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Sub-Saharan Africa Access to Energy Brief

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Introduction

Africa below the Sahara has suffered through the international slave trade, colonialism, and often despotic leadership following independence. Partly as a result, a large percentage of the population in this part of the world live without access to modern forms of energy. Instead, about 80 per cent of the population burns wood or charcoal to cook and boil water, and 67 per cent have no access to electricity.[1] Many negative effects accrue from a reliance on traditional biomass, including environmental degradation such as deforestation, and health impacts from smoke inhalation. Electricity access is a key ingredient for all types of economic activity, and a reliable supply can allow people to break free of the cycle of poverty. Additionally, a stable electricity supply is essential for achieving almost all of the United Nations' Sustainable Development Goals (SDGs), including access to health care, education, and clean water. Although sub-Saharan Africa (SSA) has far to go in securing energy access for its population, this also means that there are many opportunities to leapfrog the development of the industrialized nations by adopting newer, cleaner, and more efficient technologies.

Current Energy Landscape

Africa is a gigantic continent, with a landmass as large as the United States, Europe, Australia, Brazil, and Japan combined. Sub-Saharan Africa, which makes up the majority of the continent, includes the 47 countries south of the Sahara desert that contain 16 per cent of the global population.[2] Over 50 per cent of this population lives in rural and largely agrarian communities where it is expensive to expand power infrastructure.

1 Al-Herbish, Suleiman J. "Energy Poverty in Africa." In Energy Poverty in Africa. OFID Pamphlet Series. Abuja, Nigeria: The OPEC Fund for International Development, 2008. http://www.ofid.org/Portals/0/Publications/Pamphlet%20Series/ofid_pam39.pdf.

2 Al-Herbish, 2008.

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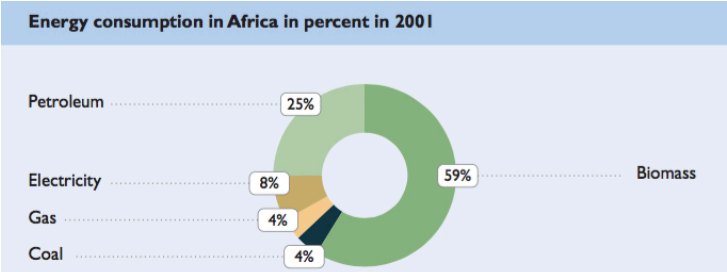
Consequently, commercial energy use is the lowest in the world at less than 700 kilograms of petrol equivalent per capita, compared to a North American average of 7,844 kg.[3]



Type	North Africa	Sub-Saharan Africa	Southern Africa
Biomass	4.1	81.2	16.5
Petroleum	61.5	14.5	29.3
Electricity	15.1	2.9	25.9
Gas	18.0	1.0	1.6
Coal	1.3	0.5	26.8

Figure 1: Overall energy consumption in Africa by source. Source: Al-Herbish, 2008.

Low commercial energy use contributes to the fact that the region only produces 2.5 per cent of world economic activity.[4] Figure 1 lays out overall energy consumption in Africa by energy source. The most striking characteristic is SSA's over-reliance on low-quality and harmful biomass. Although current energy projections show that the percentage of Africans relying on biomass will drop, thanks to population growth, absolute numbers are predicted to rise from 600 million to 700 million people by 2030.[5]

However, there are major differences across the region that are important to note. Apart from a few large oil-producing countries, SSA countries on the whole do not have access to substantial domestic fossil fuel energy reserves, and rely on imports for more than 65 per cent of energy needs.[6] The International Energy Agency (IEA) recently estimated that

3 Ibid.

4 Ibid.

5 Brew-Hammond, Abeeku. "Energy Access in Africa: Challenges Ahead." Energy Policy 38, no. 5 (May 2010): 2291–2301. doi:10.1016/j.enpol.2009.12.016.

6 Banks, John P. "Key Sub-Saharan Energy Trends and Their Importance for the U.S." In Top Five Reasons Africa Should Be a Priority for the United States. Africa Growth Initiative. Brookings Institute, 2013.

