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The Opportunity for Emergent Climate Tech in Africa



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Cover photo: Octavia Carbon.



About Third Derivative

Third Derivative, RMI's global climate tech accelerator, finds and helps the most promising early-stage climate tech companies while priming the market for their adoption. By uniting and aligning investors, corporations, and experts with the world's most promising climate tech startups, Third Derivative bridges finance and resource gaps to increase the speed to market. The flexible and highly curated remote accelerator program enables startups to focus on their unique needs and opportunities. Together, we are moving markets to achieve an equitable climate future. Learn more at third-derivative.org.



About RMI

Rocky Mountain Institute (RMI) is an independent, nonpartisan nonprofit founded in 1982 that transforms global energy systems through market-driven solutions to secure a prosperous, resilient, clean energy future for all. In collaboration with businesses, policymakers, funders, communities, and other partners, RMI drives investment to scale clean energy solutions, reduce energy waste, and boost access to affordable clean energy in ways that enhance security, strengthen the economy, and improve people's livelihoods. RMI is active in over 60 countries.

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Executive Summary



TalusAg's modular green ammonia facility in Naivasha, Kenya. Photo credit: TalusAg

For too long, the global conversation around energy and climate has framed development and decarbonization as opposing forces, a choice between prosperity and planetary health. Africa has the opportunity to rewrite this script — to establish leadership in the industries that will define a future net-zero global economy.

The Nairobi Declaration and the Paris Pact for People and the Planet lay this out in no uncertain terms: “no country should ever have to choose between human development and climate action.” These agreements call for **“climate-positive investments that catalyze a growth trajectory anchored in the industries poised to transform our planet.”**

Across the continent, African countries aren't just setting climate goals — they are hunting for the smartest, fastest, and lowest-cost path to economic transformation. Their priorities are clear: expand energy access for millions still living in the dark, unlock industrialization, and build businesses that represent the future, not the past.

Compared to so-called “developed” economies, African countries are often less burdened by sunk costs in outdated infrastructure and status-quo bias. **They are poised to bypass incumbent technologies and approaches viewed as “mature” and “proven” today that will simply be “old” and “inferior” tomorrow.**

The old trade-offs no longer apply. The next chapter of development will be powered by energy and industrial solutions that are better, faster, cheaper — and lower-carbon as a by-product, not a burden.

Africa doesn't have to just follow a new playbook — it can write it. And in doing so, it can prove that the best path to prosperity is also the best path for the planet.

The Imperative and Opportunity for Emergent Climate Tech in Africa

Historically, Africa's energy conversation has centered on scarcity: who lacks access to reliable energy and how to fill the gaps. With an estimated 570 million people lacking access to electricity in the sub-Saharan region, this story is vitally important. But with surging demand across every sector, the other story is one of unprecedented opportunity.

By 2054, Africa's population will swell to 2.6 billion, driving massive new demand for electricity, buildings, food, mobility, and the other products, services, and industries that will enable Africans to live the lives they want to live.

Today, half of the world's multidimensionally poor live in sub-Saharan Africa, where one in two people lack electricity — many African countries' biggest development bottleneck. Despite steady growth, Africa's average electricity use remains far below the “modern energy minimum” of 1,000 kilowatt-hours (kWh) per capita per year. Even under optimistic forecasts, per capita consumption will remain below that threshold until 2040. Africa's energy demand isn't just set to rise — it *must* rise for Africans to prosper. Beyond electricity, demand is exploding in other critical sectors:

- **Buildings:** 70% of Africa's 2040 building stock does not yet exist, creating a once-in-a-generation chance to construct livable, resilient, efficient cities.
- **Food:** Raising domestic productivity can help meet projected demand for more quality food (e.g., 250% more protein by 2050) and agricultural inputs (e.g., 5x increase in fertilizer demand under conventional practices) while reducing import dependence.
- **Industry:** Business-as-usual suggests that African manufacturing capacity will at least double by 2050. But it could be much more if Africa seizes its opportunity to establish leadership in industries of the future. Industrial decarbonization will be driven by the ability to provide low-carbon electricity and heat, and by the ability to build capital-intensive, long-lived plants and factories. Africa's world-leading solar and geothermal resources can provide the former, and its lack of legacy assets enables the latter.

Emergent climate technologies represent a trillion-dollar opportunity to translate this burgeoning demand into gigaton-scale industries. We define these “emergent” technologies as solutions essential for climate-positive growth but not yet commercially mature. They fall outside traditional “bankable” infrastructure projects and generally align with venture investing. The International Energy Agency (IEA) projects that over one-third of required global emissions reductions will come from these early-stage technologies. Africa is positioned to test, refine, and scale many of them faster and more affordably than anywhere else.

Emergent climate technologies aren't just better for the planet; they are simply better. They are quicker to deploy, offer lower-cost development pathways, and can be powerful enablers of energy access. Africa can meet its building needs with superior, locally sourced, low-carbon or carbon-storing materials, coupled with energy-efficient designs and superior cooling technologies. Similarly, a clean energy path could supply electricity to all Africans by 2030 at 30% lower cost and with 90% fewer emissions. Avoiding fossil fuel dependence reduces exposure to fuel price volatility and can prevent some of the 900,000 air pollution-related deaths predicted over the next four decades.

Africa's natural and human capital give it a competitive edge with many of these technologies. This includes the world's richest solar resource, with 1.4 million terawatt-hours (TWh) per year of potential (50 times the world's total electricity consumption), plus 30% of the world's critical mineral reserves, large biogenic carbon pools, soils that have not yet been degraded by decades of extractive farming, and a workforce that will swell to 800 million people by 2050 — including a population of college graduates that is growing at nearly 9% per year.

Because Africa isn't nearly as locked into legacy systems as the rest of the world, it can build the next generation of industries, based on emergent climate tech, from scratch. The future of energy and industrial innovation doesn't have to be confined to the Bay Area, Beijing, or Bengaluru; it can be built in Accra, Lagos, or Nairobi.

The Current State of Financial Flows, Deployment, and Founder Experiences

Africa's entrepreneurial energy is indisputable. There are 350 African companies with annual revenues of \$1 billion or more and (as of the time of writing) nine technology “unicorns” — all in software, fintech, and retail, which accounts for most VC-backed activity. Some of these companies provide platforms for climate-positive businesses — like M-KOPA unlocking \$1 billion in credit for solar and EVs.

But despite these successes, the continent's climate tech revolution is starved of capital and support.

Africa needs \$190 billion per year to meet its clean energy and climate goals, yet only \$44 billion flows in. The shortfall is especially stark considering that Africa's needs account for just 2.5% of the \$7.4 trillion in global climate finance needed annually. While investment in Africa must quadruple in relative terms, the global community barely needs to shift the needle to close this gap.

The funding drought is even worse for emergent climate tech. While global climate tech VC funding has averaged \$65 billion per year recently, Africa's share is a mere \$0.9 billion (1.4%). Nearly 90% of these investments since 2014 have gone to solar solutions, leaving a small portion to be invested in increasing the grid's capacity to harness these new energy resources, or to solve challenges in other sectors like heavy industry, the built environment, agriculture, and mobility.

So where is the money? The problem isn't always a lack of funds (though R&D grant funding for emergent climate tech is basically absent) — it's the **inability to crowd in private capital and the failure to deploy the capital that is already there.** Development finance institutions (DFIs) dominate African climate investment, accounting for 75% of total climate finance. Private investors, by contrast, provide just 18% of Africa's climate finance, compared with 86% in the United States, 57% in Western Europe, and 39% in East Asia. Even when money is raised, it moves at a snail's pace — of the \$33 billion mobilized by a selection of emerging-market climate funds analyzed in this paper, only \$11 billion has been deployed, and just \$8 billion has reached Africa.

The biggest culprit? A broken system of collaboration. Almost every major climate project in Africa requires both concessional public capital and private investment. But these players rarely work together effectively, if at all. Governments, DFIs, and banks have misaligned risk appetites, slow processes, and onerous eligibility requirements, and they fail to help at early stages of project development. As a result, all investors hesitate, and vital climate initiatives stall.

The challenge is exacerbated by a combination of foreign exchange risk and unreasonably expensive debt. Africa's climate tech startups often rely on commercial loans, but 65% of impact debt is denominated in dollars or euros — while revenues are earned in local currencies. When local currencies depreciate, as the Nigerian naira did by 70% against the dollar since 2023, repaying those loans becomes nearly impossible. This foreign currency mismatch, coupled with interest rates that are often 5%–6% higher than in similar emerging markets, means many African climate entrepreneurs can't afford to scale, even when they've proven out their technologies and business models.

There is good news. Africa's climate tech VC activity is growing, from virtually zero to an average of \$900 million per year over the past four years. Globally, climate funds are sitting on \$86 billion in “dry powder,” and directing just 5% of this to Africa would exceed the total climate tech VC investment over the past five years. Venture studios like Delta40, Kinjani, and Persistent Energy are helping talented founders establish businesses. VCs like Africa Climate Ventures, Catalyst Fund, Katapult Africa, and Factor E are blending investment with hands-on strategy, technology, and business model support — critical when funding alone isn't enough. At the later stages, initiatives like Great Carbon Valley are mobilizing capital and offering project development support to scale industrial-scale climate solutions.

We need to harness this momentum. It may be a tall order — investment diversification, radically improved public–private collaboration, DFI reform, currency hedging, lower-cost debt — but this isn't just an African problem. The whole world needs its fastest-growing continent to establish a paradigm for climate-positive growth.

An Illustrative Set of Emergent Climate Tech Opportunities







Follow our deep-dive series on six promising technology areas spanning energy, agriculture, heavy industry, carbon dioxide removal, and the built environment at rmi.org/insight/africa-tech-micro-theses.

We analyzed several emergent climate tech opportunities that hold major promise for Africa in the form of “micro investment theses.” We preview these micro-theses on pages 35-37 here, and will release the full content in a series of articles in Q3-2025. The micro-theses will ultimately be available as a **detailed companion to this paper**. They are intended to be illustrative, not comprehensive, and share several common characteristics. Specifically, these opportunities:

- **Anticipate growing demand** and reduce reliance on imports.
- **Offer a natural capital advantage:** they harness Africa's unique resources, from abundant sunshine to mineral wealth.
- **Enable energy access:** they increase demand for and enhance the viability of reliable, low-cost renewable power.
- **Create jobs:** at scale, they will generate skilled, well-paying jobs in the formal economy.
- **Lower costs:** they will ultimately outcompete incumbent technologies due to learning curves and economies of scale.
- **Offer superior performance:** they will produce stronger materials, more reliable power, lower-maintenance vehicles, or healthier crops, for example.
- **Are better for the planet:** they mitigate or avoid climate pollution, enhance resilience, and help with other Earth system boundaries.

Exhibit ES1

Emergent Climate Tech Opportunities for the Built Environment, Agriculture, Carbon Dioxide Removal, Industry, and Electricity

Technology	Demand multiplier (2022–50)	Opportunity driver	Promising innovation areas	Pathways to scale
 Green cement	2.3x more cement demand	Cement's price-to-weight ratio lends itself to localized supply chains	<ul style="list-style-type: none"> AI/ML for mix optimization Supplementary cementitious materials (SCMs) Alternative cements 	<ul style="list-style-type: none"> Partnerships with incumbents Developing local supply chains Performance-based standards
 Green fertilizer	5.1x more fertilizer	Potential to at least double yields with improved practices and inputs. African farmers pay high prices for fertilizer due to import and transportation costs	<ul style="list-style-type: none"> Distributed, modular green ammonia plants utilizing: <ul style="list-style-type: none"> Novel Haber-Bosch Plasma catalysis Chemical looping 	<ul style="list-style-type: none"> Efficient and safe fertilizer storage and distribution Domestic offtake contracts and forex safeguards
 Grid connectivity, intelligence, and flexibility	4.3x more electricity	Energy access is a top policy priority, and grids can be rapidly improved with metering and grid control. This is also the foundation for rapidly expanding low-cost distributed energy resources (DERs)	<ul style="list-style-type: none"> Mapping and simulation to improve visibility Grid-enhancing technologies DER management software 	<ul style="list-style-type: none"> Capacity-building at utilities Partnerships with service providers and developers Policy to enable high levels of DER penetration
 Renewable thermal technologies	1.2x–8x more industrial heat demand for different industrialization pathways	As governments prioritize industrialization, new factories can adopt cheaper, import-free heat sources instead of burning petroleum products for heat	<ul style="list-style-type: none"> Renewable thermal technologies tailorable to local resources Near term: <400°C heat for food and textiles Innovation progressing toward 400°C–1500°C 	<ul style="list-style-type: none"> Access to low-cost capital to overcome higher up-front cost and unlock lower long-term opex Cheap electricity to outcompete alternatives
 Advanced/enhanced geothermal energy	3x scaling potential by 2030	Advanced geothermal technology can unlock 12.4 TW of clean, firm electricity, with industrially useful heat as a by-product	<ul style="list-style-type: none"> Enhanced geothermal improves access to heat in the ground Closed-loop systems reduce water demand Advanced drilling reaches new frontier of “super hot rocks” 	<ul style="list-style-type: none"> Project development partnerships between producers and users of geothermal Resource assessment Overcoming up-front cost hurdle
 Direct air capture	500x larger carbon market	Renewable energy potential (including geothermal) and geophysical carbon storage potential	<ul style="list-style-type: none"> Optimize technology for geothermal with low-grade heat Mass-customize storage equipment Lower project development barriers 	<ul style="list-style-type: none"> Project development support Carbon market strategies Supportive regulation

Solutions to Spur Innovation, Deployment, and Scale

Emergent climate tech startups in Africa face gaps in funding and support across all stages, and the consultative effort around this paper highlighted seven solutions. These are neither exhaustive nor fully developed; rather, they reflect the ideas generated by the group we convened in partnership with The Rockefeller Foundation, and the areas in which the group members have some agency and influence.

