

— KEYS TO —
CLIMATE
ACTION

How Developing Countries
Could Drive Global Success
and Local Prosperity



Amar Bhattacharya, Homi Kharas,
and John W. McArthur
Editors

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**THE BROOKINGS INSTITUTION
Washington, D.C.**

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1775 Massachusetts Avenue, N.W.
Washington, D.C. 20036
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Typeset in Adobe Garamond

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ACKNOWLEDGMENTS

This volume is a product of an enormous team effort. The editors thank all the chapter authors for their collaborative efforts in contributing their unique insights and expertise in bringing this project to life. The editors are also grateful to Daniel Bicknell for outstanding project coordination and support and for his excellent comments throughout; Odera Onyechi and Charlotte Rivard for tremendous research assistance; Gaoyi Miao for support on fact-checking; Fiker Girma for final production support; Madhulika Jain, Wendy Kneissl, and Mona Tiwary for project copy-editing support; and Jeannine Ajello, Junjie Ren, Andrea Risotto, Esther Rosen, Izzy Taylor, and the Brookings communications team for invaluable communications insights and support.

Many ideas in this volume were forged at an authors' workshop at The Rockefeller Foundation Bellagio Center. The editors thank the Bellagio Center team for their unyielding support and hospitality, in addition to Linus Mofor, Nicholas Stern, and Marilou Uy for insightful comments and discussions during the workshop. Zia Khan, Kevin O'Neil, and Nicole Rasul also provided invaluable insights throughout the project.

Brookings gratefully acknowledges project support provided by The Rockefeller Foundation.

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Delivering Africa's Great Green Transformation

Vera Songwe and Jean-Paul Adam

Introduction

African countries responded to the shock of the COVID-19 pandemic through remarkable innovation, despite having only a fraction of the needed resources available. The African Medical Supplies Platform was established to fast-track production and procurement of essential medicines and equipment, while the Africa Centres for Disease Control and Prevention (Africa CDC) supported coordinated actions by member states so that the health impact of the pandemic was less dramatic than originally predicted.

But Africa's economic vulnerability has been underlined by both the pandemic, which pushed 55 million additional people into poverty, and the subsequent Ukraine crisis, which further erodes Africa's capacity to recover. Meanwhile, the ongoing impact of the climate crisis is estimated to cost African countries at least 5 percent of their GDP annually (ECA, 2014).¹ Many African countries are already spending between 2 and 9 percent of their budgets in unplanned allocations to respond to extreme weather events.²

1. UNECA models show that African countries are likely to lose up to 5 percent of warming based on an increase in temperatures of 2 degrees. In some regions such as the Sahel, and in higher warming scenarios, the losses may be as high as 15 percent of GDP. See, for example, <https://repository.uneca.org/handle/10855/43948> and <https://www.afdb.org/en/documents/climate-change-impacts-africas-economic-growth>

2. According to estimates by the African Climate Policy Centre of the United Nations Economic Commission for Africa. http://www.climdev-africa.org/sites/default/files/DocumentAttachments/Information%20Brief_Adaptation%20COP23_New.pdf

Africa's extreme exposure to external shocks—from climate to COVID-19 to the energy and food crisis—poses a fundamental economic strategy question: How to build resilience and accelerate growth simultaneously in an unfavorable global economic environment?

Therefore, while the global narrative is about the transition to a net zero economy, for Africa, the issue is one of transformation to a higher value-added economy which integrates net zero emissions into the pathway to zero poverty and zero hunger.

This “great green transformation” is not only possible but also the most viable route for a truly African-owned process, built on Africa's energy independence and its ability to massively multiply trade and investment.

It can allow African countries to reclaim agency in their own development narrative.

First, it is important to underline the scale of the transformation. Previous growth models have been predicated largely on the cheap production and export of African raw materials with minimal value addition. A continuation of this trend will undoubtedly reinforce Africa's vulnerability.

A large-scale investment in climate resilience, centered on energy access to drive sustainable industrialization, can represent one of the fastest drivers for poverty reduction while also fundamentally changing the nature of Africa's economic model, with large-scale investment in sustainable value chains. Studies undertaken by the UN Economic Commission for Africa have demonstrated higher returns on investment in green sectors such as renewable energy as compared to fossil fuel intensive sectors, with sustainable value chains generating gross value addition of up to 420 percent while creating up to 250 percent more jobs (ECA, 2021b).

Building resilience and a green transformation for African countries to address this triple crisis requires significant investment of resources upfront. A successful green transformation must be built on new models of resource mobilization with a focus on how these resources are channeled into the most critical sectors. This requires a reset of some of the development architecture available to African countries. It also requires revamping and repurposing tools available for investing in green sectors.

Notably, special drawing rights (SDRs) can potentially be reoriented toward supporting the urgent need for capital investment in green sectors in Africa and other emerging markets.

Improving the agency of African countries in investing in a viable green recovery is predicated on the ability to raise predictable flows of resources by African countries themselves. While a global tax on carbon may be the best way to raise the urgent resources required to tackle climate change as emphasized by

the UN Secretary General, African countries can improve their own resource mobilization by addressing domestic and regional frameworks as well.

Carbon taxation and access to carbon credit markets offer a potential avenue to increase this resource availability if implemented by African countries whether within a global framework or nationally or as part of regional initiatives. Africa can leverage its natural capital with a view to raise significant resources for investment in these green sectors by tapping into the market for carbon credits, which is set to grow exponentially in the context of the implementation phase of the Paris Climate Agreement. Achieving reliable flows of capital associated with carbon credits can be used to leverage investment in key sectors such as agriculture and also enhance the value of nature-based solutions.

Improving domestic resource mobilization will also be built on developing sustainable value chains through trade. The African Continental Free Trade Area (AfCFTA) provides the framework to develop harmonization of standards to ensure compatibility with climate goals and achievement of the sustainable development goals (SDGs). Delivering of targeted investment and financing through national and regional financing institutions aligned with sustainable principles could help to kick start and sustain the type of inclusive recovery needed.

Africa has the largest energy access gap of all global regions, and consequently investing in energy will be critical for stimulating all sectors of the economy. African countries which are oil and gas exporters are also at risk from significant long-term revenue and job losses, and it is essential that a just energy transition is defined with the role of transition energy sources such as natural gas clearly mapped out. Platforms for a just energy transition need to also be linked directly to identified resources for investment.

Africa's great green Transformation must be designed and led by African countries and institutions and is centered on the mobilization of new and additional resources that can be deployed urgently. Building sustainable value chains will structurally alter the relationship of African economies within the global economy and reduce the impact of exogenous shocks. Most critically, it will allow a focus on people—on ensuring the connection between the citizens of Africa and its immense natural wealth is not only protected, but that this connection be the driver of the great green transformation.

Carbon Taxation and Pricing as Development Levers

The urgent mobilization of resources is what will drive a successful great green transformation for the continent. It is understood that the immediate prospects for domestic resource mobilization are limited by the relatively small size of the

economies and the lack of economic diversification. The urgency of mobilizing predictable climate finance and the promised \$100 billion under the Paris Agreement remain critical for African countries, as the current reliance on external resources is fundamental and is reinforced by the COVID-19 crisis and the food and energy crisis associated with the war in Ukraine. This is why carbon taxation and pricing are so integral to transforming and investing in a new model for development for the continent.

