Climate-Economic Country Risk Profile

Nigeria

Climate mitigation and impacts are not separate spheres – they interact. Mitigation reduces climate damages, while avoided damages preserve resources for emissions reductions. Successes and failures in this nexus also affect geopolitical, geoeconomic and security risks, not least due to their capacity to shape socioeconomic fortunes. This profile focuses on Nigeria, which faces high transition and physical climate risks simultaneously.

Modelling has been used to understand possible "double cost crunch" pressures – a development-phase macroeconomic squeeze in which physical climate impacts reduce growth, productivity, fiscal space and domestic investment capacity, while a low-carbon transition requires large up-front capital mobilisation, infrastructure build-out, and institutional reform.

In Nigeria, these pressures interact – climate damages raise adaptation needs and can weaken revenues, while transition needs increase financing requirements precisely when capital remains expensive and public resources are under pressure. The result can be a compression of near-term policy space at a critical stage of structural transformation. The geopolitical and security dimensions of this are highlighted and recommendations are offered.

BACKGROUND

The **GeoClimRisk** (The Geopolitics of Climate Risks) project examines how climate change, its economic impacts, and their interaction with geopolitics shape emerging security risks, with a focus on countries facing an intense "double cost crunch". It aims to inform international cooperation, policymakers, and risk-management strategies.

The "**double cost crunch**" refers to the simultaneous economic pressure from climate damages and the low-carbon transition. Investments in green and decarbonised energy are widely recognised as a key engine of economic development, especially in energy-poor regions. However, substantial up-front investments demand scarce financial means with high financing costs.

The urgent need for **climate action** in Nigeria – in terms of both mitigation and adaptation – will depend on simultaneously diversifying energy, enhancing adaptation and resilient infrastructure, and implementing development and social protection.

Together, these dynamics illustrate how climate risks in Nigeria reach beyond national borders. Instead, they interact with Nigeria's **geopolitical position** to shape security, economic and humanitarian outcomes across West Africa, making climate resilience in Nigeria a matter of regional strategic importance.

PROJECT RESULTS

Nigeria's **energy transition** is not constrained by a lack of renewable resource potential, but by tight financing conditions and high capital costs, which make investment more expensive, slow renewable deployment, and can raise electricity prices. At the same time, carbon pricing can create new fiscal space, but it must be designed in a socially balanced way; otherwise, distributional problems and political backlash are likely.

Climate change poses a threat to economic development. If weak climate policies persist and the targets of the Paris Agreement are not met, total GDP losses in Sub-Saharan Africa, including Nigeria, could reach 20% and more by 2100. **Climate change and weather events damage capital, and heat stress reduces worker productivity.** At the same time, macro-financial risks arise from strained public finances, higher borrowing costs, declining investments, and intensified **climate-induced migration** that can exacerbate existing conflicts.

The double cost crunch worsens with delay of mitigation, but **long-term benefits of ambitious climate policy** far exceed near-term costs. Making both visible improves investment timing, avoids misallocation, and shows immediate action is economically rational because benefits exceed costs and early action preserves adaptation capacity.

Given the prevalence of oil and natural gas for domestic consumption and for exports, political economy considerations shape Nigeria's energy sector, making the transition more than a technical issue within a complex **geopolitical context**. At the same time, climate impacts constitute a risk to livelihoods and interact with other risks to human security, which may lead to trickle-down effects, such as displacement. Governance, partnerships and finance considerations thus co-determine Nigeria's positioning alongside climate hazards.

PIK
Potsdam Institute for Climate Impact Research

Chinedu Chime / Shutterstock.com

Nigerian village submerged by flood (2022).

1. Country context

1.1 CLIMATE-LINKED RISKS, CHALLENGES AND FUTURE PROJECTIONS

Nigeria faces a range of climate-related risks [1] due to its geographic diversity, large population (currently over 230 million, projected to reach over 400 million by mid-century [2]), and economic reliance on climate-sensitive sectors. Regionally [3], West Africa will experience rising temperatures, increasingly variable rainfall patterns, and more frequent extreme weather events throughout the twenty-first century. These changes are already observable in Nigeria, where average temperatures have risen and rainfall variability (especially in the north) has grown over recent decades [4].

The country stretches from the humid coastal regions of the Gulf of Guinea to the semi-arid Sahelian zone in the north. As a result, climate change impacts vary substantially across regions [5]. Northern Nigeria faces increasing desertification, longer dry seasons, and declining soil moisture, which together threaten agricultural production and pastoral livelihoods. In contrast, southern regions are experiencing heavier rainfall events, increased flooding and coastal erosion. In the Middle Belt, shrinking grazing lands and changing rainfall patterns also contribute to farmer–herder conflict [6]. Such regional variation creates complex challenges for national economic and development planning.

Flooding represents one of the most visible climate hazards affecting Nigeria [7]. Major river systems, such as the Niger and the Benue, periodically overflow during heavy rainfall seasons, damaging infrastructure, destroying farmland and displacing large populations. Severe floods in recent years [8] have demonstrated the scale of potential disruption, with millions of people affected and major economic losses recorded across multiple states. Flood impacts extend beyond immediate damages by affecting transport networks, food supply chains and public health.

Coastal areas are also under growing pressure from climate change. The economic hub of Lagos is particularly vulnerable to sea-level rise, storm surges and coastal erosion as large portions are in low-lying coastal zones [9]. Rapid urban expansion [10] has intensified these risks, as new settlements and infrastructure are often developed in flood-prone areas with limited drainage capacity. Without substantial investment in urban resilience and coastal protection [11], the economic costs of climate damage are likely to increase significantly.

Agriculture remains one of the most climate-sensitive sectors in Nigeria [12]. A large share of the population (roughly 34%) [13] depends on (often rain-fed) agriculture for income and subsistence, which makes livelihoods highly sensitive to rainfall variability and temperature extremes [14]. Changing precipitation patterns have already affected planting cycles, crop yields and livestock productivity. In northern regions in particular, declining land productivity has intensified competition over land and water resources. These pressures [15] are contributing to migration patterns [16] and, in some cases, local conflict dynamics [17].

Public health systems are also affected by climate change [18]. Rising temperatures increase the risk of heat stress and may reduce labour productivity in sectors that depend heavily on outdoor work. Flooding events facilitate the spread of water-borne diseases [19], while shifting ecological conditions can alter the patterns of vector-borne illnesses such as malaria. These health impacts impose additional burdens on already stretched healthcare infrastructure.

These physical risks form one side of the double cost crunch: they reduce economic growth, lower productivity, and strain public finances, leaving fewer resources to fund the transition. At the same time, the country's high exposure to climate change—combined with rapid population growth and a strong dependence on natural resources. These factors create major adaptation challenges that will shape the country´s development trajectory for decades to come.

1.2 ENERGY

Nigeria's energy sector [20] lies at the heart of the country's economy and presents a particular challenge for climate policy. As one of Africa's largest producers of oil and natural gas, hydrocarbon exports have historically provided a substantial share of government revenue and foreign exchange earnings. At the same time, Nigeria continues to experience persistent domestic energy shortages and unreliable electricity supply [21]. This combination of resource wealth and energy poverty highlights the challenge of the country's energy system. In addition, projections of economic growth in Sub-Saharan Africa, including Nigeria, suggest a potential reversal from a net exporter to a net energy importer. A key driver of this shift is that domestic oil and gas endowments are relatively limited compared to rapid population growth and the projected increase in economic activity.

Electricity generation [22] is dominated by gas-fired power plants, which account for the majority of grid-connected capacity. Large dams along major river systems also contribute a significant amount of hydropower. Despite this installed capacity, electricity production remains insufficient relative to demand. Grid instability and frequent outages [23] mean that millions of households lack reliable power, and businesses rely extensively on diesel and petrol generators to meet their energy needs. This dependence increases costs for consumers, contributes to air pollution, and raises overall emissions. Nigeria continues to have one of the world's largest electricity access gaps, with nearly half the population (43%) not connected to an electricity grid [24]. These weaknesses reduce productivity and discourage investment.

Climate change interacts with Nigeria's energy system in several important ways. Rising temperatures increase electricity demand, particularly in urban areas where cooling needs are growing rapidly [25]. As urbanisation continues and incomes rise, demand for air conditioning and refrigeration could expand further, placing additional stress on an already strained grid. Energy infrastructure [26] is also exposed to climate hazards [27]. Flooding can damage transmission networks, interrupt fuel supply routes and affect the operation of power plants. Coastal oil and gas infrastructure is vulnerable to sea-level rise and extreme weather events. In the Niger Delta region [28], where much of Nigeria's petroleum infrastructure is located, environmental degradation and flooding risks intersect with existing political and security challenges. Hydropower production [27] may also become more variable as rainfall patterns change. Periods of drought can reduce reservoir levels and limit electricity generation, while extreme rainfall events complicate dam management and increase downstream flood risks. These uncertainties make long-term energy planning more difficult.

Nigeria's dependence on fossil fuel exports today introduces an additional strategic challenge. As global energy systems gradually shift toward lower-carbon sources, long-term oil demand may weaken [29]. At the same time, demand for oil and gas in Nigeria and the broader Sub-Saharan region is expected to increase in the coming decades as economic development accelerates. This divergence makes it plausible that Nigeria could shift from a net hydrocarbon exporter to an importer. Given that government revenues today are heavily tied to hydrocarbon exports, such changes could affect fiscal stability and limit the resources available for infrastructure, social spending and climate adaptation. Consequently, Nigeria needs to reorient the revenue side of its public finances and place it on a broader, tax-based footing.

On the other hand, Nigeria has significant renewable energy potential [30], particularly through solar power in northern regions. Off-grid solar systems and mini-grids are increasingly viewed as practical solutions for electricity access in rural areas where the cost of extending the national grid would be prohibitive. However, renewable expansion faces persistent barriers [31] including financing constraints, regulatory uncertainty and grid limitations. Solutions [32] require, inter alia, investment in transmission infrastructure and improved system management. In addition, renewable technologies depend on international supply chains for components such as solar panels and batteries. For countries like Nigeria, this reliance on imported technology introduces new dimensions of energy security.

These investments must be made in a context where climate impacts are already constraining fiscal space by increasing sovereign risk and the cost of capital, while simultaneously raising public spending needs for social programmes and services. This is the double cost crunch: physical climate damages erode growth and revenues, while transition needs increase financing requirements precisely when capital remains expensive and public resources are under pressure.

These dynamics define Nigeria's energy challenge of expanding reliable electricity access and supporting economic growth while managing climate risks and preparing for structural shifts in global energy markets.

