Market assessment for supporting Green Value Chains in Africa

November 2024

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Executive summary

This market assessment for supporting Green Value Chains in Africa is based on extensive on-the-record and off-the-record interviews with practitioners and experts directly or indirectly involved in sub-Saharan Africa's (SSA's) Energy Transition Value Chains (ETVCs). While we have placed particular emphasis on primary source material, our research also draws on open-source secondary material.

Our primary objective has been to identify which areas of ETVCs align with IMCA's investment mandate. Importantly, we have assessed which opportunities have the strongest additionality potential. Our goal has also been to determine the most effective blended finance approach to support the greening of ETVCs and promotion of local economic development in SSA.[1]

We have also identified green energy sources and technologies which IMCA could invest in help address SSA's energy deficit, with a view to providing an enabling environment for economic development and employment creation.

Opportunities connected to CRM value chains

Despite significant political momentum to develop downstream Critical Raw Material (CRM) activities in SSA jurisdictions, our analysis indicates that immediate processing and refining projects face substantial barriers.

We understand that this is a priority sector for IMCA. However, the consensus view from the range of experts and practitioners we spoke with indicates that massive public investment (beyond IMCA's mandate) would be needed to address the issues below and develop critical pathways for success, including:

- SSA's current energy infrastructure cannot provide the stable, cost-competitive baseload power required for energy-intensive processing operations. Transport and logistics infrastructure is also inadequate and requires large-scale investment.
- Limited local demand for processed CRMs and China's dominance in global supply chains means investments risk reinforcing, rather than reducing, dependency on Chinese markets.
- Local value addition is limited. High-skilled job creation is held back by a systemic reliance on foreign labour.

[1] For further details about the report's focus, please refer to the introduction preceding this executive summary.

- The combination of high capital requirements, extended payback periods, and significant operational risks associated with refining and processing projects continues to deter private financing.

Our analysis suggests that investing in CRM-linked light manufacturing may be a better entry point. Manufacturing activities in emerging clean technology sectors, particularly battery assembly and e-mobility, require lower initial investment and are less energy-intensive. They also offer clear pathways to progressively increase local content. Over time, light manufacturing activities could create the market conditions and technical expertise necessary to support upstream integration into more advanced heavy manufacturing.

While none of the opportunities we have identified perfectly meet the full set of IMCA requirements (as shown in *Figure 1*), two manufacturing opportunities may be worthy of consideration:

- Battery pack assembly for grid storage (BESS) and e-mobility applications.
- E-mobility assembly, particularly in the two- and three-wheeler segment.

Other opportunities

Across the renewable energy (RE) value chain, a common challenge for industrial activity and economic development is the lack of stable, affordable energy access. This constraint affects all segments of industrial activity, from upstream mineral extraction, through to midstream processing & refining, to downstream manufacturing and assembly.

To support manufacturing growth and enable future processing capacity, we have also identified four primary RE potential areas for IMCA to invest with a strong focus on impact and additionality. These being the geothermal, off-grid solar, battery storage, and green hydrogen sectors**. We recommend that these potential investments not focus only on supporting industry. By taking a broad approach to investment IMCA can have a 'macro' level impact on economic development, the green energy transition and employment.**

- **Geothermal energy.** There is potential for IMCA to support hybrid projects in East Africa, with a strong focus on the largely untapped jurisdictions of Tanzania and Zambia. Hybrid projects combine power generation with direct-use heating and cooling applications that can have a transformative impact on local communities. Overall viability is high in our assessment.

- **Solar mini-grids (off-grid solar).** Mini-grid rollout has received significant donor attention and funding, but the sector still needs large amounts of capital. Mini-grids present an immediate opportunity to address SSA's growing energy deficit. IMCA is potentially in a position to make a real impact in such early-stage jurisdictions as Zambia, DRC, and Uganda. These

jurisdictions have received relatively little DFI funding when compared to Kenya and Nigeria.

- **Battery storage.** The sector presents an opportunity for scalable investment, especially in such markets as Kenya, Namibia, and South Africa. The jurisdictions are working to absorb intermittent wind and solar into their grids. The battery storage opportunity derives at least partly from the continuous decline in battery technology costs. Importantly, battery storage is a critical enabler for the deployment of off-grid solar and other RE systems. However, the battery storage market is immature and has strong links to China.

- **Green hydrogen.** The opportunity for IMCA in the green hydrogen space is qualified. There is potential for a long-term industrial play, with a strong focus on projects for domestic industrial use. South Africa and Namibia stand out for their strong commitment to green hydrogen. Nonetheless, export-oriented projects face a range of challenges, including inadequate transport and storage infrastructure, a lack of firm off-take agreements, inadequate transport and storage infrastructure and high operational costs.

Figure 1: Performance of identified opportunities in key metrics

Sector	Market maturity	Infra quality & avail-ability	Potential for job creation	Potential to drive GDP growth	Level of China activity	Overall viability for IMCA investment
PROCESSING & REFINING						
CRM processing & refining	Low	Low	Low	Moderate	High	**Low**
LIGHT MANUFACTURING						
Battery pack assembly for BESS	Moderate	Moderate	Moderate	High	High	**High**
Battery pack assembly for E2&3W	Moderate	Moderate	Moderate	High	High	**High**

E2&3W assembly	Moderate	Moderate	High	High	Moderate	**High**
Electric minibus & LCV assembly	Low	Moderate	Moderate	Moderate	Moderate	**Moderate**
RENEWABLE ENERGY GENERATION & STORAGE						
Geothermal	Moderate	Moderate	High	Moderate	Moderate	**High**
Off-grid Solar	Moderate	Moderate	High	High	High	**High**
Battery storage	Low	Moderate	Moderate	High	High	**Moderate**
Green hydrogen	Low	Low	High	High	Moderate	**Moderate**

Separately, we note that funding feasibility studies may present a significant opportunity for IMCA. These studies are critical for early-stage project development, particularly in technically complex energy transition sectors, yet remain critically underfunded. By addressing this gap, IMCA could play a pivotal role in de-risking projects, enabling investment, and expanding the pipeline of bankable ETVC opportunities across SSA.

On employment and social impact

As indicated in *Figure 1* above, geothermal, off-grid and green hydrogen have high direct and indirect job creation potential. While geothermal energy presents significant potential for high-skilled job creation, off-grid solar offers great scope for skilled and unskilled job generation, particularly in installation, maintenance, and supply chains. Mini-grids are meanwhile effective at indirect job creation by boosting local economies and enabling business development. Green hydrogen likewise has strong potential to generate jobs across economies.

The expansion of light manufacturing in ETVCs could also serve as a catalyst for skilled employment and broader economic growth. EV assembly and battery pack manufacturing offer promising pathways for job creation. These sectors not only generate direct employment but also drive a multiplier effect, stimulating indirect jobs in related industries such as logistics, maintenance, and component supply.

IMCA has an opportunity to invest in local skills development, focusing on STEM and vocational education. IMCA can thereby contribute to sustainable employment and enhance local value chains in the green economy.

There is variation in the extent to which labour rights are protected across Africa. Namibia and South Africa are the top labour rights performers out of the jurisdictions where we consider there to be investment potential. Rwanda, Tanzania, DRC, Kenya, Uganda, Zambia, Nigeria, and Ethiopia register greater variability or generally more negative performance.

Linking funds to sector opportunities

We screened 100+ funds, of which 18 classify as eligible for IMCA to consider, with a cumulative funds side of USD7.2 billion. We also identified 12 as 'maybe' funds, with a cumulative fund size of USD10.2 billion. While the majority of funds are equity funds (17), a few are debt and equity funds (7), leaving a few purely debt-focused funds (6).

The majority of funds have DFI involvement, which may limit the scope for additionality. Nonetheless, the strong DFI presence might also reflect strong ESG practices. Shortlisted funds have a high commitment to ESG and responsible investment. All of the shortlisted funds include some form of outcomes or impact targets.

A good number of eligible investment managers deal with the sectors we are recommending IMCA explore for investment. Out of all the funds / investment managers that we have identified as eligible, 15 invest in or are open to investing in Battery Energy Storage Systems (BESSs), nine off-grid, six geothermal energy, and two green hydrogen.

The ETVC growth and small-scale energy category – which includes funds that are willing to invest in multiple sectors linked to the ETVC such as hydrogen development – are most aligned with IMCA's objectives. The category is well positioned to drive energy access in view of SSA's grid constraints.

We have identified six concrete investment opportunities which are aligned to IMCA's mandate. These investment opportunities are not for public distribution, so we are sharing these with IMCA members in a separate document.

Recommendations

We recommend that IMCA pursue a synergistic approach to developing the Energy Transition Value Chain (ETVC) in SSA. Though not without risks, our recommended strategy focuses on supporting ETVC development, while also helping alleviate SSA's energy supply challenges. The ETVCs is in its infancy in SSA and requires development.

Below are the two main pillars that define our strategy. We will send IMCA members a list of specific investment opportunities in a separate document, as these are not for public disclosure.

Recommendation 1: invest in technology industries that uses CRM

Invest in venture capital (VC) and private equity (PE) to develop clean technology industries that use CRM inputs. We recommend focusing on battery pack assembly for Battery Energy Storage Solutions (BESS), e-mobility (specifically two and three-wheelers), and green hydrogen. The biggest potential for clean energy technology industries is in southern African countries,[2] with South Africa standing out as a focus of most screened funds in this area.

Action & intended impact

- **IMCA should consider forming a fit-for purpose VC platform that is able to identify and support the commercialisation of the most promising novel technologies that rely on critical minerals**. The platform would create a viable pipeline for CRM-linked manufacturing investments, thereby supporting industrialisation, economic growth, and job creation. Potential VC partners are Ventures Platform, Novastar, and Persistent Venture Builder.

- **In parallel, we advise IMCA to establish strategic PE partnerships which would provide enabling funding to scale manufacturing for proven ventures and integrated manufacturing.** Aligning VC/PE mandates would allow exit (if necessary) while also providing pipeline visibility to accommodate short PE capital deployment windows. Aligned investment managers who invest along the ETVC include Climate Fund Managers, Inspired Evolution, and Helios.

- **The above-mentioned initiatives should run in parallel. They are mutually reinforcing and collectively provide a positive enabling environment.** By investing in CRM-linked manufacturing and energy, IMCA would help build capabilities along the value chain, fuelling industrialisation which in time

[2] South Africa, for instance, is projected to instal between 2GW and 6.6GW of battery storage capacity by 2032, presenting a significant investment opportunity that could drive localisation and industrial growth. Kenya serves as another example. Its Cost Power Development Plan 2021-2030 (LCPDP) forecast includes BESS features prominently in its generation capacity expansion plan. It envisages 50MW of BESS in the generation mix by 2022 with the number rising to 250MW by 2026.

can create a stronger business case for processing and refining of critical minerals.

- **We would also recommend strategic energy investments to enable local manufacturing.** Our interviews reveal that inadequate energy access is one of the key obstacles to developing a local value chain. IMCA could partner with infrastructure funds or energy platform investors to invest in decentralized energy production, such as decentralised off-grid and battery systems, in the CRM value chain. We would recommend focusing on companies that undertake backward integration, such as e-mobility service providers targeting assembly, or projects utilising more local inputs. This approach would provide an enabling environment and encourage growth and scaling.

- **Viable investment platform partners include Camco, while viable infrastructure fund managers include Africa50 and AIIM.** This initiative may be extended to support other parts of the value chain.

Risks & reservations

- **High-tech, clean manufacturing is still nascent in SSA**. Weak market signals would need to be overcome by compensating investors for lower margins during the manufacturing scaling process and by stimulating demand. The development of regionally interconnected cheap energy can help drive costs down.

- **There is currently a lack of appetite to fund manufacturing due to potentially low margins and demand uncertainty.**

- We acknowledge that supporting the development of clean energy technologies does not represent the most direct approach to developing ETVC in Africa. It is for that reason that we have placed such strong emphasis on providing the conditions that will enable ETVC development. Importantly, our research did not reveal any viable direct investment options in the CRM refining or processing space. Mid-stream operations are energy intensive and reliant on access to cheap and reliable energy which is lacking in the region.

- RE project developers will pick the cheap Chinese components, every time, unless they are required to buy local over the long term. The Chinese dominate the market.

Recommended action 2: Invest in renewable power generation and transmission

Our research shows that a good range of fund managers which we classify as viable for IMCA are involved in large-scale energy, general infrastructure, small-scale energy, as well as ETVC growth.

Action & intended impact

- **We recommend IMCA consider strategic investments in hybrid geothermal energy projects, with a focus on the largely untapped jurisdictions of Zambia and Tanzania**. We also recommend that IMCA consider solar mini-grids (off-grid solar), focusing on early-stage development jurisdictions DRC, Zambia and Uganda.

- **IMCA may also consider potential opportunities in BESS and green hydrogen.** Scalable investments for the former exist in such jurisdictions as South Africa, Kenya, and Namibia. BESS is an essential enabler for the development of off-gird, solar and other RE. Green hydrogen for its part represents a long-term play. It would be advisable to concentrate on green hydrogen projects in southern Africa with a strong focus on domestic industrial use.

- **Our analysis of funds and asset managers points to opportunities in funding transmission and distribution (T&D) infrastructure in southern Africa**. This may include the connection of energy plants with manufacturing hubs.

- This recommendation overlaps with and complements *recommended action 1* insofar as it supports manufacturing growth. But it also allows IMCA to focus on tackling the regional energy deficit as a stand-alone challenge. Strategic investments will help reduce GHG emissions, generate GDP growth, and boost employment in the region.

- **Many of the stakeholders we interviewed underlined the need for feasibility study support.** IMCA could support feasibility studies through grant funding and technical assistance. This will help provide lift-off for a greater number of viable RE, clean energy transmission and CRM-dependent technology projects.

Risks & reservations

- **As detailed in this report, the solar mini-grid, geothermal, green hydrogen and BESS spaces all have their own challenges and risks.** The battery storage market is immature and strongly linked to China. The geothermal sector is still struggling to scale and faces what some experts describe as unfair perceptions of risk, while the off-grid sector (as a whole) already enjoys strong DFI interest. Green hydrogen suffers from inadequate

transport and storage infrastructure, high operational costs, and a lack of firm off-take agreements.

In conclusion, and notwithstanding the challenges, we believe that a dual and complementary approach will be most effective in developing the Energy Transition Value Chain (ETVC) in sub-Saharan African jurisdictions. The approach will also contribute to alleviating SSA's energy deficit woes.

IMCA is well positioned to leverage its members' leadership in solving energy transition challenges with novel, proactive approaches that create value across SSA for local economies, communities while also building the foundation for future critical minerals supply chain diversification.

Glossary of Terms

Green Hydrogen: a form of hydrogen produced by splitting water into hydrogen and oxygen using renewable electricity, most commonly through electrolysis. Distinguished from grey and blue hydrogen, green hydrogen is climate-neutral, producing virtually zero carbon emissions. [3] This feature positions it as a key enabler of a global transition to sustainable energy systems and net-zero emissions economies. Green hydrogen plays a crucial role in addressing critical energy challenges, particularly in decarbonising sectors difficult to electrify directly, such as heavy industry, shipping, and aviation.

Off-grid solar energy: a solar power system that operates independently from the national grid, using solar panels and batteries to meet energy needs. Solar mini-grids are localised networks that generate, store, and distribute power to small communities without grid connection. Ranging from a few kilowatts to 10 megawatts, they use renewable solar energy, and are managed by utilities, private entities, communities, or partnerships. [4]

Geothermal energy: renewable energy source generated from the heat within the earth, originating from the planet's formation and the decay of radioactive isotopes. Geothermal energy manifests in hot rocks, water, and steam heated by the earth's core, often emerging as geysers, hot springs, and lava. These heat sources can be tapped for direct heating or converted into electricity. [5]

Battery storage: refers to systems that store energy from renewable sources, like solar and wind, and release it when needed to meet electricity demand. Known as battery energy storage systems (BESS), these technologies are crucial for balancing green energy supply with grid demands, supporting the shift from fossil fuels to renewables. Currently, lithium-ion batteries dominate large-scale battery storage, ensuring a reliable supply of renewable energy for electricity grids and applications in industrial, commercial, and residential settings[6].

EV manufacturing: refers to the process of designing, producing, distributing, and recycling electric vehicles (EVs). EV manufacturers use cutting-edge technology to create electric cars, two- and three-wheelers, and other vehicles that are powered by electricity instead of fossil fuels. The EV manufacturing value chain involves research and development, assembly processes, material selection, and battery production.[7]

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[3] What is green hydrogen and why do we need it? An expert explains', World Economic Forum, December 21 2021, Link: https://www.weforum.org/agenda/2021/12/what-is-green-hydrogen-expert-explains-benefits/#:~:text=Emanuele%20Taibi,secure%20and%20affordable%20energy%20future.
[4] Introduction to mini-grids', Green Mini Grid, Link: https://greenminigrid.afdb.org/how-it-works/help-desk-developers-and-operators/introduction-mini-grids#:~:text=A%20mini%2Dgrid%20is%20a,or%20as%20renewable%2Ddiesel%20hybrids.
5 Geothermal Energy', National Geographic Education, May 10 2024, Link: https://education.nationalgeographic.org/resource/geothermal-energy/
6 What is battery storage?', National Grid, May 09 2023, Link: https://www.nationalgrid.com/stories/energy-explained/what-is-battery-storage#:~:text=Battery%20storage%2C%20or%20battery%20energy,the%20power%20is%20needed%20most.
7 A Roadmap to EV Commercialization and Compliance Success', 2022, Link: https://www.arenasolutions.com/resources/glossary/ev-

Methodology

The assessment of energy transition value chains (ETVCs) below is based on three primary criteria, namely:

A) Sector maturity
The development stage of each sector within the ETVC, including current and forecasted industry landscapes and market demand.

B) Infrastructure availability and quality
The availability and quality of supporting infrastructure critical for success, including energy supply, transport networks, and logistical capability.

C) Overall viability
The overall viability of the opportunity, drawing on insights into investor appetite and market potential from our interviews with stakeholders.

In conducting this assessment, we have been mindful of IMCA's specific investment preferences. Notably, we have:

- Prioritised funding opportunities that avoid areas where US government institutions or donors are already channelling substantial resources.
- Excluded upstream mining investments.
- Excluded value chains, projects, and companies where we discern a high presence of Chinese co-financing, ownership, or other forms of material financial involvement, in line with the de-risking preferences of the IMCA membership.

Throughout our analysis, we have factored in governance, political, and regulatory risks. A summary of the most material of these risks is provided in a table below.

Social and environmental impacts of identified high-opportunity sectors, with a focus on sustainable job creation and limiting greenhouse gas emissions, are analysed in the third chapter.

manufacturer/#:~:text=An%20EV%20(electric%20vehicle)%20manufacturer,for%20a%20greener%2C%20electrified%20future.

Snapshot political and governance risks of jurisdictions where potential investment opportunities exist[8]

Jurisdiction	Transparency International Corruption Perception Index (2023)	Fraser Institute Economic Freedom Index (2022)	World Bank Governance Indicators (2023)	World Bank Political Stability & Absence of Terrorism Indicator (2023)	Freedom House Democracy Index (2023)
Namibia	Low corruption perception	Moderate economic freedom	Strong governance	High stability	Free
South Africa	Moderate corruption perception	Moderate economic freedom	Moderate governance	Low stability	Free
Tanzania	Moderate corruption perception	Moderate economic freedom	Moderate governance	Moderate stability	Partly free
Zambia	Moderate corruption perception	Moderate economic freedom	Moderate governance	Moderate stability	Free
Kenya	High corruption perception	High economic freedom	Moderate governance	Low stability	Partly free
Rwanda	Low corruption perception	Moderate economic freedom	Moderate governance	Moderate stability	Not free
Uganda	High corruption perception	Moderate economic freedom	Weak governance	Low stability	Not free

[8] **Note:** For consistency and comparative analysis, numerical scores from various indices have been converted into three qualitative ratings (high/strong, moderate, and weak). Please refer to each individual source for detailed numerical indices and percentile rankings.

Nigeria	High corruption perception	Moderate economic freedom	Weak governance	Low stability	Partly free
Ethiopia	Moderate corruption perception	Low economic freedom	Weak governance	Low stability	Not free
DRC	High corruption perception	Low economic freedom	Weak governance	Low stability	Not free

Chapter 1: Opportunities in CRM value chains

Key takeaways

- **The development of CRM value chains in SSA requires a comprehensive enabling environment.** There has been significant political commitment to develop midstream and downstream activities on the continent. However, realising these opportunities requires strategic investment in the right enabling environment, which includes power generation and distribution, investment in infrastructure including roads and railways, development of specialised skills and technological know-how. It also involves investment in the manufacturing base, alongside market commitments and off-take agreements. The journey from raw minerals to finished products is complex and requires careful consideration of each enabling element. IMCA has the opportunity to invest in some parts of the value chain, but others are not yet viable.

- **While SSA benefits from significant raw material endowment, processing and refining value chains are immature, and in some cases yet to be proven as commercially viable, despite political momentum on the continent and from international partners.** Structural challenges — including inadequate infrastructure; insufficient access to deep water ports, chemicals, and cheap capital; unreliable and costly baseload power; and limited technical expertise — pose significant barriers to establishing competitive refining capacity on the continent. Additionally, the absence of robust local offtake means most processed CRMs are exported to China, where co-located downstream industries drive efficiencies. Without sufficient local demand, investments in refining risk reinforcing China's dominance in global supply chains rather than reducing dependency.

- **Light manufacturing ecosystems linked to CRM may offer a more viable pathway for value chain development than direct investment in CRM processing (the latter requiring project financing).** Key opportunities identified include battery assembly and packaging. These activities require lower capital investment than refining, are less energy intensive, benefit from clear market demand, and offer a pathway to progressive localisation. However, we note that manufacturing faces its own challenges — particularly around investor appetite, with potential funding partners expressing concerns about low margins and demand uncertainty. Nonetheless, targeted investments here could help to establish a strong manufacturing base in selected jurisdictions and catalyse local demand for processed CRM inputs, setting the stage for vertical value chain integration over time.

- **A phased investment approach which prioritises manufacturing and infrastructure may offer the best route to eventual CRM processing capacity in SSA.** While current refining opportunities remain constrained, demand creation through downstream manufacturing can lay the economic foundation necessary for future processing. While enabling infrastructure development — for instance around transport logistics — will be important for the sector's long-

term development, we note this represents a complementary rather than primary investment priority for IMCA.

Processing & refining

SNAPSHOT MARKET ASSESSMENT FOR CRM PROCESSING & REFINING
Sector maturity: Low
• While primary extraction of CRMs is well-established in many SSA countries, tertiary processing and refining capabilities remain underdeveloped. • The sector is in its infancy, with few operational facilities and limited technical expertise outside of South Africa in platinum group metals (PGMs). • SSA lacks a developed end market for critical minerals. Refining is dominated by Chinese companies which feed plants in China, where co-location with downstream industries, ready access to reagents, cheap coal power, and various government subsidies make operations viable.
Infrastructure quality & availability: Low
• A lack of deep-water ports, reliable and reasonably priced power, and efficient transportation networks significantly hinder the development of processing and refining facilities on the continent. • Existing port infrastructure is often poorly maintained and inadequate for the needs of advanced processing operations. Roads and rail are not designed to handle appropriate load capacities. • Complex minerals like cobalt, lithium, and rare earth elements (REEs) require advanced hydrometallurgical or pyrometallurgical processes, which SSA countries are not equipped to handle at scale.
Overall viability: Low
• A combination of technical, infrastructural, and market challenges makes processing and refining in SSA a high-risk and largely unviable endeavour in the short-to-medium term. • SSA countries are positioned as primary extractors rather than value-add refiners. While there is significant and growing political interest in changing this dynamic, the absence of technical infrastructure, expertise, and robust financing creates a 'catch-22', where investors are reluctant to commit without existing facilities, and facilities cannot be developed without investment. • Private investors systematically avoid projects which carry high jurisdictional (country) risk, high geopolitical risk, and require significant infrastructure development. Projects are challenging to fund even with substantial government backing.

- Poor governance and inadequate regulatory frameworks for CRM processing in SSA block access to affordable capital and make many jurisdictions no-go areas for companies with strict ESG standards.

Multiple structural barriers to onshoring CRM refining

The assumption that SSA's significant CRM reserves naturally lend themselves to downstream processing is misleading. CRMs like cobalt, lithium, graphite, and REEs are not bulk commodities, but rather specialty materials requiring sophisticated and high-purity refining processes as per the customer's specification (thus requiring proximity to customers which SSA is lacking). Despite considerable political momentum and commitment to develop these value chains on the continent, our analysis indicates several fundamental barriers to immediate large-scale processing and refining.

The CRM landscape in Africa is dominated by primary extraction, with limited domestic refining capacity. The DRC, for instance, produces 71% of the world's mined cobalt feedstock but processes only a fraction of this domestically.[9] What it does refine is primarily lower-value intermediate product, which is then shipped to China for further processing and value addition.[10] This situation is mirrored on the continent across many other CRMs, where a lack of advanced processing capabilities results in the export of raw or minimally processed material, often to China, for further refining.

Despite attempts by several SSA nations — including the DRC, Namibia, and Zimbabwe — to incentivise domestic CRM though export bans on raw ores, these policies have largely failed to add value.[11] Moreover, such bans risk crippling the extractive industry in countries lacking the necessary processing infrastructure and may inadvertently encourage illegal smuggling.[12]

Many CRMs are experiencing price volatility due to oversupply, which fundamentally undermines the commercial viability of new refining projects. The current market for cobalt, for example, has been oversupplied due to significant ramp-ups in production capacity, leading to a seven-year low price crash.[13] The volatility of critical minerals is particularly problematic for capital-intensive processing operations, which require stable, long-term market conditions to justify the substantial upfront investments required. New refining plants

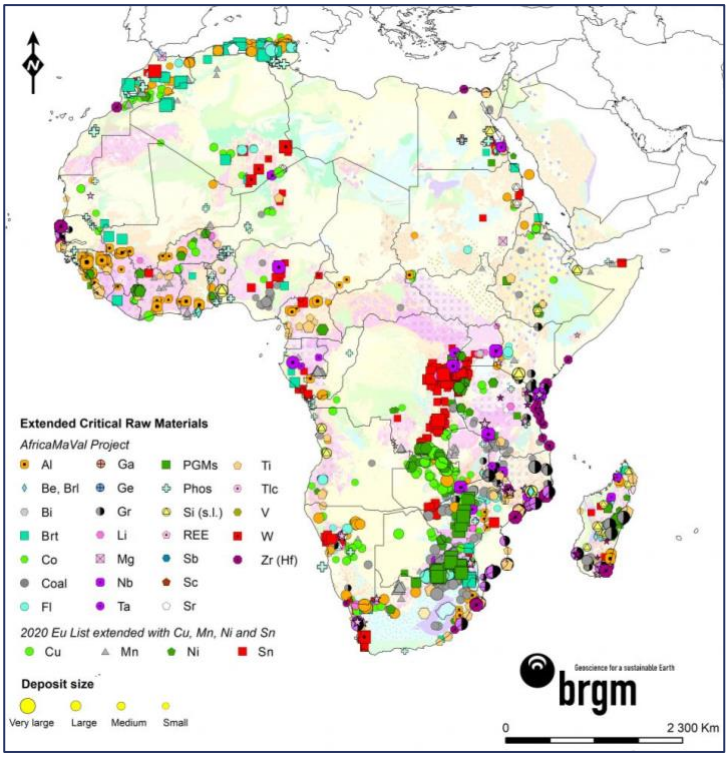
[9] 'The Cobalt Market', Cobalt Blue, April 2022, Link: https://cobaltblueholdings.com/assets/resources/The-Cobalt-Market_Apr-22.pdf
[10] 'Cobalt production in the Democratic Republic of the Congo and major projects', Mining Technology, 23 August 2024, Link: https://www.mining-technology.com/data-insights/cobalt-in-the-democratic-republic-of-the-congo/
[11] **Note:** These nations have attempted to replicate Indonesia's success. However, Indonesia is a unique case as the sector and associated infrastructure (ports, roads, coal plants) have been financed by Chinese companies and the Chinese government as part of a strategic move to secure China's access to nickel products without the environmental burden of refining in China. Various tax regimes and policies have also created an enabling environment for integrated companies.
[12] 'Zimbabwe: Raw lithium ban fails to curb smuggling', The Africa Report, 24 January 2024, Link: https://www.theafricareport.com/333577/zimbabwe-raw-lithium-ban-fails-to-curb-smuggling/
[13] 'Cobalt Crash: Why Prices Hit a 7-Year Low and What's Next', Carbon Credits, 29 August 2024, Link: https://carboncredits.com/cobalt-crash-why-prices-hit-a-7-year-low-and-whats-next/

typically cost in excess of USD1 billion and require substantial government de-risking support. Refining plants cannot be financed without secure offtake agreements. These typically include floor and ceiling prices set by the customer to mitigate against volatility. Major manufacturers and customers have not so far demonstrated willingness to back potential refineries in SSA.