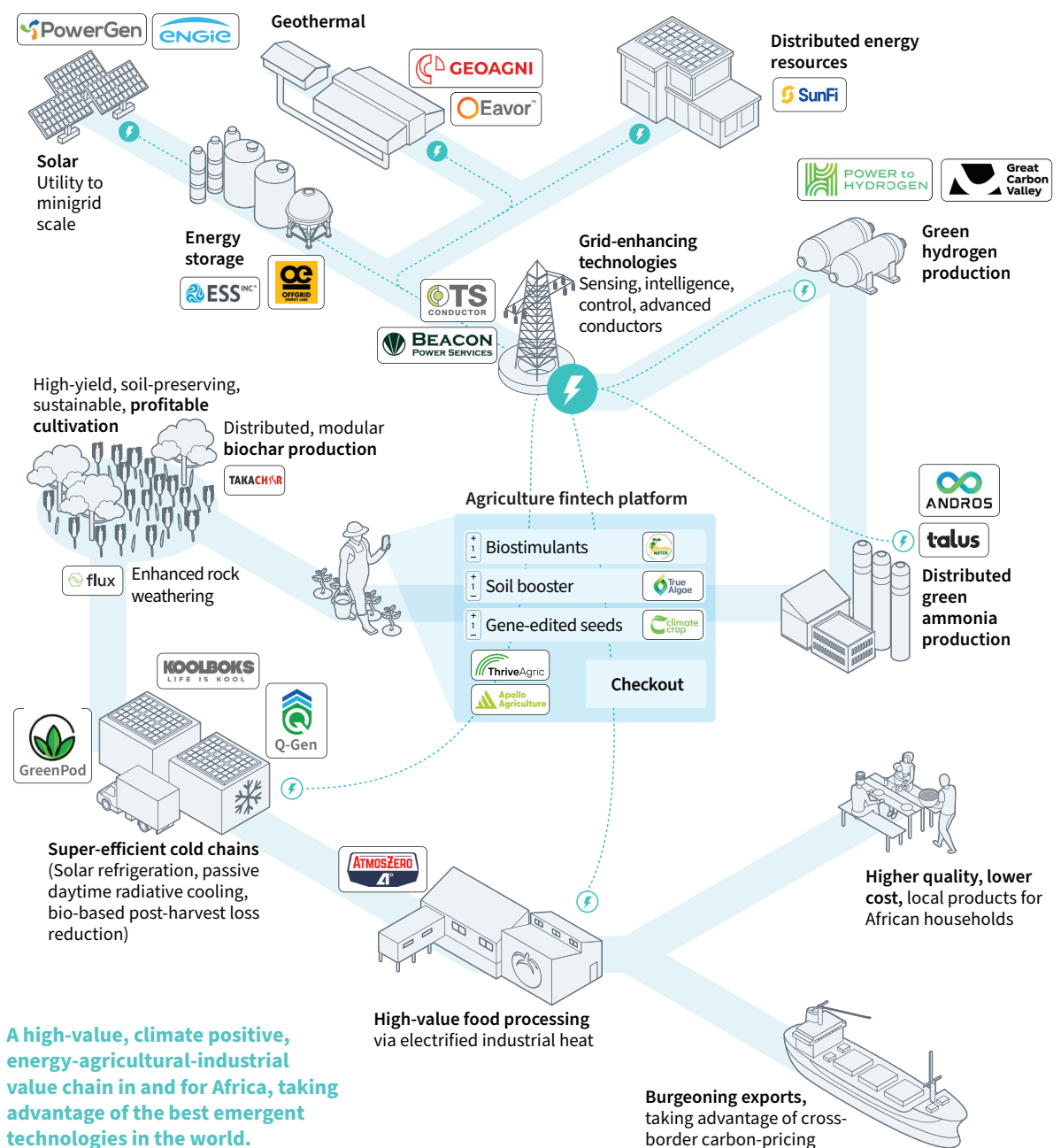
- 1. Increase Support for Africa-Based Idea-Stage Research and Venture-Building**
 - Africa lacks university and government-backed climate tech incubators like those in the United States and Europe.
 - Strong private programs like **Delta40**, **Kinjani**, and **Persistent Energy** support entrepreneurs with cash, mentorship, technical assistance, and partnerships.
 - More funding and support should go into expanding these programs across Africa.
- 2. Create a Shared Investor Research, Diligence, and De-Risking Service**
 - Few global climate tech investors focus on Africa, leading to a **chicken-and-egg problem**: investors won't conduct research unless they are convinced there is investment potential, and they won't be convinced of investment potential without research.
 - A centralized research and diligence service would develop **Africa-specific investment theses** on key opportunities including, but not limited to, the ones sketched out in this paper.
 - Partnerships with organizations like **Africa Climate Ventures**, **Delta40**, and **Factor E** could build robust investment frameworks, increasing investor confidence.
- 3. Build a Consortium of Corporate Deployment Partners and Buyers**
 - Many climate solutions require **large-scale industrial integration** but struggle to connect with corporate buyers and partners.
 - A consortium could leverage its collective influence to bring Africa-based corporations and multinationals to the table.
 - **Tech challenges and offtake agreements** could foster innovation while aligning corporate interests with those of climate tech startups.
- 4. Offer Financing Incentives to Induce Global Startups to Deploy in Africa**
 - Many promising green startups focus on the United States and Europe, ignoring Africa due to a lack of networks and support.
 - Investors could provide **highly favorable financing terms** (larger checks for less equity, relaxed control terms, share return programs) to incentivize deployment in Africa.
 - Nonfinancial support (corporate partnerships, regulatory assistance) is also crucial for success.
- 5. Create Low-Interest, Local-Currency Debt Facilities**
 - High interest rates in Africa make scaling climate solutions costly, despite strong market demand.
 - **Blended finance models** (e.g., first-loss reserves funded by philanthropy) could encourage local banks to offer cheaper debt.
- 6. Build an African “Project-Developer-as-a-Service” for Especially Complex Climate Projects**
 - Capital-intensive industrial climate tech (e.g., green cement or ammonia, direct air capture) projects require specialized development expertise.
 - Africa lacks project development firms that de-risk projects and make them bankable for large investors.

- A model similar to **Mark1 (United States)** or **Great Carbon Valley (Kenya)** could help structure and support projects from early planning through the final investment decision.

7. Create a “Deal Team” to Close Africa’s Climate Finance Gap

- Although a selection of funds analyzed for this report raised **\$33 billion** for climate projects in emerging markets, **only \$8 billion** has been deployed in Africa to date.
- A **specialized investment banking function** could **structure and close** African climate deals.
- The team would combine private and public finance expertise to **unlock stalled climate investments**.

Exhibit ES2 An African future anchored in the industries poised to transform our planet



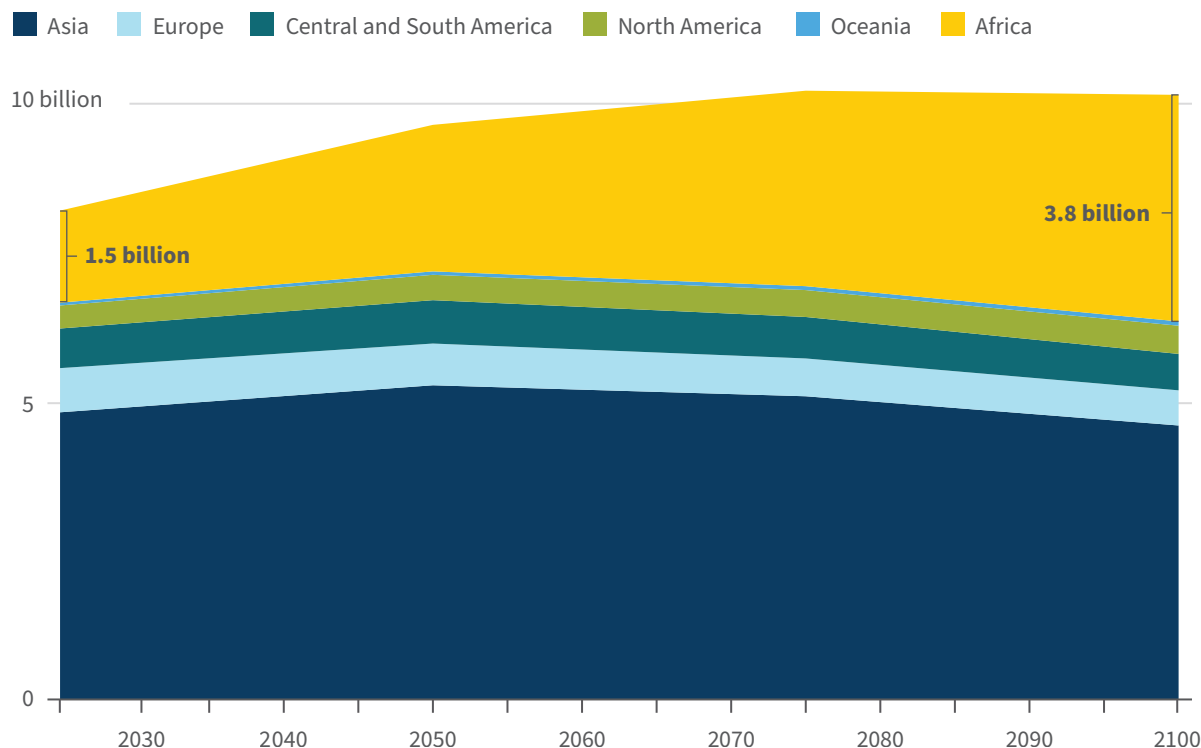
The African Climate Tech Imperative and Opportunity

The conversation on climate and energy in Africa has historically focused on need and access. But rapidly rising demand — for everything — also makes it a story of huge opportunity.

Sub-Saharan Africa is expected to grow its population by 79% over the next 30 years, reaching 2.6 billion by 2054 and upward of 3.8 billion by the end of the century (Exhibit 1).¹ Today, nearly half of the world's multidimensionally poor people live in sub-Saharan Africa,² where one in five experienced food insecurity in 2023,³ and where one in two lack access to electricity.⁴ These challenges are strongly interlinked: of those deprived of electricity, 96% lack access to clean cooking fuel, 86% live in precarious housing, and 83% live without adequate sanitation access.⁵

Exhibit 1 Africa's population will more than double by 2100 while other regions remain steady or decline

Projected population by region

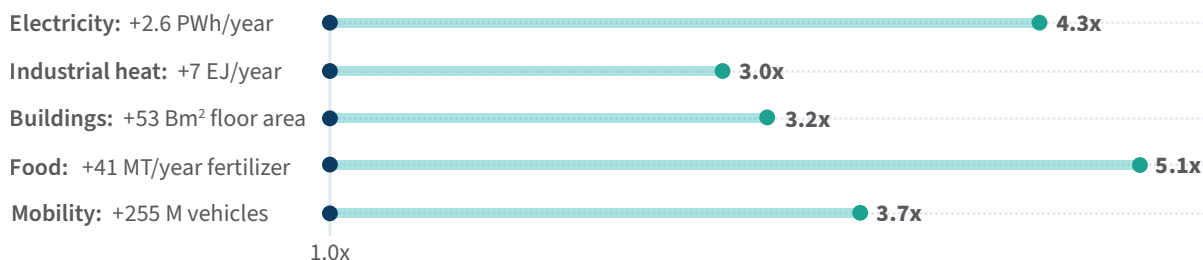


RMI graphic. Source: United Nations Department of Economic and Social Affairs

Closing these human development gaps as Africa grows will require rapid increases in the provision of energy, building stock, and food in the coming decades (Exhibit 2). These are just a few of the products and services that must expand to ensure nearly 4 billion Africans can live the lives they want to live.

Exhibit 2 A growing and wealthier Africa will see demand for energy, buildings, food and mobility grow 3–5x through 2050

Demand growth from 2022 (●) to 2050 (●)



Note: Demand trends vary with modeling assumptions about Africa's growth pathway. For example, industrial heat demand growth by 2050 ranged from 1.2–8x in models reviewed for this paper. RMI graphic. Source: IEA, Energy for Growth Hub, World Bank

Electricity consumption must multiply to provide critical energy services and achieve development outcomes.

It starts with energy services. Universalizing electricity access is arguably Africa's most pressing development imperative. As the Energy for Growth Hub observes: "no high income country is low energy," "income and electricity consumption are tightly correlated across time and space," and "sufficient energy consumption is a necessary input to economic activity everywhere while its absence is a binding constraint on income and development."⁶

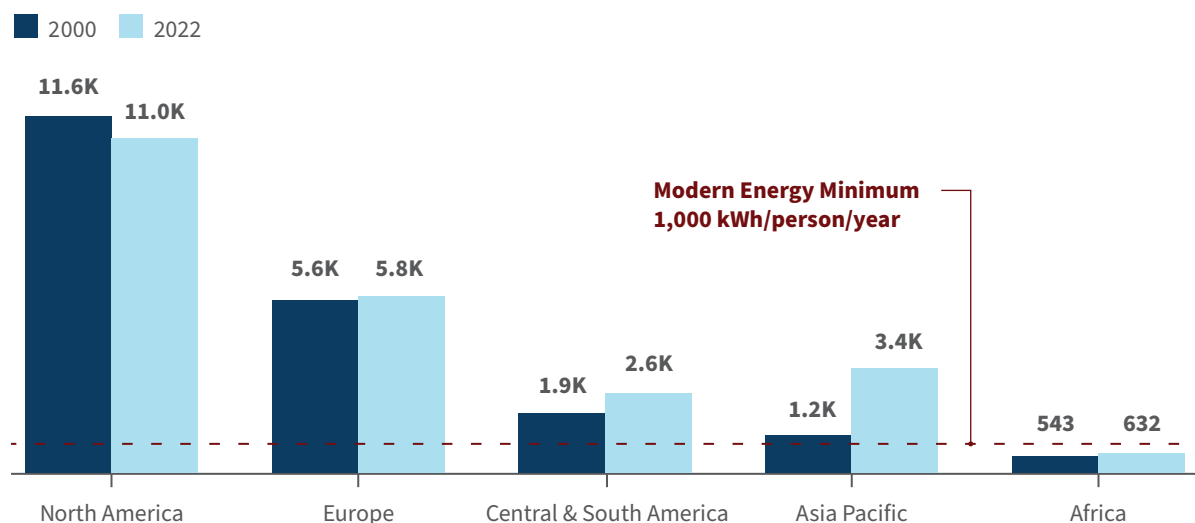
Africa is home to 570 million — over 80% — of the roughly 700 million people without electricity access today, and this share has increased over time (it was 50% in 2010).⁷ Despite steady growth, per capita electricity consumption remains far below that of richer countries and regions — and below the "modern energy minimum" of 1,000 kilowatt-hours (kWh) per capita per year that includes "both household and non-household electricity consumption and tightly correlates with an average income of about \$2,500 per year, roughly the midpoint for lower-middle income status" (see Exhibit 3, next page).ⁱ

Africa's total electricity consumption is poised to grow from 700 TWh in 2022 to 3,400 TWh in 2050 under the IEA Announced Pledges Scenario, translating to a 185% increase in per capita consumption.⁸ It should probably be more; even at this rate of increase, the average African would still consume less than the modern energy minimum until 2040.

ⁱ The Hub points out that the current definitions of the modern energy minimum from the United Nations Sustainable Development Goal 7 (SDG7) and the IEA (50 kWh per capita per year in rural areas and 100 kWh in urban areas) are too low and fail to capture consumption outside the home, where the majority of electricity is used.

Exhibit 3 Despite growth, African electricity consumption remains far below that of richer regions — and less than the “new” modern energy minimum

Electrical energy consumption per capita for different regions (kWh/person/year)



RMI graphic. Source: IEA.

Growing economies demand more, including buildings, healthy food, and mobility.

Buildings: 70% of Africa’s 2040 building stock has not yet been built.⁹ There is an unprecedented opportunity to build better — more resilient, safe, comfortable, affordable, and efficient — along with immense demand for both building materials and energy services associated with their operation, especially for cooling.

Food: Today, about three in four African households would need to spend more than half of their annual income on food to achieve a healthy diet, a situation exacerbated by food price inflation,¹⁰ which is in turn exacerbated by climate change.¹¹ This “share of wallet” challenge contributes to a damaging feedback loop: household food budgets constrain other forms of consumption, especially energy, reducing the financial viability of energy access investments, limiting economic activity and earning potential. Reaching a food-secure future for Africa will require raising household incomes to improve Africans’ ability to buy healthy foods,¹² while at the same time lowering exposure to price shocks in global markets. Raising domestic productivity can help meet projected demand for more quality food (e.g., 250% more protein by 2050¹³) and agricultural inputs (e.g., a 5x increase in fertilizer demand under conventional practices¹⁴) while reducing import dependence. Technology can help sustainably increase agricultural productivity, reduce postharvest losses, and enable greater “downstream” value capture from processing.

Mobility: The continent’s vehicle fleet is set to quadruple in size to 350 million vehicles by 2050, roughly equivalent to the size of the Indian market today.¹⁵ Around half of all vehicles currently in use in Africa are two- and three-wheelers, 90% of which are deployed in commercial activities.¹⁶ This market segment is positioned to lead in uptake of EVs: for many customers, electric two-wheelers are already cheaper to own and operate over their lifetimes than fossil fueled incumbents.



Interlocking, precast geopolymer concrete blocks produced by Ghanaian startup Theseus Development, which reduce emissions by 80% compared to standard concrete blocks, pictured alongside co-founder and COO Evans Nartey.

Industry and manufacturing: African governments are keen to seize on the economic value and jobs created by producing goods and services for sale at home and abroad. Countries such as Kenya and Uganda have set aggressive targets to raise the manufacturing sector contribution to GDP by at least 10% by 2030. This includes the industrial goods required to meet the demands described above (cement and air conditioners for buildings, fertilizer and refrigeration for crops and food, electric vehicles and low-carbon fuels for mobility), but also entirely new industries that will form a vital part of a net-zero carbon world — like engineered carbon dioxide removal.

Climate change is exacerbating Africa’s economic development challenges, raising the importance of resilience and adaptation.

In the face of these rising demands, climate change is already shifting the goalposts, making it harder for communities to flourish. Despite having contributed to less than 3% of global atmospheric warming, African countries are already facing some of the world’s worst climate change impacts and biggest resilience challenges.¹⁷ Africa accounts for 60% of countries in the bottom quartile of the Notre Dame Global Adaptation Initiative Country Index, which rates exposure, sensitivity, and capacity to adapt to the negative effects of climate change.¹⁸ The IPCC projects with high confidence that negative impacts are “projected to become widespread and severe, with reduced food production, reduced economic growth, increased inequality and poverty, biodiversity loss, and increased human morbidity and mortality.”¹⁹ However, the same report also projects that inclusive economic development can spare millions from the worst impacts of climate change, and that cross-sectoral “nexus” solutions have multiplicative benefits because they solve several problems at once. For instance, efficient cold storage can combine with green fertilizer production and solar irrigation to increase per-acre yields and reduce food waste, ultimately raising farmer incomes while sparing land for nonagricultural uses and bolstering domestic food supply.