1.3 POLICY

Nigeria has developed a range of policy frameworks addressing climate mitigation and adaptation, but implementation remains uneven. Climate governance was enhanced with the adoption of the Climate Change Act [33], which established a legal basis for national climate policy and created the National Council on Climate Change [34] to coordinate federal actions. The Act integrates climate considerations into national planning and supports Nigeria's long-term emissions strategy.

Nigeria's commitments under the 2015 Paris Agreement are reflected in its nationally determined contribution (NDC). Under its third NDC [35], submitted in 2025, the country commits to net-zero greenhouse gas emissions by 2060, with an absolute emissions reduction of 32% by 2035 relative to the 2018 baseline.

Energy transition policies emphasise the expansion of renewables and improved electricity access. National strategies such as the Renewable Energy Master Plan [36] and the National Renewable Energy and Energy Efficiency Policy [37] aim to increase solar deployment, improve energy efficiency, and reduce reliance on diesel generators while expanding rural electrification.

The government has also focused on reducing emissions from the petroleum sector. Initiatives such as the Nigerian Gas Flare Commercialisation Programme [38] are designed to capture natural gas that would otherwise be flared and redirect it to productive uses, such as electricity generation and industrial activity.

Adaptation planning prioritises some sectors like agriculture, water management and disaster risk reduction. The 2011 National Adaptation Strategy and Plan of Action for Climate Change Nigeria [39] promotes climate-resilient farming, improved irrigation and flood management, while programmes to combat desertification highlight the growing environmental pressures in northern regions. In October 2025, the revised National Adaptation Plan (NAP) was validated. Although the content is not yet finalised, the interim report is likely to prioritise climate-resilient agriculture, efficient water resource management, climate-proofing of the energy sector and measures to enhance resilience among vulnerable populations.

Climate considerations have increasingly been incorporated into broader development planning. National economic strategies emphasise infrastructure resilience, economic diversification and investment in cleaner energy systems, reflecting the recognition that climate change presents both environmental and macroeconomic risks. Implementation, however, continues to face constraints [40] related to financing, institutional capacity and coordination across levels of government.

This is where the double cost crunch becomes policy-relevant: delaying transition may protect near-term growth in carbon-intensive sectors, but it can also increase cumulative adjustment needs later, while physical climate impacts are already raising adaptation costs and straining fiscal capacity. Overall, Nigeria's policy challenge is no longer a trade-off between adaptation and mitigation, but how to finance both under tightening development constraints.

1.4 SECURITY AND GEOPOLITICAL CONSIDERATIONS

Nigeria has historically been an important supplier of oil to international markets and remains a key player in African energy diplomacy [41]. Changes in global energy demand associated with decarbonisation could therefore reshape Nigeria's external economic relationships and strategic priorities [42].

Nigeria's role in regional politics gives climate risks a geopolitical dimension [43]. As Africa's most populous country, and one of its largest economies, Nigeria is a key actor in West African political, economic and security arrangements [44], including through its leadership role in the Economic Community of West African States (ECOWAS). Climate-related shocks affecting Nigeria could therefore have consequences that extend beyond its national borders, with impacts on regional stability and development.

In northern Nigeria [45], in particular, environmental stress affecting agriculture and livelihoods contribute [46] to internal displacement and cross-border mobility into neighbouring states such as Niger, Chad and Cameroon. The risk of regional instability is driven primarily by existing security challenges and weak governance in fragile border regions. Population movements may place additional pressure [47] on local resources and institutions if existing structural vulnerabilities are not addressed.

A clear example of this dynamic is the Lake Chad Basin [45]. Long-term environmental degradation and variability in water availability have undermined agriculture and fisheries, particularly in northeastern Nigeria. The resulting economic stress and displacement have interacted with insurgency dynamics, producing cross-border humanitarian and security impacts [48] that require coordinated regional responses [49]. This illustrates how climate-related environmental change can translate into transnational security challenges.

Nigeria's economic weight also means that climate impacts on infrastructure and production capacity [50] can influence regional markets. Disruptions to transport corridors, agricultural output or energy supply can affect food prices and trade throughout West Africa. As a major trade hub and energy supplier, shocks within Nigeria [51] can therefore propagate economic stress to neighbouring countries.

Finally, Nigeria's leadership role in regional institutions means that domestic climate crises can affect the broader capacity for regional cooperation [52]. Climate impacts that constrain Nigeria's fiscal or political resources may reduce its ability to support regional collective security and development [50] initiatives. Conversely, successful adaptation and resilience-building in Nigeria would strengthen regional stability by reducing displacement pressures and supporting economic integration.

The double cost crunch intensifies these geopolitical pressures: constrained fiscal space and higher financing costs limit Nigeria's ability to invest in both adaptation and transition, while dependency on fossil fuel revenues creates political economy trade-offs between near-term growth and long-term decarbonisation.

Power distributor engineers are working on the damaged pole in Lagos Nigeria.

2. Results

Our research[1] explores how climate damages, the transition to a low-carbon economy, and their interaction in the double cost crunch might impact the geopolitics of Nigeria. It sheds light on some previously downplayed, yet critical, components of climate pressure, including various climate impacts and their persistence, the effect of capital market frictions on the total cost of the transition, and technological choices within the energy sector.

2.1 TRANSITION TO A LOW-CARBON ECONOMY

Nigeria's transition toward a lower-carbon economy is unlike that of industrialised countries because energy demand is still growing very rapidly [53]. Expanding electricity access [54] remains a central development priority, and this objective must be balanced with climate commitments and long-term economic diversification goals.

Structural dependence on fossil fuel revenues [55] complicates this transition. Oil exports provide significant fiscal resources, and rapid changes in the global energy system could affect government budgets and macroeconomic stability. Managing this transition therefore requires policies that both diversify the economy and gradually reduce dependence on hydrocarbon revenues [56].

At the same time, Nigeria [53] has opportunities [55] to expand renewable energy and improve energy efficiency [57]. Decentralised solar PV systems, improvements in grid infrastructure and investments in cleaner generation technologies could support both development and climate objectives. Achieving these outcomes [58] will depend heavily on access to international finance, technological cooperation and stable domestic regulatory frameworks.

2.1.1 The cost of capital

Nigeria is likely to undergo a significant economic transformation over the coming decades, and its population is projected to nearly triple by the end of the century compared to 2025 levels. These trends are expected to result in substantially higher overall economic output and real per-capita household income, according to the SSP2[2] socioeconomic trajectory. Realising this transformation, however, will require substantial investments across the economy, including in the low-carbon transition of the energy sector.

Figure 1 presents the annual electricity investment (Panel A) and the overall economy investments (including electricity sector; Panel B) over 2025–2050 under a current climate policy scenario.[3] The blue bars represent absolute investment levels (left axis), while the red lines (right axis) show these investments as a share of projected Nigerian GDP[4] under SSP2 assumptions, thereby placing the investment requirements within a broader macroeconomic context.

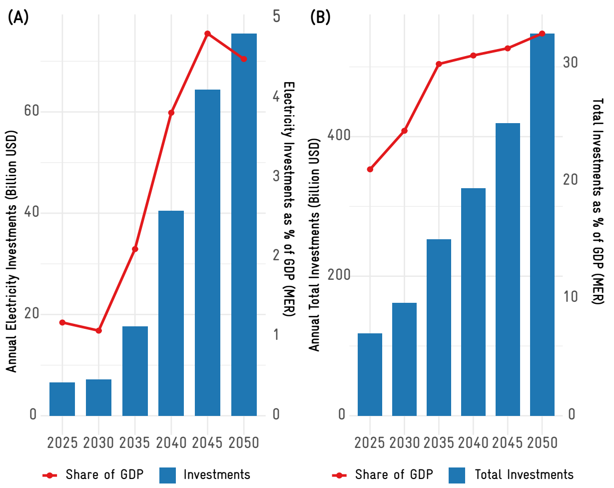

Figure 1. Annual investments in the electricity sector (Panel A) and the broader economy (Panel B) over the 2025–2050 period under a current climate policy scenario. Blue bars represent absolute investment levels on the left axis, while the red lines show their share relative to GDP (MER) on the right axis.

As shown, substantial investments are required in the power sector, even under a current climate policy scenario. These investments start to escalate from 2035 onwards, growing significantly over time both in absolute terms and as a share of GDP; however, the share slightly deescalates in 2050 reflecting higher projected GDP growth relative to electricity investment requirements.

Conversely, non-electricity investment starts at a higher absolute level and grows at a more modest pace as a share of GDP. This pattern highlights the scarcity of capital in the short-term and, thus, its high economic value due to strong investment demand during this period. This capital scarcity is a key determinant of whether Nigeria's transformation succeeds or succumbs to the double cost crunch.

In addition, the capital cost, reflected by the weighted average cost of capital (WACC), increases the overall cost of transforming both the energy system and the broader economy. Since WACC is applied to investment volumes, the resulting capital costs for economy-wide investments significantly exceed those for energy technologies alone. These additional costs can dampen economic growth and reduce energy demand. Moreover, their cumulative effect increases over time as capital stock accumulation slows down, since financing costs apply to both current and past investments that remain within their lifetime. These trends can be observed in Figure 2, which shows the total annual capital costs for the Nigerian economy, disaggregated into energy and broader macroeconomic investment-related capital costs. The red line on the right axis reflects the share of these capital costs relative to the Nigerian GDP.

Capital costs can substantially influence technological dynamics in the power sector, as illustrated in Figure 3. This figure presents the cost-optimal power mix under scenarios with perfect (circles) and imperfect (triangles) capital markets up to mid-century. Both scenarios assume the current level of climate policy ambition and SSP2 socioeconomic conditions for Nigeria.

