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A Huge Leap to Green Energy?

The Future of Africa's Energy Supply

Mathias Kamp

The lack of a comprehensive, reliable electricity supply is a central obstacle to economic development on the African continent. In times of climate change, the question arises as to how the rising energy demand can be met in a climate-friendly manner. Western partners, and Germany in particular, emphasise the opportunities presented by renewable energy, but some African countries are already making plans for nuclear alternatives – and fossil fuels are by no means out of the running, either.

More than 600 million people in Africa live without electricity. If one excludes the better-off North African states, only just over 40 per cent of the population has access to electricity. Even within sub-Saharan Africa, there are significant differences: For example, while more than 80 per cent of South Africa's population has access to electricity, in crisis-ridden Southern Sudan the figure drops to nine per cent. Despite the heterogeneity, it can be generally stated that Africa (south of the Sahara) lags far behind the rest of the world in terms of electricity supply. This is also reflected in energy consumption, of course: nowhere is per capita electricity consumption lower than in Africa – it is only about one third of the global average.¹

Among the causes, in addition to chronic shortages due to insufficient capacity, is a high degree of supply system inefficiency and enormous inequality of distribution. Almost everywhere, rural areas are particularly affected by energy poverty. But even where electricity is available, supply is often unreliable, and outages are shockingly frequent. Many African cities experience outages regularly. The hum of diesel generators, employed for self-sufficiency, is a sound that is familiar to all.

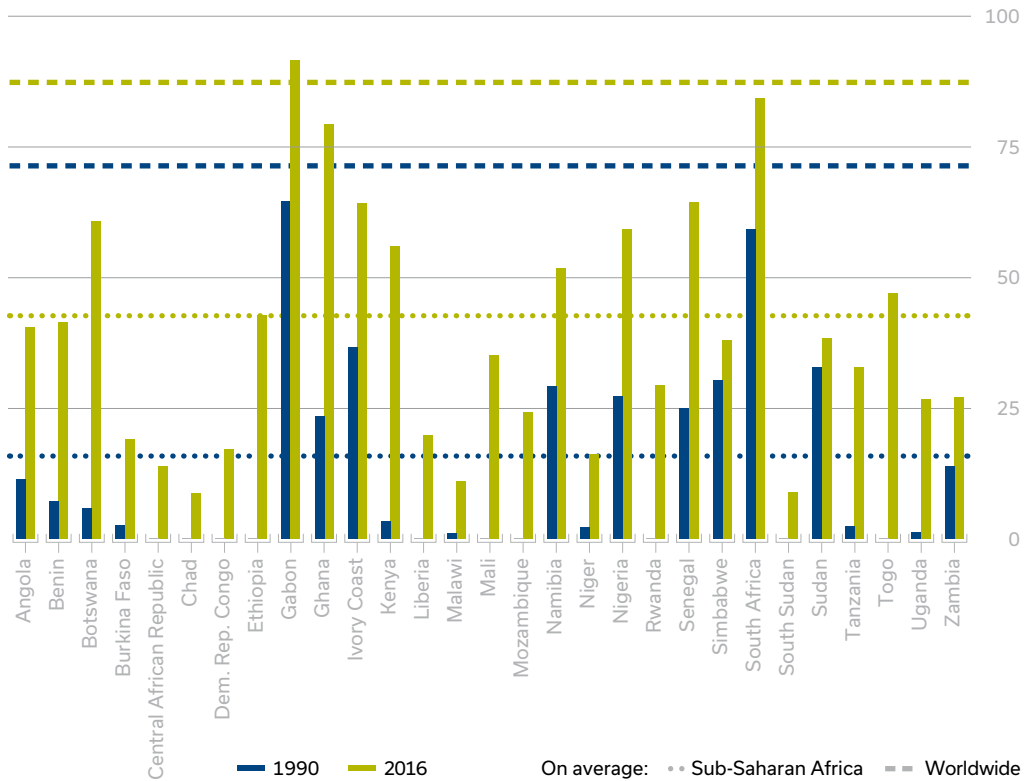
Energy Poverty Despite Wealth of Resources