Limited success stories highlight systemic challenges

While SSA countries have significant CRM deposits, few have made substantial progress in developing domestic processing and refining capabilities.

Figure 2: Identified CRM deposits in Africa.



Source: *Africa MaVal, 2023.*

Some nominal developments in processing in SSA include:

- **South Africa** has existing refining capacity for PGMs but faces significant operational challenges. Power supply issues have led to load shedding, forcing some smelters and refiners to operate at reduced capacity. In addition, the shift to electric vehicles (EVs) threatens to reduce demand for PGMs used in catalytic converters, raising concerns about the long-term viability of PGM refining.

- **DRC** has developed some local intermediate cobalt processing capacity, but Chinese investment has hindered the development of further downstream processing capacity within the country.

- **Zambia** has significant copper refining capacity, but the country's infrastructure — including its power grid — face critical challenges. Droughts and poorly maintained hydropower stations regularly disrupt supply, which is essential for smelting and refining operations to avoid operating at a loss. Zambia has also been unable to leverage its position as a copper producer to expand into higher-value CRM markets such as lithium or cobalt, despite significant political ambition to build a regional battery industry with the DRC in the Central African Copperbelt.[14]

- **Tanzania's** Ngualla Project has the potential to become a major REE producer.[15] Once operational, the project will produce REE concentrates for export. However, given the presence of Shenghe Resources in the project's ownership structure — a Chinese firm which typically only invests in projects that secure feedstock for its processing facilities in China — much of the product is likely to be exported to Beijing.

Capital constraints stifle midstream development

The financial landscape for tertiary CRM processing and refining in SSA is highly constrained due to a lack of affordable capital. One investment banker indicated to us that major financial institutions have shown very limited appetite for CRM projects. Access to debt, project finance, and equity is severely lacking. While critical minerals investments carry inherent risks regardless of jurisdiction, African projects face compounding challenges of heightened political risk, governance concerns, and corruption issues in many CRM-rich states.

At a high-level, key financing challenges include:

- **Chinese dominance:** Most financing for refining projects in the region comes from Chinese sources. Chinese state-owned enterprises (SOEs) often provide both the capital and technical expertise needed to develop processing infrastructure. Additionally, the main market for most CRMs remains China, where further refining takes place prior to use in components. SSA's limited industrialisation means there is little local demand for processed or refined minerals domestically. "Chinese groups dominate and have secured much of the available industrial space," explains George Donne, a consultant for an African midstream battery development company. He adds that "finding non-Chinese midstream investment opportunities in Africa remains challenging".

- **Limited Western donor engagement:** While some DFIs and government agencies, like the US International Development Finance Corporation (DFC), and Japan Oil, Gas and Metals National Corporation

[14] 'A Battery Industry in the Central African Copperbelt? Regional and Geopolitical Dimensions', Africa Policy Research Institute, 11 October 2024, Link: https://afripoli.org/a-battery-industry-in-the-central-african-copperbelt-regional-and-geopolitical-dimensions
[15] 'Ngualla Rare Earth Project, Tanzania', Peak Rare Earths, Link: https://peakrareearths.com/ngualla-project/

(JOGMEC) have so far provided small amounts of debt and equity financing to African CRM projects, contributions need to be matched by private finance, which is largely absent.

- **Lack of sovereign guarantees:** Cheap capital is generally inaccessible to CRM refining projects on the continent without sovereign guarantees, which are proving exceedingly difficult to secure, especially in politically unstable or conflict-affected jurisdictions. It is also hard to come by for nations which default on their IFC loans or have poor credit ratings.

Technical and logistical challenges compound market risks

Reliable, low-cost energy is critical for refining operations, but SSA struggles with both expensive and unreliable power supply. High energy costs and frequent outages not only hinder the establishment of new refining operations but also constrain the capacity utilisation of existing facilities, as seen with South Africa's rapidly declining PGM sector.[16] Mark Burnett, a geologist of over 30 years of experience, notes that "investment in any SSA CRM value chain area, including refining, is unfeasible until cheap, guaranteed energy is available". This sentiment was consistently echoed by other stakeholders who we interviewed.

While RE offers some potential to ease supply, there are issues related to grid access, storage costs and reliability. Existing hydropower facilities on the continent are performing poorly, with problems exacerbated by drought in Southern Africa and inadequate infrastructure maintenance.[17] Expanding solar and wind generation may help to plug the gaps, but as Tanisha Schultz, Senior Research Analyst at Project Blue — a market intelligence firm focussed on CRM and the energy transition — explains, the base load requirements for refineries make complete reliance on RE unfeasible. The substantial base load — the minimum continuous energy needed to keep refining and processing facilities operational — poses a fundamental technical barrier to scaling projects in SSA.

Infrastructure constraints also create significant logistical hurdles for the sector. Limited deep-water port infrastructure in SSA constrains both the export of refined materials and the import of chemicals necessary for processing. The absence of a robust chemicals industry further exacerbates this challenge, as colocation of chemical production is crucial for reducing carbon emissions, the cost of transport, and delays at customs.

The region's inadequate road and rail networks, coupled with limited deep-water port facilities, create logistical hurdles for both the import of necessary chemicals and the export of refined products. While there has been considerable optimism surrounding the Lobito Corridor and its potential to improve connectivity in Southern Africa, it may be arriving too late, as much of the supply of relevant CRMs

[16] 'SA's platinum mining industry in terminal decline, Northam CEO says', Reuters, 30 August 2024, Link: https://www.reuters.com/markets/commodities/south-africas-platinum-mining-industry-terminal-decline-northam-ceo-says-2024-08-30/

[17] 'Zambia faces 21-hour power cuts as Lake Kariba dries up', African Arguments, 11 September 2024, Link: https://africanarguments.org/2024/09/zambia-faces-21-hour-power-cuts-as-lake-kariba-dries-up/

— cobalt, copper, and REEs — has already been secured by China through long-term off-take agreements.[18]

Scale is a crucial factor in creating commercially feasible operations, but achieving this is challenging. A single mine typically cannot support sufficient input for a refinery; multiple tier 2-3 mines feeding into a single refinery are often required to achieve economies of scale. While SSA could potentially achieve scale in copper, cobalt, and manganese, refineries would need to be located as close to ports as possible due to inadequate transport infrastructure. This means that, in most cases, jurisdictions with natural resource endowment would not benefit from the value add (unless they enjoy robust existing transport networks to modern deep-water ports).

Refining CRMs requires technical expertise that can only be obtained through significant practical experience. These skills are in short supply across the West due to offshoring to China, and it can be difficult to incentivise experts to relocate to SSA. The situation is exacerbated by systemic gaps in local capacity development. Tanisha Schultz notes that insufficient collaboration between mining companies and universities has hindered the development of a sustainable local workforce capable of supporting both upstream and downstream operations. This skills deficit is further compounded by chronic underinvestment in educational infrastructure. According to Mark Burnett, the lack of substantial investment in local schools, universities, and polytechnics has left SSA without the "technical elite" needed to sustain domestic CRM projects.

Due to the significant challenges and risks associated with tertiary CRM processing and refining in SSA outlined above, IMCA may struggle to identify viable direct investment opportunities in this space at present where DFI is not already present. However, our analysis points to several areas that require development to help unlock opportunities in SSA in the long term.

As we explore in Chapter 2, investment in RE generation represents a primary opportunity to address one of the fundamental barriers to industrialisation in SSA — the lack of reliable and affordable power supply. Beyond energy, we have identified several areas requiring government-led financial support that could help create an enabling environment for processing operations. These include:

- Strategic infrastructure development, particularly transport networks and deep-water ports.
- Technical education and training programmes, with emphasis on sciences, geology, material processing, and metallurgy.
- Policy engagement to develop investment-conducive frameworks and regulations.
- Support for comprehensive feasibility studies to evaluate supply chains and potential refinery sites.

[18] 'Lobito Corridor – A Reality Check', Africa Policy Research Institute (APRI), 02 February 2024, Link: https://afripoli.org/lobito-corridor-a-reality-check

While these opportunities may not directly accelerate CRM processing in the short term, they represent critical building blocks for establishing for creating a favourable business environment. This is necessary to increase the likelihood of creating a stronger business case for processing and refining of critical minerals in SSA in the long term. IMCA may wish to consider these as part of a broader strategy to unlock SSA's downstream potential in critical minerals.

Manufacturing

Snapshot assessment of opportunities in CRM-related manufacturing

Sector	Sector maturity	Infrastructure quality & availability	Overall viability	Opportunity jurisdictions
Battery pack assembly for BESS	Moderate	Moderate	Moderate	South Africa Nigeria Kenya Namibia Zambia
Battery pack assembly for E2&3W	Moderate	Moderate	Moderate	Nigeria Kenya Ethiopia Uganda Rwanda
E2&3W assembly	Moderate	Moderate	Moderate	Nigeria Kenya Ethiopia Uganda Rwanda
Electric minibus & LCV assembly	Low	Moderate	Moderate	South Africa Nigeria Kenya

Investing in scalable manufacturing may unlock local value chain development

While immediate opportunities in CRM processing remain limited, we have identified several potential manufacturing opportunities which could act as foundational steps towards future value chain integration. New business models in e-mobility and batteries have emerged along the ETVC with significantly lower barriers to entry than processing or refining, including lower capital intensity and power requirements. These segments offer clear pathways to progressively increase local content and, over time, stimulate demand for processed materials on the continent.

Industrial development typically begins with lighter manufacturing activities as a starting point. Activities such as assembly and integration require less capital investment than heavy manufacturing and can make use of existing skills and infrastructure. While processed mineral inputs for ETVC manufacturing in SSA currently — and at least in the short-to-medium term — are likely to continue to come from China, the economics of industrialisation tell us that linkages form manufacturing scales. As local operations expand, supported by greater local content requirements and steady project pipelines, the demand for locally sourced inputs will increase. Components that can be cost-effectively produced within SSA will increasingly be localised.

SSA currently suffers from limited access to capital for industrial projects, particularly in emerging clean technology sectors like battery storage and electric mobility. Our discussions with investment managers revealed that PE investors with mandates covering both enterprise growth finance and project finance consistently choose players towards the end of the value chain (e.g., IPP) and energy projects. There is little to no focus on investment in value addition via manufacturing in the ETVC. “There is so little capital coming in now for new industries and technologies, let alone for traditional infrastructure sectors. If we are able to mobilise capital for both, this is a huge opportunity,” notes Tshepidi Moremong, Chief Operating Officer of Africa50, an infrastructure investment platform founded by the AfDB. For a detailed analysis of current investment trends, please see the 'Specific investment opportunities' section of this report.

Addressing this financing gap provides IMCA an opportunity to catalyse the growth of strategic manufacturing on the continent, helping to strengthen domestic economies and establish the demand dynamics necessary to support future, more complex manufacturing activities, including projects related to CRM processing and refining. In brief, a strategic focus on developing clean technology industries from the ground up can help unlock both short-term manufacturing opportunities and long-term upstream integration.

Light manufacturing offers a promising path to industrial scale

While many jurisdictions in SSA remain in the early stages of industrialisation, the region presents opportunities in light manufacturing, particularly within the battery supply chain. Battery pack assembly and EV integration present potential entry points. These activities require comparatively modest capital expenditure — typically under USD10m depending on the facility — and may be able to achieve commercial viability even with current power and infrastructure constraints.

However, securing investment for these opportunities faces significant headwinds. Our discussions with potential funding partners revealed that few PE and VC firms have previous exposure to ETVC manufacturing in Africa. There is notable hesitation to fund manufacturing projects due to concerns about low margins and demand uncertainty in emerging markets. This financing gap represents a material challenge for scaling manufacturing operations on the continent.

Despite these investment hurdles, our analysis identifies two main light manufacturing opportunities that may be viable for targeted investment, provided appropriate innovative financing approaches and partnerships can be established.

First, battery pack assembly shows particular potential in two key segments:

- **Stationary storage (i.e., BESS) systems:** Battery pack assembly for grid storage and commercial applications can achieve domestic market competitiveness through reduced logistics costs and duty avoidance. Small early market entrants are emerging, such as Arnergy and Duplantis Energy in Nigeria, which suggests the viability of this model in markets with significant RE deployment.

- **E-mobility battery systems:** Battery pack assembly for EVs, particularly in urban markets with supportive policies, offers another compelling entry point. These operations can serve growing local demand while benefiting from regional trade integration under the African Continental Free Trade Area (AfCFTA).

Second, EV assembly using semi-knocked-down (SKD) kits has shown early promise, particularly in the two- and three-wheeler (E2&3W) segment. A vibrant start-up ecosystem has emerged, with the Shell Foundation identifying over 20 e-mobility ventures across the continent as of 2021. [19] Companies like Roam Electric in Kenya, GOGO in Uganda, and Ampersand in Rwanda have successfully established assembly operations focused primarily on electric motorcycles. Several asset financiers are also developing dedicated models for financing. Tugende in Uganda and MAX.ng in Nigeria are piloting asset finance for E2Ws, building on their

[19] **Note:** This analysis excludes battery pack assembly and vehicle assembly for electric four-wheelers (E4Ws). The E4W segment faces two key constraints in SSA: limited market adoption driven by consumer affordability barriers and high manufacturing complexity. E4W battery systems require vehicle-specific design and close collaboration with Original Equipment Manufacturers (OEMs). With no major E4W manufacturing base on the continent outside Morocco, neither E4W assembly nor related battery pack production presents viable investment opportunities in the short-to-medium term.

existing experience of traditional internal combustion engine (ICE) 2W asset finance.

Moving upstream into lithium-ion battery cell manufacturing or component production currently faces the same constraints that limit CRM processing: high capital and energy intensity, stringent technical requirements, and significant infrastructure needs. A cost competitive plant for cathode or anode material can cost in excess of USD0.3 billion. A typical gigafactory for battery cell production is even more expensive — requiring investment of around USD1 billion.[20] However, the development of assembly operations today may create the conditions — stable demand, technical capabilities, and industrial infrastructure — that can make more complex manufacturing segments viable in the future.

The table below provides analysis of specific opportunities identified across battery pack and EV assembly, including estimates of the initial investment required, competitive dynamics of the segment, and potential opportunity jurisdictions in SSA.

Figure 3: An overview of light manufacturing opportunities connected to CRM in SSA.

Opportunity	Strategic considerations	Key SSA jurisdictions	Overall viability
Battery pack assembly for BESS	• **Estimated initial investment required:** USD 3-10m for a basic BESS assembly facility, depending on production capacity.[21] • **Potential for cost competitiveness:** High. Local assembly reduces transport costs and avoids high import duties on fully assembled units, making units competitive in domestic and regional off-grid energy markets. Export competitiveness remains dependent on access to affordable battery cells and components.	Countries with high BESS demand (i.e., high amounts of installed RE capacity): South Africa Nigeria Kenya Namibia Zambia	Moderate

[20] 'From Minerals to Manufacturing: Africa's Competitiveness in Global Battery Supply Chains', The Faraday Institution, October 2024, Link: https://manufacturingafrica.org/wp-content/uploads/2024/10/from-minerals-to-manufacturing_africa-competitiveness-in-global-battery-supply-chains_core-report-updated.pdf
[21] Ibid.

	• **Key advantages:** High demand in domestic markets for off-grid solutions; aligns with SSA's growing energy storage needs. Requires significantly lower economies of scale compared to more complex activities, e.g., battery cell manufacture. Existing small players in SSA like Arnergy and Duplantis Energy in Nigeria suggest market feasibility. • **Key challenges:** Logistical challenges for component imports. Dependent on RE project pipeline and grid expansion pace; demand could be sensitive to fluctuations in financing for energy projects.		
Battery pack assembly for E2&3W	• **Estimated initial investment required**: USD 2-5 m for a small-to-medium scale (1GWh) assembly line.[22] • **Potential for cost competitiveness**: High. Given the import costs of fully assembled EVs, local assembly offers an opportunity to undercut imported vehicles. Regional markets can also benefit under the AfCFTA. • **Competitive strengths**: Rapidly increasing demand for E2&3Ws in SSA, especially in urban areas. Low-cost assembly compared to importing full systems. • **Competitive weaknesses**: Requires a consistent pipeline of urban transport initiatives. Still reliant on imported battery cells and critical components, which impacts cost control. Faces high competition from imports until local production scales significantly.	Countries with high demand for urban and last-mile mobility solutions: Nigeria Kenya Ethiopia Rwanda Uganda	Moderate

[22] Ibid.

E2&3W assembly	• **Estimated initial investment required**: USD 5-10m for an assembly plant.[23] • **Potential for cost competitiveness**: Moderate. Local assembly may be able to compete in domestic markets, especially where customisation is required. Achieving cost parity in export is limited without significant scaling and subsidies for local parts production. • **Competitive strengths**: Dominance of 2&3Ws in urban SSA markets positions EV adoption as a natural next step. E-motorcycles, in particular, are emerging as a highly promising industry, driven by strong demand. Significant local appetite for low-cost, efficient mobility solutions, providing a foundation for initial domestic competitiveness. • **Competitive weaknesses**: Dependent on imported SKD kits; export competitiveness is hindered by lack of economies of scale and inconsistent energy supply to maintain production efficiency.	As above.	Moderate
Electric minibuses and light commercial vehicles (LCVs) assembly	• **Estimated initial investment required**: No concrete data available. • **Potential for cost competitiveness**: **Low to Moderate**. Local assembly can meet rising domestic demand for fleet electrification, but high initial component import costs and relatively small-scale production reduce SSA's ability to compete in export markets.	Countries with high demand for urban transit and relatively established automotive sectors: South Africa Nigeria Kenya	Moderate

[23] Ibid.

	• **Competitive strengths**: Public transport and logistics reforms are driving growing demand for EV minibuses and LCVs, particularly in urban hubs. Potential to expand local manufacturing with government-backed fleet conversions. • **Competitive weaknesses**: Low production volumes reduce economies of scale. Significant reliance on imported parts. High price sensitivity of local consumers. Export opportunities are limited without cost reductions and expanded production.		

While the manufacturing opportunities identified above have lower power requirements than CRM processing or battery component manufacturing, they all still require a reliable power supply and efficient logistics networks to be commercially viable. Success in scaling these industries will require a dual investment approach which couples targeted support for manufacturing with strategic infrastructure development, including in RE generation. Chapter 2 examines how investment in enabling infrastructure can support both near-term manufacturing opportunities and eventual upstream integration.

Chapter 2: Opportunities in RE generation

Key takeaways

- **Reliable power access is key to unlocking SSA's industrial potential**. The development of ETVCs — from mineral processing to manufacturing — depends on establishing a stable, affordable energy supply. Strategic development of RE resources, combined with appropriate storage solutions, can help to address this critical constraint.

- **SSA's presents distinct opportunities across the RE power generation spectrum.** Our analysis broadly identifies four areas for potential investment: namely, geothermal, off-grid solar, battery storage, and green hydrogen.

- **Geothermal energy presents a medium to long-term opportunity for investment.** Kenya and Ethiopia remain the most advanced and mature markets in the region, but other jurisdictions like Tanzania remain largely untapped. A new development in Zambia is also promising, as it suggests geothermal potential beyond the high-temperature East African system. Hybrid geothermal projects — combining power generation with direct-use applications for heating and cooling — could significantly benefit local communities and help to foster industrial development.

- **Solar mini-grids may present an immediate opportunity to address the continent's growing energy deficit crisis.** Despite considerable attention from donors, the rollout of mini-grids still requires significant capital to scale. The sector's total addressable market, estimated at USD170 billion by 2030, warrants attention. Opportunities for additionality may exist in earlier-stage markets like Zambia, the DRC, and Uganda, which have received comparatively little DFI funding compared to countries like Nigeria and Kenya.

- **Battery storage is a critical enabler for the deployment of off-grid solar and other renewable energy (RE) systems.** As battery technology costs continue to decline, the sector presents a compelling opportunity for scalable investment, particularly in markets like South Africa and Namibia which are actively working to integrate RE into grid infrastructure.

- **There may be potential for a longer-term industrialisation play with an investment in green hydrogen, but the sector faces significant near-term challenges.** Namibia and South Africa stand out as attractive investment jurisdictions due to their strong political will to develop green hydrogen markets, but export-orientated projects in these jurisdictions face significant challenges. These include high operational costs, inadequate transport and storage infrastructure, and a lack of firm off-take agreements.

- **Near-term investment focus for green hydrogen is likely best placed on projects for domestic industrial use.** These projects can be used as 'launch-

pad' investments to build technical capacity, demonstrate commercial viability, and build foundational infrastructure.

- **Across all RE technologies, early-stage project development requires strategic support and financing.** There is significant opportunity for investment in independent feasibility studies, which could help to build a pipeline of bankable RE projects and catalyse private capital.

Reliable green power is key to unlocking SSA's industrial potential

Stable and affordable power access remains a critical barrier to industrial development across SSA's ETVCs. This constraint affects all segments of industrial activity, from upstream (mineral extraction), through midstream (processing & refining) to downstream (manufacturing and assembly).

Our analysis in Chapter 1 highlights how energy constraints fundamentally undermine the business case for CRM processing and refining on the continent. Even in South Africa, which has the region's most developed industrial base, unstable power supply has forced some refineries to operate well below capacity. These challenges extend downstream to manufacturing, where unreliable electricity increases production costs and reduces competitiveness.

While SSA's abundant RE resources offer significant potential, harnessing this potential requires strategic development to address industrial power needs. Targeted RE capacity development, particularly when paired with appropriate storage solutions, could establish the reliable, cost-competitive power supply needed to support both manufacturing operations across the ETVC and more energy-intensive activities like CRM processing and refining.

The sections below examine specific RE technologies and their potential to enable industrial development across SSA's ETVCs. Our analysis focuses on opportunities that could help establish the enabling conditions for both near-term manufacturing growth and eventual upstream integration.

Snapshot market analysis of relevant RE sectors

Sector	Sector maturity	Infrastructure quality & availability	Overall viability	Opportunity jurisdictions
Geothermal	Moderate	Moderate	High	Kenya Tanzania Zambia
Off-grid solar	Moderate	Moderate	High	Zambia Uganda DRC
Battery storage	Low	Moderate	Moderate	South Africa Kenya Namibia
Green hydrogen	Low	Low	Moderate	South Africa Namibia

Geothermal energy

SNAPSHOT MARKET ASSESSMENT FOR GEOTHERMAL ENERGY
Sector maturity: Moderate
• The sector is still developing, although Kenya, the regional leader, has successfully operated geothermal plants since the 1980s. Kenya's Olkaria complex is Africa's largest and only fully operational geothermal project for electricity generation. Its success demonstrates a proven model, but scaling similar projects across the region has proven slow. • Ethiopia, Tanzania, Uganda, and Djibouti have projects in various stages of planning, but they face significant barriers, including limited access to financing, technical capacity shortfalls, and political and security risks that have slowed progress.
Infrastructure quality & availability: Moderate
▪ The Olkaria complex in Kenya is a robust example of existing infrastructure and technical capacity, but geothermal infrastructure in other African countries is underdeveloped. ▪ Ethiopia, and to a lesser extent Djibouti and Tanzania, have made modest progress in their geothermal efforts, particularly in exploration and slim hole drilling tests, but initial exploration costs are still often prohibitively expensive.
Overall viability: High
▪ Viability is increasing, particularly in areas within the East African Rift System (EARS), which contains some of the highest geothermal potential in the world, but also in non-traditional geothermal systems in Southern Africa. ▪ Technological advancements in drilling are progressing at pace and reducing the risks and costs associated with early-stage exploration, but geothermal project still face significant capital expenditure (CAPEX) challenges. ▪ We recommend exploring potential opportunities in Tanzania and Zambia.

Modest development progress beyond Kenya

Africa's geothermal sector is poised for significant expansion, with investments projected to reach USD35 billion by 2050, according to the energy consultancy Rystad Energy.[24] Rystad further forecasts that Africa could surpass Europe's geothermal capacity within the next decade.[25] However, despite its potential, less than 5% of Africa's geothermal capacity has been developed for electricity generation to date. Geothermal production is currently concentrated almost entirely in Kenya and Ethiopia, leaving much of the continent's geothermal resources untapped.

Deal flow has been limited over the past decade, but major DFIs showing renewed optimism about geothermal opportunities, particularly in light of emerging technologies. In discussions with us, a senior DFI executive emphasised strong interest in the sector, noting that while geographic constraints and market size have limited viable projects to date, they are optimistic about new and emerging opportunities.

Energy challenges across Africa, especially in regions heavily reliant on hydropower, are driving new momentum for geothermal development. Increasing concerns over water scarcity and the reliability of hydropower are prompting a surge in R&D and exploration beyond the more established geothermal markets of Kenya and Ethiopia. For example, Zambia, which relies on hydropower for 83% of its electricity, is now actively exploring non-magmatic geothermal systems to mitigate the risks associated with drought and energy security.[26]

Geothermal's key advantage is its ability to provide stable baseload power without the need for extensive storage integration, a critical factor for energy-intensive industrial operations. Unlike intermittent renewable energy sources, geothermal offers high reliability, which may make it particularly attractive for industrial applications. Peter-Vivian Neal, CEO of Kalahari GeoEnergy, highlights this potential, noting that geothermal "provides baseload power with high reliability, over 95% capacity. At a cost of USD4.4-4.5 m per megawatt installed, geothermal can be more economical than solar, which, without storage, operates at some 15% capacity and thus requires five times more installed capacity to match geothermal annual output. In fact, geothermal becomes a less expensive option than solar".[27]

[24] 'Picking up steam: Africa will overtake Europe in geothermal capacity by 2030, $35 billion investments by 2050', Rystad Energy, November 2023, Link: https://www.rystadenergy.com/news/africa-overtake-europe-geothermal-capacity
[25] Ibid.
[26] 'Kalahari presents development roadmap for Bweengwa geothermal site, Zambia', Think GeoEnergy, July 01 2024, Link: https://www.thinkgeoenergy.com/kalahari-presents-development-roadmap-for-bweengwa-geothermal-site-zambia/
[27] **Note:** It's worth highlighting, however, an observation from Mark Burnett that geothermal still cannot support the base load needed for refining or midstream activities in CRM value chains.