Emergent climate tech can help Africa assume industrial leadership, accelerate development, and adapt to a rapidly changing climate.

At the September 2023 Africa Climate Summit, African leaders committed to an African vision for “climate-positive” growth and industrial transformation.²⁰

“We call for climate-positive investments that catalyze a growth trajectory anchored in the industries poised to transform our planet and enable African countries to achieve stable middle-income status by 2050.” — *African Heads of State and Government, gathered for the inaugural Africa Climate Summit in Nairobi, Kenya, September 2023*

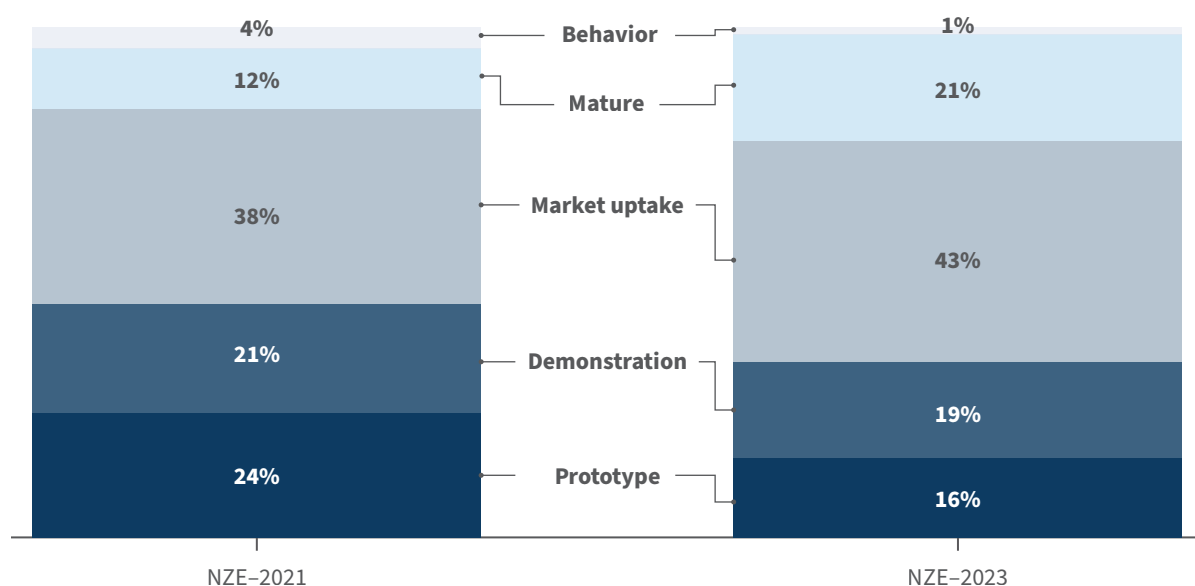
Climate Action Platform Africa further defines this “climate-positive” growth as “meeting Africa’s own growing demand for energy, goods, and services,” “producing for the world,” and “removing carbon” by “leapfrogging to widespread adoption of green technologies and practices.”²¹ These technologies and practices represent fundamentally superior ways to meet the demands of growing economies, offering greater resilience, enhanced health and well-being, job creation, and increased labor productivity — while just so happening to minimize climate pollution. They can also enable Africa to lead the world in the creation of new gigaton-scale industries that meet the continent’s needs, pull more people into the formal economy, and raise labor productivity.

Emergent climate technologies, the focus of this paper, comprise a subset of solutions that are essential to Africa’s climate-positive growth aspirations and the world’s net-zero goals but are not yet commercially mature. The IEA’s 2023 Net Zero Emissions scenario relies on climate technologies still in the prototype or demonstration stages for over a third of the reductions needed to stabilize warming at 1.5°C²² (Exhibit 4).

Emergent climate tech companies in Africa can also stake out a global leadership position, especially with respect to testing, iterating on, de-costing, and commercializing technologies at early stages of adoption (while earlier-stage R&D capacity in Africa improves). This would help make these technologies more affordable and scalable for global markets and help their investors realize earlier returns. Cella (CO₂ mineralization), Talus Ag (green ammonia), and Octavia Carbon (direct air capture of CO₂) are just a few examples of startups doing this on the continent today.

Exhibit 4 While we’re making progress, 35% of the emissions reductions we need for net zero will come from technologies that are still in development

CO₂ emissions reductions in 2050 relative to base year by technology maturity in the IEA’s 2021 and 2023 Net Zero Emissions by 2050 (NZE) scenario models



Note: The “Behavior” category describes emissions reduced by simply using less. The other categories refer to the maturity of technologies needed for all other emissions reductions to achieve the 1.5°C goal.

RMI graphic. Source: IEA.





Here is how we think about the characteristics of emergent climate technologies:

- They are broadly aligned with venture investing rather than “bankable” projects served by project finance, infrastructure funds, and later-stage growth equity (e.g., utility-scale renewables development or EV manufacturing).
- They include solutions that accelerate the deployment of commercially mature climate tech, as well as solutions that solve “end-game” decarbonization challenges — areas in which many promising technologies are only at the pilot or demonstration stage.
- They include both “direct mitigation measures” and “enablers.” Direct mitigation measures are benign alternatives to legacy, greenhouse gas-intensive anthropogenic forcers (e.g., a distributed clean energy portfolio versus a coal- or gas-fired power plant), or solutions that remove carbon from the atmosphere to “heal” some of the damage already done. Enablers create indirect impact by making it faster, easier, and/or cheaper to deploy direct mitigation measures (e.g., software-based financing and distribution platforms for electric vehicles, agricultural inputs, or home energy solutions). These platforms are also important because they have the potential to give African households and businesses access to the best available tech, regardless of where in the world it has been developed.

See Exhibit 5 for a diagrammatic representation of our definition.

Exhibit 5 How we think about emergent climate tech

Classification of climate tech enablers and direct mitigation measures, along with examples

	Enablers	Direct mitigation measures
Enabling faster, cheaper deployment of mature climate tech	<ul style="list-style-type: none"> • “As-a-service” models for clean energy • “As-a-service” models for mobility • Sensing, AI, controls for utilities • Long-duration energy storage 	<ul style="list-style-type: none"> • Superefficient cold chains • Advanced geothermal • Crop science for yield and resilience 
Solving “end-game” decarbonization challenges	<ul style="list-style-type: none"> • Access to carbon and biodiversity credit markets • Battery upcycling 	<ul style="list-style-type: none"> • Distributed green ammonia • Electrified industrial heat • Alternative cement • Carbon dioxide removal 

Emergent climate technologies are not just better for the climate — they are simply better.

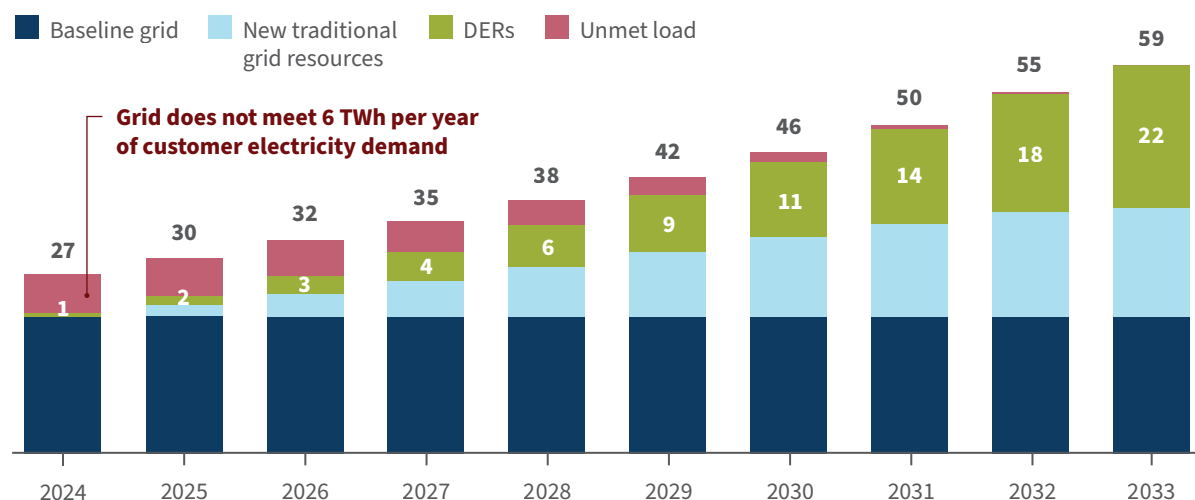
Leaders at the Africa Climate Summit stated that “no country should ever have to choose between development aspirations and climate action.” Emergent climate tech eliminates that dichotomy — these are technologies that are simply superior to their older alternatives. They deliver essential energy services at lower cost (Exhibit 6). We can deploy them faster (Exhibit 7). They are enablers of industrialization and energy access (Exhibit 8). That they are also pollution-free is just one benefit of many.

For example, for every building on the continent today, two more will be constructed by 2040. This provides an opportunity for 53 billion square meters of floor area to be constructed from superior, cheaper, locally sourced, low-carbon or carbon-storing materials.²³ Buildings can then be cooled by passive daytime radiative cooling (PDRC) materials on the roof and super-efficient appliances that together can radically shrink energy bills. We estimate, for example, that PDRC materials deployed as cool roofs across informal (self-built) settlements and low-income housing in India alone could reduce indoor temperatures, while saving 317,000 lives and over 68 million tons of carbon dioxide equivalent in cooling-related emissions between now and 2030.²⁴ Taken together, efficient design, construction, and operation of Indian buildings could save 25% of energy demand and reduce emissions-intensive materials by 45%.²⁵ Conditions are analogous in many African countries.

Similarly, a renewables-focused path can provide electricity access for all Africans by 2030, all while being 30% cheaper and 90% less emissions-intensive.²⁶ Clean energy portfolios — a mix of renewable generation, energy efficiency, demand flexibility and response, and energy storage — can offer a cheaper way to meet peaking demands on the South African grid²⁷ or to boost power availability and reliability in Nigeria in the next 10 years (Exhibit 6).²⁸

Exhibit 6 Cheaper: Distributed energy resources are key to a least-cost Nigerian grid

Projected optimized energy supply for five Nigerian utilities (TWh per year)



Note: Distributed energy resources (DERs) include utility-connected minigrids, commercial and industrial installations, and embedded generation.

RMI graphic. Source: Dadzie et al (2024).

Because climate technologies, by definition, rely on little to no fossil fuel combustion, they reduce exposure both to fuel price volatility and air pollution, helping avoid some of the projected 900,000 premature African deaths that could result from indoor and outdoor air pollution by 2063.²⁹


The supply chains associated with clean energy are also shorter and simpler than those associated with the equivalent fossil fuel infrastructure, translating to faster deployment and easier project development (Exhibit 7). We see this effect with data center project development in rich countries, with some of the fastest deployments coming from colocating new data centers with new clean energy projects, including fully off-grid systems using solar, storage, and thermal assets.³⁰ Meeting load growth and enabling energy access in Africa could follow the same logic.ⁱⁱ

Exhibit 7 **Faster: Clean energy systems can be built quicker than their fossil fuel equivalents**


Fewer deployment steps, more modularity, less long-term import dependency

Natural gas import case


Steps to deploy new energy




>




>



>



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Secure **LNG offtake agreement** and open new shipping route


Build new **LNG terminal** in harbor

Build new **gas pipelines**

Build a **new gas power plant**


Build out **centralized network** to deliver power

Construction time




5–10 years

Minimum size of investment



1–5 GW




~\$3–10 Billion

Dependency after deployment


Dependent on gas supplier and exposed to volatile gas market

Solar + battery power case


Steps to deploy new energy



>



>




Import solar panels and battery packs through existing harbor

Deploy solar + battery locally


Build a **localized grid** to deliver power

Construction time




<0.5 year

Minimum size of investment



1–10 kW



~\$2–3 Thousand

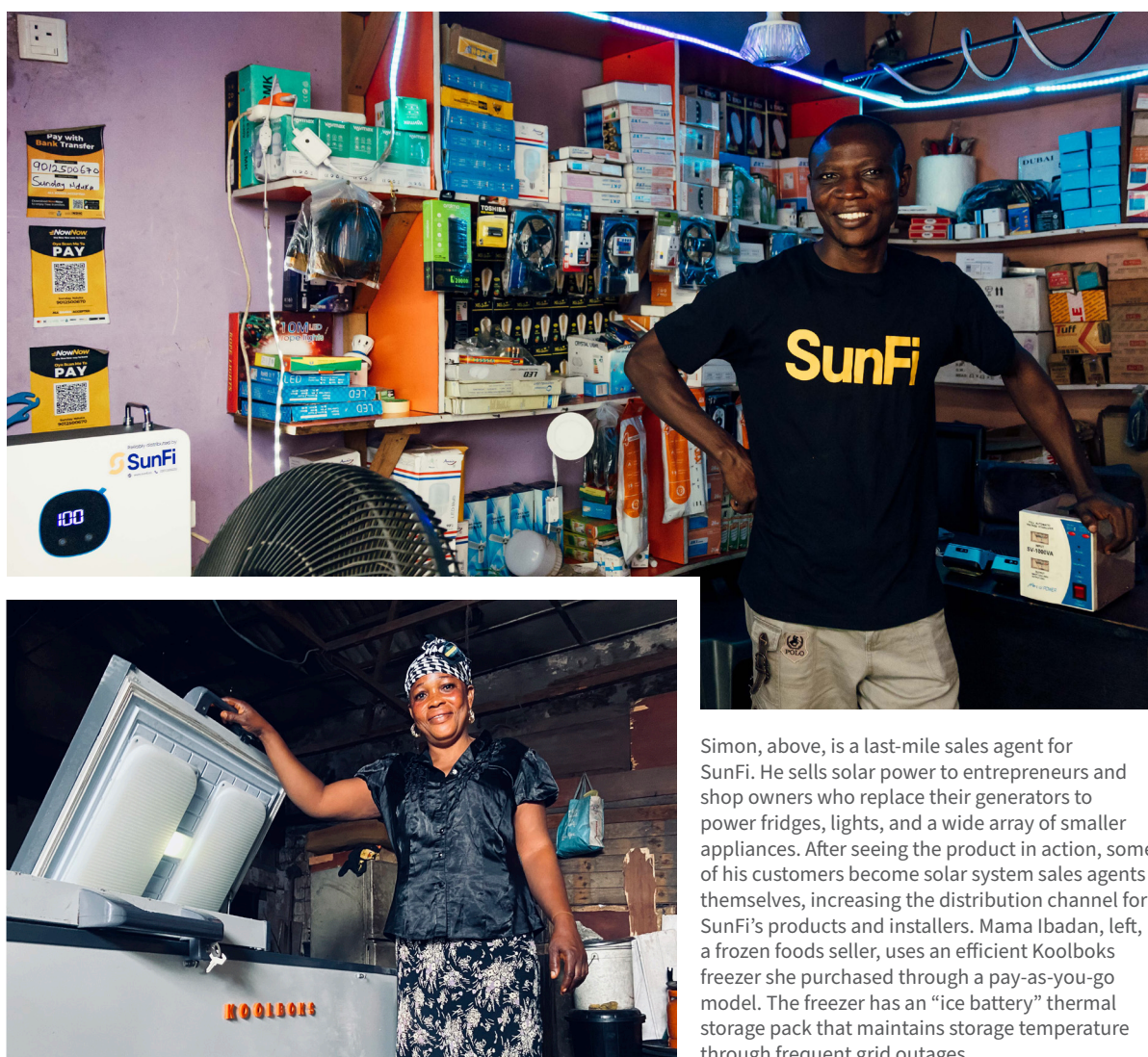
Dependency after deployment

Fully independent until solar panel and battery are at end of life in 20–25 years

ii Because latency is less of a constraint for AI training and reasoning models, this could become a real market for African countries that can move quickly to take advantage of their abundant solar resource.

