

Financing Clean Energy in Africa

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World Energy Outlook Special Report

INTERNATIONAL ENERGY AGENCY

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I am honoured to introduce this vital report on financing clean energy transitions in Africa, which sheds light on the crucial actions needed to bring about the transformation of our continent's energy systems.

Authored by the International Energy Agency (IEA) and the African Development Bank Group (AfDB), two organisations dedicated to Africa's progress, this report serves as an invaluable guide for charting our course towards a sustainable and prosperous future.

The credibility of the IEA as the world's authoritative agency for energy policy makes this report an indispensable resource for decision makers, investors and all those committed to Africa's development. Rooted in robust data and case studies from across the region, it articulates the pressing need for action from all stakeholders: governments, development finance institutions, the private sector and domestic capital providers.

Energy investment on our continent has fallen short, accounting for a mere 3% of the global total, even though Africa is home to one-fifth of the world's population. To achieve the United Nations goals for universal energy access by 2030 and meet international climate objectives under the Paris Agreement, it is imperative we take bold steps to more than double energy investment here in the next decade, with a primary focus on clean energy.

The report's examination of the cost of capital in Africa, which is at least two to three times higher than in advanced economies, is a stark reminder of the formidable challenges we must address to unleash our continent's full development potential.

Yet this report is not simply a laundry list of Africa's challenges. It is an inspiring testament to the innovative spirit of our continent. Case studies from the AfDB and other sources underscore the vast array of transformative solutions emerging from Africa's creative minds. The report provides invaluable insights on how we can harness the existing clean energy investment landscape, optimise capital allocation across sectors and technologies, and generate a transformative cycle of change to scale up investments sustainably.

By effectively mobilising private capital and securing USD 28 billion of concessional funding by 2030, we can unlock the necessary USD 90 billion in private investment for clean energy that will revolutionise our continent's trajectory and support global climate ambitions.

As we gather at the African Climate Action Summit in Nairobi, where this report will be launched, let us stand united in purpose and determination. It is our collective responsibility to draw on the insights from this report, forging new partnerships and fostering innovation that can tap into the vast potential of clean energy and improve the lives of millions of people across our continent.

Dr William Ruto

President of the Republic of Kenya

Chair of Committee of African Heads of State and Governments on Climate, African Union

Energy is central to Africa's future development, and Africa in turn will play an increasingly important role in shaping global energy trends. How these roles play out in practice will depend in large part on investment, particularly in affordable, reliable and clean energy for African consumers. African countries have huge energy potential, including a spectacular range and quality of renewable energy resources. Africa is home to more than half of the world's best solar resources, as well as great potential for hydro, wind and geothermal power, among others. But these riches are largely untapped and they will remain so without greatly improved access to capital.

African countries should make their energy decisions based on the realities they face and the priorities they have set out. In 2022, the International Energy Agency (IEA) published a landmark *Africa Energy Outlook*, which highlighted the challenges, trends and dynamics at work in African energy systems and how they could evolve in the coming decades. It laid out an ambitious path for the continent's energy systems in the form of a new Sustainable Africa Scenario in which all African energy-related development goals are achieved on time and in full. It also revealed a major shortfall in terms of investment: energy spending in Africa has been falling for over five years but needs to double by 2030. Our new analysis, working in close cooperation with our friends and colleagues at the African Development Bank Group, shows what it will take to expand dramatically the flows of investment capital to clean energy projects across Africa.

A particularly urgent task is to expand energy access, progress on which has been slowed in many countries by the Covid-19 pandemic, the global energy crisis and mounting indebtedness. African countries are also facing some of the most severe consequences of climate change despite contributing the least to global emissions to date. Today, over 600 million people across Africa live without access to electricity and nearly one billion without access to clean cooking. A key priority for the continent and its international partners must be to ensure that all Africans have access to secure and affordable electricity and clean cooking fuels.

Our analysis highlights that clean, affordable solutions are available to meet Africa's energy needs, both in relation to energy access and in many other areas. But investments are held back by a range of policy and regulatory hurdles, weaknesses in project preparation and scale, and a lack of alignment between the needs of project developers and those of finance providers. African countries are often unable to access affordable capital: financing costs can be at least two- to three- times higher than in Europe and North America. As a result, projects remain on the drawing board and energy costs rise for Africa's consumers – including the poorest households and least developed economies.

Breaking the region out of this cycle requires concerted efforts from parties on all sides of the table. African policy makers must ensure they have strong policy and regulatory environments, with a clear vision for how clean energy can contribute to reaching broader development goals, including universal access. Many recommendations for this were laid out in the *Africa Energy Outlook*, and the IEA continues to support countries in the region by

conducting in-depth reviews of their energy policies, developing energy transition plans that can help drive this forward, and providing training and capacity-building programmes for policy makers.

Unlocking the necessary capital for Africa's energy future will not be possible without concessional public finance providers. Development finance institutions are essential not only to mobilise private capital but also to provide key grant and concessional finance for areas such as nascent technologies or new markets. Resources from these providers are under strain, with multiple competing priorities globally, so it is imperative that this capital is used effectively to achieve the maximum impact.

Despite the challenges, there are numerous examples of innovative and diverse solutions that have emerged from Africa, including opportunities for countries to participate in new global clean energy supply chains. This report brings together a review of over 85 case studies from across the continent and over 40 interviews with key stakeholders to focus attention on what has worked and what lessons can be learned.

The report is a reflection of the IEA's longstanding and expanding commitment to African energy issues. This commitment is founded on the IEA's unparalleled data and analytical strengths, and on strong partnerships with key African energy players and institutions. Opening the doors of the IEA to key emerging and developing economies has been a major priority for me as Executive Director, and I am delighted that we now have five African members of the IEA family: Egypt, Kenya, Morocco, Senegal and South Africa, with Kenya and Senegal the most recent to have joined.

Supporting a sustainable energy future for all Africans will continue to be a top priority for the IEA, and I hope that our analysis will underpin productive discussions at the African Climate Action Summit in Nairobi and at COP28 in Dubai. I would like to thank the dedicated IEA team that led the preparation of this report, our excellent partners at the African Development Bank Group, and also the leading experts from across Africa and the world who contributed their expertise as reviewers.

Dr Fatih Birol

Executive Director

International Energy Agency

Africa remains energy poor, accounting for only 6% of global energy use and just 3% of global electricity demand. This is despite the important progress made in terms of access to electricity over the last decade. Today, close to 600 million people do not have access to electricity, and about a billion Africans lack access to clean cooking energy.

To meet SDG 7 goals, Africa needs to connect 90 million people annually to electricity in the next eight years and shift 130 million people from dirty cooking fuels every year. In the Sustainable Africa Scenario (SAS), which achieves universal energy access by 2030, around USD 20 billion per year is required for building the necessary infrastructure to connect people to electricity sources and almost USD 2.5 billion to provide them with clean cooking devices.

Nonetheless, universal access to electricity is possible in Africa, if the continent harnesses its massive potential in renewable energy sources. The declining costs of solar and wind energy technologies, coupled with more affordable energy storage systems makes renewables cost competitive and presents a unique opportunity for the continent to underpin its future energy needs based on renewables.

This is why the African Development Bank Group is spearheading efforts to unlock Africa's vast renewable energy potential. The Bank no longer funds coal energy projects. Since 2016, 87% of our investments in power generation are in renewables, including transformative projects such as the 510 megawatts (MW) Noor Ouarzazate solar project in Morocco, which is the world's largest concentrated power plant and the 310 MW Lake Turkana wind project in Kenya, which is Sub-Saharan Africa's largest wind farm. The Bank's USD 20 billion Desert to Power programme is developing 10 000 MW of solar power across 11 countries in the Sahel and East Africa that will provide renewable energy via solar for 250 million people. When completed, it will become the largest solar zone in the world.

We must bring down the cost of capital for clean energy projects in Africa. Treading a low-carbon development pathway necessitates targeted concessional support and technical assistance from international finance institutions and multilaterals. Through the Bank's Sustainable Energy Fund for Africa (SEFA) we are unlocking private-sector-led renewable energy and energy efficiency projects across the African continent by de-risking investments in green baseload power, green mini-grids, and decentralised off-grid energy systems. SEFA's current portfolio is expected to leverage a total of USD 9.2 billion in investment, delivering approximately 3 700 MW in new capacity and around 2 million new connections.

We are convinced that it is in the interest of Africa to green its economies. While we must, and will, do all that is possible to expand the use of renewable energy, especially given Africa's enormous potential for solar, hydro, wind and geothermal energy sources, global dialogues on Africa's energy transitions must be pragmatic and not ideological. As we accelerate the development of our massive renewable energy sources, Africa must also be given time to transition and allowed to use its natural gas as a transition fuel.

Another important feature of this report is the spotlight on critical minerals. Africa is uniquely positioned to help lead the revolution on clean energy industrial value chains because it accounts for 80% of the world's platinum reserves, 50% of cobalt reserves and 40% of

manganese reserves, as well as huge resources for graphite and lithium. Africa is therefore a crucial source for minerals and metals for clean energy value chains, including electric vehicles and utility-scale battery storage. And we should not only export – we should manufacture on the continent. Strong policy support and robust regulatory frameworks will be required to provide incentives for investment, nurture the development of local workforces and ensure reliable supplies.

We must also unlock Africa’s potential for emerging technological solutions, particularly green hydrogen, estimated at USD 1 trillion. Some African countries have already started developing green hydrogen projects. To spur this development, as well as drive the growth of green infrastructure in Africa, the African Development Bank Group, along with other partners, launched the Alliance for Green Infrastructure in Africa (AGIA) at COP27. AGIA aims to raise up to USD 500 million to provide early-stage project preparation and project development capital. This is capital that will generate a robust pipeline of bankable projects, starting with pre-feasibility stage all the way through to commercial and financial close. This is projected to generate up to USD 10 billion worth of investments in green infrastructure.

Although minimal now, domestic markets will provide a vital source of capital. Under the SAS, finance either originating or disbursed through local channels increases nearly threefold by 2030. In the interim, what Africa needs is a lot more financing to support its drive to universal access to quality energy. We should leverage the private sector for climate finance. We should accelerate investments in renewable energy. We should have just and fair energy transitions – but also guarantee universal energy access, and affordable and secure power for Africa. We should accelerate the support to countries on the development of their Nationally Determined Contributions and the Long-Term Strategies to support green transitions and green growth for our economies.

The International Energy Agency and the African Development Bank Group share common goals of promoting clean energy, addressing climate change and supporting sustainable development in Africa. We have pooled our strengths to produce this special report with the hope that it will serve as an informative tool for policy makers in Africa while providing valuable insights for developers and capital providers using best practice cases.

Dr Akinwumi A. Adesina

President

African Development Bank Group

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A dramatic increase in energy investment into African countries is essential

Multiple recent crises have made it increasingly challenging for many African countries to raise financing to support their clean energy ambitions, despite the continent's huge needs and rich and varied resources. Africa accounts for around 20% of the world's population but attracts less than 2% of its spending on clean energy. In recent years, African countries have had to deal with a series of overlapping crises, including the Covid-19 pandemic, the energy and food crises following Russia's invasion of Ukraine and worsening climate risks. Borrowing costs have reached unsustainable levels in multiple countries, and debt servicing costs are now double the level of clean energy investment across the continent.

Achieving the region's energy development and climate goals requires energy investment to more than double from today's USD 90 billion by 2030, at which point nearly two-thirds of spending would go to clean energy. Energy investment in Africa has been falling in recent years. Spending on fossil fuels – which has typically accounted for around two-thirds of investment – has declined and clean energy investment has remained flat. This report explores the continent's investment needs under the Sustainable Africa Scenario (SAS) developed in the IEA's *Africa Energy Outlook 2022*. The scenario considers the diverse needs of different African countries and sectors and lays out a pathway to achieve the energy-related Sustainable Development Goals, including universal access to modern energy by 2030, as well as fulfilling all announced climate pledges in full and on time. This requires a step change in investment, shifting away from fossil fuel projects designed to supply foreign countries towards clean energy projects, including a larger role for decentralised systems. All of this requires opening up a range of new capital sources and financing approaches.

Making capital more affordable can unlock significant development across Africa

Despite ample resources and favourable underlying economics, multiple barriers hinder the development of bankable clean energy opportunities in Africa and deter private investments in projects and companies at the necessary scale. The debt crisis in many parts of the continent means there is limited public capital available, including for state-owned utilities. Private capital therefore needs to play a key role, but many private investors are reluctant to enter African markets because of high perceived and actual risks. In more nascent markets, the regulatory environment is often not fully developed and may lead to contract instability and delays. In countries with rising debt, there are higher payment risks from state-owned utilities. And in fragile states, the political and reputational risks can be too high. The result of this environment is that most investors feel there are not enough investable projects. For the moment, development finance institutions are the largest clean energy investors in the region.

Higher perceived and actual risks push up the cost of capital, which can make projects uncommercial or more expensive for end users. The technologies deployed at scale in the Sustainable Africa Scenario are mature and commercially viable, utilising some of the highest-quality renewable resources in the world. Yet despite the limited technology risk, the

cost of capital for utility-scale clean energy generation projects in Africa is at least two to three times higher than in advanced economies and China. It is even higher for smaller scale projects, especially those that can only access debt from local commercial banks. Measures by lenders to mitigate risks, such as demanding high collateral requirements, can be prohibitive. This not only acts as a brake on investment but also pushes up the costs of electricity for consumers, leaving them reliant on polluting options with lower upfront costs but much higher operating expenses.

Achieving universal energy access requires a step change in energy project financing

By 2030, investment in energy access in Africa needs to reach nearly USD 25 billion per year to ensure modern energy for all – a small share of overall energy investment but a dramatic increase compared with today’s spending. Today, more than 40% of the population in Africa live without access to electricity, and 70% without access to clean cooking fuels. The socioeconomic impacts of this are huge. The lack of clean cooking contributes to 3.7 million premature deaths annually, disproportionately affecting women and children. While USD 25 billion is only a small amount in the context of global energy spending – the equivalent of one new LNG terminal – it requires a very different type of finance. Investment is needed in small-scale projects, often in rural areas, by consumers who have very limited ability to pay.

Affordability constraints make it less likely projects will be commercially viable, but there is a strong case for concessional financing given their social impact. We estimate that due to affordability constraints, only around half of new electricity access connections (including grid, mini-grid and stand-alone systems) providing the most basic energy services are likely to be commercially viable without incentives such as reduced connection charges, lower tariffs and subsidised electrical appliances. Without external support, most clean cooking access projects, except for improved cookstoves, would not be affordable. Grants therefore play a key role both to fund access programmes for the poorest households, as seen with the mini-grid programme for rural communities in Nigeria, and to provide early-stage financing for local companies, such as women-led off-grid companies (as seen in Rwanda, supported by GET.invest, a European programme specifically designed to support investment in decentralised renewables). Concessional finance providers can also drive further private capital involvement via the creation of more equity financing vehicles (such as Beyond the Grid Fund for Africa), piloting innovative off-balance sheet financing approaches (as in Togo), supporting commercial banks to provide more affordable long-term debt (as in Kenya), and financing productive uses (as in Uganda).

Multiple financing instruments need to be scaled up to Africa’s energy future

As things stand, there is a mismatch between the type of capital available and the needs of Africa’s emerging clean energy sector, with a particular lack of early-stage and equity financing. In the Sustainable Africa Scenario, significant investment is needed across all areas of the clean energy spectrum. This requires a broad range of instruments to move projects through the development cycle. Grants and equity tend to play a larger role in the early,

riskier stages, while affordable debt becomes more important once a project moves into construction or operation. This capital evolution varies by technology, as does the moment at which the private sector is most likely to get involved. However, across all areas of clean energy, investors often cite a lack of investable projects, indicating there is not enough funding going into the pre-bankability stages to support areas like feasibility studies.

For utility-scale clean power, private capital can take the lead, but concessional finance still plays a key de-risking role in less developed markets. Renewable power projects represent a major investment opportunity, accounting for 80% of capacity additions across the continent this decade in the Sustainable Africa Scenario. Private investment has been growing, for example in solar PV in South Africa and Egypt, where multiple auction rounds have resulted in private-led developments. In many countries, however, renewables projects are either fully or partially reliant on the involvement of concessional capital. Many projects commissioned to date have required multiple credit enhancements, including guarantees and risk sharing with development finance institutions. Innovations in this space – such as the creation of dedicated guarantee providers that can support clean power projects in nascent markets like Madagascar, the development of currency hedging products such as those offered by the development finance initiative The Currency Exchange, and the piloting of new liquidity support mechanisms in Gabon – are already allowing for the deployment of more private capital. But greater transparency around the financing terms and credit enhancements used would be likely to support more efficient mobilisation of private capital, allowing development finance institutions and donors to concentrate on the most complex investment environments.

Reliable and robust electricity grids are a missing piece of the puzzle. In the Sustainable Africa Scenario, grid investments rise from around USD 10 billion per year today to nearly USD 50 billion by 2030, requiring new financing models that are less reliant on limited state funds. Many African state-owned utilities struggle with poor financial health and high systems losses, which averaged 15% across the continent in 2020 compared with the global average of 7%. As a result, they are unable to finance the necessary expansion and modernisation of grids that the influx of renewables requires. Alongside efforts to improve the financial health of utilities, achieving the spending increase is likely to rely on grants and highly concessional capital to develop and pilot models that shift some of the financing to private players. Countries like Kenya and Uganda are also already testing innovative concession or brownfield asset refinancing approaches with the support of development finance institutions, which can serve as models for elsewhere on the continent if successful.

Energy efficiency needs to play a key role in Africa's energy economy as demand expands, but it is not yet getting enough priority. Energy efficiency spending increases sevenfold by 2030 in the Sustainable Africa Scenario, in areas such as efficient green buildings and consumer appliances like refrigerators and air conditioners. However, financing efficiency projects can be challenging, with investment in efficiency covered by less than 15% of concessional funding instruments. While many efficiency projects are cost-effective and result in savings, they are relatively small-scale and there is a low awareness of their

potential, risks and business models. Increasing public capital – from governments, development finance institutions and donors – will be essential to raise awareness, as will the creation of consumer finance schemes such as green mortgages or on-wage and on-bill payment plans such as in Kenya, Ghana, Senegal and Rwanda. Affordable low-cost debt, through instruments such as green bonds, can also prove particularly impactful for the buildings sector.

The global private sector can play a significant role in mobilising finance for the development of clean energy supply chain projects. African countries with critical minerals – such as the Democratic Republic of Congo, Mozambique and Madagascar – or with low-emissions hydrogen potential, such as Namibia and Mauritania, can take advantage of growing global demand for clean energy to drive domestic industries. Much of this critical mineral development can occur via the balance sheet of major mining companies, although their involvement will be increasingly dependent on both the regulatory situation and the strength of environmental, social and governance (ESG) data and policies. Most low-emissions hydrogen projects will rely on public support, including the critical step of creating common standards for hydrogen trade and a larger pool of buyers willing to underwrite supply projects with long-term commitments.

Concessional capital must act as a catalyst for project development and private investment

Alongside improvements in policy and regulation, concessional capital of around USD 28 billion per year is needed to mobilise the USD 90 billion of private sector investment by 2030 in the Sustainable Africa Scenario. This is a more than tenfold increase from today and requires a significant change in how concessional finance providers operate. While these providers continue to act in some cases as direct financiers of projects under the Sustainable Africa Scenario, a much larger role for them is to spur the mobilisation of private sector financing. Various initiatives are underway, notably the Bridgetown Initiative, to review and reshape how multilateral development banks operate. Stepping up their support for clean energy investment will likely require greater use of blended finance instruments. Guarantees and concessional equity can come with high mobilisation ratios and add greater flexibility to the financing sources available.

With the right regulatory environment and support in reducing risk, the global investment community could be mobilised to play a larger role, including in financing existing assets. Institutional investors worldwide hold trillions in assets but currently have limited involvement in the energy sector in African countries. Understanding where they can best be deployed and developing the right instruments is key. Institutional investors are unlikely to fund greenfield projects but can invest in brownfield projects, either via government-sponsored asset recycling programmes – as seen in The Gambia, Zimbabwe and Togo – or by providing refinancing via green or sustainable bonds, as seen in Egypt and Nigeria. Such investments have the additional advantage of freeing up construction and development capital for other greenfield projects. International bond markets can also be tapped for developing energy efficiency projects – as seen in the buildings sector in South Africa, Kenya

and Côte d'Ivoire – or for innovative solutions, like setting up a securitisation company that uses bond issuances to grant loans to financial institutions, as done by impact investor platform Symbiotics. Governments can develop taxonomies to help these markets grow – and use a sovereign bond programme to help develop the corporate bond market, as has been done in India and Colombia.

Stronger domestic financial systems are vital for long-term energy sector investment

In the Sustainable Africa Scenario, finance originating from or disbursed through local channels increases nearly threefold by 2030. Local finance removes currency risk, reduces exposure to external shocks, and can price risk more effectively due to familiarity with the local markets. Local private finance can come primarily from commercial banks and the growing base of institutional investors, notably pension funds. Today, apart from the large pan-African banks, most of these institutions lack the familiarity with the industry to participate or provide affordable capital. Governments can stimulate this involvement via the creation of public green finance facilities, supported by capacity building and concessional funds from development finance institutions and donors for onward lending, as seen in South Africa, Rwanda and the African Development Bank Group's Africa Green Bank Initiative. Equally, development finance institutions can support the creation of facilities that are targeted to increase local capital involvement, such as the providers of local currency guarantees seen in Nigeria.

Existing solutions demonstrate energy investment needs are achievable but challenging

Scaling up and replicating existing innovative financing solutions requires a coordinated approach from African governments, development finance institutions, donors and private capital. For this report, with the support of the African Development Bank Group, we reviewed over 85 case studies and conducted interviews with more than 40 stakeholders operating successful clean energy projects, companies or funding programmes on the continent. This research revealed a series of best practices that can be replicated. It also highlighted some major recurring obstacles. For example, concessional finance providers may need to take on more risk, including for pre-development stages, to help get more bankable projects in front of investors and to increase support in fragile and low-income countries. African governments also need to create the right enabling environment, ensuring stable regulation and financially reliable utilities. Meanwhile, the private sector can ensure it accurately prices risks and works in tandem with concessional providers of blended finance instruments, particularly in technologies and markets that are already proven. The African clean energy space represents a massive opportunity for growth, employment and innovation. All stakeholders – public and private, domestic and international – will need to play their part to move the continent towards a sustainable energy future.

Clean energy investment landscape

Setting the scene

S U M M A R Y

- The IEA's *Africa Energy Outlook 2022* laid out a new scenario – the Sustainable Africa Scenario (SAS) – which sees the continent achieve by 2030, in full and on time, all of its energy and climate-related goals, including universal energy access and its NDCs.
- Realising the SAS requires mobilising over USD 200 billion annually by 2030, but energy investment has been declining in Africa and in 2022 was under USD 90 billion. Clean energy spending was a fraction of this at around USD 25 billion – only 2% of the global total despite the recent rise in global clean energy investment. This is far from what is required to meet the growing energy needs of 20% of the global population.
- Under current financing norms, project developers often struggle to access adequate capital and capital providers to identify investable assets. Resolving this disconnect requires effort on both demand and supply, with African governments, donors, development finance institutions and private companies all playing a role. Increasing the availability of affordable capital can be a key lever to trigger a series of reinforcing positive outcomes, including driving the development of more bankable projects.
- The cost of capital is an important factor since many clean energy and end-use investments (including energy access projects) require high upfront spending. The cost of capital for utility-scale energy projects in Africa is two to three times higher than in advanced economies and is often higher for smaller projects that have fewer capital providers available. This can act as a major barrier to scaling up investment.
- Cost of capital largely reflects two sets of risks: those associated with the country, and those associated with the sector or technology. Addressing these requires different country-specific solutions, with country risks generally requiring longer-term structural reforms, and more specific risks addressed with energy policy reforms.
- At the country risk level, the macroeconomic context has significantly worsened in many African countries, with average external debt on the continent increasing both in absolute terms and as a share of GDP, from 16% in 2011 to 31% in 2021. When combined with currency depreciations and US and EU interest rate hikes, this has driven up debt servicing costs, which are now double the level of clean energy investment across the continent as a whole.
- Energy sector-specific risks vary significantly by country, technology and financing provider. One of the primary difficulties for utility-scale renewable or grid projects has been offtaker risk, with only about one in three utilities in Africa able to cover their operational and debt servicing costs. This increases transmission risk due to underinvestment in grid infrastructure. Decentralised solutions play a critical role, but advancing them can face regulatory hurdles or finance ill-adapted to supporting them.

1.1 Introduction

One of the principal conclusions of the IEA's *Africa Energy Outlook 2022*, which laid out pathways for Africa to achieve all its energy and climate-related goals by 2030, was the need for the rapid scale-up of clean energy investment. Overall investment in Africa's energy sector, across fossil fuels and clean energy, has been falling since 2014. Despite making up one-fifth of the global population, Africa currently accounts for only 3% of global energy investment and a mere 2% of the world's clean energy investment. While trends vary across a very diverse African energy landscape, this shortfall in investment is alarming. It puts at risk the achievement of a host of sustainable development goals and could open up new dividing lines in energy and climate at a time when clean energy transitions are gathering speed in other parts of the world, notable advanced economies and China.

This report, *Financing Clean Energy in Africa*, digs deeper into the opportunities and barriers facing investors in clean energy and infrastructure across the continent. It explores both the financing needs for different elements of the energy sector (Chapter 2) and the types of finance available (Chapter 3). In doing so, it reveals fundamental mismatches within the current system that are preventing adequate financial flows reaching clean energy projects in Africa. Project developers often find capital to be too expensive and with unworkable terms, while on the finance supply side, investors find many clean energy projects on the continent to be too small or risky.

Reducing these mismatches requires progress on both the demand and supply sides. This report uses case studies to demonstrate how these obstacles can be overcome. It opens with a discussion introducing Africa's investment needs under the IEA Sustainable Africa Scenario (SAS) and considers the risks and other factors contributing to the elevated cost of capital for clean energy projects in Africa.

1.2 The Sustainable Africa Scenario

The *Africa Energy Outlook 2022* laid out a new scenario – the Sustainable Africa Scenario (SAS) – for the continent's clean energy future. Under the SAS, universal access to modern energy services is achieved by 2030 in line with Sustainable Development Goal 7 (SDG7), and all African nationally determined contributions (NDCs) are assumed to be met in full and on time, including conditional NDCs. The scenario unfolds against the backdrop of the push to limit the increase in the global average temperature to well below 2°C above pre-industrial levels, with all that this implies for global energy trade and technology costs.

The SAS gives centre stage to economic and social development. Providing modern energy services to the more than 600 million people still lacking electricity and the 990 million without access to clean cooking remains the first priority, to help populations achieve higher standards of living across the continent. Economic growth across the region also drives higher energy demand from industry, freight and agriculture, which grows by almost 40% by

2030 (see Box 1.1). The scenario prioritises the most cost-effective technologies that manage to attract investment and which are readily available and deployed in Africa.

In the SAS, modern primary energy supply rises by a third over the decade 2020-2030, although energy use per capita remains less than one-third of the world average. Households continue to be the largest final energy consumers on the continent in 2030, with the number of air conditioners, fans and refrigerators more than doubling, their impacts on energy demand mitigated by minimum energy performance standards.

Electricity demand on the continent increases by 75% between 2020 and 2030. Renewable energy generation, mainly from solar PV, accounts for the majority of capacity additions as their ever-declining cost is driven by rapid global uptake. By 2030 solar and wind together provide 27% of the continent's power generation, eight times more than today.

Box 1.1 ▶ **Africa's economic development opportunities in the SAS**

Africa's economic growth in the SAS averages 4.2% per year to 2030 as its economies recover from the strains of a turbulent few years, helped by progress towards universal access to modern energy, more available and reliable electricity, and less volatile energy prices. This growth rate is comparable with the average for emerging market and developing economies and is 0.6% above the global average. Key industries start to expand, such as production of fertilisers, steel and cement, and the manufacture and assembly of appliances, vehicles and clean energy technologies. In line with their NDCs, many countries in Africa have already developed green growth plans that can support climate-conscious choices within industrial development.

Developments in the energy sector also play a role in economic advancement via the creation of decent jobs requiring wide-ranging skills. Africa has the youngest population in the world, with around 15 million people joining the labour force each year. As today, informal jobs dominate the continent's economies, 53% of the population being informally employed. In sub-Saharan Africa alone this share is 67%, almost double the world's average. Energy-related employment varies by region, from predominantly oil and gas in North Africa to a significant coal sector in Southern Africa, and many hundreds of thousands of workers employed in the mining of a range of minerals that are critical to global energy transitions. In the SAS, around 4 million additional energy-related jobs are created across the continent by 2030, many of which are associated with the push for universal access. Job creation as a result of extending energy access goes beyond the energy sector itself, stimulating economic activity in the communities gaining access, and therefore the number of jobs created this way is potentially far greater than those in the energy sector itself.

Note: For further information refer to Chapter 4 of the *Africa Energy Outlook 2022*.

Despite growing consumption within Africa, the prospects for oil and gas production hinge primarily on exports, which means that future oil revenues are more sensitive to the pace of global energy transitions than to domestic demand trends. Oil output declines in the SAS, as export demand to 2030 falls. Natural gas production continues to increase in the near term, playing an important role in the industrialisation of the continent. Monetising these resources will require careful balancing of domestic and export needs and tailored infrastructure expansion plans, alongside major efforts to keep project costs and delays down.

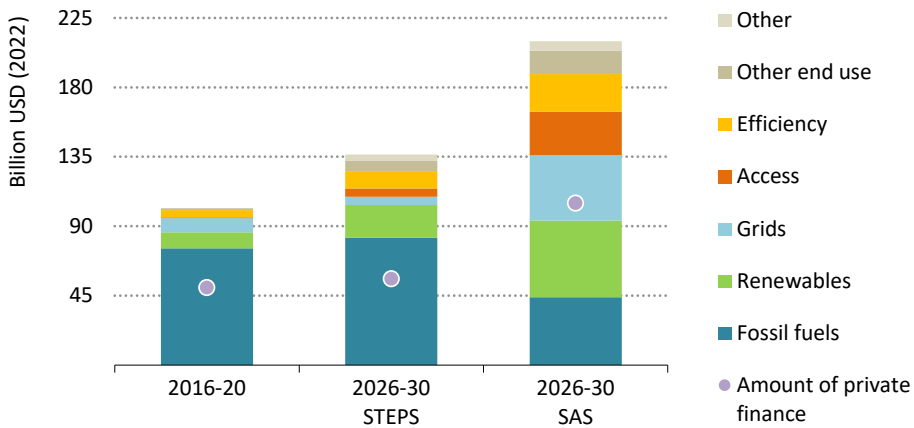
The assumptions and outcomes in the SAS contrast with those in the Stated Policies Scenario (STEPS), an exploratory scenario based on prevailing policy settings across different sectors and economies. The STEPS provides an indication of today's direction of travel for the energy system, and does not automatically assume that the SDGs or other energy- or climate-related targets are met.

1.2.1 Clean energy investment needs

Under the SAS, energy investment across the continent during 2026-2030 doubles from that seen during 2016-2020 (see Figure 1.1). By 2030 three-quarters of investment is in clean energy, representing a major break from the pattern of energy spending today, where over 70% of spending goes on fossil fuel projects, primarily anchored by exports. In the SAS fossil fuel investment decreases, driven by a reduction in private sector spending and shifts towards meeting domestic demand, primarily financed by state-owned enterprises (SOEs). Given the changing global environment, with countries moving towards net zero targets, continued fossil fuel development comes with regulatory reforms to strengthen governance at SOEs to ensure careful management of resources. The private sector continues to maintain a role in fuel supply-side investment via clean fuels, such as low-emissions hydrogen and biofuels.

Renewables and grids account for over half of clean energy investment by 2030 under the SAS. Africa is home to 60% of the best solar resources globally, yet only 1% of installed solar PV capacity. By 2030 solar PV – already the cheapest source of power in many parts of the continent – outcompetes all other sources continent-wide. This helps push renewables to over 80% of all new power generation capacity added by 2030. Supporting these capacity additions requires investment in grid infrastructure, not just to expand networks, but also to upgrade them to provide adequate flexibility and support the integration of digital technologies. The rise of renewables also requires a system-wide approach to ensure that intermittency does not result in unsustainable and unreliable power systems. Baseload power providers such as hydropower and (where relevant) natural gas support this, but so too do a range of solutions such as battery and pumped-hydro storage (see Spotlight in Chapter 2).

Figure 1.1 ▶ Annual energy investment in the SAS, 2016-2030



IEA. CC BY 4.0.

Energy investment nearly doubles by 2030 under the SAS, with a shift to clean power, including achievement of universal energy access, and accompanying grid infrastructure

Notes: Other = clean fuels, nuclear, battery storage, and fossil fuel power with carbon capture, utilisation and storage. Other end use = non-efficiency investments in buildings, industry and transport.

Investment to support the SDG7 goal of achieving universal access to energy reaches USD 25 billion per year by 2030 under the SAS. This represents only 1% of current global energy investment. By contrast, prevailing policy settings in the STEPS see access investment reaching only USD 5 billion by 2030. This highlights the importance of improving the policy environment for access projects, particularly via the creation of national targets and action plans that clearly lay out the role for different energy access solutions and providers. This policy action needs to be coupled with new financing solutions to support the effective use of public capital and to activate private capital where possible (see Chapter 2).

Investment directed towards end-use activities increases under the SAS. This surge in spending focuses primarily on enhancing the efficiency of buildings, vehicles, appliances and lighting. These efforts are driven by stricter regulations and aim to reduce energy consumption and environmental impact, for example by phasing out the traditional use of solid biomass for cooking. Other end-use activities growing in prominence include the switch to electric two- and three-wheelers, as well as green public transport such as electric buses and urban rail systems, and the use of renewables in buildings and industry for heating and cooling. These areas combined account for 20% of spending in 2030 compared with roughly 5% a decade earlier.

1.3 The cycle of change

Under the SAS, African countries face the need for major investment to put in place energy systems that deliver reliable, affordable, modern and cleaner energy to all. These systems look quite different from more mature markets in advanced economies, with decentralised off-grid solutions playing a key role.

Meeting these investment needs requires a shift in how energy projects are financed in the region. They cannot be met by public funds alone, given the starting point of high indebtedness in many countries and a range of competing priorities for public spending that are only likely to increase as the impacts of climate change intensify. Domestic capital markets in the continent are also still too small to fully fund the spending required. More capital is therefore needed from abroad. Some of this can come from concessional sources, including the growing pool of climate-related funding from donors and multilateral development banks, but a large part needs to come from the private sector, particularly international sources while domestic capital markets develop.

The solutions presented in the SAS to 2030 are based on mature, commercially viable technologies. However, a series of barriers are preventing the development of bankable opportunities, and risks – both real and perceived – are preventing capital from flowing to the projects and companies at the necessary scale. This is reflected both in the slower pace of energy development in many parts of the continent and in higher financing costs: for clean energy projects in Africa the cost of capital is at least two to three times higher than in advanced economies and China (IEA, 2023).¹ This acts as a brake on private sector involvement as it makes projects either unaffordable or unviable for the investor. It can also leave countries trapped in a loop of higher risks, higher costs, energy deficits and deepened reliance on fossil fuels, which typically require lower upfront investment but leave consumers and governments with ongoing exposure to volatile fuel prices as well as environmental risks.

Breaking out of this loop requires a series of co-ordinated actions from African governments, the community of donors and development finance institutions (DFIs), and private capital providers. The way forward will vary by country, but includes cross-sectoral capacity building in governments and financial institutions, energy sector reforms and the development of project-level financing structures. Key elements include:

- A policy and regulatory environment that facilitates investment in cost-effective clean technologies by removing market-distorting subsidies, ensuring cost-reflective tariffs and allowing new market entrants. This new environment should be anchored in each

¹ This analysis is based on data from the Cost of Capital Observatory, which collected survey data on solar PV and gas-fired power projects in South Africa and other emerging market and developing economies (EMDEs). Stakeholders interviewed for that report indicated that the cost of capital in less-developed markets in Africa is significantly higher, but limited data are available to quantify the scale.

country's commitments to goals that align with the Paris Agreement, converting them into clean energy plans, targets and roadmaps that also meet SDG7.

- Building capacity in energy institutions, regulators and industrial policy departments to improve data, policy formulation and implementation, in turn strengthening energy sector governance. These efforts are likely to need funding support for data collection and management systems, as well as training and knowledge sharing.
- Targeted technical assistance and financial support for project preparation and early-stage development to ensure the creation of a pipeline of bankable projects. Ensuring the availability of patient equity and affordable debt for local businesses – particularly small and medium-sized enterprises (SMEs) – is particularly vital as they often face the greatest struggle to access capital.
- A specific effort to identify and address the risks that discourage investors, which can vary by country, sector and technology.² Publicising data on the cost of capital, the level of credit enhancements used in projects, and default rates can also play an important part in differentiating between actual and perceived risks.
- The use of targeted concessional capital to reduce risks in partnership with national governments and private capital providers, and to ensure the affordability of projects. Note that DFIs and donor capital will also be needed to provide grants for areas such as the hardest to reach energy access projects or fragile and conflict-affected countries, where the private sector is likely to play a limited role.

These steps can lead to a series of reinforcing positive outcomes. Clear energy sector development plans combine with stronger domestic institutions to create a stronger pipeline of bankable projects. Meanwhile, reduced political and regulatory risk helps reduce the cost of capital and improve the adjusted returns on projects. In so doing, more money flows to clean energy projects, driving greater economic development and simultaneously supporting national and global sustainable development and climate objectives.

1.3.1 *The importance of access to affordable finance*

Improving access to affordable capital can serve as a key lever to trigger the positive cycle of change outlined above. Understanding the availability of affordable capital requires analysis of the drivers pushing up the cost of capital, the financing needs of energy developments under the SAS, and the possibilities to increase the supply of finance from a variety of different channels. These issues are explored in the three chapters of this report, with the discussion here using the cost of capital to explore various elements that can prevent the scale-up of clean energy development in Africa.