In the imperfect capital market scenario, heterogeneous risk premia are applied on top of the risk-free rate, whereas in the perfect capital market scenario, a uniform interest rate applies across the whole economy (i.e., no additional capital

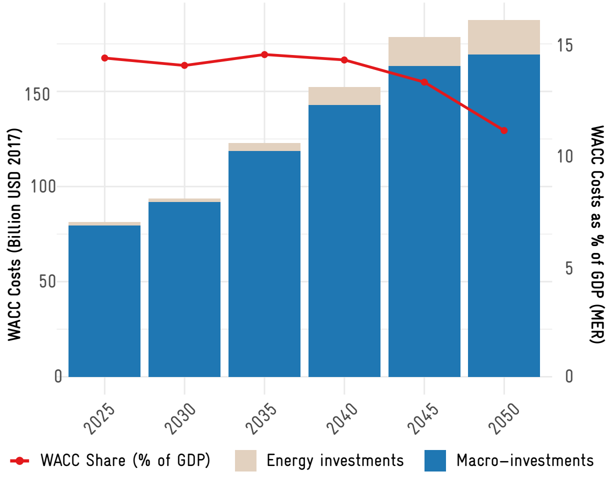

Figure 2. Annual cost of capital requirements over the period 2025–2060 for investments in the energy sector and the overall economy under a current climate policy scenario. Bars represent absolute values (left axis), while the red line shows their share relative to Nigerian GDP (MER; right axis).

cost is considered for low-carbon investments in the perfect capital market setting). The results indicate that higher costs of capital reduce the deployment of wind and solar power, instead relying on gas-fuelled technologies. This is because renewable technologies are more capital intensive, requiring higher up-front investment compared to fossil fuel technologies. The inclusion of capital costs therefore leads to a relatively higher levelised cost of electricity for renewables compared to fossil fuels, lowering the share of renewable technologies in the power mix and raising electricity prices. Lower electricity supply, in turn, can increase the use of fossil-fuel generators for non-electric energy services, which may raise dependence on imported petroleum products.

These results should not be interpreted as forecasts of Nigeria's future power mix, as outcomes will depend on the level of climate policy ambition – renewable technologies would dominate the power mix under more ambitious climate scenarios. Instead, these results reflect the impact that capital markets may have on the technological choices within the power sector.

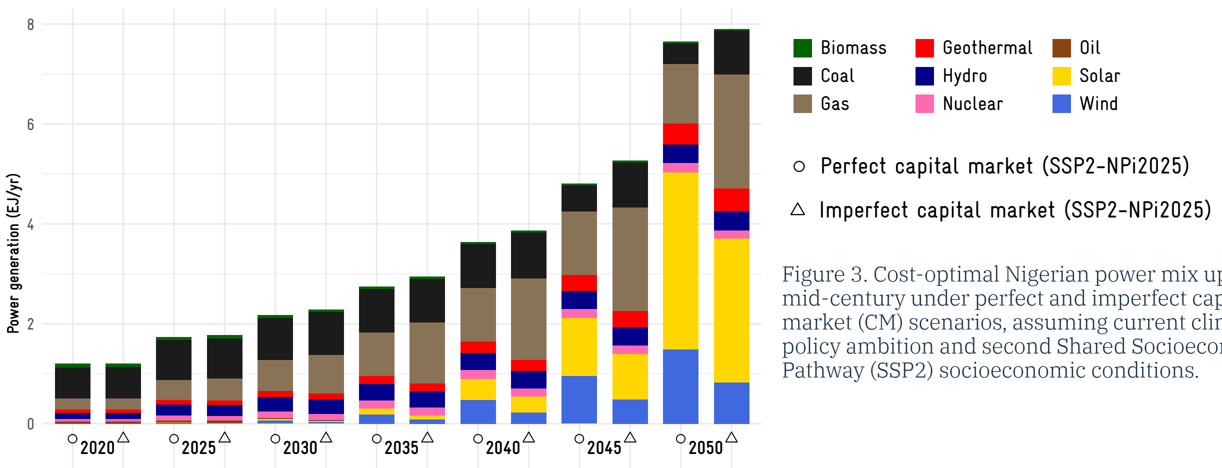

Figure 3. Cost-optimal Nigerian power mix up to mid-century under perfect and imperfect capital market (CM) scenarios, assuming current climate policy ambition and second Shared Socioeconomic Pathway (SSP2) socioeconomic conditions.

2.1.2 Carbon pricing policy

Following the successful removal of petrol subsidies in May 2023 – a reform that triggered widespread, at times violent unrest – Nigerian stakeholders are now turning to carbon pricing as a complementary policy instrument. Carbon pricing can generate fiscal space through revenue mobilisation, but without careful design it risks exacerbating distributional burdens and triggering political backlash.

Opportunity for resource mobilisation. Carbon pricing presents a promising avenue for domestic resource mobilisation, generating revenue that can be reinvested in critical sectors such as healthcare, education and climate adaptation, as well as renewable energy or energy efficiency to drive the low-carbon transition [59]. By reducing reliance on external aid, it offers a sustainable and predictable source of domestic revenue that strengthens fiscal resilience and enables Nigeria to pursue development priorities aligned with global climate goals. Revenues can also provide a cushion for highly affected households or industry, which can strengthen the acceptability of the policy.

Acceptability and risk for protest. Implementing pricing policies can lead to large-scale protests by parts of the population. Public and political support can be strengthened through transparent communication about the environmental and economic benefits of carbon pricing policies, alongside clear explanations of how revenues will be used [60; 61]. Experiences in other countries have shown that people might not know whether they were compensated or by how much. A clear communication strategy and inclusive stakeholder engagement can help to increase understanding and therefore acceptability.

Household distributional risk. Carbon pricing in Nigeria would be progressive overall, meaning that lower income households bear a proportionally smaller burden – as a share of their total expenditure – than wealthier ones [62; 63]. As Figure 4 illustrates, a carbon price of USD 40/tCO_2 without revenue recycling is progressive, but with considerable within-decile variation. Recycling 70% of revenues as lump-sum household transfers would shift the distributional consequences towards more progressive outcomes, and overcompensate the majority of the poorest 30% of the population. Despite this overall progressivity, households at similar income levels can face very different impacts depending on their location, fuel use pattern and vehicle ownership [63], signalling that many households would remain net losers even under redistribution. In Nigeria, directing revenues toward basic infrastructure investments – particularly electricity access – could deliver additional benefits to poorer households and generate so-called double progressivity [64].

2.2. ECONOMIC DEVELOPMENT AND CLIMATE IMPACTS

Climate change affects economic and fiscal growth, as well as development in Nigeria [48]. It has been ranked 6th least adaptation-ready country in the world [66]. Flooding along major river systems and in urban centres has caused repeated losses to housing, infrastructure and agriculture, while drought and land degradation in northern regions have reduced agricultural productivity and pasture availability. The impact of changing climate conditions and weather extremes on economic growth in Nigeria [48] has already been assessed. We further highlight the economic impacts assessed through (i) capital and labour channels and (ii) the conflict and migration channel.

Climate impacts will undermine both rural [67] and urban [68] livelihoods and contribute to internal displacement, accelerating urbanisation as households seek income and security. This mobility and rapid urbanisation [69] places additional pressure on housing, services and the labour market. Climate change also acts as a risk multiplier by increasing competition over land and water, amplifying existing socioeconomic vulnerabilities, weak governance and insecurity. This is already evident in northern and central Nigeria, where environmental stress has heightened tensions between pastoralist and farming communities [70].

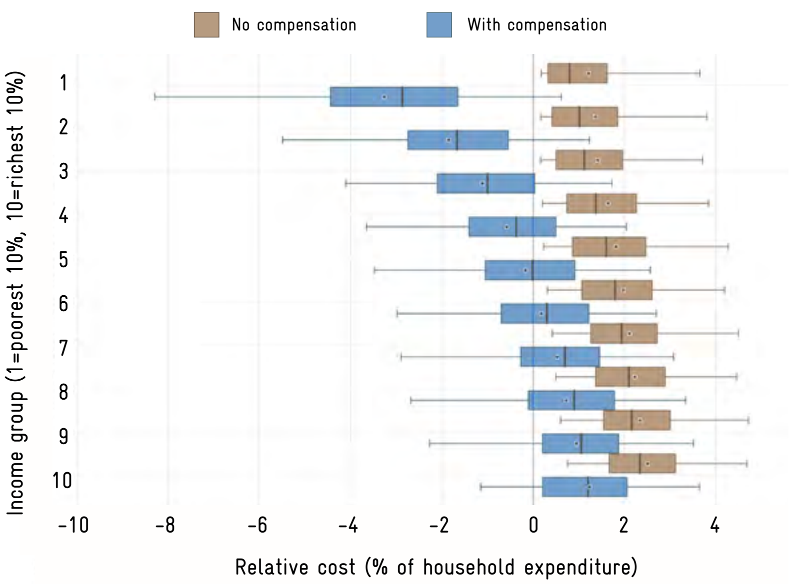

Figure 4: Distributional effects of a national carbon price of USD 40/tCO_2 with (purple bars) and without (green bars) recycling 70% of revenues (lump sum to households). Bars show relative cost burden aggregated over ten income deciles. Horizontal lines indicate median values, circles mean values, the boxes the 25th–75th interpercentile range, whiskers the 5th–95th interpercentile range [65].

Source: Carbon Pricing Incidence Calculator (2026). Own calculation based on household expenditure data (Nigeria Living Standards Survey) and multi-regional input-output data (GTAP).

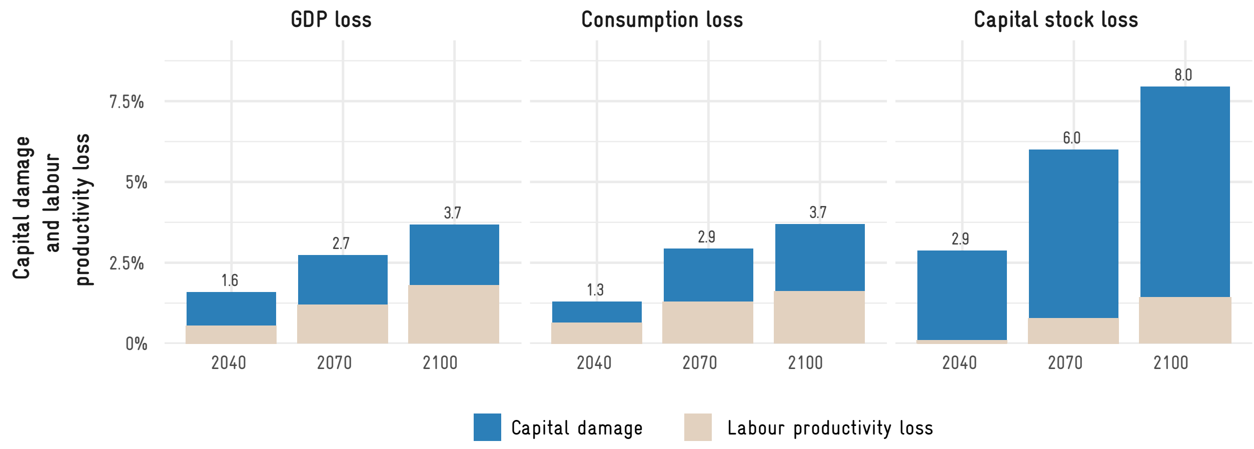

Figure 5. Economic losses due to climate change in Sub-Saharan Africa (including Nigeria) projected by the MOSAIC multi-sector growth model under the SSP2 current policy scenario. Bars represent additional losses on top of today's climate baseline (% deviation from a counterfactual run without additional climate change).[13]

2.2.1 Capital and labour channels

We analyse two key channels to estimate the economic damage of climate change on the Sub-Saharan African economy over the twenty-first century:[5] damages on productive capital (buildings, machinery, infrastructure) from physical climate impacts, and heat stress lowering worker productivity (notably in outdoor sectors such as agriculture and construction). By 2100, the combined labour and capital channels suggest GDP losses of around 2% for Europe and the USA, around 4–5% for China and Japan, around 7% for India and close to 4% for Sub-Saharan Africa (Figure 5). Note that these are damages from further warming since 2025, not the total cumulative impact of climate change. In concrete terms, an average household in Sub-Saharan Africa would consume around 4% fewer goods and services by the end of the century than in a world without further warming. In the case of Nigeria, capital damage and reduced labour productivity contribute roughly equal shares to economic loss. This reflects Nigeria's high exposure to extreme weather (recurrent and severe riverine and coastal flooding, urban flooding in Lagos) combined with the large share of the workforce employed in heat-exposed outdoor sectors – around 34% of Nigerians are engaged in rain-fed agriculture, and the northern region is dominated by pastoralists.

