospects and Transition Pathways**

Nigeria's binding renewable energy commitments have become more specific over time. The new NDCs call for renewables to account for 30 per cent of the nation's electricity generation by 2030, pledge to cut gas flaring, and boost energy efficiency of industry and transport. The 2022 Energy Transition Plan is more detailed, mapping a sector-by-sector decarbonisation pathway to net-zero by 2060 with identified policy and investment milestones at each stage. The International Renewable Energy Agency has projected that under favourable policy and financing conditions, renewable sources could account for a substantial share of Nigeria's electricity generation by 2040 (IRENA, 2021). Whether those conditions materialise is, of course, the central question.

The economic case for the transition has strengthened considerably as technology costs have fallen. The price of solar photovoltaic panels dropped by more than 80 per cent between 2010 and 2020, making distributed solar systems increasingly competitive with diesel generation even before accounting for the health and environmental costs of diesel combustion. For rural and peri-urban communities currently unconnected to the national grid, off-grid and mini-grid solar is often the fastest and cheapest path to energy access and faster, in many cases, than extending the national transmission network, which would require decades of capital investment and land acquisition. Several Nigerian states, including Lagos, Ogun, and Kano, have piloted solar mini-grid programmes with encouraging early results, though scaling these from pilots to a national solution has proved difficult.

The security argument for a distributed renewable energy system deserves more prominence than it typically receives in policy discussions. A decentralised network of solar mini grids and off-grid installations is inherently more resilient than a centralised grid that can be disrupted by a single attack on a transmission line or a gas supply interruption. For communities in conflict-affected areas of the northeast and northwest, where grid infrastructure has been repeatedly damaged by armed groups and where the state's physical presence is limited, off-grid renewable energy may be the only realistic path to energy access in the near to medium term. ECOWAS has recognised the security-energy access linkage in its regional frameworks, and Nigeria has both the scale and the institutional capacity to lead on this within the region. The transition also holds economic diversification potential that extends well beyond electricity supply. Manufacturing solar components, installing and maintaining

distributed energy systems, producing biofuels from agricultural residues, and training the engineers, electricians, and technicians a scaling sector requires are all labour-intensive activities that could generate employment across the country, including in the underserved regions where both energy poverty and insecurity are most concentrated. For a country facing high youth unemployment and a rapidly growing working-age population, a deliberately labour-intensive renewable energy expansion could serve objectives that security and social policy have been pursuing, with limited success, through other means.

### **Energy access and sustainable development.**

So much has been written on the comparative study of the Bible, that it need not be repeated here. In the last century, countries with high levels of economic growth over a short period of time have done so in tandem with and, in part, due to the significant increases in energy infrastructure and requires reliable electricity for productive Access to reliable electricity is a precondition for productive industrial activity, for health services that depend on refrigeration and powered equipment, for schools that can run evening programmes, and for the financial and information connectivity that allows rural producers to participate in broader markets. SDG 7 ensures easy access to affordable, reliable, sustainable, and modern energy for all. There is a potential alignment between expanding energy access and decarbonising the supply mix that Nigerian policy has not yet fully seized. The cheapest and fastest path to rural electrification in many parts of the country is off-grid solar, which happens also to carry a negligible carbon footprint. Meeting SDG 7 in Nigeria does not, on these terms, require a trade off against climate goals that can be designed to advance both at once. The complication arises in the urban and industrial energy sectors, where demand is high, where natural gas has historically been the dominant fuel, and where a rapid shift to renewables requires large-scale infrastructure investment and a resolution of the tariff reform question that has stalled the sector for years.

Gender equity is another dimension of energy and development that receives insufficient attention in Nigerian policy discussions. Women and girls in rural areas bear a disproportionate share of energy poverty, spending significant time collecting firewood and cooking over open fires that damage respiratory health over years of exposure. Access to clean cooking energy through improved cookstoves or cleaner cooking fuels would free up time for education and income generating work, reduce long-term health costs, and contribute to lower household-level emissions. Nigeria's NDCs acknowledge this connection in principle; the challenge lies in translating that acknowledgment into delivered programmes at the scale the population requires.

### **Obstacles to Renewable Energy Development**

Nigeria's renewable energy potential does not explain itself. The barriers to developing it are real, have been documented repeatedly, and tend to compound each other in ways that make simple solutions unlikely.

#### **Financial and investment constraints.**

High interest rates and a short loan term typical of commercial banks, which are shorter than the payback period of energy infrastructure, limit commercial bank financing. Foreign investment has expressed interest, but often never got past currency risk and regulatory uncertainty, with a number of projects dropping off at the end of development

#### **Technological and capacity gaps.**

Large-scale renewable energy investment requires long-term capital at manageable cost. Attracting such capital to Nigeria has historically been difficult. The electricity sector operates under a cost-reflective tariff problem: electricity has been priced below its actual cost of delivery for years as an implicit political subsidy, which means that project developers cannot generate the revenue streams needed to service debt on capital-intensive installations. Attempts at tariff reform have been politically contentious, this is because electricity subsidies disproportionately benefit urban consumers connected to the grid, and governments have been reluctant to remove them. The costs of solar panels, mini-grid management systems, wind turbine components, and inverters used in Nigeria are higher than those of other parts of the region due to high importation cost, vulnerability in the value chain and lower value added per installed project compared to other parts of the region. Training for domestic engineers and technicians has not been able to meet the needs of a modern energy transition. There are graduates in electrical engineering in universities and polytechnics but the courses offering specialization in renewable energy system design, installation and maintenance are very few. This skills gap is a factor that even projects financially approved and successful have to contend with delays and inconsistencies in implementation.