The cost of capital reflects how much confidence investors have in obtaining an expected return on equity, and how much confidence debt providers have in being paid back the

² One approach for such an assessment is proposed in the Cost of Capital Observatory, a joint initiative between the IEA, the World Economic Forum, ETH Zurich and Imperial College London.

money they have lent. A riskier project or company will face a higher required rate of return from equity investors, or more expensive debt financing. This can prove debilitating for SMEs, which play a critical role in improving access to energy, but which struggle to raise financing that matches their needs.

A high cost of capital has a particularly large impact on capital-intensive investments such as renewable power projects, including off-grid solutions, which require large upfront expenditure. It can lead to higher overall generation costs that are either passed through to customers or subsidised by governments. In EMDEs financing costs accounted for around half of the levelised cost of electricity (LCOE) of a solar PV plant reaching final investment decision in 2021, compared with 25-30% in advanced economies and China. This not only leads to a disproportionate impact on investment spending in EMDEs, but can also make fossil fuel projects appear more attractive by comparison even though higher operating costs and volatile fuel prices would increase the likelihood of subsidies in the future (IEA, 2023).

1.4 Factors affecting the cost of capital

The cost of capital largely reflects two sets of risks: those associated with the country (the base rate) and those associated with the sector, project or company (a premium). These risks vary significantly across the continent – some countries have investment-grade credit ratings and/or a well-developed energy sector, while others experience conflict or instability with low economic growth and struggle to attract investment. Costs also vary by capital provider and currency, depending on whether the provider is taking on currency risk, their familiarity with the local market and the base rate in their country of origin. And finally they vary according to the company or project that is seeking to raise capital. Larger international companies are more able to tap into concessional finance from DFIs and donors or cheaper capital in international markets. Meanwhile, local companies that are more reliant on domestic capital markets can struggle to access both early-stage financing to bring projects to bankability and sufficient affordable capital to develop projects.

In EMDEs the base rate tends to account for a larger share of the cost of capital. For example, in large-scale solar PV plants in advanced economies and China the base rate accounts for around 10% and 35% respectively, but in EMDEs this rises to between 60% and 90% (IEA and IFC, 2023). This has significant implications for the policy solutions and de-risking mechanisms adopted to reduce the cost of energy financing. Solutions to reduce the base rate will primarily be economy-wide developments, such as structural reforms that drive economic growth, increase debt sustainability or manage inflation, which are likely to take several years to implement but could drive significant cost reductions. Meanwhile, solutions for higher sector or project risks driving a premium are likely to be more targeted and may, in some cases, be quicker to implement, albeit with a potentially smaller impact on the overall financing costs.

Work to quantify the risks driving the cost of capital at a country level can be helpful to differentiate between actual and perceived risks, as well as for designing solutions to

overcome them. The following is an analysis of some of the major risks affecting clean energy projects in African economies. Due to the heterogeneity of the continent, this list is not comprehensive; issues such as land- or project-specific risks are not discussed below but instead covered in the Cost of Capital Observatory. While the analysis aggregates regional and continent-wide trends, it draws on experiences from individual countries as much as possible.

1.4.1 Country-level drivers

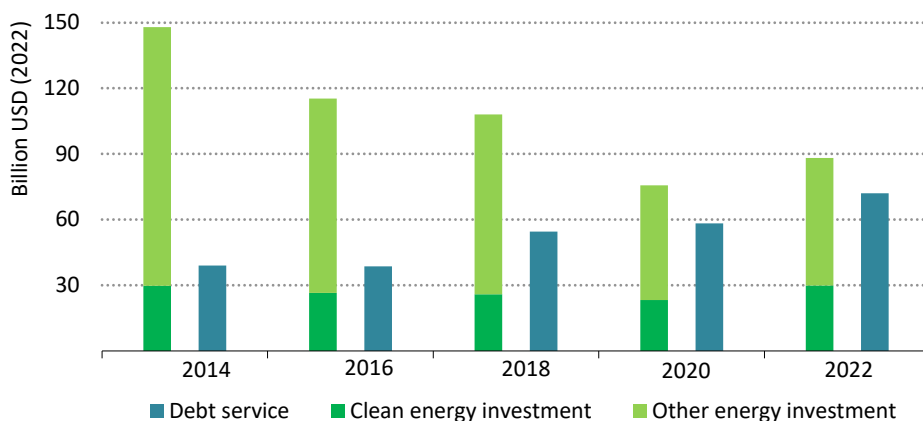
Macroeconomic environment

The macroeconomic environment of many African countries has deteriorated in recent years, worsened by Covid-19 and the food and fuel price spikes following Russia's invasion of Ukraine. These crises have further driven up overall debt burdens on the continent, which had been rising since 2010, both in absolute terms and as a share of GDP. Over a ten-year period starting in 2011, Africa's average debt-to-GDP ratio nearly doubled to 31%. Since most of this debt is held in foreign currency, the strengthening dollar and monetary tightening in the United States and Europe over the past year have also caused a significant rise in debt servicing costs for most African countries. In 2021 annual debt servicing payments³ across African countries rose to over USD 72 billion, or 11% of government expenditure, compared with 5% of government spending in 2011. Given that this rise in debt has coincided with a fall in energy investment, for the last five years, debt servicing costs have been double the level of clean energy investment (see Figure 1.2). This has implications for the role that African governments are able to play in energy investing going forward.

As a result of this worsening debt situation, 12 countries in Africa are now listed by the IMF as being at high risk of debt distress and nine as already being in debt distress. It also contributes to the negative outlook of many countries' sovereign ratings. As of June 2023 only two countries (Botswana and Mauritius) had an investment-grade sovereign rating; seven countries had a negative outlook. This drives up the cost of accessing capital as investors price in the additional risk. For example, Ghana's yields rose from 7.5% in January 2021 to 15.78% in March 2022 (B&FT, 2022), as its credit rating dropped (Trading Economics, 2023).

³ Covering interest plus principal on public and publicly guaranteed debt.

Figure 1.2 ▶ Debt servicing costs and energy investment, 2014-2022



IEA. CC BY 4.0.

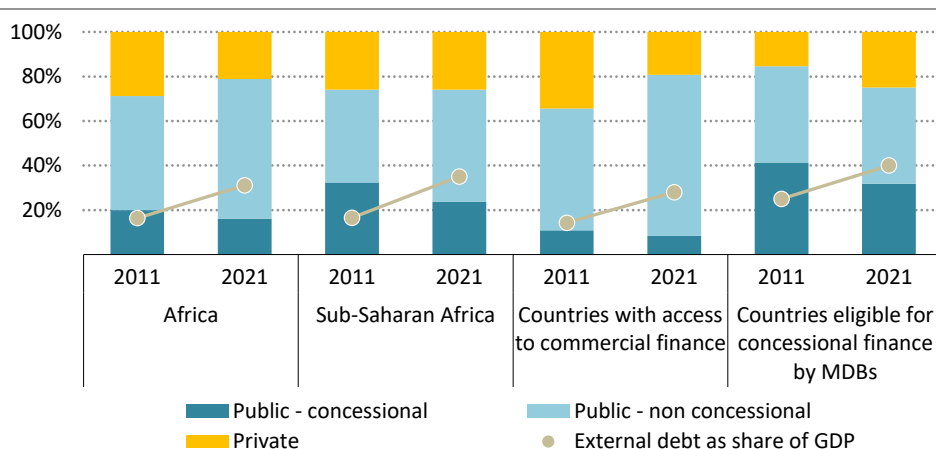
Debt servicing costs had risen to roughly 11% of the continent's total government expenditure by 2022, only one-fifth less than total energy investment

Notes: Debt service is interest plus principal payments on public and publicly guaranteed debt. Government expenditure refers to general government spending, net of acquisition of non-financial assets.

Source: IEA analysis based on data from the World Bank (2023), *International Debt Statistics*.

The structure of Africa's external debt stocks has also changed over time, with the share of concessional lending decreasing continent-wide (Figure 1.3). This slump is particularly significant in sub-Saharan Africa and in countries reliant on concessional finance, which are less likely to be able to absorb the additional costs that accompany commercial debt. Across the continent, traditional lenders such as official bilateral and multilateral creditors went from holding 20% of its debt in 2011 to 16% in 2021, even as new bilateral lenders such as China took on a more prominent role. A broader and more diverse creditor base can complicate debt restructuring processes, as illustrated by Zambia's two-year-long negotiations before reaching an agreement with creditors on new repayment terms for up to USD 6.3 billion of debt (Reuters, 2023a). Ghana, whose debt structure also includes a significant amount of domestic debt, has recently secured an agreement with the IMF and the World Bank on an extended credit facility of USD 3 billion (BBC, 2023), which could signal a replicable breakthrough for other countries facing similar challenges.

Figure 1.3 ▶ Evolution of external debt in Africa, 2011-2021



IEA. CC BY 4.0.

The debt to GDP ratio has soared across Africa, but particularly in the most vulnerable countries, which have also seen the share of concessional debt decrease significantly

Notes: Sub-Saharan Africa excludes South Africa. Country groupings refer to an aggregation of the African Development Bank Group (AfDB) country classification system, based on per-capita income and creditworthiness to sustain non-concessional financing. Countries eligible for concessional finance = countries with lower per-capita income that the AfDB classifies as having access to the African Development Fund. Countries with access to commercial finance = countries with higher per-capita income and creditworthiness to sustain non-concessional financing. Detailed country classification is included in the annex. MDB = multilateral development bank.

Source: IEA analysis based on World Bank (2023), *International Debt Statistics*.

Governments can take steps to reduce the risks associated with high debt levels by publishing regular and transparent data on debt and implementing sound debt management practices, such as disclosing actual assets and liabilities, and tracking possible but uncertain (contingent) liabilities – for example, the potential need to pay indemnities for a breach of contract that leads to termination. Failure to do so reduces government reliability as a partner for future investors, raising the default risk, while also preventing governments from investing in much-needed infrastructure. Greater investment in clean energy on the continent requires the private sector to play a significant role, which in most African countries requires careful management of contingent liabilities but does not necessarily entail raising public debt.

A growing selection of tools are available to support debt restructuring and refinancing (UNECA, 2021). Countries that are already in debt distress, i.e. that are unable to take on further concessional loans but where debt repayments are still manageable, can attract climate-conditional grants or use debt-for-climate (or nature) swaps. These swaps have been growing in scale, with Ecuador’s government announcing the largest debt-for-nature swap to date in May 2023, covering USD 1.6 billion of debt. Within the African context, in 2015 the

Seychelles refinanced USD 21.6 million of its debt via a debt-for-nature swap and, in what could be a ground-breaking transaction for the region, the Portuguese government has announced it is exploring a swap for the entirety of its EUR 140 million (USD 152 million) debt owed by Cabo Verde, converting it into investment in the country's environment and climate fund. Countries not yet in debt distress that still have access to capital markets can explore the use of sovereign green bonds to either refinance their debt or raise funds for a particular green objective, such as green public transport, at a cheaper rate (see Chapter 3).

Currency volatility

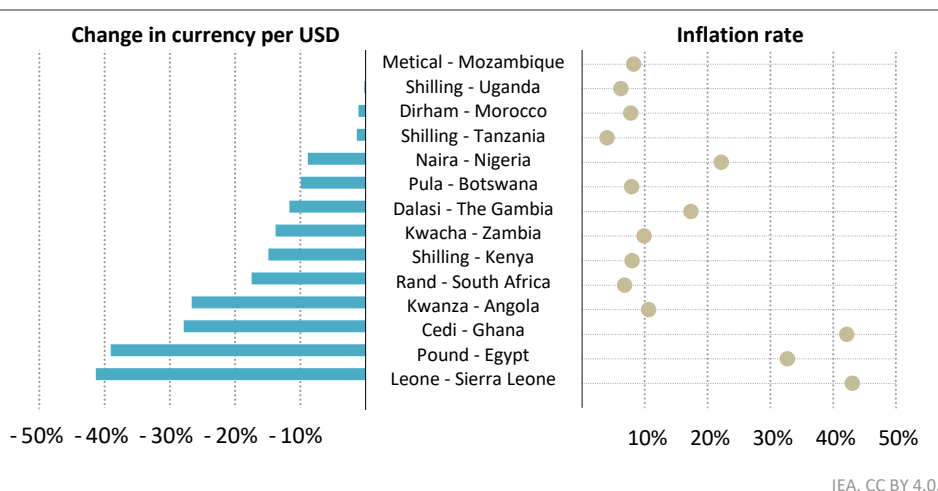
The vast majority of investments in the continent, except for South Africa which has deep capital markets, occur in foreign currency because of concerns around currency volatility and the shallowness of local capital markets (see Chapter 3). International providers of capital, whose own balance sheets are in foreign currency, are often unwilling to become involved in local currency lending for fear that depreciation will affect the value of their asset.

In 2022 most African currencies experienced accelerated exchange rate depreciation. For example, the Egyptian Pound and Sierra Leone Leone lost around 40% of their value against the USD, while others lost on average 11% (see Figure 1.4). The pressures of Covid-19 drove a wave of currency depreciation in 2021, only for currencies to be further driven down by inflationary pressures following the high commodity prices caused by Russia's invasion of Ukraine. Inflation in most African countries remained high in 2022, with at least 20 out of 45 countries experiencing double-digit inflation (IMF, 2023a). Although inflation started to decline in early 2023, these factors combine to push investors away from local currency transactions.

The implication of investment in foreign currency assets is a mismatch between the financing and revenue currencies. Most clean power projects earn revenue in local currency. Currency risk is therefore essentially passed on to the utility and in some cases end users. The offtaker may struggle to service foreign currency debt if the local currency depreciates or if a shortage of foreign reserves is affecting currency convertibility.

This adds pressure to national foreign currency reserves, particularly in periods of steep depreciation. In 2022 multiple countries applied administrative measures to control foreign exchange flows, such as foreign exchange rationing (Ethiopia, Nigeria) (IMF, 2023b). Shortages of foreign currency or capital controls can have an impact on project developers by rendering them unable to access forex to pay for imports, or in extreme cases preventing the repatriation of profits, which directly affects not just ongoing projects but also the bankability of new ones.

Figure 1.4 ▶ National currency exchange rates per USD and inflation in selected African countries over 2022-23



The national currency of most African countries has depreciated against the US dollar while inflation has soared, making debt repayments increasingly difficult

Notes: Inflation rates cover the last known 12-month period, starting in April or May 2022 depending on the country. Currency data cover the period between June 2022 and May 2023. The Mozambican metical remained stable due to monetary policy aiming to reverse previous depreciation trends.

Hedging mechanisms such as forex options or forwards can protect investors against future depreciations, but they remain expensive options. While commercial banks have hedging products, the availability of these in African markets tends to be limited, with the exception of South Africa, due to banks' own risk management and the underlying illiquidity of local capital markets (AVCA, 2022). Global hedging platforms such as the Currency Exchange Fund (TCX) fill that space by providing swaps and forward contracts that shift the currency risk away from investors, projects or countries to TCX and currency markets. TCX manages the currency risk via its currency pooling mechanism and large balance sheet.⁴ Currently, TCX is primarily used by MDBs and other development financiers to provide loans in local currency, but there is scope to expand its use to other private investors if they can absorb the cost. In the long term, developing local capital markets to provide financing in the local currency will be key to scaling up investment in clean energy projects with low exposure to currency fluctuations (see Chapter 3).

Political risk

Governance factors, including the rule of law and political stability, have a major impact on the perception of risk and investors often seek insurance to counter this. Political risk insurance, such as that provided by the World Bank Group's Multilateral Investment

⁴ For more information on TCX, see the case study in the annex.

Guarantee Agency, can cover risks linked to breach of contract, expropriation, war and civil disturbance, as well as transfer and convertibility risk linked to restrictive central bank or government decisions. However, there are some countries, such as those that are in active conflict, where the risks are too high for most investors, even with such insurances in place.

The AfDB lists 20 countries as fragile or conflict-affected, which require particular support to “consolidate peace, build resilient institutions, stabilize economies, improve the lives of vulnerable populations, and lay the foundations for sustainable inclusive growth” (AfDB, 2023). Countries with such fragilities face challenges in attracting investment, but targeted concessional support and technical assistance from multilateral development banks can contribute to improving the enabling environment and counter such difficulties.

While political risk is country specific and can vary over time, some investors tend to overlook the heterogeneity of the continent and place similar risk ratings across all African countries – this is referred to informally as the “Africa premium” and denotes a common blanket phenomenon whereby African sovereigns and corporations are consistently perceived as riskier than those in other parts of the world (Fofack, 2021). Our analysis underlines the importance of better data to ensure that risk perceptions are aligned with risk realities. Measures adopted by governments to strengthen institutions and the rule of law can contribute to changing risk perceptions over time, while investors are encouraged to focus on the specifics of each country. Given that project finance and independent power producer (IPP) projects are still relatively nascent on the continent, a track record of successful IPP procurement (e.g. in South Africa and Egypt) can reduce the perception of risk and force investors to price according to actual risk.

1.4.2 Sector- or technology-level drivers

Project-specific factors naturally vary across different kinds of clean energy project. In the discussion that follows we focus on risks facing renewable power projects. Some, but not all, of these would apply to other clean energy investments. Key technology- and sector-specific drivers for renewable power projects include the regulatory environment, the reliability of the offtake arrangement, the clarity of price signals and the availability of bankable projects.

Regulatory environment

The degree of regulatory development for clean energy varies across the continent. According to the AfDB’s Electricity Regulatory Index (AfDB, 2022), the regulatory framework of countries like Uganda, Egypt, Senegal, Ghana and Kenya are well developed and their respective utilities respond positively to regulatory guidelines. However, while higher than the previous year, the continent’s average score remains low mostly because of the poor financial health of utilities and disparities in regulatory outcomes across the continent.

Regulatory environments can affect projects in different ways, from a wider investment climate to specific energy sector regulation. Clear permitting and licensing regimes reassure investors that projects will not suffer long delays due to onerous and lengthy approval

procedures, which in turn push up project costs. One-stop shops have become a common solution to simplify and expedite such processes. Broader legal frameworks also have an impact on risk perception and the absence of specific regimes for clean energy projects can affect investors' appetite in those markets, while also placing a burden on contract negotiation.

Where regulation is in place, market design can attract or deter investment, particularly in the power sector, where private participation has been gradually increasing (see Chapter 2). For example, Namibia has introduced a modified single buyer model, which allows IPPs to generate and sell electricity to regional distributors, as well as large commercial and industrial customers, without going through the national utility NamPower. The broadening of market participants requires independent regulators with strong mandates to apply and enforce rules, notably non-discriminatory access to the grid and clear tariff-setting principles.

Fiscal regimes and incentives can also have a significant impact on clean energy projects, especially in markets with distorted price signals. Tax and customs exemptions for the import of solar panels, inverters and other necessary equipment can contribute to levelling the playing field and support investment in clean energy, particularly where fossil fuel subsidies are also in place. But they could have implications for domestic value chain development, industrial policy and job creation goals that might solicit trade-offs in long-term policy making.

For some technologies that have particularly long contract durations, such as large hydropower dams, investors often look to include stabilisation clauses fixing the applicable fiscal regime to minimise the risk of unexpected cost increases over time. These contracts can also include benefit sharing provisions to incentivise balanced agreements that minimise the long-term risk of contract renegotiation and termination provisions to reassure lenders that their debt will be repaid in the event of breach of contract. Institutions such as the African Legal Support Facility, which supports African governments in their negotiation of complex commercial transactions with the private sector, contribute to balanced contracts between sovereigns and investors in the energy sector, while also building capacity among governments for improved contract negotiations and procurement processes.

Reliability of offtake

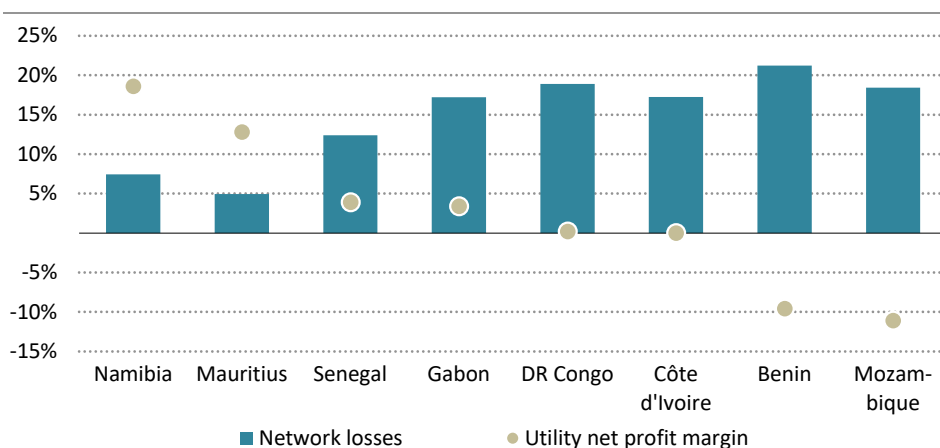
When investing in a power project, the creditworthiness of the offtaker is of vital importance to assure the capital provider that they will receive payments in full and on time. The majority of utility-scale projects in Africa will sell power to a state-owned utility. Although 30 countries allow private participation in generation, only four allow private participation in transmission.

Most utilities in Africa face significant financial challenges, both in their long-term sustainability and short-term liquidity, and many receive budgetary support from their governments. Only about one in three utilities in Africa recover their operational and debt-servicing costs, including subsidies from central government; excluding such subsidies, the

ratio drops to one in four. Many utilities are struggling with low collection rates and tariffs that are not cost-reflective, which are compounded in cases where utilities have pushed ahead with rapid electrification projects (ESMAP, 2021).

Operational difficulties put additional strain on African utilities. Close to ten utilities experience system losses of over 20%, and only a handful report losses below 10% (see Figure 1.5). These losses not only reflect power that is not delivered due to inefficiencies in the transmission and distribution networks (technical losses), but also power that is delivered to customers without going through any meter (non-technical or commercial losses), mostly through illegal connections. Countries that have managed to successfully reduce system losses (e.g. Côte d'Ivoire) have mostly done so through the implementation of strong management information systems to support operations, coupled with the adoption of efficient processes across the business (ESMAP, 2021).

Figure 1.5 ▶ Share of network losses and net profit margin of state-owned electric utilities in selected African countries, 2020



IEA. CC BY 4.0.

High system losses put strains on utilities by affecting revenues and contribute to worsening financial conditions

Note: Losses comprise technical and non-technical (including theft).

Sources: IEA and World Bank.

The poor financial health of utilities also increases transmission risk since in many cases they have limited ability to finance the necessary investment in grid maintenance and expansion. The grid’s inability to absorb power has multiple implications. Where the grid is not ready by a project’s commercial operation date, it can result in the utility paying for power that is deemed to be generated (e.g. the Lake Turkana wind project in Kenya), or, in extreme cases, developers may be forced to utilise distribution lines to evacuate power, leading to heavy losses and potentially damaging the lines. Success stories, such as Rwanda, showcase how

increasing generation capacity in lockstep with investing in grid rehabilitation, expansion and upgrade can significantly improve system reliability and reduce losses (ESMAP, 2021).

Regional power pools can mitigate the transmission risk, including through emerging private sector power traders such as Africa GreenCo, which participates in the regional Southern African Power Pool and acts as an intermediary demand aggregator. Attracting private investment into grid development will be critical to build the transmission infrastructure at the required scale (see Chapter 2).

Other solutions are emerging on the continent to mitigate offtaker risk, notably for commercial and industrial customers. Here, the offtaker is an organisation or commercial entity, often with a long track record and proven repayment ability, which can have a higher credit rating and therefore be considered more creditworthy than the public utility. However, domestic regulation to allow this does not always exist or is not clear enough to support market growth (Res4Africa Foundation, 2021). As these arrangements emerge and expand, governments and utilities need to be wary of worsening the financial health of utilities by diverting reliable customers with the capacity to pay. Planning and efficient regulation are key to minimising this risk.

Clarity of price signals

Clear price signals are critical to investors, but the prevalence of fossil fuel consumption subsidies (including for electricity generation) in many African countries, and indeed in many other emerging economies, can hinder investment in clean energy. IEA tracking of the value of these subsidies shows a substantial decline since the mid-2010s, but this trend has recently been reversed due to highly volatile fossil fuel prices following Russia's invasion of Ukraine. In 2022 fossil fuel consumption subsidies skyrocketed worldwide to more than USD 1 trillion, according to the IEA's latest estimate. This is by far the largest annual value registered since the IEA started tracking these subsidies. Many countries in Africa that had already been subsidising fossil fuels either kept those subsidies or undertook policy interventions to insulate consumers from ballooning prices, which not only deteriorated their fiscal position but also had the adverse effect of keeping fossil fuels artificially competitive with low-emissions alternatives.

In the electricity sector, end-user tariffs are subsidised in many African countries. With tariffs that are not cost-reflective, most state-owned utilities do not recover their operating and debt servicing costs. According to a study from the World Bank, the median cost of supplying electricity for vertically integrated and distribution utilities increased by 21% between 2012 and 2018, while tariffs increased by only 16% (ESMAP, 2021). Many African countries have therefore announced cost-reflective tariff reforms, with 17 currently undergoing such reforms, with nine more in discussion (AfDB, 2021). Such reform is critical to improve the financial health and sustainability of debt-saddled state-owned utilities, and simultaneously adopt measures that protect the most vulnerable members of the population.

Fossil fuel subsidy and electricity tariff reforms remain a difficult political challenge. To be durable and effective, pricing reforms need to be coupled with a broader policy package designed to stimulate a more robust, secure and sustainable energy sector, while protecting vulnerable groups of the population. But the prospects for building clean energy systems are inextricably linked with getting these price signals right, allowing prices to cover full costs.

Some countries are taking strides in phasing out subsidies to enhance the health of utilities and reduce fiscal burdens. In 2023 the government of Senegal decided to progressively remove subsidies in the energy sector (for electricity, oil products and butane gas) by 2025 (Enerdata, 2023). The reform aims to reduce energy subsidies to 1% of GDP (from the current 4%) by the end of 2024, before eliminating them entirely by 2025. In Nigeria, the newly elected President Bola Tinubu removed gasoline subsidies in May 2023 (Reuters, 2023b).

Availability of bankable projects

Capital providers often argue that the lack of bankable projects limits their ability to invest. A number of issues are at play here, including the bar for bankability and the challenge of early-stage financing. Some projects are unlikely to be bankable without either government subsidies or grants, or other concessional finance solutions. For example, many electricity and clean cooking access projects would be unaffordable for end users without subsidies, particularly in rural areas (see Chapter 2). Similarly, large-scale power projects and grid investments in countries with nascent energy sectors are likely to carry a number of additional risks that prevent private investors from seeing them as commercially viable without public or concessional support. In these cases, the threshold of bankability is therefore dependent on the supply of subsidised or concessional funds.

Another major obstacle is the lack of early-stage financing for project planning, feasibility studies, and general business support for SMEs and start-ups (see Chapter 3). Early-stage financing is high risk and is often in the form of grants and equity; it therefore cannot easily be financed by commercial banks and is likely to come from DFIs, donors or national governments. For utility-scale infrastructure projects, which generally require DFI support, some initiatives like the AfDB's Sustainable Energy Fund for Africa can provide early-stage concessional support. But smaller projects, especially involving local SMEs in the widening of energy access, are unlikely to have the capacity to apply to such funding sources, as this process tends to require significant time and expertise.

Beyond financing, the pre-development stage can also face a number of regulatory hurdles. A lack of clear energy sector planning or accompanying tendering processes can make it complex and time-consuming for developers. For example, while there are several DFI-funded technical assistance programmes to support the establishment of tender processes for utility-scale generation projects, many projects are still developed through unsolicited proposals, which depend on private sector *ad hoc* initiatives. To support the generation of a pipeline of bankable projects, governments can work with development partners to strengthen the regulatory environment and create financing facilities made up primarily of grants and equity instruments specifically targeted at the pre-development phase.

Designing finance solutions for clean energy

Solutions for key sectors

S U M M A R Y

- The doubling of energy investment in Africa seen under the Sustainable Africa Scenario (SAS) requires innovative solutions to fully mobilise capital from a range of providers – national governments, DFIs and private capital. Private capital plays a key role by 2030, increasing sixfold from today’s levels, but understanding where it can be deployed is essential to enable the design of targeted interventions. And there are still some countries and sectors where grants and concessional funding need to lead.
- Achieving universal access to modern energy requires a major uptick in spending, reaching roughly USD 25 billion per year by 2030. Affordability constraints risk acting as a brake: only around half of the new electricity access connections providing the most basic energy services are likely to be affordable in the absence of additional financial support, such as subsidies, grants or tariff reform. Clean cooking projects beyond improved cookstoves face similar challenges. Grants, concessional capital and government support will therefore play a critical role, particularly in rural areas.
- Investment in renewable power projects is set to triple by 2030 under the SAS. While investment has been growing, there is a risk that lower-income countries relying on concessional funds are left behind. These countries account for three-quarters of the region’s population, but, given their less developed regulatory environment and lower demand, attract only a small share of investment. Ensuring concessional capital is targeted to support these lower-income countries is vital.
- Massive investment in Africa’s grids is critical to improve system reliability, expand access and facilitate the integration of variable renewables. The poor financial health of utilities has hampered investment to date, but models have emerged for greater private sector participation in this segment. Adoption of these models increases private sector investment in grids from 4% to 10% by 2030.
- Energy efficiency is not currently a priority for many sources of concessional capital: it is only explicitly covered in around 15% of financing instruments. Efficiency plays a major role in the SAS, but higher upfront costs can complicate investment. Numerous innovative financing models are being trialled, from large-scale approaches to those targeting small and medium-sized enterprises and consumers, but many require policy support and concessional funding to achieve the necessary scale.
- African countries can take advantage of growing global demand for critical minerals and low-emissions fuels to drive domestic industrial development, creating value-added activities within the mineral supply chain and pursuing long-term prospects for low-emissions fuels. Many of these projects can be financed by private actors, but low-emissions hydrogen will need substantial public support to gain momentum.

2.1 Introduction

Mobilising capital to meet Africa’s requirement for clean energy investment means tapping into all sources of finance, leveraging debt to develop capital-intensive projects and bring down total costs, and raising equity for smaller, riskier undertakings that lenders would struggle to finance. Matching these alternatives – as well as the needs of finance providers – with the profiles of different subsectors, technologies and countries is key to scaling up investment in an efficient way. This chapter examines the differences among projects by focusing on the investment profiles of their respective subsectors – energy access, renewable power, grids, energy efficiency, and the development of critical minerals and low-emissions hydrogen.

Each of these areas plays a critical role under the SAS and needs to be financed by the right mix of public, concessional and private sector capital. This chapter identifies business models already in use in the region to highlight where concessional capital is most needed and to demonstrate how private capital can be deployed.

Box 2.1 ▶ Sources of finance

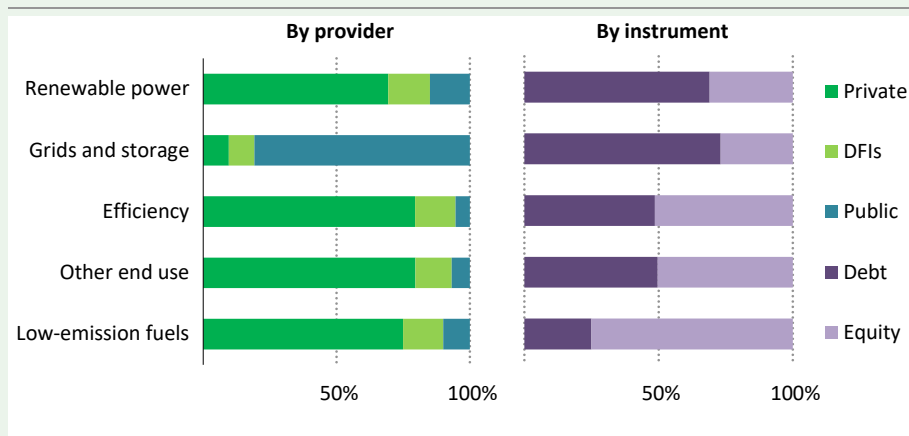
Scaling up investment in clean energy means mobilising capital providers and financing instruments to match the capital structure of energy companies and assets. Traditionally, debt plays a large role in clean energy developments due to the prominence of the power and end-use sectors, where projects generally have high upfront costs. In the African context, debt can be expensive and in short supply since private debt markets are small outside South Africa, and public debt has become increasingly unsustainable in many economies. This poses a major challenge to the expansion of clean energy projects; however, a variety of alternative financing approaches exists, each utilising different debt-to-equity ratios according to the stage of the project cycle, as broken down in the sections that follow.

While the role of debt increases under the SAS, equity remains essential where risks are higher, such as in new markets, for new technologies or during the development, construction and growth phase of projects. Equity capital is limited across African countries, with many of the equity funds currently active in energy project finance on the continent funded by DFIs. Other sources of equity include corporate balance sheets and, more commonly, private equity and venture capital firms, which are a key source of capital for start-ups, including for energy access projects. Accessing equity can be a challenge, particularly for small and medium-sized enterprises (SMEs), given that most equity providers are based abroad. Equally, there is a shortage of growth-stage equity, which can prevent the scaling-up of industries once they have passed the pilot stage.

Under the SAS, private investment increases sixfold in absolute terms, buoyed by policy reforms and effective use of concessional capital to de-risk projects. DFIs play the dual role of investing their own capital – both in projects via debt and equity and in early-stage

development financing – and using their concessional funds to mobilise the private sector. This means DFI capital is particularly active in renewable power generation, including in relation to electricity access projects, emerging technologies (such as low-emissions hydrogen) and clean cooking. Meanwhile, state-owned enterprises maintain a key role in grids and storage, although achieving the necessary level of investment will rely on improving their financial health and is likely to require grants and concessional support from donors.

Figure 2.1 ▶ Source of finance by technology in the SAS, 2030



IEA. CC BY 4.0.

The private sector plays a major role across all sectors except for grids by 2030; use of debt rises, but equity remains important for new technologies and end-use sectors

Notes: Access projects are captured within grids, renewable power and efficiency. DFI = development finance institution.

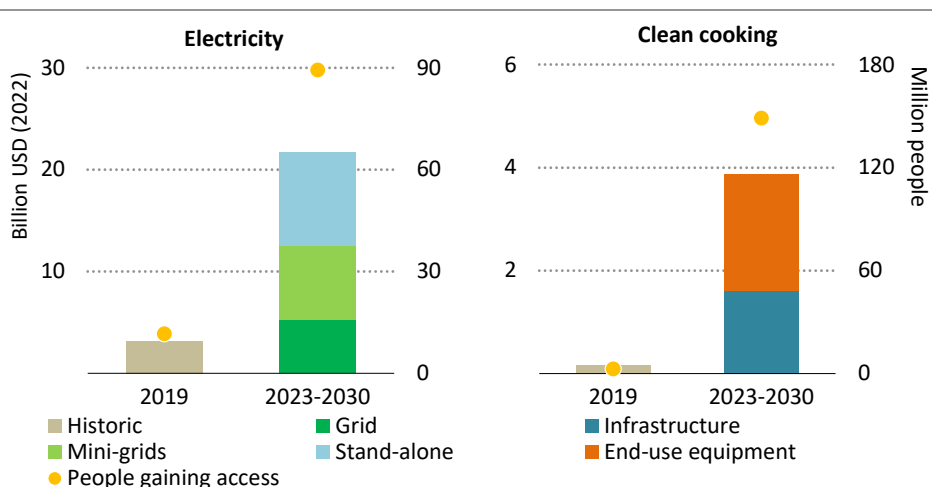
2.2 Energy access

More than 600 million people in Africa (over 40% of the population) had no access to electricity in 2022, and 990 million (nearly 70% of the population) lacked access to clean cooking. The majority of people without modern energy services are concentrated in rural areas – around 80% for electricity and two-thirds for clean cooking. Five countries – the Democratic Republic of the Congo (DRC), Ethiopia, Nigeria, Tanzania and Uganda – together account for around half of the people without access to electricity in Africa, with a similar trend for clean cooking.

In the SAS, which achieves universal energy access by 2030, around USD 22 billion per year is required to connect people to electricity sources and almost USD 4 billion annually to provide them with clean cooking devices. Even though this represents just 1% of current global energy investment, historically spending on access projects has been dramatically

lower than these required levels, with a very small presence of private capital (see Figure 2.2). Achieving energy access goals will require a step-change in investment to support electricity and clean cooking infrastructure and devices, alongside improvements in the operating environment to allow private companies to play a larger role.

Figure 2.2 ▶ Annual investment in and people gaining access to electricity and clean cooking, Africa, 2019 and 2023-2030 in the SAS



IEA. CC BY 4.0.

To achieve universal access goals, investment in access to electricity needs to increase sevenfold and investment in clean cooking over twenty-fold

Note: Historical data for investment in access to electricity comprise not only first access projects, but also investment aimed at improving the level of access for households already with access.

Sources: IEA (2023). A Vision for Clean Cooking Access for All; SE4All and Climate Policy Initiative (2021). Energizing Finance: Understanding the Landscape.

Achieving universal access requires a significant shift in the types of projects that are financed. Around 42% of the population gaining access to electricity by 2030 in the SAS does so with a grid connection, with grids eventually reaching almost every customer by 2050 (IEA, 2022). Particularly in the coming decade, decentralised solutions play an important role: of the people gaining electricity access by 2030, 30% do so via mini-grids and the remaining 27% with stand-alone systems, mostly solar PV based. On the clean cooking side, new IEA analysis highlights that around USD 250 million of cooking equipment needs to be distributed to achieve universal access by 2030 (IEA, 2023a). Improved biomass cookstoves account for 40% of this, representing a viable and affordable solution in rural areas, 33% LPG, 10% electric cooking devices and the remaining 15% biogas and ethanol stoves.