By 2100 the combined capital and labour damages reduce Sub-Saharan African capital stock by around 8% below its counterfactual (Figure 5, right-hand column) – roughly twice the GDP loss for the same year. This reflects both direct destruction by extreme weather events (orders of magnitude for the SSA aggregate, where wildfire is concentrated in Southern and Eastern Africa rather than Nigeria: wildfire ~68%, river flooding ~21%, coastal flood ~9%, tropical cyclone ~2% of capital-damage exposure [71]) and the diversion of investment toward reconstruction rather than productive expansion. This highlights the importance of disentangling the channels of economic loss: an aggregate estimate conceals how much investment is diverted to repair and relocation, and understates the drag on long-run capital accumulation on which durable productivity and consumption gains depend.

These damages translate into concrete macro-financial risks. The adaptation investment they imply – coastal protection for Lagos and other low-lying delta cities, flood-resilient transport corridors, irrigation, cooled workplaces, restoration of degraded land in the Sahelian north – could be large, recurring and hard to defer. The increased frequency and severity of extreme weather events could strain public finances and raise borrowing costs, posing exceptional challenges for highly-indebted emerging economies with high climate vulnerability [73; 74]. Climate events significantly and simultaneously impact Nigeria's growth outlook, fiscal sustainability, balance of payments and financial sector, raising debt risk and widening fiscal and external financing gaps [75].

Nigeria enters this period from a tight fiscal starting point: public gross debt stood at around 53% of GDP in 2024, with federal government interest payments absorbing roughly 41% of revenue. With no change projected through 2026 [75], Nigeria holds a speculative-grade sovereign rating (Moody's B3, S&P B-, Fitch B). Moreover, about 48% of central government debt is foreign-currency-denominated, and oil and gas supply close to 90% of Forex earnings and around half of federal revenue. The naira has lost over 85% of its value since 2015, and a sharp fall in the oil price or escalation in global uncertainty could trigger portfolio outflows, putting pressure on reserves and, in the extreme case, inducing a further steep depreciation [75]. Few Nigerian households or firms carry insurance against natural disasters, and the government holds no sovereign catastrophe bond. When major events hit – as with the 2022 and 2024 floods – the cost of relief and reconstruction falls to the government through ex-post fiscal spending rather than pre-arranged risk transfer.

The cumulative picture also weighs on foreign direct investment: market-seeking flows face a smaller target market as consumption is depressed, efficiency-seeking flows lose part of their productivity advantage as heat stress weighs on outdoor and informal-sector work, and asset-seeking flows face a higher country-risk premium. For an economy still pursuing structural transformation and electrification, the diversion of investment towards reconstruction undermines productive expansion, including the energy transition (Section 2.1). This is the core of the double cost crunch: climate damages absorb capital precisely when the transition requires large up-front investment under expensive financing conditions.

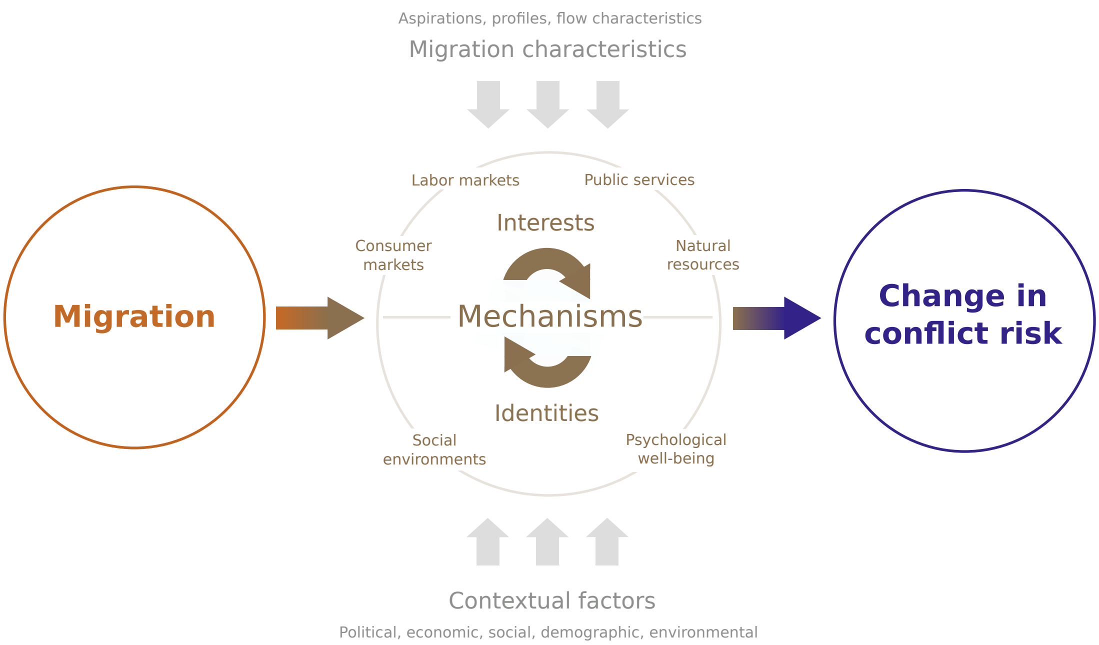

Figure 6: Conceptual framework linking migration to conflict (visualisation by Merschroth et al. [78]). Migration can affect (both increase and decrease in) conflict risk via the Interests and Identity mechanisms. The conflict outcomes further depend on contextual factors (e.g. economic development, institutional capacity, political inclusion) and migration characteristics.

2.2.2 Climate-related migration and conflict: mechanisms and heterogeneous effects

Migration is an important strategy for climate change adaptation, yet it is often framed as a security risk. While experts generally agree that climate migration has had a negligible impact on conflict risk in most contexts, it can interact with existing political, social, and economic vulnerabilities to contribute to conflict in specific settings [76]. In Nigeria, these contextual factors include poor governance, corruption, the selective application of laws in conflict resolution, poverty, cultural differences, religious divisions, and competition over natural resources, particularly land [77].

We develop a theoretical framework linking migration to changes in conflict risk through the interests and identity mechanisms (see Figure 6). Our systematic literature review of quantitative empirical studies analyses when and how climate migration and immobility have influenced conflict risk. It finds that effects are highly context-dependent and vary by migration and conflict characteristics, rather than identifying a general effect [78].

In an empirical study on six African countries we investigate several contexts in which drought and internal migration affect conflict risk.[7] It finds that a 1-standard deviation (SD) increase in aridity[8] at the place of origin is associated with a 7.4% increase in immigration at destination areas. There is also an 8.0 percentage point (p.p.) increase in violent conflict and a 2.2 p.p. increase in violent high-intensity conflict[9] at the destinations. While immigration has no effect on high-intensity conflicts, likely due to selection of safe destinations, a 1 SD increase in the immigration rate is associated with an increase in violent conflict[10] by 11 p.p. This effect is smaller in destinations with higher GDP or Human Development Index (HDI) measures, with lower agricultural dependence and where democratic rights[11] are more developed [85].

A literature review focusing on Nigeria shows that climate change functions as a strong threat multiplier for internal migration and conflict. In northern Nigeria, where land is lost to desertification (in the Lake Chad Basin at a rate of 0.6 km per year), Fulani pastoralists and rural youth are pushed southward in search of pasture, water and arable land [86]. The south, in turn, is threatened by regular flooding and erosion, resulting in hundreds of fatalities, millions of internally displaced persons (often settling in urban and highland areas) and extensive damage to housing.[12] Migration is mostly temporary or seasonal, but can become longer-term due to livelihood deterioration, resulting in non-return decisions [87].

This mobility has intensified farmer–herder conflicts in the Middle Belt (e.g. Benue-Nasarawa-Taraba borderlands) [91] and the southwest (e.g. Saki and Efon-Alaaye) [92]. These farmer–herder clashes alone claimed ~3,000 lives and displaced >300,000 (2018–2023), with ongoing incidents in 2025–2026 adding hundreds more deaths and displacements [96]. Migration also exacerbates other existing conflicts in the Middle Belt (e.g. Tiv-Jukun, Tiv-Alago) and the indigeneity and religious crisis in Wukari [93–95]. Thus, climate stressors influence migration that compound pre-existing conditions and conflict dynamics.

As climate-related migration increases, fiscal resources will be needed not only for transition investments but also for humanitarian responses. These include supporting adaptation in areas affected by climate change and strengthening the capacity of destination areas to absorb migrants successfully and peacefully – not only via economic and political measures, but also via social factors such as attitudes toward immigration. This represents another dimension of the double cost crunch.