Security risks and funding gaps slow regional expansion

Geothermal power generation is heavily concentrated in the EARS region, with Kenya leading development. Kenya's Olkaria complex, with an installed capacity of 720 MWe,[28] is the continent's largest (and currently only operational) geothermal power plant. It is also one of the most successful geothermal ventures globally. Even with Olkaria, Kenya is still only tapping into a small fraction of its estimated 7,000 MW potential, with only 200 MW of new capacity currently under development.[29]

Ethiopia is a (distant) second in terms of geothermal development, though significant delays in securing power purchase agreements (PPAs) have slowed new projects coming online. Established projects also face challenges. The country's oldest geothermal plant, Aluto-Langano, was mothballed after six workers were kidnapped in October 2023, raising concerns about security.[30] A much-anticipated new project, Tulu Moye, was recently scrapped, with site insecurity also cited as a major factor.[31] These challenges have considerably postponed timelines for the expansion of Ethiopia's geothermal capacity.

Despite the concentration of development in the Kenya and Ethiopia, geothermal potential exists beyond these jurisdictions, although awareness among policymakers and donors is relatively limited.[32] Djibouti (estimated 1,000 MW capacity) and Tanzania (estimated 650 MW capacity) are advancing geothermal projects, but these remain in the exploration or pre-construction stages. Uganda (estimated 1,500 MW capacity) has reached the advanced stage of surface exploration at two major sites.

[28] 'Africa To Overtake Europe in Geothermal Capacity by 2030', Society of Petroleum Engineers, November 06 2023, Link: https://jpt.spe.org/africa-to-overtake-europe-in-geothermal-capacity-by-2030

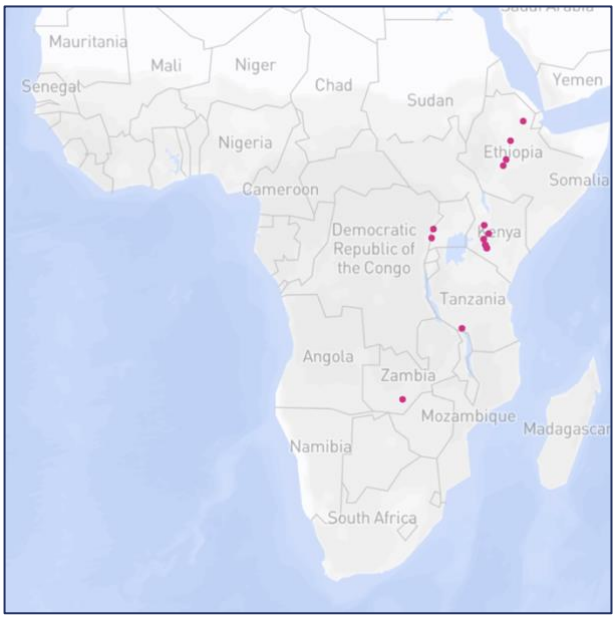
[29] 'The African Development Bank and the Climate Investment Funds support their first private sector-led geothermal power plant in Kenya', African Development Bank (AfDB), June 08 2018, Link: https://www.afdb.org/fr/news-and-events/the-african-development-bank-and-the-climate-investment-funds-support-their-first-private-sector-led-geothermal-power-plant-in-kenya-18233

[30] 'Six workers abducted near a geothermal project in Oromia', Ethiopia Observer, 04 October 2023, Link: https://www.ethiopiaobserver.com/2023/10/04/six-workers-abducted-near-a-geothermal-project-in-oromia/

[31] 'Tulu Moye Geothermal axes operations, blames OLF-Shane', The Reporter, June 29 2024, Link: https://www.thereporterethiopia.com/40855/

[32] 'Building the Global Geothermal Market: A Sustainable Energy Frontier', International Geothermal Association (IGA), April 2024, Link: https://www.youtube.com/watch?v=SuidF0PWBWU

Figure 4: Map of geothermal projects for electricity generation in SSA (Proposed, pre-construction, in development, operational & mothballed)



***Source**: Global Energy Monitor, 2024.*

Emerging markets are largely untapped

Investment in African geothermal remains concentrated in Kenya. Both state-owned enterprises and private sector players are active in the market. KenGen, the state-owned utility, has spearheaded much of the development efforts to date, and the parastatal Geothermal Development Company (GDC) has recently stepped up its ambition to harness an additional 218 MW of geothermal capacity in the next five years.[33] Private companies, and particularly the US electricity firm Ormat Technologies, have successfully entered into public-private partnerships (PPPs) with KenGen and GDC.

The Kenyan sector has also garnered strong international backing, with DFIs showing consistent support over the past two decades. Germany's KfW has emerged as a particularly important financier for Kenyan projects — including Olkaria and a newer plant, Menengai — through a combination of grants, and subsidised and commercial loans.[34] Given the strong presence of DFIs, the prospects for investment additionality in the Kenyan geothermal sector may not be very high.

Ethiopia has also been a primary geothermal focus country. The World Bank and the International Finance Corporation (IFC), a member of the World Bank Group,

[33] 'GDC launches 5-year plan for geothermal development in Kenya', Think GeoEnergy, April 12 2024, Link: https://www.thinkgeoenergy.com/gdc-launches-5-year-plan-for-geothermal-development-in-kenya/

[34] 'Energy security through geothermal power plants in Kenya', KfW, August 05 2023, Link: https://www.kfw-entwicklungsbank.de/About-us/News/News-Details_762048.html

have shown considerable interest in de-risking early-stage projects and facilitating infrastructure development in the country.

The establishment of risk mitigation facilities and an uptick in bilateral partnerships have significantly reduced upfront financial risks for new projects and accelerated FDI. The Geothermal Risk Mitigation Facility (GRMF) was established in 2012 and provides non-reimbursable grants for geothermal projects in 13 East African countries to de-risk exploratory drilling. Bilateral partnerships, such as the New Zealand–Africa Geothermal Facility, are also providing technical and financial assistance to build capacity and infrastructure.

Tanzania and Zambia signal opportunities beyond EARS

While there is significant DFI activity surrounding large-scale geothermal power plants in Kenya and Ethiopia, Tanzania is an emerging geothermal market which may offer a promising opportunity for additionality. Unlike Kenya and Ethiopia, where DFI funding is concentrated, Tanzania's geothermal resources remain largely undeveloped and open to first movers. The country's flagship Ngozi project (70 MW) is in the pre-construction phase and has secured international support with co-financing from the Geothermal Risk Mitigation Facility (GRMF) and an additional USD21.7m facility from the CIF.[35] Tanzania's relatively stable political environment and established regulatory framework for power projects may make it a viable investment target.

Djibouti is also an emerging market. A 50 MW project in Lake Assal is progressing with financing from the World Bank, the African Development Bank (AfDB), and the Global Environment Facility (GEF), as well as bilateral support from Iceland and Japan.[36] However, political risks — including a deterioration in the rule of law and democratic freedoms reported by Freedom House,[37] and the country's heavy reliance on Chinese BRI financing[38] — raise concerns about its potential as a stable long-term investment jurisdiction.

Zambia stands out as a potential investment destination. It is currently pursuing the continent's first geothermal development for energy generation outside of the high-temperature setting of East Africa. Kalahari's Bweengwa River project is exploring direct-use geothermal applications for aquaculture heating and crop drying, as well as indirect power generation. Its successful execution could potentially open a new frontier for geothermal development beyond the EARS. The project is currently in the pre-construction phase and is looking to secure the necessary financing to begin development.

Beyond power generation, geothermal resources may offer untapped potential for broader industrial applications. Helen Robinson, Africa Regional Manager and

[35] 'Tanzania wins $21.7m in CIF funding for exploration of Ngozi geothermal project', Think GeoThermal, July 19 2017, Link: https://www.thinkgeoenergy.com/tanzania-wins-21-7m-in-cif-funding-for-exploration-of-ngozi-geothermal-project/
[36] 'Geothermal energy in Djibouti', African Geothermal Association, Link: https://africangeothermal.org/countries/djibouti/
[37] 'Freedom in the World: 2023: Djibouti', Freedom House, March 2023, Link: https://freedomhouse.org/country/djibouti/freedom-world/2023
[38] 'China's Engagement in Djibouti', Congressional Research Service, September 2019, Link: https://crsreports.congress.gov/product/pdf/IF/IF11304/3

Global R&D Manager for the International Geothermal Association (IGA), points to emerging opportunities in the geothermal co-production of critical metals and green hydrogen, which could unlock which additional revenue streams for projects.

This potential is gaining momentum. We note that during a visit to the Olkaria geothermal plant in Kenya in June 2023, German Chancellor Olaf Scholz highlighted the possibility of integrating Kenyan geothermal energy with green hydrogen production.[39] KenGen is currently investigating the feasibility of using geothermal to produce green hydrogen, ammonia, and fertiliser at the complex.[40] While this is a very early use case, Germany's attention suggests an appetite for investment in innovative applications, which could open new and significant areas of growth for the sector.

Regulatory gaps and technical constraints limit rapid scaling

Geothermal investments are often perceived as high-risk due to the high CAPEX and speculative nature of early-stage exploration. However, Helen Robinson argues this is largely a misconception and that new drilling technologies are reducing the risks associated with geothermal projects: "There's still the stereotype of geothermal being high-risk, but it's more of a perception problem. Our success rates are much higher than people think — around 75-80% compared to oil and gas exploration — but we can't yet offset costs like the oil industry can by drilling so many wells".

Robust regulation for geothermal development outside Kenya and Ethiopia is severely lacking. Only these two jurisdictions have comprehensive geothermal laws.

The absence of regulatory frameworks is particularly pronounced for heating and cooling applications, which limits the full scope of geothermal resource development. While Kenya's *Energy Act of 2019* supports private sector investment in power generation, it does not include a dedicated licensing framework for direct-use applications. Ethiopia's *Geothermal Proclamation of 2016* is an exception, offering separate licensing for both power generation and direct-use projects, but such comprehensive regulation is not yet widespread.[41]

[39] 'Chancellor Scholz signals a new dawn in German-African relations', The African Courier, May 15 2024, Link: https://www.theafricancourier.de/news/africa/chancellor-scholz-for-a-new-dawn-in-german-african-relations/
[40] 'RFP – Feasibility study for green hydrogen and fertilizer in Olkaria, Kenya', Think GeoEnergy, July 30 2022, Link: https://www.thinkgeoenergy.com/rfp-feasibility-study-for-green-hydrogen-and-fertilizer-in-olkaria-kenya/
[41] Ibid.

Off-grid electrification (solar mini-grids)[42]

SNAPSHOT MARKET ASSESSMENT FOR OFF GRID
Sector maturity: Moderate
• While mini-grids are not a new concept in Africa, the market for solar mini-grids is relatively nascent. There are currently 3,000 solar mini-grids installed, compared to the projected need for 160,000 by 2030. This means that the current level of development is less than 2% of the required scale. • A significant financing gap indicates that the industry is still in the early stages of development, with much room for growth.
Infrastructure quality & availability: Moderate
• The infrastructure requirements for solar mini-grids are much lower than for other RE technologies, such as geothermal, or carriers such as green hydrogen. • Solar PV and battery storage components have matured significantly, becoming more affordable, which is driving down costs and increasing the scalability of mini-grid projects.
Overall viability: High
• The outlook is promising, supported by growing international recognition that mini-grids are the 'least-cost' solution for electrification on the continent, especially in rural areas. • Falling component costs point to a bullish future market, with predictions that mini-grids could deliver electricity at competitive prices as early as 2030. • We consider Uganda and Zambia to be target investment countries.

Energy access crisis drives need for off-grid solutions

Off-grid electrification in Africa represents a large and growing market, driven by an acute and rising need for reliable energy access. These systems, which typically combine solar generation with battery storage in hybrid configurations, are increasingly vital for providing stable power in areas where grid extension is unfeasible. As many as 618m Africans, 43% of the continent's population, lack basic

[42] **Note:** This analysis prioritises mini-grids over other off-grid technologies — notably Solar Home Systems (SHS) — due to their capacity to drive electrification at a larger scale and for a wide range of productive uses and services.

energy services.[43] With the continent currently experiencing a reversal of the electrification progress made in the mid-to-late 2010s due to rapid population growth, declining finance for grid expansion, and ongoing economic fallout from the COVID-19 pandemic,[44] these figures are set to rise. The pace of electrification will need to be rapidly accelerated in order to achieve universal access to electricity by 2030, especially in rural areas of SSA.

Solar mini-grids are increasingly positioned as the 'least-cost' solution for rural and remote areas where traditional grid extension is cost-prohibitive and logistically challenging. According to the World Bank, mini-grids and SHS may represent the least-cost solution for half of the world's people who still need access to electricity by 2030.[45] On the continent, mini-grids may already be cheaper than main grid extensions for at least 100m of the 618m Africans living off-grid.[46] **The IEA projects that up to forty percent of new connections in SSA will come from mini-grids by 2030, representing a potential opportunity for USD170 billion investment over the next decade.[47]**

The solar mini-grid sector has seen rapid growth, though it still falls short of required targets. The number of installed mini-grids on the continent has grown from around 500 in 2010 to more than 3,000 by 2024, with a further 9,000 planned or in development.[48] However, this rollout falls far short of the World Bank's projection that 160,000 mini-grids that will be needed to bring electricity to all Africans by 2030.[49]

Technological advancements have reduced the cost of electricity from solar mini-grids, making them competitive or almost competitive with national utilities in several African countries. Falling costs of solar PV systems, batteries, and related components have enabled significant scaling in high solar irradiance jurisdictions like Kenya, Nigeria, and Ethiopia. By 2030, it is predicted that solar mini-grids will be able to generate electricity at a cost as low as USD 0.20 per kWh,[50] which is significantly lower than the current cost of grid-supplied electricity in many African geographies.

[43] 'Africa Energy Outlook 2022', IEA, June 2022 Link: https://www.iea.org/reports/africa-energy-outlook-2022/key-findings
[44] 'The Covid-19 crisis is reversing progress on energy access in Africa', IEA, November 20 2020, Link: https://www.iea.org/articles/the-covid-19-crisis-is-reversing-progress-on-energy-access-in-africa
[45] 'Mini Grids for Half a Billion People', World Bank Group, June 2019, Link: https://www.worldbank.org/en/topic/energy/publication/mini-grids-for-half-a-billion-people
[46] 'Open Sourcing Infrastructure Finance for Mini-Grids', CrossBoundary Group, October 2023, Link: https://crossboundary.com/wp-content/uploads/2023/10/Open-Sourcing-Infrastructure-Finance-for-Mini-Grids-FINAL.pdf
[47] 'Scaling-Up Mini-Grids For Rural Electrification', Africa Enterprise Challenge Fund (AECF), December 2021, Link: https://www.aecfafrica.org/wp-content/uploads/2021/12/AECF-Scaling-up-mini-grids-18-Nov-2020.pdf
[48] 'Solar Mini Grids Could Sustainably Power 380 million People in Africa by 2030 – if Action is Taken Now', World Bank Group, February 26 2023, Link: https://www.worldbank.org/en/news/press-release/2023/02/26/solar-mini-grids-could-sustainably-power-380-million-people-in-afe-africa-by-2030-if-action-is-taken-now
[49] Ibid.
[50] Ibid.

Donor saturation creates opportunity in underserved markets

DFI activity has crowded the solar mini-grid space in several attractive investment jurisdictions, which may limit the additionality potential of an IMCA entry. The lion's share of public funding has gone to Nigeria and Kenya,[51] whose markets are becoming increasingly saturated.

A handful of early-stage markets are seeing increased activity due to improved investment and regulatory conditions. Zambia, Uganda, and the DRC have seen a recent uptick in announced solar mini-grid projects, supported by favourable regulatory reforms and results-based financing programmes. The Zambian market has benefited from a new regulatory framework which includes updated tariff policies and streamlined licensing.[52]

Public financing dominance masks significant private capital gap

Financing for solar mini-grids in Africa is increasing, but the scale of investment remains far below the continent's energy needs. To bring 160,000 mini-grids online by 2030 will require an estimated USD91 billion in investment. As of 2024, only USD7 billion has been secured, indicating a substantial funding gap.[53]

DFIs, donor agencies, foundations and governments have been the main financiers of the sector to date and continue to dominate the lending landscape. Power Africa, the World Bank, the United Nations Development Programme (UNDP) and the Global Energy Alliance for People and Planet (GEAPP) claim the largest number of mini-grid programmes on the continent.[54]

Geographically, Nigeria has received the largest amount of funding, with a cumulative total of USD374m investment as of 2020. A significant amount of this, USD150m, was provided by the World Bank in 2019 for its flagship Nigeria Electrification Project (NEP).[55] Kenya received the second largest amount at USD132m, including USD50m from the World Bank.[56] Other jurisdictions with high levels of donor activity include Niger, Tanzania, and Mali.

Private sector involvement is growing, albeit more modestly than some initial estimates. European multinational firms such as ENGIE, E. ON, and ENEL are particularly active, having entered the market through a series of acquisitions and investments.[57]

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[51] 'State of the Global Mini-grids Market Report 2020', Sustainable Energy for All, July 2020, Link: https://www.seforall.org/publications/state-of-the-global-mini-grids-market-report-2020
[52] 'Mini-Grid Market Opportunity Assessment: Zambia', Green Mini-Grid Market Development Programme, October 2018, Link: https://greenminigrid.afdb.org/sites/default/files/gmg_zambia-final_.pdf
[53] 'Accelerating private sector investments in green mini-grids', AfDB, July 2024, Link: https://digital-energy.eu/sites/default/files/2024-07/eaif_keytakeawaysreport2023.pdf
[54] 'The Africa Minigrids Program', United Nations Development Programme (UNDP), Link: https://www.undp.org/energy/our-flagship-initiatives/africa-minigrids-program
[55] 'State of the Global Mini-grids Market Report 2020', Sustainable Energy for All.
[56] Ibid.
[57] 'State of the Global Mini-Grids Market Report 2024', Sustainable Energy for All, August 2024, Link: https://www.seforall.org/publications/state-of-the-global-mini-grids-market-report-2024

Blended finance is opening new avenues for sector expansion and is particularly focussed on addressing the 'missing middle' financing gap for small and medium-sized enterprises (SMEs). Notable funds include the Renewable Energy Performance Platform (REPP) and the Beyond the Grid Fund for Africa (BGFA). The BGFA is a particularly prominent vehicle that has seen considerable success in Uganda and Zambia, where it provides results-based financing to SMEs that face difficulty accessing capital. So far, the BGFA has signed contracts with 29 companies in Burkina Faso, DRC, Liberia, Uganda, and Zambia. Once fully implemented, the current portfolio of BGFA programmes has the potential to reach more than 8.6m people in these five countries.[58]

Early-stage markets offer additionality

Several countries with comparatively less DFI penetration, such as Zambia and Uganda, may be potential candidates for investment compared to more saturated markets like Nigeria and Kenya. Both have received results-based financing from the BGFA but remain undercapitalised relative to their energy access needs. Zambia, for example, aims to build 1000 solar mini-grids by 2026, but still faces significant barriers to securing sufficient financing.[59] Uganda is also accelerating its mini-grid deployment with support from the BGFA and local reforms, but the market has been slow to take off.[60]

A recent flurry of investment activity in the DRC is also worth monitoring. In June 2024, the BGFA signed a EUR5m results-based financing agreement to scale the development of new solar mini-grids in the country with a funding window supported by Sweden.[61] In tandem, the World Bank Group announced a USD50.3m guarantee to DRC's Congo Energy Solutions Limited (CESL) for the largest mini-grid initiative on the continent. This project aims to expand solar-hybrid mini-grid operations across the DRC and provide energy to up to five million people by 2025, starting with 28,000 households and businesses in the east of the country.[62]

[58] 'BGFA in 2023: Over one million lives impacted so far', NEFCO, April 11 2024, Link: https://www.nefco.int/news/bgfa-in-2023-over-one-million-lives-impacted/
[59] 'Mini-Grid Market Opportunity Assessment: Zambia', AfDB, October 2018, Link: https://greenminigrid.afdb.org/sites/default/files/gmg_zambia-final_.pdf
[60] 'State of the Global Mini-grids Market Report 2020', Sustainable Energy for All, July 2020, Link: https://www.seforall.org/publications/state-of-the-global-mini-grids-market-report-2020
[61] 'Mini-grid deployments scaling up access to clean electricity in the Democratic Republic of the Congo', NEFCO, June 04 2024, Link: https://www.nefco.int/news/mini-grid-deployments-scaling-up-access-to-clean-electricity-in-the-democratic-republic-of-the-congo/
[62] 'Africa's Largest Mini-Grid to Provide Affordable and Sustainable Electricity in DRC', MIGA, June 20 2024, Link: https://www.miga.org/story/africas-largest-mini-grid-provide-affordable-and-sustainable-electricity-drc

Consumer affordability and regulation limit bankability

Most solar mini-grids in Africa rely heavily on grants and subsidies, which typically cover at least 30% of total investment costs.[63] Only a handful of mini-grids projects have successfully secured commercial loans.[64] The lack of project-based debt financing, particularly for lower-value tickets, remains a major barrier to scale. Local commercial lenders remain largely disengaged from the mini-grid sector. Most local banks still perceive mini-grids as high-risk, citing concerns about long-term revenue stability and potential grid encroachment.[65]

Regulatory bottlenecks across many African markets remain a significant impediment to scaling. Developers frequently encounter protracted approval processes, including environmental assessments and multiple levels of licensing for individual projects. These delays can lead to cost overruns and deter private sector participation. Countries like Nigeria and Sierra Leone, despite pursuing regulatory efforts to streamline regulations, still frequently see timelines exceeding one year for obtaining necessary approvals.[66]

Cost recovery remains challenging due to high upfront capital expenditures and limited consumer affordability in rural areas. Although grants and subsidies cover a portion of initial capital costs, consumer pricing still presents a barrier to sustainable operations. Rural consumers, especially those in agricultural economies, often experience fluctuating income levels, which translates into inconsistent demand for electricity.[67] Tariffs can be prohibitive for the poorest communities, leading to low uptake and underutilisation of existing mini-grid infrastructure.

Political and security risks, particularly in conflict-affected areas, exacerbate the challenges. In the DRC, Ethiopia, and northern Nigeria,[68] ongoing conflict and instability present operational and security risks that may deter long-term investment. Even with the availability of risk mitigation instruments, such as the recent MIGA guarantees in the DRC, these contexts present challenges to off-grid rollouts and the bankability of projects.

[63] 'Financing | Green Mini Grids', AfDB, Link: https://greenminigrid.afdb.org/how-it-works/help-desk-developers-and-operators/financing
[64] https://greenminigrid.afdb.org/how-it-works/help-desk-developers-and-operators/financing
[65] 'State of the Global Mini-grids Market Report 2020', BloombergNEF and Sustainable Energy for All.
[66] 'State of the Global Mini-Grids Market Report 2024', Sustainable Energy for All.
[67] 'Open Sourcing Infrastructure Finance for Mini-Grids', CrossBoundary Group, October 2023, Link: https://crossboundary.com/wp-content/uploads/2023/10/Open-Sourcing-Infrastructure-Finance-for-Mini-Grids-FINAL.pdf
[68] **Note:** Please refer to the World Bank's latest classification of fragile and conflict-affected situations. 'FY25 FCS List', World Bank Group, June 2024, Link: https://thedocs.worldbank.org/en/doc/b3c737c4687db176ec98f5c434d0de91-0090082024/original/FCSListFY25.pdf

Battery storage

SNAPSHOT MARKET ASSESSMENT FOR BATTERY STORAGE
Sector maturity: Low
• Battery storage sector on the continent is entering a period of sustained and rapid growth. Business cases for battery energy storage system (BESS) are particularly compelling for commercial and industrial (C&I) users requiring stable power for manufacturing. • South Africa is leading in deployments for large-scale utility BESS projects, but other projects elsewhere in SSA are largely in the pilot phase. Most projects depend heavily on concessional financing and private sector involvement is nascent.
Infrastructure quality & availability: Moderate
• There are some, albeit non-African-specific, supply issues connected to batteries caused by increased global demand and original equipment manufacturers (OEMs) struggling to keep up on the supply side. • However, battery technology is improving rapidly. The cost of lithium-ion batteries (LIBs) in particular has decreased significantly in the past decade. Further advancements may enable the scaling of industrial applications.
Overall viability: Moderate
• Battery storage will be essential for reliable power supply to ETVC manufacturing operations. The battery market trajectory for Africa is promising, projected to reach USD4.35 billion by 2030, and we note significant optimism from the stakeholders we spoke to, including asset managers, for scaling the BESS sector. • We consider South Africa, with its established industrial base, and Namibia, with emerging battery material processing capabilities, to be promising markets.

Grid instability and RE growth create compelling storage case

Battery storage plays a dual role in Africa's energy landscape: as an essential component of hybrid RE systems and as a standalone grid stability solution. This versatility makes BESS particularly important for industrial development, as it can both support individual manufacturing operations and enable broader grid reliability.

For industrial applications, BESS is critical for ensuring reliable power supply from RE sources. As previously highlighted, Solar PV mini-grids, which combine generation and storage, are increasingly important for electrifying the continent. They also play a pivotal role in powering manufacturing operations in areas with unreliable grid access. These hybrid systems enable consistent power delivery despite the intermittent nature of solar generation.

In grid-connected contexts, BESS is indispensable for maximising the impact of utility-scale solar and wind projects. As SSA expands its RE capacity, complementary storage will be needed to smooth supply fluctuations, manage peak loads, and reduce reliance on fossil fuels during periods of high demand. Without adequate storage, the impact of current and future investments in ETVCs will be significantly undermined.

Africa's BESS market remains nascent. According to the African Union Development Agency, just 1.7 GW of capacity is projected by 2027 — less than 0.5% of the projected global figure.[69] While McKinsey forecasts that the wider African battery market could reach USD4.35 billion by 2030,[70] the continent's energy storage potential remains largely untapped. Fully realising SSA's RE and decarbonisation ambitions will require substantial investment, particularly in utility-scale BESS, to support the grid integration of solar and wind projects at scale.

Cost barriers, long a major constraint on BESS deployment, are beginning to ease. The price of LIBs, the dominant storage technology, reached USD139/kWh in 2023 but is forecast to drop to USD80/kWh by 2030 according to BloombergNEF.[71] Falling battery prices are creating a 'tipping point' for scaling storage in both off-grid and grid-tied systems, unlocking new opportunities for investors. While substitution options are emerging (i.e., sodium), bankable projects in the near term are likely to focus on LIBs.

