MITIGATION OF CLIMATE CHANGE IN NIGERIA AND AFRICA: A DEVELOPMENT-FIRST APPROACH TO EMISSIONS REDUCTION

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Climate mitigation, Nigeria, Africa, Energy Transition, Development, Climate Finance, NDCs

Abstract

Research Problem: *Africa contributes only 4% to global greenhouse gas emissions, yet bears a disproportionate impact of climate change while still grappling with energy deficits, food insecurity, and poverty. Conventional mitigation frameworks that prioritize emissions cuts over development are neither politically viable nor effective for Nigeria and the wider African continent.*
Methods/Theory: *This paper adopts a qualitative case study approach with Nigeria as the primary case. It analyzes Nigeria's Energy Transition Plan, emissions profile, and developmental needs using policy documents, international assessments, and scholarly literature. The analysis is framed around a "Development-First Approach to Mitigation" — a strategy that aligns mitigation actions with developmental goals, prioritizes interventions with high co-benefits, and demands differentiated support from the international community.*
Results: *The findings show that in Nigeria, *gas-to-power, scaling distributed renewables, and greening agriculture and transport* offer the greatest mitigation potential while simultaneously advancing energy access and industrialization. Across Africa, similar opportunities exist in clean cooking, climate-smart agriculture, and regional power integration.*
Conclusion: *Achieving climate goals in Nigeria and Africa requires concessional climate finance, technology transfer, and recognition of carbon space for development in global negotiations. Without aligning mitigation with development, Africa's climate commitments risk failure.*
Key Contribution to Knowledge: *This paper proposes a new, evidence-based "Development-First Approach to Climate Mitigation" using Nigeria as a critical case study. It operationalizes the principle of Common but*

Differentiated Responsibilities_ by identifying specific, actionable policy pillars. This provides a pathway that is both equitable and effective for Africa.
Recommendation: *African governments should integrate mitigation into national development planning and industrial policy. International partners must reform climate finance and technology transfer mechanisms to support this development-first pathway.*

Introduction

Current environmental challenges are labelled under an existential context of uncontrollable changes in climate, or climate change. Its importance in contemporary discourse comes with disproportionate effects on least contributors. Africa has warmed faster than average, with temperatures to increase by 1.5C-3C by 2050 (IPCC, 2023). Impacts are becoming noticeable by both Africans and the world, with droughts in the horn of Africa and Sahel, excessive flooding in West & Central Africa and increasing decline of agricultural yields (UNEP, 2022). Cost could lead to 15% of annual GDP by 2050 and raise 86 million people into poverty in sub-Saharan Africa lacking an adaptation strategy (World Bank, 2021). This burden is in stark contrast to the continent's emissions contribution; with just 4.1 Gt CO2e (7.6% of global emissions) in 2020 (UNEP, 2022). Annual per capita emissions average 1.1 tonnes compared to the US's 15.2 tonnes per capita and a global average of 7.4 tonnes per capita in 2019 (Climate Watch, 2022). Cumulatively since 1850, the continent is only responsible for 3% of CO2 emissions (World Resources Institute, 2022).

The above sets up a central debate on equity versus climate ambition, with the Paris Agreement and the IPCC mandating a 43% reduction of emissions by 2030 in order to limit warming to 1.5 degrees. In the context of Africa, 600 million are without electricity and 900 million lack clean cooking (IEA, 2022). As the African continent is set to double in population size from 1.25 billion to 2.5 billion by 2050 (UN DESA, 2022), the SDGs will also require increases in energy demand, industry and agriculture. Asking developing countries in Africa to reduce emissions simultaneously to developed nations overlooks developmental requirements. In this context, this paper proposes an approach to mitigation in Africa: that of a "development first" strategy. A development-first strategy is a strategy that ensures emissions reduction is sequenced in support of a country's developmental needs and ensures the primacy of mitigation options with immediate development co-benefits and relies on provision of international finance and technology transfer for climate mitigation.

Literature Review

The view of scholarship on climate mitigation in Africa has continuously met on a single issue which is the need to cut emissions globally versus the urgent need of the continent to expand the access to energy and grow economically. This review places the present study within four themes of this literature which are the climate-development Nexus, the equity debates over differentiated responsibility, the contested role of natural gas and the growing body of work that is specific to Nigeria.

The Climate-development Nexus in African Energy Scholarship

An emerging body of research has looked at how energy transitions in Africa are modeled

and studied showing that there are significant gaps that need to be addressed. A review of 156 peer reviewed papers on the African energy transition model discovered that the literature has expanded rather quickly since the Paris agreement but a little share of this study actually treat developmental outcomes rather than the partways of emissions alone as a central objective (Blimpo et al., 2024). The same review discovered that most of this research is produced by scholars based outside Africa which raises questions about whose priorities often shape the assumption of the modeling that is used to guide policy. This finding is very important for the present study because there is a suggestion that development first framing is not just simply a political argument made by the African government but it is a corrective to a research agenda that has historically treated emissions reduction as the primary variable and development as secondary or incidental. Complementing this, bibliometric analysis of sustainable energy and climate action research in sub-saharan Africa with particular attention to Nigeria as as identified that there is a thematic shift to what decentralized renewable systems, policy outlooks and energy equity while flagging positive gaps in financing mechanism and localized case studies this gap is mainly the gap that seeks to be filled by this present paper through its sustained discussion on Nigeria's Energy Transition Plan as a single, detailed case

Equity Debate and Climate Justice

The normative framework for a development-first argument comes from the principle of common but differentiated responsibilities (CBDR); as scholars are still engaged in exploring this principle, the area remains highly relevant. According to Wallimann-Helmer (2019, pp. 107-117), in fact, CBDR not only functions as an article of the UNFCCC procedures but is rather the starting point on which climate justice discussions are predicated, and it serves practical purposes not uniformly: how exactly it operates changes depending on the specific policy domain (mitigation, adaptation, loss and damage), responsible agents and level of governance at which these responsibilities must be enforced. Indeed, this conceptual framing helps explain why CBDR triggers different demands in diverse circumstances and why African states use CBDR in mitigation negotiation instead of ignoring mitigation targets completely.

