



LIGHTS ON IN AFRICA

A RECENTLY PUBLISHED REPORT BY THE AFRICAN SCIENCE ACCADEMY DEVELOPMENT INITIATIVE, "TURNING SCIENCE ON: IMPROVING ACCESS TO ENERGY IN SUB-SAHARAN AFRICA", OUTLINES WHAT IT WILL TAKE TO BRING ELECTRICITY TO ALL AFRICANS.

There's a famous image spliced together by scientists at the US National Aeronautics and Space Administration (NASA) showing planet Earth as it appears at night looking down from space. Silhouetted against continents drawn in shades of midnight blue, the eastern United States, Western Europe and Japan shine brightly. Clustered dots of light also spread across Asia and South America. But Africa is almost entirely in the dark.



equivalent to 10% of that of Latin America. Moreover, access is concentrated around the cities. More than 70% of urban Africans has electricity, compared to just 13% of rural dwellers.

The continent's scientists have tackled this paradox head-on in a recent report. "Turning science on: improving access to energy in sub-Saharan Africa" presents an overview of access to energy services in sub-Saharan Africa and makes suggestions for expanding the generation and distribution of electrical power.

The report was presented at the sixth annual meeting of the African Science Academy Development Initiative (see sidebar) in Somerset West outside Cape Town, South Africa, from 7-10 November 2010. The publication is the second of a series of documents prepared by ASADI to illustrate science-based solutions to Africa's myriad challenges. The first report, published in 2008, examined maternal and child health.

This darkness is the result of a paradox. Africa's energy reserves, in the shape of its vast forests, mighty rivers, and oil, coal and gas reserves, are among the world's richest. Yet approximately 70% of sub-Saharan Africans do not have access to electricity.

At a time when electrification is speeding across formerly poor regions of the world, sub-Saharan Africa's power supply is stagnant. The subcontinent's entire power-supply is comparable to that of Spain, or



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Bringing clean, affordable and reliable energy to all Africans is a crucial step in fighting poverty, according to South Africa's minister of science and technology, Naledi Pandor. "Without access to energy, individuals and communities are unable to lift themselves out of poverty. It is a primary determinant of access to social and economic development," she told attendees to the ASADI conference.

As the report notes, access to energy is vital if African countries are to meet the Millennium Develop-

ment Goals (MDGs). It matters to food security as it powers the farm machinery designed to increase productivity and fuels the refrigerated trucks that speed deliveries and reduce spoilage. It matters to education as it provides light for children to read by. It matters for gender equality as women generally carry out the dangerous, tedious and backbreaking work of gathering firewood. And it matters to health as many Africans die from exposure to smoke from open cooking fires.

BLEAK OUTLOOK

The report paints a bleak picture of electricity access in Africa. Not only is access the lowest in the world, but the numbers of Africans without access is likely to rise due to rapid population growth. For instance, today around 15 million Angolans do not have access to electricity. By 2030, this number could rise to 18 million.

Moreover, sub-Saharan Africa's power grids are notoriously unreliable. Maintenance is poor, and outages common. Many consumers resort to polluting, noisy and expensive diesel generators as a back up. And widespread electricity pillaging and haphazard revenue collection has contributed to the continent's high electricity prices.

Although the continent's situation is dreary, there are home-grown solutions, the report says. These include ingenious applications of renewable energy and off-grid schemes designed to light up poor and remote parts of the continent.





For instance, more than 2,000 homes in Khayelitsha, a poor township outside Cape Town, South Africa, have been provided with solar water heaters, insulating ceiling boards, upgraded electrical wiring and energy-efficient light bulbs. The project has reduced expenditures on electricity, not only cutting the township's power consumption but also saving residents money. The initiative, which is funded by the South African government, is the first African project registered under the global Clean Development Mechanism. That means the project qualifies for trade emission reductions on the international carbon market.

It's important to note that funding to increase Africa's energy services need not rely on other regions of the world. For example, the Kenya Electricity Gener-

ating Company (KENGEN) has secured more than USD110 million through a public offer of its shares on the Nairobi Stock Exchange. This money is being invested in improving and extending services.

"Local funding is an untapped funding source in many African countries," the report says. To take advantage of this potential source of money, "policy makers must ensure that the energy sector has the leadership and capacity to plan and attract investment-worthy projects."

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MIXED BAG

The ASADI report does not promote a one-size-fits-all solution to sub-Saharan Africa's energy shortcomings and bottlenecks. Such a solution, however attractive for its simplicity, would not be suitable because each

LAKE KIVU NATURAL GAS PROJECT

The Lake Kivu natural gas extraction project in Rwanda is an example of innovative energy investments in Africa. The African Development Bank is lending USD25 million to the KivuWatt project, which will use a floating barge to extract methane gas from under the lake.