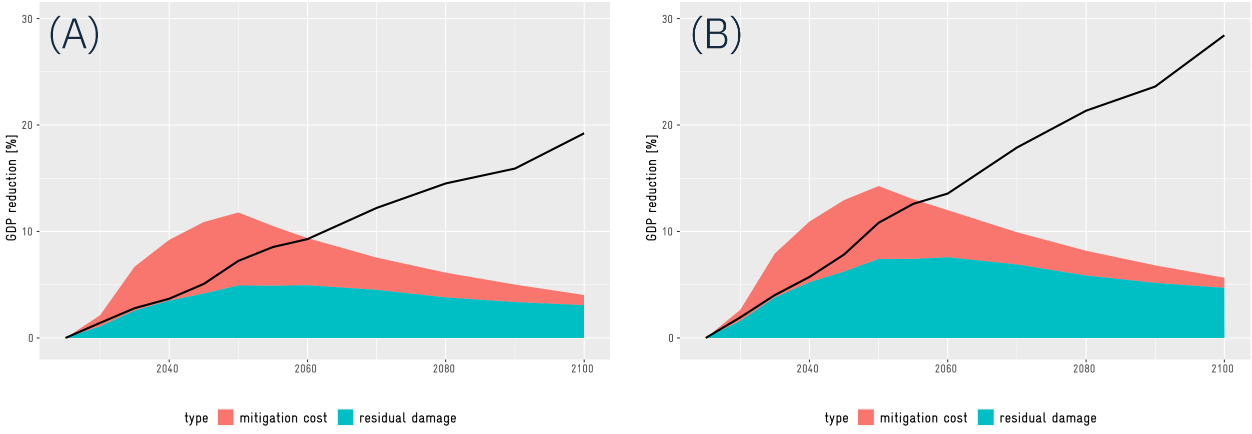

Figure 7: The double cost crunch for Nigeria: policy costs and residual damages under a Paris-compatible mitigation scenario for a medium (Scenario A) and high (Scenario B) damage specification. The black line illustrates the damages expected under the current level of policy ambition.

2.3 THE BENEFITS OF AMBITIOUS CLIMATE POLICY

Ambitious international climate policy efforts in line with the Paris Agreement would mitigate global mean temperature increases to about 1.45°C by 2100, relative to preindustrial levels. Achieving this target requires immediate action from all countries, and would reduce expected climate damages in 2100 from 19% of GDP (under Scenario A) and 28% of GDP (under Scenario B) to 4% of GDP (Scenario A) and 6% of GDP (Scenario B), respectively (Figure 7). However, this target can no longer be achieved without a so-called overshoot: the temperature will exceed this level by mid-century before declining in response to net-zero greenhouse gas emissions. Net zero will likely require some carbon dioxide capture and storage, with the level (and therefore cost) of removals determined by the degree and speed of near-term emission reductions. Delayed emission reductions will also be more costly because they will have to be more ambitious and achieved over a shorter period of time. The benefits of ambitious climate action therefore far outweigh the costs in the long run.

Failing to meet the goals of the Paris Agreement will also result in substantial residual damages. These will feed into the double cost crunch (Figure 7), complicated by near-term fossil fuel dependence, demographic shifts and distributional effects. While delays in climate policy reduce near-term transition costs, they allow climate damages to accumulate, eroding the fiscal capacity to transition and adapt to climate change. And not all climate impacts will be reversible once they have been incurred.

Taken together, governments need to navigate the trade-off between early ambition, which increases near-term investment costs but minimises long-term climate damages, and delayed ambition, which reduces near-term costs but increase damages through (potentially irreversible) overshoot consequences. The double cost crunch – combining residual damages and transformation costs – thereby intensifies with postponement of mitigation.

The message is clear: immediate action is economically rational because long-term benefits exceed costs, postponement worsens the double cost crunch, and unavoided damages can reduce the fiscal capacity needed for both adaptation and transition. Nonetheless, making both burdens visible simultaneously enables better timing of investments and avoids costly misallocations.

Visual Force / iStockphoto.com

Map of Nigeria and its neighbouring countries.

3. Conclusion in a geopolitical and security context

In Nigeria, rising temperatures, more intense rainfall, flooding, coastal erosion and drought will likely result in adverse impacts on agricultural production, access to water, human and animal health, infrastructure and urban systems. According to the Intergovernmental Panel on Climate Change (IPCC) 6th Assessment Report, climate change has already negatively affected food security across Africa by reducing crop yields, livestock productivity, fisheries, and access to food through higher prices and weaker market access. In addition, highly populated coastal cities such as Lagos, Port Harcourt and Warri experience flooding and storm surges, which will only worsen in the decades to come. These impacts carry both economic and security implications: adaptation and mitigation actions will be costly [3; 97], but so will climate inaction – not only in fiscal terms, but through diminished food security and weakened state capacity, service provision and regional influence.

These underlying risks intersect with Nigeria's oil-dependent political economy. Oil and gas remain central to domestic use and the export sector, exposing the country to resource-curse dynamics and price volatility [98; 99]. Fossil fuel rents still provide a comfortable income source for Nigeria and gas investment may support wider energy access. Unless alternative revenue streams and power sources can quickly be developed and expanded, carbon lock-in may deepen in the coming decades [100]. Critical minerals also present both opportunities and challenges. Transition minerals, including lithium for the production of rechargeable batteries, have the potential to diversify incomes [101], but harnessing the economic and social benefits will depend on local processing capacity. China currently dominates the refining of 19 out of 20 strategic minerals [102]. This highlights the role of supply-chain security, as global disruptions affect prices, shipping, fuel imports and exports, and fertiliser markets.

In 2025, Mali, Burkina Faso and Niger withdrew from the 15-member ECOWAS organisation and formed the Alliance of Sahel States. The depletion of the bloc further complicates Nigeria's geopolitical position both in the region and globally. The attenuation of ECOWAS may reduce the effectiveness of collective regional security, and hamper responses to displacement and shared challenges, including the climate crisis [103].

In the context of these cross-cutting challenges, Nigeria needs to navigate the double cost crunch of the transition away from fossil resources while adapting to those impacts that cannot be avoided. Given the high near-term cost of the green transition, in both absolute and relative terms, Nigeria is set to remain dependent on external climate finance.

ENDNOTES

1 The reported climate impact numbers are based on structural economic and econometric models and should be understood as broad orders of magnitude rather than exact forecasts. Because the underlying assumptions, input data and transmission channels from climate signals to economic damages are subject to uncertainty, the results are best used for comparing scenarios and regions within the model framework; our deliberate simplifications, such as smooth damage functions, a limited set of impact channels, and frictionless reconstruction, help isolate these comparative patterns.
2 This projection is based on the second Shared Socioeconomic Pathway (SSP2) as defined in the IPCC Sixth Assessment. Although SSP2 represents "middle-of-the-road" assumptions for Nigeria and the global economy, there is considerable heterogeneity across alternative SSP scenarios.
3 A current climate policy scenario (also called Current Policies Scenario – CPS) is a climate and energy modelling pathway that assumes that only policies already implemented and legislated will remain in place – no new policies are introduced.
4 Due to data constraints, GDP per capita is calculated using the aggregate market exchange rate (MER) and purchasing power parity (PPP) values applied across the wider "Sub-Saharan Africa" region.
5 MOSAIC resolves the world into 12 macro-regions. Nigeria is represented within the Sub-Saharan Africa (SSA) aggregate. The capital-damage shock is taken directly from Mandel et al.'s Sub-Saharan Africa estimate (2025) [71], whereas the labour productivity shock comes from a "less developed Rest of World" pool in García-Leon et al. (2021) [72], which combines Sub-Saharan Africa with the Middle East and North Africa. The labour channel therefore reflects an average that includes those neighbouring regions. The within-SSA composition matters too: the large wildfire share in the Mandel SSA aggregate is driven by Southern and Eastern African economies (Angola, Mozambique, Madagascar, DR Congo), whereas Nigeria's actual capital-damage exposure is concentrated in flooding (riverine along the Niger and Benue, coastal flooding in Lagos and the Niger Delta, urban flooding) and Sahelian drought. A single regional damage signal does not fully capture the full range of Nigeria's climatic zones, from the humid south to the semi-arid north, together with its hydrocarbon-dependent fiscal structure.
6 We define climate migration as migration that has been influenced by climate events. These can be slow-onset events (e.g. desertification, rising temperatures) or fast-onset events (e.g. floods).
7 It focuses on Benin, Botswana, Senegal, South Africa, Tanzania and Zimbabwe, using IPUMS migration data [79] at the subnational level, combined with ACLED [80] and UCDP [81; 82] conflict data from 1997–2016, aggregated over 3 years before (for conflict history) and after immigration, and mean aridity over 10 years prior to immigration as measured by the Standardized Precipitation Evapotranspiration Index (SPEI) [82; 83].
8 In our sample, one standard deviation corresponds to 0.32 units in the SPEI.
9 The authors rely on ACLED data to distinguish between violent (i.e. conflicts with at least one fatality) and non-violent conflicts. Further, they rely on the UCDP dataset for high-intensity conflicts. Compared to ACLED, the UCDP threshold for conflicts is at least one direct death and a conflict dyad must reach 25 battle deaths in any year. This means that the ACLED data also contains less-intense violent events, which are not included in the UCDP data.
10 Based on ACLED.
11 Based on the V-Dem liberal democracy index, participatory democracy index and egalitarian democracy index [84].
12 While Nigeria has experienced several floods over the years, the 2012 flood was the most devastating as it affected over 7 million Nigerians, with 2 million persons registered as internally displaced persons (IDPs), 363 people died, while more than 618 thousand houses were damaged in 33 out of the 36 states of the country [87; 88]. More recently in the southern region, flooding events in 2022 alone displaced more than 1.4 million in the Southeast and Niger Delta. For example, in Bayelsa, floods drove riverine communities to urban/highland areas [89; 90].
13 Capital damage from Mandel et al. (2025); labour productivity loss from sectoral ISO heat-stress dose-response (García-Leon et al. 2021), with vulnerability tiers mapped to sectors.

References

[1] World Bank Group, 2021. Climate Risk Country Profile: Nigeria. Available at: https://climateknowledgeportal.worldbank.org/sites/default/files/country-profiles/15918-WB_Nigeria%20Country%20Profile-WEB.pdf.

[2] UN Habitat, 2023. Country Brief: Nigeria. Available at: https://unhabitat.org/sites/default/files/2023/07/nigeria_country_brief_final_en.pdf.

[3] Intergovernmental Panel on Climate Change (IPCC), 2022. Africa. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Available at: https://www.ipcc.ch/report/ar6/wg2/chapter/chapter-9/ [Accessed 21 March 2026].

[4] Salami, A.A., 2025. Rainfall variability and trends analyses in Nigeria using remotely sensed data and CMIP5 models. Earth System Science Engineering, 9, p. 2837. Available at: https://doi.org/10.1007/s41748-024-00556-0 [Accessed 21 March 2026].

[5] IDS, 2024. Climate Change in Nigeria: Impacts and Responses. Available at: https://opendocs.ids.ac.uk/articles/report/Climate_Change_in_Nigeria_Impacts_and_Responses/26429638 [Accessed 21 March 2026].