Carbon Taxation Opportunities and Risks

In view of the chronic fiscal squeeze experienced by the majority of African countries, carbon taxation offers a significant opportunity for the mobilization of resources in a manner which incentivizes adherence to the principles of the Paris Agreement, while also boosting state coffers—with the opportunity to redistribute to the most vulnerable segments of the population.

Assuming a carbon price of \$75 per ton and taking the 2021 African consumption of 4 million barrels of oil per day, a carbon tax could generate \$40 billion per annum (Kohlin et al., 2021) for African countries. Care should be taken to ensure that carbon taxes do not indirectly contribute to a further burden on the populations of poorer countries and increase energy prices for those least capable of absorbing them. In the process this may lead to further pressure to use cheaply available firewood, further contributing to environmental degradation (Lawrie et al., 2021). The IEA (2022a) estimated that the number of people without access to clean cooking has increased by about 20 million in the period of 2020–2021—in the heart of the COVID-19 pandemic.

Fuel subsidies already cost African countries significant resources, representing 5 percent of GDP in sub-Saharan Africa and as high as 16 percent of GDP in the Middle East and North Africa region (IMF, 2021a).

The removal of subsidies and the use of targeted taxation of fossil fuels for the purposes of boosting government revenues is a means of reinforcing the agency of African countries to invest in climate resilience and sustainable development. The challenge for many African governments will be to implement such policies in the midst of an energy and fuel crisis, and the success of such strategies will depend on the capacity to protect the most vulnerable populations from the highest cost impacts on their subsistence needs.

Critically, carbon taxes institutionalize the principal of “the polluter pays.” Deployed judiciously, they may also incentivize African industries to develop more sustainable value chains within the continent.

Alongside the implementation of carbon taxation policies, African countries may also seek to access the market for carbon credits to raise resources and

stimulate investment into the rehabilitation of nature, climate resilience, mitigation, and adaptation.

Developing a High-Integrity Carbon Market to Boost Conservation of Natural Capital, Green Financing, and Growth in Africa—Lessons from the Congo Basin Climate Commission (CBCC)

The Paris Agreement's "rulebook" was concluded through the negotiations held during the UNFCCC's 26th Council of Parties (COP) in Glasgow, paving the way for a global approach toward carbon pricing. While efforts continue to find the right format for incentivizing carbon removal at global level, carbon pricing revenue globally increased by 60 percent from 2020 to 2021 (World Bank, 2022).

While African countries for the moment remain on the periphery of this market development, there is increasing political will to develop these opportunities.

The political will among African countries to access carbon credit markets has been emphasized by recent political statements including the Kigali Declaration at the conclusion of the 8th African Regional Forum on Sustainable Development (ECA, 2022a). At the forum, the countries of the Congo Basin Climate Commission³ asked the UN Economic Council for Africa (UNECA) to operationalize mechanisms for the development of a market for carbon credits including through carbon pools assessment, emissions counting, registration, and certification.

Since African countries have significant natural endowments which are well suited to large-scale carbon sequestration, governments have recognized the potential comparative advantage of deploying successful carbon policy instruments and developing the needed markets at relatively reduced marginal costs.

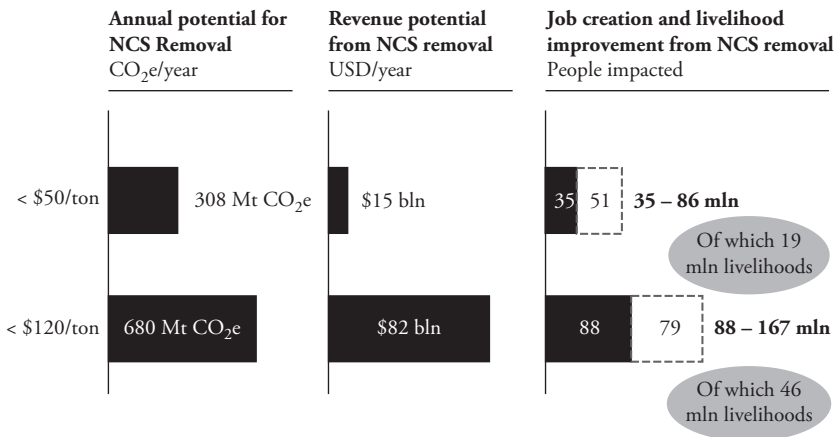
Preliminary assessment of Dalberg and ECA based on satellite data indicates that African countries can accrue vast revenues ranging from U.S. \$1 billion per annum at U.S. \$10 per ton to U.S. \$82 billion per annum at U.S. \$120 per ton (see Figure 9.1). At U.S. \$50 per ton, African countries could generate revenues of U.S. \$15 billion per annum.

Developing a Regional Registry for the CBCC

These preliminary findings indicate that countries from the CBCC could accrue significant revenues from their vast forest resources if carbon prices are improved

3. Angola, Burundi, Cameroon, Central African Republic, Republic of Congo, Chad, Democratic Republic of Congo, Gabon, Equatorial Guinea, Kenya, Rwanda, São Tomé and Príncipe, South Sudan, Tanzania, Uganda, Zambia, and one associate member, the Kingdom of Morocco.

Figure 9.1. Through nature-based carbon removal, Africa can generate a revenue of U.S. \$15–82 billion/year and support 35–167 million jobs and livelihoods



Source: Dalberg/UNECA (2021), data from Climate Action Platform. <https://capa.earthrise.media/>

and the required capacities to manage a carbon market are developed. The survey has indicated that most carbon offsetting projects in the CBCC pertain to the sectors of forestry management, agriculture, and energy efficiency and are led either through the voluntary markets or compliance market mechanisms that will be outlined later.

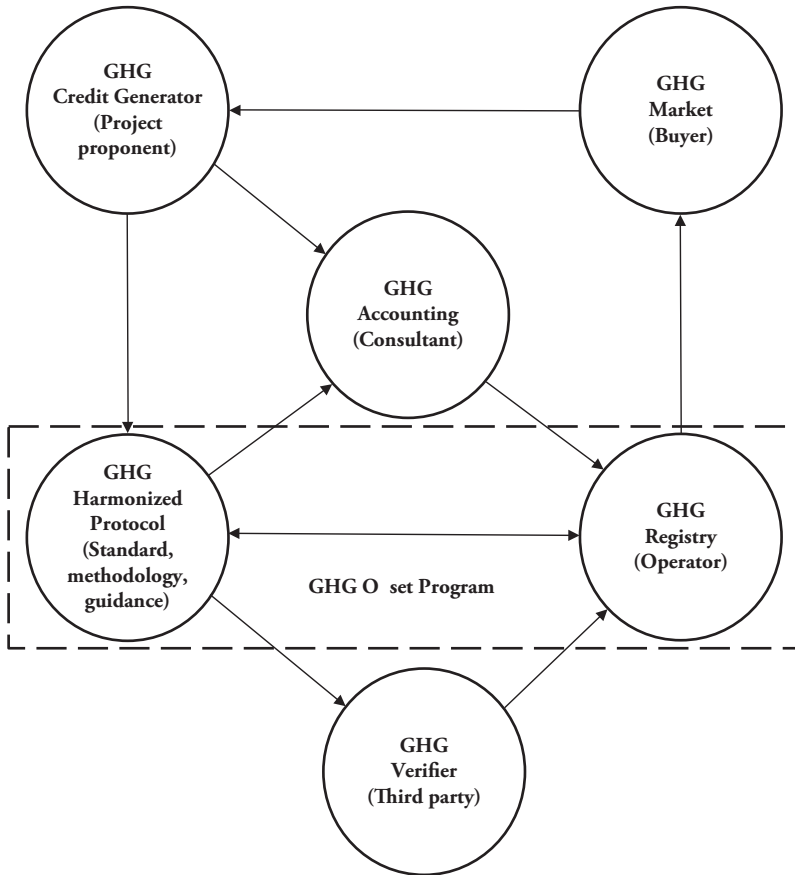
The UNECA is supporting the adoption of a harmonized protocol and template for greenhouse gas (GHG) emissions reporting by countries of the CBCC (Figure 9.2). This will pave the way for the CBCC to establish and administer a GHG offsetting program, combining the harmonized and standardized protocol and template with the GHG registry, improving the integrity of measurement, and consequently improving the viability and potential price of the carbon credits to be issued.

