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Evidence-based Transformative Pathways to Foster Climate Resilience and a Just Energy Transition for Africa

Background Paper for COP27

AFRICAN DEVELOPMENT BANK GROUP

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Background Paper

An IDEV Knowledge Product

Introduction

Evaluative evidence helps us to use information generated from experience to influence the ways in which appropriate interventions are developed or the ways they are managed. Hence, evaluations can bring significant value to learning and the forging of solutions, as part of the global efforts to foster climate resilience and a just energy transition in Africa. To this end, this background paper aims to provide critical evaluative knowledge for discussions at the COP27, by sharing the key highlights and insights from recent evaluations undertaken by Independent Development Evaluation (IDEV). These evaluations, related to energy, climate change, and green growth, aim to have informed the African Development Bank Group's (AfDB) actions in supporting its Regional Member Countries (RMCs) to foster climate resilience and a just energy transition. This paper presents background information regarding Africa's drive for energy access and economic development. It highlights the importance of climate resilience and a just energy transition for Africa. It also synthesizes the main evaluative evidence (findings, lessons learned and recommendations) related to power, energy, climate change and green growth. Finally, it provides a conclusion.

Pursuing Africa's Energy Access and Economic Development

Economic development is impossible in the dark. Energy is a key source of economic growth because many production and consumption activities involve energy as a basic input. Energy is also one of the most important inputs for economic development. Reiner et al. (2014) point to the fact that energy conversion in the machines and information processors of the capital stock drives growth in modern economies. This can be summarized by the following statement: "The economy is just transformed energy."[1] While Africa's energy sector is vital to the continent's economic prospects, it has been unable to achieve the reliable domestic energy supply that its people and businesses require. Energy demand in Africa is increasing at an annual rate of around 3 percent—the highest rate across all continents—but energy supply continues to lag significantly (PwC, 2021).

The evolving international context—with climate change, the COVID-19 pandemic, and the Russian-Ukraine conflict—is substantially impacting Africa through soaring prices of food, fertilizer, energy, and other commodities. These challenges are also deepening the financial difficulties of power utilities, increasing the risks of power outages and rationing.

While Africa has an abundance of renewable energy resources—almost unlimited solar potential (10 TW), abundant hydro (350 GW), wind (110 GW), and geothermal resources (15 GW)[2] —the pace of the energy transition towards a low carbon pathway remains slow compared with Africa's development needs. The 2021 Africa Energy Review indicates that Africa's energy mix has been relatively constant for the past 30 years and, despite successful renewable energy (RE) projects, the overall scale of RE generated in Africa remains very small. Africa's current energy generation mix is dominated by fossil-fuel generation, with hydropower making the only meaningful RE contribution. There has been a more recent shift within the RE mix to accelerate solar and wind technologies, but they remain small at just 1.6 percent.

[1] Charles Gave.

[2] https://energyindaba.co.za/why-is-africa-the-next-renewables-powerhouse/

One of Africa's greatest infrastructure challenges is energy supply, with 30 countries already experiencing regular power outages and many paying high premiums for emergency power supplies. The 2022 Africa Energy Outlook also indicates that the number of Africans lacking access to clean cooking fuels and technologies has increased as a result of the COVID-19 pandemic. In 2021, 43 percent of the population of Africa, or around 600 million people, still lacked access to electricity, 590 million of them in sub Saharan Africa. Moreover, the number of people without electricity access in sub Saharan Africa is estimated to have increased by 4 percent in 2021 relative to 2019, effectively reversing all the gains made over the previous five years (IEA, 2022). For those that do have access, consumption remains constrained by high costs and poor service quality. More than 970 million people—almost three quarters of the continent's entire population—lacked access to clean cooking facilities in 2021 (IEA, 2022).

Therefore, affordable energy for all Africans is an immediate and absolute priority. Given the relatively low level of legacy energy infrastructure on the continent and the falling cost of RE technologies, an opportunity exists for Africa—under the energy mix diversification agenda—to pivot to clean energy solutions in order to help countries mitigate climate change, build resilience to volatile prices, and lower energy costs The African Energy Outlook 2022 points to the fact that as Africa's demand for modern energy grows, efficiency keeps it affordable. Efficiency helps temper demand growth, reduces fuel imports, strain on existing infrastructure and keeps consumer bills affordable.

Climate Resilience and a Just Energy Transition

Africa at a crossroads

Africa is one of the continents that is most vulnerable to climate change and climate variability, and therefore has a strong incentive to join the global effort on climate change and bolster its adaptive capacity. At the same time, African governments are committed to industrializing and growing their economies to create jobs and wealth (Lyes Bouchene et al. 2021). The continent's choices regarding its future development trajectory will be critical in ensuring that it can achieve both goals.

Africa's contribution to the climate crisis is paltry—just 3 percent of cumulative global CO_2 emissions and the lowest per capita emissions in the world (IEA, 2022). Nevertheless, Africa recognizes that climate change is a global challenge, disrupting all lives and economies. Moreover, Africa bears a disproportionate burden of the adverse impact of climate change.