[6] Rybarczyk, K., 2021. The herder-farmer conflict in Nigeria – is there hope for the future? Institute of Development Studies. Available at: https://www.ids.ac.uk/opinions/the-herder-farmer-conflict-in-nigeria-is-there-hope-for-the-future/ [Accessed 21 March 2026].

[7] Eteh, D.R., Japheth, B.R., Akajiaku, C.U., Osondu, I., Mene-Ejegi, O.O., Nwachukwu, E.M., Oriasi, M.D., Omietimi, E.J. and Ayo-Bali, A.E., 2025. Assessing the impact of climate change on flood patterns in downstream Nigeria using machine learning and geospatial techniques (2018–2024). Springer Nature. Available at: https://doi.org/10.1007/s44288-025-00178-7 [Accessed 21 March 2026].

[8] World Weather Attribution, 2022. Climate change exacerbated heavy rainfall leading to large-scale flooding in West Africa. World Weather Attribution. Available at: https://www.worldweatherattribution.org/climate-change-exacerbated-heavy-rainfall-leading-to-large-scale-flooding-in-highly-vulnerable-communities-in-west-africa/ [Accessed 21 March 2026].

[9] Ndimele, P.E., Ojewole, A.E. and Mekuleyi, G.O., 2024. Vulnerability, resilience and adaptation of Lagos coastal communities to flooding. Earth Science, Systems and Society, 4(1). Available at: https://doi.org/10.3389/esss.2024.10087 [Accessed 21 March 2026].

[10] Koko, A.F. and Bello, M., 2023. Exploring the contemporary challenges of urbanization and the role of sustainable urban development: a study of Lagos City, Nigeria. Journal of Contemporary Urban Affairs, 7(1), pp. 175–188. Available at: https://doi.org/10.25034/ijcua.2023.v7n1-12 [Accessed 21 March 2026].

[11] Lagos State Government, 2012. Towards a Lagos State Climate Change Adaptation Strategy. Available at: https://csdevnet.org/wp-content/uploads/Towards-aLagos-Adaptation-Strategy.pdf [Accessed 21 March 2026].

[12] Omokaro, G.O., 2025. Multi-impacts of climate change and mitigation strategies in Nigeria: agricultural production and food security. Science in One Health, 4. Available at: https://doi.org/10.1016/j.soh.2025.100113 [Accessed 21 March 2026].

[13] World Bank, 2024. Employment in agriculture in Nigeria. Available at: https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS?locations=NE-NG [Accessed 21 March 2026].

[14] Ofoegbu, D.I., 2025. Mainstreaming climate action into agriculture in Nigeria. APRI. Available at: https://afripoli.org/mainstreaming-climate-action-into-agriculture-and-food-security-in-nigeria [Accessed 21 March 2026].

[15] Rigaud, K.K., de Sherbinin, A., Jones, B., Abu-Ata, N.E. and Adamo, S., 2021. Groundswell Africa: A Deep Dive Into Internal Climate Migration in Nigeria. World Bank Group. Available at: https://documents1.worldbank.org/curated/en/613181634532026170/pdf/Groundswell-Africa-A-Deep-Dive-into-Internal-Climate-Migration-in-Nigeria.pdf [Accessed 21 March 2026].

[16] Ejiba, I.V. and Adeola, O.O., n.d. Does Translocality Influence Climate Change Adaptation of Rural Farming Households? Evidence from Arochukwu, southeast Nigeria. MITRA WA. Available at: https://opus4.kobv.de/opus4-uni-passau/frontdoor/deliver/index/docId/1577/file/MitraWA_WP_5_Climate_Nigeria.pdf [Accessed 21 March 2026].

[17] IOM, 2023. Migration, Environment and Climate Change and Risk Reduction (MERC). IOM. Available at: https://crisisresponse.iom.int/sites/g/files/tmzbdl1481/files/appeal/documents/IOM%20Nigeria%20Migration%2C%20Environment%2C%20Climate%20Change%20and.pdf [Accessed 21 March 2026].

[18] Lancet Countdown, 2024. Nigeria Health and Climate Report, Data Sheet 2023. Available at: https://lancetcountdown.org/wp-content/uploads/2024/06/Nigeria_v1.pdf [Accessed 21 March 2026].

[19] Aborode, A.T., Otorkpa, O.J., Abdullateef, A.O., Oluwaseun, O.S., Adegoye, G.A., Aondongu, N.J., Oyetunji, I.O., Akingbola, A., Scott, G.Y., Kolawole, B.O. and Komakech, J.J., 2024. Impact of climate change-induced flooding water related diseases and malnutrition in Borno State, Nigeria: a public health crisis. PMC. Available at: https://doi.org/10.1177/11786302251321683 [Accessed 21 March 2026].

[20] International Energy Agency (IEA), 2024. Nigeria Energy Profile. Available at: https://www.iea.org/countries/nigeria [Accessed 21 March 2026].

[21] Somoye, O.A., 2023. Energy crisis and renewable energy potentials in Nigeria: a review. Renewable and Sustainable Energy Reviews, 188. Available at: https://doi.org/10.1016/j.rser.2023.113794 [Accessed 21 March 2026].

[22] National Bureau of Statistics, 2020. Power Sector Data 2020: Energy generated and sent out. Nigeria Energy Library. Available at: https://www.nigerianstat.gov.ng/elibrary/read/1241143 [Accessed 21 March 2026].

[23] Obele, J.D., 2025. Causes and consequences of frequent power grid failures in Nigeria. GPH-International Journal of Social Science and Humanities Research, 8(8). Available at: https://www.gphjournal.org/index.php/ssh/article/view/2093 [Accessed 21 March 2026].

[24] World Bank, n.d. TECHNICAL NOTE 2: Igniting Economic Growth by Reforming Nigeria's Power Sector. Available at: https://documents1.worldbank.org/curated/en/099061723133022449/pdf/P1762240038c17010bfb5087a5bcc325b5.pdf [Accessed 21 March 2026].

[25] Salihu, A.C., Ibrahim, Y.Z., Abdulkarim, R. and Aruya, I.E., 2026. Climate change impact on cooling energy demand of major airports in Nigeria. JATE, 15(1). Available at: https://docs.lib.purdue.edu/jate/vol15/iss1/4/ [Accessed 21 March 2026].

[26] Oyefeso, T. and Lawrence, E., 2024. Building a climate-resilient energy sector in Nigeria: Challenges and recommendations. BusinessDay. Available at: https://businessday.ng/news/legal-business/article/building-a-climate-resilient-energy-sector-in-nigeria-challenges-and-recommendations/ [Accessed 21 March 2026].

[27] Ofodile, C., Abdulkadir, S., Odenigbo, D. and Pigiligi, P., 2024. Climate change and energy security in Nigeria: analyzing the role of renewable energy solutions. IJAES, 10(10). Available at: https://iiardjournals.org/get/IJAES/VOL.%2010%20NO.%2010%202024/Climate%20Change%20and%20Energy%2056-79.pdf [Accessed 21 March 2026].

[28] Arausi, A., Clark, E.V. and Ikenga, F.A., 2023. Oil production and climate change in the Niger-Delta region: synergic implication and adaptation. Journal of Public Administration, Finance and Law. Available at: https://doi.org/10.47743/jopafl-2024-33-5 [Accessed 21 March 2026].

[29] Climate Action Tracker, 2024. Nigeria Country Profile (2024). Available at: https://climateactiontracker.org/countries/nigeria/ [Accessed 21 March 2026].

[30] International Renewable Energy Agency, 2023. Renewable energy roadmap: Nigeria. Available at: https://www.nigeria-energy.com/content/dam/markets/emea/nigeria-energy/en/2023/docs/NE23-NigeriaEnergyRoadmap-Report.pdf [Accessed 21 March 2026].

[31] Nkalo, U.K., 2025. Nigeria's renewable energy sector: analysis of the present and future prospects. Solar Compass, 2025. Available at: https://doi.org/10.1016/j.solcom.2025.100123 [Accessed 21 March 2026].

[32] World Economic Forum, 2023. Mobilizing Investments for Clean Energy in Nigeria. Available at: https://www3.weforum.org/docs/WEF_Mobilizing_Investment_for_Clean_energy_in_Nigeria_2023.pdf [Accessed 21 March 2026].

[33] Federal Republic of Nigeria, 2021. Climate Change Act. Available at: https://faolex.fao.org/docs/pdf/NIG208055.pdf [Accessed 28 March 2026].

[34] National Council on Climate Change, n.d. Official Website. Available at: https://climatecouncil.gov.ng/ [Accessed 28 March 2026].

[35] Federal Republic of Nigeria, 2025. Nigeria's third nationally determined contribution (NDC 3.0). United Nations Framework Convention on Climate Change. Available at: https://unfccc.int/sites/default/files/2025-09/Nigeria%20NDC%203.0%20-%20Transimission%20Version%202.pdf [Accessed 28 March 2026].

[36] The Federal Ministry of Environment, 2023. Renewable Energy and Energy Efficiency Policy NREEEP. Available at: https://powerlibrary.theelectricityhub.com/2023/11/10/renewable-energy-masterplan-for-nigeria/ [Accessed 28 March 2026].

[37] Federal Republic of Nigeria, 2015. National Renewable Energy and Energy Efficiency Policy (NREEEP). Ministry of Power. Available at: https://www.power.gov.ng/download/NREEE%20POLICY%202015-%20FEC%20APPROVED%20COPY.pdf [Accessed 28 March 2026].

[38] Nigerian Gas Flare Commercialisation Programme, 2024. Nigerian Gas Flare Commercialization Programme (NGFCP). Nigerian Upstream Petroleum Regulatory Commission. Available at: https://ngfcp.nuprc.gov.ng/ [Accessed 28 March 2026].

[39] Building Nigeria's Response to Climate Change Project & Federal Ministry of Environment, 2011. National Adaptation Strategy and Plan of Action on Climate Change for Nigeria (NASPA-CCN). Available at: https://csdevnet.org/wp-content/uploads/NATIONAL-ADAPTATION-STRATEGY-AND-PLAN-OF-ACTION.pdf [Accessed 28 March 2026].

[40] Animashaun, N., 2025. Nigeria's Climate Agenda: New Directions in Policy and Diplomacy. APRI. Available at: https://afripoli.org/nigerias-climate-agenda-new-directions-in-policy-and-diplomacy [Accessed 28 March 2026].

[41] Torkuma, R.A., 2025. The role of energy diplomacy in enhancing regional energy security in Nigeria. International Journal of Current Business and Social Sciences, 11(3), pp. 67–76. Available at: https://ijcbss.org/uploads/2025/03/11036776.pdf [Accessed 28 March 2026].