The establishment of this registry can pave the way for other regional registries across the continent, building capacity for an internal market for carbon credits trading through the AfCFTA, as well as better preparing African countries for potential global moves on setting a carbon price.

Carbon Pricing Policies as a Means of Attracting Revenues and Investment

The new framing by policymakers of carbon pricing policies and related markets as a win-win business proposition is an important game changer, reassuring firms, investors, and communities. They are increasingly recognizing the great potential and opportunities to diversify and expand their revenue streams and

Figure 9.2. Potential structure for the GHG registry for the CBCC



Source: ECA (Economic Commission for Africa) (2022b).

generate green industries that are more competitive and rewarding in global value chains while contributing to governments' responses' responses to climate impacts associated with those policies and markets.⁴

4. Globally, two major international market mechanisms exist to facilitate international trade of carbon credits: the Kyoto Protocol (1997), governed through the UNFCCC, and the European Union Trading System (ETS) (2005). Countries have the freedom to follow compliance markets (mainly Kyoto's clean development mechanism (CDM) and ETS) or voluntary markets (mainly VCS and Climate Community and Biodiversity Standards (CCB)) approaches. The UN Collaborative Programmes on Reducing Emission from Deforestation and Forest Degradation in the Developing Countries (UN-REDD) and the World Bank's Forest Carbon Partnership Facility (FCPF)

Firms, entrepreneurs, communities, developers, and investors are recognizing more and more that the carbon markets will accrue to them the opportunities to diversify or expand revenue streams after developing and applying innovative businesses that reduce carbon emissions, which are subject to carbon credits or permits afforded to them by states, and that are tradable. The markets allow entrepreneurial firms willing to invest in emission reduction programs to generate more low carbon, greener industries; create greener value-added products and services and greener employment; accrue revenues on investment; and support growth. This is an additional incentive to firms to complement government's response to the global commitment to reduce CO₂ emissions including through nationally determined contributions (NDCs), decarbonizing most polluting sectors, keeping global warming below the 1.5 degree Celsius target of the Paris Agreement, and moderate the cascading effects of climate change on health, land and water ecosystems, investment, and so on.

Implementing a Green African Continental Free Trade Area

The AfCFTA could be a double-edged sword depending on how it is designed and implemented. It could exacerbate environmental degradation and climate change as the expected expansion in trade and economic growth can contribute to GHG emissions through increased transportation and deforestation, *inter alia*. In contrast, it could help advance the continent's green transition agenda⁵ through fostering the development of sustainable technologies, industries, and infrastructure (van der Ven & Signe, 2021; Brenton & Chemutai, 2021).

are the main assessors of countries' readiness to implement REDD+. UNDP, UNEP, and FAO, in partnership with the World Bank and Forest Investment Programme, implement REDD+. Accredited standards, such as Gold Standard, Clean Development Mechanism (CDM), Joint Implementation (JI), Verified Carbon Standards (VCS), Climate Action Reserve, and Green e-Climate Protocol for Renewable Energy verify and certify them. These standards generally ensure inescapable delivery of claimed offsets. For developing countries, which generally did not elect stringent emission targets though the Kyoto Protocol, the Gold Standard, despite its narrow focus on energy efficiency and renewable energy, and its incongruity with tree planting projects, can be practical, even in pricing carbon emissions. The CDM and JI, which generally have linkages with broader markets in the EU and the Kyoto allowances, have also widely been used by developing countries, including some African countries.

5. One of the key goals of the African Union's Agenda 2063 is *environmentally sustainable and climate resilient economies and communities* (AU, 2022a). In a similar vein, nearly all African countries have signed and ratified the COP21 Paris Agreement, which requires them to reduce their GHG emissions and build resilient economies as outlined in their ambitious nationally determined contributions (AfDB, 2020).

Trade agreements are increasingly incorporating environmental protection and sustainable development provisions to address the trade and environment/climate nexus.⁶ The AfCFTA, however, makes minimal reference to climate change or environmental sustainability. Notably, *Article 3 (e)* makes broad reference to the need for sustainable socioeconomic development, whereas *Article 26 (b and g)* allows for exceptions related to environmental protection (AU, 2018). This underscores the need for the AfCFTA state parties to take a step further to ensure that the agreement drives the green transition agenda.

The AfCFTA protocols under both Phase I and II of the negotiations can be leveraged to facilitate the continent's transition toward a green economy. A case in point is the inclusion of specific provisions which can advance environmental and sustainable development objectives in the protocols that are currently being negotiated. For instance, the intellectual property rights protocol could include provisions incentivizing the development and diffusion of green technologies, as well as the protection of biodiversity and traditional knowledge and cultural expressions (ECA, forthcoming). This will be instrumental in encouraging green innovations.

Under the trade in goods protocol, the AfCFTA state parties should be advised not to include environments products or inputs for green production that can be competitively sourced within the continent in their exclusion or sensitive items lists. This could reduce the import dependency of such products and promote the development of green value chains (van der Ven & Signe, 2021).

There is also scope for the AfCFTA state parties to develop a protocol dedicated to environmental and climate issues since *Article 8 (3)* of the agreement allows for the addition of new instruments deemed necessary in furtherance of the objectives of the agreement (AU, 2018). Nonetheless, this decision needs to be preceded by an assessment on the imperative for having a stand-alone protocol rather than mainstreaming the specific issues in the AfCFTA protocols that are currently being negotiated. The countries also need to be cognizant of the emerging issues which are specific to climate and environment that might be best covered under a stand-alone protocol, especially if they have not been addressed in the existing regional frameworks or initiatives.

