Climate Finance Innovation for Africa

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CLIMATE POLICY INITIATIVE

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ABOUT CPI

CPI is an analysis and advisory organization with deep expertise in finance and policy. Our mission is to help governments, businesses, and financial institutions drive economic growth while addressing climate change. CPI has six offices around the world in Brazil, India, Indonesia, the United Kingdom, and the United States.

EXECUTIVE SUMMARY

The amount of climate finance in Africa falls dramatically short of what is needed to implement Nationally Determined Contribution (NDCs) in the region. CPI estimates Africa's climate finance needs at an average of USD 250 billion annually from 2020-2030, which must be provided by private and international public investors (CPI 2022a). Meanwhile, total annual climate finance mobilized in Africa in 2020 was only USD 29.5 billion (CPI, forthcoming).

Meeting Africa's climate finance needs will require significantly higher levels of investment, especially from the private sector. Due to the high real and perceived risks associated with investing in the continent, the private sector has traditionally played a marginal role in the provision of climate finance in Africa, accounting for only 14% of total flows in 2019/2020 (CPI, forthcoming). Given the scarcity of public finance – with governments' budgets further aggravated by the COVID-19 pandemic and Russia's invasion of Ukraine – the private sector must play a more prominent role in closing the climate finance gap in Africa.

This will require a shift in existing and planned investments from dirty technologies toward climate action, as well as mobilizing large capital pools such as pension funds and sovereign wealth funds currently holding over 700 billion in assets under management in Africa (CPI 2022a). Huge opportunities also lie in harnessing Africa's great and increasing capacity for innovation, where entrepreneurs in the green economy are developing climate solutions in the form of new business models and financial products.

Barriers related to financial market depth, governance, project-specific characteristics, and enabling skills and infrastructure have stifled private investment in African climate solutions to date. The relevance and intensity of the different barriers is highly context-dependent, differing by geography, sector, and sub-sector. For instance, projects in the energy, transport, and building sectors are characterized by high up-front costs and lengthy preparation and construction processes which make early-stage investment especially risky. Project-level barriers in the Agriculture, Forestry and Other Land Use (AFOLU) sector limit commercial viability, necessitating a greater share of concessionality than for more commercially mature sectors. Critically, currency risk is a prevailing issue across the four sectors analyzed – necessitating greater mobilization of local currency investment.

Harnessing climate investment opportunities in Africa will require innovation in financing structures and strategic deployment of public capital to 'crowd-in' private investment at levels not yet seen. Mobilizing investment in African climate solutions at scale will require going beyond traditional financing approaches. Innovative climate finance structures can be deployed to improve capital efficiency and overcome the barriers to finance which have stifled investment to date.

For example, traditional financial instruments, such as concessional debt and grants, are widely used in Africa, but could be deployed more efficiently to target specific barriers to finance when included in a broader financial structure. More complex solutions (e.g., structured finance and capital market instruments) have been incorporated into innovative

financial structures in more mature markets, such as Egypt, South Africa, and Kenya, and hold great potential for further deployment to catalyze local private investment in climate solutions.

We provide a framework for how these financial and non-financial solutions can be efficiently deployed to overcome barriers to finance and capitalize climate solutions in Africa. Given their specific characteristics, financial instruments and mechanisms should be deployed depending on the unique geographic and sectoral context of an investment opportunity. Some instruments can be deployed narrowly to address acute barriers to finance, such as the use of guarantees to overcome early-stage construction risk associated with climate infrastructure. Other instruments offer broad solutions to chronic barriers to finance; for example, carbon finance presents an opportunity to finance projects with high climate impact but persistent revenue risk, such as clean cookstove distribution, land restoration and avoided deforestation, or methane abatement.

In this paper, we detail four such innovative instruments that have been launched across the continent:

- **TerraFund for AFR 100** has deployed a standardized process to deploy early-stage catalytic finance and technical assistance to spur the growth of grassroots innovators operating in the challenging land restoration sub-sector.
- The **Sub-National Climate Finance Initiative** uses a blended private equity instrument that targets a 20:1 private-to-public finance leverage ratio for its investments in mid-sized climate infrastructure projects.
- Kenyan real estate developer **Acorn** has financed its green student housing portfolio by launching three separate capital markets instruments to attract a range of investors with different risk profiles.
- **Revego Africa Energy** has aggregated a diversified portfolio of operating renewable energy assets into Africa's first YieldCo, providing an avenue for risk-averse and hard to reach institutional investors to fund climate solutions.

Recommended actions for increasing deployment of innovative finance:

1. **Identify and understand barriers constraining finance more granularly by sector and geography.** In an environment where projects face numerous barriers simultaneously, private investors must assess risks affecting each investment decision based on its geographic and sectoral context. Building on their catalytic role public investors should then deploy capital in a targeted way to address the specific barriers constricting private investment.
2. **Match instruments with barriers.** Public and private investors must tailor their financial instruments and strategies depending on the acute or chronic nature of the barriers identified. Different instruments have varying degrees of effectiveness in overcoming specific investment barriers and risks. The framework developed in this study can serve as a toolbox for private and public investors to deploy the climate finance solutions in line with their mandates and risk appetite to most effectively overcome these barriers.

3. **Match instruments with project and technology lifecycles.** Climate finance investments are typically long-term endeavors, with differing considerations across project and technology lifecycles. Public and private investors must look to deploy different financial instruments and strategies in direct response to these lifecycle-dependent considerations. Specifically, as projects and technologies mature, the use of grants and concessional finance by public investors should be gradually phased out, leaving space for the private sector to realize commercial returns. The use of capital market instruments (such as green bonds and YieldCos) can facilitate exit and refinancing at later stages.

4. **Enhance engagement and co-financing with local stakeholders.** To increase the effectiveness and impact of their investments, international private and public investors must work in collaboration with local financial and political stakeholders. This can help build capacity among local investors and inform targeted action by governments to improve investment conditions. Given the urgent need for more local currency finance, international investors must include local private investors in co-financing structures. In recognition that local private sector leverage is necessary to achieve climate objectives at the scale required, public investors should increasingly view mobilization of local private investment in climate solutions as an end in and of itself.

5. **Support innovation by establishing conducive policy and regulatory frameworks.** Governance barriers remain one of the most relevant impediments to climate finance in Africa. While investors can deploy innovative solutions to mitigate governance-related risks, these can only be fully addressed through concerted action by local policymakers and regulators. To lower risk perception and build investor confidence, climate policy frameworks and long-term roadmaps are needed. Policymakers and regulators can foster climate finance innovation by adopting policies which support local capital markets and reduce administrative and regulatory barriers to finance.

With a dynamic entrepreneurial environment and climate finance needs eight times higher than the amounts currently invested, the African continent presents a massive investment opportunity for investors to advance the deployment of climate solutions in the coming decade. In order to capitalize on this opportunity and bridge the African climate finance gap, climate finance innovation most focus on deepening financial markets on the continent – both conventional (i.e., debt and equity markets) and non-conventional (i.e., carbon markets) – through direct investment and capacity building activities**.** This paper provides a framework for identifying how financial instruments can be combined in innovative ways to overcome barriers to finance and catalyze African climate solutions and entrepreneurship. Accelerating progress in what is a fragmented climate finance ecosystem will require improved coordination, knowledge sharing, and combined action from development and public finance providers, private investors, and local policymakers.

CONTENTS

1. INTRODUCTION

Africa is the region that is both least responsible for the climate crisis and among the most vulnerable to its consequences. It is crucial that sufficient capital is deployed in the continent to simultaneously support economic development, mitigate further environmental degradation, and help the population adapt and build resilience to the changing climate. In its latest analysis of African countries' Nationally Determined Contributions (NDCs), CPI finds an average of USD 250 billion in private and international public finance must be mobilized each year through 2030 (CPI 2022a). These figures far exceed the meager USD 29.5 billion in total annual tracked climate finance in Africa in 2020 (CPI, forthcoming).

Based on a review of existing literature, we have identified four categories of barriers which have stifled climate investment to date: financial, governance, project, and enabling skills and infrastructure. This paper evaluates the degree to which these barriers prevent domestic and international investment in four key sectors – energy systems, transportation, buildings, and Agriculture, Forestry and Other Land Use (AFOLU) – which together account for 95% of global climate mitigation finance (CPI, 2021). This paper then provides a framework for how public and private investors can deploy financial instruments in innovative ways to scale-up investment in climate finance and help African countries meet their NDCs. The paper further provides four examples of innovative solutions and offers recommendations for investors and policymakers.

Though the key takeaways are intended to be applicable for both mitigation and adaptation finance, the focus of this paper primarily centers on mitigation projects, as climate mitigation represents the largest investment opportunity for private investors (CPI 2022a). We refer readers focused specifically on adaptation to the work done by the Global Center on Adaptation and Climate Policy Initiative on Financial Innovation for Climate Adaptation in Africa (GCA, 2021).

2. CLIMATE FINANCE INNOVATION IN THE AFRICAN CONTEXT

2.1 DEFINING CLIMATE FINANCE INNOVATION FOR AFRICA

For the purposes of this paper, innovation in climate finance refers to any financial instrument (or combination of instruments) which improves on existing financial solutions by overcoming at least one barrier to finance in a novel geographic or sectoral context.[1]

Though novel financial solutions certainly constitute climate finance innovation, such as the Pay-As-You-Go (PAYG) solar finance model which saw rapid deployment and scale-up throughout the 2010s, an instrument need not be novel to be innovative. For example, as the first YieldCo in Africa, South African Revego Africa Energy Fund constitutes climate finance innovation as an existing financial structure deployed to overcome barriers in a novel sectoral or geographic context (see Section 5.2.4).

This view of climate finance innovation also looks beyond the inherent mechanics of an instrument and considers innovation holistically. In this way, an instrument's practical outcomes are important in defining innovation. For example, TerraFund for AFR100 (see Section 5.2.1) deploys instruments that are not inherently innovative – grants, concessional debt, and technical assistance – but are used in a unique and efficient way to improve upon status quo financing approaches. TerraFund's approach constitutes financial innovation by virtue of providing affordable early-stage capital to small and medium-sized enterprises (SMEs) operating in sectoral and geographic contexts with limited commercial viability.

Under this definition, what constitutes climate finance innovation is dependent on the barriers to finance which constrain investment given the relevant country and sector, a flexible approach that encourages context-driven innovation. This paper therefore proceeds to explore what barriers to finance exist in four key climate mitigation sectors, what financial instruments are best equipped to overcome each barrier, and to highlight examples of how innovation has been deployed to overcome financing barriers across geographies and sectors.

1 In Strategic Management (Kennedy, 2020) the author describes four types of innovation depending on new or existing technologies and markets. Meanwhile, The Global Innovation Fund defines innovation broadly as "any solution that has potential to address an important development problem more effectively than existing approaches". Point (i) attempts to adapt the definition presented in Kennedy (2020). to climate finance, whereas point (ii) aims to provide a more holistic view of innovation for the context of development finance in the vein of that presented by GIF.

2.2 THE NEED FOR INNOVATION IN CATALYZING CLIMATE INVESTMENT IN AFRICA

Insufficient climate finance flows compared to needs. The current amount of climate finance flowing to Africa is simply not fulfilling the massive needs of the continent. While climate finance needs in Africa are estimated at USD 250 billion per year[2], total climate finance mobilized in the region in 2020 was only USD 29.5 billion, only 14% of the amount needed (CPI 2022a; CPI, forthcoming).