A variety of these works support the main argument of this paper that Nigeria's conditional NDC is in line with existing trends whereby African countries operationalize in practice CBDR under the umbrella of a "development-first approach."

Energy Poverty as Hindrance to Development

Furthermore, a separate strand of scholars looked at the material impact of energy poverty. Various works have demonstrated a link between energy poverty and crop productivity, showing that insufficient or absence of access to electricity hinders rural economies, exacerbates environmental degradation and results in an underdevelopment cycle where poor development may increase vulnerability and vulnerability causes underdevelopment (Dimnwobi et al., 2023). The empirical studies carried out about Nigeria demonstrate in turn a considerable nexus between poor energy access and the development outcome of the country (Aigheyisi&Oligbi, 2020), confirming thus that Nigeria's emissions cannot be considered detached from its development deficit, and that the interventions focused on access to electricity and clean cooking are in place not merely for the purposes of the reduction of emissions but also for development outcomes.

Natural Gas and Climate Obligations

One of the most controversial topics of study regards the development of the energy systems driven by natural gas within African countries. Various research initiatives aimed at analyzing the emerging gas hubs in sub-Saharan African countries outlined both economic opportunities, ranging from power generation to industrialisation, and developmental constraints such as increased investment in 'stranding' natural gas assets and the perpetual development of fossil fuel infrastructure (Anwar et al., 2022). This trend in studies mirrors the issues of interest for the present paper where on the one hand we are witnessing a growing restrictive approach from international financial actors concerning financing of the new gas sector due to climate concerns, and on the other hand producers of gas African states argued that domestic use of gas helps substitute fossil fuel by a lesser-impact Alternative, and therefore contributes positively to emissions reduction under national conditions by not depending on diesel or biomass for the production of energy and industrial output (Anwar et al., 2022). As a means to overcome this tension a more recent approach is being developed in studies analyzing the introduction of renewable energy within African countries, by which gas is interpreted as 'complementary' and not 'competitive' with renewables (Olaniyi et al., 2025).

The relevant studies so far have shed light on the move of the African energy transition debate away from a purely emissions-centered discourse towards a climate-development linkage, even though still largely conceptual and without a fully fleshed-out argument. Further research still needs to be dedicated towards systematic analyses regarding how a singular country implements such discussions within its national energy transition strategy. By using Nigeria's ETP as an extensive case-study, this paper tests and generalises this argument development-first at the case study of the Nigerian energy transition context.

Theoretical Framework

This study is based on two interwoven theoretical traditions: sustainable development theory and the principle of common but differentiated responsibilities (CBDR). Sustainable development theory, formalized by the World Commission on Environment and Development (1987) in Our Common Future, holds that environmental protection and economic development are not competing goals but interdependent conditions for long-term human wellbeing. Development that ignores ecological limits is unsustainable, but environmental policy that ignores development needs is unjust and, in practice, unenforceable in low-income contexts. This framework rejects the premise that mitigation must come at the expense of growth, instead treating emissions reduction as one dimension of a broader development trajectory that includes energy access, poverty reduction, and industrialization. CBDR, as theorized by Wallimann-Helmer (2019), supplies the normative logic for differentiating obligations among states with vastly unequal historical emissions and present-day capacities. Rather than treating CBDR as a fixed exemption, Wallimann-Helmer frames it as a principle whose application shifts according to policy domain, the agent bearing responsibility, and the level of governance involved, allowing mitigation commitments to be calibrated to a country's circumstances without abandoning the goal of collective climate action. Together, these frameworks generate the study's central proposition: that mitigation strategies in Africa, and Nigeria specifically, will only be effective and equitable if they are designed around development co-benefits rather than emissions targets alone, and if international expectations

are calibrated to historical responsibility and present capacity rather than applied uniformly across states at different stages of development.

Research Methodology

This paper uses a qualitative and documents-based research design. Documents-based research was considered most suitable to this policy-analytic case study of how mitigation framework options are theorised and implemented at both the continent and national level. As there is a need not to generate fresh primary data by fieldwork, the study thus makes use of secondary sources, which are suitable for studying formal policy instruments, negotiated pledges and institutional reports that we use as objects of study itself. The design is based on a single-case, where Nigeria has been identified as the most pertinent unit of analysis set in an already existing framework of African climate and mitigation politics.

Nigeria, as Africa's economy and population giant, and, as oil producer with acute energy poverty and with explicit development first commitment on the grounds of climate action and energy crisis as framed in its Energy Transition Plan constitutes a classic test case for assessing the main proposal, that effective mitigation depends on synergy with development objectives. Three genres of data sources were involved for in-depth textual analyse: firstly primary Nigerian and African Union climate and policy instruments, such as its National Determined Contributions (NDCs), its Energy transition Plan (ETP) and policy document on climate change, and African Union framework on climate change and secondly: institutional reports of international organizations, including the IPCC, UNEP, IEA and World Bank as well as those from pan-African organizations. Finally, the pertinent academic literature on the climate–development nexus, energy poverty and climate justice were also included. The data sources were then explored by way of Qualitative Thematic Synthesis (QTS), identifying the treatment of four recurrent themes discussed at the literature review: 'climate-development co-benefits', 'differentiated responsibilities', 'energy poverty', 'the role of natural gas'. Those identified recurring themes enabled, in turn, the structuring of the Nigeria case study, and the development of the 'four-pillars framework for a development-first approach to climate mitigation'.

Nigeria as a Critical Case

Looking at Nigeria is not a hypothetical question. Taking a look at Nigeria which is Africa's most populous and largest economy by population, over 230 million (World Bank 2023). As its path sets the continent's trajectory it emitted just 124 MtCO2e in 2018, equivalent to 0.6 % of the world's share (Climate Watch 2022). Nigeria however has huge emission reduction opportunities when tackling waste, having released 7.4 billion cubic metres of gas in 2021– the 7th most flaring in the world (World Bank 2022).