Although solar and wind are mature technologies that continue to become cheaper and that are inherently modular and quick to build, we still need enablers to speed deployment via innovation in supply chains, finance, and project development. We also need to make the grid better able to integrate variable renewables through both hardware (energy storage, advanced conductors, and other grid-enhancing technologies) and software (utility sensing, intelligence, and controls — the focus of one of our “micro-theses”).³¹

Emergent climate tech also has the potential to offer a critical mass of energy demand that makes clean energy projects financially viable and enables low-cost, reliable energy access for the surrounding community. Donors, energy companies, and governments have embraced the importance of pairing income-generating “productive uses of energy” (PUE) with investments in electricity access to make distributed energy resource (DER) and minigrid projects more viable. In rural Nigeria, for example, a solar-hybrid minigrid can serve a typical 500-person community at a lifetime cost of \$0.56/kWh, but adding load in the form of mills, freezers, and other equipment can drop the per-kWh cost by nearly half.³² A single walk-in cold room consumes more than 100 times the electricity of a typical rural household. Emergent climate tech is already playing an important role, as exemplified by Koolboks’ efficient solar refrigeration and MAX’s purpose-built electric two-wheelers.³³



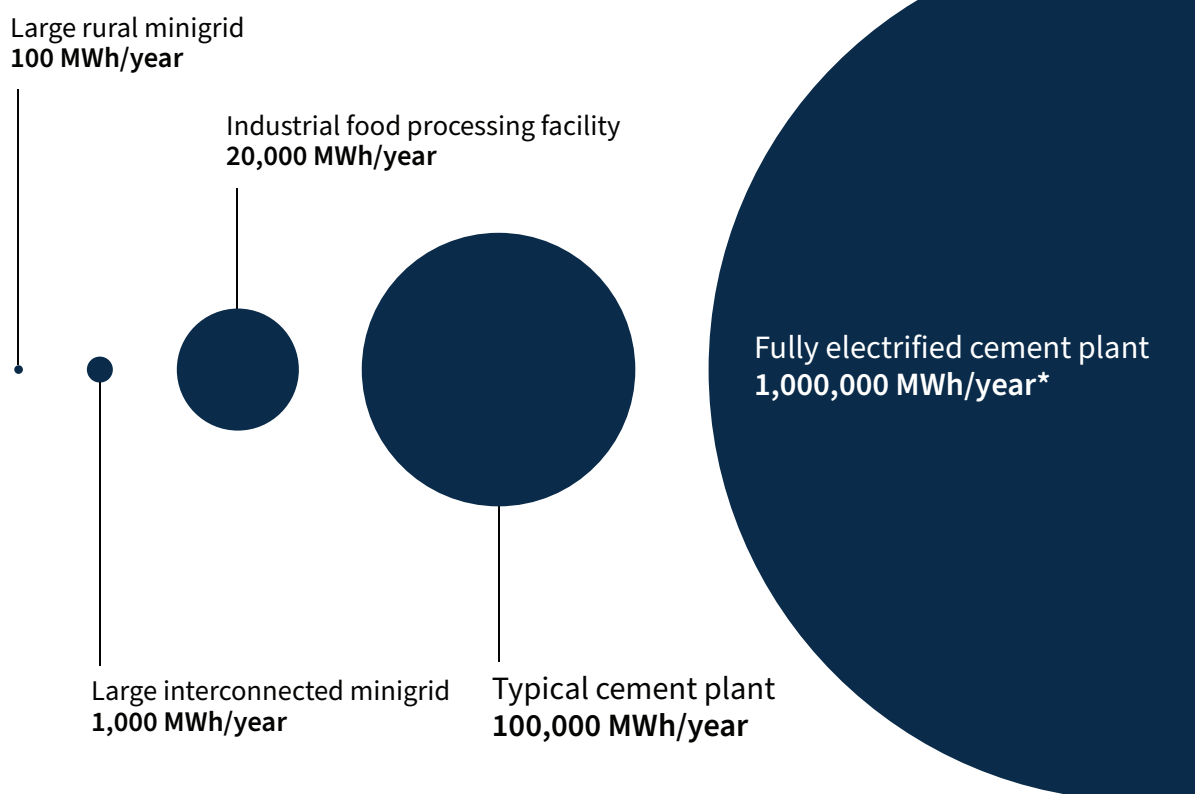
Simon, above, is a last-mile sales agent for SunFi. He sells solar power to entrepreneurs and shop owners who replace their generators to power fridges, lights, and a wide array of smaller appliances. After seeing the product in action, some of his customers become solar system sales agents themselves, increasing the distribution channel for SunFi’s products and installers. Mama Ibadan, left, a frozen foods seller, uses an efficient Koolboks freezer she purchased through a pay-as-you-go model. The freezer has an “ice battery” thermal storage pack that maintains storage temperature through frequent grid outages.

Today, the DFIs and western donors supporting these projects typically limit their purview to small-scale uses, catering to rural small business needs with equipment and appliances like rice mills, cold storage, water pumps, hair dryers, and phone chargers.³⁴ These are valuable, but the productive use logic should also apply to much larger industrial uses, consistent with African leaders' aspirations to spur investment “in the industries poised to transform our planet.”

While large rural and interconnected minigrids range between 100 and 1,000 MWh/year in electricity sales, a single food processing facility may buy 20,000 MWh in a year (Exhibit 8).³⁵ A typical African cement plant producing 1 million tons of cement per year with a traditional rotary kiln will use about 100 gigawatt-hours of electricity annually. If the same plant were built with cutting-edge climate technologies such as an electrified pre-calciner with a plasma gas kiln, it could consume over a terawatt-hour per year to produce low-carbon cement.³⁶ Properly planned, this industrial PUE could underpin investments in generation that are four orders of magnitude greater than even a large rural minigrid project, enhancing grid reliability and access for millions in the process.

Exhibit 8 **Bigger: Energy demand enabled by emergent climate tech can motivate major power system investments**

Magnitude of annual electricity demand by communities compared to industrial productive uses of energy

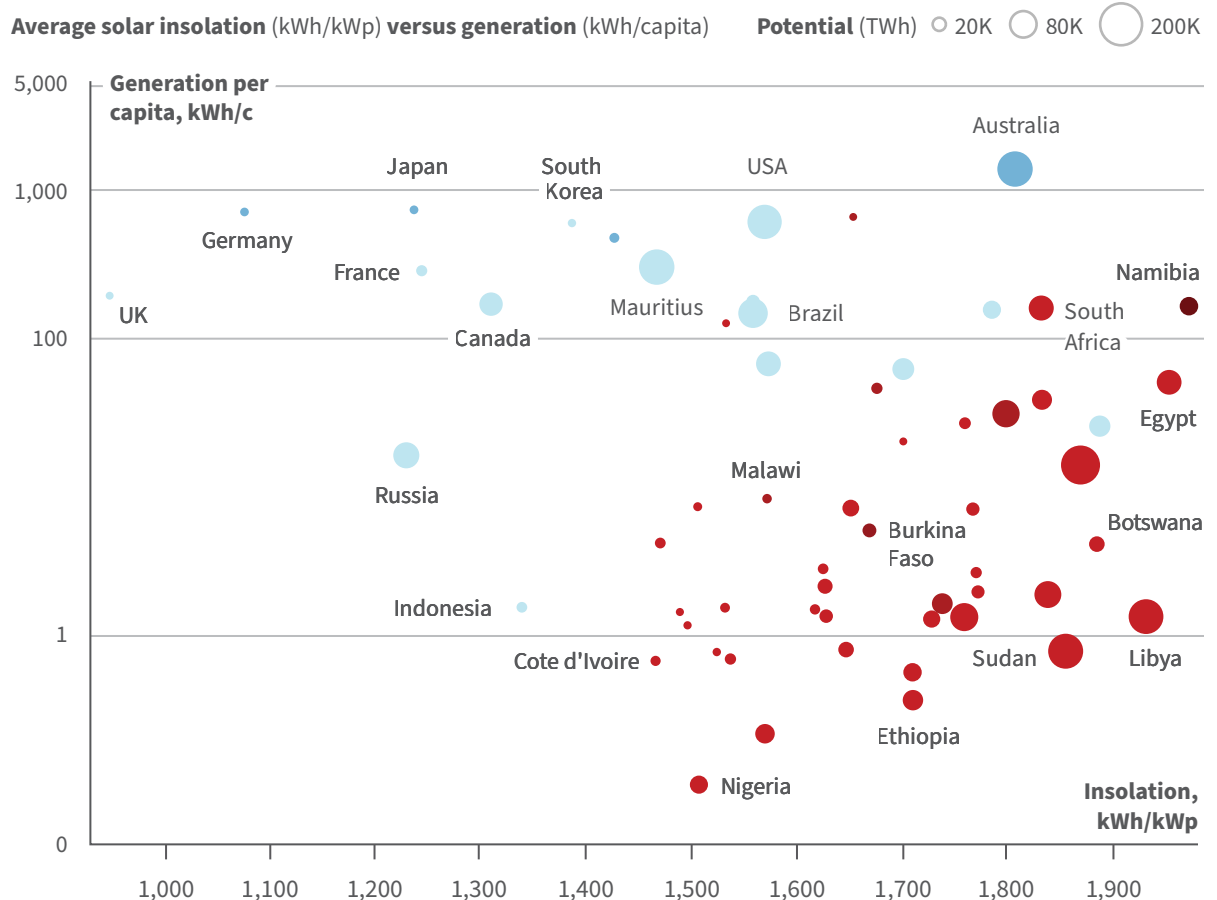


* Based on a 1M ton/year cement plant using an electrified pre-calciner with plasma gas kiln.
RMI graphic. Source: Parra and Romano (2023), Oyedepo and Oladele (2013), RMI project data.

Emergent climate tech can take advantage of Africa's unique and abundant natural and human capital.

African countries have diverse and substantial natural and human capital that could make emergent climate tech especially competitive. They have 1.4 million TWh/year of solar potential, considering only the space suitable for deployment. That is two orders of magnitude higher than the entire world's electricity consumption, but African countries only host about 1% of the world's total production.³⁷ Exhibit 9 shows Africa's world-leading solar potential relative to its very limited per capita production. (Africa also has massive technical potential for both onshore and offshore wind,³⁸ and while solar's cost and construction advantages are significant, wind will become more relevant as solar penetration increases, due to the complementarity of the power generation profiles of wind and solar.) Of the 15 GW of clean firm geothermal energy potential available in the East Africa Rift system alone, only 650 MW is currently being exploited (4%).³⁹ Technological advances to access and use harder-to-reach geothermal resources could multiply this geothermal potential a thousandfold.

Exhibit 9 African nations have world-leading solar resources but relatively little generation per capita



Note: African countries are shaded red and G20 countries are shaded blue. The darker the shading, the higher the share of solar energy in the national energy mix (0–37%).

RMI graphic. Source: Ember, Climate Action Platform Africa, Global Solar Atlas, World Bank, S. Miyake et. al (2024).

The energy transition is also a materials transition, and African nations hold 30% of the world's proven critical mineral reserves.⁴⁰ This includes 93% of platinum group metals (critical for hydrogen production via electrolysis, for example), along with nearly half the cobalt and manganese (for batteries), 33% of the aluminum (for solar and wind components and power transmission),⁴¹ 13% of the copper (for conductors), and around 5% of the lithium (also for batteries).

The presence of energy transition minerals does not guarantee positive development outcomes

The presence of these raw materials does not guarantee that their benefits will go to Africans. The “resource curse thesis,” first posited over three decades ago, analyzed how resource-rich countries, particularly those dependent on minerals, often experience slower economic growth, weaker institutions, and increased inequality.⁴²

A comprehensive 2023 study across 43 African countries found that the relationship between natural resources, democracy, and income inequality is complex and varies significantly across different regions.⁴³ Another 2023 study — utilizing computer vision to analyze satellite images covering 12% of the continent and more than 1,600 mineral deposits over 35 years — found that while mining activity boosted local economies, the benefits were often temporary, diminishing rapidly after mine closure. In autocratic regions, resource extraction was also associated with increased local conflict.⁴⁴

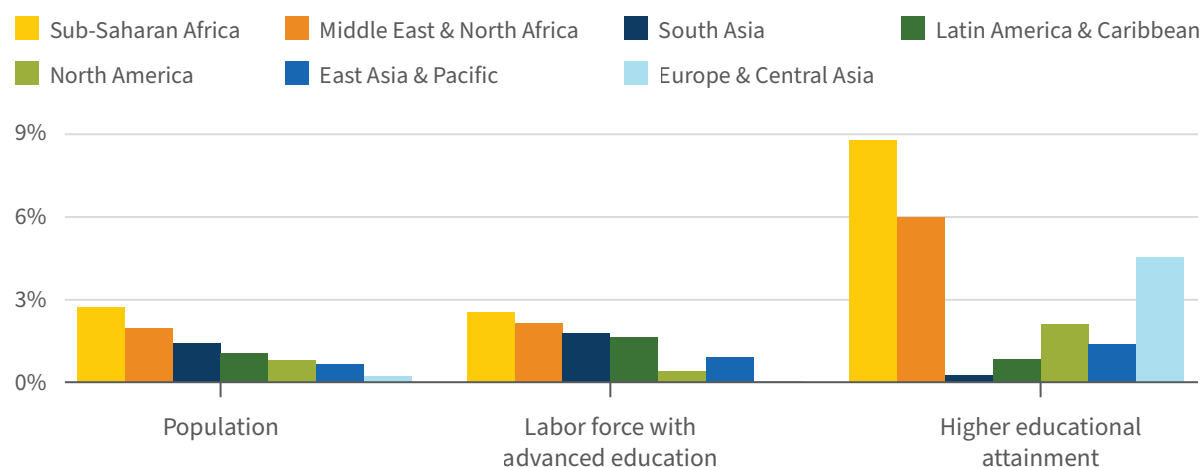
This highlights the need for nuanced, country-specific approaches with respect to ownership, extraction rights, environmental and community safeguards, value-creating processing, and wealth distribution. Managed right, the benefits from these resources can outweigh the negative effects, including by supporting the emergent climate technologies that would use them.⁴⁵

Sub-Saharan Africa also has exceptional biogenic carbon pools (0.3–1.9 petagrams of carbon uptake per year in forests and savanna).⁴⁶ There are 115 million hectares of land used to grow cereals today that can at least double on-farm yields through better agronomic practices.⁴⁷ Low farm productivity has driven agricultural extensification in Africa (i.e., clearing ecosystems to plant more land at the same yields per hectare), so raising yields is critical not only to enhance farmer incomes, but also to preserve Africa's forest and savanna and their associated biodiversity and carbon.⁴⁸ Done correctly, this can also preserve the health of African soils that have not yet been degraded by decades of input overuse, monocropping, and excessive tilling prevalent in much of the rest of the world. Our fertilizer micro-thesis shows how distributed green ammonia production can provide affordable critical nutrients, with low to no industrial emissions, to help achieve these results.

Complementing these diverse natural resources, Africa's workforce is projected to grow from 750 million to 1.5 billion people by 2050, making it larger than India's or China's.⁴⁹ This African labor force is already increasing its education rates faster than any other region (Exhibit 10, next page). Among these workers are and will be change makers who will invent new technologies, seize new opportunities for implementation, and employ their peers in dignifying work. And this burgeoning workforce will confer clear advantages for African firms, including companies like Beacon Power Services, Octavia Carbon, and Aspyre Foods:

Exhibit 10 Africa's educated labor force is the fastest-growing in the world

Average annual growth rates from 2000 to 2023 (%/year)



Note: Higher educational attainment is defined as the number of people over 25 having completed short-cycle tertiary degrees or higher.

RMI graphic. Source: World Bank.

- Beacon, a Nigeria-based data and grid management company for Africa's power sector, uses surveyors to map every building in a utility's service area, geotagging customers from household to household. This is an extremely labor-intensive process, but it is also a critical starting point for effective grid management in cities where even metered electricity customers can lack formal addresses.
- Octavia Carbon has built one of the largest direct air capture teams in the world, including 50 Kenyan engineers — enabled by local university partnerships for both equipment use and talent sourcing.
- Aspyre Foods, a South African startup producing climate-friendly dairy proteins, operates an R&D facility in Cape Town staffed with top graduates from the nearby University of Cape Town and Stellenbosch University, which have strong biotech programs.

“One of the most impactful and nonobvious advantages that Aspyre Foods has is access to exceptional talent. South Africa has multiple great universities with strong biotech, agtech, and foodtech programs, and the top-tier graduates from these programs often have a strong desire to work on solving impactful problems, while rapidly gaining experience and expanding their skill sets.”

