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Net zero central banking in Africa's diverse economies: challenges, opportunities and policy options

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Summary

The net zero transition in Africa: a diverse context and a role for central banks

Africa's economies are contending with a diverse set of challenges and opportunities in relation to building low-carbon, green economies and the transition to net zero emissions. Central banks can play a pivotal role in enabling the transition in Africa if they choose the right policy responses, adapted to the specific contexts in which they operate: that way, they can support each of Africa's 54 nations to tackle their own unique transition-related risks and seize the varying opportunities.

The transition to net zero is a strategic imperative for economic development in Africa. The related challenges differ from one country to another but, broadly speaking, the processes of rapid urbanisation, economic transformation and population growth that are underway across the continent will put pressure on traditionally high-emitting sectors including energy, infrastructure and housing. Economies will need to pivot away from high-carbon development pathways by investing in low-carbon technologies and maximising the potential for locally-generated renewable energy so that they can leapfrog the carbon-intensive stages of growth that characterised the development of today's high-income countries.

Disproportionate vulnerability exacerbated by economic and social challenges

Many African countries are highly exposed and vulnerable to climate-related risks. These include *physical* risks that threaten the predominantly rainfed agriculture that many economies depend on. Under current projections, even considering potential adaptive measures, severe impacts are expected on crops and fisheries, threatening food security and overall economic stability. Some countries, notably those relying on fossil fuel revenues, are also subject to large *transition* risks. These vulnerabilities are disproportionately high in Africa, while the continent's contribution to global greenhouse gas emissions is minimal. As a result, African leaders have made concerted calls for climate justice and equitable action from developed nations.

The transition to net zero offers African countries economic opportunities, but several challenges must be overcome to take advantage of them. The continent is endowed with extensive renewable energy sources, arable land, critical minerals and natural carbon sinks. However, obstacles such as low agricultural productivity, low-value raw material exports and environmental degradation linked to land use and biodiversity loss limit their full exploitation. This is even more critical when recognising Africa's disproportionate vulnerabilities to climate change.

Economic and social conditions add to the challenge of the low-carbon transition. Several African countries are grappling with high debt burdens, limited fiscal capacity, surging borrowing costs and volatile capital flows, which could hinder essential public and international investments in transition and climate adaptation measures.

Introducing a new country classification to guide a nuanced response by central banks

Africa's diverse landscape demands nuanced climate policy responses, including by central banks. We have developed a country classification for African economies based on each country's unique transition-related risks and opportunities. We have ranked all 54 countries and classified them as either high risk, mid-segment or high opportunity across two categories: 1) *climate and energy transition*; and 2) *economic and financial resilience*. This results in nine country groups, as illustrated in Table 1 below.

Table 1. Classification of 54 African economies by risks and opportunities from the transition to net zero

		Climate and energy transition		
		High risk	Mid-segment	High opportunity
Economic and financial resilience	High risk	**Group 1** Chad Ethiopia Somalia	**Group 2** Angola Congo Republic Djibouti Madagascar Mozambique Nigeria South Sudan	**Group 3** Burkina Faso DR Congo Malawi Mauritania Zambia
	Mid-segment	**Group 4** Central African Republic Comoros Eritrea Guinea-Bissau Liberia Mali Niger Sierra Leone Sudan	**Group 5** Algeria Benin Côte d'Ivoire The Gambia Ghana Guinea Senegal Tanzania Togo Zimbabwe	**Group 6** Burundi Cameroon Eswatini Kenya Lesotho Rwanda São Tomé and Príncipe Uganda
	High opportunity	**Group 7** N/A (None)	**Group 8** Cabo Verde Egypt Equatorial Guinea Gabon Libya South Africa	**Group 9** Botswana Mauritius Morocco Namibia Seychelles Tunisia

Note: Countries within the same category are not ranked but are listed alphabetically.

Each of the nine country groups in Table 1 represents a unique intersection of transition-related risks and opportunities. The four country groups that intersect at high/low risk and high/low opportunity across the two dimensions are:

- Group 1 – which faces significant challenges in the low-carbon transition.
- Group 9 – which is presented with significant transition opportunities.
- Group 3 – which also faces significant opportunities but is burdened by high economic risks and limited financial resilience.
- Group 7 – which represents those that are at high risk from the transition but also have a high opportunity in terms of economic and financial resilience; notably, no country currently falls into this group.

Central banks in Africa are at different stages of integrating climate considerations into their activities. Some progress has been made in the policies and interventions of central banks in the region. For example, some have issued regulatory guidance, reporting requirements and supported sustainable finance initiatives. Additionally, some have joined peer networks: for instance, 16 African central banks had joined the Network for Greening the Financial System (NGFS) by October 2023.

The differentiated and uneven levels of progress in climate policy underscore the need for policies to be tailored to the unique needs of individual central banks, in addition to country-specific conditions.

Climate change and the transition to net zero are likely to have a significant and structural impact on several dimensions relevant for central banks in Africa. For example, they interfere with several sectors that are key for the trade balance in some countries, long-term changes and short-term shocks impact the exchange rate (a key instrument for many central banks in Africa), and extreme weather events and structural change from the transition can affect inflation conditions (another crucial focus of central banks). The transition could have stabilising effects, such as more stable energy prices due to increased contributions from renewable sources, while climate shocks could be a source of financial instability. Finally, climate shocks may strain public finances through spending on responses to climate events, and through reduced revenues from key commodity sectors. The foreign-denominated debt of many African nations compounds these concerns.

Different exchange rate arrangements and monetary policy frameworks have different consequences for how central banks can implement their response to climate change and the net zero transition. Different exchange rate arrangements present unique challenges, for example. For central banks operating within a pegged exchange rate framework, how climate change and the net zero transition impact exchange rate markets may be more important than for those working under a floating exchange rate, where the effects on inflation and economic growth might be most significant. For banks with an exchange rate anchor, the impact on the soundness of their foreign reserves is of greatest importance. The exchange rate arrangement and monetary policy framework in place influences the responses.

Central banks could be instrumental in both mitigating risks and capitalising on transition opportunities in Africa. Their comprehensive knowledge of the economy and financial markets enables them to understand and communicate the impacts of climate change on price, economic and financial stability. They are also in a position to inform other policymakers about the broad economic consequences of climate change. Sound supervisory practices can foster favourable conditions for foreign and domestic funding that is vital for the transition. Furthermore, they possess the capability to promote sustainable financial products, support funding through monetary policy operations and participate in the development and implementation of coherent policy agendas at both national and regional levels, including in the design of sustainable international finance solutions.

Conclusion

Now is a defining moment for African central banks to shape the continent's sustainable future. Options for central banks' strategic responses to the risks, opportunities and challenges of the 54 diverse African economies range from maintaining financial stability in the face of climate-related risks to championing and deepening sustainable finance initiatives.

1. Introduction

Developing low-carbon, green economies in Africa is essential to meeting global net zero goals. This must happen in a way that does not jeopardise the development of African economies and instead promotes economic growth and social wellbeing. This report describes the diversity of challenges and opportunities presented by the net zero transition in African economies and classifies countries according to the level of challenge and opportunity they face. This enables us to provide central banks in Africa with a first set of options to assess their economy's particular situation in the net zero transition and to present a series of policies available to them.

Climate change and development: challenges and opportunities in Africa

Like many emerging markets and developing economies (EMDEs), African economies can play a critical role in the transition to net zero global emissions.[1] Structural economic changes, population growth[2] and rapid urbanisation in many African regions are increasing demand in high-emitting sectors such as energy, infrastructure and housing. Meeting these needs without jeopardising the net zero transition requires African economies to leapfrog emitting technologies by investing in sustainable, low-carbon sectors, infrastructure and technologies at scale.

At the same time, African households and firms are disproportionately exposed to physical climate risks, both in the short term, with more frequent extreme weather events, and in the long term, due to changing rainfall patterns and temperature increases (Box 2.1 outlines variation in risk by region). Twenty-seven of the world's 40 most climate-vulnerable countries are located in Africa (GCA, 2021). Across the continent, 95% of agriculture is rainfed, to which climate change represents a significant risk. Building infrastructure and developing economic activities that are resilient to these climatic changes requires large investments in adaptation measures. Africa also faces significant transition risks associated with changes in policy and technological development. For instance, the region's future consumption patterns and business practices could be substantially impacted by both domestic and external policies related to carbon pricing (such as carbon taxes and carbon border adjustments), and the widespread adoption of transition technologies.