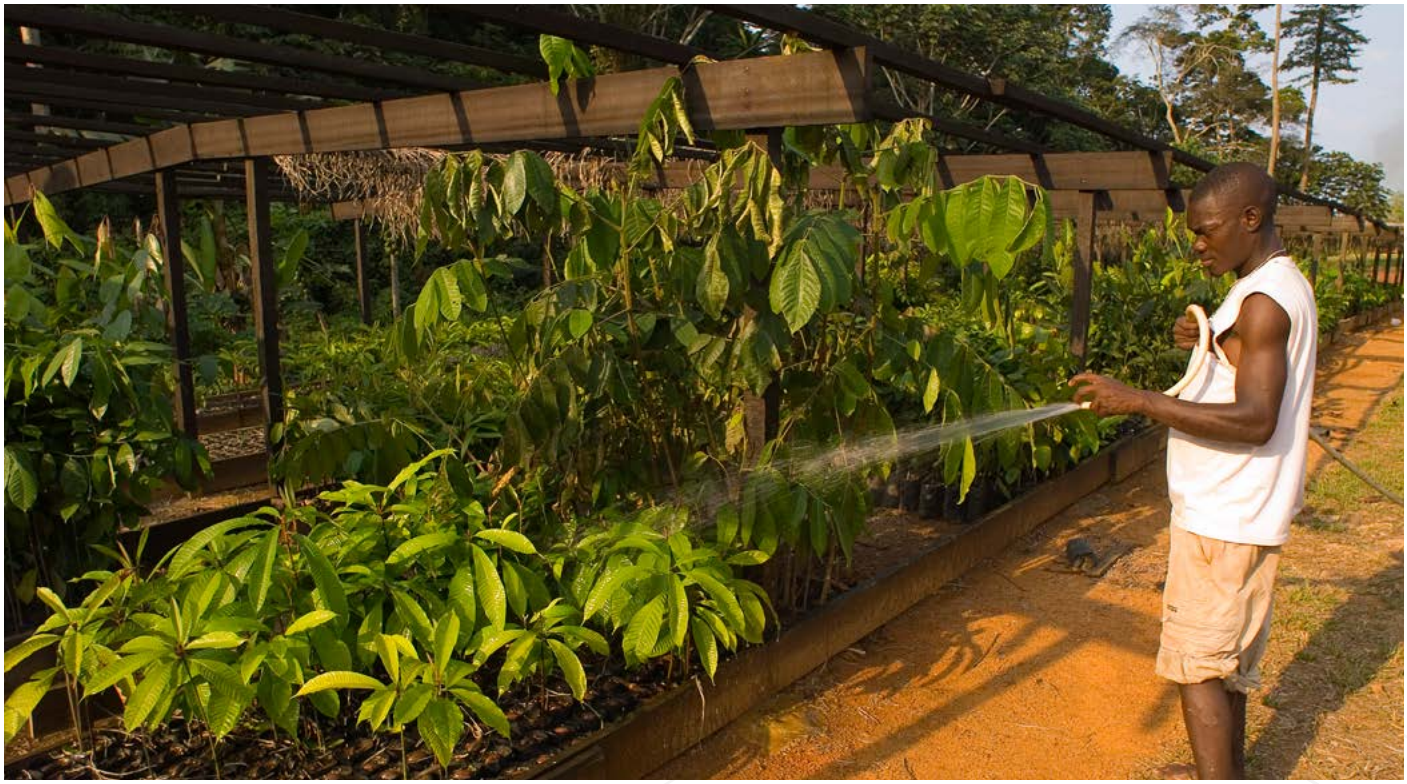
With low access to electricity for its people, the continent has been unable to add value to its exports—45 of its 54 economies still rely on raw materials for over 60 percent of their exports (W. Gyude Moore, 2022). Accordingly, African leaders, backed by the African Union, have expressed Africa's need for climate resilience and diversity in its energy mix to achieve a just transition to net zero, including a transitional role for natural gas, in line with its economic and social objectives.

Pressure on the fossil-fuel industry to stop developing new projects and to start to phase out the production of coal, oil and gas is steadily increasing. On May 18, 2022, UN Secretary-General Antonio Guterres stated unequivocally that "Fossil fuels are a dead end—environmentally and economically. […] We must end fossil fuel pollution and accelerate the renewable energy transition, before we incinerate our only home." (Reclaim Finance Blog Post, 2022.) The position on the use of fossil fuels remains ambiguous and varied on the short term based on interests within developed countries, as evidenced by the fossil-fuel resurgence in Europe in the aftermath of the Russia-Ukraine conflict due to energy security reasons. For example, Italy, Austria, and the Netherlands plan to compensate for the cut in Russian gas supplies by increasing the burning of coal. Analysis by energy think tank Ember reveals that Europe's fossil-fired electricity has returned to pre-COVID-19 levels, driven by an increase in gas generation, despite resilient growth in wind and solar power. Also, the May 2022 McKinsey Quarterly notes that in Europe, rising energy prices will drive an increase in short-term capital allocation to fossil-fuel production and consumption, particularly from existing or recently decommissioned assets. The New U.S. Africa Strategy (White House, 2022) acknowledges the continent's need for diversity in its energy mix for a just transition to net-zero greenhouse-gas (GHG) emissions, including gas-to-power infrastructure.