— **Thomas Bartleman, Cofounder and CEO of Aspyre Foods**



Inge Mendelsohn and Thomas Bartleman cofounded Aspyre Foods in South Africa.

Emergent climate tech can be a powerful creator of well-paying jobs in the formal economy — with the critical caveat that these companies need capital and electricity (two of the most commonly cited obstacles for African companies) to mature and grow.⁵⁰ Koolboks, BasiGo, and SunFi already directly employ roughly 300, 90, and 175 people, respectively, at the time of writing — and they are just getting started (Koolboks and BasiGo are at Series A; SunFi is at Seed stage). Looking forward, more than 3 million new direct African jobs can be created by 2030 solely in four rapidly growing sectors: energy, mobility, agriculture, and manufacturing.⁵¹ An additional 500,000 jobs could be created by domesticating African bauxite and iron ore processing — in addition to \$60 billion in additional revenues and 65 GW of anchor demand to drive further renewable energy development.⁵²

In the future, yet more can be created by yet-to-be-built industries that will rely on low-cost, low-carbon electricity and proximity to demand centers (e.g., green hydrogen, ammonia, and other molecules; low-carbon building materials; and engineered carbon dioxide removal). Micro-theses on green cement, fertilizer, and direct air capture provide deeper dives on the opportunity presented by some of these industries of the future.



Photo: Octavia Carbon

The Current State of Financial Flows, Deployment, and Founder Experiences

Entrepreneurs are showing how sub-Saharan Africa can achieve climate-positive growth, but they face major headwinds with respect to financing and deployment.

African entrepreneurs across the continent are succeeding despite the headwinds they face in starting and growing a business. Around 350 companies have annual revenues of \$1 billion or more, collectively producing over \$1 trillion in revenue per year. This includes burgeoning startup activity across sectors, but fintech and retail account for more than half of venture capital funding since 2019. As of May 2025, there are nine unicorn startups from sub-Saharan Africa, all hailing from the software or fintech sectors.ⁱⁱⁱ

Many African companies also have a track record of climate-positive, equitable development impact — half of the 250 largest African companies already have emissions targets.⁵³ Some fintech companies are speeding the scale of climate solutions, particularly solar power systems and EVs. For instance, M-KOPA, a Kenyan financing platform for underbanked customers, has unlocked \$1 billion in credit for their 3 million customers to own 2 million smartphones, 1 million solar home systems, and a host of other products including electric two-wheelers.⁵⁴

These success stories provide reason for optimism, but the entrepreneurs developing and deploying emergent climate technologies in Africa face major gaps in funding and support. Although Africa's small but mighty entrepreneurship support ecosystem punches well above its weight, there are broad gaps in 1) the project finance needed to deploy the mature clean energy assets that enable many climate technologies to work (e.g., cheap renewable power), 2) equity funding for startups to grow and get to market, and 3) non-dilutive capital such as grants to support early stage research and debt for scale-up.

“The results bootstrapping founders have achieved in the last 10 years have been incredible, but imagine how many good outcomes could’ve been phenomenal outcomes if there was more capital accelerating their progress, enabling them to take bolder risks, strengthen their talent base, [and] invest in stronger design and software architecture.”

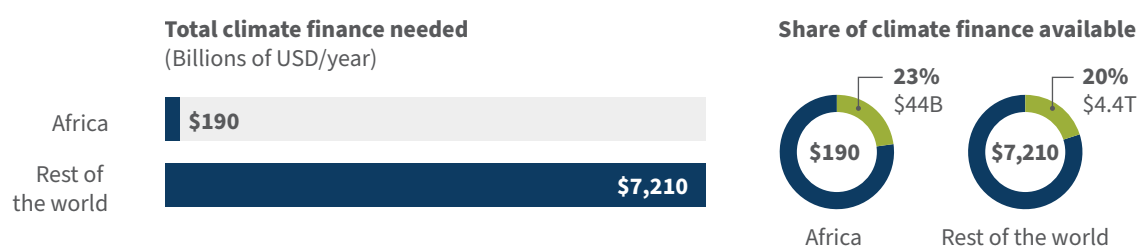
— Aaron Fu, *Sherpa Ventures*⁵⁵

ⁱⁱⁱ “Unicorns” are companies with more than a \$1B valuation while privately held, including Interswitch, Flutterwave, OPay, Wave, Andela, Chipper, MNT-Halan, Moniepoint, and Tyme.

Africa is only receiving 20% of the general climate finance it needs to meet its own energy access and climate goals.

African countries need an estimated \$190 billion per year in new investment to meet the stated energy access and emissions goals of their governments (i.e., “Nationally Determined Contributions”), but current investment is just \$44 billion per year (Exhibit 11).⁵⁶ While we need to quadruple today’s climate finance flows to Africa, it is a small amount relative to overall needs: \$190 billion is just 2.5% of the estimated \$7.4 trillion in annual global climate finance needed through 2030.⁵⁷

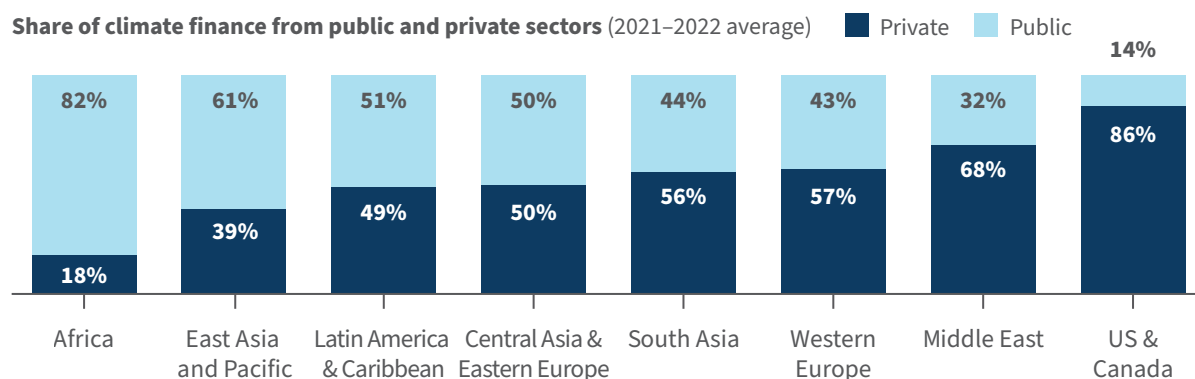
Exhibit 11 Africa’s overall climate finance needs are small relative to the rest of the world, but large compared with what is actually flowing



RMI graphic. Source: Net Zero Insights, Katapult VC, Africa: The Big Deal, Briter Bridges

DFIs account for three-quarters of African climate finance today. After accounting for other public money spent by governments and multilateral climate funds, private investors account for only 18% of Africa’s climate finance. In contrast, private climate finance accounts for 86% of the total in the United States and Canada, 57% in Western Europe, and 39% in East Asia (see Exhibit 12).⁵⁸ This represents an imperative for DFIs to mobilize more public dollars, but also an opportunity for private-sector investors to leverage the public funds spent in Africa much more than they do today.

Exhibit 12 The private sector is missing an opportunity to leverage public investments in African climate finance



RMI graphic. Source: Climate Policy Initiative

Even once raised, DFI and western donor-led funds are slow to move. Collectively, a selection of marquee emerging market-focused climate funds have raised \$33 billion, but they have only deployed \$11 billion, and just \$8 billion in Africa (Exhibit 13). There are many reasons why general climate finance is slow to deploy. Some of them relate to the lack of a sufficiently de-risked project pipeline — especially when it comes to scaling up relatively novel industrial climate technologies.⁵⁹ But perhaps the most significant is the failure of public and private financial institutions to collaborate effectively.

“Almost every major climate transition project in the Global South requires both concessional and non-concessional capital and thus collaboration across public- and private-sector entities. But here’s the rub: these institutions usually don’t work well together; indeed, at the level of specific transactions, they sometimes don’t work together at all. Perhaps the most underappreciated problem in climate finance today, this lack of collaboration across public and private finance must be solved alongside other priorities like MDB reform, project development capital, and innovation in instruments like guarantees and currency risk hedges. Otherwise, some of the world’s most important climate projects may wither on the vine.”

— Paul Bodnar, Director at the Bezos Earth Fund

Exhibit 13 There is a major gap between stated commitment and actual deployment when it comes to large Africa-focused climate funds

Funds raised, deployed globally, and deployed in Africa (dollars)

	Raised	Deployed Globally	Deployed in Africa
Total	\$33B	\$11B	\$8B
Climate Investment Funds	\$13B	\$7B	\$7B
GEAPP	\$10B	\$441M	\$241M
World Bank (Strategic Climate Fund)	\$6B	\$3B	
Green Climate Fund	\$3B	\$896M	
ACP (Allied Climate Partners)/SEACEF	\$825M	\$175M	
World Bank (Climate Support Facility)	\$110M	\$28M	
AfDB (Africa Climate Change Fund, SEFA)	\$39M	\$19M	\$19M

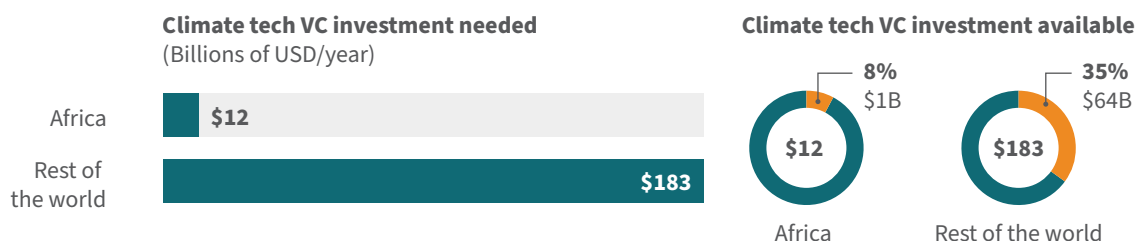
RMI graphic. Source: Aggregated data from fund websites.

A detailed evaluation of priorities for improving overall public and private climate finance is beyond the scope of this paper. The Climate Policy Initiative’s *Landscape of Climate Finance in Africa 2024* is a good source of recommendations, including advice for DFIs to supply more “concessional capital and technical assistance at early stages of project development,” to simplify eligibility requirements and “standardize procedures on a centralized trading platform [to] streamline due diligence,” and to scale the use of “guarantees, insurance, and local currency hedging — which have the highest mobilization ratios” to mobilize private capital.

For companies developing and deploying emergent climate technologies, the gap in venture investment is even bigger.

If the general climate finance gap is large, it is even larger (in proportional terms) for critical emergent technologies — the focus of this paper. We estimate Africa’s climate venture capital investment gap to be \$11 billion per year (Exhibit 14). Absent this VC investment, African founders try to make do with non-dilutive resources that are scarcer (e.g., limited R&D dollars) and more expensive (e.g., commercial debt). While global climate tech VC investments averaged ~\$65 billion per year over the past four years,⁶⁰ African climate tech averaged just \$0.9 billion per year (about 1.4% of the global total).⁶¹

Exhibit 14 Africa’s climate tech VC needs are small relative to the rest of the world, but large compared with what is actually flowing



RMI graphic. Source: Net Zero Insights, Katapult VC, Africa: The Big Deal, Briter Bridges

The climate tech VC checks that have been written have mostly gone to a single, relatively mature sector: nearly 90% of them, from 2014 through the first half of 2024, to solar power solutions like home energy systems.⁶² For comparison, clean power generation was approximately 40% of total global climate tech equity financing in 2024.⁶³ Investments are becoming slightly more diverse today, and deals in other sectors tend to be bigger, though energy and water companies still account for about 70% of African climate tech deal value.⁶⁴ While solar is critical to driving the energy transition, this imbalance highlights the need, as the CPI report puts it, to “shift focus from mature technologies like renewables to hard-to-abate sectors like industry and infrastructure; sectors where the transition has hardly begun, like natural capital in carbon sinks, biodiversity, and ecosystem preservation; and in nascent areas like the blue economy.”

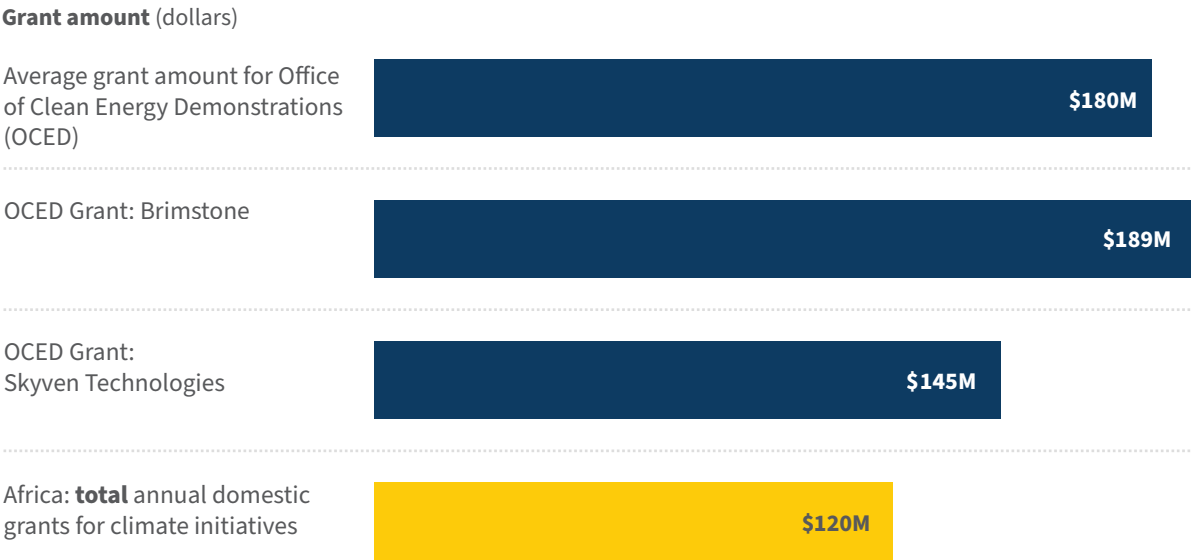
Similarly, climate tech in Africa is geographically concentrated: Kenya alone accounted for \$2.4 billion (57%) of the total \$4.2 billion in climate tech deal value from 2019 to 2024.⁶⁵ Adding in Nigeria, South Africa, and Egypt brings the total to \$3.1 billion (74% of the total). While hubs in Nairobi, Lagos, Cape Town, and Cairo can concentrate businesses into productive clusters, other countries also need this entrepreneurial energy.

The lack of VC investment is exacerbated by very little grant funding for R&D on emergent climate tech — in stark contrast to the OECD.

Beyond gaps in venture capital, many companies lack access to grants and tax incentives used to develop their ideas and technologies from the idea stage through commercial deployment. R&D spending as a fraction of GDP is more than six times lower in Africa than the global average (0.3% of GDP in sub-Saharan Africa versus 1.9% globally in 2021).⁶⁶

In recent years, African governments have spent about \$120 million annually on climate-related grants.⁶⁷ This total is routinely exceeded by *single* grants for pilots and demonstration projects in OECD countries (Exhibit 15). In 2024, six US grants in green concrete alone totaled \$1.6 billion — 13 times more than *all* African climate tech R&D grants.⁶⁸

Exhibit 15 All climate-focused grants from African governments add up to less than some single grants to individual US-based climate tech companies



Note: African government grant total reflects the amount spent on climate adaptation and/or migration, taken as an average between 2021 and 2022. Grants to support industrial decarbonization by the United States Department of Energy’s Office of Clean Energy Demonstrations (OCED) are included for comparison.

RMI graphic. Source: US DOE ECED announcements; Climate Policy Initiative: “Landscape of Climate Finance in Africa 2024”

Debt is expensive and hard to come by, especially in local currencies.