[42] Adams, U., 2024. Climate change and the future of Nigeria's oil-dependent economy. Global Journal of Management and Business Research. Available at: https://globaljournals.org/GJMBR_Volume24/1-Climate-Change-and-the-Future.pdf [Accessed 28 March 2026].

[43] Geopolitical Monitor, 2024. Geopolitical snapshot: Nigeria. Geopolitical Monitor. Available at: https://www.geopoliticalmonitor.com/geopolitical-snapshot-nigeria/ [Accessed 28 March 2026].

[44] Salisu, A., Salisu, S. and Salisu, S., 2023. Constructing geopolitical risk index for Nigeria. Scientific African. Available at: https://doi.org/10.1016/j.sciaf.2023.e01948 [Accessed 28 March 2026].

[45] Akubor, E.O., 2017. Climate Change, Migration and Conflict: A Historical Survey of People of Northern Nigeria and their Neigbhours from the period of the Mega Chad. ResearchGate. Available at: https://doi.org/10.15299/local.2017.11.7.9 [Accessed 28 March 2026].

[46] Kogoui Kamta, F.N., 2020. Conflict, Climate Change and Migration in the Lake Chad Basin with Focus on Resource Scarcity and Insecurity in Northeast Nigeria. Doctoral dissertation, Universität Hamburg. Available at: https://ediss.sub.uni-hamburg.de/bitstream/ediss/8925/1/Conflict%2C%20Climate%20Change%20and%20Migration%20in%20the%20Lake%20Chad%20Basin%20with%20Focus%20on%20Resource%20Scarcity%20and%20Insecurity%20in%20Notheast%20Nigeria.pdf [Accessed 28 March 2026].

[47] Werz, M. and Conley, L., 2012. Climate Change, Migration, and Conflict in Northwest Africa. Center for American Progress. Available at: https://www.americanprogress.org/wp-content/uploads/sites/2/2022/06/climate_migration_nwafrica_execsumm.pdf [Accessed 28 March 2026].

[48] Niang, A., 2025. Tackling security and climate challenges in the Lake Chad Basin requires collaboration. Climate Diplomacy. Available at: https://climate-diplomacy.org/magazine/cooperation/tackling-security-and-climate-challenges-lake-chad-basin-requires [Accessed 28 March 2026].

[49] World Food Programme, 2024. Conflict, climate, hunger and resilience in the spotlight at Lake Chad Basin conference. Available at: https://www.wfp.org/stories/conflict-climate-hunger-and-resilience-spotlight-lake-chad-basin-conference [Accessed 28 March 2026].

[50] Darius, R., Billot, A., Massetti, E. and Vernon-Lin, N., 2025. Macroeconomic Implications of Climate Challenges: Nigeria. International Monetary Fund Selected Issues Paper No. 2025/097. Available at: https://doi.org/10.5089/9798229018692.018 [Accessed 28 March 2026].

[51] Escalante, L., Mamboundou, P., Meyimdjui, C. and Omoju, O.E., 2025. Economic and food security impacts of climate disasters and mitigation policies: insights from Nigeria. Springer Nature. Available at: https://link.springer.com/article/10.1007/s10640-025-00981-3#data-availability [Accessed 28 March 2026].

[52] Lyammouri, R. and Bozsogi, B., 2025. Climate and Food Security Policy Initiatives in West Africa, the Sahel, and the Lake Chads Basin. Policy Center for the New South. Available at: https://www.policycenter.ma/sites/default/files/2025-04/PB_21-25_Rida%20Lyammouri.pdf [Accessed 28 March 2026].

[53] Shao, Y., Yang, Z., Yan, Y., Yan, Y., Israilova, F., Khan, N. and Chang, L., 2025. Navigating Nigeria's path to sustainable energy: Challenges, opportunities, and global insight. Energy Strategy Reviews, 59. Available at: https://doi.org/10.1016/j.esr.2025.101707 [Accessed 28 March 2026].

[54] Sesan, T., Uduka, U., Baker, L., Ugwu, O., Eleri, E. and Bhattacharyya, S., 2024. Exploring the connections between mini-grid market regulation and energy access expansion: The case of Nigeria. Energy Policy, 184. Available at: https://doi.org/10.1016/j.enpol.2023.113891 [Accessed 28 March 2026].

[55] Nweke-Eze, C., 2024. Nigeria's Energy Transition. Konrad-Adenauer-Stiftung e.V. Available at: https://www.kas.de/documents/252038/29391852/Nigeria%E2%80%99s+Energy+Transition.pdf [Accessed 28 March 2026].

[56] Climate Strategies & Salzburg Global Seminar, 2024. Prosperity post fossil fuels briefing: Nigeria. Available at: https://climatestrategies.org/publication/prosperity-post-fossil-fuels-briefing-nigeria/ [Accessed 28 March 2026].

[57] Njume, G.E., 2025. Nigeria Green Investment Plan: Industry Decarbonization Program. African Development Bank & United Nations Framework Convention on Climate Change. Available at: https://unfccc.int/sites/default/files/resource/20250506_AfDB.pdf [Accessed 28 March 2026].

[58] Energy Transition Office (Federal Government of Nigeria), n.d. Nigeria Energy Transition Plan. Available at: https://energytransition.gov.ng/ [Accessed 28 March 2026].

[59] Franks, M., Lessmann, K., Jakob, M., Steckel, J.C. and Edenhofer, O., 2018. Mobilizing domestic resources for the Agenda 2030 via carbon pricing. Nature Sustainability, 1(7), pp. 350-357. Available at: https://doi.org/10.1038/s41893-018-0083-3 [Accessed 5 March 2026].

[60] Mohammadzadeh Valencia, F., Mohren, C., Ramakrishnan, A., Merchert, M., Minx, J.C. and Steckel, J.C., 2024. Public support for carbon pricing policies and revenue recycling options: a systematic review and meta-analysis of the survey literature. npj Climate Action, 3, p. 74. Available at: https://doi.org/10.1038/s44168-024-00153-x [Accessed 28 March 2026].

[61] Bez, C.S., Bonilla, J.A., Castaneda Rodriguez, B., García, H.H., Missbach, L., Mohammadzadeh Valencia, F. and Steckel, J.C., 2026. Reforming Fossil Fuel Subsidies with Citizens' Approval: The Case of Colombia. CESifo Working Paper No. 12583. Available at SSRN: https://ssrn.com/abstract=6513101 [Accessed 12 June 2026].

[62] Ayhan, S.H., Greve, H., Lay, J., Steckel, J.C. and Ward, H., 2025. The poverty and distributional impacts of carbon pricing on households: evidence from Ghana, Nigeria and Uganda. Environment and Development Economics, pp. 1-23. Available at: https://doi.org/10.1017/S1355770X25100120 [Accessed 9 June 2026].

[63] Missbach, L., & Steckel, J. C. (2026). The heterogeneous effects of climate policy on households: Evidence from 88 countries. Journal of Environmental Economics and Management, 103382. https://doi.org/10.1016/j.jeem.2026.103382

[64] Dorband, I.I., Jakob, M., Steckel, J.C. and Ward, H., 2022. Double progressivity of infrastructure financing through carbon pricing — Insights from Nigeria. World Development Sustainability, 1, p. 100011. Available at: https://doi.org/10.1016/j.wds.2022.100011 [Accessed 20 March 2026].

[65] Steckel, J.C., Missbach, L. and Schiefer, T., 2026. The Carbon Pricing Incidence Calculator. Available at: http://www.cpic-global.net [Accessed 20 March 2026].

[66] Nwankpa, A., 2022. Managing existential risk and climate resilience: The case of Nigeria. Brookings. Available at: https://www.brookings.edu/articles/managing-existential-risk-and-climate-resilience-the-case-of-nigeria/ [Accessed 28 March 2026].

[67] Babatunde Omotoso, A. and Ayodele, M., 2026. Nigerian farmers talk about how climate change is affecting staple food crops – and what can help. The Conversation. Available at: https://theconversation.com/nigerian-farmers-talk-about-how-climate-change-is-affecting-staple-food-crops-and-what-can-help-270988 [Accessed 1 June 2026].

[68] Ola, A., 2022. Climate change effects and livelihood-adaptation strategies by the urban poor in Ibadan, Nigeria. Town and Regional Planning, 81, pp. 24–38. Available at: https://doi.org/10.18820/2415-0495/trp81i1.3 [Accessed 28 March 2026].

[69] The C²REST Project, 2025. Climate change, urbanization, and the impact on Nigeria's informal settlements. C²REST. Available at: https://ccrest.org/news/climate-change-urbanization-and-the-impact-on-nigerias-informal-settlements [Accessed 20 March 2026].

[70] Efobi, U., Adejumo, O. and Kim, J., 2025. Climate change and the farmer-Pastoralist's violent conflict: Experimental evidence from Nigeria. Ecological Economics, 228. Available at: https://doi.org/10.1016/j.ecolecon.2024.108449 [Accessed 28 March 2026].

[71] Mandel, A., Battiston, S. and Monasterolo, I., 2025. Mapping global financial risks under climate change. Nature Climate Change, 15(3), pp. 329-334. Available at: https://doi.org/10.1038/s41558-025-02244-x [Accessed 28 March 2026].

[72] García-Leon, D., Casanueva, A., Standardi, G., Burgstall, A., Flouris, A.D. and Nybo, L., 2021. Current and projected regional economic impacts of heatwaves in Europe. Nature Communications, 12, p. 5807. Available at: https://doi.org/10.1038/s41467-021-26050-z [Accessed 11 June 2026].

[73] Kling, G., Lo, Y.C., Murinde, V. and Volz, U., 2021. Climate vulnerability and the cost of debt. Oxford Open Economics, 4. Available at: https://doi.org/10.1093/ooec/odaf003 [Accessed 29 April 2026].

[74] Anyfantaki, S., Blix Grimaldi, M., Madeira, C., Malovaná, S. and Papadopoulos, G., 2025. Decoding climate-related risks in sovereign bond pricing: a global perspective. BIS Working Paper No. 1275. Available at: https://www.bis.org/publ/work1275.pdf [Accessed 30 April 2026].

[75] IMF, 2025. Nigeria: 2025 Article IV Consultation. IMF Country Report 25/157. Available at: https://www.elibrary.imf.org/view/journals/002/2025/157/002.2025.issue-157-en.xml [Accessed 15 March 2026].