The shortages cannot be explained by a lack of resources: The continent is blessed with raw materials – and new sources of these materials are being discovered on a regular basis. Africa is a supplier of energy raw materials to

industrialised countries, and its potential for renewable energy is unrivalled by any other region of the world. But in the past, the vast potential has hardly been exploited. The reasons for this are numerous: financial obstacles, wrong development and economic policy priorities, and a focus on export-oriented investment; but also inefficient management, corruption, and poor governance have all played their role. As a result, there is a lack not only of large-scale power plants that could produce the required amount of electricity, but also of corresponding power grids that would be required for comprehensive supply. The actual amount of energy that arrives at the African end user is usually far below both the theoretical and actual production volume. One reason for this is that obsolete, poorly maintained plants, and fuel shortages, result in lower production than is actually technically possible. Another reason is that there are considerable losses in power transmission, due to poor grid infrastructure, damaged power lines, and energy theft. Last but not least is the problem of power plant inefficiency and the dominance of fossil fuels, which make the electricity produced in Africa extremely expensive.

An analysis of the overall energy mix in sub-Saharan Africa shows that electricity accounts for only a small percentage. By far the most frequently used energy source is conventional biomass, primarily in the form of firewood and charcoal for household cooking and for use in small businesses. In sub-Saharan Africa, 80 per cent of the population relies on the traditional use of solid biomass. In power generation, fossil

Fig. 1: Access to Electricity in selected African Countries (in Per Cent of Population)



Source: The World Bank 2016: Access to electricity (% of population), in: <http://bit.ly/2SOetPd> [14 Dec 2018].

fuels dominate, primarily coal, followed by oil and gas. With the exception of hydroelectric power, renewable energies account for only a small share. However, there has been rapid growth in the last few years, and renewables also represent the greatest potential for the future.²

Demand is Exploding

Without new strategies and large-scale investment, the already dire situation would significantly worsen. The demand for electricity is positively exploding on the continent. The challenge is not only to overcome the current shortages, but to prepare the energy sector for both a burgeoning population and a growing economy. Nowhere else in the world is the population growing as swiftly as it is in Africa:

According to UNICEF,³ it will double by 2050 to about 2.5 billion people. At the same time, many African countries are enjoying relatively high economic growth – and there is plenty of room to grow much more. The demand for energy will grow accordingly. The International Renewable Energy Agency (IRENA)⁴ predicts a tripling of electricity consumption in Africa between 2010 and 2030. A McKinsey study⁵ discusses a fourfold increase by 2040, also using 2010 as a baseline and assuming a forecast supply rate of 70 to 80 per cent of the population. Supplying the entire population is likely to remain illusory for decades. A report by the Africa Progress Panel considers it will only be possible, given current development rates, to supply the entire African population with electricity by 2080.⁶

Energy for Development

Energy poverty and a lack of electricity supply have a decisive impact on economic development and quality of life. They hinder productivity and mobility, and impair education, healthcare provision, and other important social services. In sub-Saharan Africa, it is not just households, but also many schools and hospitals, that must manage without electricity. Important medicines cannot be refrigerated, and life-saving medical equipment cannot be operated. Lack of lighting in a house makes it hard to study after the sun goes down. Household dependence on conventional fuels for cooking results in severe health consequences due to the inhalation of smoke. According to the World Health Organisation, these consequences cause more deaths per annum than malaria and HIV/AIDS combined.⁷

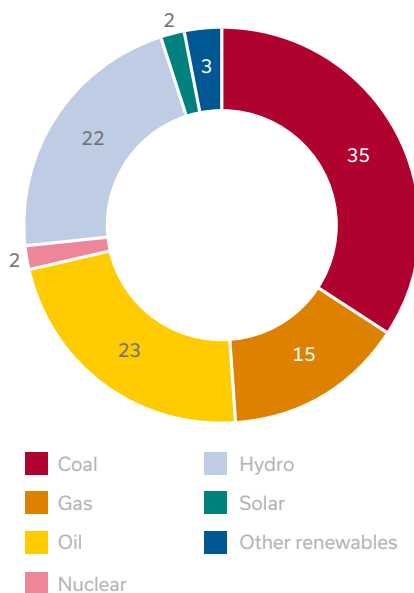
Businesses currently suffer production losses and high costs for electricity, especially when operating their own diesel generators, which is

often necessary. The energy deficit has a negative impact on production costs and competitiveness, thereby hampering economic growth, innovation, and job creation.