Limited fiscal capacity of national governments. Economic headwinds in the wake of the COVID-19 pandemic and Russia's invasion of Ukraine look to limit governments' flexibility to finance new climate projects. Falling government revenues and concurrent stimulus spending since the outbreak of COVID-19 have resulted in rising debt to GDP ratios, which are expected to stabilize around 70% in 2022, up from an average of 60% in 2019(AfDB, 2021c; AfDB, 2022). Debt ratios in some of Africa's leading economies – for example, Kenya, Ethiopia, and Ghana – are particularly worrisome. Inflation is driving interest rates up across the world, adding to the cost of debt servicing and increasing refinancing risks for countries that have come to rely on the Eurobond markets (AfDB, 2021c; AfDB, 2022).

Meanwhile, GDP growth looks to be hampered as low vaccination rates have constrained economic recovery from the pandemic while commodity price increases due to Russia's invasion of Ukraine have triggered inflation, raising concerns that Africa may enter a period of stagflation in the near- to mid-term (AfDB, 2022; IMF, 2022). Further, the mid- to long-term effects of climate change are expected to depress GDP by 2-5% annually by 2030 for most African nations (IIED, 2021). Together, these factors look to constrain government expenditures which have traditionally been the single largest source of infrastructure investment in Africa (AfDB, 2018).

Limited mobilization of private climate finance in Africa to date. Due to the high (real and perceived) risks associated with investing in the continent, the private sector continues to play a marginal role in the provision of climate finance in Africa. In 2019/2020, under 20% (USD 4 billion) of total climate finance flows to Africa came from private investors, most of which provided by international investors.[3] Globally, private capital accounted for 50% of registered climate finance during the same period (CPI, 2021). A key challenge for climate finance innovators is therefore to leverage development finance and grant funding more effectively to 'crowd-in' private investment at levels not yet seen.

The use of blended finance to mobilize private climate finance. Public investors can catalyze private finance by deploying innovative blended finance structures, leading private investors to realize competitive risk-adjusted returns exceeding those provided via conventional financing. Defined by the World Economic Forum as 'the strategic use of development finance and philanthropic funds to mobilize private capital flows to emerging and frontier markets,' blended finance works by combining concessional and private capital within the same capital structure such that each class of investor may reach their target return threshold. Those development finance institutions and philanthropic funds with below-

2 CPI (2022) estimates the total cost of implementing NDCs in Africa between 2020-2030 at USD 2.8 trillion. On this total, national governments have committed to providing USD 264 billion, leaving the remaining USD 2.5 trillion as climate finance needs for the period 2020-2030 (i.e. USD 250 billion per year, on average).

3 International investment accounted for 57% of total private climate finance commitments in Africa in 2019/2020.

market return requirements can thus improve the risk-adjusted returns of private investors. Beyond the project-level economic rationale of blended finance, inclusion of private investors in frontier geographies and sectors can result in positive learning externalities, serving to demonstrate broader market viability (IFC, 2020).

3. METHODOLOGICAL APPROACH

To identify and define the barriers at the root of constrained climate finance in Africa, we conducted a review of existing literature. We identified four groups of key barriers – financial, governance, project, and enabling skills and infrastructure – that inhibit investment in four key mitigation sectors: energy, transport, buildings, and AFOLU. This exercise also relied on CPI's experience serving as the Secretariat for the Global Innovation Lab for Climate Finance (the Lab), an incubator for innovative climate finance instruments. Through the end of 2021, the Lab has helped develop 55 innovative financial instruments, 24 focused on deployment in Africa.[4] We mapped how each of these instruments were designed to overcome specific barriers across different sectors. Drawing from the literature review and the analysis of the financial instruments developed within the Lab, we assigned a qualitative score to each barrier denoting its relevance across sectors.

To further contextualize our analysis, we mapped all 54 African countries by their respective exposure to the key barriers identified (excluding project-level barriers). To do so, we aggregated 37 country-level indicators from nine data sources.[5] Each indicator was assigned a one to five score based on each country's respective quintile among other African countries, with one reflecting a low barrier and five reflecting a high barrier.[6] Indicators were then weighted and grouped by sub-barrier in order to provide a qualitative score for each country. Annex I summarizes the results of this assessment.

Concurrently, we researched financial instruments which can be used to overcome barriers to finance, as well as of how these instruments have been deployed in innovative ways across Africa. From our research, we selected four innovative financial instruments deployed in Africa which reflect a broad spectrum of how climate finance innovation can serve to efficiently allocate capital across sectors requiring various degrees of concessionality. These four instruments – TerraFund for AFR100, Sub-National Climate Finance Initiative, Acorn Holdings Student Housing, and Revego Africa Energy Fund – are presented in Section 5.2.

4 More details about the Lab can be found at www.climatefinancelab.org/

5 World Bank, World Economic Forum, International Monetary Fund, Bankscope Fund for Peace, World Intellectual Property Organization, International Telecommunication Union, Transparency International, and The Freedom House; all accessed via The Global Economy.

6 Scores therefore reflect only the relative barrier assessment of each country within Africa rather than a general barrier assessment as compared to other geographies in order to better reflect the varied risk profiles across African countries. A score of five was assigned in cases where indicator data was unavailable, as the lack of available information was interpreted as negative signal.

4. MAPPING THE BARRIERS AND RISKS FOR CLIMATE FINANCE

4.1 THE KEY BARRIERS AND RISKS HINDERING CLIMATE INVESTMENT

Several barriers and risks (real and perceived) remain for climate investments in Africa. These are detailed in Table 1 and are grouped under four broad categories:

i. financial barriers,

ii. governance barriers,

iii. project barriers, and

iv. barriers related to enabling skills and infrastructure.

Financial barriers are related to the maturity and depth of local capital and financial markets which affect the ability of a project to access affordable short- and long-term finance at different stages of its lifetime, including early-stage construction finance, working capital facilities, and long-term refinancing. In particular, the lack of local-currency financing leaves investors exposed to currency exchange rate volatility, depressing returns on hard currency investment and increasing default risk for debt investors. In countries with established capital markets, climate finance investments may be crowded out by sovereign debt issuances with high yields and low perceived risk.

Governance barriers are related to the stability of national or sub-national political environments, the strength of legal and regulatory frameworks, and the complexity of administrative processes in the country where the project is based. Political instability and weak regulatory frameworks inhibit long-term investment planning, while inefficient or corrupt administrative processes can significantly inhibit business operations and constrain finance at the project-level. Even when well-intentioned, poor governance can result in unclear or changing regulatory frameworks which can significantly affect the profitability of projects and may put a project beyond the risk tolerance of its investors altogether.

Project barriers are related to the specific business and technical aspects of a project, including the creditworthiness of off-takers and customers, the low level of maturity of the technologies deployed, the project's ticket size, and the vulnerability of a project's assets and value chain to extreme weather events and long-term shifts in climate patterns. This includes the inherent microeconomic risks in a given sector and geography which can adversely impact project returns.

Finally, **barriers related to enabling skills and infrastructure** refer to impediments in ancillary upstream and downstream activities which can negatively impact the successful implementation of a project. These include the limited availability of information and data necessary to conduct market research and project due diligence, lack of specialized technical

skills along the value chain, and lack of raw materials and physical infrastructures needed to deliver project outputs.

Table 1: Barriers to climate finance

Category	Barrier	Description
Financial	**Lack of early-stage finance**	Lack of or limited access to early-stage capital (e.g., equity, construction finance, and working capital)
	Lack of long-term finance	Lack of or limited access to long-term debt and/or patient equity, which can limit projects' ability to sustain activities throughout their lifetime, buy out equity investments, or re-finance debt investments
	Re-financing risk	Borrower's inability to replace an existing obligation with new capital when the maturity of existing loans is shorter than the lifetime of the project
	Currency risk	Volatile foreign exchange rates arising when a project has revenues in local currency and loan payments in a hard currency (e.g., USD or EUR) impacting the ability to repay debt obligations
Governance	**Political risk**	Adverse political events which impact macroeconomic environment (e.g., central bank policy, currency inconvertibility) or the ease of doing business (e.g., turnover of key personnel, corruption, breach of contracts, property expropriation, war, civil disturbance)
	Regulatory risk	Unanticipated changes in legal or regulatory policies such as financial sector regulations (e.g., securities law), incentive programs (e.g., feed-in-tariffs), perpetration of unfavorable regulations/incentives (fossil fuel subsidies), grid interconnection regulations, permitting process, and taxation.
	Administrative risk	Delays due to corruption, permitting delays, denial or repeal, and forced relocation

Category	Barrier	Description
Project	**Counterparty risk**	Credit and default by a counterparty in a financial transaction (e.g., the power off-taker in a renewable energy project or customers with low creditworthiness)
	Technology risk	Use of nascent or untested technologies (e.g., CCS, hydrogen, and EV infrastructure) often involving higher cost of deployment
	Insufficient project size	Inability to capitalize on economies of scale, high transaction and start-up costs due to the small ticket size making projects unattractive for large investors
	Environmental risk	Damages to assets or disruptions in value chains caused by extreme weather events and long-term shifts in climate patterns (climate-related risk), and/or losses in biodiversity and ecosystem services upon which businesses and society rely (nature-related risk).
Enabling skills and infrastructure	**Lack of data/ information**	Limited information on comparable investments, informal or unaudited financial records, and lack of transparency/data on climate related disclosure, making it difficult to conduct due diligence
	Limited technical capacity	Limited technical and engineering capacity for upstream and downstream activities (e.g., lack of experienced EPC contractors to install a system, or O&M contractors to maintain the system long-term) and financial sector execution (e.g., limited credit culture, inexperienced bank personnel)
	Lack of physical infrastructure	Limited availability of raw materials and physical infrastructures needed to deliver project outputs (e.g., electrical transmission and distribution infrastructure, charging infrastructure for EVs, and roads to efficiently transport smallholder produce)

4.2 THE SECTOR-SPECIFIC BARRIERS AND RISKS TO CLIMATE FINANCE

The relevance and intensity of each barrier identified is highly context-dependent and can significantly differ by geography, sector, and sub-sector. For instance, governance barriers are typically more relevant in countries with more unstable political systems, irrespective of the sector (see Annex I for detail). At the same time, environmental risk is likely to be greater in the Sub-Saharan African AFOLU sector where only 3% of cropland is irrigated, meaning that agricultural production is highly vulnerable to weather patterns (FAO, 2020).

The following sections provide a set of qualitative sector-level barrier scores based on literature reviews of the energy, transport, building, and AFOLU sectors, along with a discussion of the rationale for each rating. Annex II summarizes these scores for all sectors.

4.2.1 ENERGY SECTOR[7]

Sub-Saharan Africa is currently home to 570 million people without access to electricity. Though investments in energy access have driven electrification rates up from 33% in 2010 to 46% in 2019, rapid population growth has increased the absolute number of Africans without power during the same time period (IEA, IRENA, UN, World Bank and WHO, 2021). Looking forward, Africa's population is expected to grow by 1.3 billion by 2050 (Alpin, 2021), necessitating an acceleration in energy infrastructure investment to achieve universal access to modern electricity.

