

Bringing sustainable electricity to rural African communities

October 4 2013



Birds-eye view of the PV system and trading centre in Makueni County, Kenya.

The University of Southampton is leading an international project to provide sustainable electricity supplies to rural communities in Africa.

The aim of the [project](#) is to establish and implement replicable, off-grid electricity generation, based on a solar photovoltaic (PV) storage system, which promotes development in sub-Saharan Africa.

The five-year "Replication of Rural Decentralised off-grid Electricity Generation through Technology and Business Innovation" or Energy for Development (E4D) is a multi-institutional research programme, funded by the Research Councils UK and the UK's Government Department of International Development.

The E4D project will develop a community-based mini-grid solar electrification system aimed at invigorating village trading centres (TC) by providing electricity directly to businesses, which in turn, provide charging for electrical appliances, such as LED lanterns for lighting and for mobile phones, to the rest of the community.

This is the concept of the Kitonyoni village market solar project established in 2012 in Makueni County, Kenya. The project displaced the use of candles or kerosene used for lighting within community households and businesses, which is expensive and has negative health effects. By working closely with the villagers, the E4D team established an economically sustainable approach, whereby the community is responsible for the operation and maintenance of the plant.

Income is generated for the cooperative, also set-up as an energy supply company (ESCO), through membership fees, local sales of electricity and share ownership. Such income covers all the running costs of the project and provides finances to the community, as well as contributing to the recovery of the capital cost of the project. Together, E4D engineers, local contractors and villagers were able to assemble the containerised 13.5 kWp photovoltaic solar plant and the mini-grid within one week. The premise of the modular project design is to make it easier to replicate and resize to suit villages of different size and requirements.

Professor AbuBakr Bahaj, Head of the University's Sustainable Energy Research Group (SERG) and the Principal Investigator on the £2.6 million project, comments: "We estimate up to 3,000 local people can

now benefit from electrical energy provided by the project. The school, health centre, churches and the 40 businesses have round-the-clock stable [electricity](#), allowing them to extend their working hours and provide additional services such as information technology training, tailoring, hair dressing as well as the charging facilities. Additionally, the solar canopy of the PV system was designed to act as a rain collector, enabling water storage and sale by the cooperative to the community throughout the year."

This month, the E4D team celebrates the first year of operation of the project, which has undoubtedly transformed the lives of the villagers. The project is now a beacon in Africa having many local and international visitors including from Japan, Germany, UK, Zambia, the World Bank and other funding agencies.

Professor Bahaj comments: "The transformation of trading centres is very clear: land prices have more than doubled, at least five new buildings have been completed, new businesses started, businesses' income has in most cases more than doubled and most importantly, a new maternity ward is now operational.

"The challenge now is to reduce capital costs and embed the concepts and models in other communities. The latter is now being done in a second project in Kenya, another in Cameroon, with other projects being planned in Mozambique and other African states. There is now strong interest from governments and the private sector to adopt our approach, as well as from international funding agencies, to provide substantial funding to support the concept on a larger scale."

Provided by University of Southampton

Citation: Bringing sustainable electricity to rural African communities (2013, October 4)

retrieved 17 April 2024 from

<https://phys.org/news/2013-10-sustainable-electricity-rural-african.html>

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