Towards a just energy transition for Africa

The African Development Bank's Seventh General Capital Increase prioritizes harnessing Africa's large and untapped clean energy sources. The Bank also has a new Climate Change and Green Growth Strategic Framework to ensure that all the projects that it finances are aligned with the Paris Agreement and help AfDB's Regional Member Countries (RMCs) shift to a low-carbon development pathway. A recent political evolution came with the 2021 Glasgow Climate Pact, which acknowledges a "Just Energy Transition".[3] A just energy transition for Africa takes into consideration the fact that the continent has barely contributed to historical emissions and accounts for only a small share of current emissions. It should also be consistent with the case that Africa's political leaders have argued that industrialization is essential for sustainable growth and development that creates stable and decent work. Reaffirming their commitment to support Africa's new path towards inclusive and sustainable economic growth and development, African heads of state and government signed the 50th Anniversary Solemn Declaration during the Golden Jubilee celebrations of the formation of the OAU /

[3] Such as "right to development," "climate justice," and "just transition." Just Transition aligns with the Paris Agreement's principles of "common but differentiated responsibilities," "right to development," poverty eradication" and "country-specificcontexts."



AU[4] in May 2013. The declaration marked the re-dedication of Africa towards the attainment of the Pan-African vision of "An integrated, prosperous and peaceful Africa, driven by its own citizens, representing a dynamic force in the international arena."

Agenda 2063, a long-term development trajectory of 50-year (2013 to 2063), is the concrete manifestation of how the continent intends to achieve this vision. Agenda 2063 provides a common strategic framework for inclusive growth and sustainable development and a global strategy to optimize the use of Africa's resources for the benefit of all Africans. Consequently, Africa is attempting to build economies that are structurally transformed through "industrialization, manufacturing and value addition to create shared growth through private sector development, entrepreneurship and decent jobs for all." The SDG 9 of Agenda 2030 seeks to build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation. A just transition that is meaningful and equitable must support the attainment of these development priorities.

For African countries, the transition must also adequately consider other criteria necessary to achieve Sustainable Development Goal 7 (SDG7), which aims to ensure access to affordable, reliable, sustainable and modern energy for all, such as finance, technology development, and capacity building. With the tendency to preclude new investment in coal power generation (Gareth et al., 2022), and the slow pace of energy transition to a low carbon pathway (IAEA, 2019 p4; CIF, 2021) compared with Africa's development needs, natural gas is being described as a possible bridging fuel to renewables (Gareth et al., 2022). The 2022 Kigali communique released during the global SEforALL Forum endorses seven transformative actions for SDG7 including: "Support Africa in the deployment of gas as a transition fuel and the long-term displacement of gas by renewable energy and green hydrogen for industrial development, if financially and technically sustainable."

These considerations underpin the Bank's working definition of "Just Transition" stated as follows: "A framework for facilitating equitable access to the benefits and sharing of the costs of sustainable development such that livelihoods of all people, including the most vulnerable, are supported and enhanced as societies make the transition to low carbon and resilient economies. A Just transition affirms Africa's right to development and industrialization based on the Paris Agreement negotiated language of equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances" (AfDB, 2020c).

The principles underlying this African Development Bank's working definition include the following:

- **Alignment with Paris Agreement and Transformational Change Framework.** Just Transition is an overlay approach toward the achievement of the Paris Agreement's targets and transformational change to low-carbon, resilient development pathways. It should not be incompatible with either.

[4] The Organisation of African Union (OUA)/African Union (UA)

Box 1 : Additional Considerations regarding principles underlying the Bank's working definition of Just Transition:

- **Multi-Scaled Application:** Global climate action; multilateral environmental policies; international climate finance flows; regionally salient climate shocks and hazards; national development strategies; NDCs; National Adaptation Plan's (NAPs) national climate change and green growth policies; economic sectors; projects and investments; urban/rural milieux; natural ecosystems; community action; households.
- **Africa's Needs and Specificity:** AfDB High 5s; Africa's disproportionate share of LDCs among global regions; importance of the informal economy; limited historical and current contributions to global GHG emissions (3% share); high dependence on natural resources for the economies and peoples' livelihood; limited share of climate finance currently flowing into Africa.
- **Common But Differentiated Responsibilities and Respective Capabilities, in the Light of Different National Circumstances:** Conditional and unconditional pathways for LDCs (depending on technology transfer, financial flows, etc.); restorative justice [Restorative justice is a theory of justice that emphasizes repairing the harm caused or revealed by antisocial or criminal behavior. It is best accomplished through cooperative processes that include all stakeholders].
- **The Right to Sustainable Development and Industrialization:** Countries with newly discovered natural resources, including fossil fuel and biomass energy sources; the huge potential of untapped renewable energy; the low access to modern technology; the varying levels of progress in achieving SDGs; development trajectories of LDCs; Bank investment criteria; the nexus between climate and development finance and within national plans, e.g., LTS, NDCs and NAPs.
- **Prioritizing Adaptation alongside Mitigation:** Closing the gap on climate finance parity between adaptation and mitigation finance; the development deficit and its impact on adaptation; restorative justice; **regional vulnerabilities to climate shocks**

Source : The African Development Bank Group Just Transition: Relevance: Implication for Africa, 2020