Financial barriers. Renewable energy systems are characterized by high upfront capital expenditures and risky development and construction cycles,[8] followed by low operating costs and relatively stable positive cashflows after commissioning. Therefore, limited access to affordable early-stage finance during development and construction stages represents an important barrier for new projects. Additionally, long project lives and the localized nature of the renewable energy projects translates into high currency risk for hard-currency investors. This can limit the ability of projects to raise capital from international financiers even for already-operating renewable energy assets.

Sector-level risk assessment

	Lack of early-stage finance	Lack of long-term finance	Re-financing risk	Currency risk
Financial Barriers	—	—	⌄	⌃⌃

7 For the purpose of this paper, energy sector investments include investments in (i) renewable fuel production (i.e., biofuels and biogas), (ii) renewable power and heat generation assets, and (iii) renewable power and heat transmission and distribution networks.
8 For geothermal projects, early-stage risk is especially aggravated by resource risk during exploration and drilling, which can account for 35%-50% of total costs before the availability of resource is confirmed (Vlahakis, 2015).

Governance barriers. Governance barriers are the main impediment to African infrastructure investments (AfDB, 2018), especially renewable energy assets (Baumli and Jamasb, 2020). In total, 80% of infrastructure projects in Africa to fail by the approval stage of development, driven in large part by burdensome administrative processes (AfDB, 2018; McKinsey, 2020). The long-term profitability of renewable energy investments is sensitive to changes in local regulations of the power and energy sectors, including supportive policies and incentives for renewables (e.g., feed-in-tariffs), but also regulations limiting end-user tariffs and the persistence of fossil fuel subsidies. Operating cashflow stability of renewable energy assets also depends on the quality and enforceability of power purchase agreements (PPAs), making reliable legal and administrative structures imperative to a project's long-term profitability.

Prior to commissioning, renewable energy projects usually go through multiple layers of administrative approval and delays in obtaining permits at various stages – often because of inefficiency or corruption – which can severely increase the time period between financial close and a plant coming on stream. The impact of such delays on the time value of money can prove devastating to project-level economics, particularly given the high cost of capital in Africa.

	Political risk	Regulatory risk	Administrative risk
Governance Barriers	—	⌃⌃	⌃⌃

Project barriers. Renewable energy projects are subject to counterparty risk due to the risk of default by power off-takers. These are often the public utilities, but increasingly include corporate PPA off-takers (Baker McKenzie, 2018). For off-grid renewables, counterparty risk is particularly high due to the low creditworthiness of end users, i.e., low-income households and businesses with limited credit history. In addition, most renewable energy projects – both on-grid and off-grid – are unable to attract large-scale investors because they are simply too small, leading to disproportionately high due diligence and transaction costs (IRENA, 2020a).[9]

	Counterparty risk	Technology risk	Insufficient project size	Environmental risk
Project Barriers	⌃	⌄	—	—

Barriers related to enabling skills and infrastructure. Limited availability of experienced local personnel along the value chain can pose challenges to the implementation of renewable energy projects. For example, lack of EPC contractors can lead to delays at the project development and construction stages. Similarly, revenues can be adversely impacted by limited availability of O&M providers (resulting in reduced or interrupted generation) and legal advisory services (exacerbating risks associated with PPA quality and enforceability).

9 Kidney and Oliver (2014) find that institutional investors such as pension funds and insurance companies usually look to invest in deals greater than USD 300 million, and most renewable energy investments do not reach this size.

Finally, limited and unreliable electrical transmission and distribution infrastructure, as well as low energy access rates, pose risks for renewable energy investors in Africa.

	Lack of data/information	Limited technical capacity	Lack of physical infrastructure
Enabling Skills and Infrastructure	⌄	—	—

4.2.2 TRANSPORT SECTOR[10]

Africa has so far lacked requisite investment in sustainable transportation systems, leading to inefficient transportation networks that have not kept up with urban sprawl. Urban transportation has become increasingly reliant on fossil fueled passenger cars and freight vehicles. Though vehicle ownership rates are low, poor emissions regulations and safety controls have led to disproportionate air quality deterioration and road fatality rates (Allianz, 2018). Investments in modern and low-carbon transport infrastructure, driving the shift from fossil fueled vehicles to cleaner and more efficient means such as rail-based transportation, are essential to drive advancements in other sectors and economic growth in the region (AfDB, 2018).

Financial barriers. Limited access to affordable, risk and patient capital represents one of the main barriers to most low-carbon transport infrastructure investments – e.g., bus rapid transport, mass rapid transit and cycling infrastructure. Up-front planning, project preparation and construction are lengthy and account for a high percentage of overall project costs, making up-front investment especially risky. In addition, the long-term nature of most transport infrastructure investments exposes hard currency investors to high currency risk.

Sector-level risk assessment

	Lack of early-stage finance	Lack of long-term finance	Re-financing risk	Currency risk
Financial Barriers	⌃	—	⌄	⌃⌃

Governance barriers. More so than other sectors, transport infrastructure relies on long-term public planning, political will to support maintenance and upgrades of existing infrastructure and coordinated decisions around the use of public spaces within the urban context. As governments tend to prioritize shorter-term priorities (so called "tragedy of the horizon"), large transportation projects risk losing political support prior to commissioning due to long development cycles (Brookings, 2015).

10 For the purpose of this paper, low-carbon transport investments include investments in (i) Evs and EV charging infrastructures, (ii) public transport vehicles (green busses), light or heavy rail fleet and related infrastructure, (iii) energy efficiency in air and marine transport, (iv) infrastructure for non-motorized transports, and (v) modal shifts with associated GHG emission cuts.

The administrative risk for transport infrastructure investments is also high due to the need to obtain various approvals and permits, a procedure which can become burdensome and lengthy when inefficient or corrupt administrative entities are involved. Changes in transport regulations, vehicle standards, and incentives can also affect purchase decisions of private vehicles and private and public fleet.

	Political risk	Regulatory risk	Administrative risk
Governance Barriers	^	^	^^

Project barriers. Given the inherently large ticket size and stable revenue structure of most transport infrastructure projects and the general reliance on well-established technologies – with the exception of EVs and other cutting-edge solutions such as electric road system (ERS) – project barriers are comparatively lower in the transport sector. Nevertheless, transport infrastructure projects are still exposed to counterparty risk related to the risk of default by the national or sub-national government-owned entities involved in transactions (e.g., public transport companies, infrastructure development companies, and airlines).

	Counterparty risk	Technology risk	Insufficient project size	Environmental risk
Project Barriers	^	—	v	—

Barriers related to enabling skills and infrastructure. Lack of ancillary physical infrastructure represents an important barrier to low-carbon transport investment in Africa, especially to the dissemination of EVs. Specifically, limited charging infrastructures and unreliable electricity supply can play a role in investment decisions of both individuals and companies, away from EVs and in favor of fossil-fueled vehicles. Inadequate existing infrastructure used to transport raw material and components can also cause delays in the construction of new low-carbon road and rail infrastructure projects. Finally, limited availability of local skilled personnel for project planning and preparation, construction, and maintenance creates constraints and delays in moving projects forward.

	Lack of data/information	Limited technical capacity	Lack of physical infrastructure
Enabling Skills and Infrastructure	v	—	^

4.2.3 BUILDINGS SECTOR[11]

With approximately 47% of Africa's urban population residing in informal settlements or slums, there is already an acute need for investment in new buildings (UN-HABITAT, 2020). As Africa's population continues to grow, so too must its towns and cities to provide

11 For the purposes of this paper, green buildings include investments in building infrastructure construction, HVAC and water heaters, and appliances and lighting.

necessary housing, commercial opportunity, education, and healthcare. It is estimated that 80% of the buildings that will exist in Africa by 2050 have yet to been built (Alpin, 2021). How these buildings develop will have huge implications on Africa's future emissions as buildings currently account for 61% of final energy consumption in the continent (GlobalABC, IEA, UNEP, 2020).

Financial barriers. Low-carbon building projects can find it hard to raise early-stage capital at affordable rates. For example, high interest on construction loans have been found to be a limiting factor for new developments in Kenya (Shah, 2019). Financial barriers are particularly high in the residential sector, where building off-take is constrained by prohibitively expensive or altogether nonexistent mortgage options for large proportions of the population (CAHF, 2021).

Investments are also subject to high currency risk given long payback periods of real estate assets and that new technologies and materials such as those used for prefabricated concrete and green roofing are often purchased internationally and paid in hard currency, while energy savings are earned in local currency.

Sector-level risk assessment

	Lack of early-stage finance	Lack of long-term finance	Re-financing risk	Currency risk
Financial Barriers	^	—	—	^^

Governance barriers. Many African countries have only recently started introducing and adopting policies and regulations around green buildings (e.g., zoning regulations, tax incentives, building codes, and energy efficiency policies). As regulatory support for green buildings is still relatively nascent, regulatory risk remains a key barrier to investment.

Investments in low-carbon building construction can also be faced with lengthy permitting processes at the city and national level, involving several requirements and substantial documentation (e.g., technical inspections, professional certification processes, zoning compliance), sometimes driven by corruption. Poor government recordkeeping can also expose developers and investors to risks associated with land title disputes.

	Political risk	Regulatory risk	Administrative risk
Governance Barriers	—	—	—

Project barriers. Counterparty risk for buildings tends to be high, especially in the residential sector when end-users might not have any credit history, or when the main counterparty is a state-owned entity such as in the construction and retrofitting of government buildings. Though there is a growing body of evidence to suggest an inverse relationship between building energy efficiency and probability of default in some geographies (EU, 2021), this dynamic has not yet been borne out in the African context.

The buildings sector is also exposed to a certain degree of environmental risk. Extreme weather events such as hurricanes and floods can cause serious damages to buildings and facilities located in urban centers and near rivers and coasts. This has led some commercial real estate investors to place a risk premium on buildings in areas exposed to environmental risk (Clayton et al., 2021).

	Counterparty risk	Technology risk	Insufficient project size	Environmental risk
Project Barriers	↑	–	–	–

Barriers related to enabling skills and infrastructure. Lack of local technical capacity and expertise also constrains investment in low-carbon buildings. In many parts of Africa, construction managers have informal knowledge and expertise developed on the job, leading to a lack of familiarity with green building certification (e.g., IFC EDGE) and materials (e.g., prefabricated concrete and solar roofing). Further, underdeveloped local value chains for green materials often require importation from international manufacturers (Chan et al., 2017; Nikyema et al., 2020).

	Lack of data/information	Limited technical capacity	Lack of physical infrastructure
Enabling Skills and Infrastructure	–	↑	↓

4.2.4 AFOLU SECTOR

As the single largest source of anthropogenic greenhouse gas emissions in Africa (South South North, 2019), climate finance mobilization in the AFOLU sector is critically important. Looking ahead to 2050, land use looks to become increasingly stressed as crop yields are expected to fall 10-20% by mid-century due to rising temperatures and changes in precipitation patterns, threatening deforestation and biodiversity loss (GCA, 2020).

Financial barriers. Lack of access to both early-stage and long-term finance is pervasive throughout the AFOLU sector. Smallholder farmers – especially those who are not landowners and cannot use the land as collateral – find it hard to access affordable early-stage finance or working capital to bridge the gap between harvest seasons (ISF, 2019). This challenge is even more pronounced in forestry projects which can take five to twenty years before generating positive cash flows and modest returns (Chatham House, 2019).