The development deficit persists- nearly 85 million people were out of electricity in 2021 and 70 % use biomass to cook (IEA 2022). Furthermore, Nigeria is deeply vulnerable - flooding in 2022 hit 4.4 million people causing nearly $10.6 billion in damage (NEMA 2022). Nigeria recently initiated its own Energy Transition Plan [ETP] in 2022 to reach net zero by 2060- estimated to cost just shy of 2 trillion dollars (FGN 2022). With their plans placing energy security top billing, promising universal access to electricity by 2030- and creating millions of new jobs, the ETP places the country 's mitigation efforts in a developmental context highlighting both increased employment and

improved air quality. The use of natural gas as a 'transition fuel,' while doubling down on solar to 30GW and raising hydropower to 5GW by 2030, is seen to be pivotal in achieving these ends (FGN 2022).

This mirrors a need acrossAfrica: promote mitigation that aligns with development gains, through distributed solar, clean cookstoves and climate smart agriculture; make use of 'transition fuel'' opportunities through natural gas while avoiding high carbon sources; seek external finance, with the long-delayed $100 billion climate finance commitment finally meeting its target in 2022 and still proving to be insufficient (OECD 2022). This will take three stages; exploreAfrica's emissions; analyze the Nigerian case; set a four-pillar development-centric framework; and provide policy suggestions culminating in a conclusion that framing mitigation with developmental benefits for Africans is a trade-off but simply the right approach.

2. African Emissions Profile and Urgency to Bend the Future Curve

Africa has a unique climate change profile compared to others: a low historical share, even lower present-day emissions, and the greatest development barriers for adapting to impacts of the phenomenon. Below are three foundational realities that shape Africa's mitigation challenge. They: First, indicate that present-day African emissions-in absolute as well as per-capita terms-are marginal on the global stage. Second, show that African emissions are set to increase significantly given African aspirations to meet basic development targets. And, finally, highlight that the most cost-effective options for abatement align with priorities set on a scale at a minimum concerning energy and land use (including land-use changes and forestry). Addressing this profile is crucial in articulating a developmental rationale.

Emissions are Presently Marginal in the Global Context

The total 2020 emissions for the continent Africa reached 4.1 gigatonnes (GtCO2e). This accounts for 7.6% of total emissions worldwide (UNEP, 2022). If all human activity relating to Land use, land-use change and forestry is removed,Africa's share of CO2 and GHG emissions from burning fossil fuels and from the industrial production of goods-its energy and industrial emissions reduces to about 4% of the worldwide total(Climate Watch, 2022).

As a basis of comparison, in 2020, Chinese CO2 emissions total was 14.7 GtCO2e, and U.S. CO2 emissions were 6.6 GtCO2e (UNEP, 2022). The EU-which contains some of the world's wealthiest economies-emitted 3.5 GtCO2e in 2020, on a par with the whole continent of Africa. The per capita story is even more dramatic. In 2019, African emissions averaged 1.1 tonnes ofCO2per capita(Climate Watch, 2022); in comparison, the global average was 7.4, EU average was 6.8, and U.S. The average was 15.2 tonnes. Average carbon emissions from Sub-Saharan Africa-excluding South Africa-were just0.8 tonnesCO2per capita(IEA, 2022). This is less than that of the round trip for any single one-way economy class flight from the continent to any major European capital city-e.g., Lagos to London.

This disparity becomes even greater historically:since1850, Africa has been responsible for only 3% of total global CO2 emissions from the burning of coal, oil, and natural gas and from the production of cement (World Resources Institute, 2022); North America and Europe have accounted for more than60% of all cumulative emissions. This

historical emissions context is an important context for establishing the UNFCCC principle of common, but differentiated responsibilities and respective capabilities (UNFCCC, 2015). Within Africa itself, emissions are highly concentrated; South Africa is responsible for over40% of the continent's emissions from burning coal and gas for electricity generation (IEA, 2022), and the top five emissions countries in the continent (South Africa, Egypt, Nigeria, Algeria and Morocco) as a group share just over60%. The remaining49African countries contribute less than40%, and numerous small states emit less than5 MtCO2 per year-comparable to the annual emissions from one moderately-sized EU city or equivalent.

Africa's Sectoral Emission Breakdown Differs from the Global Average

The breakdown of Africa's emissions also differs from the global average. At global level, the energy sector, which constitutes roughly 75% of emissions together with industry, remains in focus of most discussions and policies. In Africa, a substantial portion of emissions originates from agriculture, forestry, and land use. As per UNEP (2022) report, the energy sector accounted for around 35% of the total greenhouse gas emissions in 2020 in Africa.

This covers the emissions from electricity, transport, as well as from commercial and residential energy use. Roughly 55% came from forestry, agriculture and land use, including emission from deforestation, savana fires, forest and soil,livestock, and waste, while industrial processing and waste have an approximate 10% share. This sectoral composition has two significant consequences. Firstly, climate action measures and policies cannot solely target power plants and factories; they must include land use,and management of agriculture in terms of the food we produce and consume. Secondly, large sources of emissions are related to livelihood and poverty reduction efforts (for more detail: UN News). For example, a number of countries on the continent face a struggle against deforestation in which a key driver is charcoal production to fuel cook stoves. Land degradation exacerbated by Savannah burning to clear land and manage pasture, the main driver of the savannas, is also a significant contributor. These are not emissions linked to luxury products and consumption;these are emissions of 'survival-economies.'

In the energy sector in Africa on the other hand the cause of emissions levels in sub-Saharan Africa is not because policy has aimed towards a transition towards a low-carbon path. Rather the cause is that most people in sub-Saharan Africa has as yetnotyetbeemabletoacess electricity services: Six hundred million Africans at least are living in Sub-Saharan Africa and lack access to electricity, and nine hundred million don’t have access to cleancooking fuel and technology (IEA,2022). The consumption of energy in sub-Saharan Africa,excluding South Africa, was an 180 KWh/person average in2019 which is significantly lower than in any region;for example the European Union countries have an average consumption of 6 500KWh per capita.

Future Emissions Will Be Driven by Development Needs

Currently, the continent's emissions are relatively low, however this will not be the case in the coming decades. The rapid demographic and economic transformation of Africa will have a significant impact on energy demand across all sectors.