Green Value Chains

The abundance of natural resources in the continent shows that it already has a comparative advantage in the development of green value chains in the context

6. By 2016, about 79 regional trade agreements had substantive, specific environment-related provisions compared to just seven in 2000 (Monteiro, 2016).

of the AfCFTA. For instance, the Democratic Republic of Congo accounted for 89 percent of the world's total cobalt exports between 2016 and 2020 (Comtrade, 2022). The country has great potential to be involved in the production of low-cost and low-emissions lithium-ion battery cathode precursors, instead of being relegated to the lower rungs of the battery value chain as suppliers of the minerals (Bloomberg NEF, 2021).⁷ This battery value chain can subsequently be linked to the growing automobile value chain in Africa. Indeed, car assembly plants are increasingly being set up in the continent, signaling the sector's growth potential; Volkswagen has five vehicle assembly plants in Africa⁸ while Kenya's Mobius Motors intends to ramp up its operations within the region. The continent is also well endowed with natural products sourced from plants such as marula (*Sclerocarya birrea subsp. Caffra*), baobab (*Adansonia digitate*), Kalahari melon (*Citrullus lanatus*), and African sour plum (*Ximenia americana*), among others. Some of these products can be explored in the development of biodiversity-based value chains in sectors such as pharmaceuticals and luxurious cosmetic products (ECA, forthcoming; UNCTAD, 2021).

Food Security Through Green Investment and Predictable Trade

The COVID-19 pandemic has particularly illustrated the vulnerability of Africa's food security—pushing 47 million into extreme poverty, increasing new poor by 55 million, and adding 46 million people to those at risk of hunger and undernourishment (ECA, 2022e). Africa has borne the heaviest impact with 20 percent of the population of the continent facing hunger—more than double the ratio in Asia (FAO, 2022). But strategic investment into productive sustainable value chains can change the face of food production on the continent. In particular, investment in sustainable climate-smart agriculture and food value chains creates some of the highest multipliers in terms of gross value addition. In ECA case studies, a return on investment of 490 percent was modeled based on investment in solar powered reverse osmosis irrigation in Egypt. Meanwhile, investing in irrigation brings a return of 500 percent in the Democratic Republic

7. It would cost U.S. \$39 million to build a 10,000 metric-ton cathode precursor plant in the Democratic Republic of Congo—this is three times cheaper than what a similar plant in the United States would cost. Precursor material produced at plants in the Democratic Republic of Congo could be cost competitive with material produced in China and Poland but with a lower environmental footprint.

8. Check link for more information: <https://www.dw.com/en/german-cars-auto-africa-vw/a-56156343>

of Congo, and a return of 286 percent is achievable from the use of resilient seeds in agriculture in Kenya.⁹

Urbanization and Transport

Africa is projected to have the fastest urban growth rate in the world. In fact, by 2050, the continent will be home to an additional 950 million people (OECD, 2020). One of the major ramifications of this trend is the surge in transport demands, which leads to traffic congestion and increase in GHG emissions since most vehicles are powered by fossil fuels (Klopp et al., 2019; IPCC, 2014). Greening the transport sector should therefore be a key priority under the AfCFTA. This can be achieved through engendering the uptake of transport modes that are efficient, reliable, and environmentally sensitive. Some African cities have adopted the bus rapid transit (BRT), which is a mass transport system that uses high quality, large capacity public-based buses which have dedicated lanes on the roads, hence easing traffic congestion and reducing GHG emissions. Adoption of BRT could in turn further stimulate green investment in related sectors such as renewable energy and the circular economy.

Digital Transformation to Accelerate Sustainable Value Chains

Digital cross border payment solutions will play a key role in implementing the AfCFTA Agreement as informal, micro, small, and medium enterprises (IMSMEs) make up more than 90 percent of the private sector in Africa and they continue to rely on cash payments for cross border trade and often have limited options to use formal and digital cross border payment solutions (ECA, 2020).

Digital cross-border payment solutions will thus increasingly enable IMSMEs, women, and youth to engage in cross border trade, access finance, and make remote payments, which ultimately stimulates inclusive growth. Such developments in digital finance (fintech) can be leveraged for environmental gains as the unlocking of cross border digital payments naturally will enable mobilizing green finance and inclusive access to clean energy (UNEP, 2016).

Widespread e-commerce can be game changing for IMSMEs, connecting them to larger firms and markets which will be further strengthened by the implementation of the AfCFTA and in particular through the Protocol on E-commerce. In Africa, the e-commerce industry is projected to grow by 50 percent by 2025. In

9. Case studies featured in *Building Forward for an African Green Recovery*, <https://repository.uneca.org/handle/10855/43948>

2021, the e-commerce industry in Africa generated \$28 billion in revenue, while in 2022, the industry is predicted to produce \$33.3 billion in revenue following an increase of 19 percent. With the significant increase in e-commerce revenue in Africa, experts disclose that it will continue to increase and will likely reach a value of over U.S. \$46.1 billion (Statista Digital Market Outlook, 2022).

E-commerce will moreover facilitate the shortening of global value chains and in particular the creation of resilient regional value chains in Africa where the supply chains are increasingly regional and closer to the consumers. As a result of shorter value chains, emissions associated with freight transport can be reduced. Shortening of value chains does not necessarily lead to reduced emissions in the total GHG emissions from a single product as the carbon intensity of the manufacturing practices has a high impact on the emissions; however, digitalization can also play a key role in reducing such emissions.

To further accelerate these transitions the ECA, in partnership with Afreximbank, has supported the establishment of the Africa Trade Exchange (ATEX) platform to support AfCFTA implementation and provide buyers and member states with quality products from verified suppliers in a more efficient way at average cost, thereby improving cross-border trade. ATEX will also facilitate pooled procurement of basic commodities. It is intended that such regional platforms can be standard setters in terms of nurturing the development of shorter and sustainable regional value chains.

Financing Through Regional Financial Institutions

Financial constraints are a major impediment to the transition toward a green economy. Although Africa is still at its nascent stages of adopting green financing mechanisms, the AfCFTA can be used as a platform to strengthen and scale up some of the existing green investment instruments and initiatives that have been developed at the national, regional, and continental levels to access and mobilize green finance. Box 9.1 provides a case study on the role of development banks in supporting green investments in select regional economic communities (RECs).

Africa's Just and Equitable Energy Transformation

Africa's Energy Paradox

Africa's energy resources present a paradox—both fossil and renewable energy are abundant, but the ability to harness these resources for use remains suboptimal. The continent's under-tapped renewable energy potential includes over 60 percent of the best solar resources globally (IEA, 2022a), about 350 gigawatts (GW) of hydropower, over 110 GW of wind, and about 20 GW of

Box 9.1. Case Study on the Role of Development Banks in Supporting Green Investments in Select RECs

Regional and national development banks act as implementing partners for green investment initiatives, as well as catalysts for innovative green investment concepts as outlined subsequently.

ECOWAS: The ECOWAS Bank for Investment and Development (EBID) in its 2021–2025 strategic plan pledges to support its member states to pursue climate-friendly projects in order to avoid adverse climate-related events, with agriculture and climate resilience as one of five priority areas for intervention. One noteworthy initiative in this area is the West African Initiative for Climate-Smart Agriculture (WAICSA), initiated by the ECOWAS Commission and implemented by EBID. WAICSA is a blended finance fund which focuses on increasing the uptake of climate-smart agriculture practices by smallholder farmers. Another noteworthy player is the West African Development Bank (BOAD), which is the common development finance institution of the member states of the West African Monetary Union (WAEMU). BOAD is committed to greening the WAEMU financial sector and promoting financial innovation to increase private investments to help fight climate change and accelerate climate investments.

