

Harnessing Africa's untapped solar energy potential for health

For a continent with abundant sunlight and poor electricity grid coverage, Africa makes very little use of solar power in the health sector. Given recent initiatives, this may be set to change. Gary Humphreys reports.

Dr Sam Wamani's sister-in-law bled to death in his arms, a victim of obstetric complications. "It happened 10 years ago," says the 33-year-old resident of Leba, in western Uganda. "My brother came to my door at 1 am. I had just graduated from medical school in Kampala, and he thought I could help. I said we had to get her to the health unit."

She could not walk, so they wheeled her on a bicycle. But at the clinic, they were told that the health worker had left because there was no electricity. "By this time she was in agony," Wamani says. He tried to stop the bleeding, to no avail: both mother and baby died on the roadside in the dark.

Obstetric complications are the leading cause of maternal death in sub-Saharan Africa, accounting for roughly half of deaths globally due to pregnancy and childbirth. Lack of antenatal care, the dearth of skilled birth attendants and the limited availability of emergency obstetric procedures are among the most commonly-cited reasons for this situation.

Yet access to electricity – essential to so many medical interventions including night-time emergency response – is rarely an issue to which health policy-makers pay attention.

"Electricity should be a priority for public health," says Dr Maria Neira, director of the Department of Public Health, Environmental and Social Determinants of Health at the World Health Organization (WHO) in Geneva. "WHO and its partners are now working to foster awareness of this neglected need."

According to a WHO study published in *Global health: science and practice* in August last year, about one in four health facilities in 11 countries in sub-Saharan Africa has no access to electricity and most facilities that do have access have an unreliable supply. The study reviewed national surveys of health facilities in the 11 countries, which included six of the continent's 10 most populous: Ethiopia, Ghana, Kenya, Nigeria, Uganda and the United Republic of Tanzania. It covers over 4000 clinics and hospitals.

Diesel generators have traditionally powered off-grid facilities and also served as back-up power sources in grid-connected hospitals and clinics. But these facilities struggle with both high fuel costs and unreliable fuel delivery.

"In the six sub-Saharan countries that we reviewed with data on generator functionality, fewer than 30% of these

generators were actually operational," said Dr Carlos Dora, who leads the WHO team that did the analysis. Without power, health facilities cannot run equipment such as vaccine refrigerators or use many of the most basic, life-saving medical devices. They cannot pump or heat water. They cannot even put on the lights.

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The problem is not limited to rural areas, notes Dr Laura Stachel, an obstetrician and gynaecologist at the University of California, Berkeley, United States of America (USA). She recalls doing her doctoral research in 2008 in a Nigerian hospital, where electricity was available only 12 hours out of 24.

"Night-time deliveries were taking place in near-darkness. The results were often tragic." When the lights went out during one Caesarean section, she recalls, "people didn't even react. They were used to it. We couldn't use the suction machine, or do cautery (burning procedure) to stop the bleeding. Luckily, I had a flashlight with batteries, which they used to finish the surgery."

The experience left Stachel with a strong desire to do something. Her husband, Hal Aronson, is a solar power specialist, "so it just seemed logical to me to start thinking in those terms".

Aronson designed a "solar suitcase", a portable kit containing a small photovoltaic (PV) solar panel, battery charger and outlets for energy-efficient LED (light-emitting diode) lights. Stachel took it back to the hospital in the Nigerian city of Zaria. The doctors asked her to leave it with them, which she did. As



Laura Stachel (third from right) delivers a solar suitcase to a hospital in Nigeria

she continued her research in other clinics, observing the same problem again and again, she began to bring similar devices with her.

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Sam Wamani

This led to the creation of We Care Solar, a nongovernmental organization (NGO) that Stachel heads. Some 600 solar suitcases, now factory made, have been deployed in more than 25 countries of sub-Saharan Africa as well as Haiti and the Philippines. The suitcases have been purchased by international agencies, NGOs and governments. Stachel's work won her a nomination as one of the 2013 Top Ten CNN Heroes and WHO Director-General, Dr Margaret Chan, praised the innovation last year as “sunshine saving lives”.

The suitcase now includes several LED overhead lights and a headlamp, a fetal heart monitor, an outlet for 12 V (volt) direct current (DC) medical devices, as well as battery and phone chargers. The smallest system includes a 40–65 W (watt) PV solar panel. Another model increases peak available power to 240 W, yielding one kilowatt of power during a day of full sunlight. “The system

is basically plug-and-play,” says Stachel, whose NGO also trains health workers to install and maintain the devices.

Sam Wamani's traumatic experience also triggered a desire to change things. Today he is the Uganda country manager for Innovation Africa, an NGO that provides health clinics with a 240 W PV solar energy system for lights, simple medical devices and a low-energy refrigerator. The cost of the solar power system starts at about US\$ 3000. A remote monitoring device allows managers such as Wamani to monitor energy use and troubleshoot. The NGO helps clinics raise income to cover maintenance costs by charging cell phones for a fee.

To date, Innovation Africa has built and installed 26 units in clinics in Malawi, Uganda and the United Republic of Tanzania, as well as a mini-grid in the Malawian village of Ndaula, where a PV solar system powers the health clinic, school, a water pumping station and a drip irrigation system.

These are just two of a number of renewable energy initiatives for the health sector. But such initiatives are small compared to sub-Saharan Africa's enormous energy needs and its untapped solar resource potential. Dora believes that the health sector can seize more of that potential as a partner in the new United Nations (UN) initiative called Sustainable Energy for All, also known by its acronym “SE4ALL”, which WHO is working on together with the World Bank, the United States Agency for International Development and other agencies on energy measurement and monitoring.

WHO is also collaborating with the UN Foundation, UN Women and civil society groups, such as We Care Solar, on a new initiative focused on energy issues dubbed the High Impact Opportunity on Energy and Women's Health.

Some African countries are already embracing solar energy, according to the WHO study. In Sierra Leone, 36% of all health facilities and 43% of hospitals use solar energy in combination with other electricity sources. In Liberia, more public sector primary health clinics use PV solar systems than generators. Uganda, too, is getting behind solar power; 15% of hospitals use it to complement electrical grid access.

Health clinics and hospitals have long used a mix of energy sources as a backup, says Elaine Fletcher, a science editor who worked on the WHO study.

“For the thousands of clinics and hospitals that need a ready on-site energy source, adding solar energy to the mix may offer significant gains,” she says. “A hybrid electricity system including both PV solar energy and a generator, for instance, can improve reliability and sharply reduce fuel use and, thus, operating costs. Pollution and carbon dioxide emissions are much lower than if they were to use just the generator, reducing exposure to carcinogenic diesel emissions as well as reducing the carbon footprint per unit of electricity use.”

While the vision and efforts of NGO innovators and entrepreneurs may be inspiring, Africa's unmet demand for energy requires a broader mobilization of institutions and resources to have a meaningful impact.

That requires a more systematic evaluation of needs and interventions, Dora notes, something WHO is working on in two upcoming reports (one focusing on “green” health facilities and the other, with the World Bank, looking at energy access in health clinics in developing countries).

WHO is also hosting a meeting later this year at which experts will discuss how to expand the monitoring and tracking of the energy needs of health facilities. “We need to be clear about the costs and benefits before we can build momentum,” Dora says.

For Sam Wamani that momentum cannot come soon enough. “Every time I walk past a darkened health clinic at night, I think that someone will die,” he says. “And every time I turn on a light I feel like I am saving a life.” ■



We Care Solar

A health worker (left) in Malawi receives a solar suitcase