The number one driver is population. In 2021 the African population stood at 1.4 billion,

projected to reach 2.5 billion by 2050 (UN DESA, 2022). Africa will make up over half the growth in global population up to 2050;Nigeria alone is forecast to grow by 200 million people. Growing populations necessitate rising demand for housing, food and water, transport and energy. The second driver is urbanisation. In 2021, only 43% of Africans lived in urban areas but the continent will be 60% urban by 2050 (UN DESA, 2022). Cities are concentrated energy users for buildings, transport and industry. Without conscious intervention, this urbanisation will further lock-in energy-intensive infrastructure across the continent for decades.The third driver is progress towards the sustainable development goals. SDG 7 calls for universal access to modern, reliable and affordable energy by 2030;SDG 2 requires an end to hunger and doubling agricultural productivity;while SDG 9 targets the industrialisation of the continent. Development of this magnitude across the continent is going to require significant increases in energy consumption and corresponding increases in economic output.

The implications for energy use and CO 2 emissions are modelled in the IEA's 2022 Africa Energy Outlook. Under the Stated Policies Scenario, reflecting current policy development nothing new and nothing dramatically different, African energy demand grows by 50% by 2030 (2020-2030) while energy related CO 2 emissions grow by 30% by 2030. The Sustainable Africa Scenario, based on achievement of universal energy access and aligning with climate goals, sees energy demand grow even faster at 80% by 2030 but energy related CO 2 emissions only by 5%. To achieve the latter will require an additional $190 billion a year in clean energy, efficiency and infrastructure (IEA, 2022). The picture is clear; African emissions are set to rise. The choice is not whether but how rapidly and how carbon-intensive they will become.

Priority Mitigation Opportunities Lie Where Development and Emissions Intersect

In this context, African mitigation actions are best implemented where they both scale with predicted emissions growth and offer a development dividend. Four sectors warrant priority attention.

First is the power sector and access to clean energy: Africa is blessed with some 60 per cent of the world's best solar resources, yet the continent has less than five per cent of global solar generating capacity (IEA, 2022). The cost of solar photovoltaic electricity fell by 85 per cent between 2010 and 2020 – making it the most affordable source of new power in most of the continent (IRENA, 2021). Expanding the scale of distributed solar, mini-grids, and grid-connected renewables will meet new power demand while substituting dirty diesel generators and kerosene, thereby helping both to achieve SDG 7 and cut emissions.

Second is oil and gas methane emissions and flaring: Africa is a significant producer of oil and gas. The continent flares a total of 38 billion cubic meters of associated gas annually, the second-largest total by region globally (World Bank, 2022), producing an estimated 360 MtCO2e of flaring emissions. The countries flaring the most gas overall in 2021, including Nigeria, Algeria, and Angola, are among the world's top 10 contributors to flaring. Reducing flares through domestic gas use and utilization or reinjection is a least-cost emission reduction strategy that simultaneously offers co-benefits in terms of revenue generation and energy access. Leaks from oil and gas infrastructure in the form of methane – where the IPCC (2023) finds reducing these to be the single most impactful

mitigation option for slowing warming in the short term must be looked into

Third is agriculture and land use: With nearly 55 per cent of its greenhouse gas emissions derived from AFOLU, this sector can hardly be overlooked. Practices such as agroforestry and soil conservation on farms, as well as rotational grazing on pastures, can lead to greater accumulation of carbon in soils and improve yields (FAO, 2021). The continent has lost some 3.9 million hectares of forest per year, the highest annual deforestation rate on any continent (FAO, 2020). In large measure, much of this loss is attributable to increased reliance on burning charcoal for cooking. Instead, broadening access to piped LPG or electric stoves will not only decrease emissions but reduce deforestation and improve health outcomes.

Fourth is transport and industry: Car ownership on the African continent is forecast to double or triple by 2040 in various scenario projections (IEA, 2022) meaning a “wait and see” approach will result in a spike in emissions. By investing in integrated urban public transport and non-motorised transport and, in the long term, electric mobility, to make cities such as Nairobi, Addis Ababa and Lagos cleaner and more livable, African nations can change this trajectory. In industry, a “leapfrog” approach to industrial development through green production pathways represents a major opportunity: utilizing abundant clean power sources and natural gas reserves in Africa to develop green hydrogen for ammonia production, green steel and a wide range of other clean industrial processes (AfDB, 2021) enables industrialization and modernization without repeating the environmentally damaging industrial model of the 20th century. [AfDB]

The Equity Challenge in Global Mitigation Policy

The last piece to Africa’s emissions puzzle is the political one. The Paris Agreement is based on the principle of common but differentiated responsibilities (UNFCCC, 2015). In reality, the global discourse, however, tends to centre on percentage emissions reduction targets that disregard development needs. According to the IPCC (2023), CO2 emissions need to decline globally by 43% by 2030 from 2019 levels to limit warming to 1.5C. An undifferentiated global target would necessitate African nations to slash emissions even at a point in their development when energy access must increase , a prospect that is neither practical nor fair.African Group of Negotiators underlined this very clearly at COP27: In their official statement they reasoned that "Africa needs carbon space to develop and must not be asked to make the same sacrifices as developed countries" (African Group of Negotiators, 2022). That is why Nationally Determined Contributions from Africa so often bear caveats. Nigeria's updated NDC from 2021 indicated that only 20% of their mitigation target may be attainable with assistance from global financial and technical sources (Federal Government of Nigeria [FGN], 2021).

A development-first policy agenda acknowledges this reality. That doesn't mean it turns its back to mitigation. But it argues that mitigation in Africa must be financed, and it must be developed in a way that facilitates, rather than impedes development. As Africa's emissions story breaks down, a key lesson emerges: The continent may not be the architect of the current climate crisis, yet it holds the key to the shape of future emissions curves. Africa's current relatively low emissions are attributable to its relatively low development, while its future emissions will be driven by decisions

about urbanisation, industrialisation and powering its young population.The job for policy, consequently, involves bending that future emissions curve. This involves building the capacity for clean energy, for example, and improving land-use efficiency while avoiding high-emissions industrial lock-ins now, before the pathway for development has been set. It also requires the understanding that Africa cannot fulfil this mission without considerable global support because the required financial flows dwarf Africa's national revenues. The next section probes how the situation plays out for Africa's biggest economy - Nigeria, an especially insightful experiment.