Southern African Development Community (SADC): The Development Bank of Southern Africa (DBSA) via its climate finance unit manages a range of initiatives and programs aimed at accelerating the transition towards a sustainable low-carbon economy. An example of its initiatives is the DBSA Climate Finance Facility—a lending facility intended to increase climate-related investment in southern Africa by addressing market constraints and playing a catalytic role through a blended finance approach. It funds sustainable infrastructure in SADC countries by cofinancing green finance investments offered by local banks through leveraging on equity from its funds and external funds from the Green Finance Fund, Green Environment Facility, and other climate funds.

Source: ECA (forthcoming).

geothermal power (AfDB, 2018). Despite this huge renewable energy resources potential, to date Africa's share of electricity generation for these sources remains extremely low, accounting for only 3.4 percent of global electricity generation from hydropower, while its share of global wind and solar power generation are only 1.2 percent and 1.1 percent, respectively (BP, 2022). In terms of fossil fuel resources, Africa has 7.2 percent of the world's 1.73 trillion barrels of proven crude oil reserves and 6.9 percent of the world's 188 trillion cubic meters of proven natural gas reserves (BP, 2022). Yet, the continent has the highest regional energy access deficit with about 590 million people lacking access to electricity in 2020 (IEA, 2022a). This is 44 percent of the continent's

population and close to 80 percent of the 733 million people without access to electricity globally (IEA et al., 2022).

Economic growth is directly correlated to energy consumption. Yet, Africa accounts for 17 percent of global population but accounts for only 3.4 percent of global primary energy consumption,¹⁰ 3 percent of global energy use in industry, 3.5 percent of global installed electricity capacity of 7,100 GW, and 3.2 percent of the 27,005 terawatt-hours of electricity generated globally (BP, 2022). The continent's average per capita electricity consumption of about 600 kilowatt-hours (kWh) per year (about 200 kWh when South Africa and north African countries are excluded) is unacceptably low, ranging from less than 100 kWh in countries such as Benin, Ethiopia, and South Sudan to over 1,500 kWh in only a few countries such as Botswana, Egypt, Libya, Mauritius, Namibia, and South Africa (IEA, 2022b).

In terms of clean cooking, about 923 million people in Africa still lack access to sustainable cooking solutions, with the number increasing by 20 million per year at current policy and intervention rate in sub-Saharan Africa (IEA et al., 2022). This accounts for close to 39 percent of the 2.4 billion people without access to clean cooking solutions in 2020 globally—a result of which is some 500,000 premature deaths per year related to indoor pollution in sub-Saharan Africa, with women being impacted the most (IEA, 2022c; IEA et al, 2022).

Realizing the Energy Transformation Potential for Africa

Africa's energy transition is shaped by geopolitical tensions, the geopolitics of the energy transition, the fiscal and economic impacts of the COVID-19 pandemic, and Africa's desire to meaningfully use its abundant fossil fuel resources while taking action to tackle climate change. The global urgency to transition from fossil fuels to cleaner energy forms, especially in the context of net zero emissions to meet the temperature goal of the Paris Agreement by the middle of this century, present African countries with risks, challenges, and potentially enormous opportunities. The risks lie primarily with the potential of stranding Africa's fossil fuel resources while facing serious challenges in mobilizing enough investments, particularly from the private sector, to invest in renewables. The opportunities are many, especially given that Africa is the last frontier for any transformative global investments in renewables. Such investments will create millions of decent jobs, especially for the continent's growing youthful population.

10. ECA calculation.

Africa's Energy Transition: Huge Investment and Industrialization Opportunities

Africa's energy transition must be defined, owned, and led by Africa for it to be just and equitable. The UNECA estimates that to be on track to meet its development objectives, the continent's electricity installed capacity needs to double to about 500 GW by 2030 and increase fivefold by 2050, with at least 80 percent of that capacity coming from renewables with the right policies and support. This requires investments of the order of U.S. \$500 billion by 2030 and U.S. \$2 trillion by 2050.¹¹ With increasingly constrained public resources, most investments will come from the private sector. Yet, over the last 10 years much less than 2 percent of global clean energy investments have been to Africa, mainly in a few countries such as South Africa, Morocco, Egypt, Kenya, and Egypt (IRENA, 2022).

To unlock Africa's clean energy potential for sustainable development requires transformational leadership and mechanisms to fast-track policy and regulatory reforms to put in place the enabling environment needed to enhance the confidence of investors and leverage limited public resources against a background of competing demands for resources to mobilize the needed investments from the private sector. This requires key issues to be addressed, including, among others:

- policy and regulatory reforms covering generation, transmission, and distribution¹²
- strong institutions and enhanced bankability of utilities
- cost-reflective tariffs and subsidy reform
- clear, structured, and transparent procurement plans for long-term investments and level playing field for all market participants
- rule of law and a transparent and accessible legal system
- promotion of innovation and use of digitalization for robust grid and decentralized systems
- responding to climate change and enhanced access through investment in interconnections and strong and climate resilient grids for cross-border trade with higher shares of renewables.

11. Based on estimates of electricity demand for access to meet population growth and at average of U.S. \$2,000 per kWh of installed capacity across technologies.

12. The ECA and RES4AFRICA are conducting country studies on fixing energy policy and regulatory barriers to private sector investment in Africa.

Catalytic mechanisms to mobilize substantial private sector investments¹³ and mobilization of Africa's capital and private sector to lead Africa's energy transition investments are also important areas of influence.¹⁴

Africa is also endowed with abundant natural resources and minerals. Eight of the 15 countries globally with substantial deposits of the critical minerals for the energy transition are in Africa, with the production of these minerals expected to increase by up to 500 percent by 2050 (World Bank, 2020). Africa could leverage the Africa Continental Free Trade Area to be at the center of the global green transition agenda. A study commissioned by the ECA¹⁵ shows that producing main electric battery precursors in the Democratic Republic of Congo can be 30 percent cheaper than doing so in China or the United States (Bloomberg NEF, 2021). Doing so can significantly increase Africa's share of the U.S. \$1.4 trillion global electric battery value chain.¹⁶

An African Common Position on the Energy Transition

During the 2022 Sustainable Energy for All (SEforALL) Forum held in Kigali, Rwanda, in May 2022, African ministers from 10 countries, led by the Republic of Rwanda, announced the Kigali Communique on a just and equitable energy transition in Africa, based on seven principles.¹⁷ Subsequent to this, the African Union's Specialized Technical Committee on Transport, Infrastructure, Inter-continental and Interregional Infrastructure, Energy and Tourism convened and published a common African position on the energy transition on the continent, building from the Kigali Communique, and this was adopted by the African Union Executive Council in July 2022.

13. Mechanisms such as the ECA's SDG7 Initiative that has facilitated the issuance of ZAR 3 billion local currency green bonds for renewable energy financing in South Africa (<https://www.dbsa.org/press-releases/dbsa-launches-second-green-bond>) and the ECA's Liquidity and Sustainability Facility that aims at enhancing the liquidity of African sovereign bonds for green investments and recovery (UNECA).