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the region spends more on oil imports (US$18 billion) than it receives in international aid ($15.6 billion).[7] Recent discoveries in East Africa suggest that this may be set to change; the IEA has declared Africa the "new frontier" in global oil and gas, with major untapped reserves discovered in Cameroon, Ghana, Equatorial Guinea, Republic of the Congo, Kenya, Tanzania, and Uganda.[8] It remains to be seen whether development of these resources will translate into greater access to energy for domestic populations. Experience from the region's major oil-producers suggests that the process is far from automatic. In Nigeria, for example, although the country is sitting on the continent's largest known natural gas reserves, only 56 per cent of the population had access to secure electricity in 2013, up from just 50 per cent in 2008.[9] Without the infrastructure to collect and distribute the gas produced in oilfields, it is simply flared off.[10] The difference in lack of electricity access between urban and rural areas in Nigeria, 66 and 16 per cent respectively, gives some indication of the challenge.[11] While the greatest population without access to electricity live in rural areas, there is still a significant population living within reach of the grid who do not have access. The challenges to full access therefore lie not with supply, but instead with institutional capacity, infrastructure deficits, and financing. There are a number of ongoing strategies, both top-down and bottom-up in nature, to improve the region's access to energy.

The Causes and Effects of Energy Poverty

Access to energy and poverty are intimately bound together, as lack of income restricts families from buying mod-

7 Banks, 2013.

8 Banks, 2013.

9 Timms, Matt. "Energy Poverty Stifles Sub-Saharan Africa's Economic Development." World Finance, May 3, 2015. http://www.worldfinance.com/markets/energy-poverty-stifles-sub-saharan-africas-economic-development.

10 Lavelle, Marianne. "Five Surprising Facts About Energy Poverty." National Geographic, May 30, 2013. http://news.nationalgeographic.com/news/energy/2013/05/130529-surprising-facts-about-energy-poverty/.

11 Timms, 2015.

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ern fuels, and the lack of modern energy restricts individuals from participating in the globalized economy. Families caught in this vicious cycle have no light in the evening unless they purchase expensive and polluting kerosene lamps, limited access to the radio or other communications equipment, and inadequate education and health facilities to promote development.[12] In Eastern Africa, for instance, fewer than 10 per cent of rural schools, clinics, and hospitals have access to electricity.[13] The result is a poverty-energy cycle that is very difficult to break without some form of external intervention. A major cause of SSA's current energy access woes are past development efforts. Since independence, the dominant development model in Africa has focused on macro-economic growth by stimulating exports to the industrialized countries. The result is a preponderance of infrastructure designed for the extraction and exportation of energy resources, instead of domestic distribution. Although this strategy has successfully resulted in high rates of GDP growth in most countries (4.5 per cent in SSA in 2014), the benefits are not accruing to citizens, and are not creating the conditions for adequate energy access.[14] When policies have targeted energy access for the poor, they have often been poorly designed, and resulted in unsustainable models that do not accurately respond to the needs and capacities of the poor. For example, in urban areas, after just a few months of connection to electricity, poor people often stop using it. Despite the regular supply of kerosene, natural gas and liquefied natural gas (LNG), people revert to using firewood, charcoal or other biomass. In rural areas, off-grid generation systems are often abandoned after only a few months of use. These unfortunate circumstances are most

12 Omojolaibi, Joseph Ayoola. "Reducing Energy Poverty in Africa: Barriers and the Way Forward." Intenrational Association for Energy Economics, 2014. http://tinyurl.com/gmxplre

13 Brew-Hammond, 2010.

14 Omojolaibi, 2014.

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often the result of development programmes that do not accurately understand the needs of the poor, which could include a lack of cash flow to make regular payments for power or fuel, a lack of technical capacity to repair generation systems, or a lack of institutional support.[15]