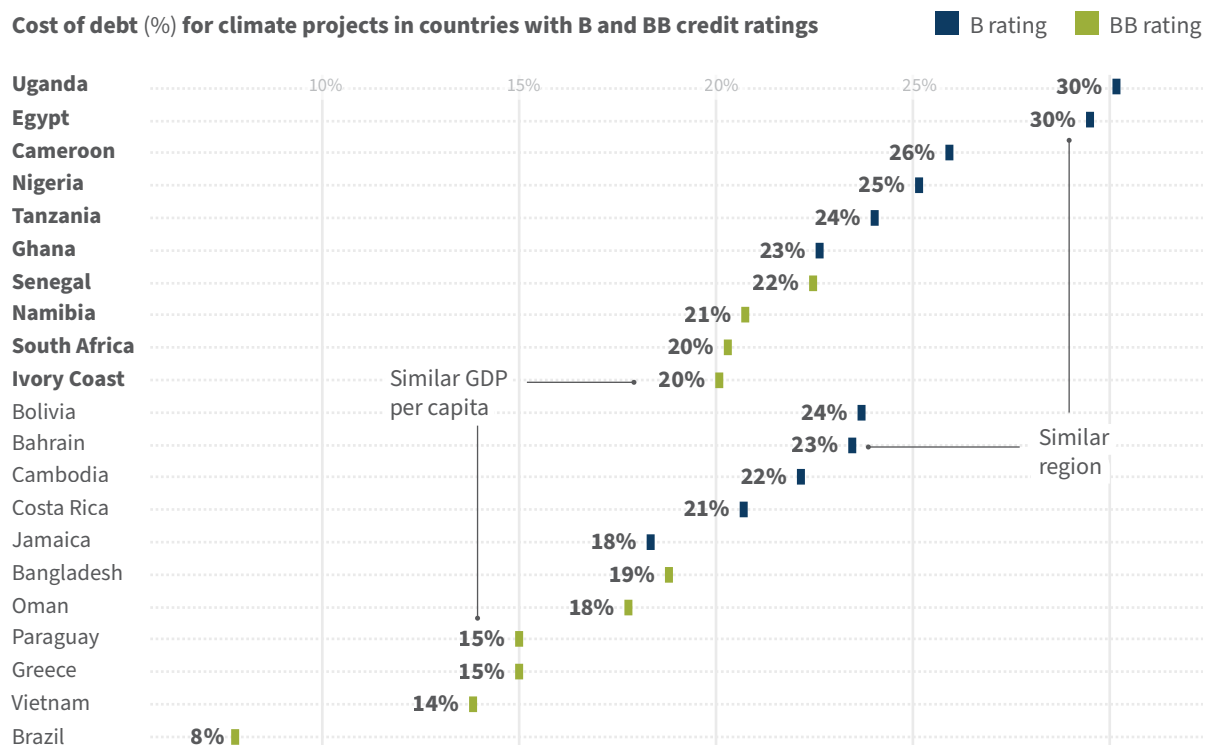
Debt finance helps companies raise capital without giving up equity in their businesses, but climate tech firms in African markets struggle to access loans in the right currency and at reasonable interest rates.

Most of the time, companies operating in Africa sell most of their products and services to customers in local currencies, but 65% of impact debt is borrowed in dollars or euros.⁶⁹ This means that companies' ability to service the debt declines as local currencies depreciate — a dilemma especially well-illustrated by the 70% fall in the Nigerian naira's value against the dollar since 2023.⁷⁰

Beyond the forex challenge, African companies are often subject to an unwarranted “Africa risk premium” from lenders; i.e., the cost of debt is out of alignment with the actual risk profile of the companies to whom it is being offered and the countries where they operate. Debt in Africa is often 5%–6% more expensive than in other emerging markets with comparable risk ratings (Exhibit 16).⁷¹ These risk ratings may themselves be flawed by credit rating agencies' lack of local presence, which consequently compromises their assessments.

Data from efforts like the Global Emerging Markets Risk Database Consortium may help find a cure. Recently released credit risk data from 40 years of lending shows that African debt has in many cases outperformed other regions, especially in the past two decades.⁷² Other factors driving up the cost of debt include limited domestic competition among banks and low domestic savings rates (19% in sub-Saharan Africa from 2010 to 2021).⁷³

Exhibit 16 The cost of capital for climate projects is much higher in African countries than it is in countries with similar credit ratings in other parts of the world



RMI graphic. Source: Recreated from “More Money, Fewer Problems,” BCG, 2024.

Taken together, this often means that interest rates are prohibitive: a 9% exchange rate hedge can be stacked on top of a 16% loan to get a 25% effective rate.^{iv} Credit guarantees can help attract more local capital to climate tech firms, and hedges can reduce exposure to exchange risk in foreign-denominated debt, but the best way to implement these tools is a subject of active debate.⁷⁴

There are positive trends, committed investors, and effective entrepreneur support organizations. We need to accelerate and support them.

Some trends are positive: Overall African VC investment across sectors has grown from essentially zero to ~\$3B–\$5B/year over the past decade. Climate tech VC alone has averaged \$900M/year over the past four years, with 650 participating investors.⁷⁵

There is also plenty more available. Globally, climate-focused funds (VC, corporate VC, growth equity, and infrastructure funds) are sitting on \$86 billion of “dry powder,” including \$30 billion in venture capital and growth equity.⁷⁶ Mobilizing just 5% of this \$86 billion in Africa would exceed the total climate tech VC spending over the past five years. This represents a tremendous opportunity to crowd in new capital to undervalued companies in some of the fastest-growing sectors in the fastest-growing economies in the world. There is also \$22 billion in later-stage climate finance dry powder committed to low- and middle-income countries (highlighted earlier in Exhibit 13) — at least some of which would be applicable to emergent climate tech.

Venture builders like Delta40, Kinjani, Africa Climate Ventures, and Persistent Energy offer idea-stage founders an environment to refine their technologies and business models without worrying about their next paycheck. Their tailored support streamlines the processes that distract from the core work of developing the business, e.g., fewer days searching for the right LinkedIn connection to a customer or cofounder, less headache struggling through a first pitch deck without expert feedback, or less risk from failing to keep proper financial records.

VCs with a specific climate tech and Africa focus include Factor E, Equator VC, Catalyst Fund, and Katapult Africa. They combine investing with support on strategy, marketing, fundraising, and technology development, delivered both individually and in the form of workshops and learning sessions. Factor E emphasizes technology brokering and thesis development, with current priorities including power systems, new mobility services, postharvest loss prevention, and climate-smart farming.

At later stages, commercialization and scale-up support is becoming available via companies like Great Carbon Valley, which brings together technology, energy, operating, and finance partners to develop large-scale carbon removal and green industry projects.

In the section titled *Solutions to Spur More Innovation, Deployment, and Scale*, we describe ideas to harness this momentum and these resources — including thesis-driven investment, entrepreneur support, technology brokering, corporate partnerships, project development support, and a dedicated deal team.

iv The average lending interest rate (the rate banks charge firms to meet short- and medium-term needs) for the 19 African countries for which the IMF had data in 2023 was 25%.



BasiGo's Path to a \$42M Series A Round

BasiGo is deploying eBus fleet and charging infrastructure in Nairobi, taking advantage of surplus clean geothermal energy on Kenya's grid at night.

In 2020, founders Jit Bhattacharya and Jonathan Green were living in Nairobi, where nearly 7 in 10 people get to work on a fleet of 20,000 private diesel buses. When COVID hit the city and the diesel buses stopped running, the air cleared and people could see the mountains on the horizon for the first time in years. Then, with the Russian invasion of Ukraine and US interest rates rising, the Kenyan government removed fuel subsidies, driving up the price of gas by 10%–15% month over month. BasiGo's reservation list quickly grew to over 200 buses as drivers, inspired by the clearer skies during lockdown, sought to reduce fuel costs and bring back cleaner air. This breaks a common stereotype, says CEO Jit Bhattacharya, in which "people perceive that Africa is too poor and cannot afford clean technologies that are higher capex and lower opex. BasiGo has proven this is absolutely false. In markets like Kenya, when something shows it's a better value prop, the market can change on a dime."

With the success of BasiGo's launch and growth in Kenya, the company started to be approached by other countries. Rwanda, specifically, was a key opportunity: the country has a favorable tax policy for EVs, and BasiGo was able to secure a \$1.5M grant from USAID for expansion in Rwanda. With this expansion, BasiGo's reservation list grew to 500 buses, with customers willing to put money down for an electric bus they knew they wouldn't receive for years. This expansion also sheltered BasiGo when Kenya's currency took a big hit in 2023. In Q4 of 2024, the company secured a \$24M Series A equity round, which unlocked an additional \$17.5M in debt, which BasiGo aims to use to deliver 1,000 electric buses in East Africa in the next three years.

"There's currently a valley of death at Series A in African climate tech that needs to be addressed. We have so many startups with extraordinary climate impact potential that have made it through technology proof-of-concept, demonstrated demand and unit economics, and yet the time and effort needed to raise this critical growth round stalls these businesses and their potential impact. This needs to be addressed or the ecosystem will continue to suffer."

— Jit Bhattacharya, CEO and Co-founder of BasiGo

Emergent Climate Tech Opportunities for the Built Environment, Agriculture, Carbon Dioxide Removal, Industry, and Electricity

Creating a prosperous, climate-positive future for Africa will require the transformation of energy, heavy industry, the built environment, agriculture, and mobility systems, as well as enhanced biosphere integrity accompanied by an increase in carbon dioxide removal. These systems are made up of millions of devices and components, backed by years of business model iteration by incumbent players, and trillions of dollars of investment to date. In Africa, however, they are often yet to be built, offering a unique opportunity to bypass incumbent technologies and approaches that are viewed as “mature” and “proven” today but will simply be “old” and “inferior” tomorrow.

See the report at
[rmi.org/insight/
africa-tech-
micro-theses](https://rmi.org/insight/africa-tech-micro-theses).

We summarize some of these in Exhibit 17 (pages 35–37) and will build them out further in the form of investment “micro-theses” in a companion series to this paper in Q3-2025. Each micro-thesis outlines the opportunity for the technology in Africa, outlines promising areas of innovation, and identifies the factors that will be key to commercialization and scale. They are intended to be illustrative, not comprehensive; there are many more technologies and innovations that hold major promise in an African context. We chose green cement for the built environment, for example, but could have just as readily featured cooling. Similarly, we could have gone with long duration energy storage instead of grid intelligence and advanced geothermal for the power sector, gene editing or soil boosters instead of green ammonia for agriculture, and enhanced rock weathering or biochar instead of direct air capture for carbon dioxide removal.

The technologies have some common features and meet the following criteria:

1. **They anticipate a major increase in demand** for the commodity, product, or service they produce, and could help minimize future import (and foreign exchange) dependency.
2. **They take advantage of African countries’ unique natural capital advantages.**
3. **They will be powerful enablers of energy access** in the form of “productive use” — both (a) increasing demand for reliable, low-cost, pollution-free electricity and enhancing the viability of power system investments, and (b) through their operational flexibility, enabling them to match variable renewable energy generation.
4. **They have significant local job creation potential**, especially for skilled, well-paying jobs in the formal economy (unlike, say, data centers — which bring lots of electricity demand but few jobs).
5. **They will ultimately be cheaper, on a levelized cost basis**, than the technologies they will bypass or replace — based on anticipated learning rates and economies of scale.
6. **Their products and services will be better** — leading to stronger buildings, more reliable energy supply, lower-maintenance vehicles, and more resilient crops.
7. **They will be climate-positive**, in terms of mitigation, adaptation, or both, and will often have positive implications for other Earth system boundaries (reducing, for example, nutrient pollution, freshwater withdrawals, or land systems change).

Exhibit 17 Cheaper, faster, better: meeting the needs of a growing Africa with emergent climate tech

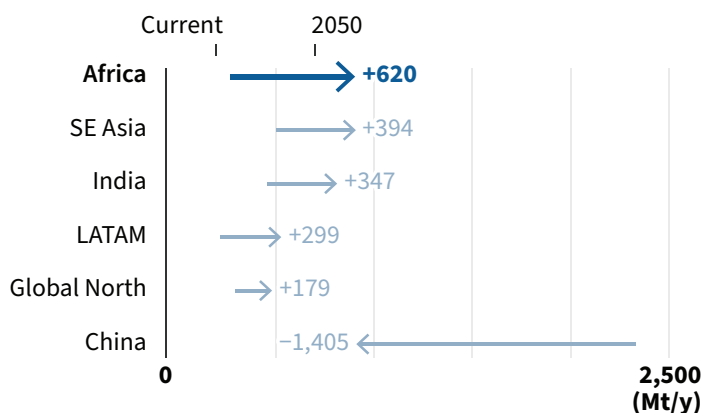
A preview of micro-theses to be released in a companion series to this paper in Q3-2025, and ultimately published as an Annex at rmi.org/insight/africa-tech-micro-theses.

GREEN CEMENT

2.3x

more cement demand

Demand for cement in Africa expected to increase 175% by 2050



Opportunity driver

- 80% of Africa's 2050 building stock is yet to be constructed.
- Importing cement is expensive, driving domestic cement plant construction.
- Localized supply chains can cut costs of materials, reduce import reliance, and grow economies.

Promising innovation areas

- Waste less: Software for design and mix optimization.
- Displace limestone with local substitutes: Supplementary cementitious materials (SCMs).
- Create superior materials: Alternative cements change product and process altogether, potentially creating stronger, cheaper materials.

Pathways to scale

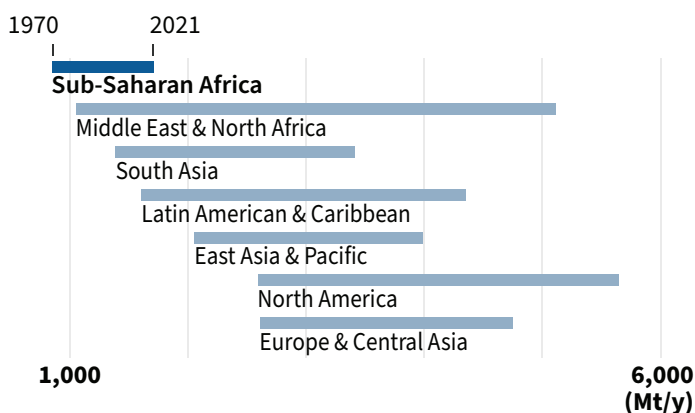
- Partnerships with incumbents can de-risk and overcome the up-front capital demands of getting new tech to market.
- Developing local supply chains can reduce costs of materials and dependence on imports.
- Performance-based standards can drive adoption of the best products and practices.

GREEN FERTILIZER

5.1x

more fertilizer

Sub-Saharan Africa's crop yields currently lag behind



Opportunity driver

- Farmers' yields can at least double through better fertilization and other inputs.
- High importation and transport costs drive high prices for African farmers.
- There is strong demand for domestically available fertilizer.

Promising innovation areas

- Distributed green ammonia plants can deliver lower-cost domestic fertilizer without exposure to fossil fuel market volatility. Emergent technologies can enable this, including:
 - Novel Haber-Bosch
 - Plasma catalysis
 - Chemical looping

Pathways to scale

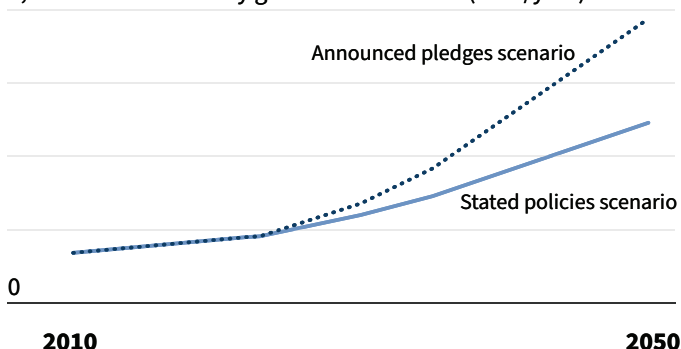
- DGA requires cheap carbon-free electricity (DGA) and can function as a "productive use" for renewable energy investments.
- Efficient and safe fertilizer storage and distribution is crucial when DGA plants are built closer to renewables (and perhaps farther from typical industrial zones).
- Strong domestic offtake contracts and forex safeguards can support domestic consumption.

GRID CONNECTIVITY, INTELLIGENCE, AND FLEXIBILITY

4.3x
more electricity

Africa's electricity generation is set to quadruple by 2050 if announced targets are met

4,000 Total electricity generation in Africa (TWh/year)



Opportunity driver

- **Closing the energy access gap** is a top priority, and strong grids are necessary.
- **African utilities** experience metering and grid control issues that digital technologies can fix rapidly.
- **These grids are ripe for DER integration once prepared:** in Nigeria alone, there is 22 GW of potential for grid-tied distributed energy in a least-cost path.

Promising innovation areas

- **Improve grid visibility** through mapping and simulation.
- **Get more out of the existing power system** with grid enhancing technologies.
- **Integrate DERs** to optimize grid flexibility and resiliency.