Securing access to affordable, reliable, sustainable, and modern energy for all is one of the Sustainable Development Goals (SDGs) of the United Nations' 2030 Agenda. Beyond this direct goal, the World Bank considers access to energy to be a key factor in achieving all other SDGs. As a report by the World Bank notes, without energy supply, it is difficult if not impossible to promote economic growth and employment, overcome poverty, and advance human development. Almost three quarters of 2030 Agenda's target indicators (125 of 169) are directly or indirectly related to the issue of energy.⁸

Poverty and energy scarcity usually go hand-in-hand. A glance at the statistics reveals that the poorest countries are usually also those with the worst energy supply. While the precise causal relationships are complex and cannot always be clearly proven, numerous studies show a close correlation between energy supply or energy consumption on the one hand, and economic growth, income level, and employment rate on the other.⁹ Energy is a key factor for economic transformation. Energy poverty thus represents a decisive obstacle to development in Africa.

Fig. 2: Electricity Production Capacities in Sub-Saharan Africa by Fuel (2016)



Climate Change as a Key Factor

Africa as a whole contributes relatively little to climate change, yet African countries are especially hard hit and threatened by its consequences. This is partly due to geographical conditions, and partly because of already precarious living conditions, difficult political situations, and the correspondingly weak adaptability such conditions engender. Climate change, and its causes and consequences, must be taken into consideration in all efforts to promote economic development in Africa. The effects of climate change can have a considerable impact on development progress. Economic growth and infrastructure expansion must therefore

Source: Own illustration based on IEA 2017, n. 8, p. 79.



Goal 7 of the 2030 Agenda for Sustainable Development: Ensure Access to Affordable, Reliable, Sustainable and Modern Energy for All

7.1 By 2030, ensure universal access to affordable, reliable and modern energy services

7.2 By 2030, increase substantially the share of renewable energy in the global energy mix

7.3 By 2030, double the global rate of improvement in energy efficiency

7.A By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology

7.B By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support

be aligned with ecological sustainability.¹⁰ The “old” development paths of industrialised countries, with their dependence on fossil fuels, cannot serve as models.

When it comes to the transformation of the African energy sector, climate change must be taken into consideration in two respects. Firstly, the energy mix of the future should be as climate-friendly as possible. Secondly, the expected consequences of climate change must already be taken into account during the planning stage. For instance, droughts and erratic rainfall can have a severe impact on hydroelectric power generation. Investment in innovative solutions is therefore particularly important, especially in the area of renewable energies.

Opportunities for Green Energy

“The enormous demand for energy presents Africa with major challenges. But we should also perceive it as an opportunity to invest in green energy. Africa could be the first continent to be supplied entirely from renewable sources,”

said Federal Minister of Economic Cooperation and Development Gerd Müller.¹¹ This focus on renewable energies has emerged as a broad consensus among experts, and above all among Western development partners. African governments are also increasingly realising the extent of the immense potential in this area, and are ratifying ambitious plans to promote the use of these opportunities. At least 40 countries on the continent already have renewable energy targets.¹²

And indeed the conditions for using renewable energy sources are better in Africa than anywhere else. Sun, wind, and water offer an incomparably rich green energy portfolio. Experts put the capacity for solar energy at 9,000 to 11,000 gigawatts; for hydropower, at more than 350 gigawatts; and for wind energy, at more than 100 gigawatts. In East Africa, there are additional opportunities in the field of geothermal energy, estimated at 15 gigawatts. By way of comparison: The total power generation capacity of sub-Saharan Africa in 2016 was 122 gigawatts.¹³ The potential of renewable energy

sources is thus more than sufficient to cover the continent's future energy needs.¹⁴ According to the International Renewable Energy Agency (IRENA), they could provide half of Africa's electricity consumption by 2030.

In Africa, the conditions for using renewable energies are much more advantageous than for old energy sources.

However, the effective use of the renewable energy potential can only be realised if both the infrastructure and administrative framework conditions are met. This requires coherent political strategies from African governments to support infrastructure expansion, provide targeted incentives, attract investment, and create a transparent, reliable regulatory framework.