The small, required investment sizes and inherent market risks of agri-SMEs inhibit their ability to secure affordable long-term financing for investments such as tractors, irrigation

systems, or storage facilities. African agri-SMEs fall into the infamous "missing-middle" comprised of businesses seeking finance in excess of what can be offered by microfinance providers, but not large enough to attract investment from conventional financiers.[12] While these challenges exist in the AFOLU sector across emerging markets, the finance gap in Sub-Saharan Africa is especially pronounced as local banks and microfinance institutions are less active in meeting financing needs (ISF Advisors, 2019).

Sector-level risk assessment

	Lack of early-stage finance	Lack of long-term finance	Re-financing risk	Currency risk
Financial Barriers	⏫	⏫	⏫	🔺

Governance barriers. Land tenure issues present a barrier to finance in the AFOLU sector as weak property rights can limit the ability of farmers to use their land as collateral. Meanwhile, poor contract enforcement exacerbates existing counterparty risks (Chiriac et al., 2020a). Regulatory and administrative processes for projects on public and community owned lands can be particularly costly, leading projects on private lands to be more attractive for investors (Knowles et al., 2017).

	Political risk	Regulatory risk	Administrative risk
Governance Barriers	➖	🔺	➖

Project barriers. Project-level economics present the most challenging barrier to investment in the AFOLU sector due to high counterparty risk, small project sizes, and high vulnerability to environmental risk (Chiriac et al., 2020a). Upstream business risks associated with global supply of inputs such as seeds and fertilizer, combined with downstream business risks due to underfinanced value chains and market volatility, lead to high counterparty risk in the AFOLU sector. External factors, such as the COVID-19 pandemic and Russia's invasion of Ukraine, have shed light on how sensitive African agricultural value chains are to global market shocks (Human Rights Watch, 2022; FAO, 2021). This is exacerbated as the African agricultural sector is comprised primarily of small-scale informal workers and businesses further inhibiting access to finance (International Labor Organization, 2020). These factors result in the African agri-SME market having twice the risk and 4-5% lower returns than SMEs in other sectors (Aceli. 2020).

12 African agri-SMEs with financing needs between USD 25,000 and USD 1.5 million comprise an estimated financing gap of USD 65 billion annually (Aceli, 2020).

Further, AFOLU activities' inherent reliance on weather patterns and climate make them extremely vulnerable to the effects of climate change. Extreme weather events (e.g., unseasonal rain or drought-driven wildfires) can damage land and destroy standing crops causing serious losses. Additionally, rising temperatures and changing weather patterns have been linked to increased risk of agricultural pests (Skendžic et al., 2021). Farmers in Sub-Saharan Africa are especially sensitive to these risks due to their disproportionate reliance on manual farming techniques and rain-fed crops (ISF, 2019).
Even small seasonal changes in climate patterns can have detrimental effects on yields, resulting in adverse ripple effects across entire value chains which exacerbate existing counterparty risks (Mazza 2021; FAO, 2016).

	Counterparty risk	Technology risk	Insufficient project size	Environmental risk
Project Barriers	⏫	🔽	⏫	⏫

Barriers related to enabling skills and infrastructure. Dovetailing with project risks, smallholders and businesses in the region often lack the technical training in advanced agricultural and forestry techniques, inhibiting their ability to increase quality and quantity of production (Chiriac, 2020a; Mazza, 2021). Further, training programs are cost prohibitive for smallholders and SMEs (WEF, 2016).

A lack of data and information for project developers to undertake project due diligence and planning can also be an obstacle (Chiriac, 2020a). Informality across AFOLU value chains limits the availability of data needed for financial institutions to deploy conventional risk assessment methodologies. For agriculture projects, this includes, for example, limited credit history of smallholders and lack of weather and soil data. In the forestry sector, limited knowledge related to the multiple functions of forests (beyond carbon sequestration) can prevent the establishment of clear definitions of sustainability and discourage private investment.

Finally, a lack of suitable physical infrastructure – e.g., reliable electricity supply and public irrigation systems, adequate transportation infrastructure, cold storage facilities – can pose challenges to AFOLU projects in Africa, hindering operations and slowing down production (Chiriac. 2020a; ISF. 2019).

	Lack of data/information	Limited technical capacity	Lack of physical infrastructure
Enabling Skills and Infrastructure	🔼	⏫	🔼

5. INNOVATIVE SOLUTIONS FOR AFRICA

While Section 4 laid out the main barriers to investments in four mitigation sectors, this section provides an overview of financial and non-financial solutions to address these barriers. Some of these (e.g., debt instruments and grants) have been widely used in Africa but could better focus on targeting specific investment barriers and gaps affecting mitigation sectors and could be used in combination with other more structured instruments to maximize effectiveness through a more sustainable approach. Other – more complex – solutions (e.g., structured finance, capital market instruments), while well established in more mature financial and capital markets, have only recently made it into the continent and hold great potential for catalyzing finance, particularly from the private sector, toward climate projects.

5.1 FINANCIAL AND NON-FINANCIAL SOLUTIONS TO OVERCOME BARRIERS

This section looks at six groups of instruments (detailed in Annex III), namely (i) non-tradeable financial instruments, (ii) capital market instruments, (iii) results-based finance instruments, (iv) risk mitigation instruments i.e., credit enhancement instruments, (v) structured finance mechanisms and (vi) non-financial tools.[13] Each of these has the potential to address one or more barriers currently hindering climate investments in Africa, as summarized in Table 2.

13 Detailed definitions of all financial and non-financial instruments are included in Annex III.

Table 2: Mapping instruments to barriers

		Financial Barriers				Governance Barriers			Project Barriers				Enabling Skills and Infrastructure		
		Lack of short-term finance	Lack of long-term finance	Refinancing risk	Currency risk	Political risk	Regulatory risk	Administrative risk	Counterparty risk	Technology risk	Insufficient project size	Environmental risk	Lack of data/ information	Limited technical capacity	Lack of physical infrastructure
Unlisted financial instruments	Grant	✓						✓		✓			✓	✓	
	Equity	✓	✓							✓					
	Debt	✓	✓	✓	✓					✓				✓	
Capital market instruments	Green bonds and sukuks		✓	✓	✓						✓		✓		
	REITs	✓	✓	✓	✓						✓				
	YieldCos		✓	✓	✓						✓				
Results-based finance instruments	KPI-linked funding	✓	✓						✓				✓		
	Environmental impact bonds	✓	✓						✓	✓			✓		
	Carbon finance	✓	✓	✓					✓	✓			✓		
Risk mitigation instruments	Currency hedging				✓										
	Guarantees				✓	✓	✓	✓	✓	✓		✓			✓
	Insurance					✓	✓		✓	✓		✓			
Structured finance mechanisms	Standardization							✓			✓			✓	
	Aggregation								✓		✓				
	Securitization		✓	✓	✓						✓				
Non-financial tools	Capacity building and training						✓	✓	✓	✓		✓	✓	✓	
	Data tools & platforms												✓		
	Servitization	✓	✓		✓						✓				

5.1.1 UNLISTED FINANCIAL INSTRUMENTS

Unlisted financial instruments include debt and equity instruments as well as grant funding which are not traded on a public exchange. Unlisted financial instruments are particularly relevant in the African context as much of the continent is characterized by shallow public capital markets. While these instruments are not intrinsically innovative on their own, they can be used in innovative ways – alone or in combination – to target new sectors, address persistent investment barriers, such as technology risk. In particular, blended finance structures which leverage grants, concessional debt, or concessional equity can successfully mobilize untapped capital pools and catalyze private debt or equity.

Unlisted **equity and debt financing** can be provided at different stages of project development to address barriers related to lack of sufficient early-stage finance (e.g., venture capital, construction loans) and long-term finance (e.g., long-dated private equity, term loans). DFIs play an important role in financing early stages of projects using instruments such as growth equity or concessional construction debt, enabling projects to overcome acute barriers to finance and establish operating performance data. Once projects mature, the role of concessional debt and equity can shift to directly mobilize private finance through blended finance structures which can address chronic barriers in the long-term. Public investors also play a key role in co-financing climate investments alongside local (public and private) investors to strengthen country ownership in climate investment and develop robustness in the private capital markets.

When provided through on-lending structures, debt instruments hold the potential of unlocking domestic capital from local commercial banks and institutional investors. In these structures, DFIs provide credit lines on concessional terms or other financial support such as credit enhancement mechanisms (i.e., sub-ordinated loan facilities, first loss facilities or guarantees) to local financial institutions, which then disburse the funds to project developers. These structures can also increase the internal capacity of local financial institutions as, together with capital, DFIs generally provide technical support and training on specific sectors and/or technologies to ensure that funds are deployed in an effective way to achieve desired outcomes (e.g., climate or gender outcomes). When DFI capital is provided in local currency, on-lending structures to local financial institutions can mitigate currency risk.

Grants can be used strategically to fund early-stage non-commercial activities which are crucial in allowing new projects and technologies to become bankable. This includes funding for capacity-building programs and research initiatives which can demonstrate new technologies and support an enabling investment environment. At the project level, grants can be effectively deployed to fund activities such as conducting feasibility studies, securing required permits, and sourcing offtake agreements.

Different types of grants can also be deployed to increase either financial sustainability or climate impact. Refundable grants provide donors with an opportunity to recycle early-stage funds once projects reach commercial viability, while convertible grants may allow donors to realize long-term returns by converting funding into to debt or equity capital once certain project milestones are achieved (IRENA, 2016; IRENA, 2020).

5.1.2 CAPITAL MARKET INSTRUMENTS

Capital market instruments – including green bonds, Real Estate Investment Trusts (REITs), and YieldCos – broaden the financing pool from which companies and projects can draw from, providing access to large-scale investors such as institutional investors looking for stable and predictable returns in the form of long-term operating assets with identifiable cash flows. These instruments work especially well to raise capital for already operating assets and can therefore be effective at reducing refinancing risk. In most cases, by pooling together several projects, they also reduce project-specific risks, offering investors diversified investment opportunities.

While the global **green bonds** market has undergone rapid growth and transformation, reaching over USD 1.5 trillion in global cumulative issuances at the end of 2021 (CBI, 2022), the green bonds market in Africa is still at an early stage with about USD 2.8 billion issued to date to finance renewable energy, buildings and land use projects (CPI 2022a; CPI, forthcoming). South Africa accounted for 80% of total issuances in the continent (IRENA and AfDB, 2022).[14] Moving forward, green bonds can be deployed by sovereign entities (as Egypt has done), or by corporate entities with sufficiently strong balance sheets (see example in Section 5.2.3) to raise capital from institutional and other investors on local debt capital markets.

REITs provide an opportunity for real estate developers to raise local currency to finance portfolios of real estate assets at lower costs of capital than would be available otherwise for individual projects seeking finance from commercial banks. In countries where early-stage risks necessitate concessional investment by DFIs during the construction phase (see Section 5.1.1), REITS can provide an exit opportunity for DFIs such that concessional capital to be re-deployed into additional early-stage projects. As an established legal asset class in several African nations, including seven countries in Sub-Saharan Africa,[15] REITs can be deployed in innovative ways to support new green building development, as described in more detail in Section 5.2.3.

Modeled after the REIT structure, **YieldCos** are entities designed to attract local-currency investment into renewable energy assets. Though still a nascent asset class in Africa, YieldCos account for about half of total institutional investment in green infrastructure globally (or about USD 155 billion) (OECD, 2020). The first YieldCo in the African continent – Revego Africa Energy Fund – was launched in 2021 (see Section 5.2.4). Moving forward, YieldCos represent an opportunity to attract local currency investment in operating renewable energy assets, allowing DFIs and other risk-tolerant investors to deploy funds in a more targeted way towards the early stages of projects which most require concessional investment.