14. The Team-Energy Africa, conceived by the ECA in partnership with SEforALL and the African Energy Chamber, has been launched for this purpose (UNECA).

15. This study was conceived and commissioned by the UN Economic Commission for Africa (ECA), Afreximbank, the African Development Bank (AfDB), the Africa Finance Corporation (AFC), the Arab Bank for Economic Development in Africa (BADEA), the African Legal Support Facility (ALSF), and the UN Global Compact and was undertaken by Bloomberg NEF.

16. For example, the Democratic Republic of Congo accounts for 70 percent of global cobalt supply but only 3 percent of the value chain.

17. See <https://www.mininfra.gov.rw/index.php?eID=dumpFile&t=f&f=44024&token=c9d8a3e4e9ad4d22aa3c3b883055c9426760c584>

Africa's position on the use of natural gas as part of the transition is based on the least cost scenarios for countries requiring large-scale investment in their base cost of investment. While this position has elicited consternation among some climate advocates, the common position does not negate the commitments already made by the African group at COP26 to achieve net zero, and African countries will require support to detail and finance their just energy transition platforms (Box 9.2).

Box 9.2. Country Platforms for Climate Action: South Africa's Just Energy Transition Partnership

A just energy transition is an inherently complex and costly undertaking, necessitating deeper private sector participation, especially in scaling up renewable energy generation, energy storage, and upgrading transmission and distribution infrastructure. Employing technocratic top-down plans in steering investment behavior have seldom succeeded in industrial policy. Rather, success has been contingent upon a strategic collaboration between governments and the private sector, identifying and tackling key barriers to private investment.

For effectiveness, the energy transition will require collective action by a critical mass and wide variety of stakeholders. Recently, there has been growing interest in designing mechanisms for collaboration within countries to enhance country contributions to climate action. One of the most substantial notions emanating from COP26 was the establishment of country platforms that could assist low- and middle-income countries to rapidly shift to low carbon and resilient development pathways by unlocking international concessional finance, signaling a step change in climate finance provision.

Country platforms are typically multi-stakeholder partnerships among development actors, including governments, civil society, the private sector, donors, philanthropic investors, and financial institutions, designed to help attain shared objectives. It blends a political agreement to confront a challenge, facilitated by a substantial package of concessional financing, with coordination structures for both government and donors, helping to mobilize private capital at scale.

South Africa is currently the leading example of a country platform for energy transitions. Mindful of its ambitious national decarbonization plans, it recently launched a ground-breaking International Just Energy Transition Partnership with the European Union, France, Germany, the United Kingdom, and the United States of America. The initiative aims to phase out coal by 2040, attain net zero emissions by 2050, and prevent 1–1.5 gigatons of emissions by 2040 toward facilitating the transition to cleaner forms of energy. The partnership will focus on the electricity system, fueled mainly by coal, within the context of attaining its revised NDC aspirations. An initial commitment of \$8.5 billion will be mobilized for the first phase of financing through various mechanisms comprising grants, concessional loans and investments, and risk sharing instruments, including to mobilize the private sector. Estimates of funding needed for a just transition amount to \$30 billion for the decarbonization of Eskom and U.S. \$60 billion for the entirety of the power sector by 2030. While this initiative presents a huge opportunity to invest in green value chains linked to the energy sector with attendant high rates of return, challenges include the risk of funding pledges not being mobilized as well as overall requirements overshooting current estimate.

Natural Gas and Green Hydrogen Can Play a Catalytic Role in Africa's Energy Transition

Both the Kigali Communique and the African Union's common position on the energy transition emphasize the critical role that natural gas must play as an enabling transition fuel. With limited grids, unaffordable storage, and lack of demand-side management, systems flexibility for increased shares of variable renewables in Africa can mainly be achieved through flexible generation. In this regard, natural gas is a key flexible generation fuel that can catalyze Africa's clean energy transformation. It is highly dispatchable and so provides system flexibility by being able to respond to changes in demand and supply in very short time intervals—e.g., changes caused by variable renewable power sources such as wind and solar power plants. Furthermore, although gas is a fossil fuel that contributes to greenhouse gas emissions, increasing its use in power generation gives African countries the opportunity to phase out more polluting fuels such as coal, diesel, and heavy fuel oil (HFO), while bringing on board more renewables. According to estimates by the Energy for Growth Hub, increasing the share of gas in meeting Africa's energy needs will result in a negligible increase in global emissions as the continent is starting from a low base (Energy for Growth Hub, 2020). In relation to energy for cooking, there is a strong case for African countries to use their abundant gas resources to provide clean cooking solutions and reduce health and environmental impacts arising from overdependence on biomass for energy in many countries. But African countries would need to develop and implement strong gas transition plans. Appendix 9.1 provides a possible clean energy transition roadmap in Africa.

Development of Financial Architecture That Is Relevant to Africa

The current development financial architecture is from a bygone era and is unfit to address truly global exogenous shocks—the climate crisis being the most sustained and impactful for African countries. The COVID-19 pandemic fully exposed these vulnerabilities and inequalities, and further reforms are required to achieve real African agency in responding to these shocks and to allow true long-term investment in resilience and adaptation (United Nations, 2021).

The Global Financial Architecture and SDRs

While multilateral financing and the Debt Service Suspension Initiative (DSSI) have been helpful in supporting African economies during the pandemic, they do not adequately meet the financing needs of African economies. The issuance of \$650 billion worth of SDRs is important in managing the crisis as it provides additional liquidity to the global economic system.

However, this would disproportionately benefit developed countries which need them the least. Africa, with about 52 percent SDR utilization rate, will only get about \$33 billion (about 5 percent) worth of SDRs, while developed countries with less than 10 percent utilization rate will get around \$418 billion (about 64 percent).

On-Lending of SDRs Through Market Mechanisms Could Lower Cost of Borrowing and Leverage Critical Investments in Countries with Market Access

Also, encouraging voluntary reallocation of SDRs from countries with strong external positions to those most in need would optimize the effectiveness of SDRs in the global financial architecture. It would allow available liquidity to be directed to where the liquidity is most needed. Options include scaling up resources for the IMF's concessional financing through the Poverty Reduction and Growth Trust (PRGT), as well as the announced Resilience and Sustainability Trust (RST) to help the most vulnerable countries with structural transformation, including confronting climate-related challenges, and lending by multilateral development banks, would play a critical role in enhancing the countries' liquidity (IMF, 2021b).

Addressing Debt Challenges and Creating Predictable Frameworks for Managing Future Debt Burdens

The most significant challenge for countries is their liquidity constraints to stave off insolvency and to restore lives and livelihoods. This means going back to the capital markets at less than competitive rates, reinforcing the urgency of expediting the implementation and operationalization of the Liquidity and Sustainability Facility (LSF) and the G20 Common Framework, as well as the reallocation of SDRs to developing countries.

There is also need for innovative ideas to compress the liquidity premium on Africa's sovereign bonds, which has been attributed to the dearth of secondary or repo markets for such debt instruments. All this calls for collaborative efforts from all the development partners working on the continent to support these initiatives to maximize the impact of the countries' public investments, such as recapitalization of development banks and restructuring of debt of the poorest countries through initiatives such as the G20 Common Framework.