Momentum is building for large-scale energy storage projects, particularly in SSA countries with ambitious RE targets or grid capacity issues. South Africa, and to a lesser extent Kenya, are leading the market, piloting large-scale hybrid projects that integrate solar, wind, and battery storage to stabilise grid performance.

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[69] 'The African Continental Power Systems Masterplan', African Union Development Agency, June 2023, Link: https://africa-eu-energy-partnership.org/wp-content/uploads/2023/08/BESS-SSS-Summary-vSHORTENED-UPDATED-CLEAN.pdf

[70] 'Enabling renewable energy with battery energy storage systems', McKinsey & Company, August 02 2023, Link: https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/enabling-renewable-energy-with-battery-energy-storage-systems

[71] 'Lithium-Ion Battery Pack Prices Hit Record Low of $139/kWh', BloombergNEF, November 26 2023, Link: https://about.bnef.com/blog/lithium-ion-battery-pack-prices-hit-record-low-of-139-kwh/

Commercial and industrial (C&I) applications for BESS are gaining traction, particularly in South Africa, where governments, utility providers, and DFIs are increasingly focused on improving energy security and cost efficiency for large industrial players. However, the immediate investment focus for battery storage remains on mini-grid and off-grid applications, given the continent's growing energy access challenges.

South Africa leads while rest of continent lags in deployment

South Africa is the most advanced market for BESS in Africa, driven by its ambitious energy transition strategy, large industrial base, and urgent need to stabilise its coal-dependent grid. The country is expected to experience the fastest growth in battery storage deployment on the continent over the coming years. Its Integrated Resource Plan (IRP) targets 18 GW of RE capacity additions by 2030,[72] necessitating significant BESS integration to manage intermittency and ensure grid stability. Large-scale hybrid projects, such as those being piloted under the Eskom Just Energy Transition Partnership (JETP), are incorporating solar, wind, and storage. Norwegian RE provider Scatec's Kenhardt solar and battery project, which combines 540 MW of solar PV with 225 MW/1,140 MWh of battery storage at a site in the Northern Cape, is one of the largest hybrid projects in the world.[73]

Kenya is a less mature, but promising, market for BESS deployment. The country's high RE energy penetration — with over 85% of the national grid powered by a combination of geothermal, hydro, and wind[74] — is driving demand. Government-owned KenGen is currently progressing plans for a BESS pilot project to hold surplus geothermal energy and facilitate the integration of solar and wind into the national grid. The company has received funding from the World Bank and is now carrying out a feasibility study.[75]

Cross-border projects may also offer potential investment opportunities in the BESS space. One enterprise that was highlighted to us as a potential interest for IMCA during our interviews is Green Metals Refining — a technology-led midstream refining company focused on high-purity manganese for the LIB market. The company has completed a scoping study on an initial plant to an export hub in Namibia with plans to use ore from Kalahari Manganese Field in South Africa. GMR plans a battery-grade pilot for 2025.

Several SSA countries have shown interest in addressing the continent's lack of energy storage capacity by joining the BESS Consortium. The Consortium is an international initiative launched at COP28 by GEAPP in partnership with the AfDB, Africa50 and the World Bank. It pledges to secure 5 GW of BESS

[72] 'Integrated Resource Plan for Electricity (IRP)', IEA, July 02 2013, Link: https://origin.iea.org/policies/5073-integrated-resource-plan-for-electricity-irp
[73] 'Energising tomorrow: Scatec ignites one of the world's largest hybrid solar and battery project in South Africa', Scatec, December 11 2023, Link: https://scatec.com/2023/12/11/energising-tomorrow-scatec-ignites-one-of-the-worlds-largest-hybrid-solar-and-battery-project-in-south-africa/
[74] 'Energy-Electrical Power Systems: Kenya', US Department of Commerce, July 05 2024, Link: https://www.trade.gov/country-commercial-guides/kenya-energy-electrical-power-systems
[75] 'KenGen Planning BESS Pilot Project', Construct Africa, November 27 2023, Link: https://constructafrica.com/news/kengen-planning-bess-pilot-project

commitments globally by the end of 2024.[76] SSA signatories include Ghana, Malawi, Mauritania, Mozambique, Nigeria, and Togo.

Private capital hesitates as DFIs drive early projects

African BESS projects are predominantly driven by DFIs and concessional finance. A major challenge in the sector is the crowding out of private sector participation, as grants and concessional loans continue to dominate the early-stage landscape, leaving relatively few bankable projects. While an Engineering, Procurement and Construction (EPC) market for BESS is developing, the independent power producer (IPP) market has been slower to take off. Notably, South Africa launched its Battery Energy Storage Independent Power Producer Procurement Programme (BESIPPPP) — the country's first grid-scale energy storage procurement initiative — in March 2023.[77]

Among the DFIs, the World Bank is highly active, often working in partnership with the AfDB. In 2022, the two institutions approved nearly USD500m in financing for the battery storage element of a hybrid project under the Eskom JETP.[78] The project aimed to decommission one of South Africa's oldest coal-fired power stations, Komati Power Station, and replace it with 220 MW of solar PV and wind power, along with 150 MW of battery storage. The funding included significant amounts of highly concessional financing.

South Africa and Kenya are pursuing large-scale storage projects

Two emerging initiatives are worth monitoring in South Africa and Kenya:

- **IPP-led Storage Projects (South Africa):** Leading developers are advancing major BESS projects in South Africa. Mulilo Renewable Project Development (South Africa) and Scatec (Norway) have recently announced significant investments in the Northwest and Northern Cape provinces.[79] Key projects include the 103MW Mogobe BESS facility and the 77MW Oasis Mookodi BESS project.

KenGen's BESS Programme (Kenya): This World Bank-supported initiative under the Kenya Green and Resilient Expansion of Energy programme aims to integrate BESS into the national grid, primarily for storing excess geothermal energy. With

[76] '10+ Countries Join First-of-Its-Kind Consortium to Deploy 5 GW of Battery Energy Storage Systems', Global Energy Alliance for People and Planet (GEAPP), December 02 2023, Link: https://energyalliance.org/10-countries-join-first-of-its-kind-consortium-to-deploy-5-gw-of-battery-energy-storage-systems/

[77] 'South Africa kicks off 616-MW battery storage RfP', Renewables Now, April 05 2024, Link: https://renewablesnow.com/news/south-africa-kicks-off-616-mw-battery-storage-rfp-853873/

[78] 'Factsheet: Eskom Just Energy Transition Project in South Africa', World Bank Group, June 05 2023, Link: https://www.worldbank.org/en/news/factsheet/2023/06/05/factsheet-eskom-just-energy-transition-project-in-afe-south-africa

[79] 'Mega battery energy storage projects in pipeline in SA', ITWeb, October 21 2024, Link: https://www.itweb.co.za/article/mega-battery-energy-storage-projects-in-pipeline-in-sa/mYZRXM9gElrvOgA8

KenGen controlling 65% of Kenya's installed capacity,[80] the programme presents a compelling opportunity for investment in utility-scale renewable storage.

Regulatory gaps and supply chain dependence threaten scale-up

Without robust regulatory frameworks, energy storage will fail to scale across Africa. There is a notable lack of clear and enforceable regulations across many African jurisdictions, which has severely constrained large-scale deployment. An absence of standardised, replicable business models is a further deterrent for private investors.

Local skill and technology gaps pose operational risks for BESS projects. Successfully operating and maintaining BESS requires technical IP that remains limited across much of SSA, including South Africa.[81] The complexity of battery systems, particularly in hot climates where they must be maintained within strict temperature bands, adds further challenges to scaling.

Future cost reductions for LIBs may be limited, making financial structuring globally, but especially in the African context, more complex. After years of sharp declines, LIB costs may eventually reach a floor.[82] If future cost reductions slow, there will be greater pressure on projects to stack revenues and find innovative business models to ensure commercial viability.

Financing remains a fundamental barrier due to the scale and complexity of BESS investments. Securing senior debt financing for battery storage projects is challenging, as the early-stage nature of the sector and the large CAPEX make battery storage projects high risk.

[80] 'Who We Are', Kenya Electricity Generating Company (KenGen), Link: https://www.kengen.co.ke/index.php/who-we-are.html
[81] 'Battery Energy Storage Systems Projects Overview', ESKOM, June 2022, Link: https://www.esmap.org/sites/default/files/events-files/ESP%20Presentations/South%20Africa%20Case%20Study%20-%202022%20June%20ESP%20Stakeholder%20Forum.pdf
[82] 'EV battery prices rise for the first time in 2023', Mining.com, June 16 2023, Link: https://www.mining.com/ev-battery-prices-rise-for-first-time-in-2023/

Green hydrogen

SNAPSHOT MARKET ASSESSMENT FOR GREEN HYDROGEN
Sector maturity: Low
• The green hydrogen sector is still in its early stages of development, both globally and in Africa. Large-scale production is not expected for at least a decade, most likely two. • An African green hydrogen market is slowly developing. Current projects in SSA are largely at the pilot or feasibility stage, with limited commercialisation. • Investment in this sector should be seen as a strategic, long-term play in industrial development as opposed to a quick win.
Infrastructure quality & availability: Low
• Supporting infrastructure, especially for export, is limited. Namibia, South Africa, and Morocco are making some strides in building electrolyser capacity, scaling RE infrastructure (solar PV and wind), and upgrading ports. The potential to repurpose existing oil and gas pipelines for hydrogen — particularly in North Africa — is speculative and would require substantial investment. • All African green hydrogen jurisdictions will face considerable investment needs to develop the necessary infrastructure for transport and storage. Grid capacity and access issues, especially for solar and wind generation, may constrain green hydrogen deployment at scale.
Overall viability: Moderate
• Africa's vast RE potential in solar and wind, large empty landmass, and growing political buy-in for green hydrogen — particularly in South Africa and Namibia — may offer some competitive advantage. • Ongoing reductions in solar PV costs are gradually improving the economic feasibility of green hydrogen projects. However, investment in the sector remains high-risk, especially for export-driven business cases. Long-term off-takers for exports remain uncertain, despite strong interest signals from European markets.

Export demand drives scale-up

Green hydrogen represents a longer-term opportunity that builds on the broader development of reliable RE infrastructure. Its production requires stable, low-cost electricity — typically from hybrid solar or wind installations with appropriate storage integration — making it both a potential user of and complement to other RE technologies examined in this chapter.

The market for green hydrogen is still in its infancy, with the International Energy Agency (IEA) estimating current global production levels at below 1 Mt per year.[83] This is compared to a total global hydrogen production of approximately 87 Mt per year according to International Renewable Energy Agency (IRENA).[84] Production is currently focused on refining and the chemical industry (ammonia synthesis), but R&D is accelerating for heavy freight, transport, and energy storage applications, all of which are expected to drive future demand.

Forecasts by the IEA suggest global demand for green hydrogen could grow to between 500 and 680 Mt by 2050.[85] Africa is poised to capture a significant share of the market, with the European Investment Bank (EIB) projecting that the continent could contribute more than USD1 trillion annually to the green hydrogen market by 2035.[86] Six African countries — Namibia, South Africa, Mauritania, Angola, Egypt, and Morocco — are particularly well positioned, with the potential to add between 6% and 12% to their GDP by 2050 if they successfully leverage their early-mover advantage.[87]

These jurisdictions have demonstrated strong political will to build green hydrogen capacity and position themselves as major exporters of green hydrogen and derivatives (such as 'Power-to-X', PtX) products, particularly to European markets. To date, more than 20 large-scale projects exceeding 100 MW of electrolyser capacity have been announced across Kenya, Mauritania, Morocco, Namibia, and South Africa.[88]

The stakeholders we spoke with were broadly underlined SSA's potential to contribute to the green hydrogen market but were quick to highlight that the sector remains in a high-risk, early-stage activation phase. Currently, only pilot or demonstration projects are operational. The global development trajectory for green hydrogen is expected to follow these key milestones:

- **Activation [2020 – 2030]**: Pilot projects and infrastructure development.
- **Scale-up [2030 – 2040]**: Expanded capacity with larger commercial projects.

[83] 'Global Hydrogen Review 2024', International Energy Agency (IEA), October 02 2024, Link: https://www.iea.org/reports/global-hydrogen-review-2024
[84] 'Global Hydrogen Trade to Meet the 1.5°C Climate Goal', International Renewable Energy Agency (IRENA), July 2022, Link: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2022/Jul/IRENA_Global_hydrogen_trade_part_1_2022_.pdf
[85] 'The Future of Hydrogen', IEA, June 2019, Link: https://iea.blob.core.windows.net/assets/9e3a3493-b9a6-4b7d-b499-7ca48e357561/The_Future_of_Hydrogen.pdf
[86] 'Africa's extraordinary green hydrogen potential', European Investment Bank (EIB), December 2022, Link: https://www.eib.org/attachments/press/africa-green-hydrogen-flyer.pdf
[87] 'Green hydrogen could sustainably industrialise Africa and boost GDP by 6 to 12% in six key countries', Climate Champions, November 2022, Link: https://climatechampions.unfccc.int/unlocking-africas-green-hydrogen-potential/
[88] 'Global Hydrogen Review 2024', IEA.

- **Consolidation [2040 – 2050]:** Full market maturity with significant liquidity, widespread production, and global export.

The economic viability of green hydrogen production in Africa is improving, although it is still far from being fully competitive with fossil-fuel alternatives. For green hydrogen to be economically viable, electricity prices must fall to around 2.5 to 3 cents per kilowatt hour (kWh). At present, only Morocco, Egypt, and select regions of South Africa consistently meet this price point. However, the rapidly falling cost of solar PV, which is critical in powering green hydrogen production, has the potential to bring many African producers closer to this threshold.

Industry projections suggest that production costs in optimal solar regions could fall to as low as USD 1.6 per kg of hydrogen by 2030, positioning Africa as a competitive player in the global market.[89] According to IRENA, SSA holds the largest technical potential globally for producing green hydrogen at costs below USD 1.5 per kg by 2050, with an estimated potential of 2,715 exajoules (EJ).[90] The favourable cost trajectory is attracting interest from a range of investors, including venture capitalists, private equity firms and DFIs.

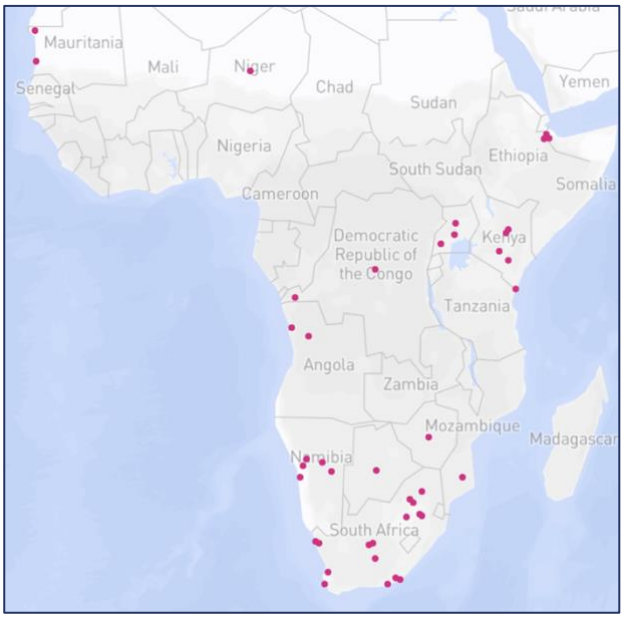
Realising Africa's potential will require substantial capital injection. If, in line with EIB forecasts, African countries were to grow their current green hydrogen production from zero to 50m tons annually by 2035, the investment required could exceed USD30 billion.[91] To put this in perspective, this amount is comparable to the total energy finance provided to Africa between 2017 and 2021.

Namibia and South Africa are promising first-movers

Three countries in SSA have emerged as potential green hydrogen hubs: Namibia, Mauritania, and South Africa. Market strategies can be broadly divided into two approaches: a predominantly export-oriented model, targeting European off-takers, and a hybrid model, which balances export potential with domestic industrial applications.

[89] 'Green Hydrogen Cost Reduction', IRENA, December 2020, Link: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Dec/IRENA_Green_hydrogen_cost_2020.pdf
[90] 'Geopolitics of the Energy Transformation', IRENA, January 2022, Link: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2022/Jan/IRENA_Geopolitics_Hydrogen_2022.pdf
[91] 'Overhyped and Underfunded: Africa's Renewable Hydrogen Projects', Energy for Growth Hub, September 2024, Link: https://energyforgrowth.org/article/overhyped-and-underfunded-africas-renewable-hydrogen-projects

Figure 5: Map of green hydrogen projects in SSA
(Proposed, pre-construction, in development, operational)



Source: *Energy for Growth African Hydrogen Projects Tracker, 2024.*

Namibia and Mauritania are primarily pursuing export-oriented strategies. Namibia, in particular, has emerged as the most hyped market for green hydrogen exports and its government has signalled considerable ambition. The country will require an estimated total investment of USD190 billion by 2040 to implement its Green Hydrogen Vision, which positions green hydrogen as the key driver of the country's development. It has signed Memoranda of Understanding (MoUs) with Germany, the Netherlands, and the EU for export offtake, but it should be noted that MoUs do not guarantee secured off-take agreements, which remain elusive and subject to securing private sector financing.[92]

South Africa, while also showing some interest in exports, has placed significant focus on domestic industrial applications. Its green hydrogen strategy published in 2022 outlines a vision for developing a domestic hydrogen and fuel cell technology value chain, with a particular focus on the platinum group metals (PGMs) sector, where South Africa is a major supplier.[93] According to Dr Rebecca Maserumule, Chief Director of Hydrogen and Energy at South Africa's Department of Science and Innovation, "expectations are that half of the demand for renewable hydrogen will go to the export market and half to domestic consumption. It's not just about decarbonisation, but also South Africa's role as a major global consumer and producer of energy."

South Africa's interest in domestic green hydrogen applications is driven by the country's large heavy industry sector, significant transport needs, and strategic

[92] 'Why Almost Nobody Is Buying Green Hydrogen', Bloomberg, August 12 2024, Link: https://www.bloomberg.com/news/articles/2024-08-12/why-almost-nobody-is-buying-hydrogen-dashing-green-power-hopes
[93] 'Green Hydrogen Commercialisation Strategy for SA', Industrial Development Corporation of SA, October 17 2023, Link: https://www.idc.co.za/wp-content/uploads/2023/11/GHCS-Full-Report-17Oct23-Public-Submission.pdf

ambition to use green hydrogen to produce value-added commodities for export. The country aims to use green hydrogen to decarbonise its steel, chemicals, and mining sectors, while consolidating its position as a global leader in PGMs, which are critical for hydrogen fuel cell technologies. It plans to produce over 5m tons of green hydrogen annually by 2040, with an estimated investment requirement of USD250 billion.[94]

As of 2024, four SSA countries have published national hydrogen strategies. They are South Africa [2022], Namibia [2022], Kenya [2023], and Mauritania [2023]. These countries are also members of the Africa Green Hydrogen Alliance (AGHA), a platform established to facilitate the development of regional green hydrogen infrastructure and regulatory policy for both domestic use and export.

European funding dominates but limited secure offtake

The bulk of FDI for green hydrogen in Africa to date has been concentrated in large-scale, export-oriented greenfield projects in Mauritania, Namibia, and South Africa. European markets, particularly Germany, and to a lesser extent Portugal,[95] are expected to be key off-takers, driven by climate targets set out in the European Green Deal and the demands of large industrial economies. The European Commission has explicitly identified Africa as a desired supplier of renewable hydrogen to the EU.[96] Outside of Europe, Japan has also expressed interest, particularly for exports from South Africa,[97] but has yet to make any financial commitments.

Mauritania has emerged as a leading recipient of investment, mostly driven by the 15GW Aman project, the largest green hydrogen project on the continent. Aman has attracted a mammoth investment of USD34 billion,[98] which accounts for more than 60% of the total FDI flow to Africa for 2023 and underscores the level of ambition within the sector.

European countries, led by Germany, are the primary investors in African green hydrogen. Approximately 80% of funding or funding commitments for renewable hydrogen projects in Africa has come from European countries. Germany plays a pivotal role, contributing 13% of total funding through its development bank KfW and demand-side mechanisms like H2Global.[99] KfW has established the PtX

[94] 'SA Sets Sights on $250 Billion in Hydrogen Investment', Bloomberg, November 14 2022, Link: https://www.bloomberg.com/news/articles/2022-11-14/south-africa-says-creating-a-successful-hydrogen-industry-may-cost-250-billion
[95] 'Civil society perspectives on Green Hydrogen production and Power-to-X products in Africa', Germanwatch, January 25 2022, Link: https://www.germanwatch.org/sites/default/files/positionpaper_greenhydrogenproductionandpower-to-x_productsinafrica_250122.pdf
[96] 'EU Hydrogen strategy', European Commission, July 2020, Link: https://energy.ec.europa.eu/topics/energy-systems-integration/hydrogen_en#eu-hydrogen-strategy
[97] 'Major Japanese investors mulling stake in GW-scale green hydrogen project in SA', Hydrogen Insight, June 13 2024, Link: https://www.hydrogeninsight.com/production/major-japanese-investors-mulling-stake-in-gw-scale-green-hydrogen-project-in-south-africa-report/2-1-1660707
[98] 'Consortium signs $34 billion MoU for hydrogen project in Mauritania', Reuters, March 08 2023, Link: https://www.reuters.com/business/energy/german-uae-egypt-consortium-sign-34-bln-deal-hydrogen-project-mauritania-faz-2023-03-08/
[99] 'Overhyped and Underfunded: Africa's Renewable Hydrogen Projects', Energy for Growth Hub.

Development Fund to support green hydrogen projects and related infrastructure in emerging markets.

Other European financiers are also making significant contributions. The Netherlands, through its DFI Invest International, reserved USD44m in June 2023 for a green hydrogen fund targeting Namibia and USD50m for a similar initiative in South Africa. France has indicated it may loan EUR350m to Morocco, in addition to a EUR0.8m grant for hydrogen projects agreed in mid-2024.[100] In contrast, the US has shown minimal support for hydrogen projects on the continent, presumably due its focus on building out a domestic market under the Inflation Reduction Act (IRA).

Within Africa, "South-South" cooperation is emerging a key funding model. For example, in December 2023, the Development Bank of South Africa (DBSA) announced a USD5m loan to the Hyphen Project in Namibia.[101]

Blended finance vehicles are also being established to attract public and private capital. Notable funds include:

- SDG Namibia One — a EUR1 billion fund managed by the Environmental Investment Fund of Namibia, Climate Fund Managers, and Invest International, primarily for the Namibian market and in particular the Hyphen Project; and
- SA-H2 Fund — a USD1 billion fund managed by Climate Fund Managers, Invest International, and Sanlam Limited and backed by the DBSA, aimed at accelerating green hydrogen infrastructure in South Africa for both domestic use and export.

Captive projects may offer a faster path to commercialisation

While large-scale, export-oriented projects have dominated headlines, smaller, captive projects focused on domestic and regional markets may present a more sustainable investment opportunity. We heard considerable scepticism about export-oriented business cases from a major DFI, given their outsized reliance on European off-takers.

Captive projects for local use, while smaller in scale, are not dependent on European demand and may generate more immediate and tangible social impacts for local communities in terms of economic development, employment, and skills transfer. They also sidestep the mammoth logistical and infrastructure challenges associated with large-scale export. Captive projects can serve a wide range of sectors, including steel manufacturing, chemical production, mining, and local transportation.

Current funding is disproportionately skewed towards export-oriented projects, potentially overlooking domestic opportunities. According to Energy

[100] 'Global Hydrogen Review 2024', IEA.
[101] 'Hyphen agrees DBSA funding for Namibian green H2 project', Renewables Now, October 25 2024, Link: https://renewablesnow.com/news/hyphen-agrees-dbsa-funding-for-namibian-green-h2-project-837651/

for Growth, 80% of funding for green hydrogen projects on the continent to date has been allocated to export-oriented projects, with only 12.9% directed towards projects with a primary focus on local end-use.[102] This imbalance signals an opportunity to diversify the funding landscape by channelling investment to projects targeting domestic markets and industrial applications.

The figure below provides a snapshot of select local-use projects in SSA.

Figure 6: Local-use green hydrogen projects in SSA

Jurisdiction	Project	Developers	Status
Botswana	Lesedi Power	Tlou Energy and Synergen Met	Pre-feasibility studies
Zimbabwe	Manicaland	HDF Energy	MoU signed
South Africa	Hydrogen Valley	Sasol	Operational
	Sasolburg	Sasol	Feasibility studies
	Ubuntu	Not disclosed	Feasibility studies
	Poelano	Not disclosed	Operational
	Omina	Not disclosed	MoU signed
	Vrendenal	Not disclosed	Operational
Namibia	Swakopmund	HDF Energy	Feasibility studies
Uganda	Kyenjojo	Tiger Power	Operational
Kenya	Naivasha-Olkaria	KenGen	Pre-feasibility studies

Source: *African Hydrogen Projects Tracker, Energy for Growth Hub, 2024.*

[102] 'Overhyped and Underfunded: Africa's Renewable Hydrogen Projects', Energy for Growth Hub.

Infrastructure gaps and reliance on public finance threaten viability

Africa's nascent green hydrogen sector is heavily dependent on public sector support and donor funding. Although there has been a surge in project announcements, all remain in the early development stages. Public and concessional funding from governments and DFIs are driving much of the momentum, and private capital remains largely absent.

Despite strong interest from European markets, the majority of investment (excluding local funding) directly allocated or committed to green hydrogen in Africa consists of targets and pledges, rather than secured off-take agreements.[103] Even where off-take agreements are in place, competition from more advanced markets like Chile and Australia is a significant risk for African producers, especially as these markets have more developed infrastructure and regulatory environments.

Without sustained public sector backing, many initiatives are unlikely to move beyond the feasibility phase. "One key challenge with renewable hydrogen is getting projects to a final investment decision", Dr Maserumule told us. Africa's project pipeline lags the global average, with only 5% reaching the Front-End Engineering Design (FEED) stage (compared to 20% globally) and only 1% passing the final investment decision (compared to 7% globally).[104]

Regulatory uncertainty remains a barrier across many jurisdictions. While seven African nations — including South Africa and Namibia — have published national hydrogen strategies, most lack detailed regulatory frameworks to enable project execution. Key issues, including land acquisition, water usage rights, licensing, and environmental approvals, remain fragmented. In key markets like Namibia, social opposition to large-scale green hydrogen projects is growing.

Infrastructure gaps also significant challenges, especially for export-orientated projects. Large-scale hydrogen projects require massive investment not only in RE capacity but also in transport, storage, and export infrastructure. Africa's ports, pipelines, and logistics networks will require significant upgrades to accommodate hydrogen exports. In Namibia, port expansion has already become a flashpoint for conflict between the community and project developers.[105]

Supply chain reliance on Chinese-manufactured components may present an additional barrier to IMCA investment. China dominates the global market for solar PV and wind component manufacture. It is also emerging as a leading player in electrolyser production, with nearly 70% of projected capacity this year.[106] While the US and EU are ramping up their own electrolyser production, non-PRC alternatives remain in the early stages, with higher costs and potentially limited scalability.