14 Other countries having issued green bonds include Côte d'Ivoire (2021), Egypt (2020), Kenya (2019), Morocco (2018), Namibia (2018), Nigeria (2017, 2019, 2021) and Seychelles (2018). In addition, in 2021, Sudan issued its first green Sukuk in the continent (Reuters, 2021).
15 Ghana, Kenya, Nigeria, Rwanda, United Republic of Tanzania, Uganda, and Zambia (RebelGroup 2021).

5.1.3 RESULTS-BASED FINANCE INSTRUMENTS

Results-based finance instruments include KPI-linked (or conditional) funding, environmental impact bonds, and carbon finance. Although these differ significantly in how they are implemented, all results-based finance instruments make financing contingent on the performance of projects in achieving climate outcomes such as GHG emission reduction or energy savings achieved.

KPI-linked (or conditional) funding refers to a funding approach in which financing terms are linked to the delivery of predetermined results (outputs or outcomes[16]). Such terms can include either adoption of more favorable repayment terms (i.e., interest rate reductions) or withheld disbursements until predetermined KPIs have been verified. By making funding conditional to performance and having results verified by an independent third party, KPI-linked funding reduces counterparty risk and the need for extensive data and information gathering upfront. These schemes are not new in the continents. KPI-linked funding has been used to finance the off-grid solar sector and increase energy access rates in various African countries, including the United Republic of Tanzania via EnDev's RBF Facility (EnDev, 2022) and Kenya through the Kenya Off-Grid Solar Access Project (KOSAP, 2022). KPI-linked funding has the potential to be scaled-up in the continent and applied to other sectors such as AFOLU where risks associated with limited credit history of smallholders are high.

Environmental impact bonds (EIBs) are a subset of impact bonds focused specifically on environmental outcomes pioneered by DC Water (Washington DC's water utility) in 2016 to manage stormwater by funding natural infrastructure development. Although EIBs have not yet been implemented in Africa, the broader impact bond structure has been deployed on the continent to drive investment in non-commercial initiatives such as malaria prevention[17] and youth employment[18]. EIBs can be especially effective at attracting private impact investors who are seeking both financial returns and environmental impacts. Through these structures, issuers can obtain the early-stage up-front capital needed to build new infrastructure projects and share risks with the private sector. EIBs also allow issues to directly incorporate the price of carbon or natural capital into financial market instruments (Escalante and Orrego, 2021; F4B, 2022).

Carbon finance is a type of results-based finance mechanism which enables operators of climate mitigation projects to monetize avoided carbon emissions. Carbon markets operate similarly to markets for renewable energy credits (RECs) – in which RECs are created and sold to supplement electricity sales from renewable generation – however carbon finance addresses the challenge of decarbonization more directly. Specifically, projects generate tradable credits for each unit (i.e., metric ton) of carbon emissions avoided or removed. These credits can then be sold on voluntary (or compliance) carbon markets to counterparties looking to offset their own carbon emissions and meet net-zero emissions targets. Proceeds from carbon credit sales can increase the economic viability of climate projects in operating in commercially challenging markets such as AFOLU or methane

16 Outputs are the direct results produced by the project that are identifiable and measurable (e.g., megawatts of clean energy produced). Outcomes are the changes in an environment that are affected by project outputs (e.g., a project that plants trees might be seeking to reduce soil erosion as an outcome) (Escalante and Orrego, 2021).
17 The Mozambique Malaria Performance Bond (MMPB) was designed to fund malaria prevention, diagnosis, and treatment programs (UCSF 2017)
18 The Inclusive Youth Employment Pay for Performance Platform was launched in South Africa in 2018 to place young people in jobs (Brookings 2019)

abatement, allowing them to secure up-front investment or fund long-term operations (World Bank and CIF, 2013, CPI 2022b).

Home to the world's second largest rainforest, Africa shows great market potential for carbon finance in the coming years. Despite being smaller in size than the Amazon, the Congo River basin stores carbon even more efficiently. As a result, the Congo river basin soaks up 1.2 billion tons of carbon per year as compared to the 1.1 billion tons of carbon removed annually by the Amazon (Harris et al, 2021).

5.1.4 RISK MITIGATION INSTRUMENTS

Risk mitigation instruments include currency hedging instruments, guarantees and insurance. While various public institutions are already providing risk mitigation instruments in Africa, their use needs to be scaled up rapidly given the large potential they hold for effectively mobilizing private capital. In fact, with a minimum requirement for public capital disbursements, these instruments can target very specific country and sector barriers, thus reducing the perceived and real investment risks for private investors.

When local currency financing is not available, **currency hedging instruments** (forwards, futures, swaps, and options) are essential to address currency risk, which was found to be among the most important barriers to investments in all the sectors analyzed. The challenge in Africa – with the exception of South Africa – is the lack of a long-term currency hedging market and the prohibitively high costs of hedging. The convertibility and availability of hard currency (i.e., USD or EUR) was also found to be a key risk in several countries in Africa. One organization that has developed a dedicated currently hedging strategy for climate finance solutions is the TCX Fund (Escalante and Frisari, 2015).

Depending on their design, guarantees and insurance instruments can cover a variety of risks, thus improving the structure and quality of an investment and making projects more attractive to private investors (IRENA, 2016). For example, **insurance** products can cover against losses arising from war, terrorism or civil disturbance (political risk insurance), property damage or theft (property insurance), and loss or damage to growing crops as a result of natural and climate-related hazards such as hail, drought, flood, and insects (crop insurance).

Guarantees can help overcome a similarly wide range of barriers – including chronic barriers to finance arising from political and counterparty risks – by enhancing the creditworthiness of otherwise risky investments. Importantly, guarantees provide an opportunity for DFIs to leverage high credit ratings rather than hard cash to support climate finance projects in African countries without exposing their balance sheets to currency risk (see example in Section 5.2.3).

5.1.5 STRUCTURED FINANCE STRATEGIES

Structured finance strategies – including standardization, aggregation, and securitization – look to serve an important role in mobilizing risk-averse institutional capital to climate finance projects. Structured finance can be deployed to overcome persistent barriers to finance such as costly administrative and due diligence processes which impact projects across all sectors, especially those characterized by small transaction sizes.

The **standardization** of contractual agreements (e.g., power purchase agreement [PPA], installation agreement, O&M agreement) can significantly reduce the time and resources needed by investors for due diligence processes. The availability of standardized contracts can also reduce barriers related to the lack of experienced local legal advisors, who would otherwise have to draft legal agreements from scratch. Standardization is also a prerequisite for the aggregation and securitization.

The **aggregation** of projects with similar terms and often in the same sector can help to increase the overall funding amount available for small-scale projects such as off-grid solar or agri-small and medium-sized enterprises (SMEs) which do not have sufficient scale to attract commercial investors (IRENA, 2020a). This bundled approach has the added benefit of diversification, as project-level risks are spread across a wide base of assets, limiting large-scale investors' exposure to acute risks.

Finally, by bundling projects together and dividing them into different financial tranches, each offering different degrees of risks and returns, **securitization** can help match existing assets with specific investors' preferences, broadening the capital pool and reducing refinancing risk. Though securitization represents the most complex financial instrument described herein, off-grid solar systems have already been securitized in Côte D'Ivoire, demonstrating the opportunity for future climate finance innovation elsewhere across the continent (AEP, 2020; Milken, 2021).

5.1.6 NON-FINANCIAL TOOLS

Various non-financial tools and strategies – including servitization, capacity building and training, and data tools and platforms – can be incorporated into innovative financial structures to support climate finance investment.

Servitization can help to address counterparty risk by adjusting payments at a level that would be affordable for individual users, reducing their risk of default. Servitization models can be deployed to improve capital efficiency by shifting long-term financing costs away from individuals with high borrowing costs to larger, more creditworthy, entities. One well-established example in Africa is the pay-as-you-go (PAYG) model for solar home systems, whereby energy consumers (e.g., low income households) pay for solar products in small increments, usually through mobile payment platforms. The introduction and scale-up of the PAYG model in Africa serves as a key example of how climate finance innovation can spur transformative impact. The PAYG solar model experienced annual growth of 133% during 2010-2015 and has inspired replication for other applications across sectors such as cooling systems, EVs, and irrigation (IRENA, 2020b; Siemens, 2020).

Typically funded by grant capital, **capacity building and training** activities specifically address barriers related to limited technical capacity and lack of knowledge along different stages of projects' value chains. They can include, for example, engineering trainings for EPC contractors, capacity building on innovative agriculture techniques, formal training for craftspeople on new green technologies and materials for buildings. Capacity building can also help to address technology risk by raising knowledge and awareness around new technologies (e.g., EVs). Similarly, it can help to reduce regulatory and administrative risks when aimed at enhancing government institutions' knowledge of policies and regulations

conducive of investments in each sector and showcasing best practices to improve efficiency and effectiveness of administrative processes.

Training programs can be provided in isolation to foster an enabling environment for third-party climate finance investment, or as part of a broader financial structure to provide targeted support for specific investments. Capacity building among local banks is particularly relevant for climate finance and impact investing where monitoring and evaluation of impact metrics may be required by international financing partners.

Similarly, several types of data tools and platforms can be used to address barriers related to lack of information. These can include, among others, platforms providing sector-specific market or financial data, customers' credit scores, analyses of country-specific climate-related risks and opportunities, technical tools assessing resource availability (e.g., for solar and wind), and climate and socioeconomic simulation models. Critically, data tools and platforms also have the potential to facilitate knowledge sharing efforts between climate entrepreneurs and innovators by disseminating lessons learned from successful projects.

5.2 CASE STUDIES OF INNOVATIVE CLIMATE FINANCE IN AFRICA

This section shows how the instruments described in section 5.1 have been utilized to overcome barriers to finance in practice, efficiently deploying capital into much needed climate solutions. From the landscape of innovative climate finance in Africa, we have identified four instruments encompassing a variety of financial and non-financial solutions and sectors. These four instruments are presented in Table 3 by the level of concessionality required (from most to least concessional) and described in more detail below.

Table 3: Selected innovative climate finance instruments in Africa

Instrument	Sector	Barriers addressed	Instruments and strategies deployed
TerraFund	**AFOLU**	Insufficient project size, limited technical capacity, counterparty risk, climate risk	Grants, debt, aggregation, capacity building and training
SCF	**Energy, AFOLU**	Administrative risk, regulatory risk, limited technical capacity	Technical assistance, blended equity
Acorn PBSA	**Buildings**	Insufficient project size, technology risk, refinancing risk	Green bond, REIT, guarantee
Revego Africa Energy Fund	**Energy**	Refinancing risk, counterparty risk	YieldCo, aggregation

5.2.1 TERRAFUND FOR AFR100 (TERRAFUND)

Investors in land restoration face a unique set of barriers due to the inherent business risks and technical challenges associated with the sector. At a project level, SMEs in the land restoration space require finance in the notoriously challenging missing-middle, comprised of businesses seeking more capital than is offered by microfinance but not enough to justify investment by corporate lenders which pass high fixed costs on to borrowers (Oxfam, 2009). Beyond project size, investments in land restoration projects are also risky given the limited technical capacity of local practitioners paired with the long-term nature of investments which compounds both currency and physical climate risks. As such, the industry requires a combination of de-risking mechanisms and concessional capital in order to feasibly attract return-oriented capital (Chiriac, 2020a).