In order to support the rollout of decentralised solutions and end-use devices, local companies including SMEs are likely to play an important role. Project size is significantly

smaller than utility-scale energy developments and even many other end-use investments, and the risk associated with the end consumer can also be much higher. The traditional channels for energy financing are not well adapted to support these smaller, higher-risk projects, or to finance SMEs and local start-ups. There will need to be an increase in patient equity and affordable local currency debt, and an emphasis on early-stage financing, to support the development of bankable projects. Concessional capital has a critical role to play in de-risking projects and increasing the role of the private sector, but government support and donor and DFI grants will also be essential for the harder-to-reach households.

Affordability of energy access projects

In sub-Saharan Africa nearly 400 million people (roughly one-third of the population) live in extreme poverty (World Bank, 2023); most of the population without access to modern energy fall within this group. Many of these households struggle to afford not only the upfront costs associated with gaining access – electricity connection, wiring the house, electrical appliances, efficient cooking stoves – but also the cost of energy to keep benefiting from it.

Affordability challenges also drastically limit the profitability of many energy access projects due to the low demand, especially in rural areas. We estimate that due to affordability constraints only around half of the new electricity access connections (including grid, mini-grid and stand-alone systems) providing the most basic energy services¹ are likely to be commercially viable without incentives such as reduced connection charges, lower tariffs and subsidised electrical appliances (see Figure 2.3). If these projects aim for slightly higher levels of energy service as in the IEA essential bundle,² only 5% of them would be affordable without public support; this falls to almost zero for the extended bundle.³ At the same time, utilities, mini-grid operators and other energy companies need to charge, or recover, the equivalent of cost-reflective tariffs to continue operating and expanding new connections. This indicates that end-user risks are likely to be too high for private companies without a combination of well-targeted government subsidies covering grid and off-grid solutions (e.g. cross-subsidisation), de-risking mechanisms including grants, and reliance on productive uses as anchor loads.

Government incentives in many African countries are concentrated on grid connections. Roughly 80% of countries in sub-Saharan Africa offer low-income electricity rates, while only around 40% have financial support schemes for mini-grids and stand-alone systems. As a result, there has been a rise in multi-donor results-based financing funds that mini-grid and stand-alone projects can tap into, such as the Beyond the Grid Fund for Africa and the SE4All-

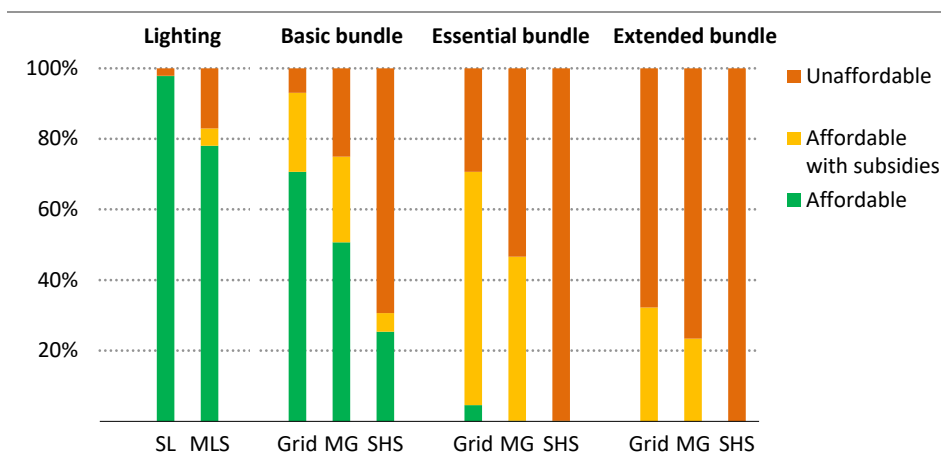
¹ The basic bundle includes more than one light point providing task lighting, phone charging and a radio. For further information on these definitions see *Guidebook for Improved Electricity Access Statistics* (IEA, 2023b).

² The essential bundle includes four light bulbs for four hours per day, a fan for three hours per day and a television for two hours per day.

³ The extended bundle includes four light bulbs operating for four hours per day, a fan for six hours per day, a radio or television for four hours per day and a refrigerator.

managed Universal Energy Facility. Sales of off-grid solar systems increased from 5 million units in sub-Saharan Africa in 2019 to almost 7 million in 2022 (GOGLA, 2023). However, four-fifths of the sales are smaller devices such as solar multi-light systems and solar lanterns that are limited mostly to basic lighting. Sales of larger solar systems are often limited to better-off households, which in some cases already have access and need a back-up solution. Business models, such as PayGo Solar, allow consumers to spread out upfront costs into monthly payments, but even these are too costly for the poorest consumers to afford larger devices without additional support.

Figure 2.3 ▶ Share of households without access that can afford electricity, by energy service and technology, Africa, 2022



IEA. CC BY 4.0.

Excluding subsidies and provided that low-cost credit is available, only limited and basic levels of energy service are affordable by households currently without access

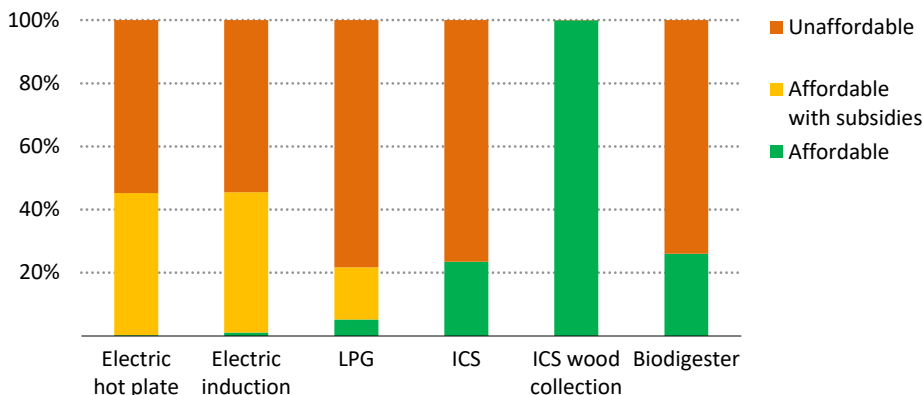
Notes: MLS = multi-lighting solar system; SL = solar lantern; MG = mini-grid; SHS = solar home system. SHS sizes considered increase from the basic (≥ 10 Wp) to the essential (≥ 50 Wp) and extended (≥ 100 Wp) bundles. For further information on the bundles see *Guidebook for Improved Electricity Access Statistics* (IEA, 2023b). In the analysis it is assumed that upfront costs are spread over the infrastructure or product lifetime. The analysis is based on household income data by percentile (World Bank, Poverty and Inequality Platform) and a solution is considered affordable if its cost is lower than or equal to 5% of household income.

Off-grid solar companies and mini-grid operators that are successful largely target the most profitable projects, such as peri-urban areas, back-up power or smaller products. However, the presence of these companies provides a useful source of technical expertise and the opportunity to devise models to enable them to deploy in more challenging areas when financial schemes and incentives becomes available.

The situation is similar for clean cooking access projects where the upfront cost of stoves and the cost of fuel (electricity, LPG or charcoal) undermine adoption (see Figure 2.4). Although LPG is one of the key solutions to closing the access gap, only one-fifth of the population

without access can afford to switch to it with current tariffs and provided they have access to affordable credit to purchase the LPG stove and cylinder. If we exclude current subsidies, only 5% of those without access could afford LPG cooking. Solutions based on PayGo models, where families can partially refill cylinders at distributed stations, have proven successful in some markets such as South Africa.

Figure 2.4 ▶ Share of households without access that can afford clean cooking, by technology and fuel, Africa, 2022



IEA. CC BY 4.0.

Without external financial support and access to credit, most clean cooking access projects are not economically viable because of the lack of customers' affordability

Notes: ICS = improved biomass cookstoves (ISO TIER > 1). ICS wood collection = improved cookstoves where wood is collected or harvested at no additional cost, as opposed to being purchased. In the analysis it is assumed that upfront costs are spread over the infrastructure or product lifetime. ICS and biogas digesters also receive subsidies, but in the absence of comprehensive information these are excluded from the analysis. The analysis is based on household income data by percentile (World Bank, Poverty and Inequality Platform) and a solution is considered affordable if its cost is lower than or equal to 5% of household income.

Without reduced electricity tariffs currently in place, no households without access to clean cooking would be able to switch to electric cooking. Improved biomass cookstoves are generally more affordable. Such cookstoves do not require the household to change fuel and by reducing consumption lead to energy and expenditure savings, paying back the upfront cost almost fourfold within one year (IEA, 2022). Along with the overall household savings associated with a switch to clean cooking, there are significant positive health impacts, particularly for women. Poor air quality from traditional cooking indoors is a major contributor to premature death, which if assessed on its own would rank third among the leading causes of death globally, and second in Africa, where over 60% of premature deaths are among women and children (IEA, 2023a). These multiple benefits indicate that clean cooking should be a priority area for public support.

Best practices to overcome financing barriers for access

International support is key to accelerating investment and overcoming the challenges associated with access financing, but governments must also play their role by creating a transparent enabling environment. Currently, only 48% of the people without access to electricity in Africa are based in countries with official national targets and plans in line with SDG7.1 goals, and only 17% of those without access to clean cooking. Developing integrated energy strategies including such targets, accompanied by action plans and dedicated government agencies and programmes, is a fundamental building block to identify where investment needs are greatest and how projects can be financed while providing certainty to investors and the private sector.

Governments also have a major role to play in funding access projects. **Grid extensions** are generally publicly funded, although there are several models of private involvement being trialled in the region (see Section 2.4). Some successful grid extension programmes have combined central government and local community financing, ensuring local engagement. For example, in 2020 Ghana introduced the Self-Help Electrification Scheme, which allowed communities to be connected to the grid earlier if they could provide poles for low-voltage lines and guarantee that at least 30% of the households in the community are ready to start using the electricity provided (IEA, 2022). Upfront connection costs are often a significant barrier for households close to the grid but without access. Some countries have implemented the option of on-bill repayment of connection costs, reducing the upfront burden and permitting many households to legally connect – as in Côte d’Ivoire.

Mini-grid projects also require public sector assistance to support the relatively high upfront costs and to ensure a tariff structure that is both cost-reflective and sensitive to end users’ affordability needs. Mini-grids serve around five million people in Nigeria thanks to the combination of electricity reforms, the existence of dedicated government agencies such as the Rural Electrification Agency catalysing a strong presence of development agencies and donors, and the ability to access finance from the Nigeria Electrification Project. Up-front grants were made available during the first mini-grid programmes in the early 2010s, creating a strong presence of local players. Developers are now able to access results-based finance, particularly since mini-grids can also be used as a clean alternative to diesel generators, and take out commercial loans from local banks (GET.transform, 2021). However, accessing growth-stage equity remains a major challenge – it is in short supply and one of the major obstacles to scaling up the industry.

One of the greatest challenges to financing **stand-alone electricity** and clean cooking projects is their small scale and how to get local SMEs fully involved. Larger, often international, companies can access international grants and equity investment, and can seek to aggregate projects either to support economies of scale during procurement or, depending on the creditworthiness of end users, to create tradable securities to raise debt (see Chapter 3).

Smaller, local companies often struggle to access DFI capital or impact funds that are based abroad and they are therefore reliant on commercial banks, who have difficulty

understanding off-grid business models. Many companies therefore operate as retail businesses, which can attract more private capital but need to focus on the most profitable projects. An alternative to this approach would be an energy-as-a-service model via public–private partnership, where the government leverages DFI capital to buy the solar home systems from a private developer, and the households pay affordable tariffs for the use of energy (and providing for equipment maintenance), which is ensured via a long-term contract.

Identifying **productive activities** that could benefit from electricity (while also stimulating rural economic development) is also key to increasing demand and improving the profitability of rural electrification projects and hence attracting greater levels of private finance. Examples include the hybrid solar mini-grid plant on Bugala Island in Uganda, which saw 400 additional businesses connected in the framework of a productive uses programme, increasing demand by almost 50% (Power Africa, 2021). Productive uses require stronger upfront planning and investment since demand can be four times higher per capita than the provision solely of essential household services (The Rockefeller Foundation, 2023). Developing productive uses also requires much broader economic development programmes, particularly targeting rural areas, which are likely to rely on government funding with donor grant capital.

Financing **clean cooking**, as with off-grid solar, requires supporting several small and local actors, but with the added complication of understanding which technology is best suited to the households’ needs. The poorest families might initially benefit from switching to improved biomass stoves, using a micro-credit loan that they pay off using savings from reduced charcoal or wood purchases. Families relying on collected biomass present particular challenges for access to clean cooking. Improved biomass cookstoves (and in some cases biodigesters) represent the most viable solution in the short term for these families, but the upfront costs would need to be fully covered in most cases.

Wealthier families, especially in urban areas, have better access to LPG or electric cooking at affordable rates, but awareness campaigns, access to credit and regulated energy prices are all required to ensure sustainable and long-term adoption. End-use LPG investments rely on infrastructure for import, local production and distribution, which if not designed correctly can push up the price for the end user. However, innovative business models such as PayGo LPG, as seen in Kenya and South Africa, can help lower the cost of supply as well as the upfront cost of cylinders to households. Meanwhile, finance for electric cooking can come from electricity providers; for example, the Kenyan utility KPLC is exploring on-bill repayment for households to purchase electric cooking appliances and already has a results-based financing facility in place for clean cooking providers to access (IEA, 2022).

Carbon markets are already playing a role in providing clean cooking solutions. Credits for clean cooking stoves represented almost a quarter of the voluntary carbon market credits issued in Africa between 1996 and 2023, and with the market set to grow, this is likely to provide a major revenue stream for clean cooking projects. However, there are still

significant gaps in regulatory frameworks and monitoring and verification systems, discussed in more detail in Chapter 3, which need to be addressed to ensure the positive impact of this growing market.

Table 2.1 ▶ **Common financing types by project stage**

Area	Development and implementation	Operation
Mini-grids	Grants	Commercial debt
	Concessional equity and loans	Results-based finance
	Commercial debt	Aggregation, securitisation
	Viability gap funding	Corporate (growth) equity and, where possible, public listing
	Private equity and venture capital (PE/VC)	
Stand-alone solar	Technical assistance and grants	Concessional or commercial debt, based on end-user risk
	Concessional equity and debt	Results-based financing
	Corporate equity (PE/VC)	Aggregation, securitisation
		Carbon markets
Clean cooking	Technical assistance and grants	Corporate (growth) equity and, where possible, public listing
	Concessional equity and debt	Carbon markets
	Corporate equity (PE/VC)	Results-based financing
		Aggregation, securitisation

Notes: Grid extensions are covered in the grids section below. Aggregation and securitisation refer to the pooling of assets and selling the cash flows to investors to raise capital, generally via an asset-backed security or a bond; this is discussed in more detail in Chapter 3. Viability gap funding can take several forms, but refers to the practice of providing grants or concessional short-term loans to projects that are economically significant but not financially viable. Results-based financing refers to approaches where payments are made, usually by governments, donors or DFIs to the private sector, on the achievement of predefined results.

2.3 Renewable power generation

2.3.1 Utility-scale projects

Renewable power becomes the largest sector by share of total investment in 2030 under the SAS, reaching over USD 50 billion compared to less than USD 20 billion in 2022 (see Chapter 1). Solar PV is the most prominent player, as already seen with new energy investment in South Africa where an impressive USD 2.7 billion was spent in 2022, accounting for nearly half of the country’s clean energy investment that year. Wind energy investment has also experienced strong growth, particularly in North Africa, expanding by 70% between 2016 and 2022. Alongside the growth in variable renewables, hydropower and geothermal provide key sources of dispatchable power. By 2030 hydropower alone accounts for almost half of total generation in the region. This shift towards renewables is driven by falling costs and policies promoting low-carbon energy, capitalising on Africa’s abundant potential for renewable resources.

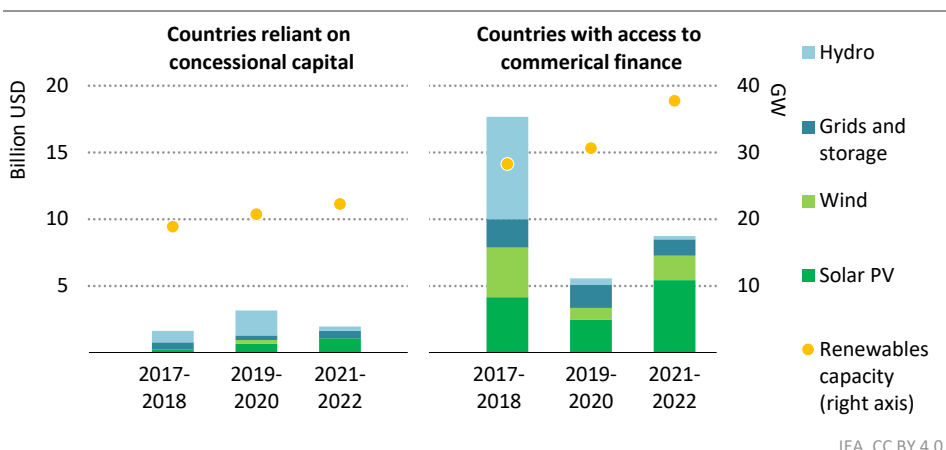
Clean energy projects, especially in less mature markets, often face challenges that can slow investment. These risks are generally higher in the development and construction phases, requiring higher levels of equity financing, as well as public spending and/or concessional support from DFIs. Geothermal projects have particularly high risks during exploration and are often located in sensitive areas. Hydropower projects also require long due diligence, permitting and environmental licensing procedures. This can present a major hurdle, particularly for large projects such as the proposed Grand Inga Dam project in DRC, which has been stalled for years due to the implications of its scale (40 GW) for both transmission works and cross-border agreements, as well as its potential environmental impact.

According to the AfDB, 22 countries in Africa are considered able to sustain commercial capital – based on their degree of financial and economic development; all other countries, which account for three-quarters of the region’s population, are reliant on concessional support. Renewable power investment has been concentrated in countries with access to commercial capital due to their broader access to finance and their higher electricity needs (see Figure 2.5). Avoiding twin-track development across the continent will require increasing the amount of funding to lower-income countries, accompanied by support to strengthen the regulatory environment and build capacity.

There are signs of progress; for example, lower-income countries are seeing a shift from licensed schemes to competitive bidding, which accounted for 20% of renewables projects in 2017-2018, rising to 90% in 2019-2021. Programmes such as the AfDB’s Desert to Power Initiative, which began working with five countries in the Sahel and is now entering a second phase in East Africa, demonstrate the value of a co-ordinated approach that includes working with governments on national sector roadmaps, as well as supporting individual projects through viability gap funding (see Box 2.2).

In more developed countries in the region, especially those with strong renewables-related regulation and existing projects, one of the key impediments to their widespread adoption is the bankability of the offtake (see Chapter 1). Several measures can be taken to mitigate the related risks, notably offtaker, transmission and regulatory risk. These include establishing a clear strategy for renewable energy development, setting renewable energy capacity targets, implementing independent power producer (IPP) frameworks and clear power purchase agreements (PPAs), and conducting competitive auctions. However, it is crucial to ensure that these mechanisms share risk between parties, without putting too much pressure on the offtakers, many of whom are already in financial difficulties. Greater transparency around financial terms, including any de-risking or credit enhancements provided by DFIs, is needed to ensure risks are shared adequately and allow for replicability.

Figure 2.5 ▶ Clean power projects' financial close by ability to access commercial capital, Africa, 2017-2022



IEA. CC BY 4.0.

Renewable power investments are concentrated in larger economies with greater access to commercial capital, risking leaving behind lower-income countries

Note: Country categories based on AfDB and World Bank lending policies.

Sources: IEA analysis based on IJ Global and World Bank Private Participation in Infrastructure database.

Once countries already have a developed market for renewables projects, the pipeline of new projects can primarily be funded via commercial debt with partial assistance from the public sector. This opens the country up to a larger pool of capital providers while also freeing up DFI or donor capital to invest in more nascent markets. Benban Solar Park in Egypt (380 MW) was originally funded with equity from the private sector and debt solely from development banks. In April 2022 Scatec and its partners refinanced the non-recourse project debt through the issuance of a 19-year USD 335 million green project bond (OECD, 2022). This transaction – the first of its kind in Africa – allowed for the reduction of the project’s financial costs while also freeing up development bank capital to reinvest elsewhere. The project also incorporates risk mitigation instruments, notably guarantees from the Multilateral Investment Guarantee Agency (MIGA) protecting over USD 50 million from currency risk for 15 years. These kinds of transaction could set a precedent for future deals that move Africa towards the objectives of the SAS.

Box 2.2 ▶ Desert to Power programme

Desert to Power is an initiative from the AfDB that aims to harness the excellent solar potential of the Sahel to massively deploy renewable energy in one of the most vulnerable regions in Africa. This flagship programme seeks to add 10 GW of solar generation capacity and provide electricity to around 250 million people in the 11 Sahel countries by 2030. The first phase focuses on the Sahel G5 (Burkina Faso, Chad, Mali,

Mauritania and Niger) and, with strong political support, has contributed to the development of national energy roadmaps and provided capacity building to enhance the expansion of on-grid solar PV generation while leveraging private capital.

By providing an overarching scheme to facilitate investment, Desert to Power supports the mobilisation of private capital in a region where individual projects would otherwise struggle to attract investment. The initiative helps bring projects to fruition by enhancing the approval of viability gap funding for project preparation through the AfDB's Sustainable Energy Fund for Africa, whose main role is to provide grants and technical assistance to bring viable renewable energy projects to bankability and enable financial closure. The Djermaya solar PV project in Chad is an example of such synergies, with the AfDB having approved a grant of USD 695 000 for its preparation. This 32 MW project, which has yet to reach financial closure, also includes 4 MWh of storage capacity and will not only be the first renewable energy project in the country, but also its first IPP.

2.3.2 Distributed renewable power for businesses

African grids are prone to frequent, planned and unplanned power outages. As a result, many users, ranging from SMEs and smallholder farmers through to large commercial and industrial (C&I) users, are forced to operate diesel generators as a back-up. This can be significantly more costly than generating their own power via rooftop solar, particularly with fossil fuel prices spiking after Russia's invasion of Ukraine.

In recent years, as the cost of solar modules has fallen, the sector providing distributed solar PV for businesses has grown. Projects are generally financed on the consumers' balance sheet or via off-balance sheet arrangements, such as third-party ownership supported by corporate PPAs. The end user will often be a creditworthy C&I business, but these third-party arrangements are also suited to cash-constrained companies, including SMEs.

Last year saw several major developments for third-party providers, including record equity and debt issuances and notable M&A activity:

- In October, Norwegian developer Empower New Energy raised USD 74 million in equity from Climate Fund Managers, a joint venture between Dutch DFI FMO and South Africa's Sanlam Group (Africa Energy Portal, 2022).
- The following month, South African firm Solarise Africa completed a USD 33.4 million debt issuance, the largest for C&I solar in Africa, financed by the Facility for Energy Inclusion, Oikocredit and the Africa Go Green Fund (RenewablesNow, 2022).⁴
- In September, Daystar Power, one of the major solar-as-a-service businesses in Nigeria, was acquired by Shell, marking the oil and gas giant's first acquisition of a power firm on

⁴ The Facility for Energy Inclusion is a debt fund that is anchored by AfDB and supported by a range of European DFIs; the Africa Go Green Fund is also a DFI-backed debt fund, initiated by KfW and supported by the AfDB.

the continent. Utilising new cash flow from Shell, Daystar aims to increase its installed solar capacity from 32 MW to 400 MW by 2025 (Bloomberg, 2022).

- Also in September, Nigeria-based Starsight Energy merged with South Africa-based SolarAfrica to create the largest pure-play C&I energy service provider on the continent. The merged company has a portfolio of over 220 MW of operated and contracted generation capacity, 40 MWh of battery storage, and a pipeline exceeding 1 GW (CleanTechnica, 2022).

Although the majority of projects to date have been concentrated in South Africa, Egypt and Nigeria, announcements have been made in at least 12 other countries in the region. National policies, particularly around third-party ownership, interactions with utility distribution and billing systems, and tax exemptions for importing solar equipment, will play an important role in supporting the further growth of distributed solar PV.

Table 2.2 ▶ Common types of renewables financing by project stage and technology

Technology	Development	Construction	Operation
Solar PV/wind – nascent market	Technical assistance grants; seed grants Concessional equity Corporate cash flow	Concessional debt Viability gap funding Corporate equity (PE/VC)	Commercial debt Aggregation; securitisation
Solar PV/wind – developed market	Corporate cash flow Equity	Project finance Commercial debt Corporate equity (PE/VC)	Commercial debt Refinance via corporate bond (if credit rating allows; on local markets ideally)
Geothermal and hydro	Technical assistance grants in new markets Equity	Funding from state-owned enterprises Project finance Concessional debt Corporate equity (PE/VC)	Commercial debt Refinance via corporate bond

Notes: Equity can be concessional if it is provided in a subordinated or first-loss capacity, or if it has lower return expectations or a longer time period to exit. Viability gap funding can take several forms, but refers to the practice of providing grants or concessional short-term loans to projects that are economically significant but not financially viable.

Ensuring security of electricity generation

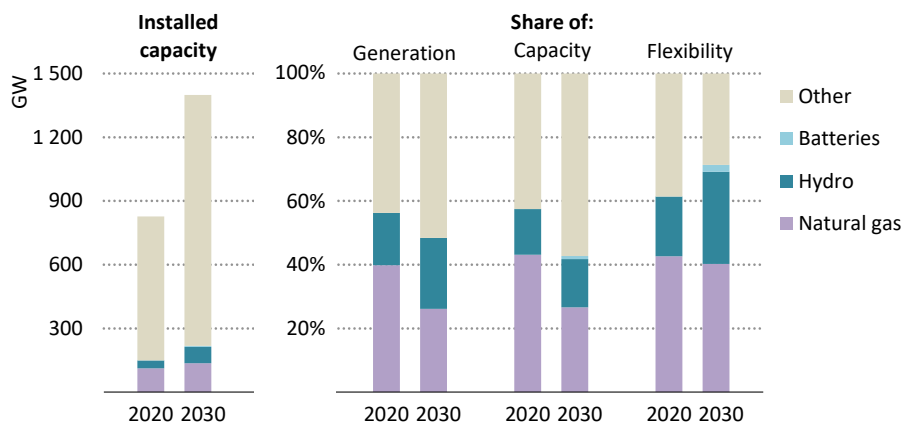
Security of electricity supply is a key consideration when assessing investment risk. It is estimated that, as a result of electricity outages, companies in emerging markets and developing economies could experience efficiency losses and costs for back-up electricity generation totalling almost USD 1.3 trillion through to 2030 (IEA, 2023c). Concerns about the reliability of electricity provision and the cost of grid-supplied electricity are driving increasing numbers of consumers to invest in alternatives, often fossil-fuelled generators but also rooftop solar. This places additional pressure on already strained utilities and further reinforces the vicious cycle of underinvestment in electricity infrastructure.

For example, in Nigeria alone 40% of all the electricity consumed is produced from back-up generation. Along with the system implications, this ends up being more costly for consumers. Between 2021 and 2022 electricity costs for Nigerian consumers using a mix of grid and back-up generation increased by 150% to 170%; for those dependent on diesel generators alone, costs increased by between 220% and 260% (IEA, 2023c).

Under the SAS, the increased share of variable renewables in power systems creates the need for more flexibility and enhanced frequency regulation capacity. In addition to core investments in grid strengthening and upgrading, a range of assets and measures are developed to support these needs and ensure enough flexible capacity to balance supply and demand. They include hydropower facilities (including pumped storage), gas-fired power plants, chemical energy storage (such as lithium batteries or hydrogen), geothermal plants and demand response (whereby consumers adjust their electricity consumption in response to economic incentives). Increased investment in cross-border electricity transmission infrastructure also plays an important role to ensure reliability, with national systems gradually integrated into regional power pools with increased cross-border trade (see below).

Fossil fuel power plants accounted for almost 80% of flexibility sources for power systems across Africa in 2020 (natural gas for nearly 45%, coal – mainly in South Africa – for 15%, and oil for over 20%), with hydropower accounting for most of the remainder. In the SAS, natural gas remains the leading source of flexibility in 2030, with an additional 25 GW on a net basis, accounting for a quarter of total installed capacity (see Figure 2.6). Hydropower (including pumped storage) is the second largest source of flexibility by 2030, overtaking oil. Geothermal and concentrating solar power (CSP) play an increasingly important role in generating baseload electricity, as well as boosting flexibility as dispatchable low-emissions sources. Battery storage also starts to emerge as a solution, but plays a larger role post-2030.

Figure 2.6 ▶ Electricity generation capacity and flexibility in the SAS, 2020 and 2030



IEA. CC BY 4.0

Gas remains the main source of flexibility in 2030, despite a drop in its share of total generation and capacity, with increasing contributions from hydropower and batteries

Note: Other = coal, oil, nuclear, geothermal, bioenergy and concentrated solar power

Source: IEA (2022). *Africa Energy Outlook*.

Digitally enabled solutions, such as solar PV plus battery behind-the-meter systems or mini-grids, are also often a cost-effective approach to ensuring reliability in new demand centres. For instance, a recent pilot project in Uganda called Utilities 2.0 has demonstrated the potential for private developers to fund remote mini-grid projects that are operated using digital meters monitored by the national distribution system operator, Umeme. This approach ensures that the local network is installed according to the utility's technical standards, guaranteeing interoperability for the future, while also minimising costs for consumers.

Regional power pools

Aggregating multiple sources of supply via power pools can enable the integration of higher levels of variable renewable energy thanks to supply diversification. On the continent, the Southern African Power Pool (SAPP) and the West African Power Pool (WAPP) are the most developed, and both include replicable elements that have helped attract investment.

WAPP is designed to connect the grid infrastructure and operating protocols of 14 Economic Community of West African States member countries to create a fully functioning market to trade power. This requires the acceleration of regional interconnections, including the transmission line linking Côte d'Ivoire, Liberia,

Sierra Leone and Guinea. To attract finance more effectively, the four countries established a supranational company, Transmission Company of Côte d'Ivoire, Liberia, Sierra Leone and Guinea (Transco CLSG), which established a clear legal basis for the project. Transco CLSG was able to secure concessional loans from the World Bank, the European Investment Bank, KfW and the AfDB. In March 2022 it reported 96% completion of construction work on the line, with work remaining on some segments and associated infrastructure.

SAPP, which connects Southern Africa Development Community (SADC) countries, has had a functioning power market since 2001. SAPP's member countries, represented by their respective utilities, participate in the power trading, which has allowed many countries in the region to rely on imports from neighbouring countries. In addition to utilities, SAPP includes several private operators and an additional participant – Africa GreenCo – which acts as an intermediary aggregator between buyers and sellers. By purchasing power from renewable IPPs and selling it to both utilities and private sector offtakers through the SAPP market, it effectively contributes to de-risking those projects by addressing the offtake risk through the natural hedge of demand aggregation.

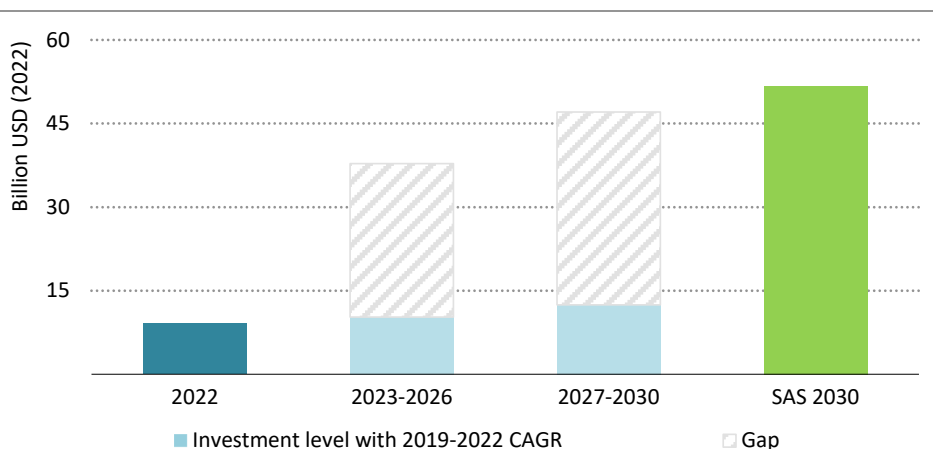
Note: For further information on these topics see IEA (2023) *Unlocking Smart Grid Opportunities in Emerging Markets and Developing Economies* and IEA (2022) *Africa Energy Outlook 2022*.

2.4 Grids and storage

Massive investment in Africa's grids is critical to improve system reliability, expand access and facilitate the integration of variable renewables. The worsening financial difficulties being experienced by many utilities are hampering investment in new transmission and distribution assets as well as maintenance, resulting in a progressively obsolescent system. These problems are manifested in extremely high system losses (including non-technical), with most African utilities reporting losses of 10-19% and an average of 15% across the continent in 2020 – more than double the global average of 7% (see Chapter 1).

Annual investment in grids in Africa grew at only 5% between 2019 and 2022, but under the SAS annual investment in grids triples, reaching over USD 50 billion by 2030 (see Figure 2.7). Distribution networks account for over two-thirds of the total, with electricity access needs alone attracting an annual average of over USD 5 billion a year by 2030. With millions of new customers and increasing demand, investment is focused on new lines and increasing grid density to support greater generation.

Figure 2.7 ▶ Annual grid investment to 2030 based on recent growth rates, Africa, 2022-2030



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Growth in grid investment over recent years has been minimal; continuing at this pace would leave investment at roughly only a quarter of the level necessary under the SAS

Note: CAGR = compound annual growth rate.

Investment in grids also needs to focus on improving existing infrastructure, as well as ensuring the system can deal with the influx of more variable sources. Under the SAS, maintenance and modernisation of existing infrastructure represents almost a quarter of the total spend on grids to 2030, helping to reduce losses in 2030 by 30% compared with 2022 (IEA, 2022). A variety of sources of flexibility are utilised under the SAS (see Spotlight), including a small amount of battery storage, primarily near large utility-scale solar and wind projects. At current price points, the use of batteries is limited to short-duration flexibility and providing storage in remote applications. However global price declines show promise in making batteries increasingly cost-competitive beyond the 2030 outlook.

Public utilities will need to be responsible for much of the investment in upgrading electricity systems across the African continent, accounting for 80% of grid investment in 2030. This is a daunting prospect given their perilous financial state today. Poor payment collection rates, illegal connections, cost increases (including the cost of capital), operational problems and supply chain constraints are reducing cash flows and driving up debt. Private sector financing will therefore need to take on a larger role, although this is likely to be limited to countries that have relatively well-developed power systems and a stable regulatory environment. A variety of approaches to this kind of investment are used globally (see Table 2.3). Governments can prepare for it by carrying out tariff structure reform and authorising the use of concession agreements or other regulatory carve-outs for private sector investment and ownership, as well as the introduction of auctions and competitive tenders.

Table 2.3 ▶ Main business models for privately financed transmission

Business model	Description	Contract coverage	Examples
Long-term concession	Private company manages and operates existing assets and expands in its area of operation	All existing and new lines in a country/region	India, Philippines, United Kingdom
BOOT (build, own, operate and transfer)	Private company finances, builds and operates line under long-term contract; transfers it later to government	New line (or package of lines)	Australia, Brazil, Chile, India, United Kingdom, United States
Financial ownership	Private company partially finances new line; built and operated by system operator	New line	Denmark and Germany
Merchant line	Private company finances, builds and operates line; revenues from short-term wholesale market	New line, often high-voltage direct current	United States and Australia
Dedicated line (for IPP)	New line evacuates power from IPP to existing grid	New line	Globally applied

Source: Adapted from IEA (2021). Financing Clean Energy Transitions in Emerging and Developing Economies.

Although private participation in generation in Africa has been increasing gradually, with over half of African countries now allowing it, only three countries (Gabon, Côte d'Ivoire and Zambia) have private sector operators represented across generation, transmission and distribution. Private sector participation in distribution is authorised in eight countries, but for transmission this falls to four. Analysis shows that private operators outperform their public counterparts across a range of technical and commercial indicators (Grids4Africa, 2021). However, it is important that any efforts to open up transmission and distribution are accompanied by strong regulation that ensures private operators or concessionaires continue to invest in less-profitable areas such as electrification of rural areas.

Several countries are exploring ways to open up networks to private investors, but public concessional finance is likely to be necessary to de-risk projects, particularly in the early stages. For example, Gridworks, an investment platform owned by the DFI British International Investment, is working with the Ugandan government on a pilot for private investment in transmission. The Kenyan government also signed an agreement with India's POWERGRID in 2022 to create Africa's first independent power transmission project.

Alongside the physical infrastructure, digitalisation plays a key role in grid investment under the SAS, offering opportunities to reduce losses (particularly non-technical) cost effectively; recent analysis from the IEA found that the commercial effect of these non-technical losses is estimated to cost utilities globally in the range of USD 80-100 billion each year (IEA, 2023c). Prominent measures include geographic information systems, outage management systems and smart metering. Several countries have already begun piloting these measures, notably smart metering (Benin, Kenya), smart substations (Senegal, DRC), fibre optic communication added to transmission lines (Ethiopia, Kenya) and the use of thermal-based tools with drones to support routine inspection of hotspots on the grid (Ghana, Kenya). Much of this

investment is likely to occur via public utilities, but it can also be supported by the private sector, particularly if accompanied by the regulatory opening up outlined above. Policy makers can further support efforts to attract private investors by ensuring robust planning to signal to the market that there is a strong pipeline of potential projects.

Table 2.4 ▶ Common financing types by project stage

Area	Development	Construction	Operation
Transmission and distribution	Grants Concessional equity Corporate cash flow	Grants Viability gap funding Concessional debt and equity	Corporate bond (if credit rating allows; on local markets ideally)

Notes: Equity can be concessional if it is provided in a subordinated or first-loss capacity, or if it has lower return expectations or a longer time period to exit. Viability gap funding can take several forms, but refers to the practice of providing grants or concessional short-term loans to projects that are economically significant but not financially viable.

