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Management Strategies for Net-Zero Emissions for Nigeria's Sub-National Level

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Abstract
Achieving net-zero emissions at the Nigeria's subnational levels begins with the adoption of Nigeria's commitment at the UNFCCC COP 21 and COP 26 which translate into the Nationally Determined Contributions towards a global temperature increase below 20C, and Carbon Neutrality by 2060. Given that the Climate Change Act (2021) and Energy Transition Plan are in place, the gap is clearly viewed in terms of implementation strategies. The sub-national regions require an intricate balance of innovative management strategies tailored to their individually unique local contexts. This paper explores the multifaceted improvement in energy efficiency, reforestation initiatives, and the promotion of smart, sustainable mining activities, regenerative and sustainable agricultural practices. Integrating these strategies involves enhancing policy frameworks, leveraging technology, and promoting inclusivity through community enlightenment, education, awareness creation and engagement. In addition, the study emphasises multi-stakeholder collaboration between government, private sector, and civil society as an essential pathway to ensuring effective and measurable implementation and scalability. By adopting and revising the comprehensive management strategies proposed by this study, Nigeria's sub-national entities approach necessary to address the diverse economic, environmental, and social landscapes that must be considered as key strategies for nationwide net-zero attainment. These include the adoption of renewable energy sources, can significantly contribute to the national goal of achieving net-zero emissions, while also fostering economic development (through innovation and adaptation) and building resilience to the impacts driven by climate change.
Keywords: management strategies, Net-zero emissions, energy transmission,

1. Introduction

The scientific community has made significant advancements in differentiating between natural and manmade influences on climate. While there are still limitations and ambiguities in accurately measuring the impact of human activities on climate change, data strongly indicates that there is a noticeable human influence on the Earth's overall climate. The atmosphere's composition and structure have been altered as a consequence of the discharge of large quantities of gases and aerosol particles caused by anthropogenic activity. Air and water pollution is caused by the release of gases, smoke, and residues from various sources, including cities, farms, and industrial complexes. These sources include activities like tree burning, deforestation, and the overuse of fertilisers. The process of deforestation and overgrazing has resulted in soil erosion and significant alterations in the surface albedo, which in turn affects the radiation and moisture balances in the immediate vicinity of the surface. Ultimately, this leads to the phenomenon of

desertification. Significant worldwide changes are anticipated to occur when human activities cause substantial physical and chemical alterations to the environment.

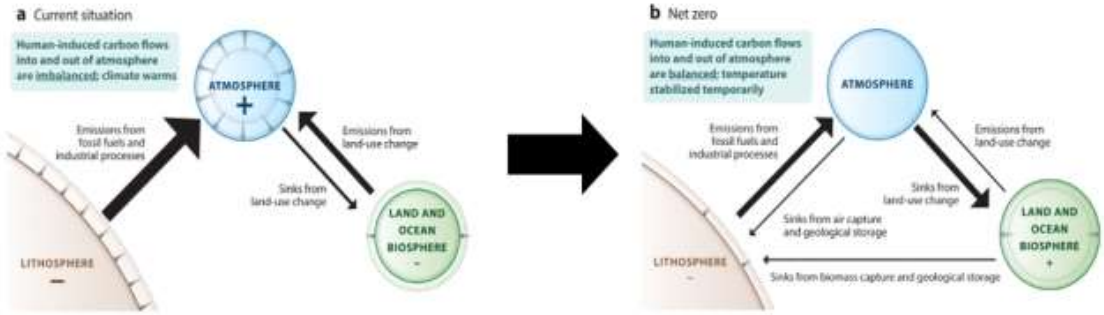

Figure 1: Simulation of current global emission situation & net-zero proposition

The financial and economic concerns associated with climate change, as well as the essential steps to address it, are easily observable. It is imperative to expedite the advancement towards a global economy that emits zero net greenhouse gases in order to curb global warming to 1.5°C, which is considered the safe limit by the Intergovernmental Panel on Climate Change (IPCC). This threshold has been supported by the worldwide scientific community and is also endorsed by the Paris Agreement of 2015. Up to this point, almost 150 countries have declared their intentions to attain net-zero emissions, along with several regions, towns, and enterprises. Nevertheless, even if the commitments made today are fully executed, there is a disparity in emissions that has to be addressed in order to align with the target of limiting global warming to 1.5°C and meet our collective objectives. In order to reach the goal of limiting global warming to 1.5°C, it is imperative to take decisive measures to strengthen and implement commitments to achieve net-zero emissions. The change will introduce novel risks and uncertainties that must be meticulously handled. The issues encompassed in this statement include concerns about energy security, potential risks associated with new and unstable supply chains, the influence of transition policies and regulations on credit risk and future asset values, as well as technology risks and corporate liability risks (UNFCCC, 2023).

