: Global Governance Spotlight

2 | 2024

Africa's Future in the Global Energy Transition: Balancing Growth, Access, and Decarbonisation

Alize le Roux and Jakkie Cilliers

Africa is at a pivotal moment in its energy journey. Although contributing less than 5% of global greenhouse gas emissions, it is projected to account for 11% of CO2 emissions by 2050, driven by rapid urbanisation, industrialisation and growing populations. Africa must balance rising energy demands, closing energy poverty and decarbonising, despite its vast fossil fuel and critical mineral reserves essential to the global transition.

Introduction

Africa's clean energy transition is not just a regional issue; it is integral to global sustainability. The world's carbon budget is shrinking quickly, with fossil fuel emissions depleting it likely before 2030 already, making climate action more urgent than ever before. While Africa seeks to gain electricity access for the 590 million people without, many nations argue their development should not be hindered by restrictive carbon targets, especially given their low historical emissions compared to industrialised nations and their access to vast fossil fuel resources.

While Europe leads in decarbonisation, and the U.S. and China progress slowly, Africa must foster growth, reduce poverty, meet climate goals, address all but 10 SDG goals and provide the minerals essential to this green transition – all while protecting critical ecosystems and vital carbon sinks. The mountain to climb is enormous.

Africa needs scalable, reliable energy to grow. While robust growth requires 8.62 barrels of oil equivalent (BBOE) per person, Africa's current access is only 3.1 BBOE, compared to the global average of over 13. This stark energy disparity illustrates the continent's significant energy deficit, compounded by a growing population that is expected to surge to over 2.3 billion[1] by 2043. This demographic boom is forecast to double energy demand in the next two decades, from the current 4.65 BBOE[1] to 9.23 BBOE[1] by 2043.

Despite Africa's rapidly growing population, its energy demand by 2043 is expected to remain less than one-third of China's and significantly lower than India's. While many large economies are forecasted to reduce their carbon emissions, Africa's CO2 emissions are projected to increase from 460 million tons to 811 million tons[1] by 2043. This rise is driven by policy inconsistencies, inadequate investment in the energy transition, and an overwhelming reliance on fossil fuels which currently constitute 95% of the continent's energy mix. Despite recent advancements, renewables still account for only 4.5% of Africa's energy supply.

Our modelling (Chart 1) using the International Futures platform shows that Africa's current development trajectory is hindered by several structural challenges, including inconsistent policy frameworks, underinvestment in critical infrastructure, rising debt levels, and persistent instability in key regions. These factors severely limit the ability to scale up renewable energy efforts. With insufficient funding for large-scale projects and energy systems often undermined

1 Using the International Futures model v8.26.

by political and security issues, fossil fuels are projected to remain dominant, comprising over 80% of the energy mix by 2043. Renewable energy growth, while promising, is expected to reach just 16%, underscoring the need for a more coordinated, stable and investment-friendly environment to accelerate Africa's energy transition.