#### **Institutional and Regulatory Fragmentation**

The energy regulatory framework has undergone a series of changes since the Electric Power Sector Reform Act of 2005, but the challenge is the fragmentation of the framework which is a major operating issue in the country. The Nigerian Electricity Regulatory Commission (NERC) determines tariffs and licenses operators, but its rulings are often contested in court and are sometimes not implemented due to political interference. The Rural

Electrification Agency's effectiveness has increased in recent years, but it is under-resourced in comparison to its mandate. The issues of overlapping jurisdictions between NERC, REA, MOP, State electricity agencies and MOPR cause bottlenecks in approvals and legal uncertainties for any developer seeking to undertake a project and increase the transaction cost. One of the most important requirements that investors must have when dealing with complex structures is certainty, which has not been reliably achieved in Nigeria

#### **Infrastructure deficits**

Also, even if electricity can be made, transmission is a separate problem that must be solved. Nigeria's national grid is indicated on maps covering most of the country but does not actually work across vast areas for a number of reasons: it is often faulty, its transmission lines are frequently overloaded, and its substations have not been substantially improved for decades. Following the 2013 sector reform, distribution companies have had difficulties in investing in network upgrades due to insufficient working capital because of the low tariff revenues. In the case of large-scale renewable schemes which need to be connected to the grid, the state of the transmission infrastructure is a real challenge. Partly this limitation can be overcome by mini-grid and off-grid solutions, but these solutions cannot be used without the national grid over long periods.

#### **Research and innovation deficits**

The level of energy research and development investment in Nigeria is a relatively low one. Development of technologies adapted specifically to the Nigerian environment is also underdeveloped, such as PV systems optimised for the local climate, biomass conversion processes adapted to locally available agricultural residues, and low-cost wind turbines adapted to the wind regime in Nigeria. If the country does not have a robust domestic research base, it will continue to rely on technologies developed for other markets that many of them have cost structures and performance assumptions that are not easily transferable to Nigeria. The academic and research institutions that can do this work are available in Nigeria, but require multi-year funding and tight linkage with the energy sector.

#### **Conclusion and Policy Recommendations**

This paper is primarily structural in nature. Nigeria's vulnerability to climate change is not an issue that can be addressed in isolation from its security issues and energy crisis. They have similar drivers: resource dependence, fragility of institutions, long-term underinvestment in rural infrastructure and public services; and they work in combination. A much-needed renewable energy transition when pursued intentionally and with momentum is going to solve all three: it will lower the price volatility of fossil fuels; it will bring energy infrastructure to remote areas that have long been neglected and that are ripe for insecurity; and it will give young people and the unemployed who currently recruit into armed groups an economic diversification pathway. In this context, the case for a more rapid transition is as much a security as an environmental issue. The policy guidance below outlines some policy areas where action is possible and would yield positive results.

Federal and state level institutions for climate governance must be significantly beefed up. While the Climate Change Act is a good piece of legislation, the secretariat set up to implement it must be adequately financed and be staffed with qualified personnel, not with an organisational chart. The governments need to be truly involved in the national climate system through technical assistance, dedicated budget lines and mechanisms of accountability that provide them with the power and motivation to take action. Fragmentation has been a major obstacle to the implementation of policies; an inter-ministerial coordination body with a clear mandate and regular reporting could help overcome this constraint.

Investment in renewable energy must increase and that means it's time to address the tariff reform issue squarely. It is impossible to secure private investment where electricity is permanently sold at a loss over and above the cost of delivery. Overall, the present system is not economically rational or fiscally sustainable; a new transition subsidy system based on income, but not on price, would be more so. De-risking measures, such as government guarantees, currency hedging facilities and first-loss financing mechanisms, can lower the effective cost of capital for renewable energy developers without an equivalent public funding. Strategic priorities should be given for local production and technical training in the field of renewable energy. Nigeria possesses the manpower, the manufacturing capabilities and the skill base to build the solar components, assemble mini-grid systems and to train the electricians and engineers needed for the scaling sector.

All of this could be accelerated by policy measures to support domestic manufacturing, technology transfer provisions in foreign investment agreement, and more universities and technical colleges offering courses in renewable energy. The jobs that would be generated by the intentional development of an industry in the local area would have positive spill over effects on the security situation of areas where youth unemployment is highest. More research and development investment should be provided. It does not involve a huge amount of money as compared to the problem at hand, but continuous funding over the years for universities and research institutes

that are doing research on energy technologies that are appropriate for Nigeria. The federal government should think of setting up dedicated energy research centres in some of the universities in collaboration with the state governments, and include and mandate them to work on applied problems such as system design (off-grid), biomass conversion, management of mini-grids, etc. rather than theoretical problems.

Last but not least, Nigeria needs to seek international climate funding more operationally than it has done before. The Nation's Energy Transition Plan is not a plan that can be funded domestically; the USD 410 billion required is just not an amount that can be obtained on the domestic capital markets. Engagement with the Green Climate Fund, bilateral climate cooperation agreements with major economies and energy cooperation frameworks at the ECOWAS level may provide some external resources. Nigeria's power on the African continent dictates its negotiating position in international climate discussions, which smaller countries lack, and which should be put to greater use than it is being utilised in recent years. All of this is not easy. Nigeria's political economy, which is founded on oil revenues, is affected by distributional conflicts between the regions, and policy commitments are not rigorously enforced, making it difficult to engage in sustained, coherent action as is required by these recommendations. But the price of inaction continues to build, also in a way that is no longer exclusively future-oriented. The communities facing farmer-herder conflict, lacking electricity and plagued by poor physical conditions are not waiting for academic consensus. That window of opportunity to do something that could prevent the worst outcomes is there but it's not infinite.

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