In order to achieve decarbonisation in economies while simultaneously meeting the social and economic requirements of countries, businesses in all industrial sectors must seek out and allocate resources to alternative technological solutions and business practices that reduce their greenhouse gas emissions. Additionally, consumers must widely adopt these resulting new solutions. Achieving such a large-scale industrial transition will necessitate substantial investment in the next two to three decades. This investment will necessitate unparalleled collaboration between public sector finance and private sector finance. Government policy plays a crucial role in shaping the transition in a country or the global economy, influencing factors such as the shape, speed, and overall costs. Additionally, government policy has the potential to drive innovation and investment. Tackling climate change will be a challenging task, but the consequences of not taking action and the potential for positive change are substantial. In 2021, Nigeria presented revised Nationally Determined Contributions (NDCs) to the United Nations Climate Change Framework Convention on Climate Change (UNFCCC) in order to fulfil its pledge to limit global warming to below 2°C. The revised Nationally Determined Contributions (NDCs) of Nigeria have expanded their objectives to encompass the waste and water resources sectors. Additionally, they now incorporate nature-based solutions that were previously omitted in the 2015 NDCs. These updates were documented by the Federal Ministry of Environment in 2021a, 2021b, and 2021c, as well as by the Nigeria Economic Summit Group in 2024. Nigeria declared its pledge to achieve carbon neutrality by the year 2060 during the UNFCCC Conference of Parties (COP) 26 held in Scotland in 2021. The genesis of Nigeria's Energy Transition Plan (ETP) was a result of the development of a comprehensive strategy that is data-driven and

home-grown. In order to reach zero emissions, the country's energy production systems and consumption patterns need to be transformed, and the ETP offers a roadmap for that. The Plan lays out a detailed framework and timetable for cutting emissions in five important areas: electricity, food preparation, transportation, and industry. This will be accomplished by utilising gas as a transitional fuel. Nigeria may achieve a substantial reduction in greenhouse gas emissions, as well as create employment opportunities and enhance energy security, by raising the proportion of renewable energy sources to a minimum of 40% by 2030 and 80% by 2050.

Nigeria's global obligations necessitate the development of a corresponding local action plan to accomplish the targets outlined in the updated Nationally Determined Contributions (NDCs) and carbon neutrality declaration. The ETP necessitates an expanded implementation strategy and comprehensive coverage across all 36 States of the Federation and the FCT, encompassing all 5 main sectors outlined in the plan. Hence, the primary goals of this study are to formulate a series of actions and strategies to be implemented at the regional level in order to fulfil the obligations of achieving carbon neutrality by 2060 and actively contribute to Nigeria's revised Nationally Determined Contributions (NDCs). The objective is to integrate and customise global climate change measures to fit the specific conditions and requirements of Nigeria, including its sub-national regions.

1. The Imperatives of Net-zero

The undeniable scientific evidence and urgent circumstances of the climate catastrophe necessitate robust measures at both national and international scales to avert the most severe repercussions of climate change. By ratifying the Paris Agreement (UNFCCC, 2016), 196 countries made a legally binding commitment to restrict global warming to below 2°C and make every possible effort to keep it below 1.5°C. In order to keep global warming below 1.5°C, the urgent need for drastic and long-term cuts in emissions of greenhouse gases was officially acknowledged at COP 26, when the Glasgow Pact was established. The goal is to achieve net-zero emissions by around the middle of the century and a 45 percent drop in global carbon dioxide emissions from 2010 levels by 2030. Therefore, this officially includes the goal and language of attaining a state where emissions are completely offset by 2050.

