

Africa's energy sector will need to transform radically—these are the five biggest challenges

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The [future of Africa's energy sector](#) is getting increasing attention from policymakers and the private sector. As demand for energy rises, current energy systems must grow rapidly to meet it. This must be done in reliable, resilient and affordable ways—while "staying the course" of climate compatibility and ensuring access for all.

Internationally, the future of energy systems has been a hotly debated topic ever since the link between [fossil fuel combustion](#) and the negative impacts of climate change became widely known. Energy transitions—pathways to shift from [fossil fuels](#) to cleaner forms of energy—have long been debated in Europe and North America. One visible outcome, among many others, is the increased use of [electric vehicles](#).

Most of the international and media attention for Africa's energy systems has focused on simply pointing out the size of the challenge—captured in statistics such as "[570 million people in Africa live without electricity](#)".

This solemn narrative has changed in recent times. With renewed investor interest in [gas contracts](#) and exploitation of [solar, wind](#) and [hydrogen](#), the "hot topic" of energy transition appears to have touched down in Africa. In many cases, it looks rather like a business opportunity rather than fundamentally a development goal or climate change commitment—but a positive change in narrative nonetheless.

Academia and international organizations have been working hard to provide a [clear picture](#) of [potential energy pathways](#) for African countries in recent years. It has been shown by [academia](#) and [international organizations](#) that the opportunity for [growing](#) African countries' energy systems in sustainable ways is promising.

The continent as a whole is enormously well-endowed with clean energy

resources: [solar](#), [wind](#), [hydropower](#), [geothermal](#), and others. These are unevenly distributed across countries, but each and every country has promising resources.

I carry out research at the [World Resources Institute](#) as part of a team that is investigating [African energy transitions](#). We start from the assumption that African countries should, and must, develop and industrialize. Our main task is to show how this could happen in clean and sustainable ways. Importantly, this work needs to be done at the country level to enable policymakers to access science-based information that can directly inform policy planning.

We have identified several key challenges that will require urgent investigation to allow proper planning and policy-making. We did so by scrutinizing previous research for missing elements and "blind spots". These are the five main challenges:

1. The real cost of renewables

We already know that, in many regions of the world, modern renewables like solar PV and wind power can [produce electricity more cheaply than fossil fuel plants](#). Recently, solar was dubbed the "[cheapest electricity source in history](#)" by the International Energy Agency.

But is this really always true? The relatively high risks that investors assign to most African countries, as compared to the rest of the world, mean they demand a [higher return](#) to justify investments. This means power plants must charge customers a higher price per kilowatt hour to break even. A failure to take such trends into account tends to [bias model predictions](#) towards overestimating the role of solar and wind.

Thus, the main question is how to [de-risk investments](#) so as to make solar and wind power not only cheap on paper or as worldwide average,

but also on the ground in every single country.

2. Variable solar and wind power

We already know that modern electricity grids can function reliably while drawing on variable solar and wind power. However, the countries where it works well, such as Denmark, Germany and Uruguay, had [achieved 100% access to electricity](#) and had [reliable and stable power grids](#) to begin with when they started investing in solar and wind plants.

The same cannot currently be said for many countries in sub-Saharan Africa. Thus, the main question is what interventions would be needed to allow African countries to expand their [underperforming](#) power grids using solar PV and wind power.

Power system models have suggested that solar and wind power [can be the cheapest way to provide electricity](#) in the long term, but usually these models do not look at grid stability aspects in detail. Done wrong, solar and [wind power](#) may worsen this, rather than improve it.

3. Matching demand and supply

We already know that most power utilities in the world are kept afloat by a [relatively small number](#) of [high-consuming customers](#). These are typically commercial and industrial. We find this trend across geographies: it is as true in the [US](#) as in, for instance, [Kenya](#).

Many sub-Saharan African countries lack a strong [industrial base](#). Meanwhile, utility companies need to connect a high number of low-consumption customers whose electricity bills will be low. All of this needs to happen while electricity prices [remain affordable](#).

Therefore, any future outlook on increasing electricity access across Africa needs to take into account the "chicken and egg" problem of reliable demand and reliable supply. Investing in new [power plants](#) will not be profitable if there are no reliable customers. Utilities will not be able to afford grid expansion without reliable customers. But these customers will not trust the grid if it can't provide reliable services.

4. Electrification and fuel substitution

We already know that the main path towards global decarbonization of energy systems would consist of [electrifying end-use sectors](#) (buildings, transport, industry) to the extent possible, and using alternative green fuels in [sectors where this is harder](#) like steel-making and fertilizer production.

The reality is that energy use in households across sub-Saharan Africa is still mostly based on [traditional biomass](#). Transport relies largely on [imported second-hand vehicles](#). And industrialization is [only beginning](#). The transition towards electrification and fuel substitution will look different in most of these countries than in the global north.

It is uncertain to what extent Africa can "leapfrog" fossil fuel use and go straight to clean energy, as is [often claimed](#). What we need to find out is how fast fossil fuel use may grow across Africa, and when it might peak. This will shed light on the economic and environmental implications for African countries.

5. Opportunities and risks in oil and gas

We already know that the exploration of oil and gas for export can be an important [boon](#) for a country's national wealth. Several prominent African leaders [insist](#) on [continued investment](#) in [exploring](#) and

[exporting](#) oil and gas to bolster government revenue and serve global demand. At the same time, the goals of the Paris Agreement have urged some investors to [back out of funding](#) further fossil fuel projects.

These mixed signals create uncertainty for investors and planners. Countries could be at risk of being left with [stranded assets](#) if they invested in new oil and gas infrastructure. And governments focused on fossil fuel extraction might miss out on clean alternatives (like green e-fuels). More clarity is needed on the opportunities and risks involved in such investments.

Conclusion

Without addressing these challenges, [debates on African energy transitions](#) are likely to be oversimplified. Answering these questions will provide the objective facts needed as the basis of finance for energy.

The implied questions can be answered through targeted research at the country level. [Existing modeling approaches](#) must expand to consider current blind spots. Country coverage must expand. And funders should stimulate research on little-studied regions and sectors. Currently, most research focuses on [a few "popular" countries](#)—such as Nigeria, Ghana and Mauritius—but countries like Niger, Chad and South Sudan are just as deserving for their energy narratives to be charted.

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