- **Social, Governance and Economic Equity.** The effects of climate change are yielding deeply unequal distributional impacts among countries, their economies, and their diverse populations. Institutional weakness in governance, especially in conflict-prone fragile states adds another layer of complexity for a number of countries. Transformational change processes toward a low-carbon, resilient future also have the potential to exacerbate existing inequalities and create new forms of inequality. A just transition framework takes these inequalities into account by striving to elevate the status of the vulnerable and promote social and economic inclusion.
- **Multi-Scaled Application.** Just transition can be applied at every level, from the local to the sub-national, national, regional, and global, although the actors and implications of just transition will look different in each context.
- **Africa's Needs and Specificity.** The African Development Bank's just transition framework supports an Afro-centric viewpoint that takes into account the overarching social and economic development needs and priorities of the continent's transition.
- **Common But Differentiated Responsibilities and Respective Capabilities, in the Light of Different National Circumstances.** This tenet of the United Nations Framework Convention on Climate Change further applies to a just transition Framework. Countries with differing levels of responsibility for and capacity to address climate change-related issues should be treated accordingly. Similarly, some countries also need more support for a just transition because of their special situations – for example, countries with high levels of informal labor who generally do not access any sort of government / social safety net.
- **The Right to Sustainable Development.** African countries should be allowed to pursue their sustainable development objectives and not be prevented from doing so by international climate action.
- **Prioritizing Adaptation over Mitigation.** Adaptation is a top priority for Africa, which is significantly affected by droughts, floods, cyclones, temperature rise, and other climate shocks, even though the region is a relatively minor contributor to global GHG emissions. The Bank's just transition framework validates the Paris Agreement's tenets to address both mitigation and adaptation on an equal footing but acknowledges the particular importance of adaptation for Africa.

Investing in Africa's renewable energy for electricity security

Investment in RE in Africa has increased dramatically in the past two decades but remains relatively low, especially compared with other world regions (Saifaddin Gala, 2022). The continent has abundant hydro, solar, wind, geothermal, and bioenergy resources. Notwithstanding this, Africa's current energy generation mix continues to rely on fossil fuels, while renewable sources account for nearly 18 percent of the electricity output (Saifaddin Gala, 2022). According to the 2021 Africa Energy Review, countries such as Egypt, Ethiopia, Kenya, Morocco, and South Africa are leading the increase in RE supply on the continent, while some of Africa's smaller countries, including Cabo Verde, Djibouti, Rwanda, and Eswatini, have set ambitious RE targets. Renewable energy is on a gradual rise across the continent with an annual growth rate of 21 percent between 2010

and 2020 and a current total renewable capacity of more than 58 GW (of which hydropower contributes 63 percent). The clean energy transition will bring a major structural change in the generation profile of African electricity systems.

Gas-to-power for Africa: Unlocking the region's gas potential

The impact of the COVID-19 pandemic, the ongoing Russia-Ukraine crisis, the intermittent nature of RE from solar and wind, as well as the recent extreme weather events, including droughts that undermine the hydropower plant performance, have drawn attention to the systemic risks that impact energy security. The IEA's mid-2019 report titled The Role of Gas in Today's Energy Transitions recognizes natural gas as one of the mainstays of global energy, with worldwide consumption rising rapidly and gas accounting for almost half of growth in total global energy demand in 2018.

The international energy forum provides some reasons that make natural gas a critical part of the energy transition. It includes the facts that: (i) natural gas is a reliable, affordable energy source that enables innovation; (ii) it acts as a bridging ingredient in the hydrogen revolution; (iii) it is a key tool in the fight against energy poverty; and (iv) along with carbon capture and storage, it can transform the energy sector. "Natural gas and LNG projects have the potential to generate essential electricity quickly and at reasonable prices," wrote Rick Perry, U.S. Secretary of Energy, in the "Power Africa Gas Roadmap to 2030" strategy report.

Africa's significant natural gas resources can provide flexible power generation that can anchor large-scale intermittent solar and wind generation. Gas-proven reserves in 2021 amount to 455 trillion cubic feet according to the Africa Energy Review (PwC, 2021). In addition, gas is an ideal fuel for countries with industrial ambitions, as it is a valuable feedstock to produce fertilizers, petrochemicals, etc., and an efficient source of process heat for energy-intensive industries, such as steel or cement production. Furthermore, it is used as a fuel in the transport sector. Hence, Africa's natural gas reserves can play a crucial role in Africa's energy transition and socioeconomic development—within the context of the Paris Agreement (AfDB, 2021b).

Key Insights from Recent Evaluations

In supporting RMCs to build their climate resilience and make the transition to clean energy, the AfDB can draw on a wealth of evidence produced by Independent Development Evaluation (IDEV)[5] to inform its policies, strategies, frameworks, and operations in the areas of power, energy, climate change, and green growth. Among others, IDEV's evaluations highlight the following:

Addressing the infrastructure financing gap

Africa faces a serious infrastructure gap that is holding back the continent's transformation and that risks compounding the impacts of climate change. As per the IEA's Sustainable Development Scenario, the investment required in the power sector over 2020–2040 is about US$2.1 trillion, which translates to about US$100 billion per year—more than twice the record investment of US$43.8 billion in 2018 (as tracked by the Infrastructure Consortium for Africa, ICA). In addition, the continent requires between US$7 and US$15 billion per year to build resilience and adapt to climate change. The energy sector in Africa will experience substantial structural change over the coming decades. Financing this change at the pace required will be the most pressing issue that Africa and the world must address (AER, 2021). Current financing levels for WASH are much lower than estimates for the attainment of SDGs. While the annual capital costs of meeting SDG targets 6.1 and 6.2 in Africa are estimated at US$39.7 billion per year, the 2017 ICA report shows that the average annual sector funding for water and sanitation in Africa between 2012 and 2017 is US$12.7 billion, or about one-third of the capital investment needs.