From an economic perspective, renewable energies are becoming increasingly attractive and competitive as compared to conventional energy sources. Technology costs are falling steadily, especially in the solar sector.¹⁵ In addition, rapid innovation leads to ever greater efficiency and reliability. This applies not only to energy generation technology, but also, for example, to energy storage systems.

Beyond falling costs, there is a whole range of other factors that favour renewable energies. For instance, their applications are far more flexible. In addition to grid feed-in, they offer decentralised supply solutions – from photovoltaics to small home systems. This makes them especially well-suited to the swift, cost-effective electrification of rural areas. They also contribute to the improvement of energy security, especially for countries that currently rely on fossil fuel imports. Studies that examine domestic African economy discover increased potential for local innovation and value creation. Renewables provide more local entrepreneurial prospects and a greater employment effect than fossil fuel energies do. Another significant advantage is that, as

compared to coal and nuclear power plants, projects in the area of renewable energies have relatively short lead times and can be implemented comparatively quickly¹⁶ – with the exception of large-scale hydropower projects.

Large Hydropower Projects

While the share of wind and solar energy is still very low, hydropower already accounts for about one fifth of electricity generation in Africa. This represents only about ten per cent of the estimated technical potential. At full capacity, hydropower could deliver more than three times the current energy consumption of sub-Saharan Africa.¹⁷

Half of the overall hydropower potential is found in the Congo. Investment in hydropower began as far back as the early 1970s with the construction of the Inga I and Inga II dams on the Congo River. A further dam, Inga III, has been in the works for a long time, but construction is delayed. Amid controversy, the World Bank withdrew from the contentious project in 2016. But other partners, including a consortium of partners from China and Spain, remain interested in the project's implementation.¹⁸ Meanwhile, critics warn of negative impacts on people and the environment. Congo, a country tormented by conflicts and corruption, has not even been able to consistently maintain its old dams. But the grand vision goes still further: The "Grand Inga" project plan includes the construction of the "mother of all dams". Its capacity could be as much as 40 gigawatts – almost twice the capacity of the Three Gorges Dam in China, which is currently the largest in the world.¹⁹ The implementation of this mammoth project would fundamentally change the African energy sector. But at the moment, that implementation seems very unlikely – and given the risks and anticipated side-effects, scarcely desirable.

Elsewhere in Africa, however, things are progressing more rapidly. Ethiopia is already the continent's leader in the use of hydropower and is in the process of expanding its capacity via



several large projects. Much attention is given to the *Grand Renaissance Dam* on the Blue Nile, which is soon to be completed, and is to produce six gigawatts of electricity.²⁰ But here, too, there is controversy. This is above all due to the fact that the project is a source of tension between the large Nile-riparian states: Ethiopia, Sudan, and Egypt. The Nile supplies almost all of Egypt's drinking water, and a reduction in flow could have dramatic consequences.²¹ Although the three countries announced a solution to the conflict at a summit in early 2018, the potential for further tension remains.²² This example

shows that hydropower requires an especially high degree of regional diplomacy and cooperation.

Meanwhile, further upstream, Uganda is also investing in the construction of more dams. In other regions of the continent, Ghana, Guinea, Mozambique, and Angola, amongst others, are also expanding their hydropower capacities.

But these large projects do not represent the ideal solution to the issue of energy shortages. In addition to concerns about the ecological and



The downside of the oil industry: Sun, wind, and water provide an incomparably rich portfolio for green energy and are a feasible alternative for Africa. Source: © Akintunde Akinleye, Reuters.

social consequences of dam construction, there are also increasing apprehensions regarding the stability of hydropower supplies. The effects of climate change could pose major challenges for hydropower generation. For African countries with a high dependency on hydropower, experts warn of the risk of electricity shortages due to insufficient rainfall and periods of drought. Hydropower can therefore only be a partial element of the future energy mix. Wind and, above all, solar energy will play a key role in the climate-friendly transformation of the African energy sector.

Many consider it a foregone conclusion that Africa will “leapfrog” to a phase beyond the power-grid age.

Leapfrogging: Is the Great Leap Coming?