Yet the net zero transition represents significant economic opportunities for Africa. Its physical attributes mean many countries possess extensive renewable energy potential, meaning they are able develop and industrialise, increasing economic inclusion for many, while omitting fossil fuels from this process entirely. Africa also possesses major reserves of critical mineral resources needed in renewable technologies, which are crucial to the global net zero transition and are in increasingly high demand.

The continent is also home to some of the world's largest natural carbon sinks, which are critical to conserve in order to achieve global net zero emissions globally. The central Congo Basin peatland, for example, is the world's largest tropical peatland complex and stores approximately 28% of the world's tropical peat carbon (Crezee et al., 2022).

It is important to acknowledge that Africa, despite contributing the smallest share of global greenhouse gas emissions relative to other regions, faces a disproportionately large adverse impact from climate change – and also from biodiversity loss. Calls for advanced economies to take responsibility for reducing their emissions and fulfilling their financial commitments to mitigate climate change are growing louder. At the same time, African leaders are increasingly urging a reform of the multilateral financial system. This was made evident at the 2023 Africa Climate Summit, convened by the African Union and hosted by Kenya in September: the resulting declaration, The African Leaders Nairobi Declaration on Climate Change and Call to Action – or simply the Nairobi Declaration – advocates for developed nations to honour the annual US$100 billion commitment in annual climate finance and to operationalise the Loss and Damage Fund agreed at

[1] EMDEs have contributed to over 95% of the increase in global emissions in the last decade and they currently account for two-thirds of global emissions (WEF, 2022; IMF, 2022). Africa's emissions are estimated at 10% of global & emissions (McKinsey Company, 2021), including land-use and non-energy emissions, which are reported to be between 2-7%.

[2] Africa's population is expected to reach 4.3 billion by 2100, representing 40% of the global population, up from 17% today.

COP27 in 2022, among other proposals. The Nairobi Declaration underscores the necessity for tangible measures to reform the multilateral financial system, all aimed at supporting African economies in addressing climate change. These proposals include better deployment of the Special Drawing Rights liquidity mechanism, the inclusion of disaster suspension clauses and debt pause clauses, and the provision of additional concessional capital to emerging and frontier economies.

African countries face a multifaceted set of challenges that limit investments in low-carbon technologies and infrastructure, and in mitigation measures: chiefly, the adverse economic situations of several countries, with many experiencing elevated levels of debt and limited fiscal space. Compared with other EMDEs, short-term economic prospects for African nations are lukewarm.[3] These factors, combined with increased borrowing costs for many, are worsening the public debt burden and put several African economies at risk of debt distress.[4] Furthermore, rising inflation and tighter monetary policies around the world have placed additional stress on exchange rates and international capital flows.

Against this backdrop, some regions in Africa are likely to experience significant funding squeezes, affecting their capacity to mobilise internal and external capital for investing in the net zero transition, despite the opportunities that it also represents.

The role of African central banks in the net zero transition

Central banks in Africa vary in the stage they have reached in integrating climate considerations into their activities. Though the focus of this report is not on the policies and interventions that central banks in the region have undertaken so far, here we highlight some of their progress, by way of background.

A 2021 study by the African Development Bank (AfDB), Global Centre on Adaptation (GCA) and United Nations Environment Programme Finance Initiative (UNEP FI) found that nine of the 11 African central banks and supervisors interviewed (82%) considered climate risk as a high or very high priority on their institutional agenda, but most were yet to issue binding regulations or supervisory guidelines.

Some central banks have joined peer networks to collaborate on the issue. For example, as of October 2023, 16 African central banks and supervisors had joined the Network of Central Banks and Supervisors for Greening the Financial System (NGFS). These include: Bank of Mauritius; South African Reserve Bank; Bank Al-Maghrib; Banque Centrale de Tunisie; Central Bank of Seychelles; Central Bank of Egypt; Financial Regulatory Authority of Egypt; Central Bank of West African States; Central Bank of Kenya; Central Bank of Mauritania; Bank of Ghana; Central Bank of Nigeria; National Bank of Rwanda; Bank of Tanzania; Bank of Uganda; and Central Bank of Libya. While some have implemented concrete measures, in general, many of the central banks and supervisors in Africa are unlikely to be working on this issue at the same level or pace as central banks in other regions.[5]

The challenges and prospects of each central bank are tightly interwoven with their nation's distinct economic conditions, which requires tailored solutions over generic ones. The challenges from climate change and the net zero transition are not uniformly experienced; nor are economic and financial market conditions the same across countries. Economic development and productive structures also differ greatly between African countries. Some economies rely on extractive sectors that are not compatible with the transition, while others possess resources that are crucial for it. Some countries are heavily dependent on agriculture and thus exposed to increased physical risks as projected over the next few decades, whereas exposure to short-term extreme weather events is a more pressing concern in other countries. These differences imply vastly different risks of stranded assets and economic losses, including job losses and social consequences, although these risks are likely to be significant everywhere.

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[3] Average growth for Sub-Saharan Africa over the next two years is estimated at 3.9%, 1.3 percentage points below growth forecasts for EMDEs in Asia (IMF, 2023a).

[4] The IMF Debt Sustainability Analysis (DSA) showed that, in May 2022, 16 African countries were at high risk of debt distress, with seven already in distress (IMF, 2022).

[5] In a study of the extent to which central banks incorporated climate and other ecological considerations into their COVID-19 response, Sub-Saharan Africa was found to have made the lowest use of instruments deployed by central banks and supervisors (see Dikau et al., 2020).

Similarly, economic conditions and financial resilience differ between African nations. Climate risks will add to worsening sovereign credit conditions for some countries. In others, climate change is likely to impact the management of exchange rates and foreign reserves (see e.g. Beirne et al., 2021; ten Bosch et al., 2022). The level of development in financial markets and financial infrastructure, and the monetary policy framework in which central banks operate, also vary considerably by country, influencing the policy responses that central banks can implement.

All these factors shape the range of policy options available to each central bank, and their potential effectiveness. Each central bank must devise its own response to the challenges of the net zero transition, considering the economic specificities, broader financial context, and climate- and transition-related risks and opportunities.

Structure and aims of this report

Section 2 reviews the main opportunities and challenges of climate change and the net zero transition for African economies. Section 3 offers an analytical classification of all 54 African nations based on key environmental, energy, socioeconomic and financial dimensions that define their unique transition-related risks and opportunities and how they intersect. Section 4 focuses on central banks on the continent, discussing the different institutional frameworks in which they operate and exploring how climate change and the net zero transition impact them in diverse ways. Section 5 lists policy options available to central banks to mitigate climate risks and support the net zero transition. Section 6 concludes.

In providing an analytical base, this report is intended to guide central banks in Africa to develop their climate policy agenda to respond to climate risk exposure and capitalise on transition opportunities in a way that is unique to their national context and that steers the continent towards a prosperous, sustainable future. This is, however, a starting point, and there is room to further refine the recommendations and shape policy proposals that are tailored to the unique national situation of each central bank.

2. The net zero transition: opportunities and challenges for African economies

According to the latest Nationally Determined Contributions (NDCs), Africa needs to mobilise between US$234.5 billion and US$250 billion every year until 2030 – between US$2.7 trillion and US$ 2.8 trillion in total – to meet the climate change mitigation and adaptation goals of the Paris Agreement (AfDB, 2023). While these needs represent opportunities for green growth, chronic barriers to investment may interfere with the flow of capital needed to unlock them, such as high perceived financial risks, limited technical implementation capacity and a chronic failure of developed countries to meet their financing commitments to developing nations set out under Article 9 of the Paris Agreement.[6] Just $29.5 billion in climate finance is raised in Africa every year (CPI, 2022), a mere 12% of what is needed.