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[103] 'Overhyped and Underfunded: Africa's Renewable Hydrogen Projects', Energy for Growth Hub.
[104] 'The Africa Hydrogen Opportunity', Hydrogen Council, March 2024, Link: https://hydrogencouncil.com/wp-content/uploads/2024/03/Hydrogen-Council-Africa-Hydrogen-Opportunity-.pdf
[105] 'Namibia's Nama community rejects green-hydrogen port expansion', Voice of America, April 17 2023, Link: https://www.voanews.com/a/namibia-s-nama-community-rejects-green-hydrogen-port-expansion-/7574111.html
[106] 'Global Hydrogen Review 2024', IEA.

Feasibility studies

Support for feasibility studies and early-stage project development represents another — albeit less direct — potential pathway to accelerating the green energy transition in SSA. More funding and support for feasibility studies is a key ingredient to providing an enabling environment. Many of the stakeholders we spoke to said there is a pressing need for funding at the early stages of project development, particularly for comprehensive feasibility assessments.

An executive at an investment platform told us: "A feasibility study goes far beyond the business plan. It must include environmental and social impact analyses, technical studies, and legal and technological assessments." The individual went on to say that "these studies typically require significant investment — approximately 5% of total project costs, ranging from USD5m to USD10m — but are crucial for project success."

The lack of high-quality, independent feasibility studies is a significant bottleneck for RE and storage projects. This challenge is particularly acute in capital-intensive and technically complex RE sectors like geothermal and green hydrogen, where detailed pre-feasibility assessments are crucial to de-risking investments and attracting the financing needed for further development.

The AfDB has identified several key challenges in conducting pre-feasibility studies in Africa, including limited funding, narrow study scopes, and inadequate technical expertise.[107] While there are some emerging initiatives to mitigate these bottlenecks — such as the World Bank's Resilient and Inclusive Supply-Chain Enhancement (RISE) programme which supports analytics and technical assistance for clean energy projects[108] — these still fall short of the need. Many high-potential projects in SSA currently stall at the conceptual stage due to insufficient funding for comprehensive pre-investment assessments.

There may be scope for IMCA to play a pivotal role in addressing this financing gap. By supporting independent feasibility studies, particularly in jurisdictions with strong potential for emerging technologies like geothermal and green hydrogen, IMCA can help governments and investors access robust, high-quality data. These studies would not only de-risk projects but also expand the pipeline of bankable clean energy investments, thereby accelerating the greening of ETVCs across SSA.

The above-mentioned executive pointed out that, "the challenge is that access to funding is often on a project-by-project basis. We don't have the capacity to send applications to different institutions with different requirements." IMCA could seize a significant opportunity by initiating a programmatic approach to catalytic capital provision for early-stage project support. This would involve establishing clear

[107] 'Approach Paper towards preparation of an African Green Minerals Strategy', AfDB, December 2022, Link: https://www.afdb.org/sites/default/files/documents/publications/approach_paper_towards_preparation_of_an_african_green_minerals_strategy.pdf

108 'Resilient and Inclusive Supply-Chain Enhancement (RISE)', World Bank Group, 21 May 2024, Link: https://www.worldbank.org/en/programs/egps/brief/resilient-and-inclusive-supply-chain-enhancement

criteria and reporting requirements and providing accessible capital pools for qualified institutions.

Chapter 3: Social and environmental impacts

Key takeaways

- **The expansion of Africa's technology manufacturing sectors, particularly in electric vehicle (EV), e-scooter, and battery production, holds potential for employment generation.** Local EV manufacturing could create thousands of jobs across Africa. Whilst overall statistics are yet to be published, the scope for employment generation is demonstrated by Spiro, an electric motorbike manufacturer, which aims to create 5,000 jobs across Africa through its plant in Kenya. It has additional plans for expansion into Nigeria. The development of a regional battery supply chain, led by countries like Tanzania, could create technical manufacturing jobs, though it has yet to scale. Scaling light manufacturing first could pave the way for complex manufacturing, boosting job creation.

- **Geothermal energy presents significant potential for high-skilled job creation, with ESI Africa – the multi-media platform – predicting 1,000-30,000 direct jobs in Africa by 2030.** Despite slower growth and job creation compared to other renewables, geothermal energy offers stable, long-term employment opportunities that could help bridge the region's skills gap. Local capacity-building initiatives like UNIDO's geothermal development programmes are promising, but further investment is needed to meet future sector demands and maximise local value addition. Geothermal energy's low environmental impact and its ability to support long-term, high-level employment make it an attractive sector for IMCA. Opportunities are concentrated in East African jurisdictions, particularly in Tanzania and Zambia.

- **Off-grid solar energy stands out for its large potential in skilled and unskilled job creation, particularly in installation, maintenance, and supply chains. ESI Africa expects the off-grid solar sector to generate 800,000 to 1.75m new jobs directly in Africa by 2030.** Some observers have rightly raised concerns that long-term job creation projections associated with solar parks and other green industries and technologies may be overstated. While not denying the big job-creating potential of off-grid energy, official statistics should be approached with a degree of caution and even scepticism as they may be inflated to attract investment.

- **Mini-grids are effective at indirect job creation by boosting local economies and enabling business development.** An analysis of solar mini-grids in Kenya and Nigeria found that commercial businesses experienced an 85% increase in earnings post-installation. However, issues related to the environmental impact of solar panel production, waste disposal, and battery recycling require careful management. For IMCA, investment in safer technologies like PFAS-free solar panels can enhance sustainability while capitalising on the sector's substantial employment and economic growth potential.

- **Green hydrogen has significant economic potential in South Africa and Namibia. The Hydrogen Council estimates South Africa's hydrogen economy could contribute up to 3.6% to GDP by 2050, creating 370,000 jobs, while Namibia's projects are already generating thousands of jobs.** As with off-grid solar employment projections, those for green hydrogen should be treated with healthy caution.[109] Wind-powered green hydrogen has low emissions and minimal environmental impact, making it a promising decarbonisation solution. Additionally, green hydrogen can support other renewable sectors, such as South Africa's PGM mining industry, by minimising energy shortages.

- **Transmission and energy storage are crucial for integrating RE and stabilising Africa's power grids. ESI Africa projects 60,000-200,000 jobs in transmission and 20,000-50,000 in energy storage by 2030, though many roles are short-term with limited local skills transfer.** While energy storage improves efficiency and reduces emissions, it still relies on non-renewable sources. Despite these challenges, these technologies are vital for energy reliability, supporting industries, and fostering local business growth, making them a potential area for IMCA investment.

- **Whilst SSA's RE sector holds immense job creation potential, the significant skills gap, especially in technical and vocational expertise, threatens local value addition**. The OECD's Africa's Development Dynamics 2024 report highlights that while 80% of African youth aspire to high-skilled jobs, only 8% actually secure such employment. Low-quality employment affects around 82% of the workforce across the continent.

- **IMCA can address this by investing in local skills development, focusing on STEM and vocational education, fostering public-private partnerships, and supporting targeted education programmes.** In so doing, IMCA can boost sustainable employment and enhance local value chains in the green economy.

- **A range of challenges related to labour rights and worker protection exist across Africa**. Namibia and South Africa are the top labour rights performers out of the jurisdictions where, in our assessment, investment opportunities exist for IMCA. The labour rights performance of Tanzania, DRC, Kenya, Rwanda, Ethiopia, Uganda and Zambia is either more variable or more uniformly negative, as reflected in *Figure 8* and *Figure 9*. Nigeria stands out insofar as it shows extremely negative performance, indicating a total lack of access to decent work.

[109] Namibia expert and economist Robin Sherbourne has openly cautioned that the Namibian government's employment projections may be exaggerated.

Employment generation of Africa's technology manufacturing sectors

Electric Vehicle (EV) and E-Scooter Manufacturing

Africa's growing electric vehicle (EV) manufacturing sector offers significant job creation potential. The Energy for Growth Hub – a global think tank advancing data-driven solutions to end energy poverty – highlights that homegrown EV manufacturers not only create high-paying jobs but also increase economic accessibility, support women entrepreneurs, and provide affordable transportation.[110] McKinsey & Company projects EV sales in SSA could reach 3.8–4.9m units by 2040.

Spiro, an electric motorbike maker partnered with European EV manufacturer Horwin, stands out. It is setting up assembly plants in Africa, starting in Kenya with plans to expand to Nigeria. The business will assemble bikes and batteries locally. Spiro expects to create over 5,000 jobs across Africa. The project will support domestic industries, and advance local technology capacity.[111] SSA's EV manufacturing sector can thus boost direct job creation and strengthen the economy through skilled workforce development and industry growth.

Battery Manufacturing

The development of SSA's battery supply chain, particularly in countries like Tanzania, could lead to the development of a stronger technical manufacturing base with high-skilled employment potential. However, as outlined earlier in this report, scaling light manufacturing first will be crucial to enable more complex manufacturing opportunities, thereby leading to increased job creation.

Employment generation of Africa's renewable energy sectors

Africa's RE sector has immense job creation potential, with the IEA projecting 4m RE jobs needed by 2030 to meet 2050 net-zero targets.[112] FSD Africa predicts 60% of employment within SSA's green energy economy will be skilled or white-collar jobs by 2030, [113] underlining the enormous potential for upskilling within local populations.

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110 Everything you need to know about African EV manufacturing', Energy for Growth Hub, November 02 2022, Link: https://energyforgrowth.org/article/everything-you-need-to-know-about-african-ev-manufacturing/

111 Spiro and Horwin Join Forces to Establish a Joint Venture Company, Expanding Presence In Electric Mobility Manufacturing Across Africa', Spiro, July 2023, Link: https://spironet.com/spiro-and-horwin-join-forces-to-establish-a-joint-venture-company-expanding-presence-in-electric-mobility-manufacturing-across-africa/

112 'The Challenge: Building Capacity for Africa's Renewables Sector', African Energy Chamber, December 2023, Link Source: https://energychamber.org/the-challenge-building-capacity-for-africas-renewables-sector/

113 According to FSD Africa's *Forecasting Green Jobs in Africa* report, 10% of these jobs will be highly skilled, requiring university degrees, 30% specialised with certification, and 20% focused on administrative roles.

However, a significant skills gap and lack of local expertise across many SSA jurisdictions may account for why so many roles are filled by foreign professionals.[114] South Africa's National Energy Crisis Committee (NECOM) lowered local employment requirements from 100% to 30% to speed up solar project deployment and address power shortages[115]. This demonstrates how the lack of local technical expertise can substantially decrease local value addition of green energy projects.

IMCA should factor in the need for local skills development and education to enhance the value addition of green value chains in SSA. The OECD's Africa's Development Dynamics 2024 report identifies that whilst 80% of youth aspire to high-skilled jobs, only 8% find such opportunities. Shortages in skilled workers limit private investment and perpetuate informal, low-quality employment for 82% of workers.[116] Kevin Minkoff from EDF Renewables notes that while private sector efforts to promote technical training are underway, more needs to be done to address future workforce demands across SSA.

There are significant gaps in STEM and vocational education, particularly in sectors like RE, where collaboration between governments and the private sector is crucial for workforce development. Investment in targeted education programmes can help meet the industry's growing needs and ensure sustainable employment[117]. The OECD identifies key areas for investment, including improving education quality through teacher training, developing national skill strategies for emerging sectors, expanding vocational education, and improving labour market data collection. IMCA can play a role by investing in these areas, fostering partnerships with the private sector, and supporting international collaboration to enhance skills, especially in digital industries.

[114] Mark Burnett highlights that "a key issue often overlooked in African development discussions is the lack of local skills and education. Many companies bring in skilled labor from abroad, with minimal transfer to local populations."
[115] 'Powering Africa's Future: Tackling the Skills Shortage in Renewable Energy' Anavo, March 2023, Link: https://www.anavo.com/learn/tackling-the-skills-shortage-in-renewable-energy-africa/
[116] More investment in skills development is key to Africa's growth potential', OECD, July 2024, Link: https://www.oecd.org/en/about/news/press-releases/2024/07/Investing-more-in-skill-development-is-key-to-making-African-economies-more-productive-.html
[117] Dr Rebecca Maserumule, Chief Science and Technology Representative at South Africa's Department of Science and Innovation, and the Project Blue team agree that strong university and innovation systems can supply the talent needed locally to unlock local value addition.

Figure 7: Energy Sector Job Overview

Sector[118]	Direct job creation by 2030 (ESI Africa)[119]	Regions
Geothermal energy	1,000-30,000 jobs	East Africa
Off-grid solar energy	800,000-1.75m jobs	Africa
Green hydrogen	370,000 jobs by 2050[120]	South Africa
Transmission and energy storage	60,000-200,000 jobs (Transmission) 20,000-50,000 jobs (Energy Storage)	Africa

***Source**: ESI Africa*

Geothermal energy

Whilst direct job creation lags behind alternative RE sectors, geothermal energy does generate numerous advanced-level employment opportunities in East Africa. This excludes Ethiopia where projects have largely stalled, limiting employment generation. FSD Africa estimates that 5,000 roles created by 2030 will be civil and electrical engineers, geologists, and pipeline experts.

Initiatives to build local technical capacity and reduce reliance on foreign workers are emerging, such as UNIDO's geothermal development programme in Eastern Africa, funded by Japan's Ministry of Economy. It focuses on training in geothermal engineering, geoscience, and environmental analysis.[121] However, with only 25 experts trained, more investment in skills development is needed, providing opportunity for IMCA. Geothermal energy offers significant potential for long-term, high-level employment, making it an attractive investment opportunity as the sector grows.

[118] Although technology manufacturing has potential for job creation in SSA, official statistics on expected job numbers were unavailable at the time of writing. Consequently, data on employment generation in this sector has not been included in *Figure 7*.
[119]'South Africa holds greatest potential for green energy jobs', ESI Africa, July 2024, Link: https://www.esi-africa.com/resources/jobs/south-africa-holds-greatest-potential-for-green-energy-jobs/
[120] 'The Africa hydrogen opportunity for a just transition', Hydrogen Council, March 2024, Link: https://hydrogencouncil.com/en/the-africa-hydrogen-opportunity-for-a-just-transition/#:~:text=The%20hydrogen%20industry%20can%20create,African%20countries%20by%20mid%2Dcentury.
[121]Generating Energy Capacity from Geothermal Power and Its Related Technologies for Sustainable Development', United Nations Industrial Development Organisation (UNIDO), August 2023 Link: https://www.unido.org/events/capacity-building-geothermal

Off-grid energy

Off-grid solar energy is a significant driver of direct and indirect job creation in SSA, with roles in R&D, manufacturing, installation, and maintenance. While there is a shortage of local expertise in solar PV design and maintenance, off-grid energy offers opportunities for skills transfer and local development.

Solar energy also boosts indirect employment by increasing business revenues and household spending. In West Africa, 24% of businesses using off-grid solar systems have grown their workforce.[122] The Africa Mini-Grids Market Outlook report states that by 2030, mini-grids could provide electricity to 100m people in Africa[123], unlocking further economic potential.

Green Hydrogen

Africa's hydrogen industry holds significant value addition potential in Southern Africa.[124] South Africa's Hydrogen Society Roadmap outlines four key projects — the Platinum Valley Initiative, CoalCO2-X, Boegoebaai SEZ, and the Sustainable Aviation Fuels project — which are predicted to create 20,000 jobs by 2030.[125] The Hydrogen Council also emphasises that in Namibia, Hyphen Hydrogen Energy's green hydrogen project in Tsau-Khaeb National Park has already created 3,000 permanent jobs and 15,000 temporary construction jobs.[126] However, economist Robin Sherbourne suggests that the Namibian government may be exaggerating job creation by solar-powered green hydrogen.

Upskilling is critical to maximising local employment, as the hydrogen sector currently relies heavily on foreign expertise. Dr Rebecca Maserumule, Chief Science and Technology Representative at South Africa's Department of Science and Innovation, told us that limited public funding further threatens the long-term sustainability of the industry, making strategic investments in workforce development even more crucial.

Developing green hydrogen corridors[127] in Africa could increase indirect employment in related renewable sectors. Henk de Hoop, CEO at Platinum Group Metals (PGMs) and green hydrogen-focused consulting firm SFA Oxford, outlines that South Africa's PGM mining industry, which is scaling down partly due

[122] 'Off-grid solar expansion and economic development in the global South: A critical review and research agenda', Energy Research and Social Science, July 2022, Link: https://www.sciencedirect.com/science/article/pii/S2214629622001773#:~:text=Turning%20to%20the%20total%20employment,800%2C000%20lower%20skilled%20roles"%20globally.
[123] Solar Energy Industry Statistics in Africa', SME Blue Pages, July 2023, Link: https://smebluepages.com/solar-energy-industry-statistics-in-africa/
[124] 'The Africa hydrogen opportunity for a just transition', Hydrogen Council, March 2024, Link: https://hydrogencouncil.com/en/the-africa-hydrogen-opportunity-for-a-just-transition/#:~:text=The%20hydrogen%20industry%20can%20create,African%20countries%20by%20mid%2Dcentury.
125 Hydrogen Society Roadmap for South Africa 2021', Republic of South Africa's Department for Science and Innovation, 2021, Link: https://www.dst.gov.za/images/South_African_Hydrogen_Society_RoadmapV1.pdf
[126] 'Namibia's progressive leap towards a green hydrogen economy', Energy Capital & Power, February 2024, Link: https://energycapitalpower.com/namibia-green-hydrogen-economy/
[127] Green hydrogen corridors are networks of infrastructure, transportation, and supply chains designed to support the production, storage, and distribution of green hydrogen.

to energy shortages, could benefit substantially from green hydrogen in Southern Africa.

Transmission and energy storage

Jobs created by energy transmission and the installation of energy storage infrastructure are often short-term construction and technical roles. But the sectors' real value lies in boosting indirect employment by providing stable electricity for growth across various industries. By ensuring a stable electricity supply, energy storage technologies unlock new opportunities and drive further employment growth across Africa's energy sector.

Moving from employment opportunities to labour rights

When considering investment opportunities in different jurisdictions it is important to consider local labour practices. The Labour Rights Index — produced by WageIndicator Foundation and the Centre for Labour Research — [128] provides IMCA with a clear view of the labour rights landscape in key investment jurisdictions. South Africa stands out as the most attractive investment destination, given its high overall score and strong performance in critical areas like fair wages, safe work, and child labour protections. Namibia and Tanzania also offer reasonable conditions but may require targeted interventions

Other countries like Kenya, DRC, Ethiopia, Rwanda, and Zambia score positively in terms of safety and labour protections, however concerns relating to wage issues could be a challenge. Kenya and Rwanda also have a lower safe work rating, which should be taken into account if IMCA considers any geothermal or BESS projects in these jurisdictions. Nigeria's score shows a total lack of access to decent work. For IMCA, jurisdictions with higher scores will present fewer risks related to compliance, workforce stability, and reputation. Addressing wage-related challenges in jurisdictions with otherwise strong scores could enhance their attractiveness.

[128] The WageIndicator Foundation's and the Centre for Labour Research's Labour Rights Index 2024 "assesses key aspects of employment regulation throughout the employment lifecycle across 145 countries. It comprises 10 indicators aligned with the Decent Work Agenda, grounded in the UDHR, multiple UN and ILO conventions, declarations, and recommendations." This makes it a highly relevant tool for IMCA's evaluation of investment jurisdictions. A perfect score of 100 indicates no significant gaps in the legal protections for decent work in the areas covered by the index.

Figure 8: Performance of selected jurisdictions – labour rights

Jurisdiction	Sector	Overall score	Fair wages score	Safe work score	Child and forced labour
DRC	• Off-grid Solar	67/100	60/100	100/100	100/100
Ethiopia	• E-mobility	62.5/100	60/100	100/100	100/100
Kenya	• Geothermal • BESS	67.5	60/100	75/100	100/100
Namibia	• Green hydrogen	70.5/100	100/100	100/100	75/100
Nigeria	• E-mobility	37/100	40/100	75/100	50/100
Rwanda	• E-mobility	70/100	40/100	75/100	100/100
South Africa	• Green hydrogen • BESS	81/100	80/100	100/100	100/100
Tanzania	• Geothermal	74/100	60/100	100/100	100/100
Uganda	• Off-grid solar • E-mobility	65.5/100	40/100	100/100	100/100
Zambia	• Off-grid solar • Geothermal	66.5/100	60/100	100/100	75/100

***Source**: WageIndicator Foundation and the Centre for Labour Research*

Despite the good number of positive scores in the index above, protection against violence at the workplace, and the right to strike and to organise, are far weaker in many of these same jurisdictions. This is reflected in the International Trade Union Confederation (ITUC) Global Rights Index 2022, shown in *Figure 9*.

Many of the jurisdictions covered in this report are rated 4,[129] reflecting widespread, systematic violations where governments or companies severely undermine workers' rights. This creates significant risks for IMCA investments in RE development across SSA.

[129] The International Trade Union Confederation (ITUC) Global Rights Index "depicts the world's worst countries for workers by rating countries on a scale from 1 to 5+ on the degree of respect for workers' rights. The index
encompasses various labour rights such as the right to civil liberties, violent attacks on workers, the right to trade union activities and the right to strike. The following scores indicate varying degrees of negative conditions: 1: Sporadic violations of rights; 2: Repeated violation of rights; 3: Regular violation of rights; 4: Systematic violation of rights; 5: No guarantee of rights; 5+: No guarantee of rights due to breakdown of the rule of law.

Namibia, however, stands out with a lower rating of 2, indicating stronger labour rights protection. Despite repeated challenges to workers' rights, Namibia's labour conditions are notably better than those in other SSA countries.

Figure 9: ITUC Global Rights Index scores for selection of countries

Jurisdiction	Sector	2022 ITUC Global Rights Index[130]
DRC	• Off-grid Solar	4
Ethiopia	• E-mobility	4
Kenya	• Geothermal • Battery energy storage systems (BESS)	4
Namibia	• Green hydrogen	2
Nigeria	• E-mobility	4
Rwanda	• E-mobility	3
South Africa	• Green hydrogen • Battery energy storage systems (BESS)	3
Tanzania	• Geothermal	4
Uganda	• Off-grid solar • E-mobility	4
Zambia	• Off-grid solar • Geothermal	4

Source: *International Trade Union Confederation (ITUC) Global Rights Index*

[130] 2022 ITUC Global Rights Index', International Trade Union Confederation, 2022, Link: https://files.mutualcdn.com/ituc/files/2022-ITUC-Rights-Index-Exec-Summ-EN.pdf

Environmental impact and Greenhouse Gas (GHG) emissions of Africa's renewable energy sectors

Geothermal energy

Geothermal power is a low-emission, sustainable energy source with significant decarbonisation potential and minimal environmental impact. Whilst geothermal power plants do release emissions due to non-condensable gases (NCGs) in geothermal fluid, they emit 97% less sulphur (through acid rain) and 99% less carbon dioxide than fossil fuel plants, according to the EIA.[131] The release of hydrogen sulphide — which is generated from geothermal plants — has significant health and safety concerns for local communities. However, environmental impacts can be minimised through the use of closed-loop projects, which release substantially fewer air emissions.

Although concerns exist around surface disturbance, seismic activity, and chemical pollution, East Africa's geothermal projects fall within World Health Organisation environmental standards.[132] Geothermal energy is generally considered to be less invasive from an environmental perspective compared to many other energy sources.

Off-grid energy

Off-grid solar energy is an effective decarbonisation tool. Solaris Renewables highlight that solar panels offset the carbon emissions generated during manufacturing in the first three years.[133] However, solar energy has environmental trade-offs, especially during panel manufacturing and battery disposal, which can harm local communities and ecosystems. Mark Burnett highlights that the establishment of solar farms can lead to deforestation and water contamination in water-scarce regions of SSA.

While solar uses less water than other sources, PFAS materials in some photovoltaic panels pose risks to soil and groundwater. Thus, any IMCA investments within the off-grid sector would be advised to focus on using safer PFAS-free alternatives. Numerous alternatives are available on the market, such as Solarge's SOLO lightweight PFAS-free solar panel, which has a 25% lower carbon footprint than conventional modules, designed to be fully circular thus promoting sustainability.[134]

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[131] 'Geothermal explained', EIA, December 2022, Link: https://www.eia.gov/energyexplained/geothermal/geothermal-energy-and-the-environment.php

[132] Geothermal energy in Kenya: Evaluating health impacts and environmental challenges', Energy for Sustainable Development, October 2024, Link: https://www.sciencedirect.com/science/article/pii/S0973082624001480#:~:text=Geothermal%20extraction%20causes%20environmental%20issues,per%20minute%2C%20raising%20contamination%20concerns.

[133] What Is the Carbon Footprint of Solar Panel Manufacturing?', Solaris Renewables, Link: https://solarisrenewables.com/blog/what-is-the-carbon-footprint-of-solar-panel-manufacturing/#:~:text=Solar%20panels%20emit%20around%2050g,of%20coal%2Dpowered%20electricity%20sources.

[134] Solar panels free of PFAS', ChemSec, Link: https://marketplace.chemsec.org/Alternative/Solar-panels-free-of-PFAS-1359

Additionally, improper waste management of the battery storage systems linked to off-grid solar energy can have detrimental environmental and social impacts. In April 2024, the University of Manchester published findings indicating life-threatening lead pollution from poorly managed battery waste in Malawi; informal recycling of lead-acid batteries releases over 100 times the lethal dose for adults.[135] Thus, off-grid solar projects must ensure proper waste management to minimise pollution and local health risks.

Green hydrogen

Green hydrogen is the cleanest way of making hydrogen, but it's carbon emissions and wider environment impact is largely dependent on the electricity source. Green hydrogen production is slightly cleaner using wind energy than solar, with a GHG footprint difference of 102 – 120%, according to the Royal Society of Chemistry. The method of electrolysis, whether alkaline or polymer electrolyte membrane (PEM), can also vary the GHG footprint by 16 – 40%.[136] Geothermal energy, whilst in its infancy, could also be a potential energy source for green hydrogen projects. For example, Power Africa is helping Kenya unlock investment in green hydrogen by leveraging geothermal energy.[137]

Environmental impacts associated with solar technology must be considered. Comparatively, wind-powered green hydrogen has minimal environmental impact. Some experts have raised concerns surrounding slight surface temperature increases and the capacity to recycle wind turbine blades and motors, which may be challenging. However, issues related to habitat loss and air pressure are minimal, posing little threat to local species.[138]

Specific mitigation strategies that prevent wind-farm disruption for migratory birds have been developed. BBC future planet suggests 70% of bird collisions can be reduce simply by painting turbine blades black or with black-and-white stripes, thus improving visibility[139]. Wind-powered green hydrogen is particularly promising in regions like South Africa, which have significant wind power potential from coastal winds, according to Henk de Hoop.

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[135] 'Scientists urge action over life-threatening pollution from solar power waste in Africa', University of Manchester, April 2024, Link: https://www.manchester.ac.uk/about/news/scientists-urge-action-over-life-threatening-pollution-from-solar-power-waste-in-africa/#:~:text=Researchers%20from%20The%20University%20of,and%20established%20energy%20storage%20technology.