2.5 Energy efficiency

Africa is set to experience an unprecedented increase in energy demand over the coming decades, driven by rapidly growing economies and populations, rising incomes and significant infrastructure expansion. Energy demand in industry, freight and agriculture is expected to increase by almost 40% by 2030, and as climate change and urbanisation drive up the need for cooling, electricity demand for household appliances could more than double to 350 TWh by 2030. In this context, energy efficiency investment becomes an important balance to the growth in demand: energy efficiency is one of the most cost-effective measures to mitigate GHG emissions while reducing stress on power grids, easing security of supply pressures and keeping enterprises competitive.

Investment in energy efficiency⁵, electrification and renewables for end use in Africa has been relatively static for more than five years, accounting for slightly below USD 6 billion in 2022. While several countries in Africa have put in place building codes and minimum energy performance standards (MEPS) for certain appliance types, there is still a lack of integrated and comprehensive policy frameworks in many cases. In 2022 MEPS and labels for air conditioners covered around 50% of the final energy consumed by all such equipment in Africa, and for refrigeration it stood at 60%, compared to the global average for both end uses of close to 90%. Minimum standards and labels for road transport vehicles and industrial motors covered less than 5% of energy consumption (TCEP 2023).

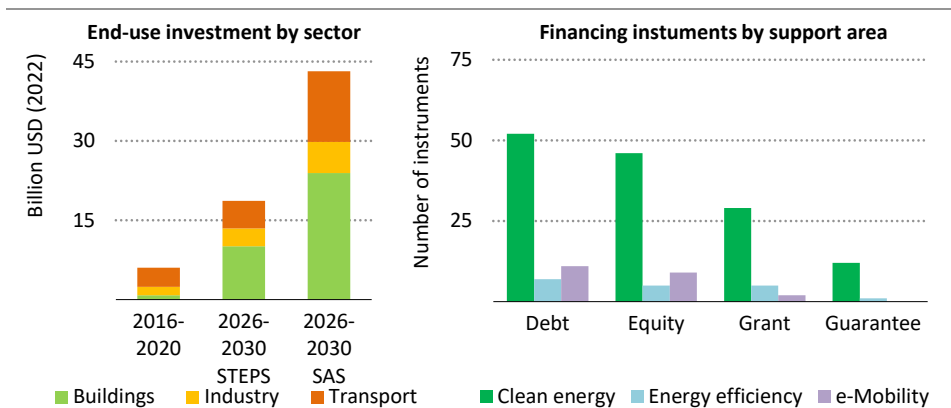
Rising incomes, expanded access to electricity, and climate change will more than double the electricity demand for household appliances from around 160 TWh to 350 TWh between 2020 and 2030 in the SAS. Cooling and refrigeration appliances drive most of this increase,

⁵ Energy efficiency investment comprises the incremental spending on new energy-efficient equipment, the full cost of refurbishments that reduce energy use, and investment in energy-efficient transport. For a more detailed definition see IEA (2023) *World Energy Investment 2023 Methodology Annex*.

while rapid implementation of MEPS and labels slightly reduce the average electricity consumption per household over the same timeframe. National and international measures to halt the dumping of inefficient second-hand appliances and banning appliances with the lowest efficiency ratings saves over 40 TWh of electricity demand in 2030 in the SAS, equivalent to one-third of total appliance-related demand today (IEA, 2022).

Under the SAS, energy efficiency-related spending rises sevenfold to around USD 43 billion in the second half of this decade. Increases in spending are driven by surging demand for housing combined with stronger policy frameworks including building codes and MEPS, purchases of more efficient and electrified vehicles, appliances and cooling systems, as well as electrification and efficiency improvements in industrial processes. Stronger policy frameworks to reduce investment risk, the use of public capital to leverage private sources and harness new financing structures will be needed to accompany this trend.

Figure 2.8 ▶ **Energy efficiency-related investment and current financing instruments, Africa, 2016-2030**



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Energy efficiency-related spending increases sevenfold during 2026-2030 in the SAS, calling for a stronger energy efficiency focus of available financing instruments

Note: This covers instruments explicitly targeting energy efficiency. Elements of energy efficiency improvements in buildings, industrial facilities, SMEs and transport may be covered under other categories.

Source (right): IEA analysis based on GET.invest Funding Database.

Energy efficiency finance is still a nascent market in many economies, yet to be prioritised for concessional and commercial capital. Only 13% of the instruments analysed for this report explicitly cover energy efficiency projects, while 16% cover e-mobility (see Figure 2.8). The complex and relatively small-scale nature of energy efficiency projects – combined with low awareness about their potential, risks and business models – requires a more systemic approach. Projects often need de-risking, standardisation and aggregation mechanisms to mitigate transaction and financing costs that reflect higher risk perception among local

financial institutions. Initially, this is likely to require grants and equity capital as markets and business models develop.

DFIs play a key role in providing catalytic capital for energy efficiency. For example, the AfDB has increased its support for energy efficiency in three ways: via equity investment in targeted funds such as the Africa Go Green Fund, concessional loans for energy efficiency improvements in government-owned facilities, and technical assistance grants for large-scale appliance programmes such as the intended replacement of one million refrigerators in Egypt. Technical assistance and early-stage grants, for instance through AfDB's Sustainable Energy Fund for Africa (SEFA) or the Energy and Environment Partnership Africa, also play an important catalytic role. Another common approach for DFIs to fund efficiency projects is via a partnership with a local commercial bank. For example, after the 2020 accreditation of Kenya's KCB with the Green Climate Fund, the IFC provided a USD 150 million senior unsecured loan in 2022 to support the bank's climate finance portfolio.

Box 2.3 ▶ **Super ESCOs in Africa**

The energy service company (ESCO) model – whereby an ESCO provides energy efficiency improvements and is compensated based on the energy savings achieved – is not widely used in Africa. Public sector “Super ESCOs” can catalyse the growth of energy efficiency markets by acting as technical and financial partners for government entities and private ESCOs, creating a project pipeline while driving down costs through bulk procurement.

The first Super ESCO in Africa was created in **Morocco** in February 2021 when an existing entity mandated to invest in energy efficiency transitioned to a public Super ESCO with the help of a technical assistance grant from the AfDB. The Super ESCO will initially focus on energy efficiency projects in public buildings and street lighting, later followed by industry and transport projects, as well as providing support services to private ESCOs. Morocco is also home to the region's first private Super ESCO, the Africa Energy Efficiency Fund, established in 2023. The fund will be a project aggregator with a standardised tendering process, offering 100% non-recourse financing with shared savings.

The Super ESCO approach is likely to become more commonplace, particularly following the launch of the AfDB's **Africa Super ESCO Acceleration programme** in March 2023. The programme seeks to support the establishment of public Super ESCOs in countries such as **Rwanda**, **Senegal** and **South Africa**, provide support services to private ESCOs and develop harmonised regional certification schemes for ESCOs and energy service professionals. **Kenya** has also embarked on the creation of a Super ESCO within the majority government-owned utility.

Numerous innovative business models exist (see Table 2.5). For large projects in the buildings and transport sectors, green, social, sustainability and sustainability-linked bonds have been rising in popularity (see Chapter 3). While energy efficiency was not an exclusive use of proceeds in any of the bonds issued to date, it featured in multiple uses of proceeds in over

40% of green bonds and a third of sustainability bonds. Access to available financing options for smaller investments by SMEs can be improved via dedicated credit lines and loan products with partial grant components or energy savings insurance schemes, combined with positive lists. Increasing levels of digitalisation and smart metering enable the collection, monitoring and analysis of large datasets to optimise the operation of an asset – allowing for the emergence of new energy-related services and business models. Numerous end-user financing approaches intend to lower or remove the upfront investment barriers for price-sensitive end users, such as green mortgage schemes or on-wage/on-bill financing models.

Table 2.5 ▶ **Innovative finance models and support tools**

Model	Details	Example
Sustainable debt issuances	Debt issuances that tend to have lower servicing costs because of their green credentials. These can be used for green buildings, clean transport and energy efficiency projects.	Côte d’Ivoire: Green bond to refinance an EDGE-certified efficient shopping centre* Kenya: Green bond for student housing in Nairobi
Positive lists or energy technology lists	Lists containing pre-approved energy-efficient appliances that automatically qualify the purchaser for subsidies or concessional funding	Egypt, Morocco, Tunisia: Part of the European Bank for Reconstruction and Development’s Green Technology Selector lists high-efficiency products and vendors by country, and is embedded in its Green Economy Financing Facilities
Green mortgage schemes	Concessional loans with lower interest rates, longer tenors or higher loan amounts to build or renovate a home according to high sustainability standards	Kenya: USD 20 million financing package from IFC to grow access to green housing finance South Africa: Absa Eco Home Loan for EDGE-certified buildings* in selected developments
Energy-as-a-service	A service provider offers energy services like lighting, cooling, heating, compressed air and e-mobility based on payments per use rather than the purchase of physical assets	South Africa: Cooling-as-a-service for the upgrade of a plant at a fruit company Nigeria, Kenya: Off-grid cold storage as a service Multiple: Battery-as-a-service models for electric two-wheelers
Energy savings insurance (ESI) model	ESI offers third-party coverage against failure to achieve agreed energy savings. Typically, it includes a standardised energy performance contract, an ESI, independent validation and a financing structure	Morocco: Pilot ESI scheme for energy efficiency improvements in SMEs (BASE, 2022)
On-wage and on-bill financing	Consumer finance scheme whereby a loan, generally below market rate or at 0%, for efficient appliances is paid back via monthly deductions from salaries or electricity bills	Ghana: Green On-wage financing mechanism for air conditioners and refrigerators Senegal: Bank loan for cooling equipment with utility on-bill repayment Rwanda: Cooling Initiative’s Green On-wage financing mechanism, including a take-back and rebate scheme for old appliances

* Certification for buildings with at least 20% less energy, water and material consumption compared to an equivalent local benchmark.

Notes: This list is not comprehensive. Several examples are further analysed in the annex.

Governments can support innovative financing mechanisms through the creation of conducive policy and governance frameworks and energy market structures, with MEPS and labels, import restrictions to avoid dumping of inefficient products on African markets and green lending targets for banks, and also by providing incentives and technical assistance. Collaboration with relevant institutions, allocation of long-term resources for setting up and managing such programmes and continuous awareness raising are important factors to ensure their long-term sustainability.

Table 2.6 ▶ Common financing types by project stage

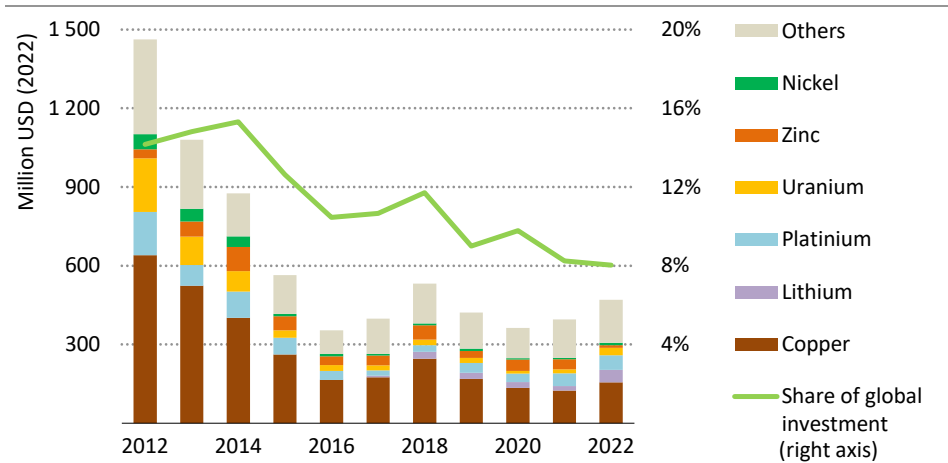
Area	Development and implementation	Operation
Commercial (including ESCOs, manufacturers, developers)	Technical assistance grants; seed funding Concessional and commercial debt Equity and corporate cash flow Energy savings insurance, reinsurance	Energy savings insurance, reinsurance Refinance via sustainable debt market
Consumer	Technical assistance grants; seed funding Concessional and commercial debt Energy savings insurance	Concessional debt and insurance On-bill/on-wage financing As-a-service and leasing models

2.6 Critical minerals

Africa holds a significant share of the world’s mineral resources, many of which are critical to several clean energy technologies. The continent dominates global production of cobalt, platinum-group metals and manganese, and has a sizeable share of the production of other mineral resources such as graphite, bauxite and copper. African countries have contributed to a recent uptick in global production for several minerals: in 2023 DRC is set to increase its production of cobalt by 60% compared with 2020, keeping its share of global production above 70%, while increasing copper production by 45%. Meanwhile, graphite production in Mozambique and Madagascar is set to rise almost sevenfold in 2023, when their combined share of global production would exceed 20%; the continent could overtake China as the largest producing region by the mid-2020s.

Following global trends, investment in the mining sector in Africa has been rising since 2020. Prices of critical minerals such as copper and aluminium are well above historical averages, although they recently moderated after surging in 2021 and 2022. Combined with policy incentives such as EU Critical Raw Materials Act, high prices triggered a rise in global investment spending by 20% in 2022, following the 30% increase in 2021. The operating profits and cash flows of mining companies have grown significantly, pushing up exploration spending, mostly led by lithium and copper. However, Africa’s share of global investment in critical minerals continues to fall from highs of 15% in 2014 to 8% today (see Figure 2.9).

Figure 2.9 ▶ Investment in exploration for selected mineral resources, Africa, 2012-2022



IEA. CC BY 4.0.

Despite a recent spike in exploration budgets, Africa's resources remain underexplored; its share of global spending has been declining since 2014

Resources in Africa remain underexplored largely due to insufficient geological data. Improving surveys and mapping is therefore a first major step to attracting interest. African governments may also need to strengthen their environmental, social and governance (ESG) data and policies, since investors globally are facing pressure to include ESG factors into their decision-making. Private capital providers, especially from Europe and North America, are likely to require enhanced governance and transparent mineral wealth management at the country level and strong environmental and social management practices at the project level.

The extractive industry already brings significant revenues to African countries and this source of income is set to grow as global demand soars. In 2021 metals and minerals (excluding gold and other precious stones) generated USD 70 billion of sales revenue and accounted for 20% of Africa's overall exports, compared with only 11% in 2016. Currently, sub-Saharan Africa accounts for 13% of global market revenues for copper and battery metals. With a similar market share by 2030, revenues would double, and with a share reaching 20% by 2050, they would exceed USD 100 billion, on a par with current revenues from fossil fuels (IEA, 2022). Dependency on commodity exports may, however, create economic vulnerabilities as well as social and governance risks. Of all African countries, 45 are considered commodity-dependent, and minerals represent over 50% of total product exports in 14 African countries, up from 9 in 2016 (UNCTAD, 2022). There is a strong need for transparent mineral wealth management to translate mining revenues into widespread economic prosperity and use them to support diversification of the economy.

Some countries are eyeing opportunities beyond mining such as the value-added transformation of minerals (e.g. refining and active material production), although strong policy support would be needed to provide incentives for investment, nurture the development of local workforces and ensure reliable electricity supplies. In 2022 DRC and Zambia set up a common governance structure – the DRC-Zambia Battery Council – to create a business environment conducive to the development of a battery value chain. Where governments have the fiscal space to fund downstream projects they can be driven by public finance, although private mining companies can also play a role. For example, in Guinea the government required financing for a 670 km rail link from the iron ore deposits at Simandou to the Forécariah port to be included in any development agreement.

Table 2.7 ▶ **Common financing types by project stage**

Area	Exploration	Development	Production
Critical minerals mining	Equity of mining juniors Corporate cash flow	Mining juniors acquired by majors and projects developed using corporate cash flow Project finance Equity from downstream offtake agreement	Corporate cash flow
Domestic value-addition industries	Grants and concessional equity	Public finance via state-owned enterprises Concessional debt	Refinance via public markets to lower capital costs

Notes: Mining juniors, often funded by speculative stock market investors, are smaller sized project-developing companies intervening in early development phases such as exploration and pre-feasibility/feasibility studies. These are characterised by lower capital requirements and a higher level of risk, due to inherent geological uncertainty, commodity prices fluctuations and long lead times.

2.7 Low-emissions fuels and feedstocks

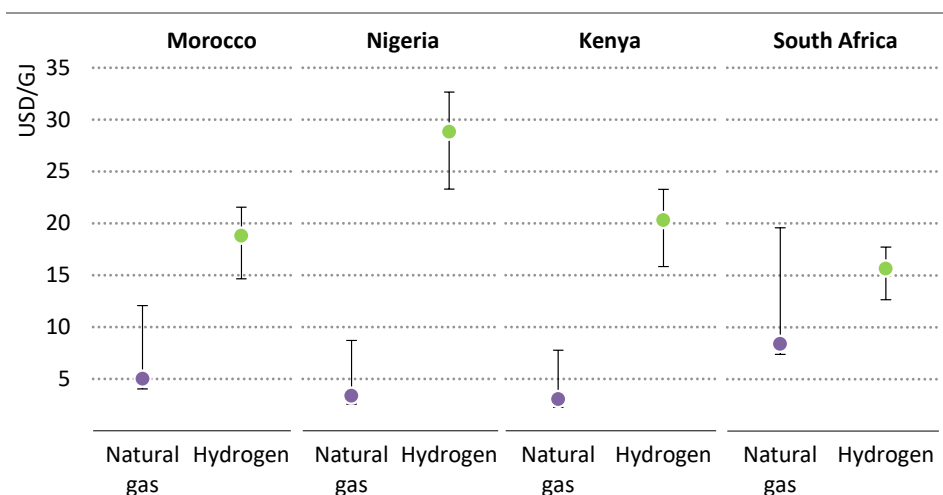
In the SAS, countries across Africa see key industries such as fertiliser, iron, steel and cement production expand, as well as the manufacture and assembly of appliances, vehicles and clean energy technologies. Production of basic materials grows by 50% between 2020 and 2030, driven by economic growth on the continent, which increases demand for goods, buildings and infrastructure (IEA, 2022). The growing energy demand needed for these industries is met mostly with electricity and natural gas. By 2030 low-emissions hydrogen represents 1% of industrial energy demand, but is expected to play an increased role beyond then, as the world accelerates its clean energy transition.

Africa’s vast land area coupled with excellent wind and solar resources, particularly in its northern and southern regions, provide opportunities for low-emissions hydrogen production. According to IEA estimates, just from areas within 200 km of its coastline, the

continent has the renewable energy potential to produce up to 5 000 Mt of low-emissions hydrogen per year at a cost below USD 2/kg (IEA, 2022). Developing African markets for low-emissions hydrogen in industry, notably for fertiliser production, and in shipping, aviation and power generation would require careful planning and support by governments and international finance. There is scope to improve the economics of projects by focusing on domestic industries located close to export facilities, transmission lines and solar resources, and where there is land and seawater for use after desalination. The pace of development of the hydrogen industry would depend critically on that of the power sector. There are question marks over whether sufficient electricity could be available for electrolyzers given the need to increase electricity supply to other sectors, including households lacking access.

Stimulating domestic demand for low-emissions hydrogen is expected to be difficult in Africa due to significant capital requirements to build production capacity, hindered by the high cost of capital and competing infrastructure needs. Low-emissions hydrogen would not be competitive against fossil fuels in the near term for most end uses in Africa without targeted policies to stimulate domestic demand (see Figure 2.10).

Figure 2.10 ▶ Industrial sector natural gas prices and renewables-based hydrogen production costs in selected African countries, 2030



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Without demand-side policies, domestic low-carbon hydrogen production would struggle to compete with natural gas for industrial uses

Source: IEA (2022). *Africa Energy Outlook*.

Anchoring demand for large low-emissions hydrogen projects in a foreign offtaker can provide the stable revenue stream needed to mobilise investors at the necessary scale. However, such projects should retain a strong focus on leveraging inflows of hard currency, technological capacity and skills to spur domestic benefits beyond pockets of domestic

industrial application. Such benefits could be achieved by oversizing facilities to provide power to local communities – critical in a continent with an average electricity access rate of 57% – and by training a skilled workforce to benefit from the creation of new jobs.

Namibia has taken the lead in this regard, signing an MoU with the European Union and a partnership with Germany at COP27 in 2021. In May 2023 Namibia signed a feasibility and implementation agreement with a German company (Hyphen) to develop a project that would produce 2 Mt of low-emissions ammonia per year for an estimated investment of USD 10 billion (equal to over 80% of the country’s GDP in 2021). The country also mobilised concessional funding of EUR 540 million (USD 579 million) from the European Investment Bank and Dutch firm Invest International to finance its industrial clean energy ecosystem and to fund a potential equity share in the project. Mauritania and Egypt also signed agreements with private developers for major projects and MoUs with potential offtakers.

Few hydrogen projects have reached a final investment decision and concessional finance can play a key role to fund demonstration projects. For example, the German government set up a EUR 350 million (USD 414 million) grant programme to support hydrogen production projects, notably in Africa. Initiatives also exist to reduce uncertainty around demand. In 2021 Germany established the H2Global instrument, a EUR 900 million (USD 1.04 billion) auction-based mechanism, using a contracts-for-difference approach to offer long-term purchase agreements to hydrogen producers and short-term contract sales to end users. South Africa announced in June 2023, with Denmark, the intention to launch a new hydrogen blended finance fund (SA-H2) to accelerate the development of low-emissions hydrogen. While public capital can play a critical role in supporting this nascent trade by stimulating both supply and demand, significant capital from the private sector will also be required.

Ultimately, the continent’s participation in the low-emissions hydrogen trade will depend on actual production costs and financing arrangements, while the eventual volumes exported will be contingent on the evolution of global demand. Currently only 17% of export projects worldwide planned for 2030 have potential offtakers (IEA, 2023d). Regulatory risks are significant, as many governments have yet to implement specific policies and regulations on hydrogen trade, and no standard certification system for the emissions intensity of hydrogen production, conversion and transport has been developed. In addition, existing transport infrastructure would need to be scaled up to withstand high trade volumes at a global scale.

Table 2.8 ▶ Common financing types by project stage

Area	Development	Construction	Operation
Low-emissions fuels and feedstocks	Government grants Concessional debt from multilateral development banks	Concessional and commercial debt Equity Grants Green, sustainability or transition bonds	Balance sheet Revenue from government subsidies

Note: Although not yet in use, green, sustainability-linked and transition bonds may allow existing users or producers of hydrogen from unabated fossil fuel sources to raise debt to shift to lower-emission hydrogen.

Box 2.4 ► Natural gas developments

The continent's large resource discoveries in the past decade provide an opportunity for natural gas to play an expanded role in Africa's energy system. Currently, gas meets around half of North Africa's energy needs, while in sub-Saharan Africa the share of natural gas in the energy mix is a mere 5%. Large resource discoveries provide an opportunity for natural gas to play an expanded role in the region's energy system. Around one-quarter of the 7 000 bcm of natural gas resources discovered in the past decade in Africa has been approved for development, including large developments in Mozambique, Mauritania and Egypt. If these projects are all completed on time, they would provide around 70 bcm of gas a year by 2030.

Cumulative CO₂ emissions from the use of these gas resources over the next 30 years would be around 10 Gt — around four months of global emissions from the energy sector today. Africa's share of cumulative energy-related CO₂ emissions from 1890 to today is around 3%. If the cumulative emissions from burning this gas over the entire lifetime were added to Africa's current contribution, it would raise this share to just under 3.5%. However, there is a risk that new projects with long lead times could struggle to recover their upfront costs if the world is successful in bringing down gas demand in line with reaching net zero emissions by mid-century.

Natural gas demand in Africa rises through to 2030 in the SAS, helping to displace costly oil projects and meet the needs of industry — notably fertiliser, steel, cement and water desalination — and the power sector as a dispatchable source of electricity generation. As a result, from now to 2030 domestic demand accounts for two-thirds of natural gas production under the SAS. Yet there are major barriers to stimulating demand, including the relatively small size of individual markets and the lack of creditworthy offtakers, which weakens the case for investing in capital-intensive, long-lived infrastructure. There is also increasing competition from renewables in power generation and from electricity in end-use sectors, including industry.

Note: For further information see IEA (2022) *Africa Energy Outlook 2022*.

Mobilising capital for a sustainable future

The key to a Sustainable Africa Scenario

S U M M A R Y

- To mobilise the over USD 200 billion needed annually by 2030 under the Sustainable Africa Scenario (SAS), the full range of capital sources need to be deployed. Increasing concessional funding while simultaneously mobilising more private capital must be a priority; in parallel, strengthening domestic financial systems is vital to create sustainable long-term financing options.
- Despite their importance, the amount of concessional funds is not increasing in Africa. They are also failing to target some of the riskiest areas where they are most necessary, such as early-stage project financing, new technologies, and fragile or conflict-prone countries. It is urgent to reorient these funds to increase their impact, including via the ongoing discussion around reforming multilateral development banks, and by reviewing how delivery mechanisms can be streamlined.
- In more developed markets and technologies, mobilising private finance should be a core objective for concessional capital. Innovative, flexible options for credit enhancement abound, and using blended finance structures can adjust project risk–return profiles to appeal to private investors. Under the SAS, concessional funds to support private mobilisation increase tenfold to USD 28 billion by 2030.
- Carbon markets can attract investment by supporting project revenue streams for a variety of projects. They can have a particularly strong impact on clean cooking, which already accounts for almost a quarter of credits issued from Africa in the voluntary market. However, to ensure the effectiveness of carbon markets, countries first need to adopt solid regulatory, monitoring and verification frameworks.
- The global investor community also represents an important capital source, although investor expectations of project size and risk–return profile may mean they require blending with concessional sources in riskier areas. Investors can provide debt via the sustainable bond market and refinancing tools can be used to replace public or DFI capital in brownfield assets with private sources. Private equity and venture capital also play a key role in funding start-ups to support the development of local industry, including in relation to off-grid electricity and clean cooking solutions.
- Although a small player now, over the long term domestic markets are fundamental to energy sector development. Under the SAS, finance originating from or disbursed through local channels increases nearly threefold by 2030. Developing green finance facilities provides a channel for finance while also supporting the creation of bankable projects and the development of capacity at other finance institutions. There are also innovative ways to tap into the growing domestic capital markets, particularly pension funds, such as local currency guarantees or securitisation of distributed energy assets.

3.1 Introduction

Many clean power projects in Africa are reliant on concessional funding, with development finance institutions (DFIs) acting as some of the largest energy investors on the continent. There is significant variance across countries and technologies, as outlined in the previous chapter, but the current approach to financing energy development in the region is failing to keep up with the needs of the SAS.

This chapter looks at the challenge through the lens of the supply of finance, and understanding how the main sources can be better mobilised to support the growing investment needs under the SAS. Enhanced commitments by donors and DFIs are an essential condition to scaling up clean energy investment. However, this also needs to be accompanied by improvements to their existing delivery channels, reviewing their business models to take a more active role in riskier early-stage project development and focusing on how to mobilise more private investment. DFIs and donors also play a particularly vital role in fragile and conflict-prone countries, where other capital is severely lacking. These markets continue to be underserved and risk being further left behind.

There is an opportunity to attract capital from institutional investors – who can provide long-term financing well-suited to clean energy projects – via tools such as sustainable debt issuances and refinancing brownfield assets. Private equity and venture capital also play an important role in funding start-ups, including companies that are tackling energy access gaps or providing innovative solutions to develop local clean energy-related industries. Over the longer term, the continent’s clean energy pathway will only be sustainable if local capital can play a larger role. This will mean supporting banks and the growing local institutional investor base to increase their involvement in clean energy projects. This section explores how to maximise concessional capital as well as the role of international and local capital, from the perspective of the providers.

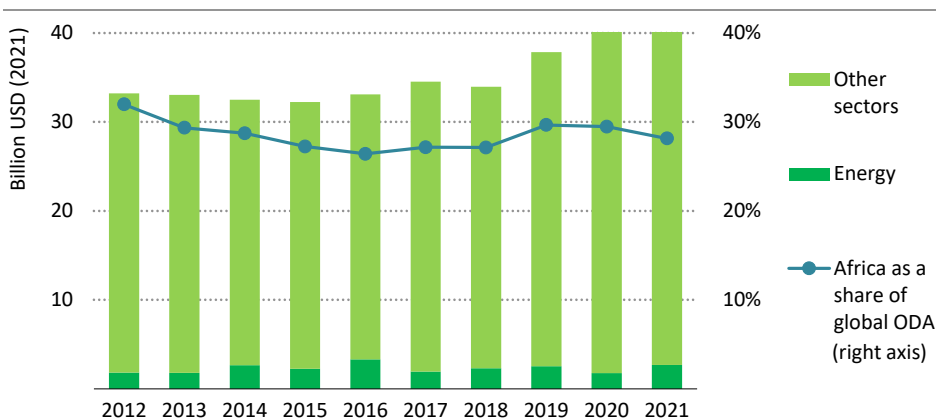
3.2 Maximising concessional capital

DFIs – both multilateral development banks (MDBs) and bilateral DFIs – are critical actors in financing clean energy transitions in Africa. But the level of investment being made thus far falls well short of what is required to meet rising demand for energy services. A stronger focus on private capital mobilisation and a shift away from direct financing towards de-risking clean energy projects can help to scale up private finance in the region. Support is also needed for project preparation and structuring to build project pipelines that can scale rapidly and address the current lack of bankable clean energy projects.

Total bilateral ODA from OECD countries to Africa has risen slightly in recent years, but energy continues to account for a relatively low 6% share – a level that has been relatively static (Figure 3.1). The largest shares of ODA support health (20%) and education (9%). Aid budgets from donor governments have come under increasing pressure in recent years, and they are likely to continue to struggle to allocate more capital to energy projects in Africa due to added pressures on budgets. Ensuring this capital is working as effectively as possible

is therefore paramount. This can be achieved by addressing the existing system's shortcomings in disbursing concessional capital, as well as dramatically increasing the share of capital targeted at mobilising private actors.

Figure 3.1 ▶ **Official development assistance from bilateral sources, Africa, 2012-2021**



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Donor support to Africa has increased marginally over the past decade, and energy projects must compete with multiple other priorities

Note: ODA = official development assistance.

Source: OECD (2022a). Development finance assistance.

3.2.1 Enhance existing concessional finance system

The 2018 MDB joint declaration on Paris Alignment committed MDBs to align all their financial flows with the objectives of the 2015 Paris Agreement, creating an important driver for channelling greater support to clean energy transitions. However, multiple calls on available funding for Africa across different sectors, combined with recent priorities related to the global pandemic, have limited the potential for stronger growth in the sector. For example, the World Bank Group's lending for energy and extraction in Africa rarely goes above 10% of its lending portfolio in the region, as the major focus is put on strengthening government capacity and lending to other development-focused sectors.

While MDBs need to continue to provide financing to cross-sectoral areas, such as governance and socio-economic development, a key question for this report is how to increase their capacity to raise capital and respond to multiple clean energy challenges. Part of the answer lies in new energy-specific initiatives: one promising recent development in this respect was the launch in late 2022 of the Distributed Access through Renewable Energy Scale-Up Platform, intended to help achieve the goal of universal electricity access by 2030 by leveraging the World Bank's expertise to develop innovative financial and de-risking instruments to finance electricity access.

Another part of the answer requires a broader reflection on the role and operation of MDBs. An important element of the MDB business model is to leverage their government-provided capital and raise low-cost debt on the bond markets to refinance the loans they make to developing countries. Historically, MDBs have been cautious about the amount of debt they issue compared with the amount of equity they own, staying well below a 1:1 debt-to-capital ratio, which does not take into account the additional callable portion of the capital they can potentially draw from their government shareholders in special cases. There is an ongoing debate whether they should look more to the debt markets and extract more funds from their balance sheet to address today's multifaceted crises.

In order to better leverage their balance sheets, MDBs in Africa have taken several innovative approaches. In 2018 the African Development Bank Group (AfDB) signed a risk transfer agreement, known as Room2Run, whereby the bank transferred the mezzanine credit risk¹ of a USD 1 billion portfolio of 47 private sector loans to investors for a fee, freeing up an expected USD 650 million in capital for additional lending (see annex for more details). This was the first synthetic portfolio securitisation² between an MDB and private sector investors. Meanwhile, since 2013 the Trade and Development Bank Group, an MDB in East and Southern Africa, has allowed institutional investors (primarily government pension funds from elsewhere in the region) to become shareholders – a model that proves mutually beneficial as it broadens the bank's capital base while also allowing institutional investors to participate in the energy sector via an investment-grade partner.

MDBs also keep a close watch on their credit ratings, although the cost of borrowing has only been marginally affected by these ratings. MDBs currently report half the level of loss allowances compared with large commercial banks, highlighting a more conservative approach to lending than the private sector and room to increase lending to riskier projects (IEA, 2021). However, increasing their leverage may require MDBs to evaluate the quality and liquidity of their overall asset portfolio and prevent them from being able to reach riskier investment areas in the African continent. The G20-commissioned Independent Review of MDBs' Capital Adequacy Frameworks provided some ideas on ways for them to ramp up lending, notably by:

- Refining risk tolerance.
- Further considering callable capital in financial decisions.
- Focusing on crowding-in private sector finance through the use of innovative financing mechanisms.
- Focusing on de-risking to improve risk-adjusted returns.

The World Bank decision to lower its capital adequacy ratio from 20% to 19%, freeing up an additional USD 4 billion per year in financing, did not have any impact on its credit rating.

¹ Mezzanine finance is a form of subordinate debt financing that allows lenders to convert their debt to equity in the case of default. The increased risk associated with being subordinate to secured lenders is typically compensated by higher interest rates and the option to receive equity instead of interest income.

² A synthetic securitisation allows the transfer of risk from one party to another without transferring ownership. It allows the issuer to free up capital and diversify its portfolio by transferring part of its loan book to a special purpose vehicle that is then sold to other investors.

Efforts are underway to transform the global financial architecture to address barriers to financing climate action in emerging market and developing economies (EMDEs). The Bridgetown Initiative, led by the UN Secretary General and the Prime Minister of Barbados, focuses on the immediate needs of developing countries facing debt distress and liquidity concerns and calls for a large-scale stimulus package to support investment in the Sustainable Development Goals (SDGs) while also calling for wholesale reform of the development finance architecture. The initiative highlights six priority actions:

- address the immediate liquidity needs of countries
- address current and long-term debt sustainability
- set a goal to reach USD 500 billion in annual stimulus for SDG investing
- mobilise over USD 1.5 trillion in annual private sector investment in green transformation
- reform international financial institution governance to make them more representative, equitable and inclusive
- create international trade that supports green and just transformation.

Climate finance under the UNFCCC

Climate finance represents an increasingly important pool of capital for clean energy projects as developed countries strive to grow the amount delivered to developing countries, in line with a previous commitment to reach USD 100 billion by 2020. According to the latest numbers from the OECD, developed countries jointly provided and mobilised USD 83.3 billion in climate finance in 2020, of which roughly USD 10.3 billion (12.4% of the total) went to energy³ projects in Africa (OECD, 2022b).

As part of these efforts, the United Nations Framework Convention on Climate Change (UNFCCC) has established a financial mechanism for developing countries to generate projects and activities related to climate mitigation and adaptation. This mechanism is run by the Global Environment Facility (GEF) and the Green Climate Fund (GCF) (UNFCCC, 2023). GEF funding is delivered through 18 GEF agencies,⁴ while GCF operates through a network of over 200 Accredited Entities.⁵ The GCF is intended to be a main channel for finance related to the USD 100 billion goal, meanwhile the GEF has a broader environmental remit. In Africa, the GEF has disbursed USD 2.6 billion (11.8% of total GEF disbursements) to 859 mitigation and adaptation projects, with an additional USD 19.7 billion in co-financing. Meanwhile, GCF has provided USD 6.17 billion in financing to African countries, attracting a further USD 18.8 billion in co-financing; of the 228 approved projects in GCF's portfolio, 92 are in Africa (GCF, 2023a).

³ Energy projects include power, industry and transport.

⁴ These include regional MDBs, UN agencies, governments, civil society organisations, private sector enterprises, and research institutions.

⁵ These include international and national commercial banks, multilateral, regional and national development finance institutions, equity funds institutions, UN agencies, and civil society organisations.

Funds such as GEF and GCF have the advantage of being able to blend a flexible range of instruments to attract private co-investors (see Table 3.1). For example, their ability to provide policy support alongside concessional funding can prove particularly helpful in scaling up nascent markets or technologies. Equally, their ability to aggregate projects and take a regional lens allows them to quickly replicate successful approaches.

Table 3.1 ▶ **Examples of GEF and GCF funded projects in Africa**

Fund	Project name	Target area	Volume of funding
GEF	Global programme to support countries with the shift to electric mobility (10270)	Large-scale introduction of e-mobility through fiscal and regulatory policies, innovative business models and finance mechanisms globally and 12 African countries ¹	GEF grant: USD 50.1 million Co-funding total: USD 651.8 million
GEF	GEF-7 Africa Minigrids Programme (AMP) (10413)	Cost reduction and innovative business models in 21 African countries ²	GEF grant: USD 33.2 million Co-funding total: USD 532.7 million
GCF	Programme for Energy Efficiency in Buildings (PEEB) Cool (FP194)	Stimulating investment in energy-efficient buildings in 11 countries, including 4 African countries ³	GCF loan and grant: USD 233.8 million Co-funding AFD: USD 1.2 billion
GCF	Leveraging Energy Access Finance (LEAF) Framework (FP168)	Supporting 6 African countries ⁴ to develop distributed renewable energy (DRE)	GCF loan, guarantee, grant: USD 170.9 million Co-funding AfDB: USD 164 million Co-funding private sector: USD 315 million
GCF	Desert to Power G5 Sahel Facility (FP178)	Facilitating private investment in solar technological innovations in 5 countries in the Sahel region ⁵	GCF loan, grant, guarantee, reimbursable grant: USD 150 million Co-funding AfDB: USD 380 million Co-funding private sector: USD 437 million
GCF	GCF-EBRD GEFF Co-financing Programme (FP025)	Encouraging private investment in energy efficiency, renewable energy, and climate resilience in 10 countries, including 3 African countries ⁶	GCF loan and grant: USD 378 million Co-funding EBRD: USD 1 billion

¹ These are: Tunisia, Sierra Leone, Côte d'Ivoire, Togo, Burundi, Seychelles, Madagascar, Mauritius, South Africa, Zambia, Zimbabwe and Senegal.