Central banks have a significant role to play in catalysing capital flows to support country-specific transition pathways by issuing regulations and guidelines (such as green taxonomies), providing low-cost financing options and advisory services to banks investing in green growth opportunities, leveraging their convening power to onboard international partners, and expanding financial inclusion in 'green' ways, for example by issuing green credit risk guarantees to households and SMEs affected by climate-related risks. However, the precise role a central bank can take will depend on the unique national context: mandates are not uniform across Africa, private financial markets vary in terms of their depth, and public budgets rely on a variety of different sources, including fossil fuel extraction. Growing exposure to the physical impacts of climate change is also affecting African economies and populations to varying degrees, with greater impacts felt where there remains a strong reliance on agriculture.

Key aspects of the net zero transition that will affect African economies include how to:

- Green the continent's future energy needs
- Conserve natural capital while benefiting from resources
- Maximise agricultural opportunities sustainably
- Build resilience to climate change impacts into development.

The opportunities and challenges presented by these aspects are discussed below.

Greening future energy needs

The renewable energy opportunity

As Africa's per capita greenhouse gas emissions are currently low, the focus for the continent is to ensure that increasing energy demand is met through low-carbon sources in a way that does not jeopardise socioeconomic development. Currently, 600 million Africans (43% of the population) lack access to electricity and 970 million (70% of the population) lack access to clean cooking fuels (IEA, 2023a). Securing universal energy access by 2030 – in line with the UN Sustainable Development Goal 7 – will require connecting 90 million Africans a year to electricity (ibid.). In addition to expanding energy access, income growth will create additional energy demand from wealthier households and from industry, freight and agriculture to produce materials, manufacture energy-efficient components, electrify irrigation pumps and extend refrigeration capacity.

Overall, energy demand in Africa is expected to increase by one-third between 2020 and 2030 (ibid.). This growing need creates infrastructure investment opportunities for extending national grids or building decentralised solar-based mini-grids and standalone systems in rural areas. There are significant opportunities to expand solar capacity to power those grids, as Africa is home to 60% of

[6] As committed in the 2009 Copenhagen Accord and extended by the 2015 Paris Agreement, developed countries were expected to scale up climate finance for developing countries to reach a collective goal of $100 billion per year by 2020, with a balanced allocation between adaptation and mitigation. This goal was not met.

the world's solar resources, yet installed solar photovoltaic (PV) capacity on the continent currently accounts for just 1% of the world's share (IEA, 2023a). Hydropower, which already generates one-fifth of Africa's electricity, will also grow in importance, and wind will play an important role in North and East Africa, where resources are located close to demand centres (ibid.). Beyond meeting its domestic energy needs, the continent's abundant renewable energy resources can be used to produce green hydrogen for export to Northern Europe or as ammonia for fertiliser.

African countries are not yet making full use of their renewable energy potential. Despite its abundant solar resources, Africa only accounts for 1% of the world's installed solar PV capacity, and only 2% of global annual investments in renewable energy between 2010 and 2020 (IEA, 2023a). The continent uses just 6% (37 GW) of its exploitable hydropower capacity of 630 GW (IHA, 2023).[7]

Challenges from continued or growing reliance on fossil fuels

If Africa's renewable energy potential is not utilised, and future energy needs are instead met by fossil fuels, emissions could grow rapidly. Today, over 70% of energy spending in Africa goes on fossil fuel projects (IEA, 2023b). Fossil fuels currently account for over three-quarters of all electricity generated in Africa, with gas and coal representing 40% and 30% respectively (IEA, 2023a).

Continued investment in carbon-intensive energy resources, especially coal and oil, exposes countries rich in fossil fuels to significant transition risks. Oil rents alone can contribute over one-third of a nation's GDP[8] and three-quarters of its export earnings (Porter and Anderson, 2022). Nonetheless, in its 'Sustainable Africa' scenario, the International Energy Agency sees a role for fossil fuels and particularly natural gas in supporting industrialisation by providing energy flexibility, extending access to electricity, and displacing heavy fuel oil and coal (IEA, 2023a). While natural gas can play a role in the expansion of variable intermittent renewable energy generation as a medium-term bridge technology, any new investments should be designed so that they do not delay the eventual adoption of renewable energy (KfW et al., 2022). New investments may also increase the exposure of African countries to financial risks resulting from sharp declines in fossil fuel exports and increasing the cost-competitiveness of renewables (World Bank, 2021).

The need for a just transition

To ensure that the decarbonisation of Africa's energy system does not come at the cost of inhibiting energy access or economic and industrial development, the just transition should be top of the global climate policy and sustainable finance agendas. The just transition is embedded in the 2015 Paris Agreement and governments agreed at the COP27 climate summit in 2022 to establish a new work programme on the just transition to mitigate the potential adverse impacts of climate action. This has led to promising international partnerships for funding transition efforts and delivering a just transition. African examples include the Just Energy Transition Partnerships (JET-Ps) with South Africa and Senegal.

To meet future energy needs, African economies also need to enhance energy efficiency. This can be achieved through actions that include switching cooking fuel from the traditionally used biomass to bioenergy and other renewables, updating building codes, and implementing efficiency standards and restrictions on the sale of inefficient appliances and lighting. Producing the materials and manufacturing the energy-efficient and clean-energy components within Africa would reduce the burden of foreign imports on balance of payments and foreign exchange reserves in many African economies, which fulfils some of the primary mandates of central banks around maintaining macroeconomic and price stability.

Natural capital

Africa has abundant stocks of natural capital, which refers to natural resources that provide valuable ecosystem services to economies and societies. This includes 65% of the world's uncultivated arable land; the second largest tropical forest in the Congo Basin; 30% of the world's mineral resources; and

[7] While hydropower has significant potential for expansion, it is also susceptible to rainfall variability and a drier climate brought about by climate change, and can divert water resources away from other societal demands (e.g. Castellano et al., 2015).

[8] For example, oil rents accounted for 34.4% of GDP in the Republic of Congo in 2021 (World Bank, 2021).

by far the world's largest technical potential for low-cost renewable energy (45% of the total global potential) (AfDB, 2023). However, the economic and societal returns made from these resources have persistently been below their potential, in part because they are exploited in unsustainable and unproductive ways.

As a result, Africa has the widest gap between actual and potential efficiency in natural resource use (Damania et al., 2023). Agricultural productivity is low by international standards and unprocessed raw materials are exported without maximising opportunities for domestic value addition. At the same time, ecosystems that provide essential services such as the healthy provision of water, food and habitats are overstretched, leading to biodiversity loss and land degradation. Between 2001 and 2018, Africa recorded the highest forest loss in the world (AfDB, 2023), and 90% of its wild fish stocks are currently exploited or overexploited (FAO, 2022). Overexploitation of natural resources not only threatens Africa's existing economic output, 60% of which is dependent on ecosystem services (AfDB, 2023), but it also jeopardises future opportunities for green growth linked to biodiversity and natural resources, such as ecotourism, carbon capture or the manufacture of low-carbon technologies.

Extracting value from mineral resources

Deepening the value chain of Africa's mineral resources provides a further opportunity for the continent to capitalise on its natural resources. Minerals like copper, lithium, nickel and cobalt are critical to the green transition (AfDB, 2023) – for example, in providing materials for batteries that power electric vehicles (EVs). Combined with rapid demographic and economic growth, Africa's abundant stocks of natural capital – such as its mineral resources and renewable energy potential – could be an anchor for the private investment greatly needed to fulfil the economic, social and environmental development objectives of governments and central banks. Global demand for EV batteries is projected to grow by 22% per year until 2030, with most of the components needed to produce lithium-ion batteries manufactured, extracted in and traded between countries of the African Continental Free Trade Area (AfCFTA).

Navigating trade-offs between nature and resources

Pursuing these opportunities can come at a cost, given the complicated trade-offs between mining and land-use change, deforestation and biodiversity loss. Some of these trade-offs could be rebalanced if Africa realises its potential to generate proceeds of $1 trillion a year by 2050 from the sale of carbon credits that protect forested areas on international markets (ibid.). An estimated 30% of the world's carbon sequestration needs for achieving net zero could be met by nature-based removals in African countries (Songwe et al., 2022).

It is important to note that not all African countries are resource-rich. At least 27 are not and therefore rely heavily on imports to meet their energy and food security needs. As a result, these countries are exposed to higher debt, current account deficits and scarcity of foreign reserves (AfDB, 2023).