The discussion on net-zero emission furthered during the COP 28 in Dubai-UAE where the “Loss and Damage Agreement” was reached, allowing rich nations to reward poor nations for harm caused by climate change, addressing the impacts of global warming on vulnerable nations. Overall, COP 28 marked significant progress in addressing climate change, with key initiatives focusing on accelerating the transition to sustainable energy sources, reducing greenhouse gas emissions, and addressing the challenges faced by countries affected by climate change. Nigeria participated actively at the COP-28 event with the aim of strengthening national commitment to attaining its NDCs to the 2015 Paris Agreement and the subsequently updated versions.

It is also instructive to note that there are actually social and economic benefits that Nigeria, at the local, State and National levels, can expect from adopting the transformations leading up to carbon neutrality. According to Fazekas et al., (2022), “reducing the use of fossil fuels equals less polluted cities and communities, bringing positive health impacts. Public transit can save billions of dollars’ worth of time currently wasted in congestion. Renewable energy, which is the cheapest form of electricity in the world, can deliver lower and more stable prices for customers and businesses. Forest and mangrove conservation comes with ecosystem benefits. And a circular economy can improve the competitiveness of industrial firms”.

2. An Overview of Nigeria’s Nationally Determined Contributions (NDCs)

The Paris Agreement is a treaty under the UNFCCC that addresses the reduction of greenhouse gas emissions, adaptation to climate change, and financial support. It was agreed upon by 195 countries on

December 12, 2015, in Paris, France. The agreement was opened for signatories on April 22, 2016 (Earth Day) in New York and officially came into effect on November 4, 2016.The central aim of the Paris Agreement is to "strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius, recognizing that this would substantially reduce the risks and impacts of climate change".

Furthermore, the agreement seeks to enhance the capacity of countries (Parties) to:

- address the consequences of climate change;
- Ensure that financial resources are directed towards activities that have low greenhouse gas (GHG) emissions and are robust to climate change.
- exert their utmost efforts through Nationally Determined Contributions (NDCs); and,
- regularly disclose their emissions and implementation endeavours.

The Agreement stipulated a periodic evaluation every 5 years to gauge the overall advancement towards the agreement's objective and to guide subsequent measures taken by participating parties. In order to achieve these lofty aims, it is necessary to fulfil the following objectives:

The key components include the mobilisation and allocation of financial resources, the establishment of a new technology framework and the strengthening of capacity-building efforts. Additionally, developing countries and the most vulnerable nations are expected to create their own action plans aligned with their national objectives. Lastly, there will be an improved transparency framework to monitor and support these actions.

Nigeria, as a participant in the Paris Agreement, has outlined the following specific goals in its Nationally Determined Contributions (NDCs):

- Eliminating gas flaring by 2030
- Achieving a capacity of 13GW (13,000MW) through off-grid solar PV
- Effecting efficient gas generators
- Attaining a yearly energy efficiency improvement of 2% (with a target of 30% by 2030)
- Promoting a shift from car usage to bus mass transit for transportation
- Enhancing the electricity grid
- Implementing climate smart agriculture and reforestation.

Figure 2: Nigeria's NDCs to UNFCCC's COP 21 Agreement

Nigeria is dedicated to decreasing greenhouse gas emissions by 20% without any conditions and by 45% with international assistance. The country has completed the development and finalisation of the Sectoral Action Plan (SAP) to implement the Nationally Determined Contributions (NDC) in the important sectors of Energy, Oil & Gas, Agriculture & Land use, Power, and Transport. This information is visually represented in Figure 3. Developing an environmental guidance framework for the proposed project would require the active integration of risk assessment measures that incorporate Nigeria's NDC into the COP 21 Paris Agreement in the relevant areas of energy usage and emissions reductions, especially given the scale of the proposed facility, which is expected to serve Nigeria and other African countries.