If the African energy revolution is to result in low-carbon energy supply, a considerable effort will be required. Despite the enormous potential for renewable energy sources, a number of obstacles must be overcome first. After all, the concern is not only electricity generation, but also universal distribution. Many experts view the poor condition of existing grids and the entirely inadequate pace of power grid expansion as both obstacle and opportunity. The creation of a comprehensive, centralised grid infrastructure would be a mammoth, near unachievable task, since it would be expensive, protracted and risk-prone. The alternative to a single “big” solution (large power plants with comprehensive grids) is therefore a combined approach based on the diversification of energy sources (with priority given to renewable energies) and many small, decentralised, grid-independent solutions.

The buzzword “leapfrogging” is often heard in this context. It refers to dispensing with or skipping development stages in the course of rapid technological and economic modernisation, and

is therefore referred to in German as “Sprunginnovation”. Africa’s current situation means that many consider it a foregone conclusion that the continent will make a “great leap” to a phase beyond the power grid age. “African nations do not have to lock into developing high-carbon old technologies,” wrote the late Kofi Annan in the 2015 Africa Progress Panel report. “We can expand our power generation and achieve universal access to energy by leapfrogging into new technologies that are transforming energy systems across the world²³.”

Multifaceted, Decentralised Solutions

Renewable energies play a decisive role in diversification and decentralisation. Many innovative photovoltaic solutions already contribute to improving quality of life, especially in rural Africa. These solutions go beyond solar modules on roofs; they include numerous mini-applications such as solar lamps, solar cookers, and solar backpacks for schoolchildren. A dynamic local and foreign start-up scene contributes to the rapid spread of increasingly reliable and, above-all, affordable solutions. This also includes German players, such as the start-up *Mobisol*, which delivers complete packages for electrification via photovoltaics in selected African countries. Micro-credit offers make these packages affordable to low-income households.

In view of the very specific and immediate needs of the undersupplied rural population, such offers often represent enormous progress. Nevertheless, they make only a limited contribution to the great transformation required. There is no doubt that large-scale projects – i.e. investment in power plants, solar and wind farms, and the expansion of centralised grids – will continue to play a decisive role for the economy as a whole. They form the backbone of energy supply and are indispensable for supplying cities, industrial centres, and boom regions. But between large-scale power plants and centralised power grids, on the one hand, and individual modules and mini-applications, on the other, there is still a large range of innovative intermediate solutions

that might significantly change the African energy sector. This includes miniature power plants for small communities, businesses, and manageable clusters of consumer households, as well as small, decentralised power grids (mini- and micro-grids). These small grids, most of which are based on solar and wind energy (and to a lesser degree on biogas plants or small hydroelectric power plants), offer promising solutions, especially for remote rural areas.²⁴ They can improve grid stability and, in many

places, replace the traditional, climate-damaging diesel generators, which still constitute a widespread alternative to the centralised power grid.

Given that comprehensive expansion of central power grids to all rural areas will take decades, decentralised approaches offer a more realistic – and above all swifter – response to the challenges of energy poverty.