[136] 'The many greenhouse gas footprints of green hydrogen', Royal Society of Chemistry, August 2022, Link: https://pubs.rsc.org/en/content/articlehtml/2022/se/d2se00444e

[137] A Clean Hydrogen Future Emerges in Kenya', Medium, May 2024, Link: https://powerafrica.medium.com/a-clean-hydrogen-future-emerges-in-kenya-ba44321a69e4#:~:text=By%20using%20geothermal%20energy%20to,productivity%20while%20reducing%20carbon%20emissions.

[138]NWCC review found that whilst there are cases of bird and bat deaths from wind turbine collisions, air pressure changes, and habitat disruption, these impacts are minimal and not a threat to species populations. Link: https://www.ucsusa.org/resources/environmental-impacts-wind-power#:~:text=Wildlife%20and%20habitat,-The%20impact%20of&text=A%20recent%20National%20Wind%20Coordinating,well%20as%20from%20habitat%20disruption.

[139] These tricks make wing farms more bird-friendly', BBC Future Planet, April 2024, Link: https://www.bbc.com/future/article/20240425-these-tricks-made-wind-farms-more-bird-friendly

Alongside risks associated with wind and solar energy, one of the main environmental concerns with green hydrogen is water consumption, as its production through electrolysis requires significant amounts of water. In regions already facing water scarcity, this demand could exacerbate shortages. This could be problematic as both South Africa and Namibia, focal points of Africa's emerging green hydrogen economy, are water-scarce jurisdictions.

Transmission and energy storage

Energy storage technologies are crucial for reducing GHG emissions in Africa by enabling RE integration, improving energy efficiency, and providing grid stability. **However, their decarbonisation potential can be undermined by a reliance on non-renewable resources.** Additionally, risks like thermal runaway and chemical leakage pose threats to human health and the environment. Thus, any IMCA-associated investments would need to implement stringent safety measures, including Battery Management Systems (BMS), which are essential to prevent overcharging and leaks.[140] This is particularly vital in Africa, where water pollution could severely affect limited water supplies.

Technology manufacturing

While EVs offer ultralow carbon emissions during operation, McKinsey & Co. highlights that their production footprint is nearly double that of internal combustion engine vehicles. This is largely due to the carbon-intensive process of manufacturing lithium-ion batteries. These batteries contribute 40-60% of total production emissions, often matching or surpassing the emissions from all other EV materials combined. [141] Therefore, IMCA should carefully consider the GHG emissions related to battery cell production when evaluating involvement in the wider technology manufacturing sector.

[140]The safety and environmental impacts of battery storage systems in renewable', World Journal of Advanced Research and Reviews, March 2024, Link: https://wjarr.com/sites/default/files/WJARR-2024-1398.pdf
energy
141 The race to decarbonize electric-vehicle batteries', McKinsey & Co, February 23 2023, Link: https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/the-race-to-decarbonize-electric-vehicle-batteries

Economic growth of Africa's renewable energy sectors

While precise predictions of the green value chain's impact on economic growth are limited, experts agree that renewable energy is key to Africa's economic development. Expanding energy production is expected to boost GDP, especially through electrification and local business opportunities. With nearly 600m Africans — 98% in SSA — still lacking electricity, closing this energy gap will help drive economic growth across the region.[142]

Geothermal

Though still in its early stages, geothermal energy offers significant potential for sustainable economic growth in East Africa. In Kenya, it has become a crucial driver of circular economic development and a cornerstone of the country's green energy strategy. The progress made in Kenya's geothermal sector has not only strengthened the nation's energy security but also attracted further investment to other renewable sources, including hydropower and solar energy projects. Similarly, unlocking the economic potential of geothermal energy in other East African countries like Tanzania and Zambia could present a valuable opportunity for IMCA investment.

Off-grid solar

The expansion of off-grid solar energy systems has been a major catalyst for economic growth in Africa, particularly in rural and underserved areas, with immense potential for future development. Carabajal et. al. (2024) conducted an empirical analysis of the social and economic impact of solar mini-grids in Africa, which found that 20% of households experienced a change in the primary income provider's occupation following mini-grid installation, driven by increased entrepreneurial activity. Business ownership rose to 73%, with 19% of new businesses started immediately after the installation. Commercial and institutional customers saw an 85% increase in overall earnings post-installation.[143] However, for mini-grids, issues related to insufficient regulatory frameworks, demand uncertainties, and a lack of technical training can hinder the scale-up and success of these systems. Theft of valuable components like PV panels and copper wires also remains a risk. Nevertheless, off-grid solar continues to be a powerful driver of economic development, with potential to further transform local economies across the continent.

[142] Africa Energy Outlook 2022' IEA, June 2022, Link: https://www.iea.org/reports/africa-energy-outlook-2022/key-findings

[143] 'Social and economic impact analysis of solar mini-grids in rural Africa: a cohort study from Kenya and Nigeria', Environmental Research: Infrastructure and Sustainability, June 2024, Link: https://iopscience.iop.org/article/10.1088/2634-4505/ad4ffb .

Green Hydrogen

The economic potential of green hydrogen in SSA is concentrated in South Africa and Namibia. According to South Africa's Department for Science and Innovation's Hydrogen Society Roadmap (HSRM), four major projects — the Platinum Valley Initiative, CoalCO2-X Project, Boegoebaai SEZ, and Sustainable Aviation Fuels (SAF) project — are projected to generate 500,000 tons of hydrogen by 2030, contributing USD5bn to GDP by 2050.[144] A report by Hydrogen Council similarly predicts the sector has potential to contribute up to 3.6% to GDP by 2050.[145] This economic growth, combined with the creation of 370,000 jobs, underscores the broader socio-economic benefits of this transition, helping to address unemployment and stimulate further development. This in turn may attract further international investment and foster innovation in other sectors.

Concerns exist that green hydrogen jobs in South Africa and elsewhere could be dominated by large corporate interests. But quality jobs, regardless of the employer, play a crucial role in driving local economic growth and socio-economic development in the regions benefiting from these investments.

Transmission and energy storage

Energy storage technologies are becoming vital for economic growth in Africa by improving energy reliability, lowering costs, and encouraging RE adoption. By stabilising power systems and reducing outages, these technologies support industries, small businesses, and rural economies. Stored RE can be used as needed, cutting costs and boosting economic activity, particularly in rural areas, while enabling local business development and improving livelihoods.

SSA jurisdictions are already advancing their energy storage potential to support RE integration and economic growth. According to ESI Africa, South Africa is expected to add between 2GW and 6.6GW of battery storage by 2032, driven by the Just Energy Transition Investment Plan (JET-IP). The South African Renewable Energy Masterplan (SAREM) indicates that localising wind, solar, and battery storage components could contribute R420billion to GDP by 2030.146 Kenya's Least Cost Power Development Plan (LCPDP) envisions 250MW of Battery Energy Storage Systems (BESS) by 2026, scaling to 450MW by 2036, to stabilise its

144 Hydrogen Society Roadmap for South Africa 2021', Republic of South Africa's Department of Science and Innovation, 2021, Link: https://www.dst.gov.za/images/South_African_Hydrogen_Society_RoadmapV1.pdf

145 The Africa Hydrogen Opportunity', Hydrogen Council, March 2024, Link: https://hydrogencouncil.com/wp-content/uploads/2024/03/Hydrogen-Council-Africa-Hydrogen-Opportunity-.pdf

146 Unpacking battery energy storage value chain opportunities in SA', ESI Africa, October 26 2023, Link: https://www.esi-africa.com/africa/unpacking-battery-energy-storage-value-chain-opportunities-in-sa/

renewable grid.147 Namibia also targets 650MW of BESS by 2040, 148 underscoring SSA's commitment to energy storage as a catalyst for sustainable development.

Social and environmental impacts of critical mineral value chains in Africa

Since we are not recommending that IMCA invest in the critical minerals value chain, we have not included it in the analysis above. However, we thought it helpful to outline the economic benefits, and the potential and existent negative impacts associated with the critical minerals value chain. Please note that a good portion of the negative impacts of the critical minerals value chain has already been covered in the first section of this report.

Critical minerals

The extraction and processing of critical minerals like cobalt, copper, lithium, and rare earth elements hold immense potential for boosting Africa's economic growth. The IMF estimates the critical minerals market could drive a 12% increase in SSA's GDP by 2050.[149] South African President Cyril Ramaphosa projects an additional USD32 billion in annual mineral export revenue, creating 2.3m jobs[150].

However, local value addition is limited, with local high-skilled job creation hindered by a systemic reliance on foreign labour. Insufficient investment in education and weak industry collaboration have stunted local workforce development with few opportunities existing beyond upstream (mining) activities in Africa. Furthermore, limited potential for beneficiation is strongly linked to the dominance of Chinese companies in extraction, processing, and refining. Involvement with Chinese firms in the critical minerals value chain often carries a significant risk of being linked to labour rights violations.

Environmental impacts also pose concerns. Berthet et al (2024) conducted an empirical study assessing the social and environmental impacts of critical mineral supply chains, which found that CRM extraction contributed to 10% of global GHG emissions in 2018, a figure expected to rise as global demand

147 Kenya: The role of grid scale battery energy storage systems in achieving renewable energy goals', Bowmans, May 17 2023, Link: https://bowmanslaw.com/insights/the-role-of-grid-scale-battery-energy-storage-systems-in-helping-kenya-achieve-its-renewable-energy-goals/#:~:text=The%20Government%20is%20taking%20steps,up%20to%20450MW%20by%202036.
148 National Integrated Resource Plan (NIRP)', Government of the Republic of Namibia, October 2022, Link: https://www.mme.gov.na/files/publications/611_NIRP_2022for_theElectricitySupplyIndustry_NamibiaSigned.pdf
149 Unlocking Africa's Potential: The Critical Minerals Boom and Economic Growth', Energy Capital & Power, October 2024, Link: https://energycapitalpower.com/unlocking-africas-potential-the-critical-minerals-boom-and-economic-growth/#:~:text=This%20potential%20is%20poised%20to,prioritizing%20midstream%20and%20downstream%20projects
150 Ibid.

increases.[151] Local environmental damage, such as the pollution of Zambia's Kafue River from copper mining, highlights the adverse effects on ecosystems and communities, including increased water shortages amongst the local population. These social and environmental challenges make CRM mid- and downstream areas less suitable for IMCA investment.

[151] Assessing the social and environmental impacts of critical mineral supply chains for the energy transition in Europe' Global Environmental Change, May 2024, Link: https://www.sciencedirect.com/science/article/pii/S0959378024000451

Chapter 4: Investment managers and funds

Key takeaways

- **With extensive screening (100+ funds screened), 30 potential funds were identified.** Eighteen of these funds are classified as eligible (USD7.2 billion cumulative fund size) and 12 classified as maybe (USD10.2 billion cumulative fund size) funds for IMCA to consider.

- Most funds are equity funds (17) with relatively few debt-focused funds in comparison (6). A few funds (7) offer both debt and equity - the fund managers of these funds typically have a majority impact focus.

- **Most of the funds have DFI involvement. Heavy DFI involvement may limit the scope for additionality. However, it can also be an indicator of strong responsible investment practices**, which is evident in the ESG and impact approach analysis of the funds.

- Funds can be categorised in four groups to narrow the scope of IMCA investment strategies. The four categories are energy transition value chain (ETVC) growth, small-scale energy, large-scale energy, and infrastructure funds. Each fund category lends itself to a unique investment strategy for developing the energy transition value chain in Africa.

- **The ETVC growth and small-scale energy categories are most aligned to IMCA's objectives.** The ETVC category includes funds which are willing to invest in multiple different sectors linked to the ETVC e.g. hydrogen development. The small-scale energy category lends itself to drive energy access given Africa's grid constraints. Energy access can be leveraged to lower costs for production across energy transition value chains.

- **We noted a high commitment to responsible investment and ESG among shortlisted funds.** All the fund managers adhered to either IFC Performance Standards or UN PRI. Many of them also adhered to the UN Global Compact principles.

- **All the shortlisted fund managers included some form of impact targets or outcomes.** All fund managers leveraged the UN SDGs in some form and some of them also leveraged other impact reporting frameworks and guidelines.

- **The most common impact indicators are linked to climate and social metrics.** Over half of the funds reported on mitigation, renewable energy production, gender equality, job creation, and energy access indicators. Other indicators frequently reported on included gender equality at the decision-making level, localisation, and catalytic impact.

Screening of asset managers

From a long list of 112 funds, we identified 30 funds which could be eligible for the IMCA funding. We shortlisted and screened 88 asset managers of which 15 did not align with the requirements of IMCA or did not have funds aligned to IMCA's objectives. 112 funds managed by the remaining 73 asset managers were screened. 30 potentially eligible funds were identified with 82 funds being screened out. Our selection is based on the criteria provided by the Alliance, detailed in *Figure 10*. Immediately below is a summary of the main characteristics of the funds we have excluded (these reasons are not mutually exclusive):

- 35 are closed for new investments or are assumed to be closed.
- 38 have a fund size of less than USD100m.
- 26 are not aligned with IMCA's geographic focus; namely, with a 100% concentration on Africa.
- 16 are not aligned with IMCA's sector focus (renewable energy and transmission.)

Deeper investigation revealed 18 'eligible' and 12 'maybe' funds out of the 30 remaining funds. By way of prioritisation, 'eligible' funds are the funds that do not have obvious issues relative to the IMCA requirements and 'maybe' funds are the funds that have one or two issues that would require IMCA to either be flexible on their criteria or negotiate with the manager to ringfence their capital. Out of the 30 shortlisted funds, 18 are eligible for IMCA support, as shown in *Figure 11*. The remaining 12 are 'maybes.'

Figure 10: IMCA requirements

Minimum investment vehicle size (capital to be invested)	USD100m
Potential catalytic capital funding	• Up to USD10m non-repayable grant capital from USG • Up to USD50m in IMCA credit guarantees • Up to USD50m in IMCA catalytic equity Applicants **need not** incorporate all IMCA instruments in the application but **must** integrate the use of USAID grant capital and **at least** 1 IMCA instrument.
Geographic focus	Funds must invest 100% of their capital in OECD DAC countries in Africa.
Sector focus	Renewable power generation and transmission (REQUIRED); critical minerals processing; resilient and sustainable value chains; circular economy solutions.
Target applicants	1. An experienced asset manager, developer, or other investor with a demonstrated track record of raising and deploying capital, as well as successfully exiting investments. 2. Developing a ETVC fund or instrument to be deployed in Sub-Saharan Africa (preference for funds ready to deploy capital). 3. Maximizing private capital mobilization through the fund or vehicle. U.S. and non-U.S. non-governmental organizations, including for-profit or non-profit entities, may apply.
Environmental and social impact	Required adherence to IFC's Environmental and Social Performance Standards and investment exclusion lists.

Figure 11: Funds that are eligible for IMCA

Fund Manager with Eligible Funds	Number of Eligible Funds
Africa50	1
Camco Management Limited	2
Climate Fund Managers	2
Cross Boundary Group	1
Cygnum Capital (formerly Lion's Head)	2
Frontier Investment Management	1
Harith General Partners	2
ARM-Harith	1
Helios Investment Managers	1
Inspired Evolution Investment Managers	1
KawiSafi Ventures (Acumen affiliated)	1
Meridiam	1
Private Infrastructure Development Group	1
Revego	1

Size of eligible funds and 'maybe' funds vary substantially

The size of funds within the eligible category varies significantly, as reflected in *Figure 12*. SDG Namibia One and SA-H2 Fund are the only two funds as big as USD1 billion. As with 14 of the other eligible funds, both Namibia One and SA-H2 Fund have DFI presence. The USD111m Revego Africa Energy Fund is the only fund in the eligible category that does not have a clear DFI link.

Similarly, all 'maybe' funds have DFI presence, as reflected in *Figure 14*. Four of the 'maybe' funds exceed or are equal to USD1 billion in size; namely, the Growth Markets Fund, the IDEAS Management Fund, the GAIA Fund, and the Khanyisa Energy Transition Fund.

Figure 12: Number of open funds disaggregated by instrument type

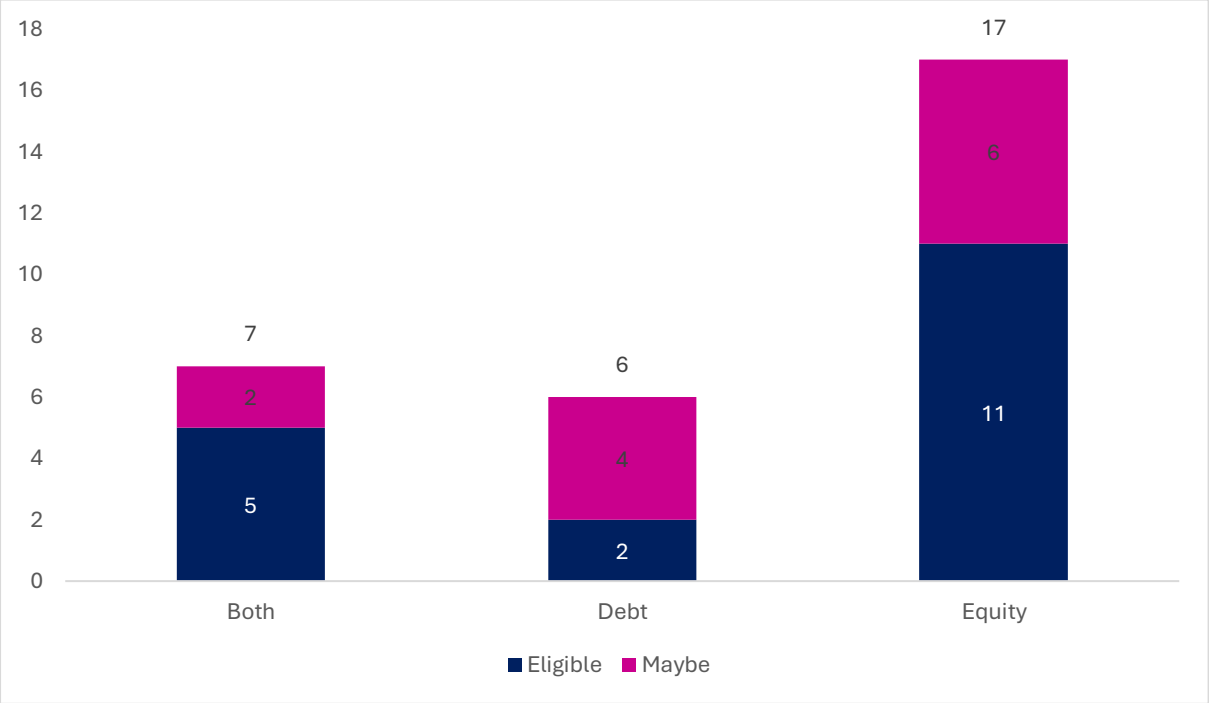


Figure 13: Eligible funds range from USD100m to USD1 billion

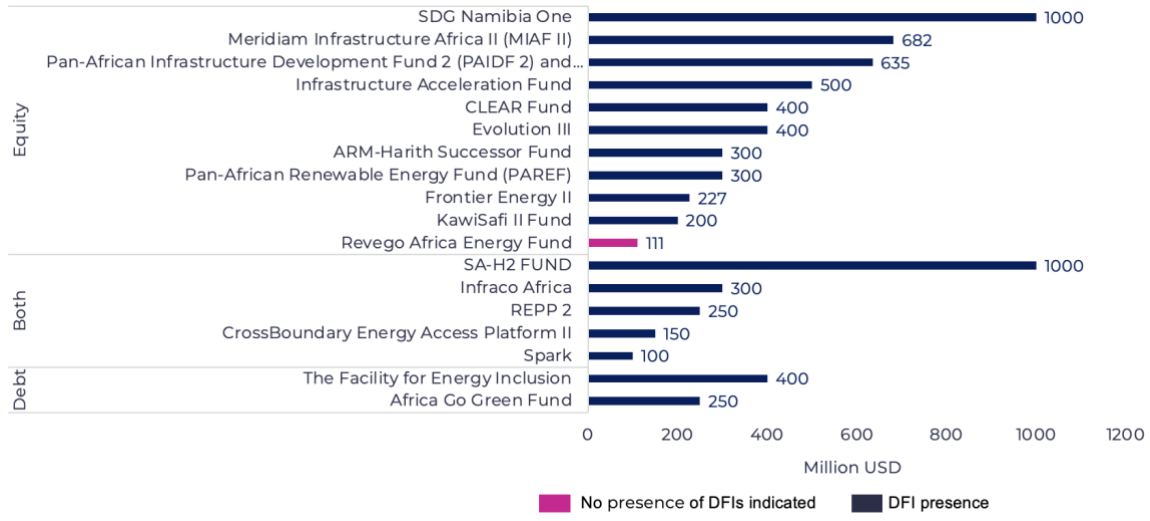
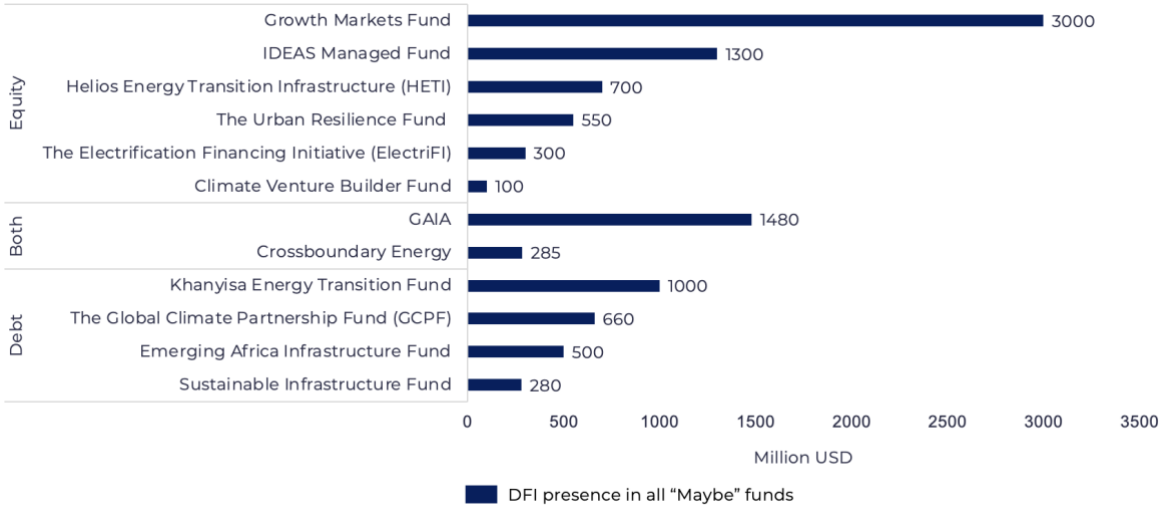


Figure 14: 'Maybe' funds range from USD100m to USD3 billion



Profiles of 18 eligible funds

The following section provides high-level profiles of the 18 eligible funds. We have categorised the eligible funds into three groups: a) Equity Funds, b) Debt Funds, and c) Equity and Debt funds, as per the tables below.

Eligible equity funds

Manager	Fund	Overview	Pros	Cons
CLIMATE FUND MANAGERS	**SDG Namibia One**	Uses a blended finance platform to develop and accelerate Namibia's green hydrogen sector and economy	• Only focused on energy transition through green hydrogen • Assumed to be open due to high target and recent launch • Targeting institutional investors • CFM has managed /manages at least 5 funds	• Green hydrogen focus limits options for investment elsewhere • USAID already involved, as well as other DFIs which may limit scope for additionality • Single country focus in Namibia
Meridiam	**Meridiam Infrastructure Africa II (MIAF II)**	Targets infrastructure projects across Africa. The Manager was founded in 2006	• MIAF I invested heavily in renewable projects, likely that MIAF II will as well • No public announcement of closure • >70% of commitments confirmed as private investment Africa focus only • Meridiam has managed / manages at least 9 funds	• MIAF I had broad infrastructure scope, which can be assumed as likely for MIAF II • Multiple DFIs involved, which may limit scope for additionality • By 2021, the fund reached two thirds of their target, hence could be closed by now
Harith FINANCIERS & DEVELOPERS OF INFRASTRUCTURE PROJECTS	**Pan-African Infrastructure Development Fund II & Top-up Fund**	Harith General Partners is the leading Pan-African investor and developer for infrastructure across the continent	• Harith has many renewable energy investments, but it is unclear if it is part of this fund portfolio • A top-up fund was established in 2022 with no public announcement of closure yet • Only AFdB indicated as an invested DFI • Large Institutional Investor Involvement • Full Africa focus only	• Manager has exposure to fossil fuels, but it is not confirmed as part of this fund • The top-up fund was aiming to close in 2022

AFRICA50	**Infrastructure Acceleration Fund**	The fund aims to catalyse further investment flows into African infrastructure by targeting private and institutional investors	• Portfolio cannot be confirmed but likely includes renewable energy and transmission • First close was in January 2024, which implies potential room for investment • Secured 16 African institutional investors • Full Africa focus • Africa50 has a supporting fund which develops projects that can be fed to this fund • This is the only fund by Africa50 which targets private capital as the other two are focused on public capital	• Portfolio focus is unclear, but likely to be broad and could include fossil fuel investments • Founded by the AfDB and governments, which may limit scope for additionality
INSPIRED EVOLUTION	**Evolution III**	Evolution III focuses predominantly on private finance for the mitigation of climate change and energy transition	• Energy transition focus, Invested in utility and C&I renewable energy companies • Fund reached its first close in 2023 and has not publicly announced meeting the target or closure • Mainly private finance • Full Africa focus • Inspired Evolution's third fund	• The fund is aiming to reach its final close by Q3 of 2024 • Multiple DFIs involved may limit scope for additionality
HELIOS Investment Partners	**CLEAR Fund**	The fund invests in climate-smart agriculture, green energy, green mobility, recycling, and digital and financial climate enablers	• Is set up to support private companies active in promoting climate action and environmental sustainability • The fund announced its first close in 2024 shy of their target with no public announcement of closure • Full Africa focus only	• Portfolio not available online, can't confirm involvement in energy transition • Focused on supporting agriculture • No clear private involvement

				• Multiple DFIs involved which may limit scope for additionality
	**Pan-African Renewable Energy Fund (PAREF)**	Seeks to accelerate execution of renewable energy projects in Africa through innovative development and financing mechanisms	• Portfolio is not available; however, fund has a clear focus on energy transition and renewable energy • Institutional investors and DFIs are targeted • No indication of DFI involvement • Full Africa focus only • No public indication of financial close	• Fund manager has exposure to fossil fuels, but this is likely excluded in the fund
	**Frontier Energy II**	Frontier Energy II is a private equity investment fund with a focus on developing, constructing and operating renewable energy assets across East Africa	• Only renewable energy investments across different technologies • Large private investor involvement • SSA focus • This is their second fund in energy that they are managing • They are in the process of establishing their third fund	• Majority of investments are government-linked and utility-scale • The first close was reached in 2017, they could likely have reached final close in the interim • Significant DFI involvement may limit scope for additionality • This is only the manager's second fund
	**KawiSafi II Fund**	KawiSafi invests growth capital in proven business models that address key market gaps. KawiSafi's focal area is clean energy access in Africa	• Clear focus on renewable energy • Full Africa focus only • First close mentioned in a 2024 article, assumed to be open for further investment	• No clear private involvement besides founding members • Multiple DFIs involved, including AfDB and UN Green Climate Fund, which may limit scope for additionality