Adaptive and regenerative agriculture

Impacts of climate change on African agriculture

Most African economies remain reliant on agriculture, which employs 52% of Sub-Saharan Africa's workforce (ILO, 2021) and accounts for almost a quarter (23%) of its GDP output (McKinsey & Company, 2019). The sector is highly exposed to the effects of climate change on precipitation, water stress and temperatures, with 90–95% of cropland in Africa relying on rainfall as its water source. Since 1961, agricultural productivity growth in Africa has already reduced by 34% due to climate change, more than any other global region (Ortiz-Bobea et al., 2021). Even accounting for adaptation action, such as adjusting sowing dates or adopting more heat- and drought-resistant crop varieties, which are commonly used by farmers in response to climate change, forecasts are alarming: growing evidence suggests that climate change is outpacing adaptation in agricultural

systems in parts of Africa, with maize yields and net productivity of rangeland both forecast to decline significantly, for example.[9]

Increasing adaptation and resilience

For African agriculture, the net zero transition will primarily involve crop diversification, shifting labour resources to off-farm work and using irrigation rather than relying on rainfall. Further, agroecological and conservation agriculture practices, such as intercropping, integrating legumes, minimising soil disturbance, mulching and agroforestry, can both increase the resilience of food systems in Africa and make them more sustainable (IPCC, 2022). However, at present smallholder farmers tend to react to shocks or stresses with short-term coping responses such as turning to charcoal production or reducing consumption, rather than making transformative adaptations.

Measures that could help overcome these barriers include strengthening land tenure security, enhancing sustainable water management, increasing financial inclusion – particularly for women (Agol et al., 2023), promoting higher-value agricultural supply chains, and expanding the use of index-based insurance schemes.[10] For example, the feasibility of irrigation systems is typically unaffordable to many smallholder farmers unless they have access to concessional finance (e.g. Schilling et al., 2020). Ultimately, these adaptations could lead to agricultural, technological and, consequently, broader economic transformation along the lines of Asia's green revolution by ensuring that land is used more efficiently to generate greater cumulative economic value, all while protecting natural capital.

Climate-resilient development

The range of damaging impacts

Climate change is already having a greater impact on Africa than other regions of the world (IPCC, 2022). Although the whole continent is experiencing increased exposure to the physical risks of climate change, the concentration of predicted changes in temperature, precipitation, droughts, floods and storms varies by region (see Box 2.1). These impacts have a more severe and lasting effect on economic activity in Africa than elsewhere, due to the continent's higher reliance on nature-based and therefore climate-sensitive sectors such as agriculture, water resource management, fisheries and aquaculture, forestry or tourism. African economies that depend on hydropower are particularly sensitive to climate vulnerability, as periods of low rainfall lead to load shedding (deliberate power outages) and reduced GDP growth (Conway et al., 2017). Every 0.5°C increase in global average temperature leads to a 1% decline in real GDP in Africa (Hu and Yao, 2019), which is double the global average and 1.6 times that of other EMDEs (IMF, 2020).

Box 2.1. Regional variations in physical risks from climate change in Africa

- Mean annual rainfall will increase in the **Eastern Sahel, East Africa and Central Africa**, and will fall in **Southern Africa** and coastal **North Africa**.
- Increases in drought frequency and duration are projected over **Southern Africa, North Africa** and the **Western Sahel**.
- Greater frequency and intensity of heavy rainfall events will increase exposure to flooding in **all parts of Africa**, except in the North and Southwestern regions.
- The last glaciers on **Mt Kilimanjaro** are projected to disappear by 2040 (Cullen et al., 2013).
- Although tropical cyclones are less likely to make landfall in **East and Southern Africa**, they will be more intense when they do.
- Heatwaves will become more frequent across the whole of Africa, but especially in **West, Central and tropical regions**.
- **West Africa** will face increased risk of flooding from sea level rise (IPCC, 2022).

[9] For example, in West Africa maize yields could decline by up to 40% by 2050 (compared with 2005 yields). Rangeland net productivity could decline by 42% under a 2°C global warming scenario (IPCC, 2022). Under a 4.3°C warming scenario, marine fish catch potential could decline by up to 69% relative to 1986–2005 levels by 2100 (ibid.).

[10] These schemes pay out fixed amounts based on the occurrence of an event, rather than full indemnification against assessed losses (IPCC, 2022).

These economic effects primarily manifest themselves in reduced productivity (of crop yields, for example) and damage to infrastructure by storms, flooding, temperature and changes in precipitation. Damage to roads, buildings and power stations is costly to repair (see Chinowsky et al., 2013), which can create a significant financial burden. These impacts are compounded by pressures on public debt and international reserves after droughts, floods and storms, caused by lower tax revenues and increased needs during post-disaster relief efforts. Furthermore, the role of central banks in maintaining financial stability can be threatened if assets become stranded by weather-related disasters, insurance company balance sheets are depleted, and affected populations or businesses are unable to repay loans (IMF, 2020).

Challenges in financing adaptation

Although adaptation to climate change is shown to be a far more cost-effective solution to climate risks than frequent disaster relief, raising adaptation finance remains a challenge. This is partly because projects are often small-scale, cross-sectoral and hard to value, which makes it difficult to attract public or private finance. Adaptation finance already accounts for 44% of total climate finance needs in Africa (CPI, 2022), but costs will rise rapidly if existing commitments are not met (IPCC, 2022). Furthermore, because informal employment accounts for 86% of Africa's workforce (Kiaga and Leung, 2020), only 2.7% of GDP is covered by insurance (Swiss Re, 2022).

Improving access to finance

Increasing households' and small businesses' access to finance (see e.g. Agol et al., 2023), including the use of digital currencies and payment systems, is an effective adaptation strategy that aligns with the mandates of many African central banks. Furthermore, social protection, including the use of public works programmes, cash transfers, or microinsurance schemes, has proven effective in building resilience to climate shocks (see e.g. Ulrichs et al., 2019).

Harnessing the potential of nature-based solutions (NbS) could also provide wider social and economic, as well as environmental, benefits beyond increasing climate resilience, given that human dependence on ecosystem services is already high in Africa. NbS are increasingly being deployed as a cost-effective and sustainable approach to climate mitigation and adaptation and nature conservation. Examples include the restoration of mangrove, wetland and riparian (riverside) ecosystems to provide coastal protection, including in low-lying cities (IPCC, 2022). These solutions can be financed in part by increasing access to multilateral funds, the Loss and Damage fund agreed at COP27 (see e.g. AfDB, 2023), and alignment of debt relief with climate goals, such as debt-for-nature swaps.[11]

[11] Debt-for-nature swaps are financial transactions in which creditors provide debt relief in return for a government commitment or investment in nature or biodiversity protection and conservation.

3. A classification of African countries' net zero risks and opportunities

This section introduces a new country classification of all 54 African economies based on their unique transition-related risks and opportunities. The classification is designed to provide central banks with a clear picture of the relative standing of African countries' risks and opportunities related to the net zero transition. This can guide them to choose the right policy responses with which to support each nation to tackle their own unique transition-related risks and seize the opportunities.

First, we present the rationale and significance of the 10 environmental, energy, socioeconomic and financial dimensions chosen for the assessment (Table 3.1). These span two broad categories: the climate and energy transition; and economic and financial resilience. This is followed by an outline of the measures for each dimension (Table 3.2), and further explanation of our classification methodology. The classification yields nine distinct country groups based on the 10 dimensions (Table 3.3).

Environmental, energy, socioeconomic and financial dimensions

Table 3.1 presents the 10 environmental, energy, socioeconomic and financial dimensions of risk and opportunities we have identified as facing African countries, and justification for their choice.