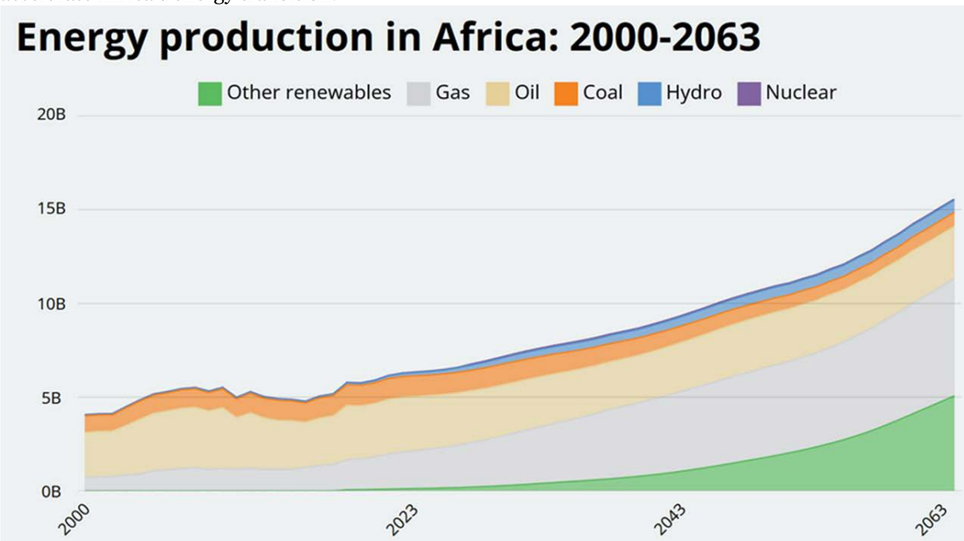

Chart 1: Africa's energy mix on the Current Path forecast, 2000-2063

Energy production in Africa: A pressing dilemma

To keep the Paris goal alive, the UNEP 2023 Production Gap Report calls for phasing out coal by 2040 and reducing oil and gas production by 75% by 2050. Our forecasts show that adhering to these guidelines would create a significant energy gap, imposing economic costs like US$231.3 billion[2] in energy imports and a US$214.4 billion[2] drop in export earnings by 2050.

Countries like South Africa, Nigeria, Egypt and Algeria, which heavily depend on coal, oil and gas, would be particularly vulnerable in the energy transition. South Africa, for example, relies on coal for about 80%[2] of its electricity generation, while Nigeria and Egypt significantly depend on oil and gas for a large portion of their gross domestic product (GDP). A rapid reduction in fossil fuel production without immediate, substantial investment in renewable energy would not only widen the energy gap but also create significant economic strain.

Africa's energy transition investment is insufficient. The International Energy Agency (IEA) estimates US$200 billion is needed annually to meet 2030 goals, yet only US$110 billion is projected for 2024, with US$70 billion still going to fossil fuels. Clean energy investment is just 1.2% of GDP and 2% of the global total. This shortfall, compounded by issues like rising debt and outdated grid infrastructure, leaves Africa trapped in a fossil-dependent pathway. Many African governments face challenges accessing funds due to low sovereign credit ratings and increased debt burdens.

Thus, while investment plans like South Africa's Just Energy Transition Investment Plan (JET-IP) provide a model for securing international support, they remain far from sufficient to address the broader challenges Africa faces. Similar initiatives are under discussion in other countries to promote equitable and sustainable energy transitions. However, without significantly greater international financial backing and targeted policy efforts to de-risk investments, Africa risks deepening its dependence on fossil fuels, despite its immense renewable energy potential.

The rise of renewables

Africa has some of the highest solar radiation levels globally, making it a prime region for large-scale solar projects. Several large-scale solar projects are already operational or under construction. Morocco's Noor Solar Complex, one of the largest Concentrated Solar Power (CSP) plants globally, has been operational for 8 years, with a capacity of over 500 MW. Egypt's Benban Solar Park, a massive photovoltaic (PV) solar farm with 1.65 GW capacity, has been running for 5 years. The newly constructed, Kenhardt Solar Facility in South Africa, one of the world's largest hybrid solar and battery storage projects, sets a new standard in combining renewable energy with energy storage.

2 Using the International Futures model v8.26.

With growing solar energy capacity, Africa is set to expand even further. The Desert to Power initiative aims to provide electricity to 250 million people across the Sahel region, generating 10 GW of solar power. Tunisia's TuNur Solar Project, still under development, targets 4.5 GW, with the goal of exporting energy to Europe. Nigeria, in a recent deal, set a target of 5 GW of installed solar capacity by 2030, with a 1 GW solar plant already under development.

Africa's wind energy capacity is also growing rapidly, with over 9 GW of wind energy already installed across 83 wind farms with Kenya's Lake Turkana wind farm currently the largest in Africa. Countries like Kenya and Senegal are leaders in wind but other nations, such as Egypt, Morocco, and South Africa, have started ramping up their efforts significantly to diversify their energy portfolios in the past couple of years.