3. Nigeria Case Study: The Energy Transition Plan and the Politics of Development-First Mitigation

Nigeria is an example of the Africa climate policy dilemma. Africa's largest economy by income, most populous (well over 200M, the World Bank estimate at just over 230M) country and among Africa's greatest fossil fuel reserves (WB 2023), Nigeria also experiences extreme energy deprivation, very high climate vulnerability, and severe fiscal limitations. Its 2022 Nigeria Energy Transition Plan (ETP) represents perhaps the most earnest effort by any African nation to thread climate mitigation with development. The following outlines Nigeria's emission realities and the scope of the ETP as well as the implementation pitfalls of that plan; this discussion of Nigerian realities provides key insight on whether a development-centric paradigm is viable for Africa.

3.1 Nigeria's Emissions Profile and Development Deficits

In 2018, Nigeria's greenhouse gas emissions totalled about 124 MtCO2e, which accounts for 0.6% of global emissions (Climate Watch, 2022). Although negligible on a global scale, its emissions have been increasing on average at 2.1% a year between 2010 and 2018. Sectorally,Nigeria's resource base combined with its development gaps are captured in its emissions' structure: the energy sector represents around 70% of the country's emissions (Federal Ministry of Environment [FME], 2021); key drivers being oil and gas sector emissions including gas flaring and combustion of diesel and petrol in vehicles and generators. Agriculture, forestry and land use are responsible for roughly 25% of emissions from factors such as deforestation, savannah fires and use of agricultural soil; other categories comprising processes and waste make up the rest.

Two particularly significant elements of Nigeria's energy-related emissions' composition for mitigation efforts are its oil and gas flaring, and the use of diesel generators. First, in 2021 Nigeria burned gas of a total amount equivalent to 7.4 billion cubic meters, making it the world's 7th largest country for the practice which amounts to a waste of US $1 billion of gas each year and adds up to approximately 45 MtCO2e emissions (World Bank, 2022). Second, unreliable state electricity supply results in widespread use of off-grid generators. As it stands, Nigerians spent US $22 billion in 2021 for electricity purchases in forms of diesel and petrol that power those generators at their homes and work premises (Federal Government of Nigeria [FGN], 2022). That is costly not just for the end consumers but also and primarily environmentally due to its carbon intensiveness. On the development front, deficiencies in energy access are significant as of 2021; 85 million people are without access to electricity, and power supplied to those connected households average four hours a day. About 70% of Nigerian homes cook using firewood or charcoal

which leads to considerable intra-households air pollution responsible for an estimated 98,000 premature deaths annually worldwide (IEA, 2022; WHO, 2021). The level of per capita electricity consumption stood at 150 kWh in Nigeria, in contrast with 3,200 kWh for the world as a whole in 2020 (IEA, 2022).

Nigeria is also highly susceptible to the adverse impacts of climate change. According to data from NEMA, the 2022 floods affected over 4 million people in 32 states and contributed to an economic loss of over US $10 billion. Northern Nigeria suffers from deforestation at a pace of 0.6 km per year. Coastal regions in the Niger Delta face similar dangers due to sea-level rise and erosion (FME, 2021). Due to dependence on rainfall patterns in agriculture that employ over a third of the total work force (approximately 35%), its productivity and hence food security heavily depend on how these trends will unfold (World Bank, 2021).

3.2 The Nigeria Energy Transition Plan: Framing Mitigation Around Development

Nigeria launched the Nigerian Energy Transition Plan (ETP) in August 2022. This plan represents an all-of-government, evidence-informed roadmap to net-zero emissions by 2060, while also tackling the country's development priorities (FGN, 2022). The ETP was developed by the Energy Transition Office (ETO) in the Presidency with support from Sustainable Energy for All (SEforall) and other international and technical partners.Five pillars structure the ETP, along with three crucial political decisions reflecting a development-first logic.

1. "Transition fuel" gas: First, the ETP designates natural gas as a "transition fuel" through 2060. Natural gas is Nigeria's primary asset. At present, Nigeria possesses 206 Tcf of proven natural gas resources and ranks the ninth largest in the world (Nigerian Upstream Petroleum Regulatory Commission, 2022). Based on this endowment, the ETP calls to expand gas-to-power generation to replace diesel generator power, provide reliable baseload for industry and back-up for variable renewable sources (FGN, 2022). The rationale is simple: gas yields roughly 30 percent fewer emissions than diesel and 50 percent fewer emissions than coal, per kWh, and is, to date, the only viable source of scaled, reliable power for the next decade and a half (FGN, 2022). This position goes against some of the international community's positioning against the financing of gas projects but represents the best option the government believes it can count on.

2. "The ambitious but conditional": Second, the ETP sets aggressive, but conditioned on financing, targets for renewable energy (RE). Under the plan, 30GW of solar and 5GW of hydro are to be developed by 2030 (FGN, 2022). In parallel, the government plans to promote decentralized electricity access with widespread distribution of home-based solar energy systems and mini-grids for the 85 million Nigerians who currently lack electricity access, aiming for near-universal electrification by 2030, five years ahead of the SDG 7 objective.

3. "The mitigation actions with co-benefits": Third, the ETP aims to implement mitigation measures with a direct link to its development mandate. These include eradicating routine gas flaring by 2030, which would enhance air quality and create government revenues. Expanding the use of cleaner household energies such as LPG and electric cookstoves to replace biomass and reduce deforestation and promoting climate-smart agriculture and e-mobility initiatives in major urban areas such as Abuja and Lagos are two of several others (FGN, 2022). Total costs are significant. The ETP costs

estimates to reach net-zero in 2060 are $1.9 billion, approximately $10 billion on average per year. The transition could create more than 5 million jobs by 2060, chiefly concentrated in the sectors of power, manufacturing, and agriculture.

3.3 Implementation Challenges: Finance, Institutions, and Political Economy

While well-intentioned, three broad problems undermine the rollout of the ETP in much the same way across sub-Saharan Africa. First is finance. Nigeria attracted an estimated $3.1 billion in climate finance over 2019 and 2020, of which just $1.2 billion was for mitigation (CPI 2022), well below the $10 billion annually that the ETP aims to channel toward its objectives.