Launched by the World Resources Institute (WRI) in partnership with AFR100, TerraFund for AFR100 aims to finance Africa's land restoration movement by deploying between USD 50k and USD 500k of catalytic investment to 100 organizations and businesses supporting innovative land restoration projects across Africa. Beyond direct reforestation funding, TerraFund is investing in innovative local businesses such as Divine Bamboo, a Ugandan producer of bamboo charcoal briquets, and Powerstove, a Nigerian developer of a power-generating clean cookstove.

In bearing high early-stage project risks in an inherently risky sub-sector, TerraFund for AFR 100 deploys donor and concessional capital into the sectoral and geographic context where it is most efficient. By partnering with AFR100, TerraFund draws from a broad pool of potential investment opportunities across regions and sub-sectors to build a high-quality project pipeline and diversified portfolio. Once selected, portfolio organizations are advanced to WRI's Land Accelerator – a technical assistance program that provides training and mentorship to land restoration businesses – to build technical capacity and reduce overall business risk. These structural de-risking attributes help to streamline due diligence processes and mitigate the market-specific risks of investment in early-stage land restoration initiatives and provide a pathway for successful investment companies to scale and secure increasingly commercial investment in the long-run.

Though TerraFund does not provide a pathway to phase out donor and concessional capital altogether, its highly selective application process and technical assistance support serve to optimize additionality and impact of each dollar invested in a critically under-funded sector. TerraFund's innovation, therefore, lies in its ability to improve the capital efficiency of philanthropic and concessional investments. In the lead up to COP26, TerraFund for AFR100 mobilized USD 20 million in its initial round of investment, doubling the fundraising target it set out to raise over three years in 2020 (UN, 2021; Chiriac, 2020b). Though TerraFund's approach is unique in its reliance on the AFR100 network and on WRI's Land Accelerator, the broad approach of dedicating sufficient up-front resources to undertake rigorous investment selection and deploy technical assistance enable capital deployment at scale and the benefits of portfolio diversification which follow.

5.2.2 SUB-NATIONAL CLIMATE FINANCE INITIATIVE (SCF)

Governance barriers represent a key constraint for infrastructure investment across the African continent as it acutely relies on administrative processes during project development and regulatory regimes throughout operations. In its 2018 African Economic Outlook, AfDB highlights (i) weak legal, regulatory, and institutional frameworks, (ii) weaknesses in infrastructure planning and project preparation, and (iii) governance and corruption as the factors explaining the low provision of infrastructure in Africa. The high up-front costs associated with infrastructure projects necessitate a high degree of administrative certainty that projects will reach operations in a timely manner in order to attract investment. Meanwhile, investors also require some level of regulatory certainty that they can remain profitable once operational. These problems are exacerbated at the sub-national level as relatively small project sizes challenge project finance economics relative to the large-scale infrastructure projects that investors prefer.

Initially conceived of by R20 Regions of Climate Action (R20), the Sub-National Climate Finance Initiative (SCF) pays special attention to overcoming these acute administrative and regulatory risks to finance smaller-scale infrastructure projects and AFOLU projects at the sub-national level. The SCF is a USD 750 million blended equity fund which is de-risked by a USD 28 million technical assistance facility (TAF) for local government capacity building. By working directly with sub-national governments, the TAF can elicit and validate governmental buy-in for its pipeline projects prior to deploying investment. The SCF then takes a 10-20% equity stake in its investments, enabling the ~USD 3 billion of commercial debt and equity co-finance to benefit from the TAF as well. Unlike most donor-funded technical assistance facilities, the SCF's TAF also has a built-in mechanism to facilitate voluntary reimbursement of feasibility study costs upon financial close of an investment, allowing it to recycle a portion of donor capital into new projects. In total, the grant-funded TAF and concessional equity included in the SCF's blended structure look to realize a 20:1 private-public leverage ratio, a significant improvement over the 1:1 ratio currently being realized across MDB portfolios (AfDB, 2019). This strategy allows the SCF to deploy its capital to a broad base of projects, creating a virtuous cycle of diversification across sectors and geographies to mitigate the baseline credit risk associated with sub-national infrastructure projects.

To date, the SCF has secured USD 150 million in funding for its blended equity fund as well as USD 18.5 million for its TAF, with the Green Climate Fund serving as anchor investor. By specifically addressing administrative and regulatory barriers, the SCF is strategic in its deployment of grant and concessional capital, providing an opportunity for commercial investors to invest in climate infrastructure and AFOLU projects than they would otherwise. This approach can be replicated across sectors to address acute barriers to finance such as technology risk, lack of data, and limited technical capacity, in addition to the administrative and regulatory barriers addressed by SCF.

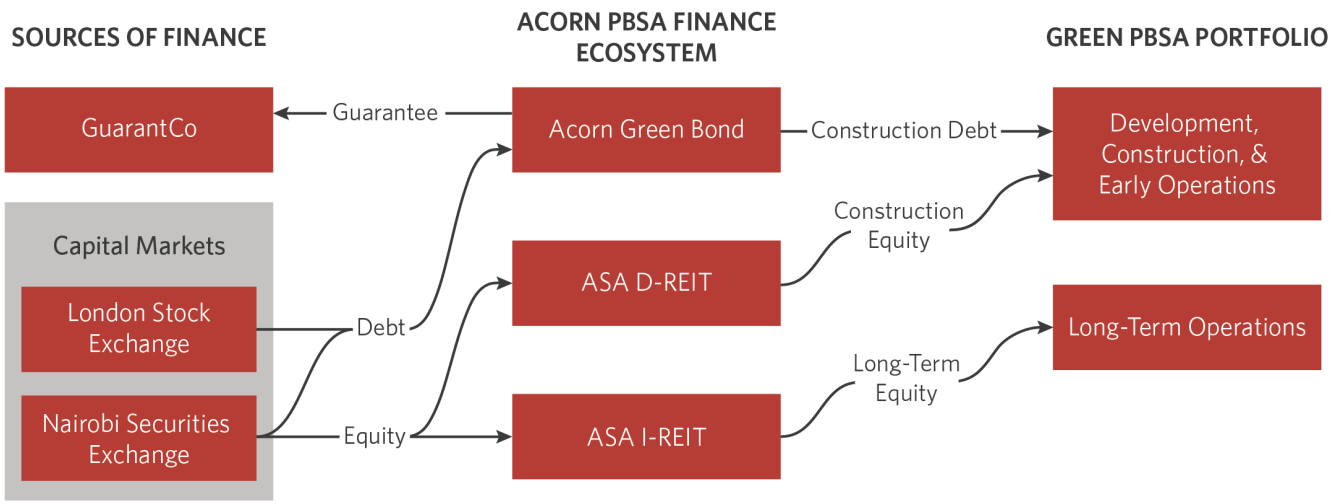
5.2.3 ACORN GREEN STUDENT HOUSING FINANCE ECOSYSTEM

Green buildings are a relatively new and unproven asset class which will be vital in meeting decarbonization goals through efficiency improvements in both upstream materials supply chains and downstream operations. However, due in part to a lack of operating history to validate the trade-off associated with up-front efficiency upgrade costs versus reduced household operating costs (and resultant impact on loan repayment), the early-stage

capital for new builds is constrained. The result is a chicken and egg problem whereby green building projects lack the finance to advance to operations and ultimately validate up-front investment.

Kenyan real estate developer, owner, and operator Acorn Holdings has structured what amounts to a lifecycle financing ecosystem for IFC-EDGE certified purpose-built student accommodations (PBSA) through the deployment of three financial instruments. First, the Acorn Student Accommodations (ASA) D-REIT, which originates, develops, and stabilizes operations of green PBSAs (Acorn, 2021a). Second, the Acorn Holdings Green Bond – the first green bond to be launched in East Africa – which provides debt capital with a five-year maturity to finance development, construction, and stabilization of ASA D-REIT- properties. And third, the ASA I-REIT, which acquires properties from the D-REIT once operational and stabilized, de-levers green bond debt from the properties, and serves as the long-term owner of the properties (Acorn, 2021b). Each of the ASA D-REIT, Green Bond, and ASA I-REIT are trading under a restricted status on the Nairobi Securities Exchange (NSE), with the green bond also cross-listed on the London Stock Exchange (LSE). Undergirding the viability of the entire ecosystem is a partial guarantee made by GuarantCo[19] which serves as a backstop for 50% of the green bond's principal and interest. GuarantCo has thus de-risked the development and construction phase of Acorn's portfolio, directly supporting investment by bond investors on the NSE and LSE, and indirectly enabling equity investment in both early-stage and operating green PBSA assets through the NSE. The overall structure of the Acorn housing finance ecosystem is depicted in Figure 1.

Figure 1: Acorn Housing Finance Ecosystem Mechanics



By segmenting the financing needs of green PBSAs into three distinct, tradable assets with different return characteristics, Acorn has managed to access a broad pool of professional investors who can deploy local currency – thereby avoiding currency risk – with the opportunity to invest in the asset type (i.e., debt vs equity) and stage (i.e., development and construction vs operations) that best suits their risk appetite. Acorn's approach can serve

19 GuarantCo is owned by the Private Infrastructure Development Group (PIDG) and FMO – the Dutch development bank, and sponsored by the governments of the UK, Switzerland, Sweden, Australia, and the Netherlands.

as a model to support the development, construction, and operations of projects with risky construction cycles but reliable operating cashflows, such as renewable energy projects. Just as REITs have been developed as a public investment structure for real estate assets, YieldCos provide a similar avenue to listing operating renewable energy assets on public markets.

5.2.4 REVEGO AFRICA ENERGY FUND

As green assets mature and establish operating track records, the challenge is less one of attracting capital, but rather ensuring that the capital is deployed and re-deployed efficiently. In other words, as assets mature and become less risky over time, risk tolerant early-stage investors should be replaced by more risk averse local-currency investors in order to facilitate re-deployment of early-stage capital into new projects. This is the case with operating renewable energy assets which have relatively predictable cashflow profiles when compared with assets in other sectors (e.g., agriculture or electric vehicles) or at earlier stages of the project lifecycle (e.g., development and construction).

As Africa's first YieldCo launched in 2021, Revego Africa Energy Fund provides such an opportunity by pooling de-risked operating assets into a single investment opportunity, allowing local currency investors to reap the benefits of diversified investment in a broad asset class. The YieldCo value proposition is similar to that of the ASA I-REIT described above, however Revego's YieldCo is more diversified. As part of a broader strategy of vertical integration, the ASA I-REIT focuses on a specific asset class of green student housing in the greater Nairobi area. Conversely, Revego has an initial portfolio of both wind and solar assets across South Africa sourced from third-party developers, with plans for greater diversification across technologies and geographies. With support from a public-private partnership between Macquarie and the UK Government, Revego has secured elusive institutional capital from one of the largest pension funds in South Africa (IEA, Imperial College London, 2022).

With renewable energy deployment in Sub-Saharan Africa projected to increase by 75% between 2021 and 2026 (IEA, 2021b), Revego's YieldCo model represents a promising opportunity for replication which can attract long-term local currency investment and allow risk-tolerant development capital to be recycled into new projects. Just as YieldCos were first developed as a way to apply the REIT structure to renewable energy assets, the broad approach of pooling together de-risked operating assets into a low-risk security can also be replicated across Africa to finance the long-term operations of other infrastructure projects such as electricity transmission lines or green transportation infrastructure.