3. Nigeria's Energy Transition Plan (ETP)

Nigeria declared its pledge to achieve carbon neutrality by 2060 during the COP 26 conference. Afterwards, the ETP was revealed, emphasising the magnitude of the endeavour needed to attain the 2060 net-zero objective while simultaneously fulfilling the country's energy requirements. In order to bring this into effect, the Climate Change Act of 2021 was enacted, the Federal Government has given full approval to the Energy Transition Plan (ETP), and a working group called the Energy Transition Implementation Working Group (ETWG) was established, with the backing of an Energy Transition Office (ETO). The formation of the National Council on Climate Change (NCCC), led by the President and managed by a Director-General, has significantly progressed the necessary mechanisms for implementing the ETP and achieving net-zero. Nigeria's ETP is a domestically developed strategy that relies on data and encompasses multiple approaches. The primary goal is to attain a state where the country's energy use results in no net emissions. The strategy provides a clear plan and structure for decreasing emissions in five key sectors: Power, Cooking, Oil and Gas, Transport, and Industry. These sectors combined account for almost 65% of Nigeria's emissions as outlined in the policy.

The ETP focuses on the following key objectives:

- Elevating 100 million Nigerians from poverty and stimulating economic growth;
- Providing modern energy services to the entire population;
- Effectively handling the anticipated decline in employment opportunities in the oil sector caused by the decreasing global demand for fossil fuels;
- Taking a leading role in Africa by advocating for a just, all-encompassing, and equitable energy transition on the continent, which includes the utilisation of gas as a transitionary fuel.
- Simplifying current and upcoming government initiatives related to energy transition.

Figure 3: The Nigeria Energy Transition targets a net-zero environment by 2060
(Source: FGN, 2021a)

Nigeria's plan to achieve net-zero emissions will lead to substantial job growth, with an estimated 340,000 jobs created by 2030 and up to 840,000 jobs produced by 2060. This growth will mostly be driven by the Power, Cooking, and Transport sectors, as seen in Figure 4 (FGN, 2021a). Petrol will be crucial in Nigeria's journey towards achieving net-zero emissions, serving as a transitional fuel, especially in the Power and Cooking sectors. Nigeria's shift towards alternative energy sources presents lucrative investment prospects, including the development and growth of sectors associated with solar energy, hydrogen, and electric cars.

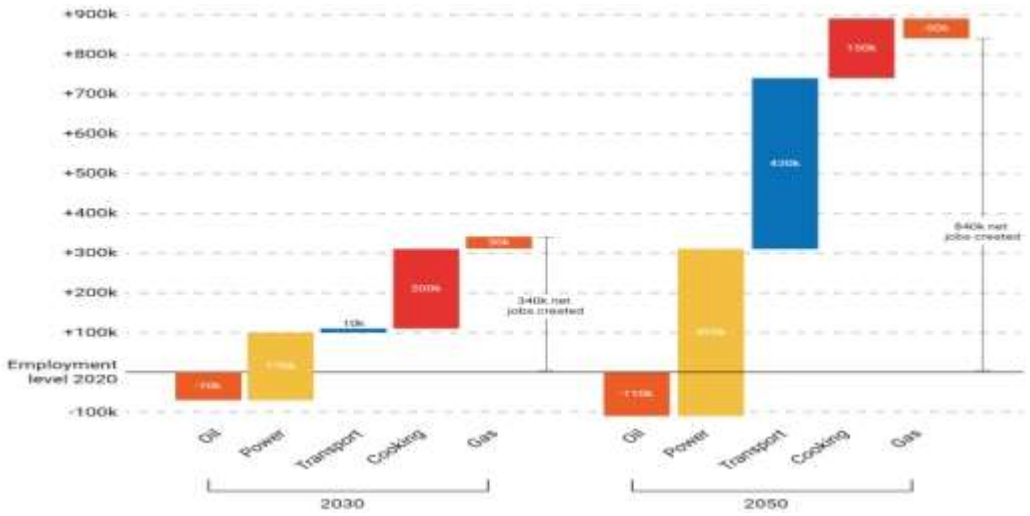

Figure 4: Net job creation per sector under Nigeria's net-zero scenarios for 2030 and 2060 (Source: FGN, 2021a)

Nigeria needs a total of $1.9 trillion in financial terms to achieve net-zero emissions by 2060. This amount includes an additional $410 billion beyond the estimated typical spending. The supplementary expense amounts to approximately $10 billion per year, as stated by the FGN (2021a), and is projected to persist throughout the following decades.