² 1st round: Angola, Burkina Faso, Comoros, Djibouti, Ethiopia, Eswatini, Madagascar, Malawi, Nigeria, Somalia and Sudan; 2nd round: Benin, Chad, Mali, Mauritania, Niger, São Tomé and Príncipe, and Zambia; 3rd round: Burundi, Democratic Republic of the Congo (DRC) and Liberia.

³ These are: Nigeria, Tunisia, Djibouti and Morocco.

⁴ These are: Ethiopia, Guinea, Nigeria, Ghana, Kenya and Tunisia.

⁵ These are: Burkina Faso, Chad, Mali, Mauritania and Niger.

⁶ These are: Morocco, Egypt and Tunisia.

Note: These projects are further analysed in the annex. EBRD = European Bank for Reconstruction and Development; GEFF = Green Economy Financing Facility.

Source: GEF (2023). *GEF Project Database*; GCF (2023b). *Project portfolio*; plus stakeholder consultations.

GEF and GCF remain important vehicles for climate finance for African countries. That said, stakeholders interviewed for this report highlighted three main challenges common to the two funds:

- **Length of process to access funding:** The numerous requirements to access funds mean it can take years between a proposal and the disbursal of funds. Even though GEF and GCF have significantly streamlined their procedures, recipient countries and MDBs still perceive them to be a major hurdle. Navigating the processes also often requires the expertise of dedicated climate finance experts at recipient governments, or of external consultants, which are often from advanced economies, making the geographical distribution of knowledge challenging and adding extra costs to the process.
- **Aligning recipient and funder needs:** GEF and GCF attract funds through economies of scale, often aggregating countries into regional projects. This approach can fail to adequately address country-specific needs, may risk lowering country ownership, and leads to higher transaction and operating costs and possibly sub-optimal results (Mubisa, et al., 2022). However, the alternative – prioritising national programmes – would often mean trying to attract finance for distributed projects that do not align with the size requirements of capital providers.
- **Accreditation challenges:** Several Accredited Entities and agencies consulted for this report expressed concerns about the complexity of the information requested for accreditation. This results in high transaction costs and lengthy processes that can generally only be taken on by large, international institutions. National entities take on average over 10 months longer to go through the GCF accreditation process than international entities (Independent Evaluation Unit, 2023). These lengthy processes are also likely to have an adverse impact on project timetables. Moreover, in certain cases, national Accredited Entities are required to manage and execute projects, but in many African countries potential entities lack the capacity and resources to do so.

While not the main focus of this report, stakeholders also flagged challenges specific to financing adaptation projects, where significant further work is needed to develop clear benchmarks for investors and to unlock financing for climate adaptation. The newly introduced AfDB Adaptation Benefit Mechanism acknowledges that the majority of adaptation efforts have a financial barrier and are not financially viable for private sector investors. The mechanism offers a clear and reliable method to assess the level of financial assistance needed to attract developers to an adaptation activity. This topic is explored in more detail in the IEA's *Africa Energy Outlook 2022*.

Box 3.1 ▶ **Just Energy Transition Partnerships in sub-Saharan Africa**

In recent years, Just Energy Transition Partnerships (JETPs) have emerged as a new means of channelling targeted funds to EMDEs to support their transition plans. At the Glasgow COP26 in 2021, the first political agreement for a JETP was announced for South Africa as the European Union, France, Germany, the United Kingdom and the United States

proposed to support a package of USD 8.5 billion over three to five years to fund the country's transition.

Since the announcement, South Africa has developed a USD 98 billion Just Energy Transition Investment Plan 2023-2027, which identifies priority sectors (power, electric vehicles and low-emissions hydrogen) for JETP support. Transmission infrastructure is expected to account for a large share of the support given the particular challenges in attracting finance to this area (see Section 2.4). However, there is still a lack of clarity over several key aspects of the JETP. For instance, difficulties have arisen when defining the breakdown of funds into the share of grants and concessional funding, and the contributions from each of the five funders.

Although implementation can be complex, JETPs provide a useful framework for international co-operation that is centred on the beneficiary's priorities. Success will depend on securing match funding to support them. Additional JETPs have since been announced at COP27 for Indonesia (USD 20 billion) and Viet Nam (USD 15.5 billion). In June 2023 a EUR 2.5 billion JETP was declared for Senegal. This country is the first Least Developed Country recipient, and not a large emitter. Funds pledged are on par with South Africa and Viet Nam on a per-capita basis, but 7 to 15 times higher relative to national emissions.

3.2.2 Mobilising private capital

DFIs can utilise a wide range of proven tools to facilitate greater levels of private investment. Technical assistance and capacity-building grants can help improve the broader operating environment, but deals can also be structured to include a combination of credit enhancements, such as guarantees, risk-sharing mechanisms and targeted measures like currency hedging (see Table 3.2).

The use of these mechanisms has evolved significantly over time and, as government guarantees have fallen out of favour due to high debt levels in many countries, innovative solutions have emerged that are more tailored to the needs of the country and technology. One example of this is the financing structure for the Kinguélé Aval hydro plant, the first grid-connected independent power producer (IPP) in Gabon. This 35 MW project was sponsored by France-based private investor Meridiam alongside the Gabonese sovereign wealth fund. Debt was raised from both DFIs and private investment funds via a special purpose vehicle. In order to mitigate liquidity risk at the offtaker, an escrow account was established and payments to the project will be channelled via a mobile money operator, Airtel, based on prepaid electricity payments.

Table 3.2 ▶ Credit enhancements commonly used in African energy projects

Enhancement group	Instruments	Risk mitigated	Examples
Government support	Sovereign guarantee Letter of support	Regulatory risk Political risk Offtaker risk Termination risk	Egypt: Benban solar project Kenya: Thika power project
Multilateral guarantee and insurance	Partial risk/credit guarantee (PRG/PCG) Political risk insurance Reinsurance Export credit guarantees/ trade products Factoring	Offtaker risk Political risk Regulatory risk Termination risk	Providers such as AfDB (PRG and PCG), GuarantCo, MIGA, Africa Trade Insurance Regional Liquidity Kenya: Lake Turkana wind power Senegal: Taïba Ndiaye Ethiopia: Tulu Moye geothermal Djibouti: Ghoubet wind farm
Risk sharing and pooling products	First-loss provisions Mezzanine finance Contingent loans Viability gap funding Demand aggregation	Lack of project pipeline Offtaker risk	Funds such as SEFA, Emerging Africa Infrastructure Fund, Africa Guarantee Fund Multiple projects including Chad (Djermaya solar PV), Guinea Bissau (Saltinho hydro), São Tomé and Príncipe (mini-hydro) and Togo (mini-grid)
Liquidity support	Escrow account Letter of credit Liquidity facility Overcollateralisation	Offtaker risk Inflation Currency risk	Commonly used in project finance, notably in transactions structured by or involving DFI support Gabon: Kinguélé Aval
Currency hedging	Local currency guarantee Currency swap or derivative product	Currency risk	The Currency Exchange (TCX) Nigeria: InfraCredit

Notes: This list is not comprehensive. Many of these examples are explored in more detail in the annex.

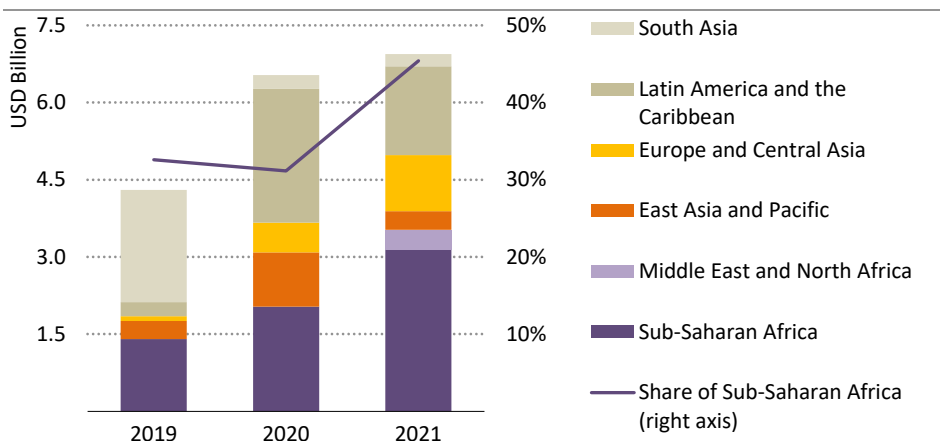
DFIs will often apply credit enhancements via blended finance transactions. Blended finance⁶ is a structuring approach that uses concessional development funding to mobilise private capital by improving the risk–return profile of projects. This is primarily achieved by lowering the cost of capital with concessional capital, using guarantees or other risk-sharing and liquidity support to mitigate risks, or providing grants to support project preparation and project structuring.

The African region has been one of the main recipients of blended finance both in the number of deals and total amount, with current annual spending of around USD 3 billion (see Figure 3.2). However, this falls short by a factor of nearly ten the needs of the SAS in 2030, by which time an estimated USD 28 billion in concessional funds would be required to

⁶ The OECD defines blended finance as the strategic use of development finance (from public and philanthropic funders) for the mobilisation of additional finance towards sustainable development in developing countries.

mobilise some USD 90 billion in private financing.⁷ About half will be needed to create and expand renewable power systems, with another third going to efficiency and end-use, and the remainder supporting development of low-emissions fuels, grids and energy storage. Concessional financing will play a key role in supporting newer technologies such as battery storage and low-emissions hydrogen that are not yet cost-competitive.

Figure 3.2 ▶ **Blended finance by region, 2019-2021**



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The use of blended finance instruments has been steadily increasing, with sub-Saharan Africa now accounting for over 40% of transactions

Note: There are some projects at a global level that are excluded from this figure.

Source: Analysis prepared by Convergence (2022).

Part of the challenge in designing blended finance transactions is ensuring the right proportion of concessional funding is used – enough to attract the private sector while still ensuring the most efficient use of public capital. According to Convergence, more than half of the blended finance transactions for all climate-related projects include concessional loans, whereas only about 20% utilise guarantees and risk insurance and another 20% use technical assistance grants. A shift towards guarantees and insurance would help to leverage higher amounts of private capital and require less concessional funds as the provision of a guarantee would require holding just 25-30% of the amount in reserve, therefore allowing more projects to be supported.

Equally, data collected by Moody’s shows that default rates on infrastructure projects in Africa are among the lowest in the world – 5.5% compared with 8.8% in Asia and 12.9% in

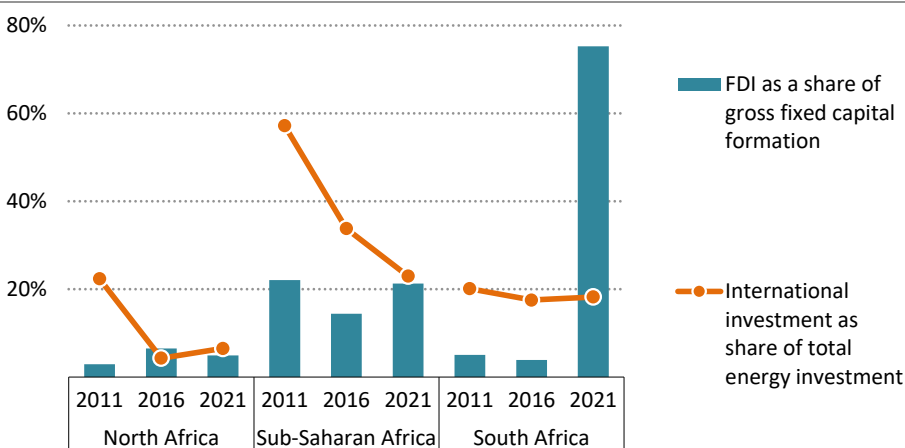
⁷ These estimates do not include any concessional support to state-owned enterprises, which are likely to need DFI and donor capital to shore up their finances and make public investments, or for government capacity building, which will be essential to ensure that there are enough bankable projects to absorb the capital raised.

Latin America (The East African, 2022). This is likely to be due to the high bar that projects must clear in Africa to attract finance and implies that at least some of the risks being mitigated are perceived as opposed to actual. Further data on both default rates and the extent of credit enhancements on each project would allow for a more granular analysis of risk, potentially reducing the level of concessional finance necessary for future projects.

3.3 Unlocking international private investment

International investment plays a key role in clean energy development, particularly while local capital markets are still developing. However, overall foreign direct investment (FDI) into Africa has been volatile over recent years, falling to its lowest level since 2005 in 2020. While this was primarily the result of the Covid-19 pandemic, even in the five years prior, FDI had fallen from USD 55 billion to USD 40 billion as investor interest in EMDEs waned. Flows have since rebounded but, excluding South Africa, inflows are still nearly 20% lower than the record high reached in 2015.

Figure 3.3 ▶ Role of FDI in domestic capital formation, and international investment in the energy sector, regions of Africa



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Foreign investment in energy has fallen over the past decade, along with economy-wide FDI, which still accounts for a small share of investment, particularly in North Africa

Notes: South Africa's FDI in 2021 was skewed by the share exchange between two technology companies and the country drawing down on special drawing rights. These were both one-off events and are therefore not indicative of broader trend.

Source: World Bank (2023). *World Development Indicators*.

Greenfield FDI – investment into new production facilities as opposed to the acquisition of existing ones – has also failed to significantly ramp up. Globally, greenfield FDI fell at an average rate of 3% per year between 2010 and 2021; Africa accounted for less than 10% of

this investment. Despite this, there are signs of progress in sub-Saharan Africa, with FDI taking on a larger share of gross fixed capital formation since 2016 – a measure of total investment (see Figure 3.3).

Increasing the level of foreign investment in the continent relies on understanding where this capital can most effectively be deployed and creating an appropriate pipeline of investable products. The growth of mandatory and voluntary carbon markets can help with the project pipeline since, although they do not provide upfront financing, they can provide revenue streams that strengthen the commercial viability of projects. Over time, they may also lead to the creation of new financial instruments, including the securitisation of revenue streams, in order to attract further capital.

Outside their role as buyers of carbon credits and thus a source for generating project revenue, international investors participate in energy projects via equity (in either public or private companies, or off-balance sheet structures), or via debt financing from banks or the bond market. The limited pool of large, creditworthy projects means much investment is channelled through specialist investment funds to access non-listed companies or to finance projects directly. This also means private equity and venture capital have a particularly significant role to play in supporting innovation and start-ups.

Box 3.2 ▸ The changing role of Chinese financing

China's role in African economies has been increasing since the early 2000s. It became the continent's largest trading partner in 2009. China is now the fourth largest investor in Africa and accounts for about one-fifth of all lending, much of which goes to energy and infrastructure projects. China committed USD 148 billion in loans to Africa between 2000 and 2018, roughly a quarter of which were in the energy sector (Brautigam, et al., 2020). However, lending to African power projects fell from its peak of almost USD 8 billion in 2016 to USD 1.5 billion in 2019 as China's policy banks focus more on domestic projects (Brautigam, et al., 2020).

Financing from China has primarily been in the form of large low-cost loans from development banks or state-owned energy and construction enterprises. Changing dynamics point to a shift in China's dealings with Africa. At the Forum on China Africa Cooperation in November 2021, China's president announced a one-third reduction in public financing to Africa and emphasised the growing role of Chinese private investment, although no specific targets have been announced. Together with China's move away from funding coal plants abroad and the country's huge capacity for clean energy manufacturing, this is likely to result in more emphasis on renewable energy projects via Chinese developers.

Note: For further information refer to Chapter 3 of the *Africa Energy Outlook 2022*.

3.3.1 Carbon markets

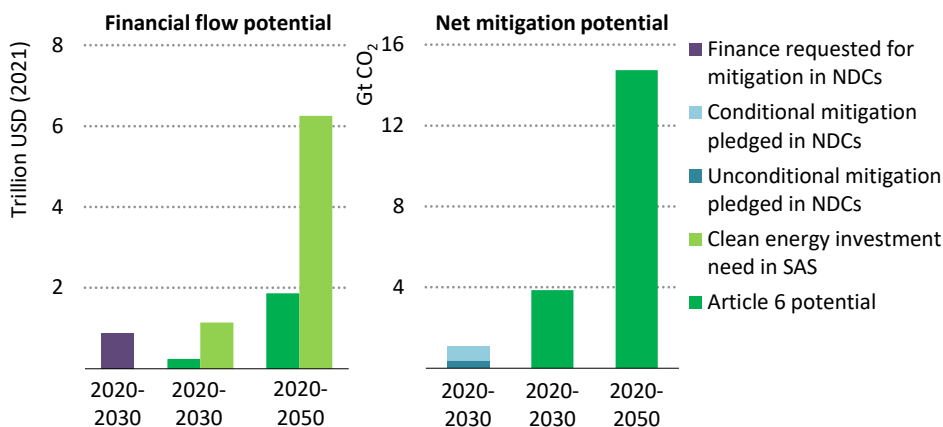
International carbon markets allow countries and companies to generate and trade carbon credits, each of which is verified metric tonne of GHGs reduced, avoided or removed from the atmosphere. These markets can provide flexibility as to where and when GHG emissions are reduced or removed, and in doing so offer economic efficiency. Carbon markets also provide host countries and project developers extra revenue streams, which de-risk their clean energy investments while enabling buyer countries to adopt more ambitious mitigation targets. Project developers can generate and sell credits either under the international crediting mechanism of the UNFCCC (such as the Clean Development Mechanism [CDM] under the Kyoto Protocol in the pre-2020 period, or Article 6 under the Paris Agreement post-2020), or via voluntary carbon markets (VCMs), which are independent crediting mechanisms, self-regulated and managed by non-governmental entities (such as Verra or Gold Standard).

Most African countries were not able to take full advantage of the CDM due to a combination of the slow pace of establishing the necessary institutional and governance frameworks, difficulties with private sector engagement, uncertainty over the investment environment, and reliance on imported technologies (Hunzai and Krämer, 2021). Collectively, all 54 African countries accounted for only 3% of CDM credits issued globally; moreover, four countries (Egypt, South Africa, Uganda and Kenya) accounted for 83% of these. One single nitrous oxide (N₂O) destruction project in Egypt alone represented almost 30% of all CDM credits issued in Africa.

In the post-2020 regime, Article 6 of the Paris Agreement presents new opportunities for African countries to engage in carbon markets. They can exchange Internationally Transferred Mitigation Outcomes (ITMOs) among each other or with other bilateral partners (under Article 6.2) or issue credits in a new UNFCCC-governed international carbon market, known as the Article 6.4 mechanism. Voluntary co-operation under Article 6.2 has already started, while the Supervisory Body of the Article 6.4 mechanism aims to have it operational by COP28.

At least 42 African countries have expressed their interest in or intention of engaging under Article 6 in their latest NDC submissions, with the majority seeing themselves as a seller of credits. In the IEA's *Africa Energy Outlook 2022*, an assessment of the potential of Article 6 for African countries showed that this could generate USD 225-245 billion by 2030, while reducing 3 500-3 850 Mt CO₂ compared with scenarios without Article 6 co-operation over the same timeframe (see Figure 3.4). This implies that the implementation of Article 6 could deliver financial flows that exceed 20% of clean energy investment needs in Africa by 2030. While these investment flows would apply across all sectors, they could nonetheless be an important investment source for the energy sector, helping tip clean energy projects into bankable propositions.

Figure 3.4 ▶ Finance requested in latest NDCs, potential Article 6 financial flows and CO₂ emissions reduction potential in Africa



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Article 6 financial flows could reach over 20% of the total investment in clean energy required under the SAS in Africa in 2020-2030 and roughly 30% in 2020-2050

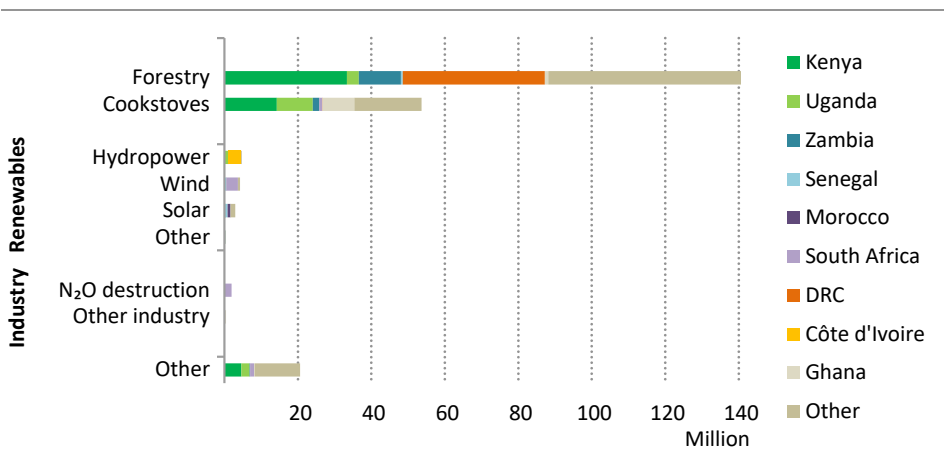
Notes: The estimation of Article 6 financial and mitigation potential is from the research project “Modelling the Economic Benefits of Article 6” by the International Emissions Trading Association (IETA) and the Center for Global Sustainability at the University of Maryland. Levels reported represent upper bands of the scenarios included in the model. The model simulates demand and supply of credits through Article 6 co-operation by countries, and presents some limitations, such as the assumption that all revenues from Article 6 co-operation are reinvested in increased mitigation ambition.

Source: IEA analysis based on data from Yu et al. (2021). The Potential Role of Article 6 Compatible Carbon Markets in Reaching Net-Zero.

To participate in Article 6, interested countries have to develop new or update existing institutional frameworks, monitoring procedures and GHG inventories. Some countries have already made significant progress: Ghana is among the most advanced countries globally, with Kenya, Malawi, Nigeria, Rwanda, Senegal, Uganda and Zambia also actively preparing for Article 6 implementation (Hynes, Hall, and Machnik, 2023). Ghana took early steps to develop and enforce the necessary legislation to participate in Article 6.2, adopting a framework law in 2022 followed by the creation of the Carbon Market Office and accompanying website for transparent reporting on Article 6 co-operation. This high level of preparedness and transparency has built confidence in prospective buyer countries, and as of June 2023 Ghana has already signed four Article 6.2 agreements, with Switzerland, Sweden, Singapore and Korea. The bilateral agreement with Switzerland includes the National Clean Energy Access Programme (NCEP), which enables Switzerland to purchase ITMOs generated by private-sector led solar PV and improved cookstove projects through a payment-for-results mechanism (UNDP, 2023a). According to the UN Development Programme (UNDP), private sector investment in projects covered by this initiative can be equivalent to four times the revenues generated by the ITMOs (UNDP, 2023b).

African countries can also tap into the potential of VCMs to develop climate mitigation projects. However, only 11% of all credits used in VCMs between 2016 and 2021 were issued in African countries. The African Carbon Markets Initiative (ACMI) estimates that Africa currently utilises only 2% of its yearly carbon credit potential (ACMI, 2022). VCM projects are currently concentrated in five countries (Kenya, Zimbabwe, DRC, Ethiopia and Uganda), which account for 65% of credits issued over the past five years. Moreover, 15 project developers own projects that have issued 73% of all credits on the African continent over the past ten years (ACMI, 2022). And 85% of all African VCM carbon credits issued between 1996 and 2023 are from two types of project: forestry and land use, and clean cookstoves (see Figure 3.5).

Figure 3.5 ▶ Volume of VCM carbon credits issued in Africa by project and country, 1996-2023



IEA. CC BY 4.0.

Around 85% of VCM credits in Africa have been issued from projects relating to forestry and land use and clean cookstoves in a handful of countries

Source: IEA analysis based on Berkeley (2023). *Voluntary Registry Offsets Database*

Some African leaders, such as Kenya's President William Ruto in his address at COP27 (NTV Kenya, 2023), have called for higher transparency and fewer intermediaries in VCMs.⁸ Costly (international) intermediaries between project developers and buyers, and a lack of overall transparency on benefit sharing can significantly reduce the amount of funding to Africa and local communities, often to as little as 10% of the carbon revenue (Climate Action Platform Africa, 2023). The lack of regional validation and verification bodies also adds costs to the VCM credits. Some countries, such as Zimbabwe (Bloomberg, 2023a), Kenya, Malawi and

⁸ H.E. William Samoei Ruto stated that, "Kenya's next significant export will be carbon credits. This is why we call for simplified, more transparent carbon market systems that directly benefit communities and not just intermediaries".

Zambia (Bloomberg, 2023b) have proposed measures that stipulate the share of carbon credit revenue that must be allocated to the government and local investors.

Box 3.3 ▶ **Carbon credits for clean cookstoves**

Clean cookstoves are the most represented type of energy-related project in VCMs: 15% of the almost 8 000 VCM projects that issued credits are for clean cookstoves (University of California, Berkeley, 2023). Of these, almost 60% are based in Africa, which have issued around 54 million credits, or 68% of all carbon credits issued by this type of project globally. Clean cookstove projects have the advantages of typically being highly additional (i.e. the projects would not have happened in the absence of the price signal from carbon credits) and of bringing valuable sustainable development co-benefits to the local population, such as increased energy access and health benefits. However, according to the Carbon Credit Quality Initiative, crediting from clean cookstove projects also presents some known limitations, such as:

- **Overestimation of emission reductions:** Most clean cookstoves projects use a manual monitoring, reporting and verification (MRV) system to verify the volume of credits that can be issued. This often involves random sampling to establish usage trends of the new cookstove, which can inevitably lead to extrapolated uncertainty. The Carbon Credit Quality Initiative estimates that 70% of energy-efficient cookstove projects globally are likely to be overestimating the reduced emissions (Calyx Global, 2023). Although some partial technical solutions are known, their implementation costs are still disproportionately high.
- **Non-permanence of emissions avoided:** Clean cookstoves reduce both the GHG emissions associated with the combustion of traditional biomass while also reducing deforestation and the emission of CO₂ stocked in forests or other land areas. However, forests are also vulnerable to several other natural risks, including climate change or forestry policy changes that could reverse the emissions avoidance effect of clean cookstoves.
- **Double issuance of credits:** Without a systematic check, there is potential for overlapping claims of avoided deforestation between forestry and clean cookstove projects operating in the same area.

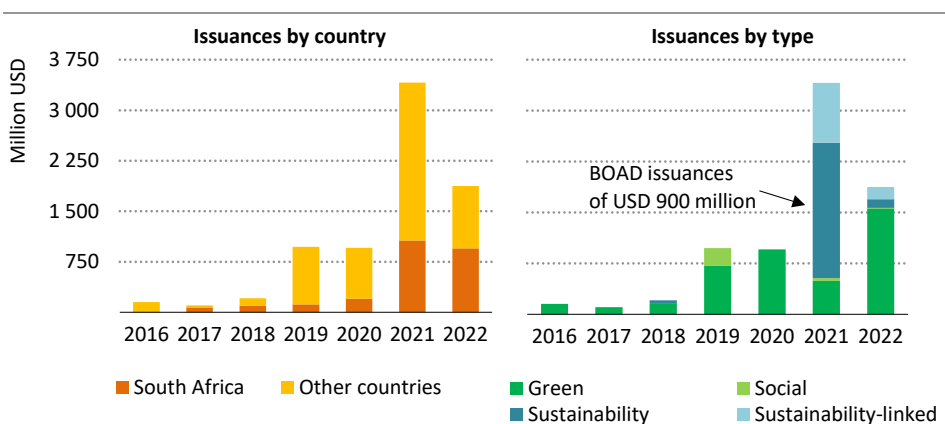
3.3.2 Sustainable bond issuances

Worldwide, bonds are a common way for companies to raise debt, but they are less prevalent in EMDEs since issuances may not be large enough to meet international market expectations and many would-be issuers lack investment-grade credit ratings. Bond markets in Africa are still nascent, totalling less than USD 1 trillion – the equivalent of less than 1% of the global total. They are also heavily dominated by government bonds, which accounted for just under 90% of total issuances in 2021. Most of these government issuances are in the domestic market, although since 2007 21 African countries have accessed international debt

markets via Eurobonds (foreign currency bonds issued in major global financial hubs) (IMF, 2021). By 2021 these Eurobond issuances had reached USD 140 billion, or roughly 20% of total outstanding government bonds in the region.

Although this access to the international market has added to the debt levels of the region (discussed in Chapter 1), it also presents a significant opportunity to raise capital for energy projects. In particular, green, social, sustainable and sustainability-linked (GSSS) debt instruments have been growing in popularity since they often attract a lower yield than their vanilla counterparts (known as the “greenium”). These instruments can be issued by corporates to support project or company finance, by financial providers to support green lending, or by government bodies to support debt management and raise green public capital.

Figure 3.6 ▶ Sustainable debt issuances by country and type, Africa, 2016–2022



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GSSS issuances have been steadily increasing, but are dominated by South Africa except for one-off issuances, mostly by pan-African banks

Note: BOAD = La Banque Ouest Africaine de Développement (West African Development Bank).

Sources: IEA analysis based on Environmental Finance (2023). *Data*; and Bloomberg (2023c). *Sustainable Debt Issuances*

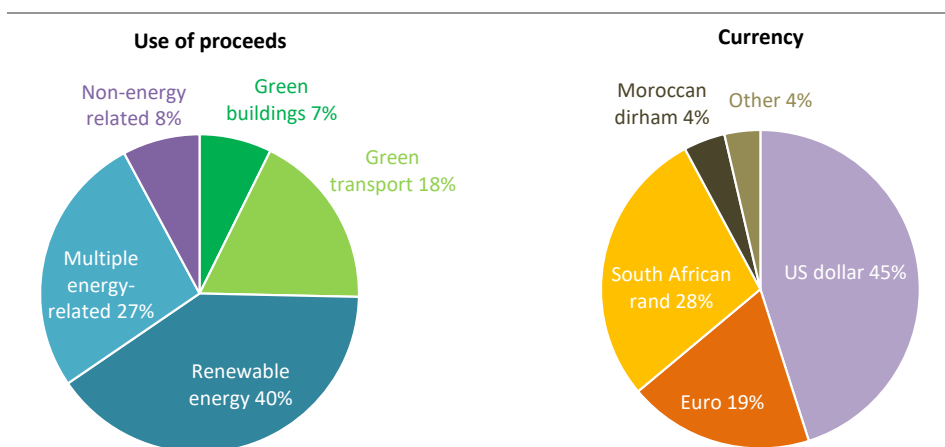
GSSS issuances in Africa have increased from USD 207 million in 2018 to nearly USD 1.9 billion in 2022, but still account for less than 1% of the global GSSS market. Issuances are concentrated in South Africa, which accounts for over 35% of issuances by dollar value to date (see Figure 3.6).⁹ Corporates make up the largest group of issuers, although large regional banks have becoming increasingly active in the space over the last two years. For

⁹ This refers to the GSSS labelled space. The unlabelled space is large in many emerging and developing markets either because relevant taxonomies are not in place or because issuers are not familiar with the process to secure a GSSS label.

example, the Banque Ouest Africaine de Développement (West African Development Bank, BOAD) issued a EUR 750 million (USD 890 million) 12-year sustainability bond in 2021, marking the largest GSSS issuance on the continent.

Green bonds are generally the preferred instrument by number of issuances. Use of proceeds are dominated by renewable energy, which accounts for 40% of cumulative issuances (see Figure 3.7). Public transport has been a key target for public sector bonds; for example Egypt’s first sovereign green bond, issued in 2021, will be partially used to finance the Cairo Monorail, and Morocco’s rail operator issued a green bond in 2022 to refinance debt to build an electrified high-speed line. Within the past two years green buildings have also become more prominent, particularly in South Africa and following Kenya’s first green bond issuance, which will fund efficient student housing in Nairobi.

Figure 3.7 ▶ **Characteristics of sustainable debt issuances in Africa, 2014-2023, by dollar value**



IEA. CC BY 4.0.

Green bonds most commonly target renewable energy, with sovereign issuers focusing on green transport; issuances are dominated by hard currency outside Southern Africa

Note: Use of proceeds allocated according to primary use unless not possible to determine.

Source: IEA analysis based on Environmental Finance (2023). *Data*; and Bloomberg (2023c). *Sustainable Debt Issuances*.

Alongside more traditional green bonds, there has also been a rise in sustainability and sustainability-linked bonds, which can be particularly useful for sovereigns since fungibility rules can prohibit the issuance of a “use-of-proceeds” bonds. In 2021 Benin became the first country in Africa to issue a sustainability bond – a EUR 500 million bond with a 12.5-year tenor that was reportedly three times oversubscribed and attracted a greenium of 20 basis points. Although Benin’s sovereign credit rating was below investment grade, the bond was

able to attract international investors thanks to its detailed SDG Framework, costing analysis and monitoring and evaluation plans, as well as a partial credit guarantee provided by AfDB.

Nearly two-thirds of issuances occur in hard currency, which is the natural result of both the dollarisation of many large investments in the region and the need to appeal to international investors. In other EMDEs there has been a rise in local currency sovereign issuances, including India's recent issuance that attracted a 5-6 basis point premium and was four times oversubscribed. These are often used as a tool to spur local currency corporate issuances. Local currency bonds are most likely to be issued in countries with more liquid financial markets or in West and Central African countries where the currency is pegged to the euro. Outside these areas, issuances may also need to be accompanied by a de-risking element – either currency hedging or a guarantee from an investment-grade issuer, such as a DFI.

The size and creditworthiness requirements for bond issuances are likely to serve as a block to the widespread role of GSSS bonds outside countries with well-developed capital markets and creditworthy entities in the energy sector. However, using DFI and donor guarantees, as seen with the Benin sovereign issuance, can help a broader range of actors utilise these tools, including countries with credit ratings below investment grade.

Innovative solutions are also emerging to target underserved markets. For example, impact investor platform Symbiotics has set up a securitisation company, MSME, that uses GSSS bond issuances to grant loans to financial institutions in EMDEs. Application of the proceeds includes several off-grid projects in Africa, including Greenlight Planet (now Sun King) in December 2021. Similarly, in Nigeria local currency guarantee provider InfraCredit has helped grow the local green bond market (see Section 3.4).

Governments can also play their part by developing sustainable finance taxonomies and environmental, social and governance (ESG) reporting frameworks, in line with international best practices. Currently, few of these are present across Africa: notable exceptions include South Africa's ESG taxonomy, published in April 2022, and Nigeria's Green Bond Framework, developed in 2017 and allowing for the launch of the continent's first sovereign green bonds. Countries with larger financial markets, such as Mauritius and Kenya, have also sought to develop sustainable finance regulations, especially within the banking sector.

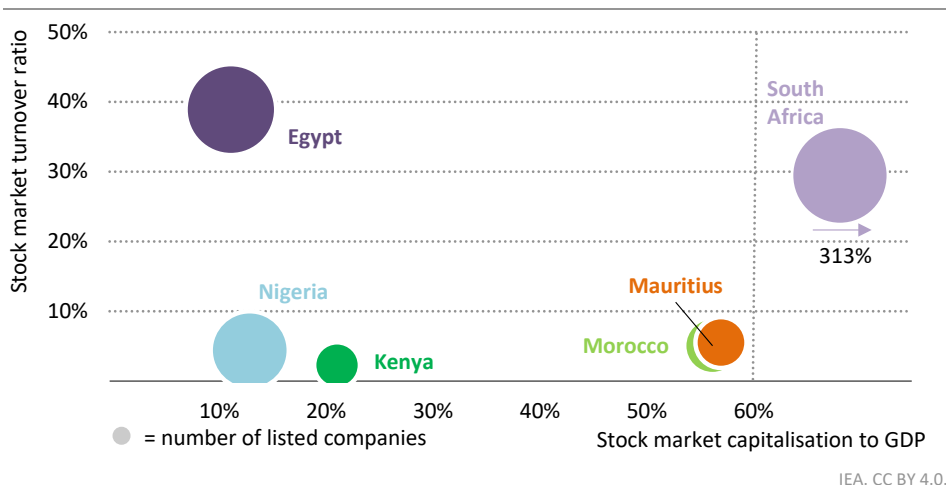
3.3.3 Public equity investment

Capital markets in Africa are significantly smaller and generally less liquid than advanced economies (with the exception of South Africa), which limits the role of public equity investing. There are currently 29 stock markets in Africa, but only three – South Africa, Egypt and Nigeria – have more than 100 companies listed, and the majority have low stock turnover rates, indicating the lack of liquidity (see Figure 3.8). The small size of listed markets and the low sovereign credit ratings across the continent, mean that only 12 countries¹⁰

¹⁰ Morocco, Nigeria, Kenya, Mauritius, Côte d'Ivoire, Tunisia, Botswana, Ghana, Namibia, Zambia, Egypt and South Africa.

feature on major emerging and frontier indexes, which serve as benchmarks for many investors. Accessing assets beyond these countries is left to specialists with the expertise and fiduciary capacity to explore such opportunities.

Figure 3.8 ▶ Characteristics of the largest stock markets in Africa



Only six stock markets in Africa have over 50 listed companies; turnover rates are low outside Egypt and South Africa, demonstrating the limited liquidity

Note: Bubble size = number of listed companies.

Sources: World Bank (2023). World Development Indicators; Statista (2023). Africa: Number of Publicly Listed Companies by Country.

The pool of investable assets is also small. Energy and utility companies make up a small proportion of listed companies, and the sector’s assets in most cases are concentrated into one or two companies. Equally, infrastructure assets on the continent do not generally meet the needs of investors. Infrastructure assets are often appealing to investors due to their non-cyclical nature, which stems from their recurring revenues. However, many assets in Africa are greenfield and exit opportunities have historically been limited by the small secondary debt markets and illiquidity within the equity space. As a result of these challenges, most investments in African infrastructure are unlisted – either through direct project finance or via private investment funds – and are only accessible to a much smaller part of the global investment industry.