Egypt, in particular, has set ambitious goals, aiming for 42% of its energy to come from renewable sources by 2030, largely driven by wind and solar projects. While South Africa under its Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) has attracted more than 3.4 GW in installed wind capacity. Across Africa, 140 new projects are in the pipeline, set to bring 86 GW of additional wind energy by 2035, making Africa a vital region in the global renewable energy transition.

However, to fully realise this potential, significant infrastructure upgrades are essential. The challenges include energy storage solutions, decentralised power management and attracting financing. International investments and local manufacturing are crucial while political stability and regulatory certainty are necessary to encourage long-term projects. The continent can look towards Morocco, South Africa, Kenya, Egypt and Senegal to see how a combination of clear policies, international investment and regulatory frameworks have and continue to promote renewable energy development. These countries are unfolding proof that a just and sustainable energy transition is possible across the continent.

Hydropower remains essential for stabilising Africa's energy grid. Ethiopia's Grand Renaissance Dam (6,450 MW) is the largest project currently in completion, alongside Uganda's Bujagali Dam (250 MW) and Cameroon's Nachtigal Dam (420 MW). Angola's Lauca Dam (2,070 MW), Mozambique's Cahora Bassa (2,070 MW), and Egypt's Aswan High Dam (2,100 MW) rank among the continent's largest hydro instalments. Africa's 42 GW installed capacity provides reliable baseload power essential for grid stability. The IEA also states that Africa can generate over 12 times today's hydropower with the correct investment climate.

The planned Grand Inga hydropower project in the Democratic Republic of Congo (40 GW) remains Africa's most ambitious hydropower project to date, reflecting the continent's vast untapped potential. However, it faced decades of persistent challenges, such as political instability, difficulties in securing financing and environmental concerns. These obstacles have delayed the project substantially, underscoring that stable investment conditions are essential for large-scale projects.

Natural Gas as a necessary evil (for now)

This brings us to the vital role of natural gas in Africa's energy future. Our modelling confirms that gas is crucial for the continent's energy transition. While solar and wind are essential for decarbonisation, they face intermittency challenges, complicating grid stability, especially in regions with insufficient energy storage and infrastructure. Gas, with lower CO_2 emissions than coal and oil, offers a critical baseload power solution (a necessary evil) during the transition, enabling the continent to balance energy security and emissions reduction.

Countries like Nigeria, Algeria and Mozambique possess vast natural gas reserves, which can meet immediate energy needs and provide essential revenue to fund the transition to cleaner energy sources. Natural gas will play a pivotal role in supporting energy security while fostering economic growth and reducing emissions. Without it, many African nations risk deepening energy poverty and slower economic development. Balancing short-term gas usage with long-term renewables scaling should be a key priority for African countries sitting on large gas reserves.

However, it's important to recognise that the global energy landscape is evolving. Investors are becoming increasingly wary of fossil fuel projects due to decarbonisation efforts, and many are pulling back from long-term investments in gas infrastructure, such as pipelines and LNG facilities. While gas is needed to address the immediate energy gap and support renewables, it also faces the risk of becoming a stranded asset if the global decarbonisation momentum accelerates. Africa must ensure that, as it scales renewable energy, it does not over-rely on gas and develops the necessary infrastructure to avoid stranded assets.

Nuclear in Africa's future

When forecasting Africa's energy mix for 2043, Small Modular Reactors (SMRs) were seen as a promising but distant frontier, primarily due to the technology's developmental stage, uncertain-

ties surrounding investment, and challenges with R&D and large-scale deployment. SMRs offered the potential for smaller, faster-to-deploy and cost-effective nuclear power alternatives. However, the commercial viability of SMRs remained uncertain, particularly in Africa, where nuclear experience is limited, with South Africa as the sole operator of nuclear plants on the continent and Egypt set to join the ranks in 2026.

However, the landscape is changing rapidly. On October 16, Amazon, in their quest to become carbon neutral whilst powering the growing data centre industry, became the third tech giant to invest heavily in SMR technology, committing US$500 million towards its development in Virginia. This follows recent significant investments in the U.S. to advance SMR technology, indicating that SMRs are gaining traction and suggesting that the path for their deployment may be accelerating faster than initially expected.