Top-Down Solutions

The New Partnership for Africa's Development (NEPAD) set the ball rolling for regional commitments to energy access in 2001 with its goal of increasing access to reliable and affordable commercial energy for Africa's population from 10 to 35 per cent or more in 20 years.[16] In support of this goal, the World Bank prepared a report indicating the required levels of investment to achieve 100 per cent electricity access, and the more realistic target of 48 per cent access, by 2030. The World Bank report estimates US$11 billion or $4 billion, respectively, per annum, while pointing out that even the $4 billion yearly investment required for 48 per cent electricity access by 2030 is twice that of historical investment levels.[17] Some of this investment is occurring through large infrastructure projects across the continent. Africa's first privately funded and constructed geothermal plant is scheduled to come online in the near future in Naivasha, Kenya, and a massive 155 megawatt photovoltaic (PV) power plant will increase Ghana's power capacity by six per cent when it comes online later this year. The DRC's 40,000 MW Grand Inga Dam and Ethiopia's 120 MW Ashegoda wind farm are further evidence of growing investment in a variety of large-scale renewable energy projects.[18] However, these large projects will only help meet the growing demand of urban and peri-urban areas, and only if economic develop-

15 Omojolaibi, 2014.

16 Brew-Hammond, 2010.

17 Ibid.

18 Timms, 2015.

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ment gives these potential customers the capital to connect to the grid.

Bottom-Up Solutions

Although most African countries are urbanizing at an alarming pace, birth rates in rural areas remain high, and it is these remote populations that face the biggest challenges to achieving access to modern energy. The literature on energy access generally acknowledges that the most cost-effective and realistic strategy for electrifying rural communities will be the expansion of microgrids.[19] Best practice programs to implement microgrids are modular in design, and include the community in an ongoing dialogue about their actual energy needs. For example, the grant-funded Energy for Development (e4d) concept successfully supplied a remote Kenyan village of 3,000 inhabitants with high-quality solar power by forming a community-based collective to help construct, own, and operate the modular solar plant, battery bank, and PV canopy above the local market. Today, the school, clinic, and churches in the village have a 24-hour electricity supply. Land prices around the market have more than doubled, and at least 10 new buildings containing new businesses have been constructed since the project's inception. Key to this success were community participation and modularity, which has allowed the project to expand slowly as the village develops.[20]

A key ingredient in implementing off-grid solutions, as always, is financing. The burgeoning mobile market in SSA (in Kenya, for example, there are currently 70 mobile subscriptions for every 100 people) provides one promising model to supply the capital necessary for families to purchase pico-scale solar

19 Bahaj, AbuBakr, ed. "Transforming Rural Communities through Mini-Grids." In Smart Villages: New Thinking for off-Grid Communities Worldwide. Centre of Development Studies, University of Cambridge, 2015.

20 Bahaj, 2015.

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devices or home systems.[21] This is an extremely dynamic market, with strategies and business models shifting on a month-to-month basis. However, the core concept behind Pay-As-You-Go (PAYG) models is that it is a financing platform. The PAYG model came into existence because traditional financial institutions have been unwilling to contribute financing for pico-solar systems because the risk profile was largely unknown, and because transaction costs for facilitating such small loans (anywhere from US$10 to $250) are relatively high.[22] However, the advent of a complex and widely distributed mobile network across SSA has allowed long-term mobile-based repayment schemes, and consistent remote service and system monitoring by distributors. Essentially, PAYG systems work by signing families up for some form of off-grid energy, be it a stand-alone solar light fixture or a full-home system, and having them agree to an affordable monthly installment plan to pay back the loan, administered by cellphone. The growth of this market has been substantial, with an estimated 30 companies now operating in at least 32 SSA countries. Early studies estimate that PAYG financing results in roughly a doubling or tripling of sales of pico-solar lamps.[23] Finally, PAYG financing schemes have the added benefit of allowing consumers to build a credit history of regular payments, that can give them access to other small business or household microloans. Bottom-up business models such as PAYG that treat the poor as consumers with their own agency, hold great promise to increase electrical connectivity in SSA's rural areas.

21 Alstone, Peter, Dimitry Gershenson, Nick Turman-Bryant, Daniel M. Kammen, and Arne Jacobson. "Off-Grid Power and Connectivity: Pay-As-You-Go Financing and Digital Supply Chains for Pico-Solar." Lighting Global, May 18, 2015. https://www.lightingglobal.org/wp-content/uploads/2015/05/Off_Grid_Power_and_Connectivity_PAYG_May_2015.pdf.

22 Alstone et al, 2015.

23 Ibid.