Under the SAS, opportunities emerge to build on recent progress and take advantage of the growing number of brownfield assets that will come to market as the energy sector develops. Over recent years there have been several examples of using public listings to raise institutional investor capital for existing assets while also providing DFIs a means of exit. For example, in 2019 Helios Towers, which owns over 7 000 mobile communications towers across the continent, completed an initial public offering (IPO) on the London Stock

Exchange, raising GBP 250 million (USD 317 million) and allowing the IFC, one of its existing shareholders, to reduce its stake (MOBILIST, 2021). Another means of exit is for DFIs to sell their assets to a company that is already listed, as occurred in 2020 when Norfund sold its shares in SN Power – a company created by Norfund and Norwegian government-owned hydropower company Statkraft AS – to Oslo-listed Scatec Solar for USD 1.17 billion (MOBILIST, 2021). SN Power acquired, developed, constructed and operated hydropower assets in EMDEs. Both of these examples involved international stock exchanges, which are more able to handle transactions of this larger scale. African governments have the opportunity to seek to grow local capital markets by including requirements that at least some of the equity in energy projects is listed on local stock exchanges.

Another area with significant potential is refinancing and asset recycling, particularly in the larger capital markets that are more familiar to broader investors. Refinancing vehicles can be created prior to assets becoming operational – as seen with the three-step Climate Investor One fund (see Box 3.4) – or preparations for refinancing can be made at financial close, allowing the construction finance to be provided by commercial banks and later replaced by institutional investors and debt providers. This provides equity investors with a means of exit, and longer-term debt providers a lower risk opportunity to enter. There have already been developments in this area, with a report from AIIM finding that 24% of infrastructure deals on the continent between 2009 and 2017 were exits for equity holders. Governments and DFIs can support these efforts by designing an asset recycling programme that frees up their capital to reinvest in greenfield assets.

Box 3.4 ▶ **Piloting approaches to brownfield asset financing**

Brownfield assets in Africa are in short supply and many are public assets that may have restrictions on who can own them. However, steps can be taken to prepare for the next wave of assets that come online, as evidenced by the complete life cycle project financing fund **Climate Investor One**, operated by Dutch DFI **FMO**. The fund is split into three – a development fund, a construction equity fund, and a refinancing fund – with the level of concessional capital decreasing as projects move through the funds. No projects have yet reached the refinancing fund, but the vehicle is designed to provide long-term senior debt, allowing for a reduction in the cost of capital, and hopefully attracting primarily private investors. The fund will provide an interesting test case for refinancing as it will indicate the level of blending that private investors will find necessary.

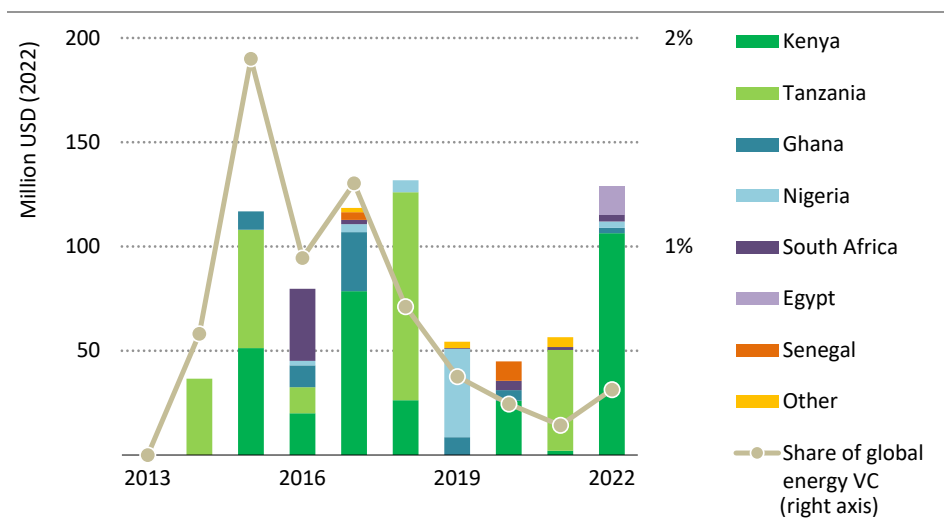
Another key programme to change the approach to brownfield asset financing is **Africa50's Asset Recycling Programme**. In January 2023 Africa50, the pan-African infrastructure investment platform, signed an MoU with the Gambian government to manage and operate the Senegambia Bridge under a public–private partnership (PPP), freeing up public resources to invest in other infrastructure assets. A similar arrangement was signed with the Zimbabwean government for three airports in December 2022, and with the Togolese government in July 2023 to convert a road project into a PPP.

3.3.4 Private equity and venture capital

Globally, clean energy transitions will result in a tripling of the current market for mass-manufactured clean energy technologies, the market reaching a value of USD 650 billion a year by 2030 if countries worldwide fully implement their announced energy and climate pledges (IEA, 2023a)). Africa’s economy grows faster in IEA scenarios to 2050 than any other region except India, increasing its share of global GDP by more than 50%. This presents a significant opportunity for the continent to increase its role in global markets for industrial materials, construction and consumer goods, including those related to clean energy.

Venture capital (VC) and private equity can play a key role in financing the development of these new products and services. VC is the typical way in which early-stage entrepreneurs are financed to test and bring an idea to market. In 2022 early-stage VC for energy start-ups grew by 20% to USD 6.7 billion globally (IEA, 2023b). As start-ups grow into more established private enterprises, they seek to tap into growth-stage equity investment, a market that reached USD 34 billion globally in 2022 for energy start-ups.

Figure 3.9 ▶ **Venture capital investment in energy start-ups based in Africa, by country, 2013-2022**



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While African energy start-ups attracted over USD 130 million in 2022, substantial year-on-year growth in the sector has eluded African countries over the past decade

Note: Includes early-stage and growth-stage investments according to the methodology used in IEA (2023). *World Energy Investment 2023*.

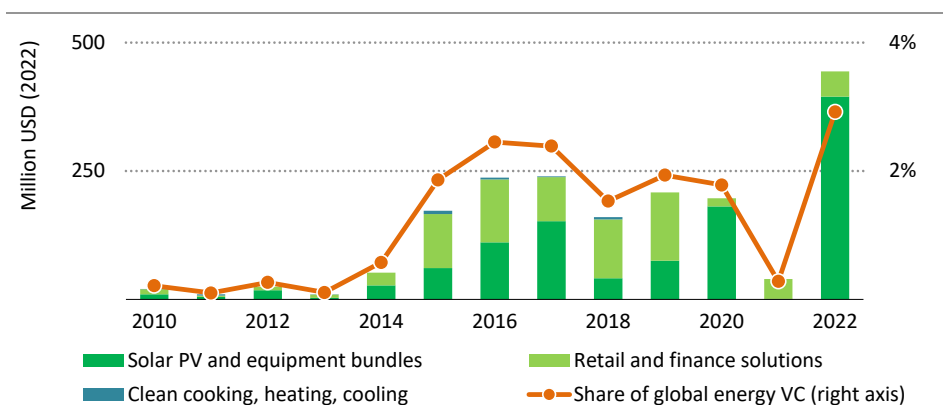
Source: Cleantech Group (2023).

Just 0.3% of this early- and growth-stage investment went to Africa-based start-ups in 2022 (see Figure 3.9). While the global amount of VC for energy start-ups has risen sixfold since

2015, and more than doubled since 2020, African start-ups have represented a steadily decreasing share. Just five countries – Kenya, Tanzania, Ghana, Nigeria and South Africa – represent 95% of the African total since 2015. This concentration is, in large part, due to the financing challenges in smaller markets. Shifting this trend to a more positive outlook will take a long-term commitment to addressing barriers, some of which lie far outside the purview of energy and environment ministers (IEA, 2020). The development of institutions that nurture and formalise private equity investment is a step that underpins the development and growth aspirations of most EMDEs (Bonini and Alkan, 2012).

Attention also needs to be given to relevant technologies from non-African start-ups that are supported by VC portfolios in advanced economies. Equity investment in start-ups aiming to improve access to energy services in EMDEs rose above USD 400 million in 2022, but still represented just 1% of total energy VC globally. This share reflects lower profit expectations for energy access compared with other energy areas and a lack of awareness of this critical challenge among innovators and investors in advanced economies (see Chapter 2). Yet the addressable market opportunity is large and the need for appropriate innovation is striking.

Figure 3.10 ▶ VC investment in start-ups developing energy access products and businesses, Africa, 2010-2022



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VC investment in energy access reached a new high in 2022, in absolute terms and relative to other energy VC; this was dominated by funding for start-ups producing solar PV systems

Note: Includes early-stage and growth-stage investments according to the methodology used in IEA (2023). *World Energy Investment*.

Source: Cleantech Group (2023).

To date, VC-backed energy access start-ups have piggybacked on broader technology trends. Digital solutions for clean energy retail led during 2015-2019, before being overtaken by makers of bundles of solar PV, batteries and appliances. That many of these start-ups are based in Africa and Asia is highly encouraging, showing the value of local knowledge of which

solutions are affordable and attractive to consumers with limited resources. However, other important technology areas appear underserved, including culturally suitable electric stoves, low-cost efficient cooling, passive building designs for hot climates, electrification of appropriate transport modes, affordable long-duration energy storage and others. Encouraging clean energy innovation in EMDEs is not only an investment in future economic opportunities, but is also more likely to deliver technologies suited to the local context.

Table 3.3 ▶ Selected African clean energy start-ups

Name	Country	Focus	Founded	VC raised
BasiGo	Kenya	Electric buses, charging and finance	2021	USD 15 million
Beacon Power Services	Nigeria	Digital grid and energy management services	2013	USD 2.7 million
Brayfoil Technologies	South Africa	Wind turbine blades	2017	Seed funding
Cella Mineral Storage	Kenya	CO ₂ storage	2021	Seed funding
Cold Hubs	Nigeria	Cold rooms powered by solar PV for food storage	2014	Seed funding
i-G3N	South Africa	Lithium-ion batteries	2014	USD 1.3 million
M_KOPA Solar	Kenya	Pay-as-you-go solar PV and equipment bundles	2011	USD 230 million
Nuru	DRC	Renewable project development	2015	USD 41 million
Powerstove Energy	Nigeria	Clean cookstoves	2017	Seed funding
Shift EV	Egypt	Electric vehicle drivetrain technology and fleet services	2020	USD 13 million
WidEnergy	Zambia	Pay-as-you-go solar PV and equipment bundles	2016	Seed funding

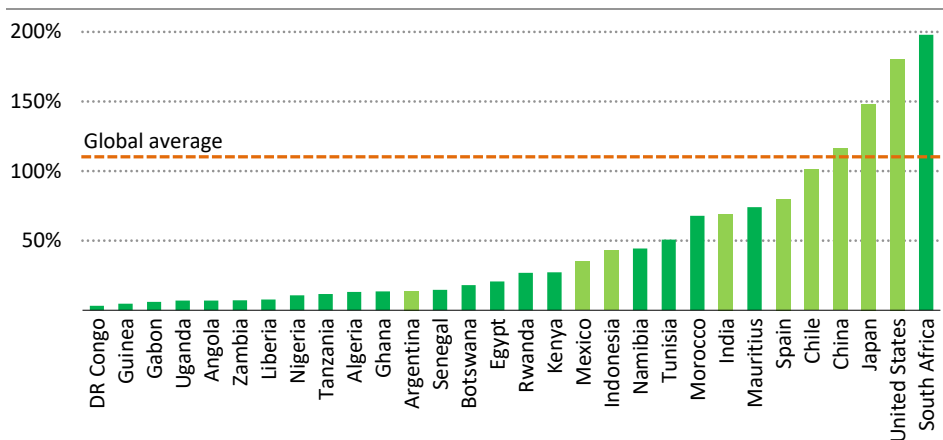
There are excellent examples of energy innovation policies in Africa and around the world from which governments and their partners can learn. These are not limited to energy access technologies, and some extend to supporting innovation in fields where EMDEs can access rapidly growing markets in advanced economies, such as critical minerals processing or electric vehicle component manufacturing. The range of policies includes systems for supporting technology incubators in India and helping researchers in Morocco to scale up their ideas (IEA, 2022). Kenya’s Climate Innovation Center has been active since 2012, with Danish and UK public funding.

Recently, intergovernmental organisations and MDBs have begun to take a stronger interest in the challenges of clean energy ecosystems in EMDEs. The UNFCCC launched its Climate Change Global Innovation Hub in late 2021 and in 2023 G7 leaders confirmed that they “will keep supporting the research, development, and deployment of clean technologies as a critical enabler of an accelerated clean energy transition in LMICs [low- and middle-income countries]” (G7, 2023). As an example of MDB activity, Fonds Innov Invest was established in Morocco with support from the World Bank to support start-ups, and this model could target clean energy specifically. More recently, MDBs have committed several billion US dollars to projects for low-emissions hydrogen production in EMDEs, creating a clear opportunity to build local capacity and value chains (IEA, 2023c).

3.4 Increasing the involvement of local capital

Africa currently suffers from an over-reliance on hard currency to finance its clean energy projects, with local currency finance being in short supply and often at prohibitively high costs. Local capital markets in Africa are underdeveloped, often characterised by low levels of domestic savings, limited availability of private debt and equity, and illiquid capital markets (see Figure 3.11). South Africa stands out due to its large stock market, but otherwise all other African countries fall below the global average, which is likely to limit the availability of local capital, particularly debt.

Figure 3.11 ▾ Financial system development indicator for selected countries



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Financial conditions vary across the region, but the vast majority of African countries have underdeveloped banking sectors and capital markets compared with the global average

Notes: This indicator shows the average of the share of private credit and the share of stock market capitalisation (both as a percentages of GDP) over 2017-2021; the global average is weighted by GDP.

Source: Calculations based on World Bank (2022). *World Development Indicators*.

Despite the nascent state of capital markets, domestic savings in sub-Saharan Africa have risen from 19% of GDP in 2017 to 25% in 2021. There is also significant scope for further growth. As of 2021 only 8.5% of Africa's working-age population were actively contributing to pension schemes (the rate in North Africa as a sub-region is notably higher at 17.4%); this compares to the global average of 32.5% (ILO, 2022). Improving savings rates will require African governments to design pension schemes that specifically target underserved communities, including workers in the informal sector, which accounts for up to 90% of the labour force by some estimates (ILO, 2018).

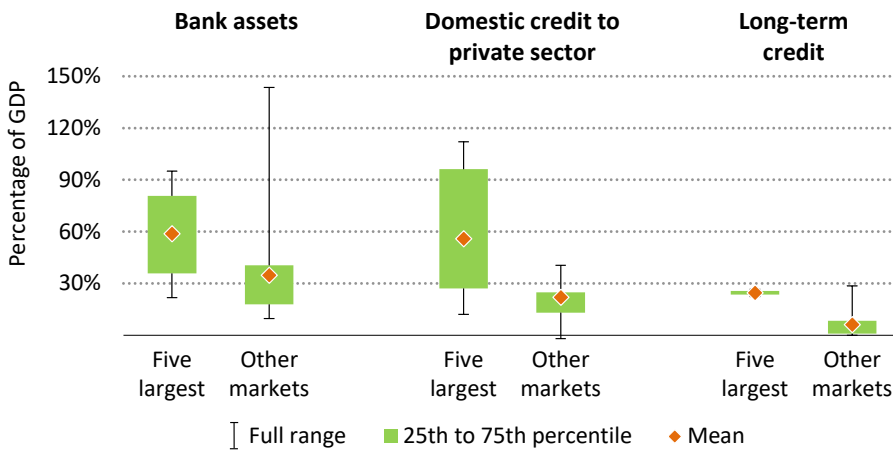
Under the SAS, efforts by local pension regulators to boost savings rates combined with improving socio-economic development supports capital accumulation, allowing local capital to play a larger role. This reduces currency risk (although does not entirely eliminate it as imports are likely to be in US dollars) and exposure to external shocks, creating a more sustainable financing environment. As local capital markets deepen, governments and international investors can also play a role by ensuring that instruments exist to channel this new source of capital to energy and infrastructure projects. Capital market authorities can ensure that the regulatory environment encourages investment in alternative asset classes, as well as familiarising investors with the risks and opportunities associated with these investments. Meanwhile, international investors can co-invest with local partners, which can be mutually beneficial by combining foreign investors' familiarity with energy investment mechanisms with local investors' familiarity with the risk environment.

3.4.1 Banking sector

Most financial systems in African countries are heavily reliant on banks due to the small size of capital markets. Five countries dominate the regional banking sector, but many of the largest banks are pan-African, sometimes referred to as network banks. These banks play a key role in financing projects in countries with smaller banking sectors. Cross-border banking is likely to receive a boost from the introduction of the African Continental Free Trade Area, which includes a system for instant cross-border payments, supported by Afreximbank.

Even as banking assets scale up, there is still a misalignment between banking products and clean energy project needs. In the more developed banking markets, long-term credit amounted to an average of nearly 25% of GDP, but this falls to 5% in less developed markets (see Figure 3.12). Large-scale projects, including IPPs, generally need loans of 10-15 years, but many banks struggle to provide tenors of over seven years due to the absence of long-term savings.

Figure 3.12 ▶ Depth and characteristics of banking sector as a percentage of GDP among African countries, 2021



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Outside the five largest banking markets, private sector access to capital is limited, with long-term credit in limited supply even in larger markets

Notes: Five largest banking markets = Egypt, Kenya, Morocco, Nigeria and South Africa; Other markets = rest of Africa

Source: World Bank (2023). *World Development Indicators*.

Beyond the tenor, the terms of available bank financing can be unfavourable for energy projects. Banks often have to lend at high, variable rates to account for inflation and the high interest rate on government securities. As of June 2023, 16 African countries have interest rates over 10% – this compares with 5.25% in the United States and 4% in the Eurozone. Additionally, smaller banks struggle to assess the risk of complex clean energy projects, particularly distributed renewable energy projects, and can therefore require significant collateral (AfDB, 2020). Such terms are particularly prohibitive for energy access projects, which often involve local SMEs with no track record and high potential end-user risk. Such projects need access to cheap debt, ideally via a revolving fund, and are unlikely to be able to provide a high level of collateral.

Banks have indicated that they are interested in becoming more involved in green finance, including clean energy projects. For example, Standard Bank – the largest lender by assets in the region – exceeded their internal target for lending to sustainable projects in 2022. According to the European Investment Bank and Making Finance Work for Africa annual survey of sub-Saharan banks, nearly 70% of banks see climate lending as an opportunity, but to date only one-fifth have dedicated green lending projects (European Investment Bank, 2022). In order for banks to fully take advantage of the opportunity, they are likely to need

support to develop their expertise, as well as data and tools for assessing climate risk and opportunities (European Investment Bank, 2022).

Box 3.5 ▶ **The role of dedicated green finance facilities**

Dedicated green lending institutions can help finance clean energy projects while also boosting the pipeline of bankable projects via the use of targeted de-risking mechanisms. Green banks or finance facilities are able to access concessional capital from MDBs and climate facilities, which they then invest either in dedicated instruments, such as investment funds, or directly into projects while aiming to crowd-in private capital as co-investors. They primarily provide local currency financing, often using a currency hedging mechanism if only hard currency finance is available.

Africa currently has two major green banks or facilities: the **Climate Finance Facility (CFF)** of the Development Bank of South Africa, and Rwanda's Green Fund – **FONERWA** – which is partnering with the Bank of Rwanda. The CFF was established in 2017, becoming the developing world's first green facility with the aim of co-financing projects with local commercial banks. The facility primarily offers subordinated debt and first-loss positions, as well as other credit enhancements to extend the tenor of loans. Meanwhile, FONERWA combines a project preparation facility with a credit facility that will offer debt, equity or venture capital to work with the broader ecosystem of investors. These different models demonstrate the potential role of green lending institutions in markets with varying degrees of energy and financial sector development.

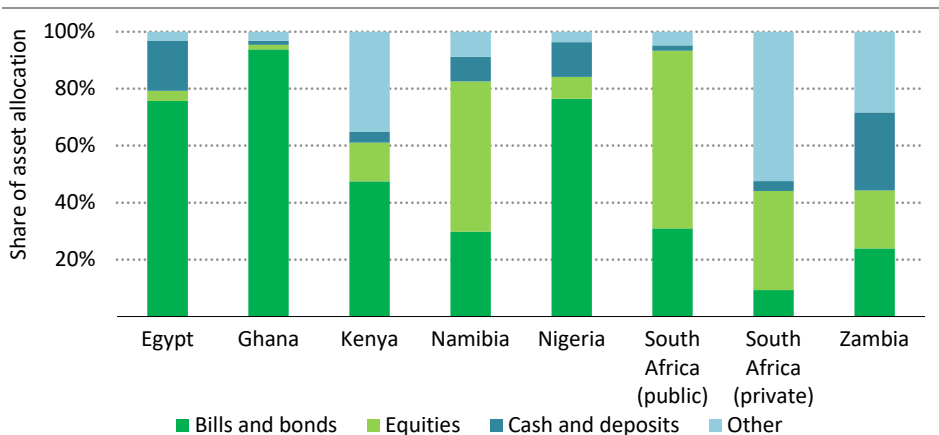
AfDB is looking to support the creation of further green facilities and is working with banks in Benin, Ghana, Mozambique, Tunisia, Uganda and Zambia under its **African Green Bank Initiative**. In May 2023 AfDB announced that USD 1.6 million had been secured to set up the first two facilities under this initiative, which will be housed at La Caisse des Dépôts et Consignations du Bénin and the Ivorian National Investment Bank (AfDB, 2023). The initiative will be supported by the **African Green Finance Facility Fund (AG3F)**, which will provide technical assistance to governments and financial institutions in creating and capitalising green facilities. The fund will then co-invest alongside those facilities and provide de-risking instruments to mobilise private capital. The combination of training alongside co-investment or on-lending has proven particularly effective at mobilising new actors and can serve as a useful model for other efforts to increase local banking sector involvement.

3.4.2 *Capital markets*

Thanks to the combination of pension fund reform to allow privately managed funds and rising per-capita incomes, the size of pension funds on the continent has been growing. The South African pension industry is still over five times larger than in any other African country, but assets under management in pensions in Nigeria grew over ninefold between 2006 and

the end of 2020, sevenfold in Kenya and over fivefold in Ghana (AfDB, 2022). Despite this progress, there is still significant opportunity to further the growth of these funds. Gross savings rates as a proportion of GDP averaged 20% in 2020 in sub-Saharan Africa, compared with 42% in developing economies in East Asia and the Pacific (AfDB, 2022).

Figure 3.13 ▶ Pension funds asset allocation, selected countries, 2022



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Pension funds outside Southern Africa, where funds have access to the South African stock exchange, are heavily concentrated in government securities

Notes: Infrastructure assets would fall into the “Other” category, which also includes real estate, insurance and private equity and corporate bonds. In Kenya, “Other” assets are primarily real estate; in private pensions in South Africa they are primarily insurance policies.

Source: Annual reporting from country regulators.

Most pension funds in Africa still have a strong preference for government securities, which provide relatively high risk-free yields (see Figure 3.13). For example, pensions in Egypt, Ghana and Nigeria allocate over 75% of their assets to government securities. Equities play a larger role in South Africa and Namibia due to the size and liquidity of the market, but only in private South African pensions and Kenyan pensions do other asset classes, including infrastructure, make up more than 25%.

In order to increase pension fund allocations to infrastructure assets, capital market authorities that regulate pension funds can clearly define alternative asset classes and raise the ceiling for investment in these areas. For example, in Kenya the Retirement Benefit Authority increased the threshold for pension fund allocations to infrastructure assets from 5% to 10% in 2021, which resulted in the Kenya Pension Funds Investment Consortium (KEPFIC) committing to invest over KES 25 billion (USD 229 million) in infrastructure over 2021-2026 (US Embassy Kenya, 2020). Pensions funds will also need training on how to invest in these asset classes, as well as a pipeline of appropriate investment opportunities that meet

their risk, return and size requirements. In markets with a stock of existing energy assets, local currency guarantees, accompanied by technical assistance programmes, can prove particularly effective, as seen in Nigeria (see Box 3.5)

Box 3.6 ▶ **Local currency guarantees in Nigeria**

Nigeria has the second largest pension industry on the continent, with large public and private funds and a broad range of investable instruments in use. Nigerian pension funds have one of the largest shares of assets under management invested in locally domiciled alternative assets. Much of this comes via government sukuk (Islamic securities), which are earmarked to finance infrastructure (AfDB, 2022), but also thanks to the presence of local currency guarantees for investments in infrastructure, provided by AAA-rated provider, **InfraCredit**.

InfraCredit was established by GuarantCo and the Nigerian Sovereign Investment Authority in 2017 and since then has issued 16 guarantees to mobilise NGN 159 billion (USD 206 million) into 10 different infrastructure projects. Over 19 local pension funds have invested, demonstrating appetite from the domestic market. Issuers include North South Power to support the operation of their hydro dams, whose first issuance of a NGN 8.5 billion green bond for 15 years in 2019 was supported by an InfraCredit guarantee; they were then able to go to market two years later for a second issuance without a guarantee. More recently, InfraCredit announced an innovative blended guarantee to support an aggregated portfolio of mini-grid projects by local firm Darway Coast – a sector that pension funds generally consider too small and risky. The UK-funded Climate Finance Blending Facility provided subordinated debt, which, combined with InfraCredit’s guarantee, was able to mobilise NGN 800 million (USD 1 million) from local institutional investors. To date, InfraCredit has been able to leverage its own equity threefold via its guarantees, demonstrating the catalytic impact of first-loss capital.

Aggregation and securitisation

Securitisation, whereby assets are pooled into a special purpose vehicle to create a tradable asset-backed security, can be an effective means of raising debt from capital markets in local currency, particularly for distributed energy assets. Asset-backed securities are complex instruments and are unfamiliar to many developers and financiers in Africa, and so are not currently widely used. However, there has been progress; for example, the West African Economic and Monetary Union has seen 12 securitisation deals, six of which have occurred since 2020.

Numerous challenges abound before such instruments can be more widely used. Initial asset-backed security offerings are likely to need de-risking support, either in the form of guarantees, or with DFIs as investors, potentially in a first-loss role. The securitisation model was given a boost in June 2023 when US-based Sun King and Citibank announced a record

USD 130 million deal to support off-grid solar systems in Kenya. The securitisation structure, which is entirely denominated in Kenyan shillings, will be based on the expected receivables of over a million customers and has attracted a range of local commercial banks and DFIs.

Asset-backed securities are only ever likely to finance a small share of the energy investment necessary under the SAS. In 2021 (latest estimate) the UNDP estimated the potential size of the financial aggregation market for distributed renewable energy in sub-Saharan Africa at USD 400 million – while this represented less than 1% of total energy investment in the continent that year, it is the equivalent of 88% of off-grid spending in the same year (UNDP, 2022) (GOGLA, 2023). Their potential to finance vital energy access projects and to be funded by local investors means that these instruments would also have significant indirect positive impacts. They could potentially lower the cost of energy access financing, free up equity to be invested elsewhere, and familiarise local capital providers with the energy sector.

The evolving range of tools available to attract both local and international capital to energy projects in Africa demonstrate that it is possible to achieve the investment needs of the SAS, but there are still significant challenges to overcome. Many clean energy projects in Africa are still considered too risky by private investors and the over-reliance on limited concessional finance resources acts as a break on developments. Urgent steps are needed to unlock private capital, starting with some of the lower-risk investments, such as clean power projects in countries with a successful track record and established regulatory environment. This can allow concessional funds to focus on some of the more complex or non-commercial areas, such as early-stage financing, energy access projects, or fragile and conflict-affected states. Concessional funds also play a vital role in supporting governments as they implement regulatory reforms and build capacity at energy institutions.

This review of financing channels has sought to highlight where each type of capital can immediately focus its attention in order to most rapidly scale-up spending on clean energy in African countries. As outlined in the cycle of change laid out in Chapter 1, this financing increase cannot be realised without a series of coordinated actions from African governments, donors and DFIs, and the private sector. These efforts can not only ensure Africa's secure and sustainable energy future, but also help achieve urgent climate objectives and drive the continent's socioeconomic development.

Case studies

For the preparation of this report, the IEA reviewed over 85 case studies and carried out over 40 stakeholder interviews. Case studies listed in this annex respond to a wide variety of solutions designed to overcome barriers to investment, across different sectors, technologies and regions. The selection of case studies featured in this annex is not exhaustive and does not represent an endorsement by the IEA Secretariat of the institutions or projects referred therein over other stakeholders consulted.

This annex features further detail on the following case studies, listed in alphabetical order:

- **Acorn Green Bond** – sustainable debt issuance for green buildings
- **Africa GreenCo** – aggregating renewable energy supply through intermediary power trading services
- **Africa Minigrids Programme, GEF-7** – improving the financial viability of renewable energy mini-grids
- **African Trade & Investment Development Insurance** – providing insurance to investors to de-risk projects
- **Currency Exchange Fund (TCX)** – hedging currency risk to enable investment in developing and frontier markets
- **Desert to Power G5 Sahel Facility** – using blended finance in nascent renewables markets
- **EBRD-GCF Green Economy Financing Facility** – extending credit lines to local financial institutions
- **ECOFRIDGES Initiative** – on-bill and on-wage financing for efficient, climate-friendly refrigerators and ACs
- **Emerging Africa Infrastructure Fund** – leveraging concessional finance to mobilise private capital
- **GET.invest** – providing early-stage financing to clean energy
- **Global Electric Mobility Programme, GEF** – targeting the nexus of e-mobility and renewable power integration
- **GuarantCo** – using local currency guarantees to mobilise private capital for infrastructure projects
- **InfraCredit** – using local currency guarantees to attract domestic institutional investors
- **Kinguélé Aval** – enhancing the bankability of an IPP project through innovative securitisation
- **Leveraging Energy Access Finance (LEAF) Framework** – addressing financial barriers to deliver distributed power
- **Moon** – public private partnership to provide electricity as a service for last-mile rural households

- **MUNYAX ECO** – supporting women’s empowerment alongside energy access
- **National Clean Energy Access Programme (NCEP) Ghana** – using carbon markets to drive energy access
- **Pro Mini Grids, Uganda** – improving enabling environment for mini-grids in rural areas
- **Programme for Energy Efficiency in Buildings (PEEB) Cool** – dual funds providing finance and technical support
- **Room2Run, AfDB** – freeing up concessional capital to reinvest
- **Sustainable Energy Fund for Africa** – providing catalytic finance to unlock private-sector investment
- **Spark+ Africa** – dedicated clean cooking investment fund
- **Transco CLSG** – financing grids with a regional approach
- **UpEnergy Improved Cookstove Programme** – voluntary carbon markets supporting efficient cookstoves

Acorn Green Bond – sustainable debt issuance for green buildings

Sector: Energy efficiency, emissions reduction

Countries: Kenya

Financial mechanism: Sustainable debt issuance

Overview

Acorn Holding Limited issued Kenya and East Africa’s first green bond in October 2019, raising KES 4.3 billion (USD 41.5 million) for the construction of six student accommodation properties in Nairobi. The buildings will be certified with the International Finance Corporation’s EDGE (Excellence in Design for Greater Efficiency) standard for 20% less water use, energy efficiency and low embodied energy in building materials. The bond’s primary buyers included local institutional investors and commercial banks, development finance institutions (DFIs) and the Emerging Africa Infrastructure Fund (a blended finance fund).

Key elements

Kenya’s first green bond was issued under the Policy Guidance Note on Green Bonds, published by the Kenyan Capital Markets Authority in February 2019 with strict reporting requirements on allocation of proceeds and impact. As a new product in the market, efforts were made to increase investor confidence, with GuarantCo providing a partial credit guarantee on 50% of the principal and interest. Engagement with the Green Bond Programme Kenya (GBPK), EDGE green building certification and Climate Bond Initiative certification also raised awareness and offered investors a clear understanding of the project’s environmental and energy performance.

Table A.1 ► Barriers addressed or mitigated

Barrier	Detail
Limited access to appropriate finance	Energy efficiency projects can struggle to attract long-term, affordable debt. Green bonds can complement traditional debt financing, allowing for medium and long-term debt from institutional investors. In Acorn’s case their existing asset pipeline with environmental, social and governance credentials together with the partial credit guarantee improved the risk profile of the bond.
High risk perception and lack of data	Green buildings reduce compliance and construction risks as well as operating costs, making them a higher value and lower risk asset for investors. CBI and EDGE certification together with strict reporting requirements improved risk assessment, accountability and trust.
Lack of awareness and capacity	Green bonds are a new instrument to many African capital markets. Government support, in this case via the GBPK, is therefore often crucial for the initial issuances. The Kenyan government also included affordable green housing as a core pillar of the government’s national development agenda, lending further support to the project.

Africa GreenCo – aggregating renewable energy supply through intermediary power trading services

Sector: Renewable energy

Countries: Zambia, Namibia, South Africa, Zimbabwe

Financial mechanism: Aggregation of risk, creditworthy offtaker

Overview

Africa GreenCo (GreenCo) acts as an intermediary aggregator of renewable energy, buying and selling power from renewable independent power producers (IPPs) on a portfolio basis. This serves to de-risk the offtake, facilitating investment in the energy sector while reducing financial reliance on national utilities and host governments. It is headquartered in Lusaka, Zambia where it holds an electricity trading licence, and in 2021 it became the first market participant member of the Southern African Power Pool (SAPP), enabling it to trade on the regional power markets. Its current investors comprise the Danish Investment Fund for Developing Countries (IFU), the EU-funded Electrification Financing Initiative (EDFI ElectriFI) and InfraCo Africa, part of the multi-donor Private Infrastructure Development Group (PIDG).

Key elements

GreenCo's model mitigates against the risk of non-payment by the buyer. It does this through a combination of the liquidity support it provides to IPPs and by aggregating generation and supply across a regional portfolio to diversify the risk. GreenCo's portfolio approach enables it to take more risk on any single buyer and also accept mismatches between buy and sell side transactions, providing flexibility to bridge IPP bankability requirements and customer operational demands. It operates in close collaboration with the state-owned utilities in its countries of operations, which it pays for wheeling and system operations services including energy balancing.

Table A.2 ▶ Barriers addressed or mitigated

Barrier	Detail
Creditworthiness of public offtakers	Clean power projects require the purchase of power produced, which is typically done by state-owned utilities (offtakers). Most state-owned utilities are in poor financial health and their lack of creditworthiness poses the risk that purchases will not be paid on time or in full. With its strong balance sheet and operational capabilities, GreenCo mitigates this risk through its ability to secure alternative buyers in case of default.
Reliance on a single offtaker	Reliance on a single entity increases the offtaker risk. By implementing a portfolio approach and accessing the SAPP regional markets, GreenCo effectively contributes to de-risking IPP projects by reducing the reliance on a single offtaker through the natural hedge of demand aggregation.

Africa Minigrids Programme, GEF-7 – improving the financial viability of renewable energy mini-grids

Sector: Energy access, renewable energy

Countries: Angola, Benin, Burkina Faso, Burundi, Chad, Comoros, Djibouti, Democratic Republic of Congo (DRC), Eswatini, Ethiopia, Liberia, Madagascar, Malawi, Mali, Mauritania, Nigeria, Niger, Sao Tome and Principe, Somalia, Sudan, and Zambia

Financial mechanism: Climate finance (the Global Environment Facility [GEF])

Overview

The Africa Minigrids Programme (AMP) is a USD 565.9 million programme aiming to increase clean energy access. By providing cost-reduction levers (in hardware costs, soft costs, and financing costs) and innovative business models, AMP improves the financial viability of mini-grids. As mini-grids become more competitive, this can lead to greater private capital flow, in turn resulting in both GHG emission reduction, and lower tariffs for end-users.

Key elements

AMP works at both regional and national levels. The regional Knowledge Management platform supports the mini-grid market through knowledge exchange, tailored technical assistance, regional Communities of Practice, digital tools, and solutions for mini-grid cost-reduction. Within the context of 21 national projects, AMP will develop comparative advantages across three key areas of opportunity: national dialogues on delivery models, productive use of energy and digitalisation for mini-grids to drive cost reduction. The link between the regional and national projects ensures consistency while mainstreaming digital tools and solutions for mini-grid cost reduction and scale-up.

AMP aims to directly avoid 380 000 tCO₂-eq and reach 430 000 direct beneficiaries. The USD 33.2 million grant from GEF will leverage USD 532.7 in co-financing from the United Nations Development Programme, the AfDB, Rocky Mountain Institute and the private sector.

Table A.3 ▶ Barriers addressed or mitigated

Barrier	Detail
Lack of early-stage development finance	The private sector faces a range of barriers holding back investment. Nearly all current investment in mini-grids is in the form of grants and non-commercial, patient capital. AMP will help mini-grid business developers to access large volumes of commercial financing, particularly commercial debt, that is necessary to scale the sector's growth.
Lack of awareness and capacity	Accelerating the learning curve for the complex array of stakeholders involved in delivering modern electricity services is needed to scale up mini-grids. AMP helps developers to collect data from a substantial sample of mini-grids using a uniform set of metrics and guidelines and derives insights from national projects' data. These insights are then systematically disseminated with participating AMP countries and the broader mini-grids sector in Africa.

African Trade & Investment Development Insurance – providing insurance to investors to de-risk projects

Sector: Renewable energy, energy access, energy efficiency

Countries: 21 African countries that are members of ATIDI

Financial mechanism: Investment and trade insurance, reinsurance, surety bonds

Overview

African Trade & Investment Development Insurance (ATIDI) is a multilateral organisation that provides political risk insurance to investors and lenders. It offers a range of solutions to mitigate risk, including liquidity support and insurance policies tailored to the energy sector. With support from the European DFIs, ATIDI has developed products that enhance the bankability of energy projects, making it easier for private sector investment.

Key elements

To support IPP projects, ATIDI and KfW Development Bank launched the Regional Liquidity Support Facility (RLSF), which later drew additional funding from the Norwegian Agency for Development Cooperation. The RLSF targets small and mid-scale renewable energy projects with installed capacity of up to 100 MW by insuring IPPs against the risk of delayed payments by state-owned utilities – one of the largest concerns of private investors, particularly in the current debt crisis. The facility can also support larger projects, on a case-by-case basis.