There is also a constraint on domestic fiscal space. Nigeria's budget is highly reliant on the unpredictable revenues generated by the oil sector (accounting for 50 percent of government income), and in 2022 the petroleum and electricity subsidies consumed $10 billion that could otherwise be funneled into the energy transition (NNPC 2023). Nevertheless, by far the single greatest constraint lies in the ability to access concessional climate finance and large-scale private sector finance. Second are institutional capability and policy coherence. Nigeria boasts of a long history of having energetic but poorly implemented energy policies. The Renewable Energy Masterplan was unveiled in 2005 but had very little to show.

Power generation has also remained stuck at 5 GW for almost a decade, a consequence, inter-alia, of the sector's privatisation, liquidity constraints, transmission losses and gas supply disruptions (World Bank 2021). To respond to this, the ETP envisages establishing a unit within the Presidency with the duty to coordinate across the relevant ministries but this will require strong political backing and the coherence of individual state governments, many of whom manage the regulatory regimes related to land-use and utility distribution. The third major obstacle for implementing the ETP is political economy and social acceptability. Removing and reducing some of the fuel subsidies was partially implemented in 2023. Although this may ultimately facilitate climate transition by opening up fiscal space, in the interim has given rise to rampant inflation and large-scale protests. Similar obstacles present themselves when it comes to replacing household bioenergy with LPG. The ETP explicitly recognises the requirement of a 'just transition', which implies a 'protect people affected by the transition' to 'ensure no one is left behind' (FGN 2022), through support schemes for vulnerable households, retraining programmes, and new employment opportunities.

3.4 What Nigeria's Experience Tells Us About Development-First Mitigation

The Nigerian ETP is significant for three reasons with relevance beyond Nigeria to the rest of Africa:

First, it provides evidence that African countries are capable of designing robust, long-term mitigation strategies which are grounded in their development aspirations. In it, they are not outright challenging the Paris Agreement, but interpreting the Paris Agreement in terms of their particular need for industrialisation and energy access.

Second, it addresses the centrality of gas to the immediate term transition in Africa. For gas-endowed nations, the issue is the domestic use of gas for mitigation purposes instead of the export of high-carbon fossils for external use; a strategy that is both a development and a mitigation strategy. For the sake of progress, the global

climate finance architecture needs to be sensitive to this reality, rather than to a one-size-fits-all transition away from all hydrocarbons.

Third, it emphasizes the critical need for finance and partnership in the implementation of these measures. While Nigeria has pledged a 20% reduction in emissions by 2030 in its conditional NDC (FGN 2021), 15% of this reduction is contingent upon international support, showing the need for delivery of the $100 billion climate finance pledge and for transfer of technology; otherwise, the best of plans will falter. The Nigerian Energy Transition Plan is the boldest explanation to date of a development-centered approach to climate mitigation in Africa. This plan does not repudiate the need for reductions, but insists that these can and should take place in a way that increases energy access, job creation and industrial growth. The use of gas as a transition fuel, the focus of dispersed renewable energy generation on access, and the full costing of the transition are all driven by this logic.

There are of course risks associated with the ETP. In particular, it needs $10 billion annually, the strengthening of institutional capacity and the management of potential social consequences of increased energy prices (as part of further fossil fuel pricing reform). But as a model, it provides a useful template for the rest of the continent to appropriate. It also makes clear that mitigation and development need not be opposing concepts when it is conceived from the outset to meet the imperatives of development: The next section moves from Nigeria to an examination of a generalized, four-pillar framework for this development-first approach in Africa.

4. A Four-Pillar Development-First Framework for Mitigation in Africa

In the Nigeria case, it highlights that Africa cannot have mitigation independent from development. The Nigerian example is not an anomaly across the entire continent: emissions are low now, but energy consumption will rise substantially in Africa over the next decade, paralleled by a ramp-up in the growth of output and job creation, if countries are to meet development objectives in line with the UN's Sustainable Development Goals (SDGs). A development first approach is not one that postpones action; it reorders priorities, seeking actions with combined climate and development benefits: raising access, jobs, industrialization and productivity.

This paper outlines in these subsequent chapters a four-pillar approach to directing mitigation policy in Africa based on the evidence in Nigeria, across Africa and, implicitly, in International Energy Agency, IPCC, and African Development Bank reports and analyses. These pillars provide co-benefits for climate and development, and they are all conditional on adequate international support and engagement

Pillar One: Focus on immediate co-benefit mitigation development initiatives

A development-focused approach begins with emissions reductions that simultaneously resolve development issues. They are not all the same. In an increasingly constrained setting, African governments ought to pay more attention to high value interventions that are of benefit to both countries and the global community at once, in terms of emissions reduction and overall country welfare gains.

The closest to this, for many of the continent’s developing countries, is

electrification, with distribution renewables offering the surest, fastest, and cheapest path to serve the 600 million people in Sub-Saharan African that lacked electricity access in 2021, according to the International Energy Agency (IEA, 2022). A strategy for 2030 for the full provision of electricity on and off the central grid for all is simply unrealistic. Mini-grids, as well as distributed solar home systems, can and do supply remote as well as peri-urban areas at lower cost with far greater speed than traditional grid expansion. They displace kerosene and diesel-based electricity that is both cost- and carbon intensive. Indeed, the IEA Sustainable Africa scenario states that nearly half (45%) of net additional electricity connections between now and 2030 can come from distributed renewables while meeting SD G 7 as well, the climate emissions do not even rise. The next such prioritization area must be clean cooking that is estimated to provide a source of 500,000 premature deaths a year in the continent by WHO due to the "indoor air quality" of using burning fuels for cooking at home (WHO, 2021).

The energy used for cooking in Africa as of 2021 is fire wood, charcoal and dung, estimated by IEA to stand to 900 million people, with resulting "outdoor air quality" due problems as well. Using biogas, as well as electric cooking and LPG, on one hand directly "locks in" not only emissions but some of the worst of the air quality and related adverse impacts, at the same time reducing land as well as general air pollution etc. Nigeria's plan makes this objective part of achieving all theSDGs by 2030 with most provision coming from LPG and electric cooking at home. (Federal Government of Nigeria [FGN], 2022). The third area is for agriculture itself - African emissions from this section are around 20%, but it makes up ~60 percent of all labour (F A O , 2021). Agro-forestry, climate smart farming and conservation Agriculture with management of agricultural fields' soil status and post-harvest losses could raise crop yields as well as lock-in Carbon.