Power will be produced by integrated sets of methane-fuelled reciprocating generators that produce a combined total of 25 megawatts (MW) of electricity. Phase II will produce an additional 75 MW of power. The project will create 250 jobs during construction. Some 200 workers are expected to come from the local community.

"The KivuWatt project creates a low cost energy solution, which will help Rwanda meet its domestic energy requirements while reducing reliance on expensive imports from neighbouring countries or high cost emergency diesel generation," the Bank notes.



country has different energy resources within its borders. Indeed there are significant differences in the ‘energy mix’ of various African countries.

For instance, figures from the International Energy Agency (IEA) show that while biomass (charcoal, wood, and waste burning) provides most of the energy in Africa, each country’s access to ‘modern’ energy sources is not the same. In Nigeria, the main formal energy sources are oil and natural gas. Ethiopia, meanwhile, relies on hydroelectric dams. In South Africa, coal dominates the energy mix.

Countries should build on their natural resources to promote modern and clean energy generation, the ASADI report says. Countries should pursue regional efforts for energy distribution so that one country’s surplus can overcome another’s deficit. Regional collaboration would have the added benefit of helping to enhance the continent’s resilience by bringing together a wider array of energy sources.

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Many African energy sources are wasted, or not used locally. For instance, Mozambique exports natural gas to other countries while its people continue to rely on wood-fired stoves. Meanwhile, natural gas is flared off in Nigeria because of limited demand and the desire to speed the production of oil for export. In central Africa, hydropower derived from the mighty Congo River could play a key role in sating the basin’s thirst for electricity by serving as a source of hydropower. In short, a diverse set of resources provides African governments with a wealth of opportunities for exploitation.

Africa’s equatorial sun and brisk winds make solar and wind power an obvious candidate for electrifying remote African villages. Kenya’s government is investing in geothermal power in the geologically active Rift Valley region, which could hold as much as 9,000 megawatts – equivalent to nine nuclear power stations.

ASADI IN A NUTSHELL

The African Science Academy Development Initiative (ASADI) is a 10-year effort to strengthen the capability of African science academies to provide advice to African governments. Launched in 2004 by the U.S. National Academies and funded by the Bill & Melinda Gates Foundation, it aims to encourage a culture of evidence-based policy making in Africa. The grant supports capacity-building efforts with the science academies of Uganda, South Africa, and Nigeria. It also provides modest support to the academies of Ghana, Cameroon, Senegal, Kenya, and the regional African Academy of Sciences for strategic planning efforts. For additional information, see www.nationalacademies.org/asadi/about.html

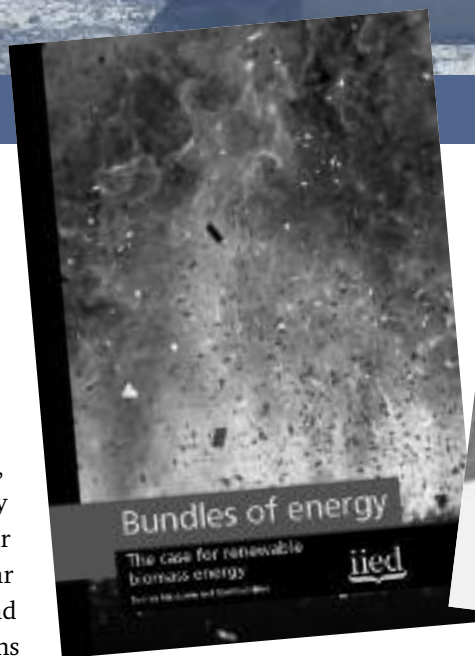


Then there is the lure of nuclear power itself. A number of African countries (Sudan, Nigeria, Senegal, Uganda, Ghana and Niger to mention a few) have expressed a desire to acquire nuclear technology. But so far, in sub-Saharan Africa, only South Africa operates a nuclear power plant. In fact, nuclear power will likely remain beyond the grasp of most African nations for many decades to come. The recent catastrophic meltdown at the Fukushima nuclear plant in Japan, moreover, might push the prospects for nuclear power in Africa even farther into the future.

MAKING BIOMASS SUSTAINABLE

While the African continent is awash with energy-generation potential, the continent's politicians should not expect to wean its population off biomass for cooking and heating any time soon.

"Logging may have a bad name among environmentalists due to its role in deforestation, but it plays a vital role in Africa," says Gisela Prasad from the University of Cape Town's Energy Research Centre, one of the main authors of the ASADI report. Buying and selling charcoal and fuel wood is how many Africans earn their living, she says. For example, it accounts for 2% of the gross domestic product (GDP) in Malawi and Rwanda.