To ensure their continued contribution to the recovery process in the short to medium term, there is a need for public development banks to be recapitalized and to have more flexible mandates that allow them to finance the transformation of African economies to mitigate the exposure of the region to recurrent adverse commodity terms of trade shocks and global volatility. All this will require coming up with mechanisms that speed up implementation for countries in need of debt restructuring.

For countries that are not in debt distress, debt swaps provide an opportunity for them to divert debt payments to mutually agreed priority areas such as the

environment, health, and infrastructure. At the recently convened pre-COP27 International Cooperation Forum, ministers of finance, economy, and environment asked for a Sovereign Sustainable Debt Hub to link debt issuances with climate key performance indicators (ECA, 2022d). Such a hub can help simplify the process for countries to access blended financing resources which can be deployed to increase Africa's share of green bond financing.

Furthermore, additional sources of funding are needed to scale up the LSF, which could also utilize part of the \$650 billion of the SDRs created by the IMF in August 2021, to help low- and middle-income countries weather the pandemic. The LSF will also support investments in digitization and the implementation of the AfCFTA.

Conclusions

African countries can redefine their development model through a strategic focus on investing in a green transformation. This transformation cannot be externally imposed, nor will it succeed if dependent only on promises of external funding.

The transformation will be possible if the means to implement it are rooted within the productive capacity of the continent. To achieve this requires reform of the financing architecture, both from external development partners and through the development of local markets. It also requires investment in those strategic sectors which will provide the greatest multiplier effect on growth and consequently improve perspectives for domestic resource mobilization.

The fundamental driver of success for Africa's green transition will be the availability of resources for investment. A large portion of these resources are theoretically available globally—but are not appropriately channeled toward Africa.

The reallocation of SDRs toward countries with the greatest liquidity needs is a fundamental step toward rebalancing the global financial architecture through international financing institutions.

This must be accompanied by the strengthening of the ability of African countries to mobilize their own resources. And any domestic resource mobilization is built on the foundations of solid and inclusive economic growth. The African Continental Free Trade Area already provides the framework to fashion the continent's green transition. With the right investment in sustainable value chains and the right framing incentives, which can still be built into the protocols, intra-African trade can flourish on the basis of green investments—with no better example than the battery value chain linked to critical minerals. The strengthening of availability of adapted financing instruments through regional development banks will also be critical to allow the quick up scaling of promising value chains in green sectors.

The opportunity to deploy carbon taxation and the potential development of carbon credit markets also represents an opportunity to stream new forms of

revenue quickly, while helping to build nature-positive investment. Africa is facing some of the highest rates of environmental degradation globally, with immediate impacts on populations. Initiatives such as those led by countries of the Congo Basin are designed to provide adaptation to climate change, while also aiming to develop livelihoods connected to the preservation of the region's unique natural heritage. While COP27 presents an opportunity to provide further momentum toward a global carbon price, the development of high integrity regional carbon markets provides a platform for investment in nature-based solutions and providing critically needed financial resources that can be invested in improving the lives of populations of those regions.

An African green transformation, and a successful redesign of the African economic model, hinges on the right formula for Africa's energy transition. The scale of investment required for universal access, based on existing technological availability, requires an energy mix which in many cases cannot be achieved with renewables alone based on existing technologies.

However, the emerging potential of green hydrogen could mean that this transition can be accelerated if the appropriate investment is made at the right time. Critically, African countries need to avoid locking into defunct energy models and stranded assets, and the investment in country platforms for energy transitions can allow appropriate matching of financial resources with infrastructure projects with high return on investment.

The green transformation in Africa is predicated on the availability of resources for investment—a front-loaded transformation package.

Support is required at the global level to provide the large-scale investment required. But there is also a need for decisive regional shift. African countries have already broken the mold by pushing ahead with the African Continental Free Trade Agreement. The great green transformation is the new comparative advantage for the continent, and this must be reflected by the way in which we invest in it. Regional development banks have a key role to play and need new sources of capital to be able to play that role.

By investing in the right sectors, the conditions will be established for Africa to be able to raise its own resources. This a shared opportunity—for both Africa and its partners. The world continues to be mired in economic uncertainty of recession and sluggish economic growth. The impetus of a great green transformation in Africa delivers returns which are beyond the pale of any other region.

There is extreme urgency. The economic opportunity cannot be divorced from the scale of potential calamity.

African countries will hold their partners accountable for promises made. But African countries are also determined not to be bystanders and to lead by doing. This great green transformation is built on this shared determination.

Appendix 9.1. A possible clean energy transition roadmap in Africa

Africa's energy situation at beginning of Decade of Action on the SDGs (2020)	By 2025	By 2030	Beyond 2030 to 2050
<ul style="list-style-type: none"> • Fastest growing population and urbanizing continent 	<ul style="list-style-type: none"> • Increasing energy demand 	<ul style="list-style-type: none"> • Near universal access to electricity and clean cooking in urban areas 	<ul style="list-style-type: none"> • Africa's installed electricity capacity passes 600,000 MW
<ul style="list-style-type: none"> • Abundant energy resources—fossil and renewable (e.g., 40 percent of global potential for solar resources) 	<ul style="list-style-type: none"> • Increasing intra-regional trade and industrialization 	<ul style="list-style-type: none"> • Transformative rural electrification programs 	<ul style="list-style-type: none"> • Africa's transboundary energy resources fully developed for shared prosperity
<ul style="list-style-type: none"> • But 42 percent of the population have no access to electricity, while 68 percent lack access to clean cooking solutions 	<ul style="list-style-type: none"> • Reforms increase private sector confidence and investment 	<ul style="list-style-type: none"> • Up to 100,000 MW of new clean power capacity addition, creating some 5 million jobs 	<ul style="list-style-type: none"> • Full access to affordable and clean energy for electricity and cooking in rural and urban areas
<ul style="list-style-type: none"> • Has 17 percent of world population but accounts for less than 2 percent of global energy-related emissions, 3.2 percent of global electricity generation, 3 percent of global electricity installed capacity, and 20 percent of global per capita primary energy consumption 	<ul style="list-style-type: none"> • Reform of utilities and comprehensive review of subsidies and tariffs 	<ul style="list-style-type: none"> • Secure, affordable, and reliable clean energy for development—health, education, industry, youth, and gender 	<ul style="list-style-type: none"> • An integrated and climate resilient African power system with fully functional power sector market driven by private sector players
<ul style="list-style-type: none"> • Most vulnerable region to climate change impacts across sectors—energy, agriculture, water, transport, and ecosystems 	<ul style="list-style-type: none"> • Enhanced climate ambition through bankable clean energy actions in NDCs 	<ul style="list-style-type: none"> • Millions of young Africans employed across the clean energy deployment value chain 	<ul style="list-style-type: none"> • Industrialized Africa with strong intra-regional trade powered by the continent's abundant clean energy resources
<ul style="list-style-type: none"> • Limited local content in clean energy deployment value chain 	<ul style="list-style-type: none"> • Resolution and targeted use of feed-in tariffs and tender systems for power procurement 	<ul style="list-style-type: none"> • Power pools interconnected with increased cross-border power trading within pools toward an integrated African power market 	<ul style="list-style-type: none"> • Gas has helped integration of large shares of variable renewables
<ul style="list-style-type: none"> • 22,000 MW of clean energy actions in NDCs 	<ul style="list-style-type: none"> • Up to 20 countries implementing independent power producer programs with competitive tariffs 	<ul style="list-style-type: none"> • Gas has helped integration of large shares of variable renewables 	<ul style="list-style-type: none"> • Gas has helped integration of large shares of variable renewables
<ul style="list-style-type: none"> • Only about 1.5% of global clean investment flow 			