Table 3.1. Ten dimensions of transition risks and opportunities

	Dimension	Rationale and significance
Climate and energy transition		
1	Exposure to climate physical risks	Many African economies are disproportionately affected by climate change impacts relative to their contribution to global emissions.
2	Exposure to climate transition risks	Adaptive capacity and readiness for transition risks (e.g. policy shifts and technological change) will be increasingly critical to the net zero transition.
3	Economic and social reliance on agriculture	Many economies depend highly on the agricultural sector, which itself is highly dependent on rainfall. The sector will become even more susceptible to climate change impacts.
4	Economic and social reliance on fossil fuels	The capacity to leverage renewables for energy generation over fossil fuels is critical to the transition.
5	Natural resource endowment	Endowment with natural resources such as forests and transition-critical minerals is important as they act as carbon sinks and provide resources for technologies key to the transition.
Economic and financial resilience		
6	Demographic situation and prospects	Demographic pressures such as high population growth, rapid urbanisation and the need to increase access to basic services will affect how a country can navigate the low-carbon transition.
7	Public debt and finance situation	Debt distress and thus the capacity to service debt amid other competing public finance demands could have negative consequences for financial resilience and the transition.
8	Climate investment needs	Climate financing needs, inferred from Nationally Determined Contributions (NDCs), funding gaps and other financing needs, indicate the level of investment needed to enable the transition.
9	Financial market development	Financial development, as inferred by a country's financial institutions and markets, is strongly linked to the ability to mobilise capital, a key factor in enabling the transition.
10	Economic endowment and prospects	A country's economic factors such as income levels, growth prospects and financial resilience, affect how it can best finance the climate transition.

Table 3.2 presents selected measures that would suitably capture each of the dimensions.

Table 3.2. Select measures of transition risks and opportunities

	Dimension	Measure	Description	Year
1	Exposure to climate physical risks	ND-GAIN vulnerability score*	Measures susceptibility to physical climate risks	2021
2	Exposure to climate transition risks	ND-GAIN readiness score*	Measures capacity and preparedness for the transition	2021
3	Economic and social reliance on agriculture	Agriculture, forestry, and fishing, value added (% of GDP)**	Measures reliance on sectors on which many African economies are reliant that are highly exposed to climate risk	2020
4	Economic and social reliance on fossil fuel energy	Electricity from renewables (% of all energy)***	Measures dependence on renewable energy sources indicating exposure to energy transition	2020
5	Natural resource endowment	Forest and mineral rents (% of GDP)**	Measures economic endowment and reliance on forest and mineral resources critical for the transition	2021
6	Demographic situation and prospects	Demographic pressures index****	Measures demographic challenges that can influence vulnerability to climate impacts	2022
7	Public debt and finance situation	Total debt service (% of gross national income [GNI])**	Measures indebtedness, which impacts ability to allocate resources to climate transition	2020
8	Climate investment needs	Average cost of fulfilling NDC per year, per capita (US$ bn)*****	Measures financial need and financial obligations for the climate transition	2020
9	Financial market development	International Monetary Fund (IMF) Financial Development Index	Measures development of financial institutions and markets to attract and mobilise climate finance	2020
10	Economic endowment and prospects	GDP per capita (constant 2015 US$)**	Measures economic status, which influences capacity to mobilise finance for the transition	2022

Notes:
** The two ND-GAIN scores are developed by the Notre Dame Global Adaptation Initiative (ND-GAIN). ** These measures are from the World Bank. *** This measure is from Our World in Data. **** This index is from TheGlobalEconomy.com. ***** This measure is from the Climate Policy Initiative (CPI).*
The selection of measures was influenced by data availability across all 54 countries, with 2020 as the primary reference year. In cases where data was missing, 2021 or 2022 was used.

Classification methodology and country groups

Our country classification methodology ranks all 54 African economies to evaluate their relative standing in terms of transition-related risks and opportunities. All the countries are ranked across each of the 10 dimensions and measures in Table 3.2 and these dimensions are clustered into two broad categories:

i) Climate and energy transition

These are the environmental, agriculture and energy dimensions (measures 1 to 5)

- Risk is assessed by ranking countries based on climate risk exposure and/or reliance on highly exposed sectors (*1 and 3*)

- **Opportunity** is assessed by ranking countries on their transition readiness, renewable energy utilisation and/or endowment with critical transition resources (*2, 4 and 5*).

ii) Economic and financial resilience

These are the demographic, economic and financial dimensions (measures 6 to 10)

- **Risk** is assessed by ranking countries based on demographic pressures, debt stress and/or climate financing needs (*6, 7 and 8*)
- **Opportunity** is assessed by ranking countries by their financial market development and/or economic strength (*9 and 10*).

For each category, we divide country rankings into three segments: high risk, mid-segment, and high opportunity. To determine if a country falls under the 'high risk' or 'high opportunity' category, we check its ranking within the specific measures that define that category and normalise these scores such that each country measure is attributed a value between 0 and 1, which is used for the overall ranking. If a country ranks within the top 10 for any of the chosen risk or opportunity measures, it is classified as high risk or high opportunity, accordingly. Countries that fall outside the high risk and high opportunity groups form the mid-segment.

Some countries qualify as both high risk and high opportunity on two different measures within the same category. Their scores are therefore adjusted based on country specificities. These instances were resolved as follows:

- **The Central African Republic and Sierra Leone** rank as high risk in terms of the climate and energy transition but also as high opportunity due to their share of renewable energy potential. However, their electrification levels are low (at 15% and 26% respectively), which may put pressure on the use of non-renewable energy sources and undo the opportunities of renewables. We therefore leave these countries in the high risk category.
- **Guinea-Bissau, Liberia and Mali** rank as high opportunity in terms of their large share of forest rents (Guinea-Bissau and Liberia) and mineral rents (Mali). However, they rank as high risk given their vulnerability to climate change impacts (e.g. threats from sea level rise and deforestation in Guinea-Bissau and Liberia, and from reduced rainfall and desertification in Mali), placing them at high risk on the climate and energy transition dimension.
- **Gabon and South Africa** rank as high risk in terms of exposure to climate transition risks since they have high NDC financing costs per capita, but equally high opportunity due to their high GDP per capita. In this case, we keep them as high opportunity since the category is mostly a measure of relative economic and financial resilience.
- **Somalia** ranks in the top 10 countries at high risk from the climate and energy transition based on the ND-GAIN vulnerability score, but it also ranks as high opportunity based on forest and mineral rents. We keep it as high risk based on the vulnerability score, which is consistent with its top ranking in the International Rescue Committee (IRC) list of 10 countries most at risk of climate disaster and its listing in the FAO-WFP Hunger Hotspots 2023 list.
- **Cabo Verde, Botswana, Mauritius and Seychelles** consistently rank as high opportunity in terms of economic and financial resilience but also as high risk on average NDC financing costs. Given the latter is per capita and these are relatively low population countries, and given their consistency on the other measures, they remain in the high opportunity segment.

All other countries fall into distinct rankings in one of the three segments, within each of the two categories, based on our classification methodology. (Find the data from our calculations and classifications to download from the web page of this report.)

Lastly, we classify each of the 54 countries into the three segments – high risk, mid-segment or high opportunity – across the two categories. This results in nine distinct country groups; see Table 3.3.

Table 3.3. Classification of 54 African economies by transition risks and opportunities

		Climate and energy transition		
		High risk	Mid-segment	High opportunity
Economic and financial resilience	High risk	**Group 1** Chad Ethiopia Somalia	**Group 2** Angola Congo Republic Djibouti Madagascar Mozambique Nigeria South Sudan	**Group 3** Burkina Faso DR Congo Malawi Mauritania Zambia
	Mid-segment	**Group 4** Central African Republic Comoros Eritrea Guinea-Bissau Liberia Mali Niger Sierra Leone Sudan	**Group 5** Algeria Benin Côte d'Ivoire The Gambia Ghana Guinea Senegal Tanzania Togo Zimbabwe	**Group 6** Burundi Cameroon Eswatini Kenya Lesotho Rwanda São Tomé and Príncipe Uganda
	High opportunity	**Group 7** N/A (None)	**Group 8** Cabo Verde Egypt Equatorial Guinea Gabon Libya South Africa	**Group 9** Botswana Mauritius Morocco Namibia Seychelles Tunisia

Notes: Countries within the same category are not ranked but listed alphabetically. See the raw data from the calculations and classifications in this downloadable Excel sheet.

Digging deeper: country groups at the high risk/high opportunity intersection

Each of the nine country groups shown in Table 3.3 represents a unique intersection of transition-related risks and opportunities. Below, we explore in further detail Groups 1, 3, 7 and 9, as they represent the countries exposed to the highest levels of risk and opportunity across the two assessed dimensions of the net zero transition.