[76] Šedová, B., Thalheimer, L., Lohr, S., Benveniste, H.S., Brzoska, M., Buhaug, H., Cottier, F., Crespo Cuaresma, J., Hoffmann, R., Ide, T., Koubi, V., Petrova, K., Scheffran, J., Schewe, J., Siders, A.R., Thornton, F., Upadhyay, H., van der Geest, K., Vinke, K., von Uexkull, N., Walelign, S.Z. and Oppenheimer, M., n.d. Climate drives migration, conflict rarely follows. Manuscript submitted for publication.

[77] Nnam, M. U., 2025. Violent herder–farmer conflicts and human security in Nigeria: a focus on food security. Development in Practice, 1–12. Available at: https://doi.org/10.1080/09614524.2025.2573963 [Accessed 27 July 2026].

[78] Merschroth, S., Lohr, S., Thalheimer, L. and Šedová, B., 2026. A Systematic Review of Statistical Evidence on Climate-Related Migration, Immobility, and Conflict: No General Effect and Substantial Evidence Gaps. CEPA Discussion Papers 99. Center for Economic Policy Analysis. Available at: https://ideas.repec.org/p/pot/cepadp/99.html [Accessed 11 March 2026].

[79] Hoffmann, R., Abel, G., Malpede, M., Muttarak, R. and Percoco, M., 2024. Drought and aridity influence internal migration worldwide. Nature Climate Change, 14(12), pp. 1245-1253. Available at: https://doi.org/10.1038/s41558-024-02165-1 [Accessed 11 June 2026].

[80] Raleigh, C., Linke, A., Hegre, H. and Karlsen, J., 2010. Introducing ACLED – Armed Conflict Location and Event Data. Journal of Peace Research, 47(5), pp. 651-660. Available at: https://doi.org/10.1177/0022343310378914 [Accessed 2 June 2026].

[81] Davies, S., Pettersson, T., Mollenberg, M. and Öberg, M., 2025. Organized violence 1989–2024, and the challenges of identifying civilian victims. Journal of Peace Research, 62(4). Available at: https://doi.org/10.1177/00223433251345636 [Accessed 11 June 2026].

[82] Sundberg, R. and Melander, E., 2013. Introducing the UCDP Georeferenced Event Dataset. Journal of Peace Research, 50(4). Available at: https://ideas.repec.org/a/sae/joupea/v50y2013i4p523-532.html [Accessed 5 March 2026].

[83] Beguería, S., Vicente-Serrano, S.M., Reig, F. and Latorre, B., 2014. Standardized precipitation evapotranspiration index (SPEI) revisited: parameter fitting, evapotranspiration models, tools, datasets and drought monitoring. International Journal of Climatology, 34(10), pp. 3001–3023. Available at: https://doi.org/10.1002/joc.3887 [Accessed 23 April 2026].

[84] Coppedge, M., Gerring, J., Knutsen, C.H., Lindberg, S.I., Teorell, J., Altman, D., Angiolillo, F., Bernhard, M., Cornell, A., Fish, M.S., Fox, L., Gastaldi, L., Gjerløw, H., Glynn, A., Good God, A., Grahn, S., Hicken, A., Kinzelbach, K., Krusell, J., Marquardt, K.L., McMann, K., Mechkova, V., Medzihorsky, J., Natsika, N., Neundorf, A., Paxton, P., Pemstein, J., von Römer, J., Seim, B., Sigman, R., Skaaning, S.-E., Staton, J., Sundström, M., Tannenberg, M., Tzelgov, E., Wang, Y., Wiebrecht, F., Wig, T., Wilson, S. and Ziblatt, D., 2025. V-Dem [Country-Year/Country-Date] Dataset v15. Varieties of Democracy (V-Dem) Project. Available at: https://doi.org/10.23696/vdemds25 [Accessed 12 June 2026].

[85] Lohr, S., Hoffmann, R. and Šedová, B., n.d. Rural-urban climate migration and conflict: Analysis of drivers and contexts. Unpublished manuscript.

[86] Madu, I.A. and Nwankwo, C.F., 2021. Spatial pattern of climate change and farmer–herder conflict vulnerabilities in Nigeria. GeoJournal, 86, pp. 2691–2707. Available at: https://doi.org/10.1007/s10708-020-10223-2 [Accessed 12 June 2026].

[87] Ajaero, C.K., Mozie, A.T. and Abu, I.N., 2018. Migrating from migratory waters to migration of livelihoods. Social Indicators Research, 136, pp. 319–333. Available at: https://doi.org/10.1007/s11205-016-1524-x [Accessed 12 March 2026].

[88] Onyekuru, N.A., Marchant, R., Platts, P., Chukwuone, N., Mukaila, R., Omeja, E. and Ajaero, C., 2026. Ecoregional assessment and mapping of climate change impacts and adaptation strategies among farmers across Nigeria. Mitigation and Adaptation Strategies for Global Change, 31, p. 13. Available at: https://doi.org/10.1007/s11027-025-10281-2 [Accessed 2 June 2026].

[89] Onwusiribe, C.N., Oteh, O.U., Oloveze, A., Agwu, N.M., Nto, P.O.O. and Chukwu, J., 2024. Climate change and conflict: Understanding the relationship between environmental challenges and communal conflicts in OFSP farming communities in Southeast Nigeria. African Journal of Agriculture, Nutrition and Hospitality, 1(2), pp. 25–48. Available at: DOI:10.31920/3050-2276/2024/v1n2a2 [Accessed 30 April 2026].

[90] Michael, T.O., 2024. A qualitative exploration of the influence of climate change on migration of women in the riverine area of Bayelsa State, Nigeria. Social Sciences, 13(2), p. 89. Available at: https://doi.org/10.3390/socsci13020089 [Accessed 1 June 2026].

[91] Nwankwo, C.F., 2025. Assemblage Thinking: Understanding Farmer–Herder Conflicts in the Nigerian Benue Valley. Doctoral dissertation, University of Leicester. Available at: https://doi.org/10.25392/leicester.data.28238951 [Accessed 12 June 2026].

[92] Olaniyan, A. and Okeke-Uzodike, U., 2015. Desperate guests, unwilling hosts: Climate change-induced migration and farmer–herder conflicts in southwestern Nigeria. Conflict Studies Quarterly, 10, pp. 23–40. Available at: https://www.academia.edu/64931048/Desperate_Guests_Unwilling_Hosts_Climate_Change_Induced_Migration_and_Farmer_Herder_Conflicts_in_Southwestern_Nigeria [Accessed 23 April 2026].

[93] Nwankwo, C.F., 2025. Articulatory flow of Fulanisation discourse of the farmer–herder conflicts in the Benue Valley region, Nigeria. Critical African Studies, 17(1), pp. 77-96. Available at: https://doi.org/10.21203/rs.3.rs-6967990/v1 [Accessed 2 June 2026].

[94] Nwankwo, C.F., 2025. Interactions between territorial partitioning, indigeneity crises, and farmer-pastoralist conflicts in the Benue-Nasarawa region. Political Geography, 117, p. 103262. Available at: https://doi.org/10.1016/j.polgeo.2024.103262 [Accessed 12 June 2026].

[95] Nwankwo, C.F. and Upton, C., 2026. Between development and dispossession: Understanding why there is weak collective resistance to large-scale land acquisitions in Nasarawa South, Nigeria. Environment and Security, 4(1), pp. 69-91. Available at: https://doi.org/10.1177/27538796251366389 [Accessed 25 April 2026].

[96] Internal Displacement Monitoring Centre, 2025. Global Report on Internal Displacement 2025. Available at: https://www.internal-displacement.org/global-report/grid2025/ [Accessed 12 June 2026].

[97] World Bank Group, 2021. Climate Risk Country Profile: Nigeria. World Bank Group. Available at: https://climateknowledgeportal.worldbank.org/sites/default/files/country-profiles/15918-WB_Nigeria%20Country%20Profile-WEB.pdf

[98] Ross, M.L., 2012. The Oil Curse: How Petroleum Wealth Shapes the Development of Nations. Princeton: Princeton University Press.

[99] U.S. Energy Information Administration, 2025. Country Analysis Brief: Nigeria. U.S. Department of Energy. Available at: https://www.eia.gov/international/content/analysis/countries_long/Nigeria/Nigeria-2025.pdf.

[100] Unruh, G.C., 2000. Understanding carbon lock-in. Energy Policy, 28(12), pp. 817–830. Available at: https://doi.org/10.1016/S0301-4215(00)00070-7.

[101] International Energy Agency (IEA), 2021. The Role of Critical Minerals in Clean Energy Transitions. World Energy Outlook Special Report. Available at: https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions.

[102] International Energy Agency, 2025. With new export controls on critical minerals, supply concentration risks become reality. IEA. Available at: https://www.iea.org/commentaries/with-new-export-controls-on-critical-minerals-supply-concentration-risks-become-reality

[103] Asadu, C., 2025. ECOWAS pledges to "keep door open" after 3 coup-hit West African nations exit regional bloc. Associated Press, 29 January.

Potsdam Institute for Climate Impact Research

The project is implemented by the Potsdam Institute for Climate Impact Research (PIK) and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH through the Climate Diplomacy Action Programme (CDAP) on behalf of the International Climate Initiative (IKI) of the federal government of Germany. Within the federal government, the IKI is anchored in the Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety (BMUKN) with this project being under the responsibility of the Federal Foreign Office (AA).

Supported by: Federal Foreign Office

on the basis of a decision by the German Bundestag

IKI International Climate Initiative

Implemented by giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

EfD | NIGERIA

DGAP

Scientific content developed by:
Potsdam Institute for Climate Impact Research (PIK)
Telegraphenberg A 31
14473 Potsdam, Germany
pik-potsdam.de

DOI:
https://doi.org/10.48485/pik.2026.34

Scientific coordination:
Andrea Kambergs, PIK

Concept:
Dr Fanny Thornton, PIK

Editorial Support:
Annemarie Welle, PIK

Authors:
Chukwuedozie Ajaero, EfD; Dr Nico Bauer, PIK; Dr Nnaemeka Chukwuone, EfD; Andrea Kambergs, PIK; Dr Diamantis Koutsandreas, PIK; Sarah Lohr, PIK; Dr Cletus Nwankwo, EFD; Dr Benjamin Peeters, PIK; Dr Franziska Piontek, PIK; Anna Reckwitz, PIK; Tessa Schiefer, PIK; Dr Jan Steckel, PIK; Stefanie Wesch, DGAP/PIK; Dr Fanny Thornton, PIK

Stakeholdermanagement:
Elena Barth, GIZ;
Florian Postel, GIZ

Editing:
Aiden Selsick

Layout & Design:
Miguel Faber (Allcolours)