With support from the European Investment Bank, KfW Development Bank and MunichRe, ATIDI has also set up the African Energy Guarantee Facility, which is a reinsurance platform that provides up to USD 1 billion of additional underwriting capacity to support energy access, energy efficiency and renewable energy projects by insuring against political risk. Many international investors require such insurance products in order to provide long-term capital.

Table A.4 ▶ Barriers addressed or mitigated

Barrier	Detail
Creditworthiness of public offtakers	In most African countries, state-owned utilities are the primary or sole offtaker. These utilities are generally in poor financial health and their lack of creditworthiness poses the risk that purchases will not be paid on time or in full. By insuring against delayed payments, ATIDI enhances the bankability of renewable energy IPPs without requiring the national government to provide a guarantee, which is increasingly challenging given rising debt in the region.
Political risk	Political risks such as expropriation, transfer restrictions and currency inconvertibility, war or civil disturbance, and/ or the breach of contractual obligations by the host government can hinder investment. International investors typically need to have political risk insurance but can struggle to access this for some of the most complex countries in the region.

Currency Exchange Fund (TCX) – hedging currency risk to enable investment in developing and frontier markets

Sector: Renewable energy, energy access

Countries: All of Africa, mostly low-income countries

Financial mechanism: Currency risk hedging, swaps and forward contracts

Overview

The Currency Exchange Fund (TCX) is a development finance initiative and global currency hedging facility designed to reduce the currency risk associated with projects borrowing in hard currency, but earning local currency revenues. TCX facilitates indexed local currency lending, where borrowers receive hard currency but all of the loan repayments are indexed to the local currency. This makes debt repayments predictable and unimpacted by fluctuations in the exchange rate, enhancing debt sustainability. At the same time, TCX supports capital market development by selling some of the frontier currency exposure to private investors, thereby transferring risk from borrowers in developing markets to international investors from developed markets.

Key elements

TCX offers cross-currency swaps and forward contracts in more than 70 low- and middle-income countries. As a development finance initiative, TCX pursues maximum development impact and prices hedging instruments on a risk-reflective basis. The combination of funding costs, credit margin and swap rates can at times lead to unaffordable financing costs in low-income, high-risk countries. To ensure the affordability of indexed local currency financing, TCX has worked with the European Commission and other donors on an innovative blending approach to make currency hedging more accessible. Because TCX pools the risk of a wide variety of emerging and frontier market currencies, it can achieve diversification and scale that none of the development financiers can accomplish on their own.

Table A.5 ▶ Barriers addressed or mitigated

Barrier	Detail
Currency risk	Most clean energy investment in Africa is done in hard currencies, creating a mismatch between the financing and revenue currencies, as most projects earn revenue in local currency. TCX's hedging mechanisms transfer the currency risk from the utility or end users to TCX's balance sheet, where it manages exposure to a large number of currencies.
Limited long-term local currency finance	Capital markets to provide local currency financing are still not large or deep enough to meet the clean energy investment needs across the continent. TCX enables MDBs and other development financiers to provide loans in local currency by hedging the currency risk resulting from their balance sheets in foreign currency.

Desert to Power G5 Sahel Facility – using blended finance in nascent renewables markets

Sector: Grids, renewable energy

Countries: Burkina Faso, Chad, Mali, Mauritania, Niger

Financial mechanism: Climate finance (Green Climate Fund (GCF))

Overview

The Desert to Power (DtP) G5 Facility¹ is a USD 966.7 million programme that aims to assist five countries in the Sahel region in achieving universal access to electricity by harnessing their largely untapped solar potential. The innovative blended finance approach of the facility increases engagement of private sector financing for renewable energy projects in markets that are otherwise challenging for them to access due to their nascent state.

Key elements

The facility is expected to result in 500 MW additional solar generation capacity, with 239 MWh of innovative grid storage capacity, and to facilitate electricity access to 700 000 households. By doing so, it aims to avoid 14.4 MtCO₂-eq and directly benefit 3.5 million people. The project facility benefits from concessional finance from GCF (USD 150 million) and AfDB (USD 380 million); this aims to leverage USD 437 million (45.2% of the total budget) in private sector funding. The concessional funding provided is via a mix of instruments. For example, GCF contributes via grants (5%), loans (55%), guarantees (13%) and reimbursable grants (27%). This allows for a range of de-risking support, including technical assistance grants which are particularly important in newer markets.

Table A.6 ▶ Barriers addressed or mitigated

Barrier	Detail
Unclear policies and regulations	The DtP countries represent nascent markets for utility-scale solar generation. This has a number of major implications: the absence of a clear framework for IPPs, a lack of clear institutional roles between agencies, low planning capacity, the mismatch between tariffs in urban and rural areas, and absence of incentives for enhancing gender mainstreaming. The DtP facility includes a technical assistance grant component to support government reforms.
Transmission risk due to limited grid infrastructure	Grid infrastructure can be particularly challenging to finance since it often relies on public funding, which is already constrained in the DtP countries. Failure to expand and modernise grids means new IPP projects may not be able to evacuate power once online. The DtP facility includes investment in grid infrastructure to act as a de-risking factor for IPPs.

¹ The Desert to Power G5 Facility is part of the broader Desert to Power (DtP) flagship Initiative of the AfDB. DtP will add 10 GW of solar generation capacity in the Sahel region and provide electricity to 250 million people in the 11 Sahel countries by 2030. The implementation of DtP started in 2019.

EBRD-GCF Green Economy Financing Facility (GEFF) – extending credit lines to local financial institutions

A

Sector: Emissions reduction, energy efficiency, renewable energy, energy access

Countries: 10 countries across 3 continents. In Africa: Egypt, Morocco, and Tunisia

Financial mechanism: Climate finance (Green Climate Fund (GCF))

Overview

The European Bank for Reconstruction and Development (EBRD) is partnering with the GCF to scale up private sector climate financing by extending credit lines (Green Economy Financing Facilities) to participating financial institutions (PFIs). The PFIs² on-lend the funds to borrowers – micro-, small and medium-sized Enterprises or and households – for energy efficiency, renewable energy, and climate resilience projects. The programme will support over 20 000 projects, designed to be scalable and replicable, through at least 32 local PFIs.

Key elements

The programme will contribute to the countries' Nationally Determined Contributions (NDCs) through an innovative combination of financial support, capacity building and technology transfer and supported by a deep level of country ownership. The GEFF programme is not just Africa focused and has the broader goals of demonstrating and scaling up sustainable energy and climate resilience financing, skills transfer to PFIs, and raising public awareness of the benefits of these projects. The GEFF programme aims to avoid 27.5 MtCO₂-eq globally and by developing a market for sustainable energy solutions; the Programme is anticipated to create 11 500 green jobs.

GEFF has a blended finance approach. GCF contributed USD 378 million, primarily in concessional loans with a small share of technical assistance grants, that will leverage USD 1 billion from the EBRD and up to USD 200 million from the private sector.

Table A.7 ▶ Barriers addressed or mitigated

Barrier	Detail
Limited long-term local currency finance	Financing facilities can contribute to increased market confidence and reduced risk perception. The GEFF countries are characterised by a diversity in funding sources, pricing and market penetration. GEFF will address financial barriers specific to each country's market context.
Lack of awareness and capacity	Financial institutions and end borrowers lack experience and expertise in developing economically viable energy efficiency and renewable energy projects, are often unaware of the potential of energy costs saving opportunities and lack the technical expertise required for feasibility studies and energy audits. Energy technology lists and technical assistance help in overcoming these.

² PFIs include banks, leasing companies and microfinance institutions.

ECOFRIDGES Initiative – on-bill and on-wage financing for efficient, climate-friendly refrigerators and ACs

Sector: Energy efficiency, emissions reduction

Countries: Ghana, Senegal

Financial mechanism: Debt finance and technical assistance

Overview

The ECOWAS Refrigerators and Air Conditioners (ECOFRIDGES) Initiative, developed by UNEP United for Efficiency (U4E), BASE Foundation and the governments of Ghana (Energy Commission) and Senegal (National Energy Conservation Agency AEME), aims to accelerate the adoption of certified energy efficient and climate-friendly domestic refrigerators and room ACs while mitigating upfront investment costs, lowering electricity bills and relieving strains on the power system, thereby expanding access to energy services.

Key elements

In Ghana, a Green On-wage (GO) financing mechanism comprises a bank loan with zero or preferential interest rates for salaried employees with repayment through payroll deductions. As of June 2023, ECOFRIDGES-GO had unlocked USD 1.6 million for the purchase of over 3 300 high performance cooling units. In Senegal, utility customers of SENELEC with pre-paid meters can apply for a bank loan (zero or preferential interest rate), repaying the costs through a monthly fee on their electric utility bill. By 2024, ECOFRIDGES Senegal aims to unlock USD 5.6 million to support the purchase of over 19 200 efficient cooling units.

Key elements include a positive list of eligible cooling products (ACs and refrigerators) with a negotiated discount from vendors and preferential financing conditions from participating local financial institutions (LFIs). This is complemented by awareness raising and dedicated marketing campaigns and measurement, reporting and verification (MRV) Guidelines to estimate the GHG emissions reductions, mobilised funding and other co-benefits. A take-back scheme for the collection, recycling and disposal of discarded appliances was designed.

Table A.8 ▶ Barriers addressed or mitigated

Barrier	Detail
Affordability constraints	The market-based consumer financing model eliminates the upfront cost barrier for energy efficient appliances for households and lowers repayment risks. Through collaboration with LFIs, it offers preferential financing terms.
High risk perception and lack of data	Energy efficiency projects are often considered too small and risky for many financiers. The ECOFRIDGES initiative collaborates with LFIs and vendors to create a market for high-performance products and facilitates risk assessment.
Lack of awareness and capacity	Building on existing government programmes, minimum energy performance standards (MEPS) and energy labels, the initiative raises end-user awareness and enhances capacities at LFIs. Robust and certified MRV processes allow LFIs to align with principles of green finance.

Emerging Africa Infrastructure Fund – leveraging concessional finance to mobilise private capital

Sector: Renewable energy

Countries: Covers all of Africa. Closed projects in Burkina Faso, Cameroon, Chad, Côte d’Ivoire, DRC, Djibouti, Ghana, Guinea, Kenya, Mali, Mozambique, Nigeria, Rwanda, Senegal, Sierra Leone, Tanzania, Uganda and Zimbabwe.

Financial mechanism: Blended finance

Overview

The Emerging Africa Infrastructure Fund (EAIF) was established as the first entity within the Private Infrastructure Development Group (PIDG). Managed by Ninety One, EAIF is a blended multi-donor fund that provides long-term debt to finance infrastructure projects in Africa. As of June 2023, the loan portfolio size was USD 1.25 billion, funded by debt and equity.

Key elements

EAIF was created to provide a platform that would act as a specialised DFI and leverage concessional donor funding to mobilise private sector investment for infrastructure development. It covers several sectors, including power, and has already contributed to the financing of more than 90 projects across the African continent.

EAIF provides first loss equity, senior debt and subordinated debt for the development of infrastructure, with a particular focus on low-income countries. EAIFs capital comes from DFIs, MDBs, commercial banks, and institutional investors – effectively making it a successful blended finance vehicle. It increasingly attracts capital from institutional investors. By resorting to different types of capital, it is able to both de-risk projects and leverage the use of limited amounts of public capital to catalyse private sector mobilisation.

Table A.9 ▶ **Barriers addressed or mitigated**

Barrier	Detail
Limited access to appropriate finance	Clean energy projects generally require affordable long-term capital, which is not always available. EAIF provides a range of financing options, including first-loss equity on sub-commercial terms, and senior and subordinated debt on commercial or near-commercial terms.
Lack of pipeline of bankable projects	By establishing a track record of completed projects, which have proven the viability of private sector financing of infrastructure on the continent, EAIF contributes to reducing the mismatch between availability of capital and of bankable projects in Africa.
Lack of catalytic concessional capital	The pool of concessional capital available to support energy projects in Africa is limited. EAIF uses relatively small amounts of public funds to de-risk projects and catalyse larger amounts of private-sector capital to build and operate infrastructure on the continent, particularly in low-income countries.

GET.invest – providing early-stage financing to clean energy

Sector: Renewable energy, energy access, energy efficiency, e-mobility and low-emissions hydrogen

Countries: Sub-Saharan Africa

Financial mechanism: Investment preparation advisory support

Overview

GET.invest mobilises investment in clean energy in developing countries, first by supporting energy projects and companies towards bankability, and then by connecting them with financiers. GET.invest is supported by the European Union, Germany, Sweden, the Netherlands, and Austria, and since 2022 it has acted as a One Stop Shop for the Africa-EU Green Energy Initiative – a flagship programme from the EU and European governments.

Key elements

GET.invest provides advisory and transaction support services on areas such as investment strategy, business case structuring, financial modelling and accessing matching finance. This is complemented by work with domestic financiers for mobilising local currency funding and co-operation with industry associations through events and trainings. GET.invest seeks to improve access to investment-related information via tools such as a database of financial instruments and a new data platform that provides real-time data and analytics on energy systems and portfolio performance.

As of July 2023, GET.invest has supported over 400 clients, of which 154 (about 38%) were accepted by financiers with a total investment volume of almost USD 2 billion. Eighty-two projects representing USD 420 million have reached financial close. There is no specific focus on ticket size: 22% of projects range above USD 22 million, 27% between USD 22 and 5.5 million, 39% between USD 5.5 million and 550 k, and the remaining 12% below USD 550 k.

Table A.10 ► Barriers addressed or mitigated

Barrier	Detail
Limited access to appropriate finance	The landscape of financing instruments available for clean energy projects in Africa is complex. To navigate this, GET.invest developed a comprehensive database of financing solutions, allowing advisers to identify the right financing instruments to support the transaction advisory process.
Lack of early-stage development finance	The lack of early-stage financing can prevent the creation of projects that investors find bankable. GET.invest provide support to companies to improve their investment proposals, structure business cases, and develop financial models. They also carry out independent financial modelling to confirm project viability, and hold matchmaking sessions to bring stakeholders together.
Difficulty in financing small ticket sizes	Smaller projects can be more complicated to finance because of perceived higher risks and transaction costs. GET.invest supports companies and project developers by mobilising catalytic finance, by bundling multi-site projects, and by providing advisory support as companies scale.

Global Electric Mobility Programme, GEF – targeting the nexus of e-mobility and renewable power integration

Sector: Energy access, transport, energy efficiency

Countries: 27 countries across 4 continents. In Africa: Burundi, Madagascar, Mauritius, Seychelles, South Africa and Togo

Financial mechanism: Climate finance (the Global Environment Facility [GEF])

Overview

GEF's Global Electric Mobility Programme is a multiagency programme operational at national, regional and global levels. The aim of the programme is to support low- and middle-income countries with the shift to electric mobility by focusing on electric buses, electric two- and three-wheelers, and electric light-duty vehicles. The programme funds awareness campaigns, capacity building and the development of structures to support electric mobility.

Key elements

Low- and middle-income countries generally have a very sparse EV charging infrastructure, if they have one at all, and can have an unreliable power supply. This enforces the view that EVs may not be practical, particularly for longer trips, and has made it hard to attract finance to e-mobility. GEF's programme promotes investment and technology transfer through:

- Four Global Thematic Working Groups (established with the IEA) that provide policy advice and promote the sustainable acceleration of e-mobility.
- Four Support and Investment Platforms to create communities of practice and provide investment.
- Tracking progress, EV market monitoring and results dissemination to promote the wider uptake of e-mobility.

GEF's contribution of a USD 50.1 million grant to the programme will leverage USD 651.8 million in co-financing from the United Nations Environment Programme (UNEP).

Table A.11 ► Barriers addressed or mitigated

Barrier	Detail
High upfront investment costs	Smaller projects can be complicated to finance because of perceived higher risks and transaction costs. The programme's use of (sub)regional platforms to bring countries, cities, technology providers and financial institutions together promotes investment, allowing for innovative financing models that spread the financial risk among parties.
Unclear policies and regulations	Many low- and middle-income countries have no dedicated regulatory policies to incentivise the uptake of EVs; many in fact have disadvantageous fiscal policies that complicate EV imports. Developing policies to foster the uptake of e-mobility often includes stakeholders from various ministries and requires thorough analysis and understanding of the national transport sector. Decision makers need technical support during all stages of EV policy development.

GuarantCo – using local currency guarantees to mobilise private capital for infrastructure projects

Sector: Renewable energy

Countries: Madagascar

Financial mechanism: Local currency guarantee

Overview

GuarantCo was established in 2005 to provide local currency credit solutions that support the mobilisation of private capital for infrastructure projects across Africa and Asia. It is funded by the United Kingdom, Switzerland, Australia and Sweden through the PIDG Trust, by the Netherlands through FMO and the PIDG Trust, France and Global Affairs Canada.

Key elements

GuarantCo uses blended finance to provide a range of credit solutions, including partial credit guarantees and liquidity extension guarantees, focusing on local currency to stimulate domestic capital markets and mitigate currency risk. With a leverage ratio of up to three, GuarantCo helps mobilise private capital into infrastructure projects in the continent.

A successful example of GuarantCo's intervention is the two-phased support provided to the Green Yellow project in Madagascar. The 40 MW solar PV plant will be the country's first grid-connected solar project and will also include a 5MW/MWh battery system. Given that it is such a nascent market, GuarantCo provided an MGA 60.6 billion (Malagasy ariary) (USD 14.6 million) 50% partial credit guarantees with a nine-year tenor in order to de-risk the project and raise capital.

Table A.12 ► Barriers addressed or mitigated

Barrier	Detail
Limited long-term local currency finance available	Clean energy projects generally require affordable long-term capital in local currency, which is unavailable from major providers such as DFIs (generally hard currency) and commercial banks (shorter tenors). Through a range of credit solutions, GuarantCo provides guarantees that extend the maturity of local currency loans, making longer-term local currency debt available.
Developing local capital markets	Institutional investors typically have minimum credit rating thresholds for investment, which bond issues by companies in nascent markets often do not meet. GuarantCo's credit solutions support companies to access these capital markets by improving the credit rating of the issued bonds, widening the range of potential investors and stimulating the development of local capital markets.

InfraCredit – using local currency guarantees to attract domestic institutional investors

Sector: Renewable energy, energy access

Countries: Nigeria

Financial mechanism: Local currency guarantee

Overview

InfraCredit provides guarantees in Nigerian naira (NGN) to encourage institutional investors – primarily pension funds – to invest in more infrastructure assets. InfraCredit was established in 2017 by the Nigerian Sovereign Investment Authority, in collaboration with GuarantCo, and has issued 16 guarantees to mobilise NGN 159 billion (USD 206 million), mainly in long-term debt, into 10 infrastructure projects. More than 19 local pension funds have invested, demonstrating appetite from the domestic market.

Key elements

InfraCredit uses its own capital base to provide guarantees, which can be used to de-risk traditional green bonds. Electricity producer North South Power (NSP) issued an NGN 8.5 billion green bond for 15-years in 2019 to support operations of its hydro dams, which was supported by an InfraCredit guarantee. Two years later, NSP issued a second bond without the need of a guarantee, demonstrating increased confidence from the market.

Recently, InfraCredit announced an innovative blended guarantee to support an aggregated portfolio of mini-grid projects by local firm Darway Coast – a space that pension funds generally consider too small and risky. The UK-funded Climate Finance Blending Facility provided subordinated debt, which combined with InfraCredit’s guarantee, was able to mobilise NGN 800 million (USD 1 million) from local institutional investors.

Table A.13 ▶ Barriers addressed or mitigated

Barrier	Detail
Limited long-term local currency finance	Clean energy projects generally require affordable long-term capital in local currency, which can be provided by local institutional investors. InfraCredit’s model has shown that guarantees can effectively mobilise these investors.
Difficulty in financing small ticket sizes	Energy access projects, including mini-grids, are often considered too small and risky for institutional investors. InfraCredit have proven a replicable model to security investment using aggregation.
Lack of catalytic concessional capital	The pool of concessional capital available to support energy projects in Africa is limited. Ensuring this capital is truly catalytic is vital. InfraCredit’s model has demonstrated the catalytic impact of first-loss capital, by being able to leverage their own equity base up to three-fold for guarantees.
Developing local capital markets	Infrastructure assets make up a small share of many African institutional investors’ portfolios. Through their knowledge development work, InfraCredit helps drive an overall deepening of local capital markets.

Kinguélé Aval – enhancing the bankability of an IPP project through innovative securitisation

Sector: Renewable energy

Countries: Gabon

Financial mechanism: Credit enhancement, securitisation

Overview

Kinguélé Aval, a 35 MW hydropower project, is the first independent power producer (IPP) in Gabon. Investors were concerned about the potential for delayed payments from the offtaker, the state utility. They therefore developed an innovative mechanism to securitise payments from the offtaker to the IPP through receivables from Airtel, the telecom operator, which collects electricity bills from most end users.

Key elements

With a total cost estimated at EUR 178 million, the project was financed through loans from the International Finance Corporation, the African Development Bank, the Emerging Africa Infrastructure Fund and the Development Bank of Southern Africa, as well as with equity from the sponsors Meridiam and Fond Gabonais d'Investissements Strategiques.

The special purpose vehicle set up for this project, Asohna Energie, will also operate the Kingulé Aval project, which will sell clean power to the Gabonese offtaker. The innovative securitisation mechanism provided an effective credit enhancement that contributed to the bankability of the project.

Table A.14 ► Barriers addressed or mitigated

Barrier	Detail
Creditworthiness of public offtaker	Clean power projects require the purchase of power produced, which is typically done by public or semi-public utilities (offtakers). Most are in poor financial health and their lack of creditworthiness poses the risk that purchases will not be paid on time or in full. By providing a securitisation mechanism whereby receivables from Airtel, the telecom operator, cover this risk, the project was able to secure financing without other credit enhancements.

Leveraging Energy Access Finance (LEAF) Framework – addressing financial barriers to deliver distributed power

Sector: Grids, energy access, renewable energy
Countries: Ethiopia, Ghana, Guinea, Kenya, Nigeria, Tunisia
Financial mechanism: Climate finance (Green Climate Fund [GCF])

Overview

The Levering Energy Access Finance (LEAF) Framework³ is a USD 959.9 million programme which aims to address financial and investment barriers toward delivering distributed renewable energy (DRE), such as mini-grids, solar home systems and commercial and industrial solar solutions. The framework focuses on using guarantees and concessional subordinated and senior debt to mobilise commercial, local currency debt.

Key elements

LEAF will offer technical assistance by supporting financial institutions to engage with and invest in DRE, facilitate policy development, and develop innovative financing structures to make mini-grids commercially viable. LEAF will de-risk, unlock access to finance and scale investments in DRE by the private sector through concessional guarantees, concessional subordinated debt, and senior debt. LEAF aims to result in 386 MW of additional capacity, increase access to electricity to over 5.9 million people and avoid 28.9 MtCO₂-eq. LEAF benefits from concessional finance from GCF (USD 170.9 million) and AfDB (USD 164 million); this aims to leverage USD 315 million in private sector funding and USD 310 million in equity contribution. GCF’s contribution is composed of loans (USD 80 million), guarantees (USD 80 million) and grants (USD 10.9 million).

Table A.15 ► **Barriers addressed or mitigated**

Barrier	Detail
Limited long-term local currency finance	Commercial banks only offer loans to DRE projects only on prohibitive terms because of a lack of familiarity and high-risk perception. LEAF addresses financial barriers through credit enhancement instruments and new financial products to crowd in local currency debt and commercial capital.
Difficulty in financing small ticket sizes	Perceived higher risks and transaction costs make small projects more complicated to finance. LEAF reduces overall cost of capital, provides liquidity, and provides flexible structures with tenor up to 12 years.
Unclear policies and regulations	A lack of clear institutional roles among agencies and low planning capacity hamper the implementation of DRE projects. LEAF will provide technical assistance and support governments’ policy development necessitating harmonisation.

³ LEAF is part of the AfDB’s broader off-grid strategy under the New Deal on Energy for Africa and complements existing initiatives such as the Sustainable Energy Fund for Africa which provides finance to unlock private investments in renewable energy and energy efficiency.

Moon – public private partnership to provide electricity as a service for last-mile rural households

Sector: Energy access

Countries: Senegal, Togo

Financial mechanism: Public private partnerships

Overview

Moon was developed in 2015 and spun off in 2019 from Sunna, a company that designs and manufactures smart solar street lighting solutions with 100 000 products installed. Moon finances, installs and operates electricity systems for hard-to-reach rural communities in sub-Saharan Africa, primarily Senegal and Togo. Alongside leasing arrangements for solar home systems (SHS) with households, Moon is able to offer a unique energy-as-a-service model that reduces the overall costs for end-users.

Key elements

Under Moon’s model, end users pay a small fee for the use of the SHS – similar to how they would pay for electricity if they had access to the grid. This fee covers maintenance and replacement of the SHS, as necessary. Households do not cover the capex of the SHS, which is provided by public infrastructure funds and/or concessional finance. This approach enables the operator to act as a service provider, offering electricity with SHS today but with the option to switch to another technology such as a mini-grid or distribution utility concession in the future if that proves to be a more fitting solution for the community.

Revenues collected from customers cover the maintenance and operation costs, but finance is still required for infrastructure, development and overhead costs. To raise this capital, Moon creates a special purpose vehicle to attract equity from infrastructure funds and to raise long-term debt, including from concessional finance providers. The government also provides support, either through subsidising the tariff to facilitate payments by end-users or by creating other financial support schemes to allow households to purchase SHS.

Table A.16 ► Barriers addressed or mitigated

Barrier	Detail
Affordability constraints	Low-income rural households cannot afford acquiring a modern solar stand-alone system, but are able to pay for the electricity consumed, as grid-customers do. The electricity-as-a service approach adopted by Moon reduces the costs for households and maintains the option to develop larger systems such as mini-grids or distribution networks as demand grows.
Limited access to appropriate finance	Rural energy access projects are particularly hard to raise capital for due to the lower income levels of end users and the lower energy demand. Thanks to the creation of an SPV, Moon is able to raise both equity and affordable debt, while also guaranteeing government support via a public-private partnership.

MUNYAX ECO – supporting women’s empowerment alongside energy access

Sector: Renewable energy, energy efficiency
Countries: Rwanda, Burundi and DRC
Financial mechanism: Grants and debt finance

Overview

MUNYAX ECO is a company from Rwanda working in the solar energy and energy efficiency sectors. Founded in 2013 by Francine Munyaneza – one of the ten finalists for the 2022 Africa’s Business Heroes Awards – this 100% women-owned and led company provides and installs environmentally friendly and high-quality solar equipment at affordable prices. The company upholds a gender-focused recruitment and sales strategy and provides training to the local youth and women. Identifying water heating as a major energy consumer in African households, MUNYAX ECO started by supplying and installing solar water heaters to end-users in urban and rural Rwanda, and progressively expanding its services with solar home systems, solar LED street lighting, and solar systems for commercial, industrial, and productive use.

Key elements

Since 2020, MUNYAX ECO has embarked on a sustained growth path with support from GET.invest. Starting from the revision of its business strategy and financial model, funding opportunities were identified and a data room was set up to address financiers’ and investors’ information needs. After an introduction to potential financiers, MUNYAX ECO successfully negotiated an equity raise. As a result, several transactions are now at financial close with total projected investment volume of USD 3.6 million, expected to provide clean energy to half a million people. With financial advisory services from GET.invest, the company now focuses on attracting external equity and expanding its business to neighbouring countries.

Table A.17 ▶ Barriers addressed or mitigated

Barrier	Detail
Lack of early-stage development finance	Locally owned start-ups can struggle to attract finance as they have limited access to international financial markets and local commercial banks cannot provide loans on viable terms. Many of these businesses also need support to create a bankable investment proposal, but they lack capital to fund these activities. GET.invest’s support services helped hone MUNYAX ECO’s business model and facilitated access to finance.
Gender imbalance within the energy sector	Women are often under-represented in the energy sector, but are disproportionately negatively affected by lack of access to electricity and clean cooking. As a female-led business with an emphasis on gender-focussed recruitment, MUNYAX ECO helps grow the female workforce in the energy sector, while also providing energy access to households.

National Clean Energy Access Programme (NCEP) Ghana – using carbon markets to drive energy access

Sector: Energy access, renewable energy

Countries: Ghana

Financial mechanism: Article 6 of the Paris Agreement

Overview

The National Clean Energy Access Programme (NCEP)⁴ is a programme run by Ghana's Environmental Protection Agency to improve clean and affordable energy access. The programme is linked to the country's Nationally Determined Contributions (NDC), which has allowed it to benefit from mechanisms under Article 6 of the Paris Agreement. Following a bilateral agreement between Ghana and Switzerland in 2020, Swiss companies can now fund projects under the NCEP in return for internationally transferred mitigation outcomes under Article 6.2. Switzerland's KliK Foundation, which fulfils the Swiss motor fuel industry's obligation to partially offset the carbon emissions from the country's transportation sector, is the first to take advantage of this.

Key elements

NCEP supports households and small and medium-sized enterprises by making investments in solar PV installations financially viable. This includes the use of results-based financing. NCEP consist out of two components: (1) a digital measurement, reporting, and verification (MRV) platform that tracks solar PV generation and resulting emission reductions; and (2) A solar PV rooftop programme, with a capacity of up to 1 MW monitored by the digital MRV platform. Between 2021 and 2030, the NCEP aims to directly avoid 350 000 tCO₂-eq.

Table A.18 ► Barriers addressed or mitigated

Barrier	Detail
Limited access to appropriate finance	A major barrier lies in the perceived risk of renewable energy projects and resulting unattractive lending conditions which lead to a lack in (upfront) financing. NCEP will address this barrier through performance-based payments for emissions reductions and securitised loans at concessional conditions.
Lack of early-stage development finance	By de-risking local banks, projects participating in NCEP gain access to affordable loans. With this approach, investments become financially viable and offer sustained benefits from clean and affordable energy.
Lack of awareness and capacity	Consumers, policy makers and investors are not fully aware of the environmental and economic benefits related to clean energy. This knowledge gap is partly caused by the lack of or fragmented and inadequate monitoring of clean energy revenues and return on investment.

⁴ The technical and legal ownership of the programme lies with KliK.

Pro Mini Grids, Uganda – improving enabling environment for mini-grids in rural areas

Sector: Energy access, renewable energy

Countries: Uganda

Financial mechanism: DFI support for enabling environment

Overview

The Promotion of Mini-Grids for Rural Electrification project (Pro Mini Grids) was developed to de-risk the enabling environment for mini-grid investment in Uganda. GIZ through the Global Energy Transformation programme (GET.transform) worked with the Ugandan government to introduce a new regulatory framework, including a tendering process. The first tender for 40 mini-grids, won by Winch Energy (now represented as NEoT Offgrid Africa), marks the country’s first public-private partnership (PPP) for mini-grids. GIZ estimates that 20 000 people will gain access to electricity via these new mini-grids.

Key elements

The Pro Mini Grids programme supported Uganda’s Electricity Regulatory Authority to develop mini-grid technical standards for areas such as Engineering, Procurement and Construction contracts and grid interconnection guidelines, aiming to reduce the overall cost of service for mini-grids. The PPP model utilised is also an innovative approach, which ensures government buy-in but relies on private sector financing and expertise. The programme also funds capacity building, both for the relevant government bodies and the private sector, as well as access to finance for small and medium-sized enterprises, farmers and households.

Table A.19 ► Barriers addressed or mitigated

Barrier	Detail
Unclear policies and regulations	Incomplete policy and regulatory frameworks for off grid projects can hinder investment. By working with the government to develop the regulatory environment, create a tendering process, and produce standardised sector guidelines, Pro Mini Grids contributed to removing a regulatory barrier.
Limited access to appropriate finance	Mini-grid projects can struggle to attract concessional finance, including if they are too small or if there is a risk that they will be replaced by grid connections in the near future. The PPP approach adopted by Pro Mini Grids bundles projects together, increasing the scale of the proposal for developers, and the locations are selected with buy-in from political stakeholders reducing the risk of overlap with grid extensions.
Mini-grid commercial viability	Mini-grid projects often need to be anchored on viable productive uses of energy to guarantee sustainable cash flows and avoid pushing up the tariffs to socially untenable levels. The Pro Mini Grid programme works with target areas for mini-grids to stimulate economic activity, particularly value addition in agriculture, to drive greater energy demand for mini-grids.

Programme for Energy Efficiency in Buildings (PEEB) Cool – dual funds providing finance and technical support

Sector: Energy efficiency, renewable energy

Countries: 11 countries across 4 continents. In Africa: Djibouti, Nigeria, Morocco, Tunisia

Financial mechanism: Climate finance (Green Climate Fund [GCF])

Overview

The Programme for Energy Efficiency in Buildings (PEEB) Cool programme aims at transforming the buildings sector to a zero emissions and resilient sector through financing, policy and capacity building. The programme addresses crosscutting mitigation and adaptation challenges to stimulate investment in green buildings, which have multiple positive impacts. Alongside improved resilience of the most vulnerable communities, the programme also aims to mitigate 1.56 MtCO₂-eq with 1.2 million direct beneficiaries; it will also facilitate the creation of 47 000 jobs.

Key elements

PEEB Cool is composed of two facilities: one that provides investment and another that focuses on the enabling environment. The Investment Facility is implemented by the Agence Française de Développement (AFD) and develops large-scale green building projects through financing (concessional loans and grants), as well as expert support throughout all stages of the project cycle to public and private projects. The Enabling Facility is implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ, the German development agency) and through capacity building and providing access to international networks and best practices, supports stakeholders in understanding relevant policies (e.g. national cooling strategies for buildings, building code development and enforcement). It also improves strategies and regulations for resilient and efficient buildings through policy advice, capacity building and international awareness. GCF contributed USD 233.8 million in loans (80%) and grants (20%) to the Investment Facility in order to leverage a further USD 1.2 billion from AFD.

Table A.20 ► Barriers addressed or mitigated

Barrier	Detail
Lack of early-stage development finance	Many projects in energy efficiency struggle to reach bankability due to a lack of early-stage financing. PEEB Cool provides technical assistance to owners on the feasibility, design and construction of energy-efficient low-carbon and resilient buildings (Investment Facility) and through capacity building (Enabling Facility).
Lack of awareness and capacity	Green buildings represent a relatively new investment prospect in most African countries outside of South Africa. PEEB Cool's dual facility approach means that project owners can access concessional loans, but also that governments can receive support to develop sectoral frameworks and drive further mobilisation of investments.

Room2Run, AfDB – freeing up concessional capital to reinvest

Sector: All

Countries: All

Financial mechanism: Synthetic securitisation transaction

Overview

AfDB’s Room2Run Synthetic Securitisation Transaction (SST) was a risk transfer agreement signed in 2018 whereby the bank transferred a portion of risk from a USD 1 billion portfolio to institutional and public sector investors: Mariner Investment Group, Africa50 and the EU-backed European Fund for Sustainable Development (EFSD). By reducing risk on the balance sheet, the deal freed up an estimated USD 650 million in additional lending capacity.

Key elements

Room2Run focused on a portfolio of 45 private sector loans, which was then divided into four tranches: equity, mezzanine, senior mezzanine, and senior (in order of descending risk). The AfDB retained the equity and senior tranches. The risk on the two mezzanine tranches – totalling USD 152.5 million and USD 100 million respectively – was then sold to investors. The deal is a synthetic securitisation, meaning the AfDB remains the lender of record but pays investors a credit protection premium (similar to an insurance policy) in exchange for a payment of the mezzanine tranche in case of default. The senior mezzanine tranche is guaranteed by EFSD. This reduces the risk assigned to the loans featured in the underlying portfolio, thereby freeing up risk capital for reinvestment.

As a first of its kind transaction, the SST took two years to structure. Challenges included understanding how credit ratings agencies, in this case S&P, would measure the impact of the transaction on the bank’s prudential ratios, and ensuring that investors had enough familiarity with the loans in the portfolio. Having piloted the approach, Room2Run SST can now be replicated by other MDBs. For example, in April 2023, the Inter-American Development Bank announced they were planning a similar transaction.

Table A.21 ► Barriers addressed or mitigated

Barrier	Detail
Limited pool of MDB capital	MDB resources are limited and they need to maintain a strong capital base in order to act at the scale required. Room2Run was able to free up capital for further lending without further contributions from shareholders and without affecting the bank’s credit rating.
Private sector unable to access projects	Many institutional investors that are not familiar with African markets are more comfortable partnering with an MDB due to its strong due diligence processes and high credit rating. By keeping AfDB as the lender of record, Room2Run SST ensured the bank retains an incentive to prevent the loans from defaulting, adding additional protection to investors.

Sustainable Energy Fund for Africa (SEFA) – providing catalytic finance to unlock private-sector investment

Sector: Renewable energy, energy access, energy efficiency

Countries: All

Financial mechanism: Concessional finance, results-based finance, technical assistance

Overview

The Sustainable Energy Fund for Africa (SEFA) is a multi-donor special fund, managed by the African Development Bank Group. It is a flexible mechanism that provides technical assistance to improve enabling environments, project preparation support and catalytic finance to unlock private capital investment in renewable energy and energy efficiency.

Key elements

SEFA offers technical assistance and concessional finance instruments to address market barriers, build a more robust pipeline of projects and improve the risk-return profile of individual investments. It provides a combination of pure grants, reimbursable grants, concessional loans and first-loss equity to bridge the viability gap and catalyse private capital into clean energy projects.

While the focus has historically been towards countries with traditionally scarce private sector investment or no track record of renewable energy development, with the advent of just energy transition initiatives, SEFA's footprint is gradually extending to cover countries faced with the challenge of scaling up decarbonisation programmes. This dual approach aligns with SEFA's overarching purpose to help achieve universal access to affordable, reliable, sustainable and modern energy services for all in Africa.

Table A.22 ► **Barriers addressed or mitigated**

Barrier	Detail
Lack of catalytic concessional capital	The pool of concessional capital available to support energy projects in Africa is limited. SEFA provides project preparation grants, viability gap funding, concessional loans and first-loss capital to de-risk projects and catalyse more significant amounts of private sector capital to finance utility-scale renewable energy generation, mini-grids and energy efficiency projects.
Lack of pipeline of bankable projects	Many clean energy projects struggle to reach bankability due to a lack of early-stage finance. This finance is vital to help companies develop investable propositions. SEFA's broad range of instruments, including grants and viability gap funding, allow the fund to fill this gap, especially in countries that have traditionally received scarce private investment. It has developed programmatic approaches to support the scale-up of renewable energy and energy efficiency investments, such as the Africa Green Mini-Grid Acceleration Programme, the Energy Efficiency Market Development Program, and recently, the Africa Energy Transition Catalyst Programme.