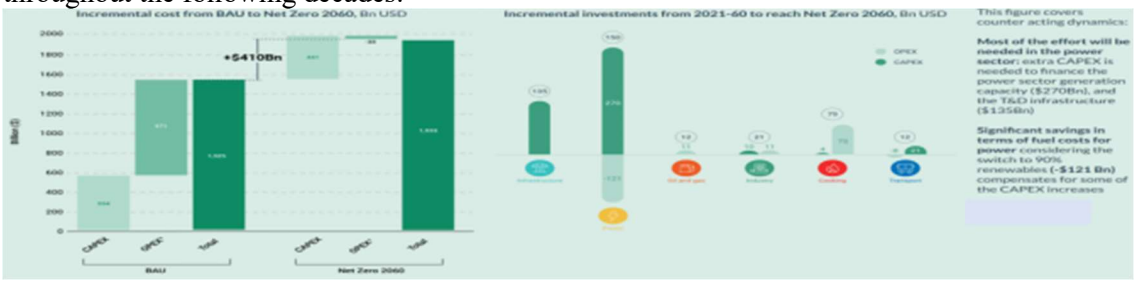

Figure 5: a) Incremental cost from BAU to Net-zero 2060; **b)** Incremental investments from 2021-2060 (Source: FGN, 2021a)

4. Strategies for the Management of Net-Zero Emissions Target for Nigerian States

The administration of a net-zero emissions goal often entails a comprehensive approach focused on diminishing greenhouse gas emissions to a point where they are counterbalanced by carbon removal or offsetting actions. The research presents a comprehensive approach in Table 1 below, which outlines the strategic framework for managing Nigeria's net-zero aim in all 36 States and the FCT.

Table 1: Elements of Net-zero Target Setting for Nigerian States

Table 2: Strategic Framework for Net-zero Target for Nigerian States

Steps	Activities/Actions	Expected Outcome	Affected Sectors	Responsibility of	Target Date
GOALS • Elevating a minimum of 50% of the State's population from poverty and stimulating economic expansion; • Ensuring universal access to contemporary energy services for the entire State's population; • Effectively handling the anticipated enduring employment reduction in sectors impacted by the implementation of net-zero projects. Goals are in line with Nigeria's ETP	• Develop legal framework & policies, create institutional structures and systems for net-zero programmes' implementation; • Development of alternative energy sources including relevant infrastructure like energy-efficient buildings, efficient public transport systems, etc.; • Create enabling environment to pull investments into the State; • Conduct massive education (Skill-based & Technical) drive for youthful population; • Create a revolving fund to support MSMEs in the State;	• At least 50% of State's population to become self-sufficient and have improved livelihoods; • Full adoption of renewable energy sources such as Solar PV; • Aggressive diversification of the State's economy towards secondary, tertiary & quaternary economic activities	Multi-sectoral with focus on: • Energy, • Water Resources, • Agriculture, • Forestry, • Mining	• States Government & all relevant MDAs; • Businesses; • Communities; • CSOs; • Multi-lateral funding Agencies	2060

SECTORAL APPROACH	Tailor strategies to different industries and sectors on the basis of their contribution to emissions in the State	Sector-specific targets to be achieved through relevant, laid down strategies	Multi-sectoral	States Government	2060
REGULATORY MEASURES	Implement emissions limits, carbon pricing mechanisms (such as carbon taxes or cap-and-trade systems), and strict environmental regulations for industry.	The implement of these regulations will limit GHG emissions across sectors	Multi-sectoral	States Government; Relevant MDAs	2060
INCENTIVE PROGRAMMES	Commence the process of designing & developing subsidies for renewable energy projects, tax credits for energy-efficient technologies, etc.	These incentives would help reduce emissions voluntarily	Multi-sectoral	• States Government; • Relevant MDAs; • CSOs; • International Donor Agencies; • Multi-lateral Funding Organisations	2060
RESEARCH & INNOVATION	Begin funding for clean energy & low-carbon research, technology demonstration projects, and innovation competitions	Serve as a support for research & development efforts targeting advancing low-carbon technologies and practices	Multi-sectoral	• States Government; • Relevant MDAs; • Institutions of Learning (Universities & Polytechnics, etc.); • International Donor Agencies; • Multi-lateral Funding Organisations	2060
INTERNATIONAL COOPERATION	Begin to domesticate International Climate Agreements to which Nigeria is signatory (e.g. Paris Agreement, Net-zero, Sendai Disaster Management Framework, SDGs, etc.)	Capacity to share best practices and technology with other States & nations	Multi-sectoral	• International Donor Agencies; • Multi-lateral Funding Organisations	2060
CARBON REMOVAL & OFFSETTING	Begin afforestation, reforestation, and investment in carbon capture and storage technologies across the	Removal of carbon dioxide from the atmosphere & off-setting emissions	Multi-sectoral	• States Government; • Relevant MDAs;	2060

