

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Compared to so-called “developed” economies, African countries are often less burdened by sunk costs in outdated infrastructure and status-quo bias.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