Therefore, mobilizing increased financing for the infrastructure transition is crucial. To increase the Bank's funding to countries and to the private sector in the domain of sustainable infrastructure access, IDEV's evaluations in the infrastructure sectors such as energy, water, transport, and agriculture, recommend scaling up blended finance approaches that mobilize more private sector investments and creative concessional finance.

Supporting and creating an enabling environment

The evaluations also highlight the importance of technical assistance and adequate project preparation to help optimize the investments. Accordingly, the AfDB needs to continue its support that contributes to creating a conducive environment for private sector involvement, ensuring the utilities' creditworthiness, and offering tailored guarantees where appropriate. The Evaluation of the AfDB's Country Strategy and Program in Uganda 2011–2021 (2022) recommends considering providing strong support for building capacity in energy sector coordination, planning, and policy formulation in collaboration with other development partners. Sector policy coordination and coherence become more important when institutions are unbundled and public-private partnerships in the sector are growing.

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[5] IDEV at the AfDB carries out independent evaluations of Bank operations, policies and strategies, working across projects, sectors, themes, regions, and countries. By conducting independent evaluations and proactively sharing best practice, IDEV ensures that the Bank and its stakeholders learn from past experience and plan and deliver development activities to the highest possible standard

Green growth and climate change resilience

Regional power interconnections foster climate resilience by enabling resource-poor countries to tap into cheaper and cleaner sources of energy with limited GHG emissions. However, evaluative evidence, such as from the Powering Africa Through Interconnection: Cluster Evaluation Report (2018), points out that for multinational projects to achieve long-term results, they require sustained political commitment from the participating state parties. Also, an inbuilt tariff adjustment mechanism in Power Purchasing Agreements (PPAs) is an incentive for power exports.

Focusing on learning about green growth and climate change mainstreaming at the country level is imperative. In Mozambique, for example, there is evidence that lessons learned from the use of green growth and climate change approaches and technologies in the agriculture sector are being leveraged for other projects in the country. Sharing lessons and experience across projects and among staff within a Bank-assisted Ministry or Department has the under-reported effect of lessons being adopted and applied.

Addressing climate resilience through project quality at entry

Ensuring the resilience[6] of infrastructure to climate change is a major climate change adaptation measure. Whether threatened by flooding or drought, Africa's infrastructure needs to be more resilient. The 2020 AfDB Water Policy, informed by evaluative evidence, indicates that the Bank will seek to support water infrastructure projects and operations that use smart, innovative, and greener technologies that are more sustainable, make better use of water, reduce water-related disasters, and are more resilient against disasters and climate change effects. Building such adequate infrastructure requires new management approaches and capacity development. How to design an intervention to be climate resilient requires thoughtful considerations. Accordingly, improving the quality at entry of infrastructure projects is critical to provide climate-smart infrastructure.[7]

Infrastructure sector evaluations, such as the Evaluation of the AfDB's Assistance to the Energy Sector (1999–2018): Refocusing Support for Improved and Sustained Energy Access in Africa (2020), the Evaluation of the AfDB's Support to the Water Sector (2005–2016: Beyond Infrastructure Development: Toward Service Delivery and Behavioral Change (2020), and the Cluster Evaluation on Strengthening Agricultural

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[6] Resilience is often defined as the capacity of an ecosystem to absorb disturbance without shifting to an alternative state and losing function and services (Côté & Darling, 2010).

[7] Climate-smart infrastructure refers to infrastructure that is resilient to damage caused by extreme weather and climate change and that reduces heat-trapping emissions to the maximum extent possible. (www.ucsusa.org/climate-smart-infrastructure)

Value Chains (AVCD) to Feed Africa (2018), point to the key critical success factors that need to be carefully considered in sustainable and resilient infrastructure development. The first relates to project design, the second concerns the participatory process, and the third is about the technology choice. The final aspect points to the risk assessment.

- **Project design.** Project design requires a sound preparatory phase, with adequate and updated feasibility studies for successful subsequent implementation. For instance, during the economic analysis, the decision-making process needs to account for the uncertainty associated with climate change. Poor quality feasibility studies lead to poor quality of project design and subsequent implementation challenges (time and cost overruns with subsequent consequences on beneficiaries). The Cluster Evaluation on Strengthening Agricultural Value Chains to Feed Africa (2018), for instance, highlights the insufficient analysis in AVCD project designs that constrains achievement of outcomes and impact, while comprehensive value chain analysis guides implementation and responsiveness to changes in markets and contexts.

- **Participatory process.** An effective participatory process during project design is essential for enhanced ownership. The extent and quality of collaboration with stakeholders matter. An effective participatory process during project design allows for the better identification of needs and the selection of the most appropriate technologies for local conditions. The choice of appropriate technologies for WSS facilitates the feasibility and operations and maintenance (O&M), both of which are critical to sustainability. It is important to mention that there are different levels of participation. Conducting meetings, consultations and focus groups is the low level of participation, while empowering program beneficiaries is the more powerful participation approach.

The Cluster Evaluation on Strengthening Agricultural Value Chains (AVCD) to Feed Africa finds that the appropriateness of the scope of interventions and approaches would improve designs. The interventions and approaches used did not always have an appropriate scope and scale, largely due to the lack of stakeholder participation in designing and implementing interventions.