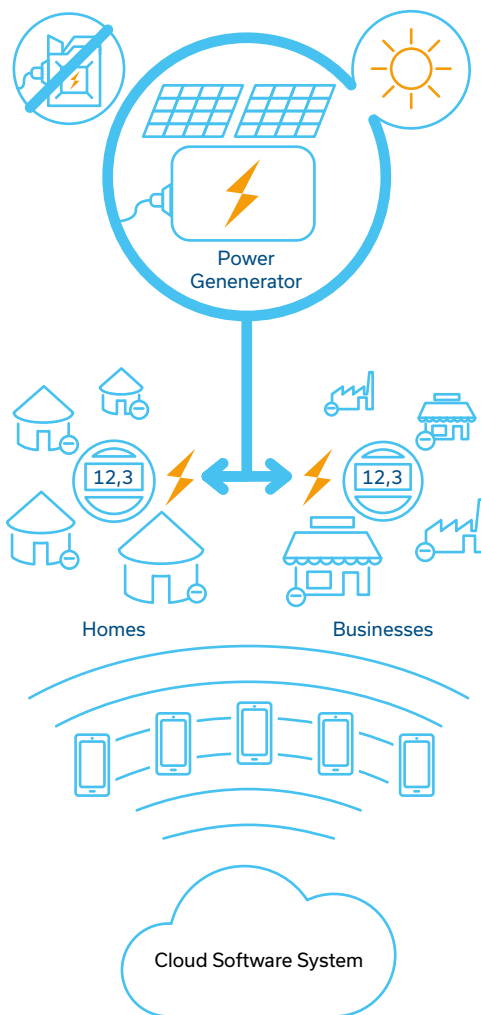
Fossil Energy Sources Remain Relevant

Despite all the euphoria and pioneering spirit surrounding the opportunities provided by renewable energies, it must not be forgotten that fossil fuels have not been ruled out by any means. Africa has vast oil and gas reserves, many of them entirely undeveloped. From a climate policy perspective, it would be advisable to leave these resources as untouched as possible. But given the energy supply challenges described above, the complete phase-out of fossil fuel use in Africa, as indeed in the rest of the world, is not something that will happen overnight. On the contrary, in the short to mid-term, the use of fossil fuels will likely be expanded in parallel with the development of renewable alternatives, and will thus remain a central component of the energy mix. The International Energy Agency forecasts that in 2030, just over half of the electricity produced in sub-Saharan Africa will still be generated from fossil energy sources (with production capacity doubling from 2016 levels): 21 per cent from coal, 18 per cent from gas, and twelve per cent from oil²⁵. Modern gas-fired power plants will probably dominate the future: while the proportion of energy from coal and oil will gradually fall, the share of natural gas in electricity generation will rise, compared to current levels. Technical innovations can increase efficiency and significantly reduce CO₂ emissions.

Nuclear Alternatives?

Another option that is usually consciously neglected in many reports and plans is nuclear power. This is not because nuclear power has no

Fig. 3: Decentralised Power Grid (Micro-Grid)



Source: Own illustration.



A light in the dark: To satisfy the growing demand for energy, the use of fossil fuels in Africa will also have to be further expanded. Source: © Siphwe Sibeko, Reuters.

role to play. The International Atomic Energy Agency (IAEA) reports that a large number of African states are interested in investing in nuclear power. There are more or less concrete plans in twelve African countries. Some African politicians seem to find the option attractive. They see nuclear power as a fast, efficient,

climate-friendly way to escape energy poverty and to stimulate the economy. China and Russia present themselves as two potential partners who, according to some observers, are already in the midst of a fierce race to export nuclear technology.

Various African countries are considering using nuclear power, with China and Russia as potential partners.

In some countries, planning is already at an advanced stage. South Africa is the furthest along. Since 1984, the only nuclear power plant on the continent has been located in Cape Town. In addition, in 2015, plans were introduced to construct further reactors with an overall capacity of 9.6 gigawatts – initially with a view to a possible partnership with Russia. Since then, however, much criticism and doubt has been voiced as to the sense and feasibility of the plans, and their future appears uncertain.²⁶ But other countries are also at the starting point: In 2016, Sudan signed a framework agreement with China which provides for the construction of an initial nuclear power plant by 2027. Kenya also intends to build four reactors by 2030 with Chinese assistance. Nigeria has chosen Russia as its partner, and also plans to build four nuclear power plants. In West Africa, Ghana has dreamt of having its own nuclear power plant since its independence; now there are concrete plans for constructing two reactors. There has, as yet, been no decision on a potential partnership with China or Russia.²⁷

It remains to be seen when these plans will come to fruition, if indeed at all. The majority of experts are sceptical. Obstacles cited include: high initial investment; possible environmental consequences and security risks (especially where there is political instability); high technical and personnel requirements; and the pessimistic forecasts regarding profitability. Given the falling costs and rapid innovation in other energy sources, the plans do not seem particularly prudent from a market economy perspective.²⁸ Some critics therefore analyse them as two things: a dying industry's struggle for relevance, and largely symbolic geopolitical manoeuvres.

Partnerships for Funding

If the African energy revolution is to become a reality, African governments need not only to set the requisite political and administrative course, but above all to involve their international partners and the private sector in order to overcome the immense financing challenges. Within a very short time, massive investments are needed, and African countries are not in a position to make them unaided. The International Energy Agency estimates a required investment volume of at least 450 billion US dollars²⁹ in order to halve power outages and ensure universal access to power in cities – and this is still a long way off from the goal of nationwide supply.