This has indeed already been part ofAU Comprehensive Africa Agriculture development Strategy (AU,2014). This commonality of these three groups (electricity , cooking and agriculture-related emissions that will very certainly continue to grow as countries increase wealth and the number of people gain income, with all of them addressing those increases immediately and in ways that have broad benefits across society) can be applied, broadly.

Pillar Two: Employ Natural Gas as a Transition Fuel where it facilitates development

The second pillar addresses where fossil fuels, and in particular natural gas, fit into Africa's transition. An assumption of mitigation is that global fossil fuel investment should end now. A development first approach recognizes this does not fit with Africa's energy reality.Africa's power system is low capacity, expensive and unreliable. The average cost of electricity in Sub-Saharan Africa was $0.18 per kWh in 2021 against a world average of $0.12 per kWh, while outages cost businesses an estimated 2% of Africa's GDP each year (IEA, 2022). While new renewable capacity is the cheapest form of new power generation across many African countries (IRENA 2021) it is intermittent and requires backup. Grid-scale battery storage remains too expensive for most African utilities. Gas presents a lower emission alternative to coal and diesel, and can offer dispatchable power to back up variable renewables. According to the IPCC (2023), it has a role in transition pathways in regions with limited infrastructure. Utilising domestic gas in energy-rich African countries, such as Nigeria,

Algeria, Egypt, Mozambique, and Tanzania, serves a dual purpose of development and mitigation: it displaces diesel generators and biomass for power and industry; it provides feedstock for fertilizer and petrochemicals; and it generates government revenue.

Waste must be eliminated. In 2021 Africa flared 38bn m3 of gas, with associated emissions of 360 MtCO2e (World Bank 2022). Nigeria, Algeria and Angola were amongst the top 10 largest flaring countries in the world. Capturing this gas and utilizing it domestically is a low-cost mitigation measure with immediate benefits. New gas projects must also be linked to domestic utilization not exports.This requires a new approach to international public finance. Currently MDBs have a restriction on financing gas projects regardless of whether they are for export LNG infrastructure or to support domestic power generation in energy poor nations. A development-first approach necessitates a case-by-case risk assessment rather than a broad exclusion.

Pillar Three: Adequate concessional climate finance and tech transfer

Pillar Three relates to the finance gap. The level of finance required for us to bend the emission curve of Africa and reach our development needs is nowhere near to what is available within the continent. The Nigeria Energy Transition Plan estimates $10 billion per year until 2060 would be required to develop the Nigerian energy system (FGN, 2022). A similar report by the IEA identified a need for $190 billion per year of energy investment in Africa through 2030 (IEA, 2022).

Between 2019 and 2020 only $30 billion per year flowed to Africa and only 25 percent of it was dedicated to climate mitigation. Climate Policy Initiative [CPI], 2022) Developed countries made a promise in Copenhagen COP15 of mobilization of climate finance to US $100 million every year in 2020 but they finally did in 2022, two years after target(OECD, 2022) but still predominantly provided as loan not grant, predominantly to mitigation and predominantly focused on only a few sectors. Concessional finance must also be focused on developing appropriate technology in Africa to ensure local content so that we do not have to import all our solar panels, batteries, and electrolytic equipment. The AU has created the Africa Continental Free TradeArea(ACFTA) which can play a pivotal role in the region to foster development of green technology value chains across the region (AU, 2018).

Just as with the financing, we need support from international partners via joint ventures, tech and skills transfer as well as a temporary waiver on IP for certain key climate technologies. The Just Energy Transition Partnerships with SouthAfricaandSenegal serve as examples that should be replicated.

Pillar Four: Integrate mitigation into national development planning and industrial policy

The final pillar concerns governance and strategy. Mitigation needs to be mainstreamed, rather than set aside as an environmental issue. It should be integrated into national development plans, budgets, and industrial policies; the primary vehicle for this is the Nationally Determined Contribution (NDC) under the Paris Agreement. African NDCs should not just set target emissions: they need to specify how these targets translate to job creation, energy access and structural transformation. Nigeria's 2021 updated NDC does exactly this by binding20% of its target to external support and quantifying the co-benefits (FGN, 2021).

Integration at the regional level is equally important. Through the African Continental Power system Masterplan, African countries are aiming to connect national grids into continental power networks enabling continental electricity trade (AUDA-NEPAD, 2021). This allows countries with solar and hydropower resources to export the surplus electricity to their neighbours and minimizes the need for fossil fuel backup. Similar benefits of integration can be realized in the area of green hydrogen and green fertilizer to industrialize across Africa, drawing on a combination of renewables and gas.

The focus on development also means being strategic about what industrializes. Unlike adopting heavy carbon-intensive industries like before, African countries can capitalize on sectors that they can compete in the low carbon world, like green steel production with green hydrogen, green ammonia for fertilizer and processing of minerals needed for batteries and renewables (AfDB, 2021). Taken together, the four pillars describe what a development-first approach to mitigation looks like. It is not a rejection of ambition, but a call for proper sequencing and incentive alignment. By focusing mitigation first on delivering energy access, clean cooking and agricultural productivity, responsibly using gas as a transition tool, negotiating for adequate financing and technology and mainstreaming. it into national development planning, Africa could grow its economy whilst lowering its emissions curve.

The framework does not allow Africa off the hook: African governments must make difficult policy choices and implement them. But it also obliges the international community to acknowledge that there are diverse pathways to effectiveness and equity. The final part of this policy brief translates the framework into concrete recommendations for Nigeria, African countries and international actors.

5. Policy Recommendations and Conclusion

A development-first approach to mitigation is not a theoretical concept. It requires concrete policy choices by African governments and by international partners. If mitigation is to succeed in Nigeria and across Africa, it must be financed, implemented, and perceived as legitimate by the populations it is meant to serve. This final section sets out specific recommendations for three sets of actors: the Government of Nigeria, African governments collectively, and international partners including multilateral development banks and donor countries. It then concludes with the broader implications for global climate policy.

Policy Recommendations for the Government of Nigeria

The Nigeria Energy Transition Plan offers a realistic path, although the real test will be in its execution over the next five years. Three areas rise in prominence.