	State			• Institutions of Learning (Universities & Polytechnics, etc.); • International Donor Agencies; • Multi-lateral Funding Organisations	
COMMUNITY ENGAGEMENT & EDUCATION	Engage with communities & stakeholders to build awareness of the importance of reducing emissions & garner support for policy measures	These campaigns will empower individuals to take action in their own lives and communities	Multi-sectoral	• States Government; • Relevant MDAs; • Institutions of Learning (Universities & Polytechnics, etc.); • International Donor Agencies; • Multi-lateral Funding Organisations	2060
ADAPTATION MEASURES	Investing in resilient infrastructure & promotion of sustainable land management practices	Measures will promote adaptation to impacts of climate change	Multi-sectoral	• States Government; • Relevant MDAs; • Institutions of Learning (Universities & Polytechnics, etc.); • International Donor Agencies; • Multi-lateral Funding Organisations	2060
EQUITY AND JUST TRANSITION	Establish mechanisms to monitor progress towards emissions reduction targets and report transparently on results	Promotion of equity and social justice considerations in policies & programmes	Multi-sectoral	• States Government; • Relevant MDAs;	2060
MONITORING, EVALUATION & LEARNING	Establish mechanisms to monitor progress towards emissions reduction targets and report transparently on results.	Regular monitoring allows for adjustments to policies and strategies based on performance.	Multi-sectoral	• States Government; • Relevant MDAs; • Institutions of Learning	2060

				(Universities & Polytechnics, etc.); • International Donor Agencies; • Multi-lateral Funding Organisations	

By implementing the comprehensive policy framework in Table 2 above, States will begin the long but necessary walk of effectively managing a net-zero emissions target by contributing to meeting Nigeria's NDCs and ETP, while also backing to the global efforts to combat climate change.

5. Conclusion

The occurrence of desertification in the northern region, floods in the central areas, pollution and erosion along the coast, and the subsequent socio-economic ramifications all demonstrate the undeniable and severe consequences of climate change in Nigeria. Hence, it is imperative to promptly implement resolute actions to alleviate the impacts of climate change. Nigeria's goal of achieving net-zero emissions involves reaching a state of balance between the amount of greenhouse gases emitted into the atmosphere and the amount that is removed from it. This can be accomplished either by directly reducing emissions or by compensating for them through activities like carbon capture and storage or reforestation. Essentially, the aim is to achieve a state where any remaining emissions are balanced by equivalent removals, resulting in no additional contribution to global warming. This target is crucial in combating climate change and limiting the rise in global temperatures to mitigate its adverse effects.

Nigeria made three significant commitments at the COP 26 conference. Firstly, Nigeria pledged to achieve net-zero emissions by 2060. Secondly, Nigeria joined more than 100 countries in committing to decrease global methane emissions by at slightest 30% from 2020 levels by 2030. Lastly, Nigeria was one of the 141 countries that agreed to conserve and restore forests over the next decade, as stated in the Glasgow leaders' declaration on forests and land use. This study makes a case for inclusion of sub-nationals in attaining these commitments. The study therefore, seeks to integrate all commitments made by Nigeria at different international climate fora including the SDGs (2015 – 2030), Paris Agreement of 2015, Net-zero Emissions Target (2021 – 2060), among others. This study acknowledges the importance, as stated by the National Economic Summit Group (2024), of consolidating several policies into a small number of practical and straightforward ones. This approach aims to prevent complications and unnecessary repetitions that may impede a seamless transition to a net-zero state.

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