Group 1: Chad, Ethiopia and Somalia

The low-carbon transition poses a significant challenge to these countries. Not only do they face high climate-related and energy transition risks, but also significant economic risks and limited financial resilience. This combination hampers their ability to respond to climate risks and finance their transition. As a result, they might struggle to adapt to the changing climate and face difficulties securing funds for projects that harness opportunities from the low-carbon transition.

Group 3: Burkina Faso, Democratic Republic of Congo, Malawi, Mauritania and Zambia

Countries in this group have significant opportunities in the climate and energy transition (such as high forest cover). However, they are burdened by elevated economic risks and limited financial resilience, which could limit their capability to fully tap into these opportunities. These countries should aim to strike a balance between leveraging opportunities and mitigating vulnerabilities. For

instance, they could pursue economic diversification to counteract an over-reliance on agriculture, where productivity is threatened by climate risks.

Group 7: No countries

Notably, we have assessed none of Africa's countries as being both at high risk from the transition and presented with high opportunity for economic and financial resilience. This result is not surprising. As observed by Zettelmeyer et al. (2023), "the countries most exposed to climate shocks tend to be poorer and at high risk of debt distress...". Considering that those countries contributed very little to today's stock of global emissions, this prompts the question of whether there is a strong case for increased fiscal support and transfers to countries with highly pronounced climate risks but limited economic means and financial resilience. (Such interventions would also highly benefit Group 1 countries.)

Group 9: Botswana, Mauritius, Morocco, Namibia, Seychelles and Tunisia

These countries possess high transition opportunities across both categories. With their relatively high levels of GDP per capita and developed financial systems, these countries are better equipped to mobilise resources for climate action. They could lead transition initiatives in the region, capitalising not only on their climate and energy transition potential but also on their economic endowment and financial resilience.

4. Central banks in Africa and the net zero transition

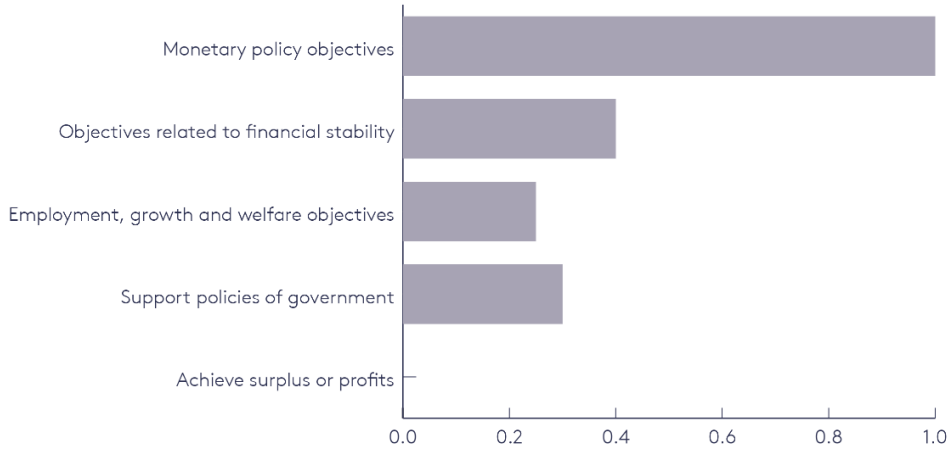
Many African central banks operate in economies that are adversely affected by the impacts of climate change and the economic transition to net zero, as indicated by the categorisation of nations provided in the previous section. The variation in economic and financial conditions also calls for specific policy responses in each economy. Further, central banks must account for the mandate and monetary policy framework in which they operate, while also adjusting to the regional monetary policy context and specific monetary challenges that the net zero transition poses to their economies.

This section presents the institutional frameworks in which African central banks operate in terms of their mandates and monetary policy frameworks, and highlights some key features of the monetary environment that they navigate. It then identifies some of the channels through which climate change and the net zero transition affect the economic parameters that are key to African central banks' policy implementation.

Central bank mandates

The objectives of central banks are legally defined in their mandates. All central banks have a monetary objective, which is usually defined in terms of price stability or exchange rate stability. They also usually have a financial stability objective in their mandate. Central banks sometimes have additional objectives related to employment, growth and welfare, as well as supporting government policies (see Figure 4.1).

Figure 4.1. Weight of central bank objectives in central bank laws (% of 41 central banks worldwide)



Source: Bank for International Settlements (2009)

Sustainability objectives are sometimes included in central bank mandates, though not always explicitly or clearly. The central banks and supervisors' Network for Greening the Financial System (NGFS) estimates that almost one in four central banks explicitly mentions sustainability aspects in its objectives and one in two central banks are mandated to support economic development or government economic policies, which sometimes include sustainability and development goals (NGFS 2020). Dikau and Volz (2021) estimate that around half of central banks are equipped with a mandate to enhance the sustainability of economic growth or sustainability in general: 30% of them have an explicit sustainability mandate and 70% have an indirect sustainability mandate, through the government policy objective.

We have no specific figure for the number of sustainability objectives in the mandates of African central banks, but there is no reason to believe that they would fundamentally differ from the figures given above. Dikau and Volz (2021) give some suggestions of how African central banks include sustainability objectives in their policies by examining the extent to which central banks incorporated climate and other ecological considerations into their COVID-19 response strategies. They found that

less than 1% of central banks and supervisors directly tied their COVID crisis response to sustainability factors, and of the 188 economies reviewed, the Sub-Saharan Africa region showed the least use of 10 instruments deployed by central banks and supervisors.

Monetary policy frameworks

Table 4.1 presents the exchange rate arrangements and monetary policy frameworks within Africa.

Table 4.1. Monetary policy frameworks and exchange rate arrangements of African countries

Exchange rate arrangement	Monetary policy framework						
	Exchange rate anchor				Monetary aggregate target	Inflation–target framework	Other
	USD	EUR	Composite	Other			
Currency board	Dijibouti						
Conventional peg	Eritrea	Cabo Verde	Libya	Eswatini			
		Comoros		Lesotho			
		São Tomé and Príncipe		Namibia			
		WAEMU					
		Benin					
		Burkina Faso					
		Côte d'Ivoire					
		Guinea-Bissau					
		Mali					
		Niger					
		Senegal					
		Togo					
		CEMAC					
		Cameroon					
		Central African Republic					
		Chad					
		Congo Republic					
		Equatorial Guinea					
Stabilised arrangement		Gabon			Nigeria*		Egypt*
					Tanzania*		Malawi*
							Mozambique*
							Sudan*
Crawling peg			Botswana				
Crawl-like arrangement					Algeria*	Ghana*	Mauritania*
					Burundi*	Kenya*	Mauritius*
					DR Congo*		Tunisia**
					Ethiopia*		
					The Gambia*		
					Guinea*		
					Rwanda*		
Pegged rate within horizontal bands			Morocco				
Other managed arrangement					Liberia		South Sudan
					Sierra Leone		Zambia
					Zimbabwe		
Floating/ free-floating					Angola	Seychelles	Somalia
					Madagascar	South Africa	
						Uganda	

Notes: *WAEMU = West African Economic and Monetary Union. CEMAC = Central African Economic and Monetary Community.*
**The country maintains a de facto exchange rate anchor to the US dollar.*
***The country maintains a de facto exchange rate anchor to the euro.*
Kenya, Liberia and Zimbabwe's exchange rate arrangements were reclassified twice during this reporting period.
Currently the Central Bank of Somalia does not have a monetary policy framework.

Source: IMF (2023b)

Most African central banks implement an exchange rate stability objective with some form of exchange rate management around an exchange rate anchor. This includes the two monetary unions of the continent: West African Economic and Monetary Union (WAEMU), formed of eight countries; and the Economic and Monetary Community of Central Africa (CEMAC), with six member countries. Most of them implement this objective through an exchange rate anchor or monetary aggregate targets; only a few of them have a formal inflation target.