Spark+ Africa – dedicated clean cooking investment fund

Sector: Clean cooking, energy access

Countries: Portfolio companies active in sub-Saharan Africa

Financial mechanism: Growth capital and technical assistance for early-stage companies

A

Overview

Spark+ Africa Fund was established in 2022 by stakeholders from the clean cooking and impact investment ecosystems. The fund has raised USD 64 million from over 16 investors, including the African Development Bank Group and other DFIs, as well as foundations, family offices, and pension funds. It aims to address the clean cooking gap in Africa, supporting companies that offer distributed cooking energy solutions to the mass market, primarily focusing on domestic users but also targeting institutions such as schools and hospitals. Targeted companies include designers, manufacturers, distributors, and retailers of cooking solutions, as well as microfinance institutions and off-grid electricity access operators.

Key elements

Spark+ Africa Fund invests in early-stage companies whose technology and solutions have demonstrated market fit and are active in the value chains of various cooking fuels including efficient biomass stoves, LPG, biofuels such as ethanol and pellets and electric appliances. These companies often struggle to access affordable capital on viable terms, since they tend to be small-scale and reliant on either local commercial banks or international private equity and venture capital. The fund invests in companies ranging from USD 0.5 million to USD 7 million via a large and flexible toolkit that includes debt, mezzanine, and in selected cases, equity capital.

To complement the capital invested, the fund also provides technical assistance and support to management teams, leveraging expertise within the investment team ecosystem and partners such as the Clean Cooking Alliance. In May 2022 Spark+ Africa Fund made its first investment of USD 6 million, via a long-term quasi-equity instrument, in Burn Manufacturing, a global vertically integrated leader in the design and manufacturing of cooking solutions.

Table A.23 ▶ Barriers addressed or mitigated

Barrier	Detail
Difficulty in financing small ticket sizes	Cooking projects are generally considered too small and risky for many investors, particularly start-ups which generally cannot access commercial bank capital. Thanks to its impact investment focus, Spark+ is able to invest in early-stage start-ups that have already started generating revenues.
Unproven business models	Business models addressing the cooking gap are still pioneer, with limited track record of successful exits for investors. Impact investment approaches can accompany start-ups to scale-up by offering technical assistance, customised support to management, as well as a combination of sources of finance.

Transco CLSG – financing grids with a regional approach

Sector: Transmission infrastructure

Countries: Côte d’Ivoire, Liberia, Sierra Leone and Guinea

Financial mechanism: Pooling of DFI financing

Overview

Transco CLSG (Transco) is a multinational investment operation developed by the West African Power Pool (WAPP) to accelerate regional interconnection among the states of Côte d’Ivoire, Liberia, Sierra Leone and Guinea (CLSG). The overall goal is to ensure the transit of low-cost electricity supply in the CLSG countries through establishing a joint market for sellers and buyers and by supporting appropriate infrastructure.

Key elements

The key mission of Transco is to finance, construct, operate, maintain, own and develop a transmission line to connect the CLSG countries. Financed by the World Bank, the European Investment Bank, KfW and the African Development Bank Group, with financial contributions by the CLSG countries, the project mobilised USD 531 million in total. By pooling resources from DFIs and managing the full lifecycle of the project through a centralised mechanism, Transco successfully proved the effectiveness of a model through which a transnational company leads the deployment of regional transmission infrastructure.

The 225 kV transmission line stretches over 1 303 kilometres through the four countries, which had the potential to cause multiple delays. A clear legal basis and strong political support underpinned the success of the project, not just at national and municipal level but also among local communities led by respected elders and women’s groups.

Table A.24 ► **Barriers addressed or mitigated**

Barrier	Detail
Limited access to appropriate finance	Regional transmission infrastructure can be difficult to finance and often faces limited stakeholder coordination. Setting up a multinational entity to pool capital and centralise procurement, construction and operation of the asset proved to be a successful way to mitigate these difficulties.
Community opposition	Large-scale energy infrastructure projects can be hindered by community opposition, particularly in light of sensitive resettlement plans. Strong political support at all levels ensured buy-in and positive outcomes.
Risk of delays due to multiple stakeholders	Countries participating in regional projects can develop interconnectors at different speeds. This raises the risk of assets remaining idle if not all the interconnectors are completed at the same time. The coordinated approach through a multinational entity mitigates this, with one entity having oversight of the procurement processes and the implementation of the overall project.

UpEnergy Improved Cookstove Programme – voluntary carbon markets supporting efficient cookstoves

Sector: Energy access, renewable energy, energy efficiency

Countries: Uganda

Financial mechanism: Voluntary carbon market (VCM)

Overview

UpEnergy – a Uganda-based company focused on emissions reduction – operates a number of projects in clean cooking, safe water, and afforestation. The emissions reductions from these projects generate UN-certified carbon credits and Verified Emission Reductions that buyers can access through the Clean Development Mechanism (CDM) and voluntary markets. Their access to these markets is enhanced by their certification by Gold Standard, a voluntary carbon offset scheme that provides a label to verified carbon credits generated by projects for carbon offsetting purposes. Projects under both voluntary markets and compliance markets, such as the CDM, are eligible for the Gold Standard label.

Key elements

Climate action initiatives, such as clean cookstoves, that would not otherwise be able to get off the ground are funded by the carbon credits to receive private investment. The purpose of the UpEnergy Improved Cookstove Programme is to facilitate the transition away from inefficient traditional non-renewable biomass-fired stoves, by providing high-efficient biomass-fired improved cookstoves (ICS). The energy-saving cookstoves help users save an average of 16% of their annual income.⁵ Firewood and charcoal (often generated unsustainably and inefficiently) lead to deforestation and their combustion emits GHGs. The programme targets urban and peri-urban areas where charcoal is the primary fuel used for cooking on traditional biomass stoves.

Table A.25 ▶ Barriers addressed or mitigated

Barrier	Detail
Affordability constraints	Clean cooking projects often struggle to access finance as they may not always be commercially viable due to high costs and affordability constraints of the end users. Through research and development, production and transportation activities partially funded by CDM, UpEnergy managed to bring the upfront investment cost of ICS down, making them affordable to households
Lack of awareness and capacity	People are often unaware of the negative effects traditional cookstoves have on their health and the environment. Moreover, traditional cookstoves can be costly to use when there is no natural fuel around. The programme actively seeks local partnerships to enable communities to access new technologies and contributes to the scale-up of local businesses and organisations.

⁵ This is an estimate based on fuel savings (measured) and average fuel cost.

Definitions

This annex provides general information on terminology used throughout this report including: units; definitions of fuels, processes and sectors; regional and country groupings; and abbreviations and acronyms.

Units

Distance	km	kilometre
Emissions	Mt CO ₂	million tonnes of carbon dioxide
	Gt CO ₂	gigatonnes of carbon-dioxide
Energy	GJ	gigajoule (1 joule x 10 ⁹)
	MWh	megawatt-hour
	TWh	terawatt-hour
Gas	bcm	billion cubic metres
Mass	kg	kilogramme (1 000 kg = 1 tonne)
	Mt	million tonnes (1 tonne x 10 ⁶)
	Gt	gigatonnes (1 tonne x 10 ⁹)
Monetary	EUR million	1 euro x 10 ⁶
	EUR billion	1 euro x 10 ⁹
	KES million	1 Kenyan shilling x 10 ⁶
	KES billion	1 Kenyan shilling x 10 ⁹
	NGN million	1 Nigerian naira x 10 ⁶
	NGN billion	1 Nigerian naira x 10 ⁹
	USD million	1 US dollar x 10 ⁶
	USD billion	1 US dollar x 10 ⁹
	USD trillion	1 US dollar x 10 ¹²
Power	Wp	watt peak
	MW	megawatt (1 watt x 10 ⁶)
	GW	gigawatt (1 watt x 10 ⁹)

Exchange rate (All as of 31 May 2023).

- 1 Angolan Kwanza (AOA) = USD 0.00171
- 1 Botswanan Pula (BWP) = USD 0.07246
- 1 Egyptian Pound (EGP) = USD 0.03241
- 1 Ethiopian Birr (ETB) = USD 0.01833
- 1 Gambian Dalasi (GMD) = USD 0.01638
- 1 Ghanaian Cedi (GHS) = USD 0.09029
- 1 Kenyan Shilling (KES) = USD 0.00722
- 1 Malawian Kwacha (MWK) = USD 0.00098
- 1 Moroccan Dirham (MAD) = USD 0.09817
- 1 Mozambican Metical (MZN) = USD 0.01565
- 1 Nigerian Naira (NGN) = USD 0.00217
- 1 Sierra Leonean Leone (SLL) = USD 0.000044266
- 1 South African Rand (ZAR) = USD 0.0507
- 1 Tanzanian Shilling (TZS) = USD 0.00042
- 1 Ugandan Shilling (UGX) = USD 0.00027
- 1 Zambian Kwacha (ZMW) = USD 0.05124

Definitions

Agriculture: Includes all energy used on farms, in forestry and for fishing.

Ammonia (NH₃): Is a compound of nitrogen and hydrogen. It can be used directly as a fuel in direct combustion processes, as well as in fuel cells or as a hydrogen carrier. To be a low emissions fuel, ammonia must be produced from low-carbon hydrogen, the nitrogen separated via the Haber process with electricity generated from low-carbon sources.

Aviation: This transport mode includes both domestic and international flights and their use of aviation fuels. Domestic aviation covers flights that depart and land in the same country; flights for military purposes are included. International aviation includes flights that land in a country other than the departure location.

Back-up generation capacity: Households and businesses connected to a main power grid may also have some form of back-up power generation capacity that, in the event of disruption, can provide electricity. Back-up generators are typically fuelled with diesel or gasoline. Capacity can be as little as a few kilowatts. Such capacity is distinct from mini-grid and off-grid systems that are not connected to a main power grid.

Balance sheet finance: Involves the explicit financing of assets on a company's balance sheet using retained earnings from business activities, including those with regulated revenues, as well as corporate debt and equity issuance in capital markets. To some extent, it measures the degree to which a company self-finances its assets, though balance sheets also serve as intermediaries for raising capital from external sources. This report also refers to "corporate finance" when describing balance sheet financing.

Battery storage: Energy storage technology that uses reversible chemical reactions to absorb and release electricity on demand.

Biogas: A mixture of methane, carbon dioxide and small quantities of other gases produced by anaerobic digestion of organic matter in an oxygen-free environment.

Blended finance: A broad category of development finance arrangements that blend relatively small amounts of concessional donor funds into investments in order to mitigate specific investment risks. This can catalyse important investments that would otherwise be unable to proceed under conventional commercial terms. These arrangements can be structured as debt, equity, risk-sharing or guarantee products. Specific terms of the arrangements, such as interest rates, tenor, security or rank, can vary across scenarios.

Bond: A financing instrument that represents a loan made by an investor to a borrower, which can be a corporate or a government. A bond is typically issued with an end date by which the principal of the loan is due to be paid back to the creditor (see bond maturity). Other than repayment of the principal, a bond also includes variable or fixed interest payments payable by the borrower or bond issuer to the creditor or bondholder.

Bond maturity: The date in which the borrower is due to pay back to the creditor all amounts detailed in the bond instrument, including principal and any outstanding interest payments.

Bond yield: The return an investor or bondholder expects to receive over the lifetime of the bond.

Buildings: The buildings sector includes energy used in residential, commercial and institutional buildings and non-specified other. Building energy use includes space heating and cooling, water heating, lighting, appliances and cooking equipment.

Carbon capture, utilisation and storage (CCUS): The process of capturing carbon dioxide (CO₂) emissions from fuel combustion, industrial processes or directly from the atmosphere. Captured CO₂ emissions can be stored in underground geological formations, onshore or offshore or used as an input or feedstock in manufacturing.

Carbon dioxide (CO₂): Is a gas consisting of one part carbon and two parts oxygen. It is an important greenhouse (heat-tapping) gas.

Clean energy: In *power*, clean energy includes: generation from renewable sources, nuclear and fossil fuels fitted with CCUS; battery storage; and electricity grids. In *efficiency*, clean energy includes energy efficiency in buildings, industry and transport, excluding aviation bunkers and domestic navigation. In *end-use* applications, clean energy includes: direct use of renewables; electric vehicles; electrification in buildings, industry and international marine transport; use of hydrogen and hydrogen-based fuels; CCUS in industry and direct air capture. In *fuel supply*, clean energy includes low emission fuels, liquid biofuels and biogases, low-carbon hydrogen and hydrogen-based fuels.

Clean cooking systems: Cooking solutions that release less harmful pollutants, are more efficient and environmentally sustainable than traditional cooking options that make use of solid biomass (such as a three-stone fire), coal or kerosene. This refers primarily to improved solid biomass cookstoves, biogas/biogasifier systems, electric stoves, liquefied petroleum gas, natural gas or ethanol stoves.

Coal: Includes both primary coal (i.e. lignite, coking and steam coal) and derived fuels (e.g. patent fuel, brown-coal briquettes, coke-oven coke, gas coke, gas works gas, coke-oven gas, blast furnace gas and oxygen steel furnace gas). Peat is also included.

Concentrating solar power (CSP): Solar thermal power generation technology that collects and concentrates sunlight to produce high temperature heat to generate electricity.

Concessional finance: Resources extended at terms more favourable than those available in the market. This can be achieved through one or a combination of factors: interest rates below those available on the market; maturity, grace period, security, rank or back-weighted repayment profile that would not be accepted/extended by a commercial financial institution; and/or by providing financing to the recipient otherwise not served by commercial financing.

Credit rating: An independent assessment of a government's creditworthiness in general terms or with respect to a particular debt or financial obligation, which is done by specialised credit rating agencies.

Critical minerals: A wide range of minerals and metals used in clean energy technologies. They include chromium, copper, battery metals (lithium, nickel, cobalt, manganese and graphite), molybdenum, platinum group metals, zinc, rare earth elements and other commodities, as listed in the Annex of the IEA special report on the *Role of Critical Minerals in Clean Energy Transitions* available at: <https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions>

Debt: Bonds or loans issued or taken out by a company to finance its growth and operations.

Debt issuance: A financial obligation that allows the issuer to raise capital by agreeing to pay back the lender within a given time period accruing a fixed or variable interest rate. Bonds are among the most common forms of debt issuance by governments.

Debt service: The capital required to pay back the principal and make interest payments on outstanding loans for a particular period of time.

Dispatchable generation: Refers to technologies for which power output can be readily controlled, i.e. increased to maximum rated capacity or decreased to zero, in order to match supply with demand.

Electricity demand: Defined as total gross electricity generation less own use generation, plus net trade (imports less exports), less transmission and distribution losses.

Electricity generation: Defined as the total amount of electricity generated by power only or combined heat and power plants including generation required for own use. This is also referred to as gross generation.

End-use sectors: Include industry (i.e. manufacturing, mining, chemical production, blast furnaces and coke ovens), transport, buildings (i.e. residential and services) and other (i.e. agriculture and other non-energy use).

Energy-related and industrial process CO₂ emissions: Carbon dioxide emissions from fuel combustion and from industrial processes. Note that this does not include fugitive emissions from fuels, flaring or CO₂ from transport and storage. Unless otherwise stated, CO₂ emissions in *Financing Clean Energy in Africa* refer to energy-related and industrial process CO₂ emissions.

Energy sector greenhouse gas (GHG) emissions: Energy-related and industrial process CO₂ emissions plus fugitive and vented methane (CH₄) and nitrous oxide (N₂O) emissions from the energy and industry sectors.

Energy services: See useful energy.

Equity: The amount of money that would be returned to a company's shareholders if all the assets were liquidated and all of the company's debt was paid off. An equity investment is money that is invested in a company by purchasing shares of that company, either on the stock market for public companies or via private equity deals for non-listed companies.

Ethanol: Refers to bio-ethanol only. Ethanol is produced from fermenting any biomass high in carbohydrates. Currently, ethanol is made from starches and sugars, but second generation technologies will allow it to be made from cellulose and hemicellulose, the fibrous material that makes up the bulk of most plant matter.

Fossil fuels: Include coal, natural gas, oil and peat.

Geothermal: Geothermal energy is heat derived from the sub-surface of the earth. Water and/or steam carry the geothermal energy to the surface. Depending on its characteristics, geothermal energy can be used for heating and cooling purposes or be harnessed to generate clean electricity if the temperature is adequate.

Grant: Resources allocated by development finance institutions or donors to recipient countries which do not earn interest and do not need to be paid back. Grants are generally provided to support specified development objectives.

Green bank: Refers to a public, quasi-public or non-profit entity established specifically to facilitate private investment for low-carbon, climate-resilient infrastructure.

Green bond: Refers to a bond that is a type of fixed-income instrument created to fund projects that have positive environmental and/or climate benefits.

Greenium: The notion that green, social, sustainable and sustainability-linked (GSSS) debt instruments often attract a lower yield than their vanilla counterparts.

Guarantee: An agreement that secures the repayment of a debt to a lender by a third-party if the borrower defaults. The third-party acts as a guarantor and assumes responsibility for the repayment of the debt if the original debtor defaults.

Heat (end-use): Can be obtained from the combustion of fossil or renewable fuels, direct geothermal or solar heat systems, exothermic chemical processes and electricity (through resistance heating or heat pumps which can extract it from ambient air and liquids). This category refers to the wide range of end-uses, including space and water heating and cooking in buildings, desalination and process applications in industry. It does not include cooling applications.

Heat (supply): Obtained from the combustion of fuels, nuclear reactors, geothermal resources and the capture of sunlight. It may be used for heating or cooling, or converted into mechanical energy for transport or electricity generation. Commercial heat sold is reported under total final consumption with the fuel inputs allocated under power generation.

Loan: A financial instrument whereby a party borrows money from another party, undertaking to repay the nominal amount borrowed (principal) and interest within a given time period.

Low-emissions fuels: Include modern bioenergy, low-emissions hydrogen and low-emissions hydrogen-based fuels (**e.g., ammonia made from low-emissions hydrogen**).

Low-emissions hydrogen: Hydrogen that is produced from water using electricity generated by renewables or nuclear, from fossil fuels with minimal associated methane emissions and processed in facilities equipped to avoid CO₂ emissions, e.g. via CCUS with a high capture rate, or derived from bioenergy.

Hydropower: The energy content of the electricity produced in hydropower plants, assuming 100% efficiency. It excludes output from pumped storage and marine (tide and wave) plants.

Improved cook stoves (ICS): Intermediate and advanced improved biomass cook stoves (ISO tier \geq 1). It excludes basic improved stoves (ISO tier 0-1).

Industry: The sector includes fuel used within the manufacturing and construction industries. Key industry branches include iron and steel, chemical and petrochemical, cement, aluminium, and pulp and paper. Use by industries for the transformation of energy into another form or for the production of fuels is excluded and reported separately under other energy sector. There is an exception for fuel transformation in blast furnaces and coke ovens, which are reported within iron and steel. Consumption of fuels for the transport of goods is reported as part of the transport sector, while consumption by off-road vehicles is reported under industry.

Informal employment: Comprises workers whose main or secondary jobs are associated with informal sector enterprises, workers whose production is exclusively for final use by their own household, and workers whose employment relationship is not subject to national labour legislation, social protection, income taxation and/or employment benefits.

Investment: Investment is measured as the ongoing capital spending in energy supply capacity, energy infrastructure and energy end-use and efficiency. All investment data and projections reflect spending across the lifecycle of a project, i.e. the capital spent is assigned to the year when it is incurred. Fuel supply investments include production, transformation and transportation for oil, gas, coal and low emissions fuels. Power sector investments include new builds and refurbishments of generation, electricity grids (transmission, distribution and public electric vehicle chargers) and battery storage. Energy efficiency investments include those made in buildings, industry and transport. Other end-use investments include direct use of renewables; electric vehicles; electrification in buildings, industry and international marine transport; use of hydrogen and hydrogen-based fuels; fossil fuel-based industrial facilities; CCUS in industry and direct air capture. Investment data are presented in real terms in year-2020 US dollars unless otherwise stated.

Mini-grids: Small electric grid systems comprised of generation unit(s) and distribution lines, not connected to main electricity networks that link a number of households and/or other consumers. Mini-grids can be eventually connected to a main grid.

Modern energy access: Includes household access to a minimum level of electricity (initially equivalent to 250 kWh annual demand for a rural household and 500 kWh for an urban household); household access to less harmful and more sustainable cooking and heating

fuels, and improved/advanced stoves; access that enables productive economic activity; and access for public services.

Mezzanine finance: A form of subordinate debt financing that allows lenders to convert their debt to equity in the case of default. The increased risk associated with being subordinate to secured lenders is typically compensated by higher interest rates and the option to receive equity instead of interest income.

Natural gas: Comprises gases occurring in deposits, whether liquefied or gaseous, consisting mainly of methane. It includes both non-associated gas originating from fields producing hydrocarbons only in gaseous form, and associated gas produced in association with crude oil as well as methane recovered from coal mines (colliery gas). Natural gas liquids, manufactured gas (produced from municipal or industrial waste, or sewage) and quantities vented or flared are not included. Gas data in cubic metres are expressed on a gross calorific value basis and are measured at 15 °C and at 760 mm Hg (Standard Conditions). Gas data expressed in tonnes of oil equivalent, mainly for comparison reasons with other fuels, are on a net calorific basis. The difference between the net and the gross calorific value is the latent heat of vaporisation of the water vapour produced during combustion of the fuel (for gas the net calorific value is 10% lower than the gross calorific value).

Nominal (terms): Nominal (value or terms) is a financial and economic term that indicates the statistic in question is measured in actual prices that exist at the time. Nominal value of any economic statistic means the statistic is measured in terms of actual prices that exist at the time.

Off-grid systems: Mini-grids and stand-alone systems for individual households or groups of consumers not connected to a main grid.

Oil: Includes both conventional and unconventional oil production. Petroleum products include refinery gas, ethane, liquid petroleum gas, aviation gasoline, motor gasoline, jet fuels, kerosene, gas/diesel oil, heavy fuel oil, naphtha, white spirits, lubricants, bitumen, paraffin, waxes and petroleum coke.

Power generation: Refers to fuel use in electricity plants, heat plants and combined heat and power plants. Both main activity producer plants and small plants that produce fuel for their own use (auto-producers) are included.

Project finance: Involves external lenders, such as commercial banks, development banks and infrastructure funds, sharing risks with the sponsor of the project. It can also involve fundraising from debt capital markets with asset-backed project bonds. They often involve non-recourse or limited recourse loans where lenders provide funding on a project's future cash flow and have no or limited recourse to liability of the project parent companies.

Productive uses: Energy used towards an economic purpose: agriculture, industry, services and non-energy use. Some energy demand from the transport sector (e.g. freight) could be considered as productive, but is treated separately.

Renewables: Includes bioenergy, geothermal, hydropower, solar photovoltaics (PV), concentrating solar power (CSP), wind and marine (tide and wave) energy for electricity and heat generation.

Road transport: Includes all road vehicle types (passenger cars, two/three-wheelers, light commercial vehicles, buses and medium and heavy freight trucks).

Securitisation: Financial instrument whereby assets are pooled into a special purpose vehicle to create a tradable asset-backed security.

Solar: Includes solar photovoltaics and concentrating solar power.

Solar home systems (SHS): Small-scale photovoltaic and battery stand-alone systems (with capacity higher than 10 watt peak [Wp]) supplying electricity for single households or small business. They are most often used off-grid but also where grid supply is not reliable. Access to electricity in the IEA's definition considers solar home systems from 25 Wp in rural areas and 50 Wp in urban areas. It excludes smaller solar lighting systems, for example solar lanterns) of less than 11 Wp.

Solar photovoltaics (PV): Electricity produced from solar photovoltaic cells.

Sovereign debt: Debt issued by a government as a form of raising capital, typically by issuing bonds, bills, debt securities, or contracting loans from other countries, multilateral organisations and development finance institutions.

Stand-alone systems: Small-scale autonomous electricity supply for households or small businesses. They are generally used off-grid but also where grid supply is not reliable. Stand-alone systems include solar home systems, small wind or hydro generators, diesel or gasoline generators, etc. The difference compared with mini-grids is in scale and that stand-alone systems do not have a distribution network serving multiple costumers.

Senior debt: Debt with the first order of precedence for repayment in the event of default by the borrower, therefore carrying the lowest downside risk for the lender.

Subordinated debt: Unsecured debt, which in the event of default by the borrower is only repaid to the lender after more senior loans or securities are paid.

Synthetic securitisation: Allows the transfer of risk from one party to another without transferring ownership of the underlying loans. It allows the issuer to free up capital and diversify its portfolio by transferring part of its loan book to a special purpose vehicle that is then sold to other investors.

Traditional use of biomass: Refers to the use of solid biomass with basic technologies, such as a three-stone fire or basic improved cook stoves (ISO tier 0-1), often with no or poorly operating chimneys.

Transport sector: Fuels and electricity used in the transport of goods or people within the national territory irrespective of the economic sector within which the activity occurs. This includes fuel and electricity delivered to vehicles using public roads or for use in rail vehicles;

fuel delivered to vessels for domestic navigation; fuel delivered to aircraft for domestic aviation; and energy consumed in the delivery of fuels through pipelines.

Unabated fossil fuels: Consumption of fossil fuels in facilities without CCUS.

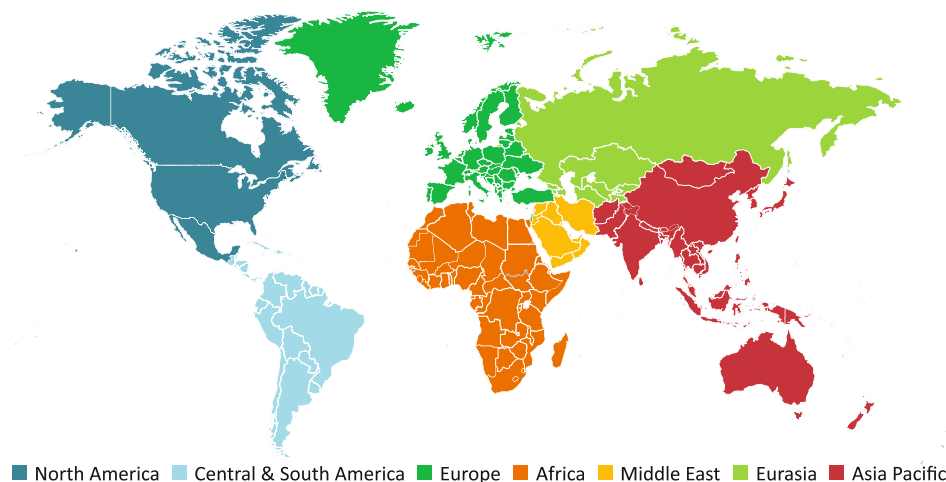
Useful energy: Refers to the energy that is available to end-users to satisfy their needs. This is also referred to as energy services demand. As result of transformation losses at the point of use, the amount of useful energy is lower than the corresponding final energy demand for most technologies. Equipment using electricity often has higher conversion efficiency than equipment using other fuels, meaning that for a unit of energy consumed, electricity can provide more energy services.

Variable renewable energy (VRE): Refers to technologies whose maximum output at any time depends on the availability of fluctuating renewable energy resources. VRE includes a broad array of technologies such as wind power, solar PV, run-of-river hydro, concentrating solar power (where no thermal storage is included) and marine (tidal and wave).

Viability gap funding: Capital needed to make a given project financially viable, particularly for demonstration projects or projects that would otherwise struggle to be profitable.

Weighted average cost of capital (WACC): The weighted average cost of capital is expressed in nominal terms and measures a company's required return on equity and the after-tax cost of debt issuance, weighted according to its capital structure.

Figure C.1 ▶ Main country groupings



Note: This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Advanced economies: OECD regional grouping and Bulgaria, Croatia, Cyprus^{1,2}, Malta and Romania.

Africa: North Africa and sub-Saharan Africa regional groupings.

Asia Pacific: Southeast Asia regional grouping and Australia, Bangladesh, Democratic People's Republic of Korea (North Korea), India, Japan, Korea, Mongolia, Nepal, New Zealand, Pakistan, People's Republic of China (China), Sri Lanka, Chinese Taipei, and other Asia Pacific countries and territories.³

Caspian: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan.

Central Africa: Cameroon, Central African Republic, Chad, Congo, Democratic Republic of the Congo (DRC), Equatorial Guinea and Gabon.

Central and South America: Argentina, Plurinational State of Bolivia (Bolivia), Brazil, Chile, Colombia, Costa Rica, Cuba, Curaçao, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Nicaragua, Panama, Paraguay, Peru, Suriname, Trinidad and Tobago, Uruguay, Bolivarian Republic of Venezuela (Venezuela), and other Central and South American countries and territories.⁴

China: Includes the (People's Republic of) China and Hong Kong, China.

Countries eligible for concessional finance: Countries with lower per-capita income that the AfDB classifies as having access to concessional resources from the African Development

Fund. Countries included in this grouping include Côte d'Ivoire, Djibouti, Ghana, Lesotho, Mauritania, São Tomé and Príncipe, Benin, Burkina Faso, Burundi, Central African Republic, Chad, Comoros, Democratic Republic of Congo, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Liberia, Madagascar, Malawi, Mali, Mozambique, Niger, Rwanda, Sierra Leone, Somalia, South Sudan, Sudan, Tanzania, Togo, Uganda and Zimbabwe.

Countries with access to commercial finance: Countries with higher per-capita income and creditworthiness to sustain non-concessional financing, which according to AfDB's classification have access to non-concessional resources or a combination of both concessional and non-concessional resources. Countries included in this grouping include Algeria, Angola, Botswana, Cabo Verde, Cameroon, Egypt, Equatorial Guinea, Eswatini, Gabon, Kenya, Libya, Mauritius, Morocco, Namibia, Nigeria, Republic of Congo, Senegal, Seychelles, South Africa, Tunisia and Zambia.

Developing Asia: Asia Pacific regional grouping excluding Australia, Japan, Korea and New Zealand.

Eastern Africa: Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Rwanda, Seychelles, Somalia, South Sudan, Uganda, United Republic of Tanzania, Zambia and Zimbabwe.

East Africa Community: Burundi, Kenya, Rwanda, South Sudan, Tanzania and Uganda.

Economic Community of West African States (ECOWAS): Member states include Benin, Burkina Faso, Cabo Verde, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo.

Emerging market and developing economies: All other countries not included in the advanced economies regional grouping.

Eurasia: Caspian regional grouping and the Russian Federation (Russia).

Europe: European Union regional grouping and Albania, Belarus, Bosnia and Herzegovina, North Macedonia, Gibraltar, Iceland, Israel⁵, Kosovo, Montenegro, Norway, Serbia, Switzerland, Republic of Moldova, Turkey, Ukraine and United Kingdom.

European Union: Member states include Austria, Belgium, Bulgaria, Croatia, Cyprus^{1,2}, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain and Sweden.

IEA (International Energy Agency): OECD regional grouping excluding Chile, Iceland, Israel, Latvia, Lithuania and Slovenia.

Latin America: Central and South America regional grouping and Mexico.

Middle East: Bahrain, Islamic Republic of Iran (Iran), Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syrian Arab Republic (Syria), United Arab Emirates and Yemen.

Non-OECD: All other countries not included in the OECD regional grouping.

North Africa: Algeria, Egypt, Libya, Morocco and Tunisia.

North America: Canada, Mexico and United States.

OECD (Organisation for Economic Co-operation and Development): Member states include Australia, Austria, Belgium, Canada, Chile, Czech Republic, Colombia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom and United States. Costa Rica became a member of the OECD in May 2021; its membership is not yet reflected in the *Africa Energy Outlook* projections for the OECD grouping.

OPEC (Organisation of the Petroleum Exporting Countries): Algeria, Angola, Republic of the Congo (Congo), Equatorial Guinea, Gabon, the Islamic Republic of Iran (Iran), Iraq, Kuwait, Libya, Nigeria, Saudi Arabia, United Arab Emirates and Bolivarian Republic of Venezuela (Venezuela).

Sahel: Burkina Faso, Chad, Mali, Mauritania, Niger and Senegal.

Southern Africa: Botswana, Eswatini, Lesotho, Namibia and South Africa.

Southeast Asia: Brunei Darussalam, Cambodia, Indonesia, Lao People’s Democratic Republic (Lao PDR), Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam. These countries are all members of the Association of Southeast Asian Nations (ASEAN).

Southern African Development Community: Angola, Botswana, Comoros, Democratic Republic of the Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, United Republic of Tanzania, Zambia and Zimbabwe.

Sub-Saharan Africa: Angola, Benin, Botswana, Cameroon, Republic of the Congo (Congo), Côte d’Ivoire, Democratic Republic of the Congo, Eritrea, Ethiopia, Gabon, Ghana, Kenya, Mauritius, Mozambique, Namibia, Niger, Nigeria, Senegal, South Sudan, Sudan, United Republic of Tanzania (Tanzania), Togo, Zambia, Zimbabwe and other African countries and territories.⁶ For the purposes of this report, South Africa is presented separately from sub-Saharan Africa as its energy demand trends and energy composition differs substantially from the rest of sub-Saharan Africa, and can mask trends in the region

Western Africa: Benin, Burkina Faso, Cabo Verde, Côte d’Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone and Togo.

Country notes

¹ Note by Türkiye: The information in this document with reference to “Cyprus” relates to the southern part of the island. There is no single authority representing both Turkish and Greek Cypriot people on the island. Türkiye recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the “Cyprus issue”.

² Note by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

³ Individual data are not available and are estimated in aggregate for: Afghanistan, Bhutan, Cook Islands, Fiji, French Polynesia, Kiribati, Macau (China), Maldives, New Caledonia, Palau, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste and Tonga and Vanuatu.

⁴ Individual data are not available and are estimated in aggregate for: Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bonaire, British Virgin Islands, Cayman Islands, Dominica, Falkland Islands (Malvinas), French Guiana, Grenada, Guadeloupe, Guyana, Martinique, Montserrat, Saba, Saint Eustatius, Saint Kitts and Nevis, Saint Lucia, Saint Pierre and Miquelon, Saint Vincent and Grenadines, Saint Maarten, Turks and Caicos Islands.

⁵ The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD and/or the IEA is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

⁶ Individual data are not available and are estimated in aggregate for: Burkina Faso, Burundi, Cabo Verde, Central African Republic, Chad, Comoros, Djibouti, Kingdom of Eswatini, Gambia, Guinea, Guinea-Bissau, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Réunion, Rwanda, São Tomé and Príncipe, Seychelles, Sierra Leone, Somalia and Uganda.

Abbreviations and acronyms

AfDB	African Development Bank Group
CDM	Clean Development Mechanism
CFF	Climate Finance Facility
CLSG	Côte d'Ivoire, Liberia, Sierra Leone, Guinea
CO₂	carbon dioxide
COP	Conference of Parties (UNFCCC)
DFI	development finance institution
DRC	Democratic Republic of the Congo
DtP	Desert to Power
EMDE	emerging market and developing economy
ESCO	energy service company
ESG	environmental, social and governance
ESI	energy savings insurance
EU	European Union
FDI	foreign direct investment
FID	final investment decision
GCF	Green Climate Fund
GDP	gross domestic product
GEF	Global Environment Facility
GHG	greenhouse gases
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
GSSS	green, social, sustainable and sustainability-linked
ICS	improved cookstove
IEA	International Energy Agency
IPP	independent power producer
ITMO	Internationally Transferred Mitigation Outcome
JETP	Just Energy Transition Partnership
KfW	Kreditanstalt für Wiederaufbau
LCOE	levelised cost of electricity
LPG	liquefied petroleum gas
MDB	multilateral development bank
MEPS	minimum energy performance standards
MoU	memorandum of understanding
NDC	nationally determined contribution
N₂O	nitrous oxide
OECD	Organisation for Economic Co-operation and Development
PPA	power purchase agreement
PPP	public-private partnership
PV	photovoltaic
SAPP	Southern Africa Power Pool
SAS	Sustainable Africa Scenario
SHS	solar home systems

SME	small and medium-sized enterprise
SOE	state-owned enterprise
STEPS	Stated Policies Scenario
TCX	The Currency Exchange
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
VC	venture capital
VCM	voluntary carbon market
WAPP	West Africa Power Pool

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Financing Clean Energy in Africa

World Energy Outlook Special Report

Although Africa accounts for one-fifth of the global population, the region currently attracts only 3% of global energy investment. By 2030, energy investment needs to double to over USD 200 billion per year, in order for African countries to achieve all their energy-related development goals, including universal access to modern energy, while meeting in time and in full their nationally determined contributions.

Financing Clean Energy in Africa, a World Energy Outlook Special Report, builds on the key findings from the Africa Energy Outlook 2022, which introduced the Sustainable Africa Scenario (SAS), and charts innovative investment solutions across the continent that are critical to scale up energy investment. It develops a theory of change based on the positive spillover effects of increasing the availability of affordable capital for clean energy projects. Currently, the cost of capital for energy projects in African countries is at least 2-3x higher than in advanced economies and China, which hinders investment by raising project costs.

The International Energy Agency (IEA) and the African Development Bank Group have joined forces to produce this new analysis, which benefitted from the review of over 85 case studies and over 40 stakeholder interviews. The report focuses on a range of topics, spanning technologies and financing providers, including local institutions, and looks at what types of capital are most suited for the specificities of each sector or technology. The analysis pays close attention to how to scale up private investment, including the role of de-risking support from development finance institutions (DFIs) and donors: by 2030, USD 28 billion of concessional capital will be necessary to mobilise the required USD 90 billion in private investment in clean energy. Increasing the role of the private sector allows DFIs and donors to also scale up support to non-commercial areas, such as enabling environments, unproven technologies and fragile and conflict-afflicted states, unproven technologies.