One of the key instruments for providing the required support is the Africa Renewable Energy Initiative (AREI), launched at the Paris Climate Change Conference in 2015. Under this African-led initiative, up to ten gigawatts of additional renewable energy generation capacity is to be created by 2020; the 2030 target even rises to 300 gigawatts. Bilateral and multilateral initiatives have provided ten billion US dollars in financing for the first phase (ending in 2020). Germany is the largest contributor with three billion euros.³⁰ As early as 2013, the US, under Barack Obama, initiated the Power Africa programme, which channels over 50 billion US dollars for investments in the African energy sector via a public-private partnership model. Despite such large-scale programmes, both commitments and actual investment in the African energy revolution have remained below both expectations and targets.

The shortfall is especially large in the private-sector investments, which are urgently needed if the gap between the growing demand and the enormous potential is to be closed. Many investors hesitate to commit themselves in most African countries. It is up to African governments to improve the investment climate, create incentives, and minimise risks. Above all, a proper political and administrative framework is required, namely: fair competitive conditions,

reliable regulations, security of the rule of law, transparent decision-making procedures, efficient bureaucratic structures, and the containment of corruption. But Western partners must also do their part to mobilise more private capital by means of incentives, improved safeguards, and multifaceted partnerships.

Summary: Ten Points for a Sensible African Energy Agenda

In view of the developments described above, the author has identified ten key elements that should be considered in the development of a sensible energy agenda for Africa. They apply to the African countries' national and regional development and electrification plans, as well as international funding programmes, and, last but not least, the dialogue with private-sector players.

1. The agenda's top priority must be to **close the massive supply gap** and **overcome inequalities** in access to energy as soon as possible. Energy poverty is a decisive obstacle to development, which means that the transformation of the African energy sector is a fundamental prerequisite for economic growth and the improvement of living conditions. There is a clear consensus surrounding the idea that the ambitious goals for poverty reduction and economic transformation cannot be achieved without improved electricity supply. This consensus is also reflected in the prominent position of the energy supply question in national and international development plans. This, in turn, provides the foundation for appropriate political action.
2. The agenda must follow a **comprehensive strategy** based on a **holistic understanding** of the situation. This involves an expanded view of the energy issue that goes beyond electricity generation. The various challenges and needs of households and businesses of rural and urban areas, require an integrated strategy with diverse components – a standardised blueprint will not work.

The foundation for this is a further optimisation of the use of comprehensive data, so as to correctly align the strategy to suit regional and local characteristics. The data revolution, and especially the emergent possibilities offered by Open Data, will greatly facilitate such alignment in future. An example for this is the energydata.info data platform³¹, in which German Development Agency, GIZ, is also involved. Comprehensive studies, such as the mapping of wind and solar energy capacities in Africa, undertaken by the University of California, Berkeley³² facilitate the focus on solutions in electricity generation and supply that are adapted to specific geographical conditions.

The wide variety of players means that, with a view to creating a comprehensive strategy, a multi-level approach is best, with special attention given to the promotion of regional and local solutions. While national governments do play a central coordinating role, local players and innovative start-ups can – at least in the short to mid-term, and especially in rural areas – realistically do more for electrification than centrally planned, comprehensive projects, the implementation of which often remain as pipe dreams for a very long time.

3. Due to the challenges posed by climate change and the opportunities presented by technical innovation, **renewable energies should clearly remain at the centre** of the agenda.

The signs are favourable: One, is that political pressure to fund environmentally friendly technology is mounting in view of the already noticeable effects of climate change. Another, is that technical innovations continue to present new opportunities, and the cost of producing energy from renewable sources is falling steadily. In the African context, various studies reveal not only the enormous potential of green electricity, but also indicate its economic attractiveness – both in terms of cost projections and expected

employment effects. The corresponding declarations of political intent seem promising, but the extent to which actual implementation keeps pace with them remains to be seen.

4. The goal of an intelligent, sustainable, climate-friendly energy mix can be achieved only **in phases**. In the short and medium-term, conventional energy generation will continue to play a role, even though carbon-neutral energy supply remains a fixed long-term goal.