Different exchange rate arrangements have different implications for central banks when it comes to the challenge of climate change and the net zero transition. For central banks that operate in a pegged exchange rate framework, the impacts of climate change and the net zero transition on exchange rate markets are of primary importance. Such impacts can arise in the short term, e.g. following extreme weather events, or be medium- to longer-term impacts by causing structural change in the capital and trade flows across regions as a result of the net zero transition. These dimensions also matter for central banks in a floating exchange rate framework, but possibly less so than in a pegged framework, while other dimensions such as the impact of the net zero transition on inflation and economic growth might have relatively more importance.

Different monetary policy frameworks might also affect how central banks implement their response to climate change and the net zero transition through monetary policy operations. For example, the management of foreign reserves is key for central banks with an exchange rate anchor, so the climate and transition-related impacts on the soundness of these reserves are the first consideration. In this context, the adequate management of reserves' exposure to climate risk is central, and would include mitigating the exposure while also pursuing potential growth opportunities in the transition (e.g. see measures taken in Singapore for the management of foreign reserves). Central banks with monetary aggregate targets mostly implement monetary policy through domestic credit monetary policy operations. This type of operation is particularly appropriate for targeted refinancing operations that align with the transition to net zero (see Colesanti Senni and Monnin, 2021). Central banks with an inflation target are also affected by climate change and the net zero transition in specific ways: in particular, the demand or supply shocks to economies as a result of climate change and the transition will greatly determine how central banks can address them (McKibbin et al., 2017).

Monetary policy environment

In implementing monetary policy, African central banks must consider the important monetary parameters that characterise the region. In terms of exchange rate management, which is the arrangement in which most African central banks operate, they must consider the following factors:

- **Large foreign exchange mismatch and high pass-through.** Large mismatches in foreign exchange on balance sheets can cause exchange rate depreciations to have detrimental impacts on the financial health of companies and households, generating negative co-movements between output and inflation. In this context, central bank credibility can impact the pass-through from the exchange rate to inflation, in that the lower the credibility, the higher the pass-through. Foreign exchange mismatches and high pass-through tend to worsen exchange rate stability, as well as the economic and financial trade-offs that monetary policymakers face in times of instability.
- **Volatile capital flows.** Capital flow volatility has been high in Africa in recent years and this also presents a challenge to exchange rate stability. During the COVID-19 pandemic, Sub-Saharan African economies benefited from extraordinary policy stimulus in advanced economies. But the global surge in inflation is likely to result in a tightening of global financial conditions, which could prompt capital outflows from emerging markets and developing economies, including in Africa.
- **Public debt.** The soundness of the sovereign balance sheet is key for exchange rate stability, and for the transmission of monetary policy, of which implementation often extensively relies on sovereign assets. Public debt is high in many Sub-Saharan African countries, at almost 60% of GDP on average, and the pandemic has only added to the debt burden. High public debt poses risks of fiscal dominance over monetary policy in some countries, including as some central banks continue to lend to governments for fiscal purposes.

The specific financial market conditions that African central banks face are another important consideration. Currently, most of them implement monetary policy in the context of relatively shallow financial markets, which creates excessive exchange rate volatility and places obstacles ahead of mobilising domestic and foreign capital. A lack of deep currency and financial markets also complicates the implementation of exchange rate management interventions. Additional institutional constraints, bank concentration, and other rigidities in the system, which are frequent in some countries of the region, can additionally undermine the effectiveness of monetary policy transmission.

High and rising inflation is another key challenge for several (but not all) African countries, having risen rapidly during and since the pandemic in some cases. Where inflation remains low, these countries may have a peg (e.g. to the euro for the CEMAC and WAEMU) or an inflation target, as in the case of Uganda.

Impacts of climate change and net zero for African central banks

Climate change and the transition to net zero could have a significant and structural impact on several dimensions that are relevant for central banks in Africa. These include:

- Exchange rate stability. Climate change and the transition to net zero interfere with several sectors that are key for the trade balance of some countries in the region. Some countries are heavily reliant on food imports while others have a crucial reliance on fossil fuel exports. Central banks must account for the impacts of long-term economic changes and short-term shocks on exchange rates that result in their exchange rate policy. These shocks and structural changes, and the exchange rate policies associated with them, can potentially erode the foreign exchange reserves of central banks, hampering their ability to implement the exchange rate targets that they aim at, thereby threatening their credibility. Bortz and Toftum (2022), for example, show that in Argentina, changes in rainfall impact foreign exchange reserves.
- Sovereign debt. Climate shocks have significant impacts on public finance. Many African nations are already spending between 2 and 9% of their budgets on unplanned allocations to respond to extreme weather events (Songwe and Adam, 2023). Lower productivity and sectoral growth for economic activities that are particularly affected by climate change and the transition, e.g. agriculture and fossil fuel extraction, can imply lower revenue generation possibilities for the sovereign from crucial and large sectors. Climate change also interferes with export receipts and foreign exchange earnings due to reduced activity from key commodity exports and imports. This is concerning given the level of foreign-denominated debt that some governments in the region must service in the short to medium term. Linked to this, lower exports can exacerbate already high current account deficits, particularly for non-resource-intensive African economies.
- Price and economic stability. There is increasing empirical evidence to show that the physical impacts of climate change are affecting inflation. This is witnessed in advanced economies (Beirne et al., 2021; Faccia et al., 2021), but even more in the Global South (Parker, 2018; Heinen et al., 2019; Mukherjee and Ouatarra, 2021). More frequent and severe weather events as projected in the future could have a significant impact on agricultural and industrial production, potentially leading to supply shocks that manifest as cost-push inflation (Dikau and Volz, 2019). In a similar vein, nature and ecosystem losses could lead to disruption to provisioning services (e.g. pollination, fisheries and soils) that would negatively affect agricultural and other commodity production, also causing prices to rise. Inflation shocks could impede the net zero transition by creating an economic environment that is generally volatile and not conducive to long-term investments. Inflation episodes can strongly constrain the policy space in which central banks operate, leaving them less freedom to implement adequate policies for the transition. In this context, however, central banks must also consider the potential positive effect of the transition on price stability, e.g. through the more stable energy prices generally associated with larger contributions of stable renewable forms of energy in the energy mix.

5. Policy options for African central banks

Climate change and the transition to net zero are affecting African nations in diverse ways and will continue to do so as each economy navigates its specific economic, financial and monetary environment. An appropriate response by central banks to the challenges of the net zero transition would take these diverse conditions into account and adapt to them. The priorities underpinning the central bank policy response in countries that are highly exposed to climate risks and are in a relatively weaker economic position will likely be significantly different to those with a stronger economy and ample opportunities to take advantage of the transition.

This section sets out several ways in which Africa's central banks can respond to climate risk exposure and to transition opportunities. Note that the options presented indicate general directions in which African central banks can advance their net zero strategy. They are not uniformly applicable to all countries. Depending on a country's environmental, economic and financial situation, a central bank might prioritise some aspects over others. The concrete implementation of these options also strongly depends on the extent to which central banks integrate the climate and net zero transition dimensions we have identified into their current practices and policies, and on the bank's existing level of knowledge about these issues. The central bank must also take into account the monetary policy framework and conditions in which it operates.

i) Policy responses to climate risk exposure

The possible contributions of central banks to the overall policy response to climate change and the net zero transition have been extensively highlighted by academics and economists, as well as by central banks themselves, through the work of the NGFS, for example. One important and frequently emphasised contribution of central banks is their extensive knowledge of the economy and financial markets, which can be used to support other stakeholders and policymakers to better understand and communicate the impacts of climate change and policies on price, economic and financial stability. The NGFS also stresses the role of central banks as financial regulators and supervisors in this context, along with the contribution they can make through their own monetary policy operations.

Three key central bank policy responses to mitigate climate and transition risks are described below.

Assessing the economic impact of climate change and the transition

With their extensive access to data and research expertise, central banks are exceptionally well placed to contribute to improving knowledge of how climate change and the transition to net zero interact with the economy and financial systems, and how economic and financial policies can best support them. In this context, they must understand the consequences of climate change and the transition on their objectives and instruments. In Africa, where most central banks implement monetary policy with an exchange rate strategy, it is crucial to understand how the exchange rate specifically is affected, including the trade balance, foreign exchange reserves and the sovereign debt soundness that underpin its value. Central banks can also provide other policymakers with key information about the general economic prospects likely provided by climate change and the net zero transition, including the financial situation of public institutions. In this way, central banks can actively contribute to the development and implementation of a comprehensive and coherent national policy agenda that addresses climate risks. They can, for example, engage with other authorities and stakeholders, and advise, support and feed into collective national and regional policy initiatives to bolster the credibility and stability of the regional economic and financial framework and thus strengthen domestic and foreign investments.