- **Technologies choice.** Technology choices need to be relevant to the intervention area's characteristics and the scale of the interventions. They also need to reflect and address community needs and capacities, be based on whether they have previously delivered sustained results, and finally provide the best value for money and have low maintenance costs. The use of "state-of-the-art" technologies investment in climate-smart infrastructure is only relevant if they meet needed technology requirements and there is adequate availability of spare parts and relevant expertise.

- **Risk assessments.** The comprehensive evaluations in the energy, water and transport sector also point to the need for rigorous assessment of risk, including climate change impact, during the intervention design phase, if they are to deliver sustained results. In power interconnection projects, for instance, while risks threatening the achievement of sustainable outcomes were generally well identified in the planning stage, they

were insufficiently analyzed, and assumptions tended to be overly optimistic. In the water sector, critical risks concerning the reliability and quality of water resources were not always adequately addressed during the AfDB-supported water sector project designs, while water security is one of the elements at greatest risk from climate change. Concerning the transport sector, evaluations indicate that there is further room for improvement in the analysis of project assumptions and risks, which constitutes a routine part of the project appraisal process.

In power and water sectors, as long as climate risk analysis is fully integrated in the project cycle—starting from the upstream stages of planning at the national, river basin, regional, and power-pool levels, and in pre-feasibility studies of individual investments—climate risks can be significantly mitigated in a cost-effective manner (World Bank, 2015). The 2021 Evaluation on Mainstreaming Green Growth and Climate Change into the AfDB's interventions shows that the AfDB did well in developing tools, guidelines, relevant processes and targets with a clear climate change mainstreaming perspective. Therefore, GG-CC considerations were systematically introduced during project design, although GG-CC mainstreaming is not being adequately measured during implementation. Insufficient mechanisms to monitor and track GG-CC results throughout the project cycle make it difficult to report on the added value of applications of these AfDB tools, guidelines and relevant processes. A high level of uncertainty exists about pathways to change. The evaluation points to the need to establish a clear theory of change (in particular for GG, but also CC), and an integrated GG-CC results framework, with clear definitions that follow the recently strengthened and agreed GG-CC definitions of MDBs. In addition, the evaluation recommends putting in place adequate mechanisms to monitor and track GG-CC results throughout the project cycle. This will enable to (i) promote continued attention to GG-CC during project implementation, (ii) address potential barriers to the uptake and effectiveness of GG-CC mainstreaming, and (iii) improve reporting on the results achieved.

Policy and strategy considerations

Evaluations such as the Evaluation of the AfDB's Assistance to the Energy Sector (1999–2018): Refocusing Support for Improved and Sustained Energy Access in Africa (2020) point to the need for RMCs to enhance their capacity to formulate and implement comprehensive energy policies. These should encompass long-term power development plans, energy security strategies, and energy efficiency/conservation plans. To this end, evaluations recommend strengthening the Bank's assistance to countries by increasing the use of non-lending instruments, such as analytical work and technical assistance, and by strengthening policy dialogue based on established and well-structured national sector reform strategies and road maps.

The Evaluation of the AfDB's Country Strategy and Program in Uganda 2011–2021 (2022) recommends supporting the development of a master plan for the climate-resilient power sector to balance supply and demand, expand access to affordable power, and promote the supply of off-grid energy.

Financial viability of infrastructure sector: The road to sustainability and resilience

The increasing threats of climate change are requiring utilities to make operational changes and investments to improve the resilience of the electricity system. Therefore, addressing the challenge of financial viability through tariff reforms towards cost recovery and improving the performance of power and water utilities, as well as the performance of the road funds and road agencies, is critical. The sustainability of infrastructure intervention benefits is one of the common challenges in African countries. Financial sustainability poses the greatest threat to the overall sustainability of the infrastructure sectors.

Evaluative evidence (for example, the Impact Evaluation of the Kenya Last Mile Connectivity Project, Phase 1 (2022) and the Evaluation of the AfDB's Assistance to the Energy Sector (1999–2018): Refocusing Support for Improved and Sustained Energy Access in Africa (2020) point out that the long-term maintenance of climate-resilient electricity infrastructure in RMCs is associated with the strength of the power utilities' business model. IDEV therefore recommends increasing the Bank's support for interventions that strengthen the organizational and operational capacity of power utilities in RMCs. Priority action areas are investment-balancing power generation, transmission, and distribution, and taking a holistic approach to electricity cost drivers, innovative subsidy design, and electricity pricing.

In the water sector, the Evaluation of the AfDB's Support to the Water Sector (2005–2016): Beyond Infrastructure Development: Toward Service Delivery and Behavioral Change (2020) also points to the fact that financial sustainability poses the greatest threat to the overall sustainability of the sector. Addressing the challenge of financial viability through tariff reforms towards cost recovery and improving the performance of Urban WSS Utilities is critical.