6. CONCLUSIONS AND RECOMMENDATIONS

With the need for accelerating climate finance across sectors in Africa, it is imperative that innovative financing structures be deployed to enable investment at scale. Specifically, such innovations should seek to optimize capital efficiency by strategically leveraging financial and non-financial instruments to manage risk and overcome the barriers which have stifled investment to date. Innovative instruments should also leverage different capital pools effectively, taking into account each investors' risk preference, mandate and regulatory constraints; in particular they should ensure that public resources are not crowding out private investments.

The financial structures detailed in Section 5.2 represent examples of how various instruments can be deployed in innovative ways to address the root cause of some of these most persistent barriers to finance. Developed for the AFOLU sector where commercial viability is the lowest among all sectors discussed, **TerraFund for AFR 100** utilizes a standardized process to deploy early-stage catalytic finance and technical assistance to spur growth of grassroots innovators. Next, the **SCF** narrowly directs concessional capital to address acute governance and project barriers, bridging the early-stage valley of death faced by sub-national climate projects to achieve a 20:1 private-to-public finance leverage ratio. **Acorn's Green Bond** addresses early-stage barriers by securing guarantee finance to de-risk debt capital markets investors, enabling local currency commercial equity investment in both the D-REIT and I-REIT through issuances on the Nairobi Securities Exchange. Finally, **Revego**'s pioneering of the YieldCo structure in the African context provides a model for how de-risked operating assets may be aggregated to attract risk-averse and hard to reach institutional investors.

Drawing from the analysis in this paper, we have developed recommended strategies for private and public investors to improve the effectiveness of their interventions and spur climate finance innovation in Africa. As investors do not operate in isolation, we have also laid out a number of additional conditions needed to mobilize climate finance in the continent requiring concerted actions from a variety of stakeholders, including policymakers and regulators.

RECOMMENDED ACTIONS FOR INCREASING DEPLOYMENT OF INNOVATIVE FINANCE

While each climate investment opportunity presents specific challenges and finance needs depending on the specific project characteristics and the context in which it is developed, the recommended strategies described in this section aim to provide a set of guiding principles for private and public investors to enhance the effectiveness of capital, lower risks for investors and build the necessary capacities to sustain future climate finance flows to and within the continent.

1. **Identify and understand barriers constraining finance more granularly by sector and geography.** The African continent holds great potential for private investment in innovative climate finance structures, as highlighted in Section 5. In order to capitalize on such opportunities, private investors must accurately evaluate the risks and barriers affecting the narrow sectoral and geographic context of each investment decision. Section 4 showed how climate finance deployment in Africa can be inhibited by a broad spectrum of barriers to investments. While these barriers are real, the perception of risk linked to investments in the African continent is often aggravated by a limited understanding of national contexts by **private investors**, which may end up steering their capital toward other markets – perceived as safer – hence missing potentially profitable investments opportunities. A similarly high perception of risk related to technologies and sectors considered as new or unknown can push local private investors to invest in better-known assets such as sovereign debt instruments.

   Given their catalytic role, public investors – and specifically DFIs – need to understand which specific barriers are most salient to the private sector. Where acute barriers to finance are insurmountable, private investors should proactively and transparently engage public capital providers, in order to deploy instruments and strategies to overcome those specific barriers.

2. **Match instruments with barriers.** Once investors identify relevant barriers to investments, they should tailor financial instruments and strategies to effectively tackle them. For some investors, this may require the use of instruments which have never been employed in a given context or forming partnerships with other capital providers with complementary risk tolerance and capacities. The framework developed in Section 5 could be used as a toolbox which private and public investors can draw from to deploy climate finance solutions in line with their mandates and risk appetite.
   Depending on the nature of barriers, the use of different instruments and strategies might be more appropriate. Some of these barriers manifest themselves as acute pressure points – affecting specific projects and requiring case-by-case interventions – while others represent chronic challenges to investment, requiring more systematic and long-term solutions.

   Public investors should consider that catalytic unlisted instruments (e.g., grants or concessional debt and equity), KPI-liked funding, and EIBs have a key role to play in climate finance innovation but must ensure that these are deployed efficiently to maximize impact and avoid serving as one-time wealth transfers from public to private sector actors. Such instruments are most efficient when deployed narrowly to address acute barriers to finance rather than broadly to address more chronic challenges. For example, grant capital can be used to provide technical assistance to build capacity among local practitioners or, as in the case of SCF, to alleviate administrative risks for climate projects at the sub-national level.

   Conversely, chronic barriers such as currency risk, sector-wide counterparty risk, and widespread regulatory risk should be managed through more commercial means, namely through participation in local capital markets or voluntary carbon markets. **Private and public investors** can supplement blended finance structures with a combination of structured finance strategies (e.g., aggregation) and risk mitigation instruments (e.g., guarantees and insurance products) to sufficiently alleviate risk throughout the duration

of a project's operating life. The example of Revego Africa Energy Fund shows how limited public capital can be used effectively to mobilize critically important pension funds into climate finance.

3. **Match instruments with project and technology lifecycles.** To optimize capital efficiency, innovative climate finance structures investors must look to deploy different instruments and strategies depending on the level of project and technology maturity. Specifically, **public investors** should deploy catalytic investment early in project and technology lifecycles (e.g., prior to bankability) in order to support a robust pipeline of commercially investable projects. While grants and concessional finance are still necessary to test new technologies or when risk adjusted returns are not yet attractive during a project's early operations, these solutions should be gradually phased out as projects and technologies mature. This type of approach is deployed by Acorn by limiting its use of guarantee finance to enhance credit during project development and early operations, before transitioning de-risked assets to the I-REIT for long-term operations.
   As in Acorn's case, capital markets instruments represent a vital pathway for the public investors, especially DFIs, to progressively exit investments once assets have matured to the point that private finance may be crowded in, improving overall additionality of development finance. For example, concessionality may take the form of unlisted first-loss investment during the development phase of a renewable energy asset before being replaced with a partial offtake guarantee during early commercial operations, and ultimately phased out once the asset may be aggregated into a YieldCo or other capital markets instrument.

4. **Enhance engagement and co-financing with local stakeholders.** When developing innovative climate finance solutions, **international private and public investors** should work in collaboration with local policymakers, government institutions, and investors to maximize capital efficiency and lower risks. Better communication with local private investors and political institutions around the main barriers to investments in a specific country can help raise awareness and inform targeted action by governments to improve investment conditions. For example, the international organizations backing TerraFund and SCF (i.e., WRI and R20, respectively) incorporated direct engagement with local stakeholders for implementation: TerraFund through its strategic partnership with AFR 100, and SCF through its dedicated technical assistance facility.
   Public investors should increasingly view the mobilization of local private investment as key goal, not to supersede climate objectives, but in recognition that local private sector leverage is necessary to achieve those outcomes at the scale required. As such, public investors should adopt key performance indicators aimed at increasing private-public leverage ratios far above the 1:1 ratio currently being realized across MDB portfolios (AfDB, 2019). Co-financing structures represent an approach which public investors can disperse risks and lower overall cost of capital to mobilize local private investment. Through participation in co-financing structures, local investors can build capacity for future direct climate investment by first investing in climate projects indirectly via funds (IRENA, 2020). Such strategies can help to increase the proportion of total climate finance in Africa provided by local private investors above the 8% seen in 2020 (CPI, 2021).

5. **Support innovation by establishing conducive policy and regulatory frameworks.** Governance barriers were found to be among the most challenging to overcome in Africa. When taking into account the influence of policy on currency risk, governance is the most challenging barrier to climate finance analyzed in Section 4. While investors can deploy innovative solutions to mitigate governance-related risks, these can only be fully addressed through concerted action by local policymakers and regulators. Though recommendations for structural change that governments can make to strengthen the rule of law and manage currency risk are beyond the scope of this paper, there are actionable steps that **governments** can take to alleviate regulatory and administrative risks.

   First, **policymakers** must put in place long-term climate roadmaps to build investors' confidence as they provide clear signals of government support for climate investment. To be credible, these frameworks should include supportive regulations for green technologies and sectors (e.g., feed-in-tariffs, tax exemptions) as well as the removal of support for carbon intensive activities (e.g., fossil fuel subsidies). Passage of financial sector reforms can establish legal frameworks which support local capital market development. For example, The South African Bank Act has been successful in expanding the market for securitization in South Africa and can serve as a model for other African nations (Structured Finance Association, 2022).

   Regulators are also well positioned to foster the alignment of financial systems with climate-related objectives. They can, for example, adopt green bonds standards, establish new requirements for investors to disclose their climate change risks, as well as review institutional investors' investment mandates and capital adequacy rules which may limit their ability to invest in assets such as climate infrastructure (IRENA, 2020). Regulators at the national and sub-national levels must also strive to standardize and simplify permitting and approval processes for climate infrastructure projects. This can be done by reducing registration and permitting fees, creating online portals for permit application, and tightening timelines for application review. Many African nations have implemented reforms to reduce administrative barriers in recent years and should continue to build on this momentum (World Bank, 2020). [20]

20 Thirteen African nations were reported to have improved construction permitting processes in the World Bank's 2020 Doing Business report, including Cabo Verde, the Democratic Republic of the Congo, Eswatini, Ethiopia, Gabon, Kenya, Mauritius, Morocco, Nigeria, Rwanda, Seychelles, Togo, and Zimbabwe.

CONCLUSION

With a dynamic entrepreneurial environment and climate finance needs eight times higher than the amounts currently invested, the African continent presents a massive investment opportunity for investors to advance the deployment of climate solutions in the coming decade. In order to capitalize on this opportunity and bridge the African climate finance gap, climate finance innovation most focus on deepening financial markets on the continent – both conventional (i.e., debt and equity markets) and non-conventional (i.e., carbon markets) – through direct investment and capacity building activities.

This paper provides a framework for identifying how financial instruments can be combined in innovative ways to overcome barriers to finance and catalyze African climate solutions and entrepreneurship. Accelerating progress in what is a fragmented climate finance ecosystem will require improved coordination, knowledge sharing, and combined action from development and public finance providers, private investors, and local policymakers.

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8. ANNEX I: COUNTRY BARRIER ASSESSMENT

Table A1 below illustrates African countries' respective exposure to the key barriers identified (excluding project-level barriers to finance) based on 37 country-level indicators from nine data sources shown in Table A2. Each country-level indicator was assigned a one to five score based on each country's respective quintile amongst other African countries, with one reflecting a low barrier and five reflecting a high barrier. Scores therefore reflect only the relative barrier assessment of each country within Africa rather than a general barrier assessment as compared to other geographies in order to better reflect the varied risk profiles across African countries. A score of five was assigned in cases where indicator data was unavailable for a particular country, as the lack of available information was interpreted as negative signal. The indicators shown in table A2 were weighted and grouped by sub-barrier in order to provide a qualitative score for each country.