				• Focus seems aimed at retail (SME and consumer) market
REVEGO	**Revego Africa Energy Fund**	Focused on the electricity sector in SSA. The fund invests in a mix of utility-scale operating renewable energy projects in SSA	• Still shy of their target size, implying room for additional investment • SSA focused • Multiple Institutional investors invested	• Utility scale projects mainly, which means the focus may not be on decentralised energy • All portfolio assets mentioned on website are part of the REIPPPP programme • Evidence suggests this is the first and only fund managed by the fund manager
ARM Harith INFRASTRUCTURE FUND MANAGERS	**ARM-Harith**	Invest equity capital and occasionally mezzanine instruments in West African infrastructure assets for a significant minority stake	• Specific focus on energy transition and energy investments mentioned • No details provided, however, documents relating to the fund are relatively recent and there is no information on closure, so it is assumed that the fund is open • Private investors targeted for the fund • Both ARM and Harith are well-established fund managers, and this is a successor fund for the JV • Africa-focused, with a preference for West Africa	• Slightly broad focus on infrastructure • Small chance that fund may not be open, due to limited information • Evidence of DFI involvement, which may limit scope for additionality • Focus on one region, although there could be flexibility for investments outside of West Africa

Eligible Debt Funds

Manager	Fund	Overview	Pros	Cons
Cygnum Capital	**The Facility for Energy Inclusion**	A renewable energy investment fund which is technology agnostic, focusing primarily on C&I off-grid solutions	• Invests in C&I off-grid solutions with a maximum size of 25 MW • Invests only in renewable energy • Invests only in Africa • Cygnum has managed / manages at least 6 funds • At first close, the fund still required USD240m to reach their target, implying room to invest	• Multiple DFIs involved with the fund, and no clear indication of private involvement, which may limit potential for additionality • First close was in 2021, hence they may have raised to their target, but this has not been publicly announced
Cygnum Capital	**Africa Go Green Fund**	Provides debt and guarantees to spur investment in energy efficiency and renewable energy projects and entities in Africa	• Have invested in multiple decentralised energy projects, including for recycling and manufacturing facilities • Full Africa focus only, with a priority for West African investments • Cygnum has managed/manages at least 6 funds • Interim close in 2023 implies future opportunity for raising capital	• Multiple DFIs involved with the fund, and no clear indication of private involvement, which may limit potential for additionality • Provides their own guarantees, which may limit potential for additionality

Eligible debt and equity funds

Manager	Fund	Overview	Pros	Cons
Private Infrastructure Development Group	**InfraCo Africa**	Invests in climate-resilient infrastructure in SSA to reduce risks and costs, ensuring project success and high-quality delivery	• Has multiple energy investments including renewable energy projects linked to manufacturing • Full Africa focus only • PIDG is an experienced blended finance fund manager with multiple funds • No indication of closure date, assumed to be an open-ended fund	• Focused more on project development, than long-term investment • Significant government funding, with no clear involvement of private capital, which may limit room for additionality • Broad infrastructure focus i.e., not just renewable energy
camco A BRIGHTER FUTURE, TODAY	**Renewable Energy Performance Platform 2 (REPP 2)**	Finances on-and off-grid renewable energy solutions in SSA, with a mix of debt and quasi-equity instruments	• Focus is solely on renewable energy and finance on-grid, off-grid and C&I solutions • Minimal DFI involvement evident (Green Climate Fund) and evidence of private investors • Camco manages multiple impact-focused funds, and REPP 2 is a follow-up fund • Only invests in SSA	• They are likely be closed as they appear to be fully committed, however, no announcement of closure has been made • Camco may be one of the smallest asset managers as the latest assets under management are USD130m
camco A BRIGHTER FUTURE, TODAY	**Spark**	Finances C&I energy efficiency and captive generation projects in SSA	• Focus is solely on renewable energy and energy efficiency • First close was targeted for Q4 2023, indicating room for additional investment	• Multiple DFI involvement may limit potential additionality, however, commitments are small • Camco may be one of the smallest asset managers as

			• Clear evidence of private investment • Only invests in Sub-Saharan Africa • Camco manages multiple impact-focused funds	the latest assets under management is $130m
CLIMATE FUND MANAGERS	**SA-H2**	SA-H2 is an innovative blended finance fund, that will facilitate and accelerate the development of a green hydrogen sector and circular economy in South Africa	• Only focused on energy transition through the focus on green hydrogen • Sanlam is an investor in the fund • Closure intent unclear, however, given high target and recent launch, assumed to be open • CFM has managed / manages at least 5 funds	• DBSA and IDC involvement which may limit scope for additionality • Only hydrogen assets • Single country focus in South Africa
CROSSBOUNDARY ENERGY ACCESS	**Energy Access Platform II**	Invests project finance capital into rural solar mini-grids providing first-time electricity to communities in Africa	• Focus is solely on renewable energy mini-grids • Clear evidence of private involvement • CrossBoundary has managed/manages at least 4 funds, has a large energy portfolio and this is a successor fund • Investments target Africa, specifically Nigeria	

As indicated in the first section of this report, we have identified potential investment opportunities for IMCA in geothermal energy, the CRM-linked tech industry (which includes BESS plus electric two- and three-wheelers), green hydrogen and off-grid. How each fund sits in relation to each of these sectors is reflected in *Figure 15* below.

Figure 15: Whether eligible investment managers deal with green hydrogen, geothermal, off-grid solar and BESS

Investment manager	Funding mechanism	Green hydrogen	Geothermal	Off-grid solar	BESS
Climate Fund Managers	SA-H2 FUND	Yes	No	No	Yes
Private Infrastructure Development Group	Infraco Africa	No	Yes	Yes	Yes
Camco Management Limited	REPP2	No	No	Yes	Yes
Camco Management Limited	Spark	No	No	Yes	Yes
Cygnum Capital	The Facility for Energy Inclusion	No	No	Yes	Yes
Cygnum Capital	Africa Go Green Fund	No	Yes	Yes	Yes
Climate Fund Managers	SDG Namibia One	Yes	No	No	Yes
Meridiam	Meridiam Infrastructure Africa II (MIAF II)	No	Yes	Yes	Yes
Harith General Partners	Pan-African Infrastructure Development Fund 2 (PAIDF 2) and its Top-up Fund	Unclear	Unclear	Unclear	Unclear
Africa50	Infrastructure Acceleration Fund	No	Yes	Unclear	Yes
Inspired Evolution Investment Managers	Evolution III	No	No	Yes	Yes
Helios Investment Managers	CLEAR Fund	No	Yes	Yes	Yes
Harith General Partners x Anergi	Pan-African Renewable Energy Fund (PAREF)	No	Unclear	Unclear	Yes
Frontier Investment Management	Frontier Energy II	No	Yes	Unclear	Yes
KawiSafi Ventures (Acumen affiliated)	KawiSafi II Fund	No	Unclear	Yes	Yes
Revego	Revego Africa Energy Fund	No	No	No	Yes

Fund Manager Archetypes

As part of our analysis, we have categorised fund managers and funds according to the scale of their energy and infrastructure interest, as shown in *Figure 16* below.

Figure 16: Fund manager archetypes. Table A describes four different archetypes while table B shows the funds linked to each category

Table A

	ETVC Growth	Small-scale energy	Large scale energy	General Infrastructure
Description	*Climate impact enterprise scaling and clean energy project development*	*Small-scale renewable energy, primarily embedded generation projects (typically <25-50MW)*	*Large scale on- and off-grid renewable energy generation projects (typically >25-50MW)*	*Broad infrastructure mandate which may include climate impact projects or enterprises*
Total cumulative size of funds	USD 3 billion	USD 1.1 billion	USD 0.6 billion	USD 2.4 billion
Proposed investment approach	Opportunity to scale markets for clean tech e.g. green hydrogen including local manufacturing (equity)	Proven model for energy access, but lower additionality due to saturation – may be jurisdiction / tech specific (guarantee or equity)	Room to support with overcoming market risks e.g. in riskier jurisdictions / tech (guarantee)	Catalyse feasible approaches to enabling infrastructure with less direct climate impact (e.g. T&D, storage) (guarantee or equity)

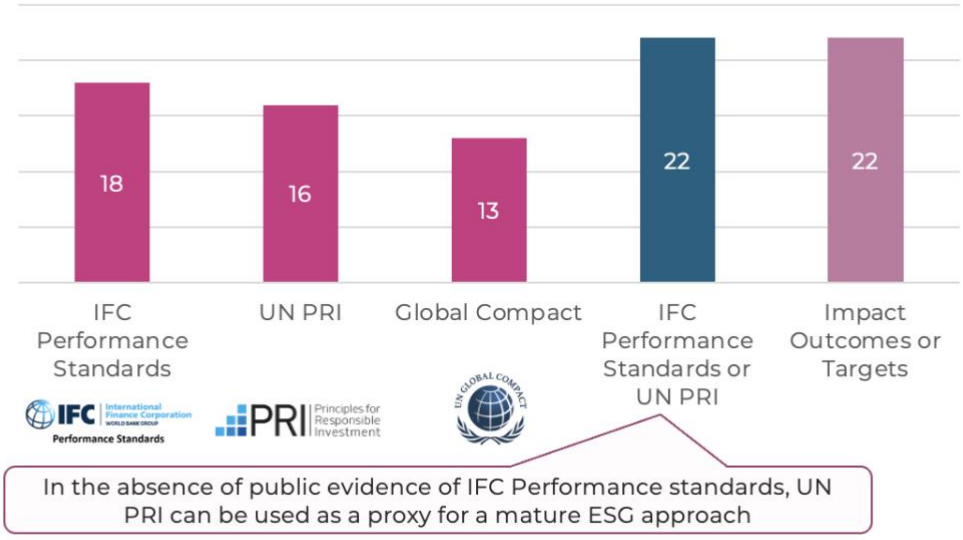
Table B

ETVC Growth	Small-scale energy	Large scale energy	General Infrastructure
Inspired Evolution, Evolution III (E): Invests in projects and enterprises to mitigate climate change, drive energy transition	Camco, Spark (D&E): Finances C&I energy efficiency and captive generation projects in sub-Saharan Africa	Frontier Energy II (E): Focus on developing, constructing and operating renewable energy assets across East Africa	Meridiam, Infrastructure Fund II (E): Targets infrastructure projects across Africa, including renewable energy
Helios, CLEAR (E): Invests in climate-smart agriculture, green energy, green mobility, recycling, and digital and financial climate enablers	Cygnum, Facility for Energy Inclusion (D): Technology agnostic financier of primarily off-grid C&I renewable energy projects	Harith (and Anergi), PAREF (E): Invests in on- and off-grid renewable energy projects	Africa50, Infrastructure Accelerator Fund (E): Invests in infrastructure assets with catalytic impact as a priority
CFM, CI3 SA-H2 (D&E): Blended finance fund that accelerates the development of a green hydrogen sector in South Africa	Camco, REPP 2 (D&E): Invests in small-scale renewable energy on- and off-grid	Revego, Africa Energy Fund (E): Invests in a mix of utility-scale operating renewable energy projects in Sub-Saharan Africa	Harith Pan-African Infrastructure Development (E): Invests broadly in infrastructure and infrastructure-related assets
CFM, CI3 SDG Namibia One (D&E): Blended finance fund that accelerates the development of a green hydrogen sector in Namibia	KawiSafi, Fund II: Invests in projects and enterprises linked to off-grid energy access		PIDG, InfraCo Africa (D&E): Invest mainly in early-stage infrastructure to create bankable projects
Cygnum, Africa Go Green Fund (D): Invests in energy efficiency and renewable energy-related projects, aiming to reduce GHG emissions for various sectors	CrossBoundary, Energy Access Platform II (D&E): Invests project finance capital into rural solar mini grids		ARM-Harith, Successor Fund: Invests in infrastructure assets, with a focus in West Africa, and specific inclusion of climate resilience and GHG reduction

ESG and impact investing and reporting by target investment managers

The 22 'eligible' and 'maybe' investment managers we have shortlisted apply varying ESG and impact approaches. All appear to anchor their ESG approach in either IFC Performance standards or UN PRI, while using UN SDGs to illustrate their impact, as shown in *Figure 17.* Many investment managers also subscribe to the UN Global Compact. This analysis is based on publicly available information, and there may be additional guidelines and standards that the investment managers adhere to but do not publicise widely.

Figure 17: Rate of adherence to standards, reporting and guidelines by the 22 'eligible'[1] and 'maybe'[2] fund managers based on desktop review



1. Eligible = Meets IMCA requirements at a fund level; 2. Maybe = Requires flexibility on 1-2 of IMCA's requirements

All investment managers display a mature ESG approach. The maturity of ESG approaches were illustrated through adherence to either IFC Performance Standards or UN PRI, and the presence of impact targets or outcomes.

The relative ESG maturity of the fund managers is also reflected by their Environmental and Social Management Systems (ESMS), and alignment with DFIs or B-Corp status. Over half of the funds publicly disclose an ESG Policy or description of an ESMS, which provides further context to their ESG approach. We note that Inspired Evolution and Frontier Energy describe explicit alignment to the requirements of DFIs. We also note that both Helios and Meridiam are certified B-Corp organisations.

Global agreements also guide commitments such as the Paris Agreement (30%), which six players have adopted, and the Addis Ababa Action Agenda to which only EDFI aligns.

Investment managers frequently adopt voluntary local ESG standards. Harith, AIIM and Sanlam for instance both adhere to King IV, a South African governance

framework, while Ninety One (a 'maybe' fund) adheres to the UK Stewardship Code. This is typically linked to their local jurisdiction.

Fund managers leverage international standards in the absence of hard regional guidance. Some of the investment managers outline their ESG approach by region e.g., applying local regulations for US and European investments and applying IFC performance standards for developing nations.

Diverse approaches for impact reporting

The UN SDGs feature prominently on the agenda of all investment managers, with the exception of Ninety One (which we have included as a 'maybe' fund.)[152] The specific fund managed by Ninety One is owned by PIDG, and the fund does outline their theory of change and how this is linked to the UN SDGs on a separate platform to Ninety One. Below are examples of fund approaches:

- Camco and CIP give a detailed breakdown of SDGs. These managers define the relative importance per SDG.
- Africa50 provides a theory of change linked to SDGs. The fund defines its theory of change and the SDGs it supports.
- Harith links SDGs to sectors. It reports impact by sector and notes the key SDGs that these sectors support.

Meridiam defines key SDGs per fund and provides impact through the lens of those SDGs. Common additional reporting standards and guidelines include TCFD reporting (45% of all eligible and maybe funds), the 2X Challenge (27%), IFC Operating Principles for Impact Management (27%), and IRIS+ Metrics (20%). While some of the investment managers have an impact report, others have an interactive dashboard, with only a few of them not using either.

Fund managers with an ESG and Impact approach fit for IMCA

All the fund managers have ESG and impact approaches that would be a fit for IMCA. A comparison of individual fund ESG profiles is captured in *Figure 18* below. The funds are classified as either being a 'strong fit' or being a 'fit,' as detailed in the legend. Note that IFC performance standards are more prescriptive and could show stronger commitment to ESG, but they are not always publicly disclosed, whereas UN PRI usually is. However, UN PRI has been used as a proxy for ESG approach maturity as it can be reasonably inferred that adherence to UN PRI would imply adherence to either IFC Performance Standards or a similarly strict set of ESG guidelines. UN Global Compact was also added due to IMCA's alignment with the principles.

[152] Ninety One provides no clear indication of how its impact is linked to achieving the UN SDGs. However, it does have an impact report and notes the following impact-related guidance and associations: TCFD reporting, alignment with Paris Agreement, subscription to Net Zero Asset Managers, alignment with EU Sustainable Finance Regulation and the development of CDP reports.

Figure 18: Investment manager ESG approach maturity and alignment with key ESG and impact standards and guidelines

Fund manager	ESG Approach Maturity	IFC Performance Standards	UN PRI	UN Global Compact
AIIM	Strong fit			
★ARM-Harith	Strong fit			
★Cygnum Capital	Strong fit			
★Frontier Energy	Strong fit			
★Meridiam	Strong fit			
Sanlam	Strong fit			
Stanlib	Strong fit			
★Camco Management Limited	Strong fit			
★Climate Fund Managers	Strong fit			
★CrossBoundary	Strong fit			
★KawiSafi Ventures	Strong fit			
Persistent Energy Capital	Strong fit			
★Private Infrastructure Development Group	Strong fit			
Copenhagen Infrastructure Partners	Strong fit			
★Africa50	Fit			
★Helios Investment Partners	Fit			
★Inspired Evolution Investment Managers	Fit			
responsAbility Investments AG	Fit			
EDFI Management Company	Fit			
★Harith General Partners	Fit			
Ninety One	Fit			
★Revego	Fit			

★ = Manages at least one of the "eligible" funds

Strong fit = Aligns to either IFC Performance Standards or UN PRI, and to UN Global Compact, and does track impact

Fit = Aligns to either IFC Performance Standards or UN PRI, but not to UN Global Compact, and does track impact

Chapter 5: Investment strategy and opportunities

Key takeaways:

- **We lay out three complementary investment strategies to support the development of the Energy Transition Value Chain (ETVC) in Africa**:
    1. Investing in venture capital and private equity to develop industries that leverage Africa's rich CRM endowment, including BESS, e-mobility, and green hydrogen solutions.
    2. Incentivising the procurement of local goods while scaling business models, which will drive further offtake of CRM.
    3. Lifting energy constraints hindering value chain expansion, by supporting the deployment of decentralised solar and battery systems in the clean technology manufacturing sector.

- **IMCA should consider establishing a fit-for-purpose VC platform to support the emergence of an African ETVC-cleantech industry.** The platform should identify the most promising novel technologies and support their commercialisation, overcoming the threat of cheap imports during critical early years. There is an unmet need for high-risk capital for ventures driving new, clean technologies using CRM. Selecting a VC partner with wide reach and a manufacturing focus is critical to build and convert an adequate pipeline, given the very early stage of this type of manufacturing on the continent.

- **IMCA should consider forming strategic private equity partnerships to scale manufacturing operations and business models using CRM-rich inputs.** Linking the VC platform manager to PE investors with aligned mandates would enable an exit while providing the necessary pipeline visibility to accommodate short PE capital deployment windows.

Greater local demand supports scaling and more competitive future pricing in cases where local conditions are favourable, i.e. in existing manufacturing hubs. IMCA should also consider partnering with energy sector PE investors to incentivise localisation via companies undertaking backward integration (e.g., e-mobility service providers targeting assembly) or projects using local components (e.g., solar projects sourcing balance of plant locally).

Broader investment, including feasibility study funding, in renewable power generation and transmission would support GDP growth, the development of industry, and employment generation. In particular, investments in geothermal energy, off-grid and clean energy transmission will help SSA jurisdictions move towards a green energy transition and support the development of the CRM sector.

Specific investment opportunities

Based on our research, we have been able to identify a range of concrete investment opportunities related to e-mobility, battery pack assembly, green hydrogen and transmission & distribution (T&D). All are aligned to IMCA's mandate. We are sending the list of these opportunities in a separate document as they are not for public consumption.

Investment strategies linked to gaps in the ETVC

Creative strategies would need to be leveraged to build the ETVC in Africa from the bottom up as there is currently low appetite for investment earlier in the chain. However, IMCA may be able to capitalise on investment opportunities aimed at developing the ETVC. Through expert interviews and research looking at the funding gaps, we have identified three potential strategies for IMCA to consider:

1. **Venture Capital Platform:** A new VC Platform investing in emerging industries along the ETVC can provide high risk capital for ventures driving new technologies using CRM.

2. **Private equity partnerships:** PE partnerships built on incentives to scale manufacturing for (1) proven ventures and (2) integrated manufacturing.

3. **CRM enabling energy platform**: Partnering with energy platform investors or infrastructure funds to invest in decentralised energy production for either manufacturing along the ETVC or in CRM mines, processing and refining facilities.

These three strategies should be targeted in parallel as they reinforce one another. Investing in the venture capital platform can create a viable pipeline for manufacturing investments. Investing in the energy platform can create the enabling environment required for manufacturing investments. Investing in manufacturing and energy could build capabilities along the value chain and allow more linkages to develop over time.

VC platform

There is a gap in VC funding in Africa. In 2023, the number of active investors in African venture capital decreased by 33%, with 545 deals completed, totalling just USD3.6 billion in deal sizes.[153]

Risk capital is needed to finance the development of new business models and technologies linked to CRM. The three areas which stand out are e-mobility,

[153] 2023 Venture Capital Activity in Africa, The Africa Private Capital Association. Link: https://www.avca.africa/data-intelligence/research-publications/2023-venture-capital-in-africa-report/

green hydrogen, and batteries. An example of an e-mobility venture is Max, an e-motorbike venture in Nigeria, which is looking into assembling as a growth opportunity. New battery ventures being developed include I-G3N, a lithium battery producer in South Africa. In green hydrogen, Climate Fund Managers have set up funds specifically targeting hydrogen, supporting industrial innovations such as green iron in Namibia.

There is an opportunity for IMCA to establish a new VC platform investing in emerging industries along the ETVC, by providing high risk capital for ventures driving new, clean technologies using CRM. Aligning to industry trends, the platform would partner with a PE Fund to enable exit and provide growth financing at the next stage. The ideal partner would already have these relationships in place or be willing to cultivate them. Grant funding can be used to build the capabilities of a selected VC partner, as well as fund feasibility studies informing its capital allocation decisions, given inherently high level of technology and market risk. We have identified potential partners, including:

- Ventures Platform: A diversified VC play operating at impressive scale. The manager has signalled appetite to venture into cleantech.
- Novastar: A reputable diversified VC manager which has also invested in e-mobility and signalled interest in further cleantech investing.
- Persistent Venture Builder: A platform aimed at enabling the transition to clean energy. Persistent has already invested in e-mobility ventures.

Private equity partnerships

There is currently a lack of appetite for manufacturing in the ETVC, given potentially low margins and demand uncertainty. None of the funds we identified as potential partners have exposure to ETVC manufacturing. Weak market signals would need to be overcome through both stimulating demand, and compensating investors for lower margins during the manufacturing scaling process. The former can be achieved through incentivising production or greater use of local components, the latter through linking the level of concessionally to local beneficiation.

There are opportunities to provide catalytic capital for manufacturing along the ETVC, including:

- **Proven cleantech ventures:** investing in scaling manufacturing for commercially viable technologies using CRM.
- **Integrated manufacturing**: Investing in businesses which undertake or support local manufacturing.

Firstly, as new technology ventures mature, they should become commercially viable and feasible for large-scale rollout. There is an opportunity to directly finance manufacturing to scale operations, tied to offtake agreements. There could

be an opportunity to develop one or more VC-PE partnerships to facilitate this opportunity.

Scaling clean tech ventures may require further feasibility studies as new applications are considered, beyond the primary market. Grant funding could be used for this purpose.

Secondly, there could be an opportunity to invest in local value chains. The two primary opportunities are as follows:

- Some energy sector businesses target backward integration along the value chain, e.g. by assembly or customising components for local conditions such as e-motos. This could lead to a growth strategy leveraging vertical integration.

- Project developers can procure certain components locally in some countries (e.g. solar balance of plant in South Africa) which creates the offtake required to sustain ETVCs.

In these cases, whilst local manufacturing is not the investment focus of the PE investor, it can be incentivised to support localisation strategies through offering higher returns where investees utilise locally manufactured goods, especially those with strong links to CRM.

Initially, the primary initial focus would be rebalancing returns to enable feasibility of investments using CRM-rich goods, while in the medium term, supporting more ambitious cleantech investments over time. This strategy can be implemented by teaming up with PE managers with aligned mandates. In this report, we have identified asset managers who invest along the ETVC, including Inspired Evolution, Climate Fund Managers, and Helios.

Investing in energy as an enabler

IMCA can also invest in energy supply to enable ETVC development. Our interviews revealed that inadequate energy access is one of the key hurdles to developing a local value chain. Investing in energy infrastructure, either through decentralised energy generation or transmission and distribution systems, would stimulate economic growth and generate employment in regions of strategic interest. The investments can create future entry points for IMCA to gain direct exposure to both manufacturing and critical minerals.

Whilst solar mini-grids are an obvious target, a larger universe of project types is envisioned here. This includes:

- Transmission and distribution (T&D) infrastructure connecting energy plants with manufacturing hubs, and, subject to IMCA's appetite, CRM mining (e.g. copper belt in Zambia/DRC).

- Development of newer renewable energy sources like geothermal energy, in the Rift Valley.

Whilst many energy infrastructure investors exist in SSA, IMCA can show additionality in three ways:

- Solving the revenue model challenge for critical T&D infrastructure investments. Historically, energy systems operated by centralised utilities have bundled supply of energy generation and T&D. Today, a profound challenge exists to find a viable business model for supply of grid connection services, in an environment of diversifying sources of energy supply.

- Financing novel technologies like geothermal energy. This will likely include the need to undertake feasibility studies through grant funding; and

- Supporting new energy system projects. One private equity investor we identified spoke of the delays experienced in securing offtake agreements with large miners as a deterrent to pursuing commercial and industrial energy investments in these areas. This has undermined the feasibility of this model for PE investors, who prefer to pursue larger deals elsewhere. Platform models are ideal to aggregate and convert this demand.

Project developers and infrastructure asset managers such as CrossBoundary, Africa50, Camco or AIIM, could serve as partners to help develop energy projects that will contribute to manufacturing in Africa. Various funding vehicles or energy platforms like Camco's Spark and REPP 2 or AIIM's IDEAS fund are available to host and develop such investments. IMCA funding can be used to directly finance these projects or as catalytic capital to attract investment.

Chapter 6: Local ESG standards

Key takeaways

- **National policies and regulations within the examined jurisdictions are consistent with commonly used impact standards, such as the IFC and EDFI.** South Africa and Kenya, emerge as the jurisdictions with the most robust responsible investment and ESG policy development with Tanzania, Namibia, and Zambia following.

- **South Africa and Kenya are leaders in ESG, as both have a mix of well-established policy and regulation, and mature responsible investing landscapes,** as well as widespread adoption of responsible investment standards.

- **Tanzania, Namibia and Zambia also have relatively mature ESG policies. However, implementation is less advanced,** and adoption of responsible investment standards is lower in these countries. Namibia typically closely follows South African initiatives.

- **The DRC has fewer comprehensive ESG regulations, but they do have some alignment to global standards, although this is limited.** There is evidence of policy movement, however, concerns about ESG adoption still exist and there is less evidence of implementation of policies.

- **Our findings did not identify any significant Africa-focused ESG investing initiatives.** While global frameworks exist, no specific initiatives were widely adopted in the examined jurisdictions.

ESG and impact standards relevant to ETVC Investing in Africa

International ESG and impact standards function as 'soft laws,' encouraging the integration of environmental and social risks, broader impact themes, and responsible stewardship into investment decision-making. [154] *Figure 19* highlights a selection of internationally recognised ESG and Impact standards that are particularly relevant to IMCA's investments in Africa.