Also, transport project sustainability remains weak, as reforms of road funds and road agencies are yet to deliver results. The Transport Cluster Evaluation (2021) found that the sustainability of the road transport projects remains questionable, as ongoing reforms of road funds and road agencies are not completed. Lack of adequate road maintenance, compounded by overloading of vehicles, is likely to result in rapid deterioration of project-built assets unless countries significantly improve their road asset management frameworks. Without enforcement, there is no certainty that the measures built into the projects will be sufficient to mitigate vehicle overload, speeding, and safety concerns. The evaluation concludes that incorporating a revenue generating mechanism into the transport projects can be an effective way to address the lack of funding and maintenance capacity. Climate change has significantly increased the frequency and intensity of natural hazards such as floods, erosion, and landslides. Improving the resilience of the road network to all types of natural hazards is of paramount importance. This also increased the burden of roads maintenance on the RMCs.

In addition, several recent country strategy and program evaluations (e.g., Benin 2022, Gabon 2021, Uganda 2022, and Rwanda 2022) indicate that lack of ownership and weaknesses in road maintenance pose a real threat to short- and medium-term sustainability. One of the reasons for this is the low allocations granted to Road Maintenance Funds. In Uganda, the capacity of institutions and beneficiaries still needs to be built to maintain the new infrastructure (roads, irrigation systems, agricultural markets, and newly acquired equipment at hospitals and universities). Rwanda has strong governance and institutional structures, with strong technical capacities that are likely to ensure a continued flow of benefits related to Bank-supported projects in the transport sector upon completion. However, road projects are also likewise facing risks due to insufficient maintenance budgets and delays in implementing axle-load control.

Finally, the impact evaluation of the Fufulso-Sawla Road Project in Ghana concludes that regular maintenance is a critical requirement for sustaining the positive impacts that the road and ancillary facilities bring to communities. The site visit and interviews with the beneficiaries reveal that many of the facilities provided, particularly the health centers, schools, and the bungalows built for teachers and nurses, were affected by poor maintenance. This problem was exacerbated by the lack of maintenance plans at the local government authority level. The Larabanga-Sawla section of the road was degraded even before its delivery, reducing the impact of the project. Several factors contributed to this: poor scheme design, weak organizational and institutional capacity, and the lack of an active community and government ownership of the project.

Paving the way for climate resilience: integrated infrastructure solutions

Addressing the impacts of climate change on infrastructure suggests the need to do development differently to secure greater development benefits. In the past, infrastructure was delivered and managed in silos or on a sector-by-sector basis. However, there has been a gradual transition towards more integrative cross-sector infrastructure delivery models in recent years, to maximize the synergies between interlinked climate-resilient infrastructure systems. The case in point is the Ghana Fufulso-Sawla Road Project, which supports the improvement of the investment environment through transport infrastructure development comprising the construction of a road, as well as the provision of ancillary works along the main road corridor.

Rural Electrification for Spurring Local Socio-Economic Development. Evaluation evidence reveals that integrated solutions in rural areas have a sustained development impact (Spurring Local Socio-Economic Development Through Rural Electrification: Cluster Evaluation Report (2018)). They optimize the productive use of electricity and help foster rural business development and expansion. Integrated solutions require more synergy between rural electrification interventions and other rural development interventions that involve energy services, for example, agricultural, commercial and industrial activities.

An effective rural electrification strategy requires additional measures to promote economic activities that spur the productive use of electricity in the electrified areas. These include integrating complementary interventions (e.g., micro-finance services, vocational training services, sensitization campaigns, etc.) that link electricity access to income-generating activities.

The availability of appropriate infrastructure and information & communication technology (ICT) in agricultural value chains. The Cluster Evaluation on Strengthening Agricultural Value Chains (AVCD) to Feed Africa highlights the fact that, historically, the Bank has been focusing on infrastructure and contributing to AVCD, yet the infrastructure created was not always effective in addressing the priority needs of value chains' actors. The use of ICT, particularly to improve the provision of market information and early warning systems, is an area that requires strengthening.

The water sector evaluation indicated that the use of horizontal and vertical integration solutions in the design of water interventions is critical to fostering development effectiveness. For urban sanitation projects to be efficient, a value chain approach and the reuse of treated wastewater can generate additional resources for large recurrent costs.

The IDEV knowledge product on Water Supply & Sanitation in Africa: Findings, Lessons and Good Practices to Improve Deliver highlights the factors shaping WSS interventions' theories of change, including the fact that the integration of safe water supply, sanitation and health education—a key design feature of the majority of the projects—promises to generate benefits where the whole is greater than the sum of the benefits of individual components because of their complementarity. Project sustainability can be improved by considering large-scale, multipurpose integrated water projects that contribute to regional water development rather than individual, smaller projects.

In the transport sector, the use of a more integrated approach by combining, for instance, road construction with ancillary works (hospitals, schools, water supply, markets, etc.) is an effective approach for increasing access to socio-economic infrastructures and fostering poverty reduction. The Ghana Fufulso-Sawla Road Project is an example for which the impact evaluation found significant impact in transportation-related outcomes, access to quality water supply, health of beneficiaries, increasing household income and reducing multidimensional poverty. Most important the ancillary works generated a proportionately higher additional effect than their additional costs.

Beyond climate-resilient infrastructure development: Towards service delivery

Infrastructure evaluations point to the fact that greater emphasis on the quality-of-service delivery in infrastructure sectors is paramount if they are to maximize the impact of the infrastructure built. Service delivery consists of a series of highly localized actions by agents in public agencies or private enterprises to provide needed goods and services to citizen beneficiaries "in a way that meets their expectations" (Kim, 2012). Climate-resilient infrastructure service delivery remains a major challenge to the achievement of the AfDB Ten-Year Strategy (2013–2022) overarching twin objectives

of inclusive growth and the transition to green growth. Any model can deliver infrastructure (water supply, sanitation and hygiene; transport; and energy) services, but how effectively or sustainably it does so depends largely on the contextual and enabling conditions (IEG, 2013). This highlights the need for the Bank to go beyond climate-resilient infrastructure development towards service delivery.