Contributing to financial stability

Climate risks are financial risks and, as such, can jeopardise the resilience of financial institutions (NGFS, 2019). International supervisory bodies have already developed best practice supervisory guidelines for national supervisors in relation to climate risks (BCBS, 2022). These guidelines cover all

the traditional fields of microprudential supervision: adequate reflection of climate risks in supervisory requirements (e.g. capital requirements); risk management practices by financial institutions; and the disclosures of these risks and how banks address them. Given the clear systemic dimension of climate change and the transition, these risks should also be addressed at the macroprudential level, and some policy options have been suggested for that, such as systematic risk buffers and exposure concentration limits (Hiebert and Monnin, 2023). Sound supervisory practices are a key part of delivering favourable conditions for financial institutions to channel the foreign and domestic funding that is necessary for the transition, especially in economies with weaker financial markets.

Managing risk in monetary policy portfolio

Like any other financial institution, central banks are exposed to climate financial risks through the financial assets that they own and the credit they give. It is crucial for maintaining their own credibility that central banks keep financial risks in check on their own balance sheets (Bini Smaghi, 2011). Climate-related financial risks are no exception here, and the NGFS recommends that central banks account for them through risk management. The NGFS (2021) presents several ways in which central banks can control the exposure to climate financial risks of the assets they own, the credit they give and the collateral they accept, such as tilting their corporate holding portfolios, adjusting the interest rate of their credit operations and screening the assets eligible for collateral. Similar options are suggested for addressing climate risks in central banks' foreign exchange reserves (Fender et al., 2022).

ii) Policy responses to transition opportunities

In addition to supporting the implementation of policies that increase regional financial market stability, public finance soundness and, more generally, economic resilience to climate risks, central banks can help the country to seize economic opportunities as part of the low-carbon transition. They can, for example, foster the development of sustainable financial solutions provided by regional financial institutions; indirectly support sustainable funding through their monetary policy operations; and participate in the development and implementation of regional and global financial initiatives that improve their access to international funding for transition and adaptation investment.

Three central bank policy responses to maximise opportunities from the transition are described below.

Developing sustainable financial markets

Financial markets and institutions are key to providing and channelling the funding that is necessary for private and public investments into solutions that serve the net zero transition and climate adaptation. To do this, they must develop sustainable finance solutions such as financial products and investment practices that meet investors' needs, and adequate data to better assess them. Sustainable bonds, such as green bonds, blue bonds or sustainability-linked bonds, are a potential solution here. Africa accounted for just 0.2% ($4.7 billion) of the total value of global green bond issuance ($2.2 trillion) between 2006 and 2022, far below its relative economic and demographic size (2.8% of global GDP and 17% of the world's population) (CPI, 2022).[12] Aligning regional financial products and practices with internationally agreed sustainability standards, including in terms of data disclosure and supervisory policies, is likely to improve access of regional financial markets to foreign funding and could be an opportunity to develop financial markets in general, especially in regions with lower financial market capacities. Such financial development could also be beneficial for central banks by deepening financial markets and thus improving their ability to implement monetary policy with financial instruments.

Supporting sustainable funding through monetary policy operations

All types of monetary policy operations, whether credit operations, foreign currency purchases or domestic asset purchases, tend to support some economic activities more than others, depending on how they are implemented and allocated (Colesanti Senni and Monnin, 2020). The NGFS (2021) has

[12] Most issuances in Africa have been in Benin, Egypt and South Africa. Nigeria, Morocco, Kenya, Namibia and Tanzania have also entered the market, broadening opportunities for liquidity and pricing (AfDB, 2023).

highlighted several options for central banks to provide some support to economic activities that contribute to the transition and mitigate climate risks. Credit operations, like refinancing operations or foreign exchange refinancing lines, for example, could be used by central banks to support regional banks to extend lending to firms and businesses whose activities contribute to this objective. Targeted refinancing programmes could also help to initiate a market for new sustainable financial products in a way that is adapted to firms' and businesses' needs – for example through syndicated small loans to farmers and micro-enterprises for adaptation and transition measures. Central banks frequently rely on such policies to support other economic objectives and have prior experience in implementing them (Colesanti Senni and Monnin, 2021). Their use, however, is potentially constrained by central banks' monetary objectives, especially if they impact the exchange rate or inflation. The degree to which such policies generate allocative incentives in financial markets and the economy can also be a constraining factor. Central banks, especially those with a narrow mandate, tend to limit their impact on the allocation of resources across different sectors. However, central banks with broader objectives in their mandate, e.g. developmental objectives, have more leeway in implementing such policies.

Development of regional and global financial initiatives for the net zero transition

Central banks can greatly contribute to unlocking the finance needed in each African country by actively participating in the development and implementation of comprehensive and coherent policy agendas at the national and regional levels. By engaging with other authorities and stakeholders, as well as advising and supporting them, they add their commitments to the effectiveness of transition and adaptation policies, reinforcing their effectiveness and credibility. Central banks, together with other African authorities and multilateral development banks, can also engage at the international level to support the design of sustainable international finance solutions that work for them. They could, for example, promote the use of sustainability-linked private and sovereign bonds to reward the achievement of climate objectives; and advocate a wider use of debt-for-nature swaps to reduce debt burden. Since 1987, only $318 million of debt has been transacted through bilateral or multilateral debt-for-nature swaps in Africa (African Natural Resource Management and Investment Centre, 2022), with Cabo Verde, Cameroon, Ghana, Madagascar and the Seychelles among the countries that have implemented such schemes (AfDB, 2023). Central banks could also engage in the development and evaluation of national plans, such as South Africa's Just Energy Transition Investment Plan (JET IP), for which funding is negotiated with international partners.

6. Conclusion

African economies face very different risks, opportunities and challenges in the net zero transition. They also embark on this journey with highly varied economic and financial backgrounds and resources. This diverse landscape demands that central banks in Africa formulate nuanced policy responses that are adapted to the environmental, economic and financial situation of their country, and are compatible with the monetary policy and exchange rate framework in which each bank operates.

The classification of African economies according to their transition-related challenges and opportunities as presented in this report is designed to support central banks to make their own assessment of their economy's situation in the net zero transition and identify policy options available to them.

In summary:

- In all African countries, an adequate central bank response consists of a holistic package with measures to mitigate the exposure of the financial system and the economy to climate risks and measures that support local and international financial markets in funding the transition.
- In countries with high economic risk, it is crucial that the central bank carefully assesses and communicates the social, economic and financial consequences of climate change, the economic opportunities of the net zero transition and funding needs to achieve this transition. They must ensure that the financial system they supervise (as well as their own balance sheet) is resilient to climate shocks, and that financial stability is guaranteed so that domestic and international financial institutions can provide finance to those working to advance the transition. Concerns about economic and financial stability are aggravated in countries with high climate risk exposure.
- In countries with high climate transition opportunities, central banks can help reap the benefits of a global transition by contributing to the development of sustainable finance, in terms of market infrastructure and financial professional expertise. Depending on their mandate, they can also amplify the development of sustainable finance markets by supporting sustainable funding through monetary policy operations. Countries with high climate transition opportunities are also ideally placed to start implementing regional and international financial instruments to fund the transition and extend them to other countries with their experience. With their regional and international outreach in diverse policymaking forums, central banks can contribute to putting such instruments in place.

Next steps

We intend to build on the analytical base provided by this report to increase understanding of how the key climate and transition risks and opportunities we have identified can affect central banks' policies and objectives, and how they can leverage these factors to contribute to the net zero transition in their respective countries and on the continent of Africa at large. We also aim to expand and refine the country classification presented in this report to capture the specificities of different economies in greater detail. This would help us to identify a few typical conditions that several central banks share and develop a greater number of specific policy options for them, based on the general directions presented in this report.

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