- High perceived risks resulting in low private sector participation in generation, transmission, and distribution of electricity
- Limited institutional and individual capacities for integrated energy systems and investment planning
- Policy and regulatory challenges
- Bankrupt utilities and perverse fossil fuel subsidies
- Only 307,000 employed in clean energy sector
- Power pools in all subregions but very little cross-border power trade
- Power mix dominated by fossil fuels—only 22.5 percent of power generated from renewables
- Learning curve of non-hydro renewables improving with world competitive solar and wind power tariffs in Morocco, South Africa, Zambia, Namibia, and Senegal
- Poor use of feed-in-tariffs and large inertia on public tendering for on-grid power contracts
- Increasing discovery of gas reserves but gas only 40 percent of power mix dominated by north African countries (about 12% in rest of Africa)
- Gas flaring common
- Up to 50,000 MW of new renewable capacity additions
- Substantial investments in interconnectors and transmission and distribution systems with blueprint for role of public and private capital
- Rollout of viable business models and private sector investments in off-grid energy systems
- Increased employment opportunities in clean energy
- Greater gender and youth empowerment through clean energy for productive uses and value chain extensions
- ECA's SDG7 Initiative for Africa helps mobilize private sector finance for at least 10,000 MW of clean energy capacity additions
- Implementation of strategies to reduce and eventually end gas flaring
- Climate resilience integrated in energy systems planning
- Toward critical mass of energy and investment planning
- High shares of local content in the clean energy deployment value chain
- Energy systems more resilient to climate change
- Capacity for energy systems and investment planning
- Reformed power sector with substantial private sector participation in generation, transmission, and distribution
- Fully targeted subsidies for consumers and cost reflective tariffs for generators
- Framework for transmission system operators
- Retirement of coal and oil powered electric power plants
- Business models for capture and monetization of otherwise flared gas
- Electric mobility and smart cities blueprints
- African countries with critical minerals for the energy transformation are adding value and plugging into the global clean energy value chains
- Countries like DRC, Cameroon, and others are critical producers of components of the global clean energy transformation
- Climate-informed development for shared prosperity and all countries reaching net zero emissions
- Phase-out of gas transition power plants

Source: Based on background work undertaken by the African Climate Policy Centre to inform the AU Common Position on the Energy Transition (Africa Union, 2022b).

Acknowledgments

The authors would like to acknowledge the substantial contributions of the following staff members from the United Nations Economic Commission for Africa: Hopestone Kayiska Chavula; Adam Elhiraika; Gamal Eltaib Ibrahim; Stephen Karingi; Louis Mitondo Lubango; Linus Mofor; Laura Naliaka; Nassim Oulmane; Mekalia Paulos; Mactar Seck; and Mie Vedel Joergensen as well as Carlijn Nouwen from Cap-A for the data on Africa's carbon potential.

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About the Center for Sustainable Development at Brookings

The Center for Sustainable Development generates leading research, insights, and convening to advance the economic, social, and environmental challenges of global sustainable development and help implement the Sustainable Development Goals (SDGs) within and across all countries.

To set a more robust global path to net-zero emissions by 2050, the world needs to pay greater attention to the needs of emerging markets and developing economies (EMDEs), even when holding aside the special case of China. Over the coming several decades, no part of the world will play a greater role in both experiencing and affecting global climate change outcomes than EMDEs themselves. They need greater international support to tackle growth-enhancing sustainable development strategies.

In *Keys to Climate Action*, twenty-five authors describe new economic narratives and global actions that can help catalyze progress toward inclusive, sustainable, and resilient growth in EMDEs. The volume begins with the stark reality of climate change's devastating consequences already hindering economic development around the world. It underscores the need for urgent investments in adaptation, resilience, and nature to avoid development setbacks while paying heed to the world's narrow window for climate action. It requires empathy for many developing countries' profound energy conundrum: a tension between the need to expand access for people who need it most while facing pressures to pursue low-carbon opportunities, often in the face of local political and financing headwinds. It implies practical urgency in tackling the broken threads of the international financing system for climate and development.

The volume brings together a cross-section of distinguished academics and leading policy voices from a variety of developing country geographies and contexts. It presents perspectives on the country-specific climate and development challenges and opportunities in Bangladesh by **SALEEMUL HUQ** and **MIZAN KHAN**, Egypt by **HALA ABOU-ALI**, **AMIRA ELAYOUTY**, and **MAHMOUD MOHIELDIN**, India by **MONTEK SINGH AHLUWALIA** and **UTKARSH PATEL**, Indonesia by **MUHAMAD CHATIB BASRI** and **TEUKU RIEFKY**, Nigeria by **BELINDA ARCHIBONG** and **PHILIP OSAFO-KWAAKO**, and South Africa by **RICHARD CALLAND**. Then, broader case studies focus on regional issues in East Africa by **NJUGUNA NDUNG'U** and **THÉOPHILE AZOMAHOU**, across the African continent as a whole by **VERA SONGWE** and **JEAN-PAUL ADAM**, in Latin America and the Caribbean by **DANIEL TITELMAN**, **MICHAEL HANNI**, **NOEL PEREZ BENITEZ**, and **JEAN-BAPTISTE CARPENTIER**, and among the Vulnerable Twenty Group of Ministers of Finance of the Climate Vulnerable Forum by **SARA JANE AHMED**. A final chapter by **MONTEK SINGH AHLUWALIA** and **UTKARSH PATEL** focuses on systemic issues in financing development and climate-driven prosperity.

AMAR BHATTACHARYA is a senior fellow in the Center for Sustainable Development at the Brookings Institution, where he specializes in global economy, development finance, global governance, and the links between climate and development. He co-led the Independent Expert Group on Climate Finance commissioned by the U.N. Secretary-General and has served as Executive Secretary of the Independent High-Level Expert Group on Climate Finance. **HOMI KHARAS** is a senior fellow in the Center for Sustainable Development at the Brookings Institution, where he specializes in analyzing policies and finance in support of sustainable development. He was lead author and executive secretary of the U.N. Secretary-General's High-Level Panel on the post-2015 development agenda. His previous books include *Breakthrough: The Promise of Frontier Technologies for Sustainable Development* and *Leave No One Behind: Time for Specifics on the Sustainable Development Goals*. **JOHN W. MCARTHUR** is a senior fellow and director of the Center for Sustainable Development at the Brookings Institution. He previously served as deputy director of the U.N. Millennium Project and is co-founder and co-chair of the 17 Rooms initiative for the Sustainable Development Goals. His previous books include *Breakthrough: The Promise of Frontier Technologies for Sustainable Development* and *From Summits to Solutions: Innovations in Implementing the Sustainable Development Goals*.

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