But biomass production and harvesting must become more sustainable to protect the continent's forests, she adds. This is usually best done by the communities with residents who largely live on the land and draw on the land's bounty both for their sustenance and livelihood. "There used to be a culture dedicated to looking after the forest. This culture has gradually disappeared. We need to take steps to regain the level of sensitivity for the forests that once existed among the people," Prasad says.

The London-based International Institute for Environment and Development (IIED) made the same point in March 2011. According to the IIED report, "Bundles of energy: The case for renewable biomass energy", global reliance on biomass fuels is set to triple from 10% to 30% of global energy consumption by 2050.

"Many governments in developing nations dissuade people from burning wood or charcoal as fuel. They

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think it represents a backward form of behaviour. But this mentality just penalizes poor people for their energy needs and does little to limit deforestation. Instead government should embrace and legalise biomass fuels as a source of energy and enact policies that make supply chains sustainable,” noted Duncan Macqueen, a

senior researcher in IIED’s natural resources group, in a statement issued by the institute last spring.

‘TASTES OF THE SUN’

Another challenge lies with social acceptance of new technologies.

LIGHTING UP AFRICA

A number of African organisations conduct research aimed to help the continent’s policymakers expand energy access.

- *The Energy Research Centre at the University of Cape Town, South Africa, is one of Africa’s leading academic centres focusing on energy. It studies energy efficiency, climate change, energy systems planning and poverty, and also plays a key role in forming the continent’s stance in international climate change negotiations (www.erc.uct.ac.za/).*
- *AFREPREN, a nongovernmental organization (NGO) based in Nairobi, Kenya, brings together over 300 African energy researchers and has initiated energy policy research studies in 19 African countries. AFREPREN focuses its efforts on energy-sector reform, extending clean energy services to the urban poor; broader use of renewable energy in rural areas and issues related energy use and gender (www.erc.uct.ac.za/).*
- *The Environment and Development Action in the Third World (ENDA-TM) is a nongovernmental organization based in Dakar, Senegal, comprised of a network of research centres dedicated to the study of energy use and sustainable development in Africa. More specifically, ENDA-TM focuses on continent-wide issues that lie at the interface of energy and the environment. Such issues include biodiversity conservation and desertification (www.enda.sn/).*
- *KITE, a non-profit organization based in Ghana, aims to influence policy in the country’s energy sector. It has published studies on development and the environmental and social impacts of Ghana’s emerging oil and gas industry (www.kiteonline.net/).*
- *The Association of Mediterranean Energy Regulators (MEDREG) brings together electricity and gas regulators in countries bordering the Mediterranean Sea. Financed in part by the European Union (EU), MEDREG seeks to promote stable and harmonised legal and regulatory frameworks within the region. Strategies designed to facilitate technology transfer, especially for clean energy technologies, are a key aspect of its work (www.medreg.ipi.it/).*



In South Africa, the roll-out of solar heaters for poor households has had caused many South Africans to turn their backs on this renewable-energy device because they now associate solar power with being poor. “Electricity from the grid is seen as superior to off-grid technologies,” says Prasad. This has resulted in calls for wealthy South Africans to put solar heaters on their roofs to remove the negative associations.

People have also been reluctant to adopt cutting-edge cookers that use solar energy, complaining that ‘the food tastes of the sun’.

“Social acceptance is a problem in South Africa,” says Prasad. But the situation is not the same across the continent, she adds. For instance, solar power is accepted in Kenya.

ADVICE TO GOVERNMENTS

Ultimately, the ASADI report calls on Africa’s governments to draw on the full range of energy expertise dotted around Africa to influence their roll-out of energy services (see sidebar, p. 34). To advance this goal, the ASADI report itself needs to be aggressively promoted among African governments.

Science academies can assist governments in their efforts to address energy access issues in several ways, the report says: They can convene expert groups to brainstorm on scientific and policy challenges, they can inform policymakers of the role of science, they can highlight examples of best practices, they can identify gaps in knowledge, and they can track government investments.

South Africa’s ASSAF is already doing this by giving input on the country’s “Integrated Resource Plan”. The plan, which has been widely criticised for not focusing sufficient attention on renewable energy sources, nevertheless presents a vision for the country to invest in electricity generation and distribution. The primary goal is to extend electricity access to those who currently do not have it.

The South African government’s request to the academy to offer its views on the plan represents a step in the right direction for evidence-based policymaking. However, science can only play a

part in the solution. Political will and effective policies and regulations will be vital to the process of extending energy services in Africa and creating a brighter future for the continent and its people.

Only when such initiatives have been launched and sustained will NASA’s night-time portrait of the Earth from space cease to show a broad area of darkness as a distinguishing characteristic of sub-Saharan Africa, where economic distress and electricity shortages have gone hand-in-hand for too long. It’s time to turn on the lights in Africa. ■

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