For instance, the Evaluation of the AfDB's Support to the Water Sector (2005–2016): Beyond Infrastructure Development: Toward Service Delivery and Behavioral Change (2020) indicates that, in rural areas, effective and sustainable access to, and use of, water sources are adversely impacted by the limited functionality of the water supply facilities (on average, around one-third of facilities used to be non-functional), resulting from poor maintenance and the insufficient quality of water. In urban water supply, African water utilities are overwhelmed with levels of non-revenue water (NRW) as high as 50 percent, with an average NRW of 30.3 percent against a benchmark of 20 percent. Limited revenue collection and human resources capacity of water providers adversely affect the financial health of the utilities, as well as the reliability of their service delivery. One of Africa's greatest infrastructure challenges is energy supply, with 30 countries experiencing regular power shortages and many paying high premiums for emergency power supplies.

Governments' political goals may not match those of their utilities regarding the need of providing reliable and quality infrastructure services. The consequence is often insufficient tariff levels, restricted budgets, or even a power system in disrepair that cannot meet the electricity demand of connected customers. The precarious financial sustainability of the energy sector threatens the long-term sustainability of results achieved and, in turn, the quality-of-service delivery. Financially struggling utilities are unable to operate sustainably and fail to attract meaningful private sector financing, resulting in reduced investment and therefore the service delivery. Private sector funding to the water sector in Africa is minimal: in 2017, it represented around 0.14 percent. An IEG (2013) working paper notes that cost recovery and subsidies are major concerns in the infrastructure sectors, with political will lacking to implement the tariff structure. The Evaluation of the AfDB's Assistance to the Energy Sector (1999–2018): Refocusing Support for Improved and Sustained Energy Access in Africa (2020) indicates that the Bank places too much emphasis on a 'cost-reflective tariff' structure and little focus on 'cost-efficient' tariff structures. Tariff design aims to recognize the various opportunities for reducing systemic operational and business losses, and motivate the utility managers and governments to address them. Otherwise, allowing utilities a tariff adjustment to meet delivery costs will make electricity unaffordable to many, or require governments to provide electricity subsidies for a greater proportion of society. In addition, the evaluation notes that most of the power utilities in Africa are either government-owned or parastatals with governments possessing a controlling share. Therefore, power utilities have less flexibility in implementing their own financial decisions to improve the quality of service without the support of governments.

Climate change will have significant impacts on the levels of service, risks to service delivery, and costs of service delivery. The increasing threats of climate change are requiring utilities to make operational changes and investments to improve the resilience of the infrastructure system. Additional costs are incurred from increased deterioration and higher O&M expenses caused by climate change hazards.

The 2021 Sustainable Development Goals Center for Africa Report on "The Africa 2030: SDGs within social boundaries—leave no one behind outlook" points out that in the transport sector only 25 percent of Africa's road network is paved, compared with the world average of more than 50 percent. Africa also lags behind other regions in terms of quality of roads, well below Asia, Europe, and North and South America. Only 49 percent of the paved roads are in good condition and 85 percent of rural feeder roads remain in poor condition, depriving many people from access to basic services.

Conclusion

Africa today stands at a crossroads. While the continent contributes only marginally to climate change, accounting for just 3 percent of global emissions, it is one of the continents that is most vulnerable to climate change and climate variability. This is why it has a strong incentive to join the global efforts on climate change and strengthen its adaptive capacity. At the same time, African governments are committed to industrializing and growing their economies to create jobs and prosperity. Climate resilience and a just energy transition for Africa will be of paramount importance, and gas-to-power will play a crucial role in unlocking the region's gas potential. In building RMC climate resilience and making the transition to clean energy, countries and development partners can draw on a wealth of evidence emerging from the AfDB's IDEV evaluations highlighted in this paper, to inform policies, strategies, frameworks, and operations in the fields of energy, climate change, and green growth. Finally, since the value of evaluative knowledge lies in its use, the more it affects decision-making and influences change, the more it contributes to improving African people's lives.

The main takeaway relates to the need to:

- Address the infrastructure financing gap through scaling up blended finance approaches, that mobilize more private sector investments and creative concessional finance, in addition to the leverage of climate finance.
- Support and create an enabling environment by providing strong support for capacity building in energy sector coordination, planning, and policy formulation in collaboration with other development partners.
- Address climate resilience through project quality at entry, with sound project design, effective participatory process, and better risk management.
- Give due policy and strategy consideration with regard to increasing the use of non-lending instruments, such as analytical work and technical assistance, and strengthening policy dialogue based on established and well-structured national sector reform strategies and road maps. Supporting the development of a master plan for the climate-resilient power sector to balance supply and demand, expand access to affordable power, and promote the supply of off-grid energy.
- Improve service delivery by focusing on national utilities' financial viability and operational performance, regional trade efficiency, and energy efficiency.

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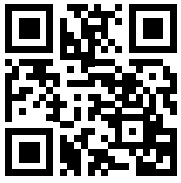

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