Pathways to scale

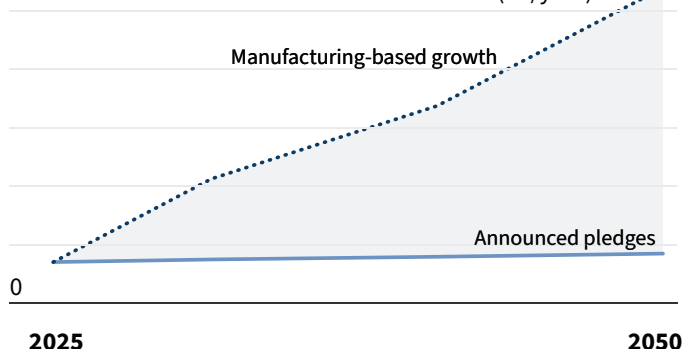
- **Help utilities solve the physical, financial, and human resource gaps** preventing adoption of digital grid tools.
- **Build partnerships with service providers and developers** who can help implement the solutions.
- **Develop policy to allow high levels of DER penetration,** as well as cost-reflective prices and demand response.

RENEWABLE THERMAL TECHNOLOGIES

1.2x-8x
more industrial heat demand

Industrial heat demand projected to increase by 20–700% under different industrialization scenarios

25 Total Industrial Heat Demand in Africa (EJ/year)



Opportunity driver

- Today, **Africa has 18% of the global population** but is only responsible for **2% of manufacturing value added**.
- **Governments are keen to grow domestic manufacturing** to cover increasing domestic demand and for export.
- Many **industrial processes require heat**, which can be cost effectively and dependably served by domestic renewable thermal technologies instead of burning fossil fuels.

Promising innovation areas

- Renewable thermal technologies can be tailored to local energy resources to provide clean, reliable, cost competitive industrial heat.
- Many of these technologies are already commercially proven or are being actively piloted to provide low-grade heat used in industries like food and textiles (<400 °C).
- Innovation is progressing rapidly to enable renewable thermal solutions to address high temperature process heat that accounts for over half of energy usage globally (400 °C - 1500 °C).

Pathways to scale

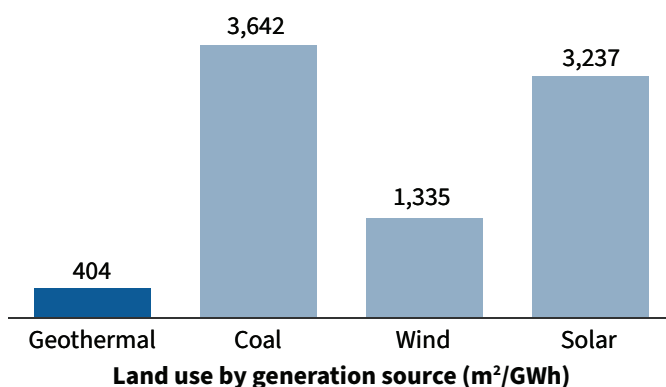
- **Access to low-cost capital** can accelerate deployment of these technologies, which are more expensive upfront but provide savings in operating costs.
- Cheap electricity required for electrified solutions to compete with fossil fuels, though consistent baseload demand and the potential to shift time of use can help to incentivize the deployment of renewables.

ADVANCED/ENHANCED
GEOTHERMAL

3x

geothermal capacity by 2030

Geothermal uses substantially less land than other alternatives

**Opportunity driver**

- Conventional geothermal has > 15,000 MW potential. Advanced geothermal could unlock over 12,400,000 MW, 100x Africa's current electricity consumption
- Small footprint makes geothermal particularly well suited to direct use for C&I or mini-grids
- Regulatory environment is supportive, particularly in East Africa.

Promising innovation areas

- **Enhanced geothermal:** stimulating underground rock formation to improve heat transfer-reducing the number of wells and making geothermal possible even in less favourable geologies
- Closed loop systems-eliminating the need for fresh water
- Advanced drilling to reach "super hot" rocks-much greater power transfer if deeper thermal reservoirs can be accessed

Pathways to scale

- **Productive use:** connecting geothermal developers with credible off-takers such as C&I, mining, data centers, green hydrogen production, etc.
- Detailed resource assessment for both conventional and next generation technologies
- Cost and availability of capital. Though electricity cost is competitive, there is a high upfront capital cost, and risk associated with new technologies

DIRECT AIR CAPTURE

500x

larger carbon market

Africa has a strong potential for carbon dioxide removal

2035 global projected CDR market



2030 Africa's potential for CDR



(Mt/y)

Opportunity driver

- Global carbon markets are set to grow as much as 500-fold by 2050, and African companies can compete.
- Africa, especially the Great Rift Valley, has many ideal DAC sites with renewable energy potential, geophysical carbon storage potential, and decarbonized incumbent energy mixes.

Promising innovation areas

- **Optimize DAC technology** to suit Africa's energy resources, especially geothermal with low-grade heat.
- **Mass-customize storage equipment**, ideally while increasing domestic content of components.
- **Speed project development** by reducing barriers to developers who need energy, land, logistics, or permitting to build

Pathways to scale

- **Project development support** is needed to make the jump from the lab to the construction site.
- **Pre-commercial support** is needed to help companies reach the maturity required to market their carbon credits.
- **Supportive regulation** can guide project stakeholders and provide timely permitting.

Solutions to Spur More Innovation, Deployment, and Scale

Despite the immense opportunity (outlined in the previous section), emergent climate tech startups in Africa face gaps in funding and support across all stages, from idea-stage research and venture-building through venture capital and entrepreneur support, to project investment and debt financing.

In this section we propose seven solutions. They are neither exhaustive nor fully developed, so they should not be viewed as a comprehensive list of everything that needs to happen in order to accelerate climate tech development and deployment in Africa.

Rather, they reflect the ideas generated by a coalition of contributors, listed in the *Acknowledgments*, over the course of two gatherings (July and September 2024), and they reflect areas in which participants have some agency and influence.

We know, for example, that DFI reform, national industrial policy, and credit rating processes are all very important, but we don't include them. We do, however, include some solutions that are ordinarily the province of other groups or institutions, but where interested investors, NGOs, and philanthropies could help address deficiencies. DFIs should be offering or enabling the provision of lower-cost financing denominated in local currencies, for example. But they are not, so maybe private impact capital can instead. African governments would ideally have larger R&D budgets, but they are burdened by unreasonable levels of public debt, so perhaps philanthropy can step in.

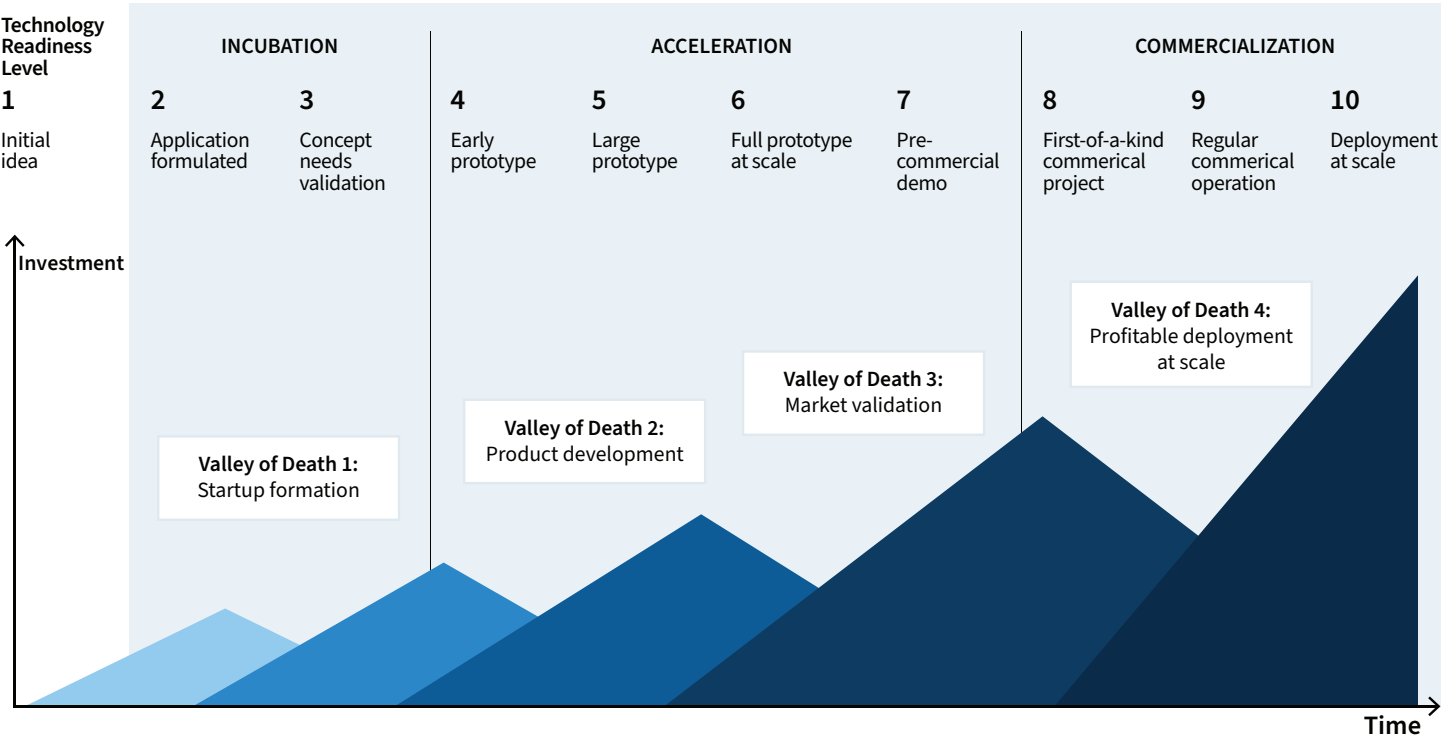
Exhibit 18 (next page) summarizes the proposed solutions, mapped to climate tech “valleys of death.”



Simeon Ubong (Farm Warehouse), Sarah Maina (GEAPP) and Ruth Kimani (CLASP) designing a business model to deploy agricultural processing and cooling equipment at solar minigrids across Nigeria. Photo: RMI

Exhibit 18

The coalition’s proposed solutions, mapped to climate tech ‘valleys of death’



Startup formation	1. Increase support for Africa-based idea-stage research and venture building
Product development & market validation	2. Create a shared investor research, diligence, and de-risking service to induce more investment in emergent African climate tech 3. Build a consortium of corporate deployment partners and buyers 4. Offer financing terms to incent global climate tech startups to develop and deploy their solutions in Africa
Profitable deployment at scale	5. Create low-interest rate, local currency debt facilities 6. Build an African “project-developer-as-a-service” for especially complex, capital-intensive first-of-a-kind African climate projects 7. Create a deal team (a shared investment banking function) for first-of-a-kind African climate projects

1.

Increase support for Africa-based idea-stage research and venture-building

Idea-stage founders benefit greatly from the ability to conduct research in a supportive environment without having to worry about their next paycheck. In the rich world, there are many fellowship and entrepreneur-in-residence programs, some attached to universities (e.g., MIT’s Engine and UC Berkeley’s SkyDeck), some supported by government (the US Department of Energy’s Lab-Embedded Entrepreneurship Program), and some independent (e.g., Activate’s fellowship, Marble’s Explore-Create-Build program, Deep Science Ventures’ Venture Science Doctorate).

These programs typically include stipends (enough to live on), mentorship and partnership to refine ideas, technical resources that enable company creation, and support from a network of experts (scientists, engineers, investors, corporate partners, and other founders).

Africa does not have a strong system of university- and government-based idea-stage and venture-building support. The African Institute for Mathematical Sciences (AIMS) is looking to change this via a network of centers specializing in climate science and machine intelligence, aimed at “enabling Africa’s talented students to become innovators.”

Robust private programs include those of Delta40, Kinjani, and Persistent Energy. Delta40, with offices in Nairobi and Lagos, and Kinjani, based in Cape Town, both run entrepreneur-in-residence programs. They support prospective founders with combinations of cash, ideation and research, and technical assistance, including techno-economic analysis and life-cycle assessment, product design and prototyping, go-to-market strategies, talent strategies (finding cofounders, organizational design, recruitment, retention), commercial support, corporate partnerships, and investment. (See Exhibit 19 for a schematic of Delta40’s venture-building support.) Persistent Energy, also with offices in Nairobi and Lagos, offers its expertise via “hands-on operating roles as part of the management team of the partner company, at the board level, or as strategic advisers.”

We need to **supercharge these strong local climate tech venture-building programs** — and ideally support the equivalents in other African countries.

Exhibit 19 Schematic of Delta40’s entrepreneur-in-residence program and venture-building support

An integrated and diversified approach to filling these gaps, building ventures, and creating a thriving innovation ecosystem in Africa with a sustainable Delta40 business model



2. Create a shared investor research, diligence, and de-risking service to induce more investment in emergent African climate tech

There are a handful of committed, sophisticated climate tech investors focused on Africa, including Africa Climate Ventures, Catalyst Fund, Katapult Africa, Delta40, Factor E, and others. But a lot more need to be crowded in, given the size of the funding gap in emergent climate tech investing (shown in Exhibit 14).

North American and European climate tech investors often invest on both sides of the Atlantic — but rarely south of the 30th parallel. Of the 181 companies listed across the Breakthrough Energy Ventures and Lowercarbon Capital portfolios, for example, only three are based in Africa. Norrsken, an example of an investor with a broader mandate and a strong Africa presence, invests heavily in climate tech — but only in Europe (12 of its 15 African seed and growth fund investments are in fintech).

The confidence and ability to invest in African climate tech rests, in good part, on better research and insights — and therein lies a chicken-and-egg problem. Global North VCs are unlikely to invest in Africa-based research and diligence capabilities unless they are convinced they want to invest there. And they are not going to have the conviction to invest in Africa absent those research and diligence capabilities.

One way to overcome this challenge is to create **a shared service that develops robust Africa-specific investment theses**, including clear problem and opportunity statements, robust assessments of the local industry, insight on policy and regulation, promising innovation and cost-reduction pathways, the landscape of relevant startups, and investment considerations.

Third Derivative (D3) has approximately 35 global investment theses either completed or under development, with several that are highly relevant to the African context — including carbon markets, advanced geothermal energy, energy storage, bio-based building materials, green cement, super-efficient cooling, green hydrogen, green ammonia, advanced biofuels, industrial heat, and various forms of carbon dioxide removal. It would be relatively easy to adapt and create Africa-specific versions of many of them, in partnership with an Africa-based venture builder or fund like Delta40, Africa Climate Ventures, or Factor E. (The micro-theses presented earlier in the paper offer just a small sense of what these would look like.) Factor E, similarly, has or is developing Africa-specific theses in the areas of clean power, transportation, buildings and industry, water, and sustainable agriculture.

Robust investment theses, in turn, make the process of scouting and diligencing startups much more efficient and effective. With an understanding of the state of the industry and the headwinds and tailwinds within specific markets, a clear sense of the most promising innovation areas, and a preview of relevant startups, investors already have a strong sense of what to look for. A robust diligence process includes a technical evaluation of the solution and value proposition, demonstrated proof and the next product development milestone (the extent to which the technology has been de-risked), market analysis (the overall revenue potential), the business model (how it will make money) and unit economics, the go-to-market strategy and the path to scale, the competitive landscape and “defensibility,” and the quality of the team.

Because diligence is typically conducted under nondisclosure agreements, these evaluations cannot be made public. But **diligence memos can be shared with a consortium of paying investors subject to a collective NDA with the startup in question.**

A robust program of support can further build investor conviction — and increase the startups’ likelihood of success. The best accelerator programs for emergent climate tech are not “one-size-fits-all.” They are tailor-made to meet founders’ needs based on where they are in their startup’s journey. Their experience is as light-touch or involved as they need — typically with account managers whose job is to be responsive to the startup’s needs. There is an array of programming on offer — but the startup teams choose what to attend.

Support typically includes refining product-market fit, brokering connections with corporations for offtake or deployment (more on this below) and with capital partners, finding the right mentors, building the team, and preparing startups for their next funding rounds.

In the case of Third Derivative’s 18-month program, founders gain access to the expertise and networks of RMI’s 700-plus energy professionals. This expert network spans power, heavy industry, the built environment, transportation, and carbon dioxide removal, and includes connections to the government, private, and nonprofit sectors.