Sector-level risk assessment

Table A1: Country barrier assessment

		Barriers related to enabling skills and infrastructure			Financial		Governance		
Country	ISO	Lack of data	Lack of infrustructure	Limited technical capacity	Currency risk	Access to credit	Administrative risk	Political risk	Regulatory risk
Eastern Africa									
Burundi	BDI								
Comoros	COM								
Djibouti	DJI								
Eritrea	ERI								
Ethiopia	ETH								
Kenya	KEN								
Madagascar	MDG								
Malawi	MWI								
Mauritius	MUS								
Mozambique	MOZ								
Rwanda	RWA								
Seychelles	SYC								
Somalia	SOM								
South Sudan	SSD								
United Republic of Tanzania	TZA								
Uganda	UGA								
Zambia	ZMB								
Zimbabwe	ZWE								

		Barriers related to enabling skills and infrastructure			Financial		Governance		
Country	ISO	Lack of data	Lack of infrustructure	Limited technical capacity	Currency risk	Access to credit	Administrative risk	Political risk	Regulatory risk
Middle Africa									
Angola	AGO	▲	▲	▲	▲▲	▲▲	▲	▲	▲
Cameroon	CMR	▼▼	▲	—	▼	▲	▲	▲	—
Central African Republic	CAF	▼	▲▲	▲	▼	▲	▲	▲	▲▲
Chad	TCD	▼	▲▲	▲	▼▼	▲▲	▲▲	▲	▲
Dem. Rep. of the Congo	COD	▼	▲▲	▲	▲	▲▲	—	▲▲	▲▲
Equatorial Guinea	GNQ	▼	▲▲	▲	—	▲▲	▲▲	▲	▲▲
Gabon	GAB	▼	—	▼	▼▼	▲	▼	—	▲
Congo	COG	▼	▲▲	▲	▼	▲▲	▲	▲	▲▲
São Tomé and Principe	STP	—	▲▲	—	—	▲▲	—	▼▼	—
Southern Africa									
Botswana	BWA	▼▼	▼	▼	▼	▼▼	▼	▼▼	▼▼
Namibia	NAM	▼	▼▼	▼	▼	▼	▼▼	▼▼	▼▼
South Africa	ZAF	▼▼	▼▼	▼▼	—	▼	▼	▼	▼▼
Sudan	SDN	▲	▲▲	▲	▲▲	▲▲	—	▲▲	▲▲
Eswatini	SWZ	—	—	—	—	—	▼▼	—	▼
Tunisia	TUN	▼	▼	▼▼	▲	—	▼▼	▼	▼▼
Western Africa									
Benin	BEN	▼	—	—	▼	—	▼	▼	▼
Burkina Faso	BFA	▼	▲	—	▼	—	—	▼	▼
Cabo Verde	CPV	—	—	—	▼▼	▲	▼▼	▼▼	▼▼

		Barriers related to enabling skills and infrastructure			Financial		Governance		
Country	ISO	Lack of data	Lack of infrustructure	Limited technical capacity	Currency risk	Access to credit	Administrative risk	Political risk	Regulatory risk
Côte d'Ivoire	CIV	⌄⌄	⌄	⌄	⌄⌄	—	^	—	⌄⌄
Gambia	GMB	^	⌄	—	^	^	⌄⌄	⌄	⌄
Ghana	GHA	⌄⌄	^	—	^^	^	⌄	⌄⌄	⌄⌄
Guinea	GIN	⌄	—	^	^^	^	—	^	—
Guinea-Bissau	GNB	⌄	^^	^	⌄⌄	^	—	^	^^
Liberia	LBR	^	^	^	^	^	—	—	^
Mali	MLI	⌄	^	^	⌄⌄	—	^	—	—
Mauritania	MRT	⌄	^^	^	⌄	—	^	—	—
Niger	NER	⌄⌄	^^	^^	⌄⌄	—	—	—	⌄
Nigeria	NGA	⌄⌄	^	—	^^	—	—	^	^
Senegal	SEN	⌄⌄	⌄	^	⌄	—	⌄⌄	⌄⌄	⌄⌄
Sierra Leone	SLE	—	^	^^	^^	^	—	⌄	^
Togo	TGO	⌄⌄	^^	—	⌄⌄	—	—	—	⌄
Northern Africa									
Algeria	DZA	^	⌄	⌄	—	—	^	—	—
Egypt	EGY	⌄⌄	⌄⌄	⌄⌄	^	—	⌄	^	⌄
Lesotho	LSO	—	^	—	—	—	⌄⌄	⌄	—
Libya	LBY	^	^	^	—	^	^^	^^	^^
Morocco	MAR	⌄⌄	⌄⌄	⌄	⌄⌄	—	—	—	⌄⌄

Table A2: Country risk assessment indicators[21]

Sector-level risk assessment

Barriers	Risk	Indicators
Financial	**Currency risk**	Inflation, inflation forecast
	Access to credit	Firms using bank credit to finance investment, small firms with bank credit, non-performing loans as percent of all bank loans, Interest rates on bank credit to the private sector, real interest rate, bank overhead costs
Governance	**Administrative Risk**	Time spent dealing with the requirements of government regulations, control of corruption, corruption perceptions index
	Political Risk	Human rights and rule of law index, CPIA property rights and rule-based governance rating, strength of legal rights index, control of corruption, corruption perceptions index, political rights index, civil liberties index, voice and accountability index, fragile state index, state legitimacy index, political stability index
	Regulatory Risk	Government effectiveness index, regulatory quality index
Barriers related to enabling skills and infrastructure	**Lack of data**	Credit information sharing index, depth of credit information index, business extent of disclosure index
	Lack of infrastructure	Mobile network coverage, percent of the population, international Internet bandwidth, quality of roads, quality of railroad infrastructure, quality of port infrastructure, quality of air transport infrastructure
	Limited technical capacity	Logistics performance index, innovations index, secondary school enrollment, tertiary school enrollment, human flight and brain drain index

21 Indicator scores per World Bank, World Economic Forum, International Monetary Fund, Bankscope, Fund for Peace, World Intellectual Property Organization, International Telecommunication Union, Transparency International, and The Freedom House; all accessed via The Global Economy.

9. ANNEX II: SECTOR BARRIER ASSESSMENT

Sectoral barrier assessments shown in Table A3 reflect the qualitative sector barrier assessment shown in Section 4.2 of this paper. Sector barriers were assessed based on a review of literature focusing on each sector both globally, and in the African context specifically. All such barriers to finance are dependent on the unique country context for investment, and should therefore be viewed in the context of Annex I.

Table A3: Sector barrier assessment

Sector-level risk assessment

		Energy Systems	Transportation	Buildings	AFOLU
Financial Barriers	Lack of early-stage finance	—	^	^	^^
	Lack of long-term finance	—	—	—	^^
	Re-financing risk	v	v	—	^^
	Currency risk	^^	^^	^^	^
Governance Barriers	Political risk	—	^	—	—
	Regulatory risk	^^	^	—	^
	Administrative risk	^^	^^	—	—
Project Barriers	Counterparty risk	^	^	^	^^
	Technology risk	v	—	—	v
	Insufficient project size	—	v	—	^^
	Environmental risk	—	—	—	^^
Enabling Skills and Infrastructure	Lack of data/ information	v	v	—	^
	Limited technical capacity	—	—	^	^^
	Lack of physical infrastructure	—	^	v	^

10. ANNEX III: INSTRUMENTS FOR CLIMATE FINANCE INNOVATION

Table A4 below provides a definition for the financial and non-financial instruments analyzed in Section 5 of this paper and describes in more detail their features and mode of employment.

Table A4: Financial and non-financial instruments

	Instrument	Description
Unlisted instruments	**Debt**	Investments made in a company, an individual or a project with the expectation of being paid back at a future date (maturity) with interest. Depending on the loan agreement, payments can be made monthly, half yearly, or as a lump-sum at the end of the loan tenure. Loans are usually secured or collateralized with the assets owned by the entity taking the loan and, in case of liquidation or bankruptcy, claims held by debt providers rank higher than those held by equity providers
	Equity	Investments made into a business by investors in exchange for common or preferred stock. Equity investments do not have a maturity and involve higher risk compared to debt investments as return depends on the company's ability to generate profits and, in case of liquidation or bankruptcy, they are repaid last. As equity investors accept a higher risk than debt investors, return expectations are usually higher
	Grants	Funds provided by an entity (usually a public body or a charitable foundation) to an individual or institution for a specific purpose believed to be in the public interest. Unlike loans, grants are not to be paid back for a return on investment. Some grants (i.e., convertible or refundable grants) can be converted into equity or loans if a project reaches certain pre-agreed milestones

	Instrument	Description
Capital markets instruments	Green bonds and sukuks	Green bonds are fixed income securities whose proceeds are earmarked to climate and environmental assets, or to finance specific climate or environmental projects. Green sukuks are Shariah-compliant financial certificates similar to green bonds where instead of interests, investors receive an agreed share of the profits generated by the pool of underlying assets, which are partially owned by investors
	REITs	A real estate investment trust (or REIT) is an entity formed to own, and potentially operate, cashflow generating real estate assets which can pass income to shareholders in the form of dividends
	YieldCos	A yield company (or YieldCo) is an entity formed to own operating assets and raise funds by issuing shares to investors. Cash flows from these operating assets are then used to distribute dividends (cash payments) to shareholders over time
Results-based finance instruments	Results-based funding	Results-based (or conditional) funding is a board term used here to include any type of payment-by-results mechanisms (either output-based or outcome-based), where funds are disbursed by investors only after the project has achieved certain predetermined results, irrespective of how these were achieved. Results are usually verified by an independent auditor.
	Carbon finance	Carbon finance is a type of results-based finance mechanism which involve contracts to trade emission reductions on carbon markets in the form of quotas or carbon credits (e.g., Certified Emission Reduction [CER]). Emission reductions are usually verified by a third-party auditor.
	Environmental impact bonds	An environmental impact bond (EIB) is a pay-for-success innovative financing instruments where financial returns on the investment are directly tied to the ability of the project to deliver successful environmental outcomes.
Risk mitigation instruments	Currency hedging instruments	Derivative instruments used to offset the risk posed by specific foreign exchange positions. These include currency forwards,[1] futures,[2] swaps[3] and options[4]
	Guarantees	Promise of performance to a beneficiary in the event that the party who would normally provide a service or good fails to do so. A guarantee inserts a third party into a legal agreement to provide an extra layer of protection for the beneficiary
	Insurance	Direct agreement between an insurance provider and a policy holder providing financial compensation in the instance of an event that results in harm or loss

	Instrument	Description
Structured finance strategies	**Standardization**	Process of standardizing legal agreements (e.g., power purchase agreement, O&M agreement) between two of more parties whereby most of the contractual terms are established in advance and non-negotiable
	Aggregation	Process of bundling two or more projects together into one transaction
	Securitization	Procedure where an issuer designs a marketable financial instrument by merging or pooling various financial assets into one group. The new, securitized, financial instrument is then divided into different tranches, each of which consist of individual assets grouped according to various factors (e.g., type of loan, maturity date, interest rates, remaining principal)
Non-financial tools	**Capacity building and training**	Training activities targeting a variety of stakeholders aimed at developing and strengthening individual and organizational skills, abilities, processes, and resources needed to support and implement projects at different stages of development
	Data tools and platforms	Data modelling tools and platforms include software applications and databases providing a variety of information useful to support and implement projects at different stages of development
	Servitization	Servitization is the process through which a company shifts from a product-centric business model to a service-centric one. In a servitization model, the customer pays a fixed fee per unit of service consumed, while the ownership of the system remains with the technology provider, who remains responsible for all operation costs

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