Figure 19: International ESG and Impact Standards that are most relevant to Africa's energy transition

Relevant international ESG standards	<u>Highly relevant standards</u> 1. International Finance Corporation (IFC) Environmental and Social Performance Standards 2. United Nations Principles for Responsible Investment (UN PRI) 3. United Nations Global Compact 4. Equator principles <u>Additional standards</u> 1. International Labour Organization
Relevant international impact standards	<u>Highly relevant standard</u> 1. Sustainable Development Goals (SDGs) <u>Additional standards</u> 1. European Sustainability Reporting Standards (ESRS) 2. Task Force on Climate Related Financial Disclosure (TCFD) 3. Global Reporting Initiative (GRI)

Our findings did not identify any regional or international African ESG investing initiatives of high relevance. Whilst there are various global frameworks, no specific Africa-focused ESG initiatives emerged as significant or widely adopted within the jurisdictions examined. However, the national policies and regulatory frameworks within these countries provide ESG guidelines that align with impact standards commonly used in development assistance, such as IFC and EDFI standards.

Countries with the strongest institutions in sub-Saharan Africa appear to be South Africa and Kenya, where policy development is robust and effectively implemented. They are followed by Zambia and Tanzania, which show proactive policy efforts but with less action on the ground. Botswana and Namibia have less developed policy frameworks, likely due to their smaller economies, which often

[154] Impact themes include sustainable development and climate change.

take direction from South Africa's advancements. The DRC stands out as an outlier in this landscape.

Adoption of ESG policies and standards in attractive ETVC jurisdictions in Africa

This section examines the ESG standards implemented across key value chain sectors in the main SSA jurisdictions covered by this report. It assesses their alignment with impact standards typically used in development assistance, while also identifying any gaps and challenges in their application.

South Africa

South Africa has an advanced responsible investment landscape. The country's regulatory and policy framework demonstrates strong alignment with international ESG and impact standards. South Africa has multiple policies and initiatives with evidence of strong implementation support. The responsible investment industry is considered mature relative to other African countries.

Policy communication and regulation has been clear in support of climate and, broadly speaking, ESG integration. The upcoming Climate Change Act 22 of 2024,[155] the Just Transition Framework,[156] and the USD100 billion Just Energy Transition Investment Plan (JET IP) [157] align well with global decarbonisation and sustainability goals, in particular spurring sustainable infrastructure investment. Furthermore, Regulation 28 of the Pension Funds Act and voluntary guidelines like Code for Responsible Investing in South Africa (CRISA) [158] emphasise the integration of ESG factors in investment decisions, reflecting a strong correlation with development assistance standards.

While the policy framework in South Africa is robust, challenges include the delayed enforcement of the Climate Change Act, which could impact the pace of ESG adoption. Furthermore, CRISA and the King IV Code on Corporate Governance[159], a key framework for promoting corporate governance and responsible investment, are voluntary for non-listed entities. Consequently, the absence of mandatory enforcement may limit the broader application of these guidelines and reduce their ability to ensure full adherence to ESG standards across all companies in the rapidly growing renewable energy sector. Additionally, while the Broad-Based Black Economic Empowerment Act (B-BBEE) promotes local

[155] Government Gazette', Republic of South Africa, July 2024, Link: https://www.gov.za/sites/default/files/gcis_document/202407/50966climatechangeact222024.pdf
[156] Just Transition Framework', Presidential Climate Commission, Link: https://www.climatecommission.org.za/just-transition-framework
[157] South Africa's Just Energy Transition Investment Plan (Jet Ip)', The Presidency Republic of South Africa, 2023, Link: https://pccommissionflo.imgix.net/uploads/images/South-Africas-Just-Energy-Transition-Investment-Plan-JET-IP-2023-2027-FINAL.pdf
[158] Code For Responsible Investing In South Africa,' CRISA, Link: https://www.crisa2.co.za
[159] King IV Report', Institute of Directors South Africa, Link: https://www.iodsa.co.za/page/king-iv

ownership, there are no sector-specific requirements for the energy sector,[160] potentially creating gaps in ESG-focused energy investments.

IMCA's development actors should adopt relevant South African frameworks such as CRISA and King IV in addition to international ESG standards like IFC Performance Standards and the UN Sustainable Development Goals (SDGs). These frameworks ensure responsible investment in alignment with global best practices, with a focus on governance, environmental stewardship, and local empowerment through B-BBEE. Additionally, compliance with Regulation 28 and alignment with the Just Energy Transition Plan will be essential for sustainable long-term returns in the energy sector.

Kenya

Kenya is similar to South Africa as it is known to have a relatively mature responsible investment landscape. In Kenya, ESG regulations are anchored in several legislative and regulatory frameworks. Key among them is the Climate Change Act (2016)[161], which mandates entities to integrate climate-related considerations into their strategies and operations. To this end, the Central Bank of Kenya (CBK) has published Guidance on Climate-Related Risk Management (2021)[162] to address the risks posed by climate change to financial sector stability.

The Capital Markets Authority (CMA) has issued important regulations applying to all listed entities, such as the Stewardship Code (2017)[163] and **the Code of Corporate Governance Practices for Issuers of Securities to the Public (2015)[164]**. These codes require companies to establish comprehensive environmental, social, and governance (ESG) frameworks and propose that companies publicly disclose their ESG performance in their annual reports.

The Kenya Companies Act[165] also stipulates that directors must review environmental, social, and community issues that could affect the company's future development, performance, and overall position. Additionally, the Mwongozo Code of Governance for State Corporations[166] obliges boards of state corporations to ensure that their strategies align with long-term sustainability

[160] B-BBEE Codes, B-BBEE Acts, Strategies & Policies', DTIC, Link: https://www.thedtic.gov.za/financial-and-non-financial-support/b-bbee/b-bbee-codes-b-bbee-acts-strategies-policies/
[161]'Climate change Act,' National Council for Law Reporting, Link: https://new.kenyalaw.org/akn/ke/act/2016/11/eng@2023-09-15
[162] 'Guidance on Climate-related Risk Management,' Central Bank of Kenya, Link: https://www.centralbank.go.ke/2021/10/15/guidance-on-climate-related-risk-management/
[163] The Capital Markets Act, 1989 Link: https://www.ecgi.global/sites/default/files/codes/documents/Kenya.pdf
[164]Code of Corporate Governance Practices for Issuers of Securities to the Public, 2015, Link: https://cma.or.ke/wp-content/uploads/2023/03/Code-of-Corporate-Governance-Practices-for-Issuers-of-Securities-to-the-Public-2015-Code-8.pdf
[165] 'Legal guide for company directors in Kenya,' CMS, Link:https://cms.law/en/int/expert-guides/cms-expert-guide-for-directors-of-companies/kenya
[166] 'The Code of Governance of State Corporations,' State Corporations Advisory Committee, Link: https://kmtc.ac.ke/wp-content/uploads/2019/06/MWONGOZO-The-Code-of-Governance-for-State-Corporations.pdf

goals and to monitor the organisation's performance to avoid compromising future generations' ability to meet their needs.

The Nairobi Securities Exchange (NSE) has further developed an ESG Disclosure Manual[167] to guide listed companies in ESG reporting. Although the manual primarily focuses on listed companies, it also serves as a resource for investment managers, assisting them in complying with the CMA Code, relevant international treaties, and local regulations. The manual identifies environmental and social risk management as mandatory reporting topics for listed entities, and it refers to the International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability for common ESG indicators and metrics used by investors when evaluating investments.

Additional ESG guidance is provided by the Kenya Bankers Association (KBA) through its Sustainable Finance Initiative (SFI) principles.[168] Furthermore, over 200 organisations in Kenya, including listed companies, are part of the Global Compact Network Kenya, the local chapter of the United Nations Global Compact (UNGC), promoting ESG best practices across the business landscape.

The Companies Act 2015 requires that foreign companies registering in Kenya cede at least 30% of their shareholding to persons who are Kenyan citizens by birth. Investors who fail to comply with this rule will be fined Sh5m (around USD38,610). However, the new law does not apply to existing companies already registered in Kenya.

The Capital Markets (Foreign Investors) Regulations 2002 (as amended in 2015) allows for the Cabinet Secretary for the National Treasury to prescribe a maximum foreign shareholding in instances where local ownership in a strategic industry or sector is desirable, or where it is in the national interest to maintain a certain level of local ownership.[169] Currently, there are no sector specific requirements for local ownership in the energy sector.

Tanzania

Tanzania's extensive regulatory framework, including the National Climate Change Response Strategy (NCCRS) 2021-2026,[170] aligns well with international impact standards commonly applied in development assistance, such as the IFC and EDFI. The NCCRS, along with the Third National Development Plan (FYDPIII) and the National Environmental Master Plan (NEMPSI) 2022-2032,[171] outlines key actions to address climate change. The updated NCCRS introduces

[167] 'Nairobi Securities Exchange ESG Disclosure Guidance Manual, Nairobi Securities Exchange, November 2021, Link: NSE-ESG-Disclosures-Guidance-Manual.pdf
[168] 'Kenya Sustainable Finance and Principles,' Kenya Bankers Association, 2015, Link: sfi-booklet.pdf (kba.co.ke)
[169] Kenya Profile, UN Trade and Development, Link: https://investmentpolicy.unctad.org/investment-policy-monitor/measures/2973/kenya-kenya-implemented-30-domestic-ownership-requirement-for-newly-registering-foreign-companies
[170] National Climate Change Response Strategy 2021-2026', United Republic of Kenya, 2021, Link: https://www.taees.org/wp-content/uploads/2021/09/NCCRS-2021-2026_-Final_PK.pdf
[171] National Environmental Master Plan for Strategic Interventions (2022-2023)', United Republic of Tanzania Vice President's Office, June 2022, Link: https://faolex.fao.org/docs/pdf/tan214784.pdf

adaptation and mitigation measures across major sectors, aiming to strengthen climate resilience and reduce greenhouse gas emissions.

The Bank of Tanzania's Guidelines on Climate-Related Financial Risks[172] and the emphasis on ESG reporting by the Dar es Salaam Stock Exchange (DSE) [173] **also reflect strong governance and climate risk management principles that are consistent with global standards**. Additionally, the focus on renewable energy in the Third National Development Plan (FYDPIII)[174] aims to integrate climate change into national planning across all economic sectors. It supports sustainability objectives central to development assistance programmes.

While Tanzania's policies demonstrate alignment with global ESG standards, gaps exist in enforcement and sector-specific regulations, particularly in the emerging renewable energy sector. The lack of mandatory local ownership requirements in energy,[175] compared to other sectors like mining and oil, could limit local value creation and empowerment. Additionally, while the DSE mandates ESG reporting, there may be challenges in ensuring comprehensive adoption and reporting across all listed companies, especially within their supply chains.

IMCA's development actors should adhere to Tanzania's National Climate Change Response Strategy (NCCRS) and the DSE's ESG reporting requirements, in addition to international standards such as the IFC Performance Standards and the UN Sustainable Development Goals (SDGs). The integration of the Bank of Tanzania's climate risk guidelines and the FYDPIII's renewable energy focus will be crucial for ensuring sustainable investments in the energy sector. These standards could ensure alignment with both local and international best practices in climate resilience, governance, and sustainability.

Namibia

Namibia's National Climate Change Policy (2011),[176] operationalised through the National Climate Change Strategy and Action Plan (NCCSAP),[177] and the NamCode (Namibian Corporate Governance Code)[178] align with impact

[172] Guidelines on Climate-Related Financial Risks Management, 2022', Bank of Tanzania, 2022, Link: https://www.bot.go.tz/Publications/Acts,%20Regulations,%20Circulars,%20Guidelines/Guidelines/en/20221026122017 47.pdf
[173]Annual Report 2022', DSE, December 2022, Link: https://dse.co.tz/storage/securities/DSE/financial_statement/Annual/TWFMoAZNFRM4vLlDZlmVwG6fRuT5RA435NoeaGmC.pdf
[174] National Five Year Development Plan 2021/22 - 2025/26', The United Republic of Tanzania, June 2021, Link: https://faolex.fao.org/docs/pdf/tan205461.pdf
[175] An Overview of Investment Regulations in Kenya and Tanzania: 6 Points to Consider Before Investing in Kenya and Tanzania', LinkedIn, September 2023, Link: https://www.linkedin.com/pulse/overview-investment-regulations-kenya-tanzania-6-points-amne-suedi/
[176] National Policy On Climate Change For Namibia', Government Of The Republic Of Namibia, October 2011, Link: https://www.meft.gov.na/files/files/National%20Policy%20on%20Climate%20Change%20for%20Namibia%202011(1).pdf
[177] National Climate Change Strategy & Action Plan', Republic of Namibia Ministry of Environment & Tourism, 2015, Link: https://faolex.fao.org/docs/pdf/nam191143.pdf
[178] The Nam Code: The Corporate Governance Code for Namibia', NSX, Link: https://nsx.com.na/images/reports/Namcode-Inside.pdf

standards such as those promoted by the IFC and EDFI. The country's focus on climate resilience, sustainable development, and the integration of climate change considerations across sectors reflects international best practices. Additionally, the Namibia Stock Exchange (NSX) requires companies issuing green bonds to develop an ESG framework[179] that complies with international standards, such as those set by the International Capital Markets Association (ICMA). Adherence to ICMA's Green and Social Bond Principles and Sustainability Bond Guidelines further align Namibia's frameworks with globally accepted ESG and sustainability standards. Namibian standards and guidance are often closely aligned to South African standards, e.g. the NamCode being inspired by the King Code.

While Namibia's frameworks are largely in line with international standards, there are some gaps. The absence of mandatory local ownership requirements in the energy sector could limit the broader impact of ESG initiatives on local empowerment. According to the Foreign Investment Act, 1990, which currently applies in Namibia, foreign nationals engaged in business activities or intending to commence activities in Namibia are not required to have local equity participation, subject to certain exceptions, nor transfer their businesses or any part thereof to the Government or to any Namibian.[180] This could limit local value addition in Namibia's expanding renewable energy sector.

IMCA's development actors should adopt Namibia's NamCode and NSX directives, particularly the Social, Ethics, and Sustainability (SES) Committee, [181] as appropriate ESG standards. International frameworks, such as the IFC Performance Standards and ICMA Green Bond Principles, should also be incorporated to ensure transparency and accountability in sustainable investments. By embedding these standards, IMCA can promote ethical leadership, sustainability, and responsible governance in Namibia's growing renewable energy sector, while ensuring alignment with global best practices.

Zambia

Zambia's National Policy on Climate Change (2016) [182] aligns with international development assistance standards like the IFC and EDFI by promoting climate change mitigation and adaptation across all economic sectors, including renewable energy and green infrastructure. Initiatives such as the **Green Bond Guidelines,[183]** introduced by Securities and Exchange Commission (SEC) in 2020, and Green Loan Guidelines,[184] published in 2023 by Bank of Zambia, further

[179] The rise of sustainable finance in Namibia', ENSight, Link: https://www.ensafrica.com/news/detail/7075/the-rise-of-sustainable-finance-in-namibia
[180] 2023 Investment Climate Statements: Namibia', U.S. Department of State, 2023, Link: https://www.state.gov/reports/2023-investment-climate-statements/namibia/#:~:text=There%20are%20no%20general%20mandatory,variable%20percentage%20of%20local%20ownership
[181] Understanding the significance of ESG for corporate directors in Namibia', ENSight, Link: https://www.ensafrica.com/news/detail/7297/understanding-the-significance-of-esg-for-cor
[182] National Policy on Climate Change', Ministry of National Development Planning, April 2016, Link: https://faolex.fao.org/docs/pdf/zam174957.pdf
[183]Zambia Gazette', SEC Zambia, January 2020, Link: https://www.seczambia.org.zm/wp-content/uploads/2020/01/The-Securities-Green-Bonds-Guidelines-2019.pdf
[184] Gazetting of the Green Loans Guidelines, 2023' Office of the Deputy Governor – Operations, November 2023, Link:

supports the integration of sustainability in finance, similar to international impact standards.

While Zambia has a robust policy framework for sustainable finance, gaps remain in mandatory enforcement of ESG-related provisions. For instance, adherence to sustainability practices under the Lusaka Stock Exchange (LuSE) Code of Corporate Governance[185] is voluntary. Additionally, there very few sector-specific requirements for local ownership in the energy sector, which could limit local empowerment and long-term sustainable development in renewable energy. At present, foreign private entities can establish and own businesses in Zambia, with the only requirement being that at least one local director must reside in the country, and if there are more than two local directors, the majority must be Zambian residents.[186]

IMCA's development actors could apply Zambia's Green Bond and Green Loan Guidelines, the National Policy on Climate Change, and the LuSE Code of Corporate Governance as relevant ESG standards. These should be supplemented by international standards such as the IFC Performance Standards and the UN Sustainable Development Goals (SDGs) to ensure robust sustainability and governance frameworks in Zambia's energy sector investments.

DRC

Although the DRC lacks the comprehensive ESG regulations seen in other jurisdictions discussed in this report. Nevertheless, its affiliation with both the UN Principles for Responsible Investment (UNPRI), and the UN Global Compact (UNGC), as well as its participation in the CRE Finance Council's Green Lending Initiative[187] demonstrate some alignment with international development assistance impact standards. While the DRC government has not established comprehensive due diligence or reporting requirements on human rights or responsible business conduct across most industries, some existing legal frameworks do offer protections. The Labor Code, though largely voluntary, provides worker protections, and has legal provisions mandating environmental safeguards, guiding companies toward ethical and sustainable practices, despite the absence of strict government regulations.[188]

Other regulatory frameworks include The Global Compact Network DRC, which encourages sustainable business practices, reflecting international efforts to

https://www.boz.zm/CBCIRCULARNO.33OF2023GAZETTINGOFTHEGREENLOANSGUIDELINES2023.pdf

[185] The Lusaka Stock Exchange (Luse) Corporate Governance Code For Listed And Quoted Companies', Lusaka Stock Exchange, 2005, Link: https://www.luse.co.zm/wp-content/uploads/2024/02/LUSE-CORPRATE-GOVERNANCE-CODE.pdf

[186] 2023 Investment Climate Statements: Zambia', U.S. Department of State, 2023, Link: https://www.state.gov/reports/2023-investment-climate-statements/zambia/

[187] About CREFC's Sustainability Initiative', CREFC, Link: https://www.crefc.org/cre/content/engage/Sustainability-Initiative.aspx?iUniformKey=2668875b-064d-48cd-a6ab-db48a82c1e55&WebsiteKey=105b6c32-4dc8-4e9f-8ba4-8b92bdce1c9e&hkey=e67c19e2-1307-4995-a126-35e736fbc760&MainCCO=3

[188] 2024 Investment Climate Statements: Democratic Republic of the Congo', U.S. Department of State, 2023, Link: https://www.state.gov/reports/2024-investment-climate-statements/democratic-republic-of-the-congo/

promote responsible investments. Additionally, the country's National Adaptation Plan to Climate Change (2022-2026) aligns with global climate adaptation goals by focusing on strengthening frameworks that enhance responsible environmental management.[189]

Nonetheless, there are notable gaps in comprehensive due diligence and reporting requirements on human rights and responsible business conduct, which IMCA would be wise to consider in any investment decision. The largely voluntary nature of ESG-related practices and the lack of stringent government enforcement present serious challenges.

[189] IBID

Adoption of Standards

Kenya and South Africa have the most widespread adoption of International ESG standards, providing evidence of their relatively mature responsible investing landscapes as shown in *Figure* 20. The rest of the countries have varying degrees of uptake across ESG standards with no significant differences among them. While international impact standards are generally voluntary, South Africa and Kenya once again lead in voluntary adoption of these standards, as shown in *Figure 21*.

Figure 20: Mapping the Adoption of Selected International ESG Standards in Attractive Jurisdictions in Africa

ESG Standards	 **Principles for Responsible Investment (PRI)**	EQUATOR PRINCIPLES **Equator Principles (examples of adherents)**	United Nations Global Compact **UN Global Compact**
Namibia	Signatory identified (Link)	Adopted by multiple Financial Institutions (e.g. First Rand Standard Bank)	No participants
Tanzania	Signatories not identified	Adopted by multiple Financial Institutions (e.g. Standard Chartered, Absa Bank)	Seven Participants (Link)
Zambia	Signatories not identified	Adopted by multiple Financial Institutions (e.g. Standard Chartered, Standard Bank Group, Absa Bank)	Two Participants (Link)
South Africa	Large number of signatories identified. (Link)	Adopted by multiple Financial Institutions (e.g. First Rand, Standard Bank Group, Nedbank Limited)	117 Participants (Link)
Kenya	Signatory identified (Link)	Adopted by multiple Financial Institutions (e.g. Absa Bank, Standard Bank Group, Standard Chartered)	306 Participants (Link)
DRC	Signatories not identified	Some evidence of uptake (e.g. Standard Bank Group)	49 Participants (Link)

Notes: International Finance Corporation (IFC) Performance Standard – assumed to be adopted by financial institutions across the seven countries. International Labour Organization (ILO) – all seven countries are members.

Figure 21: Mapping the adoption of selected international impact standards in attractive jurisdictions

Impact Standards	 **International Financial Reporting Standards (IFRS): S1 and S2**	 **European Sustainability Reporting Standards (ESRS)**	 **Global Reporting Initiative (GRI)**	 **Task Force on Climate Related Financial Disclosures (TCFD)**	 **Sustainable Development Goals (SDGs)**
Namibia	Not mandatory (Link)	Voluntary adoption to promote trade and investment	Voluntary adoption	Voluntary adoption	Integrates the SDG implementation into the fifth National Development Plan. Launched the Development Finance Assessment (DFA), in 2021, to finance achievement of the SDGs and NDP (Link)
Tanzania	Not mandatory but encouraged (Link)	Voluntary adoption to promote trade and investment	Voluntary adoption	Voluntary adoption	SDGs have been integrated into and are implemented through national medium-term plans (Link)
Zambia	Not mandatory (Link)	Voluntary adoption to promote trade and investment	Voluntary adoption	Voluntary adoption	Zambia's current National Development Plan (7NDP) has embraced an integrated multisectoral approach (Link)
South Africa	Not mandatory. Preparing to adopt IFRS S1 and S2 (Link)	Voluntary adoption to promote trade and investment	Voluntary adoption	Voluntary adoption by most financial institutions	Prioritises sustainable development and inclusive growth as part of the National development Plan (Link)
Kenya	Not mandatory. Intention to adopt IFRS S1 and S2 (Link)	Voluntary adoption to promote trade and investment	NSE requires use of the GRI standards (Link)	Voluntary adoption. Informs climate risk reporting (Link)	Integrated Development Plans, 2018 -2022, position Kenya to better implement the SDGs and Agenda 2063
DRC	Not mandatory	Voluntary adoption to promote trade and investment	Voluntary adoption	Voluntary adoption	Has achieved alignment of National Strategic Development Plan and Strategies sector and provincial sectoral targets on the SDGs (Link)

Conclusion

As highlighted by this report, sub-Saharan Africa as a whole faces a range of challenges. These include the region's power deficit, inadequate energy and logistical infrastructure, a lack of industrialisation, over-dependency in China in the CRM value chain, in addition to political and regulatory risk, from a longer list of challenges. In combination, these challenges make the task of driving the development of Energy Transition Value Chains (ETVCs) without billions of USD on the table particularly difficult.

However, we have developed a strategy for IMCA that has the potential to move the needle positively for ETVCs, while also helping to alleviate SSA's power shortfall. This involves establishing a Venture Capital Platform and developing Private Equity Partnerships for technology manufacturing that uses critical minerals.

At a broader level, and in order to address SSA's energy challenges, IMCA also has the opportunity to invest in geo-thermal, off-grid, BESS and green hydrogen. One plank of this strategy should be to support ETVCs, complementing localised energy access initiatives.

IMCA would also benefit from seeing whether there are opportunities to leverage existing investment structures where possible without compromising its objective to generate new additionality. In combination, this approach should provide a catalytic impact.

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List of Abbreviations

ACP	Allied Climate Partners
AfCTFA	African Continental Free Trade Area
AfDB	African Development Bank
AGHA	Africa Green Hydrogen Alliance
B-BBEE	Broad-Based Black Economic Empowerment Act (South Africa)
BESS	Battery Energy Storage System
BESIPPPP	Battery Energy Storage Independent Power Producer Procurement Programme
BGFA	Beyond the Grid Fund for Africa
BMS	Battery management system
BRI	Belt and Road Initiative
CAPEX	Capital expenditure
CFM	Climate Fund Managers
CESL	Congo Energy Solutions Limited
CRISA	Code for Responsible Investing (South Africa)
C&I	Commercial and industrial
DBSA	Development Bank of South Africa
DFC	US International Development Finance Corporation
DRC	Democratic Republic of Congo
DSE	Dar es Salaam Stock Exchange
EDFI	European Development Finance Institution
EJ	Exajoules
EIB	European Investment Bank
EPC	Engineering, Procurement and Construction
ESMS	Environmental and Social Management Systems
ESRS	European Sustainability Reporting Standards
ETVC	Energy transition value chain
EV	Electric Vehicles
E2&3W	Electric two- and three-wheelers
E4W	Electric four-wheelers
FDI	Foreign Direct Investment
FEED	Front-End Engineering Design
FYDPIII	Third National Development Plan (Tanzania)
GDC	Geothermal Development Company
GEAPP	Global Energy Alliance for People and Planet
GEF	Global Environment Facility
GHG	Greenhouse gas
GRMF	Geothermal Risk Mitigation Facility
GRI	Global Reporting Initiative
IEA	International Energy Agency
ICE	Internal combustion engine
IFC	International Finance Corporation
IGA	International Geothermal Association

IHA	International Hydropower Association
IMCA	Investment Mobilization Collaboration Association
IPHE	International Partnership for Hydrogen and Fuel Cells in the Economy
IRP	Integrated Resource Plan
IRENA	International Renewable Energy Agency
ITUC	International Trade Union Confederation
JETP	Just Energy Transition Partnership
JOGMEC	Japan Oil, Gas and Metals National Corporation
KBAA	Kenya Bankers Association
LCVs	Light commercial vehicle
LIB	Lithium-ion battery
LuSE	Lusaka Stock Exchange
NamCode	Namibian Corporate Governance Code
NCCACP	Namibia's National Climate Change Strategy and Action Plan
NCCRS	National Climate Change Response Strategy (Tanzania)
NECOM	South Africa's National Energy Crisis Committee
NCG	Non-condensable gases
NEMPSI	National Environmental Master Plan (Tanzania)
NEP	Nigeria Electrification Project
NSE	Nairobi Securities Exchange
OECD	Organisation for Economic Co-operation and Development
OEM	Original equipment manufacturers
PGM	Platinum group metal
PPA	Power purchase agreement
PPP	Public-private partnership
RE	Renewable Energy
REPP	Renewable Energy Performance Platform
REE	Rare earth elements
SFI	Sustainable Finance Initiative
SDG	Sustainable Development Goal
SEC	Securities and Exchange Commission (Zambia)
SES	Social, Ethics, and Sustainability Committee (Namibia)
SHS	Solar Home Systems
SKD	Semi-knocked down kits
SME	Small and medium-sized enterprise
SOE	State-owned enterprise
SSA	Sub-Saharan Africa
TCFD	Task Force on Climate Related Financial Disclosure
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
UNPRI	United Nations Principles for Responsible Investment