See Exhibit 20 for an overview of D3’s process from thesis development through startup acceleration.

Exhibit 20 Third Derivative’s approach from thesis development through startup acceleration

Understand what technology we need

- Conduct sector deep dives to inform strategy
- Develop investment theses...
- ...drawing on expertise from across RMI
- Proposed focused cohorts on sectors and suites of technologies identified as high impact

Accelerate their journey to deployment and scale

- Tailored, light-touch 18-month program
- Dedicated Account Managers to help navigate D3 ecosystem
- Focus on connecting startups with:
 - Corporate and investor partners
 - D3 and RMI expertise
 - Curated mentor network
- \$100k optional investment (convertible note)



Assemble the ecosystem

- Recruit (or confirm that we already have) industry partners ready to pilot and test D3 startups’ solutions
- Ensure that we have investor interest to support D3 startup’s fundraising
- Identify the experts—both within and outside RMI—to offer expert technical, market, and policy guidance

Source and select startups

- Active sourcing... not passive receiving
- ~3,000 applications, with each cycle yielding more high-quality applicants
- Rigorous startup selection process and diligence:
- Climate+ impact assessment
- Techno-economic analysis
- Ecosystem additionality assessment
- Yielding highly selective portfolio: 286 companies as of 06/25

3. Build a consortium of corporate deployment partners and buyers

Many forms of emergent climate tech are capital-intensive and involve significant physical assets. These solutions cannot be built in isolation; they need to plug into existing energy and industrial value chains and markets, and they need partnerships with companies that build, buy, and sell things at scale.

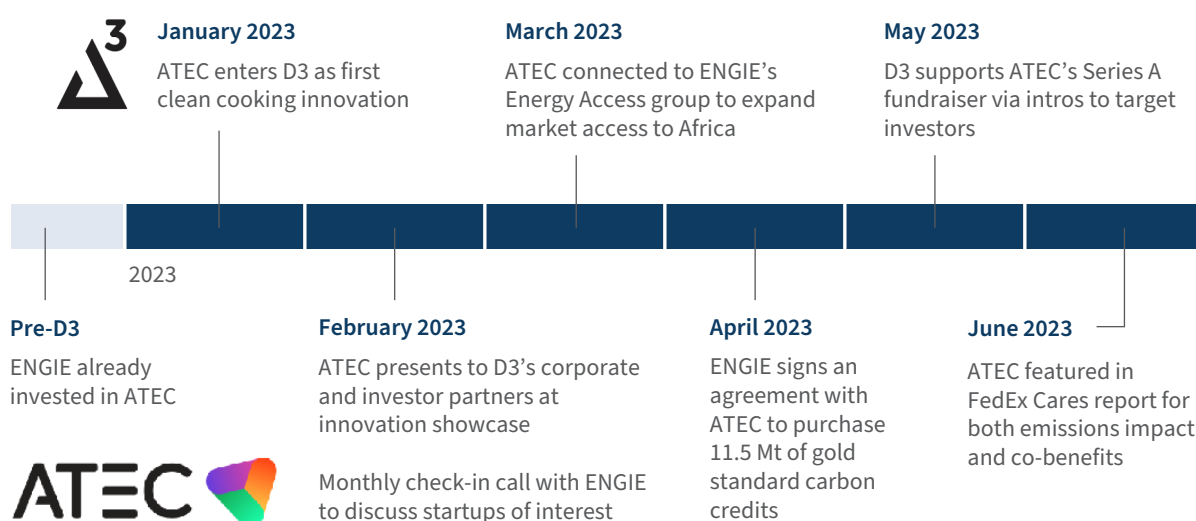
The collective convening power of a consortium could help bring a group of leading Africa-based corporations to the table and then help broker effective connections between them and the startups offering solutions relevant to their problems and aspirations.

These companies could variously offer test beds and piloting opportunities, offtake, joint project development, strategic business partnership, outright acquisition — or a combination. It creates a powerful alignment of incentives, for example, when an offtake agreement is combined with an equity stake; the corporate partner wants the startup to succeed from the perspective of both its business operations and as an investor.

The companies could include both Africa-based companies (like the Dangote Group, a Nigerian industrial conglomerate) and multinationals with a significant African presence (like Holcim, a leading cement producer). Open calls for “tech challenges” can help African companies — which may not have a corporate VC fund or innovation unit — become aware of startups that are building solutions relevant to their current challenges, or that may present future business opportunities. Partnerships with multinationals could enable technology brokering, with IP flowing both ways.

This could be especially powerful when combined with the previous solution. The research and diligence service would provide a deep understanding of the startups’ solutions and technology readiness levels, enabling much more informed and effective brokering with the corporate partners. See Exhibit 21 for an illustration of this process in action.

Exhibit 21 An example of effective startup-corporate engagement, brokered by Third Derivative



4. Offer financing terms to incent global climate tech startups to develop and deploy their solutions in Africa

Many startups are developing solutions that are highly relevant and promising for Africa — but they are highly unlikely to develop and deploy their solutions on the continent. Why would they, when their networks and knowledge keep them rooted in their home countries? On the other hand, there are plenty of American founders building their businesses in Europe, plenty of European founders building their businesses in America, and plenty of Indian founders building theirs in both geographies. Clearly, with the right support and incentives, founders and startups can be induced to build their businesses wherever there is a clear path to profitability and scale.

So how do we induce a promising green cement, green ammonia, or green industrial heat company to deploy in Nigeria, Angola, or Kenya instead of Massachusetts, France, or California? **One answer may be to make them an offer they can't refuse. Catalytic investors could lead investment rounds and offer terms that are extremely favorable to founders, on the condition that they build their products or facilities in Africa.** Pricing is perhaps the most obvious lever — i.e., taking less of the company for a given check size, or offering a larger check for the same share of the company (see Exhibit 22). We recognize that this may not make other, financial-returns-first investors particularly happy, but that is not what we are solving for.

Exhibit 22 Concessional pricing terms to induce development and deployment in Africa

A Less than other prospective lead investors **B** More than other prospective lead investors

Securities to be issued:

[**A**] shares of Series Seed Preferred Stock

Price:

[\$ **B**] per share (based on the capitalization of the Company set forth on Attachment A hereto under the heading “Pro Form Capitalization”). To the extent the capitalization indicates fewer or more shares than assumed herein, the price per share price shall be adjusted to reflect a promoney valuation of \$[**B**]. The number of shares of Common Stock and options available for issuance under the Company's stock option plans shall equal [**A**]% of the fully diluted capitalization of the Company following the closing of the financing.

Pricing aside, a lead investor could also make concessions on control terms (e.g., board composition and the ability to influence operational decisions, right of first refusal to purchase stock) and avoid or eliminate nonstandard economic terms designed to protect their money or “juice” their return (e.g., liquidation preferences, cumulative dividends, warrant coverage, participation rights for future rounds, or anti-dilution protection).

There are other financing solutions where the same logic could apply (mezzanine, venture debt, project finance); the focus here on dilutive funding is illustrative. Another option could be acquiring equity at standard terms, and then returning shares to the company when it achieves milestones related to technology development, commercial progress, impact, or governance. This share return could take the form of an employee stock ownership plan, or ESOP — a potentially powerful tool for long-term impact, encouraging talented Africans to stay with impactful African companies versus being lured away by western corporate or aid agency paychecks.

A founder-friendly term sheet may not be enough to encourage a US, European, or India-based startup to deploy in Africa — and it will certainly not be enough to ensure that startup's success. In order to make that happen, the financial terms would need to be combined with the right program of support and corporate partnerships (as outlined in the two solutions described above), along with the right conditions for doing business (governance, rule of law, currency stability, infrastructure, electricity supply).

5. Create low-interest rate, local currency debt facilities

In the case of some solutions, the key to scale is simply access to lower-cost capital. This is especially true of “enablers” like financing and distribution channels for home energy systems (pay-as-you-go, or PAYGo, companies like Sun King SunFi, d.light, and BioLight) and agricultural inputs (like Thrive Agric and Apollo Africa). These companies have minimal to no technology risk, high-caliber teams and execution, and linear scaling models. Their experience suggests that reducing the cost of products and services by one-fifth can lead to a fivefold increase in adoption of clean energy solutions, increase customer repayment, and improve profitability/viability of these business models.

When Sun King, for example, was able to take advantage of a subsidy to reduce its retail prices by 20%–25%, it immediately saw monthly connection rates increase from just under 7,000 households per month to around 35,000 households per month. Following this spike, the connection rate continued to grow steadily over the eight months that the subsidy was in place, eventually peaking at 80,000 connections per month. When the subsidy was abruptly withdrawn, Sun King was forced to immediately raise prices — and the connection rate dropped by half.

While public sector subsidies may be out of scope for this paper, there are other ways to reduce the cost of capital. As we note in Exhibit 16, African countries and companies are burdened with interest rates that are out of step with their true risk profiles. This not only hurts high-performing companies — it represents an arbitrage opportunity for investors and significant impact potential for catalytic capital providers.

If DFI's won't or can't do it, **philanthropy and private providers of catalytic capital could offer a first-loss reserve to local banks in exchange for them offering lower-cost debt to climate tech companies ready to scale** (like the ones highlighted above). While smaller loan portfolios could remain on balance sheets, they could transition to off-balance-sheet securitizations as they grow, the market matures, and banks simplify the process. Citi Social Finance, BII, and AFC offer examples of blended securitization facilities. This could set a powerful flywheel in motion, with lower-cost capital enabling lower prices and consumer financing costs for critical climate tech, leading to higher demand and lower default rates, leading to higher purchase and production volumes, leading to lower production costs, enabling even lower prices, leading to higher demand and adoption.

6. Build an African “project-developer-as-a-service” for especially complex, capital-intensive, first-of-a-kind African climate projects

The successful scale-up of many of the solutions in this paper is heavily contingent on the development of highly complex, capital-intensive, first-of-a-kind (FOAK) commercial facilities.^v Companies at this stage require an entirely new set of skills, tools, and relationships. High capital requirements rule out many investors, including the VC funds that have been able to support startups up until this point in their journey. Investors who can meet these capital requirements — including infrastructure and project financiers — typically focus on much more mature technologies. This project finance can, however, be unlocked through effective project development, by systematically de-risking these projects to the point that they are considered “bankable.” This is what Mark1, a new “project-developer-as-a-service,” is trying to do in the United States: provide intensive project development support, beginning at the project planning stage and extending into execution. To do this, Mark1 is building a dedicated in-house team steeped in project finance, offtake and procurement strategies, EPC contracting, technology scale-up, site control, and navigating siting and permitting. It is also, crucially, bringing the right mix of EPCs, insurers, offtakers, lawyers, and project services to these projects earlier than they would otherwise be willing to engage. Exhibit 23 gives an overview of Mark1’s services.

Exhibit 23 Solution program details, 12–18 months

Core deliverables

- Pre-FEED (FEL 1, 2)
- Feasibility study
- Project execution plan
- Project financial model
- Offtake LOIs / contracts
- Financing strategy
- Siting assessment
- Permitting strategy
- EPC engagement and readiness
- Feedstock procurement strategy
- Utility requirements assessment
- Risk assessment and insurance strategy
- Financier term sheets for FEL-3 & 4

Technical

- Perform techno-economic sensitivity analysis (TEA) to inform design and improve cost estimation
- Complete conceptual engineering including process flow diagrams (PFD), mass and energy balance, piping and instrument (P&ID) diagrams to bring project through FEL-2
- Refine project schedule from late stage development through construction phases
- Improve cost estimate accuracy
- Integrate safety planning into facility design
- Identify needs and support recruiting

Finance

- Engage with capital providers across spectrum of financing solutions to leverage options across project debt, project equity, corporate equity, etc.
- Map government incentives and funding schemes
- Validate the project proforma with experienced underwriters
- Coordinate project financing across project equity holders and commercial contracts
- Involve insurers early to identify risk gaps and obtain appropriate coverage

Bankability

Commercial

- Map offtaker targets and generate leads
- Evaluate commercial structures and establish financeable terms with credit-worthy offtakers
- Integrated project delivery contracting from earliest stages of planning across offtake, supply chain, epc, etc
- De-risk supply chain, feedstock and utility inputs
- Early understanding of independent engineering and underwriting requirements
- Recruiting

Siting + regulation

- Engage host communities and develop relationships with key stakeholders
- Define siting criteria and identify target locations
- Perform critical issues analysis (CIA) of each site and identification of required discretionary and ministerial permits
- Engage site owners, negotiate and obtain site control

^v Note that we use FOAK here as shorthand for projects that would be among the first few deployed anywhere in the world, and for projects that may have precedent in other geographies, but not in Africa.

Mark1 aims to bring each project to an advantaged stage of conceptual development — to the point where a go/no-go decision is made on whether to proceed with the plant. In the jargon of processing industries, this entails getting the projects to “FEL-2” (FEL refers to the “front-end loading” of project design work). The preliminary equipment design, plant layout, construction schedule, and cost estimate would all be complete. After this point, an engineering team — likely with an EPC firm — would engage in detailed design work, including the exact specifications for how the plant will be constructed, commissioned, started up, and operated.

Africa needs a similar project development service, which could take the form of supporting and building out the capabilities of an existing company. For example, Great Carbon Valley (GCV), a Kenya-based company, aims to offer many of the same services as Mark1, including siting solutions (providing leases), regulatory expertise, power procurement, and partner mobilization. GCV’s current offering does not include Mark1’s engineering and project design support — but this could certainly be built out.

It also could take the form of using philanthropic capital to get an established EPC firm to play this role for a cohort of projects and companies (although this might be a harder sell, given the size and value of projects that EPC firms typically take on).

7. Create a deal team (a shared investment banking function) for first-of-a-kind African climate projects

As we note above, even the climate capital that is explicitly committed to Africa is not being deployed. Collectively, a succession of marquee emerging market-focused climate funds have raised \$33 billion, but they have only deployed \$11 billion, and just \$8 billion in Africa. Part of the reason is poor collaboration across public and private finance. To solve this, Paul Bodnar of the Bezos Earth Fund has proposed the creation of a “Deal Team for the Planet” to provide the investment banking function missing for climate finance in emerging economies:

“[This deal team would be] a commercial locomotive staffed by professional investors from both “sides of the aisle” whose sole mission is to drag across the finish line the most important climate finance deals of the decade. This Deal Team for the Planet would ask relatively little of participating FIs. And it could be designed to support, not compete with, other new climate finance initiatives in areas like blended finance, financial innovation, and country-level capacity building.

The Deal Team for the Planet would operate as a specialized intermediary (not a fund) focused on structuring and bringing to financial close strategically important or complex transactions to drive meaningful climate outcomes... While at root it would be an initiative serving in-country project proponents, it would be a tool at the service of capital providers.... [it] should not be understood as an NGO or philanthropic initiative, nor a private finance “club.” Starting with a relatively small team of senior investment professionals and other experts, the Deal Team for the Planet could be mandated to work on five to seven of the most important, highest-impact regional climate investments, with its key KPI being public-private deals brought to financial close.

Key design parameters and governance would need to be determined by participating FIs, but nailing down the following elements will be critical:

- **Clients:** The Deal Team could have a client fiduciary duty to the “sell side,” i.e., country governments and/or project developers and their equity sponsors.
- **Services:** The Deal Team could provide financial advice from project preparation to closing stages, especially financial structuring and transaction due diligence as well as financing and negotiations.
- **Talent sourcing:** The Deal Team could combine private and public sector professionals and capabilities. It would be led by a permanent core team recruited by the initiative and complemented by participating institutions’ secondments of qualified professionals.
- **Revenue model:** The Deal Team would initially be funded by participating institutions providing operating support and in-kind contributions (including secondments) and philanthropy/donor governments. Over time, there is the option to make the Deal Team self-sufficient by charging success fees.
- **Balance sheet:** The Deal Team should not be backed by a big new fund. But it should have access to financial resources to pay for some soft costs related to the transactions it supports. Optionally, the platform could be complemented by a facility aimed at financing the development stage of target transactions (subject to further discussion among donors and participants).⁷⁷

The project development services outlined above would create a pipeline of de-risked and bankable FOAK projects. The Deal Team would then get them financed — with at least some of that money coming from \$30 billion in climate finance “dry powder” already committed to Africa.



Solar minigrid powering agricultural processing, cooling, small businesses, and homes in Aninigi, Nigeria.

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