The focus on renewable energies outlined above should not obscure the fact that many African countries are just beginning to develop their large oil and gas reserves. It would be foolhardy to believe that these countries' governments could be convinced to leave these reserves unexplored in the ground. Compromise is necessary – and will only be achieved if the alternatives prove to be economically attractive through innovation and investment. The answer to nuclear alternatives is easier: neither are they desirable, nor do they make economic sense.

5. Investments in **micro- and macro-solutions** can complement each other in useful ways. Decentralised solutions must be promoted in parallel with the capacity expansion of central power grids. The African energy sector of the future will be a combination of micro-grids, regional and supra-regional power grids.

The realisation that there need not be one single great success, but that instead there are many opportunities for smaller needs-based solutions, facilitates cooperation among many players. This is also reflected in the design of various funding programmes, which focus specifically upon the innovative power of local initiatives and start-ups. One example is the German Federal Ministry for Economic Cooperation and Development's (BMZ) "Grüne Bürgerenergie für Afrika" (Green Citizen Energy for Africa) project, which is aimed at supporting decentralised,

people-oriented energy supply in rural areas, modelled upon the 850 energy cooperatives in Germany.³³

6. In addition to the issue of energy generation, investments must also be made in **technical progress** for **energy efficiency** and improved **storage capacities**. Since firewood and charcoal will remain relevant for rural households for a long time to come, even the promotion of more efficient stoves and cooking methods can make a considerable contribution to improving quality of life. Energy consumption can also be reduced via improved **user behaviour** by means of education and awareness-raising measures. The work of GIZ in Africa is particularly noteworthy in this area.
7. **Regional cooperation** and integration will be key if ambitious solutions are to be reached. Interconnected networks can contribute greatly to capacity expansion, increased efficiency and energy security. So-called power pools facilitate cooperation among national electricity providers. The leader among them is the Southern African Power Pool (SAPP) in southern Africa. But West and East Africa have also produced similar networks. Additionally, conflicts can be avoided through regional cooperation, especially in the area of hydropower. One successful example of this are the recent agreements concluded between the Nile-riparian countries.
8. The transformation of Africa's energy sector requires **massive financial resources**. Both international partners and the private sector are needed. Reliable partnership must form the basis for mobilising the necessary investments. National players must actively promote private sector involvement. The large-scale initiatives mentioned above, such as AREI and Power Africa, show that there is a willingness to be involved, even if these initiatives have so far fallen short of expectations. Further initiatives are therefore called for. From a German perspective, investment

partnerships that are part of the Compact with Africa, further detailed below, show the greatest potential for opening up new avenues of involvement.

9. The energy agenda must be based on **realistic expectations of the economic effects**. The positive economic effects and growth stimulus provided by electrification will not come to fruition overnight. The benefits will emerge in the very long term. The concern is therefore to correct exaggerated expectations and to work with realistic forecasts. Rapid effects will initially be observed in conurbations where a number of positive factors have an impact (general infrastructure, education, local entrepreneurship, access to markets, etc.).

10. Without **promoting the optimal political and administrative framework conditions**, the ambitions for the African energy revolution are doomed to failure. Part of the agenda must therefore include an active dialogue concerning standards for market economy, democracy, and the rule of law.

Conclusion: African Energy Revolution is in Germany's Interest

Various German initiatives, such as the Compact with Africa as part of the G20 or the BMZ's proposed Marshall Plan with Africa particularly emphasise the interest in funding renewable energies in Africa. The transformation of the African energy sector rightly receives special attention in German development cooperation. It is a key factor in improving the quality of life, achieving sustainable, dynamic economic growth, creating economic and professional prospects for Africa's young population, combatting climate change, and securing peace and stability on the continent. Germany's commitment in this area is thus, not least, a contribution to combatting the causes of refugee flight.

The African energy revolution is important for the German economy, too. Current developments offer great potential for projects that could

be very interesting for German companies. The African energy sector offers the German economy promising markets for its products and services. German technology and expertise are in demand. But although Germany is a recognised leader in the area of renewable energies, China has surpassed Germany in this field by now. So far, existing incentives and investment security appear to be insufficient to provide the necessary push for a German private sector that is hesitant about involvement in Africa. But greater involvement by German companies would clearly benefit both sides. Strong efforts by German companies could contribute to putting the African energy revolution on the right course, making it innovative, inclusive, sustainable, and climate-friendly.

—translated from German—

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