First, Granting Full Institutional and Budgetary Ownership of the ETP. The Energy Transition Office within the Presidency must be provided with a legal mandate, and it should receive a specific vote in the annual budget. It should be vested with adequate powers to coordinate across the Federal Ministries of Power, Environment, Petroleum and Finance, and to interact with State governments (Federal Government of Nigeria [FGN], 2022). Otherwise, the ETP may end up being one of several discarded policy documents. An annual public report on the ETP's implementation, featuring quantifiable progress metrics on

energy access, emission levels, job creation, could foster accountability.

Second, Implement Policies on No Flaring by 2030 and Mass Distributed Energy Access. Nigeria can eliminate the cheapest and most cost effective methane emissions by stopping routine flaring of gas by 2030 (Nigerian Upstream Petroleum Regulatory Commission [NUPRC], 2022). The Nigerian Gas Flare CommercialisationProgramme is crucial and should be intensified, and penalties for flaring imposed where compliance can be guaranteed by 2030 (World Bank, 2022). In 2021, the 7.4 billion cubic meters of flared gas resulted in USD2.2bn in lost revenues and 45 MtCO2e in greenhouse gas emissions (World Bank, 2022).Simultaneously, the government's commitment to accelerate reaching 10 million additional new connections through Solar Power Naija and the Rural Electrification Agency's mini-gridprogramme should become a government priority (FGN, 2022). Results-based financing and regulatory assurance should be instrumental to mobilise private finance.

Third, Ensure Price Reforms of Energy carriers promote a Just Transition. The elimination of gasoline subsidies in 2023 was prudent from a fiscal viewpoint but has amplified inflation and exacerbated household costs. To protect domestic support for the reforms, gains should be reallocated to subsidies on clean cooking, to public transport improvements, and to more targeted cash-transfers (World Bank, 2023). Creating an oil "just transition fund" to support workers in O&G and help affected populations with transition away from biomass remains a necessity.

Policy Recommendations for African Governments Collectively

Country-level actions are not sufficient; a collective approach at both the regional and global level is needed to meet Africa's mitigation challenge. Firstly, negotiate as a bloc for differentiated contributions and carbon space for Africa within the Global Stocktake. The African Group of Negotiators (AGN) needs to continue to drive the application of common but differentiated responsibility. African NDCs should thus be measured against development priorities such as energy access and poverty alleviation, in addition to percentage emissions reduction targets, and the African Union Agenda 2063 needs to be formally tied into NDC implementation.

Secondly, enhance regional infrastructure integration-The African Continental Power System Masterplan envisages the integration of grids across five power pools by 2040 and has considerable potential for energy trade. Integrating electricity grids and enabling regional power trade will allow countries with high solar, hydro and gas resource bases to export electricity to their neighbors, potentially in exchange for the provision of energy to African countries with low solar and hydro resource bases and reducing their need for the reliance on expensive and GHG-intensive diesel generation on the periphery. The African Continental Free Trade Area could then provide for the generation of supply chains at a continental level, particularly for solar components, batteries, and green fertilizers. Third, improve the climate for investment in clean energy. This ranges from tariff adjustments toward cost-reflective levels and transparent power purchase agreements with national energy utilities through to de-risking measures, particularly to enhance the creditworthiness of energy utilities in many African countries so that

these are attractive to private investors (IEA). Collaboration between governments and agencies such as the African Development Bank will be necessary to boost utilities' balance sheets and standardize power purchase agreements for independent power producers.

Policy Recommendations for International Partners and Multilateral Institutions

First, no development-first approach can work without a fundamental overhaul of the way climate finance and technology are delivered to Africa. Second, scale the $100bn climate finance pledge, with 50% to the left (and right) of center, going to mitigation and adaptation. In 2022 the OECD (2022) announced that the $100bn commitment had finally been met, primarily in the form of loans. Africa needs a significant increase in grants and more concessional finance for its infrastructure investments. Dedicated to green industrialization for Africa, a new facility could be housed in the Green Climate Fund to support projects across batteries, green hydrogen and manufacturing (Climate Policy Initiative [CPI], 2022). Fourth, address development-first. Third, provide technology transfer and support domestic production. African economies will be reliant on many critical climate technologies, which are currently inaccessible due to intellectual property constraints and a lack of domestic production capacity. Joint ventures and investment in African firms operating in solar assembly, battery storage or electrolyzers could foster such capacity development (IRENA, 2021). And the current "Just Energy Transition Partnerships" with countries such as South Africa and Senegal can be extended and adapted for gas-rich economies such as Nigeria. For one obvious reason - the global climate crisis cannot be solved without Africa – climate solutions in Africa that sacrifice the interests and development ambitions of the world's youngest and fastest-growing continent, and particularly West Africa and Nigeria, will fail at the ballot box and at the table. This paper has sought to persuade the reader that, for the African continent and Nigeria in particular, a "development-first approach" to mitigation presents the most promising avenue for meeting the imperative of emission reductions while also driving inclusive growth and human development.

The rationale is stark. Africa is responsible for far less than 4% of global emissions but is home to all those impacted most severely by it (United Nations Environment Programme [UNEP], 2022). As it strives to meet the development needs of another 2.5 billion people by 2050,Africa's emissions are set to grow. The question facing humanity's engagement with Africa over the next several decades, therefore is not between growth and mitigation. It is about whether those growth trends will be characterized by high or low levels of carbon-intensive activity (United Nations Department of Economic and Social Affairs [UN DESA], 2022). And the Nigerian approach as highlighted by Nigeria's Energy Transition Plan demonstrates that there is a way to deliver growth and mitigation through a range of complementary actions - in this instance, using gas as a transition fuel, deploying sufficient scale of renewables, ending flaring and decarbonizing agriculture (FGN, 2022). The four pillar approach presented here demonstrates how to replicate that logic at the continental level. The global community must choose either to condemn African states to follow development pathways optimized for wealthy industrialized countries; or a sustainable global engagement model where Africa can follow a developmental approach to its mitigation efforts – an approach underpinned by appropriate financial support, a ready supply of applicable technology and an

understanding of Africa's inherent right to develop.

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