In Africa, Rwanda has also moved forward by signing a Memorandum of Understanding (MoU) with NANO Nuclear Energy in 2024, aiming to develop its nuclear energy capabilities through advanced reactor technologies like the ZEUS and ODIN microreactors. This partnership underscores Rwanda's ambition to lead in advanced nuclear technologies, positioning the country as a potential early adopter of SMR solutions on the continent. These moves, combined with growing international and regional investments, particularly from tech giants, suggest that SMRs could play a pivotal role in Africa's energy transition sooner than previously anticipated.

Conclusion

Renewable energy offers potential, but financial, infrastructural and governance barriers hinder progress. Addressing the finance gap and creating investment-friendly environments with stable regulatory frameworks is crucial for attracting both local and foreign investors.

Further, the infrastructural deficit poses significant challenges to the deployment of renewable technologies. Outdated transmission networks and insufficient energy storage solutions hinder the effective integration of renewable energy sources into existing grids. Africa must prioritise the modernisation of its energy infrastructure to ensure reliable energy delivery and support the anticipated surge in demand from a growing population.

Lastly, governance and political stability are critical to the success of Africa's energy transition. Political instability and inconsistent policy frameworks can delay or derail renewable energy projects, particularly those requiring long-term investment. Strengthening governance structures and fostering transparent decision-making processes will be essential for creating an environment that encourages innovation and sustainable energy solutions. By resolving these key issues, Africa can harness its renewable energy potential, ensuring that the transition benefits all citizens and contributes to economic growth while minimising environmental impacts.

Authors

Alize le Roux | Senior Researcher, African Futures Program, Institute for Security Studies (ISS), Pretoria
Dr Jakkie Cilliers | Head of African Futures & Innovation, Institute for Security Studies (ISS), Pretoria

References

Cilliers, J. & Le Roux, A. (2024). How will Africa navigate its future energy transition? https://futures.issafrica.org/blog/2024

IEA (2024). World Energy Investment 2024, IEA, Paris https://www.iea.org/reports/world-energy-investment-2024, Licence: CC BY 4.0

Le Roux, A. & Cilliers, J. (2024). An urgent call for a global carbon tax framework to combat the climate crisis, https://futures.issafrica.org/blog/2024/An-urgent-call-for-a-global-carbon-tax-framework-to-combat-the-climate-crisis

Le Roux, A. & Cilliers, J. (2024). Climate, https://futures.issafrica.org/thematic/14-climate-change/

Le Roux, A. & Cilliers, J. (2024). Global carbon tax urgently needed to manage worsening climate crisis, Daily Maverick, https://dailymaverick.co.za/article/2024-04-30-global-carbon-tax-urgently-needed-to-manage-worsening-climate-crisis/

Presidential Climate Commission(2024). South Africa's Just Energy Transition Investment Plan (JET-IP), https://www.climatecommission.org.za/south-africas-jet-ip

Ramaite, A. & Le Roux, A. (2024). Accelerate, extend or abandon? Africa's SDG dilemma, https://issafrica.org/iss-today/accelerate-extend-or-abandon-africa-s-sdg-dilemma

SEI et al. (2023). Phasing Down or Phasing Up? Top Fossil Fuel Producers Plan Even More Extraction Despite Climate Promises: Production Gap Report 2023

The Development and Peace Foundation (sef:) was founded in 1986 on the initiative of Willy Brandt. As a cross-party and non-profit-making organisation, the sef: provides an international high-level forum for shared thinking on urgent peace and development issues.

Global Governance Spotlight is a policy-oriented series whose purpose is to critique international negotiation processes from a global governance perspective.

Published by
Development and Peace Foundation (sef:)/
Stiftung Entwicklung und Frieden (sef:)
Dechenstr. 2 : 53115 Bonn : Germany
Phone +49 (0)228 959 25-0 : Fax -99
sef@sef-bonn.org : @sefbonn
www.sef-bonn.org

Editor
Nora Witt

Basic Design Concept
Pitch Black Graphic Design
Berlin/Rotterdam

Layout
Nora Witt

ISSN 2566-624X