

Optimizing Solar for Social Economic Development in Kenya's Counties

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Introduction

Over the last eight years, Kenya witnessed rapid growth in electrification. The access rate more than doubled, from 36% in 2014 to 75% in 2018¹. Rural electrification increased from 25% in 2014 to 50% in 2018. Progress in rural electrification has been achieved through government programmes like Last Mile Connectivity, support from development partners and stand-alone solar. The adoption of stand-alone solar products was particularly impressive, making Kenya a market leader². The number of solar units sold in the country increased from 413,544 units in January to June 2017, to 974,973 over the same period in 2019³. To date over 4.3 million solar units have been sold in the country. Solar home systems constitute 18% of these sales, while pico-solar products take up 82%. Up to 99% of Kenya's existing off-grid electrification is through stand-alone solar⁴.



The socio-economic impact of stand-alone solar

The increment in stand-alone solar units sold can be linked to the enabling environment created by tax waivers and innovation by solar companies as they try to reach lower income groups. Consumers are in turn using solar products to improve their livelihoods and generate additional income. According to a report by the Global Off-Grid Lighting Association⁵, rural households using solar in East Africa are generating more income, have better health, children enjoy longer study hours and generally have a higher quality of life than before. Up to 44% of households that purchase solar systems spend more time at work in the evening, either at home or running businesses. In addition, stand-alone solar companies are creating employment along the value chain. Employment opportunities available at the local level include sales and distribution, installation and technical maintenance, and customer support. In East Africa, employment across the solar value chain is expected to raise from 75,000 in 2018, to 350,000 by 2022⁶.

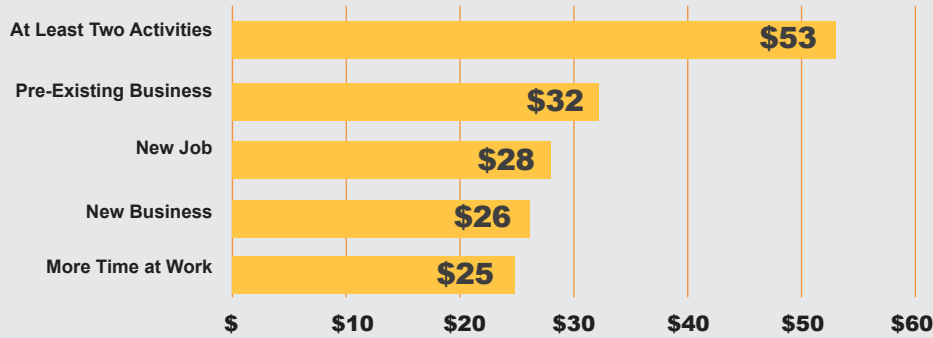


44%
Households that purchase solar systems spend more time at work in the evening



\$53
Increase in earnings for households with more than two sources of income

Average additional monthly income generated by type of economic activity



Source: Global Off-Grid Lighting Association

Cost reduction and improvements in technology over the past decade have made solar an economically and technologically viable solution for electrification⁷. For instance, the Kenya Off-Grid Access Project (KOSAP) that targets 14⁸ underserved counties is using solar to transform previously excluded communities. Kenya aims to achieve universal electricity by the year 2022. To achieve this target, at least 1.96 million solar home systems are needed in areas not likely to be reached through grid extension or mini-grids⁹.

Solar Opportunities in Counties

Studies on cost-effective electrification show that a combination of mini-grids and stand-alone solar is necessary in areas that are remote and sparsely populated. While mini-grids require significant capital to deploy, stand-alone solar solutions cost much less. The main factors that affect the cost of electrification in rural areas are:



Population size



Population density



Distance to the national grid



Terrain



Level of economic activity, and



Sources of energy that are readily available¹⁰.

Advances in technology have also increased the diversity of solar products available in the market. These products are addressing pressing problems like:



Unclean or dim lighting



Food insecurity



Little or no access to water



Low income,



Unemployment



Insecurity, and



Limited access to information

Opportunities to solve these problems and transform livelihoods using stand-alone solar at household and community levels have expanded as shown in Figure 1.

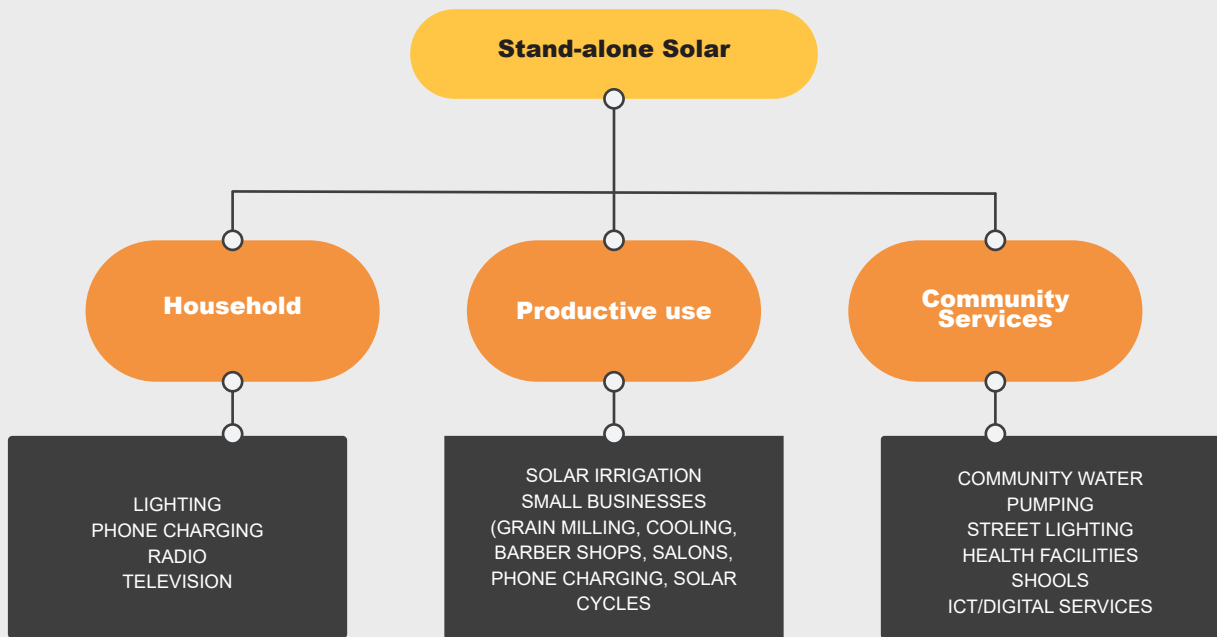


Figure 1: Uses of stand-alone solar at household and community levels

Households

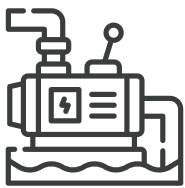


Households need power for lighting, heating, education and entertainment. While the initial solar photovoltaic products available in the market were for lighting and phone charging, they have since expanded to include radio, television and appliances like fans and refrigerators¹¹. The pay-as-you-go (PAYG) business model is one of the innovative approaches being used to make solar products affordable among lower income groups¹². The model allows customers to make a minimal down payment with the balance paid through mobile money for 6-36 months depending on what is included in the solar home system. However, a recent study showed that up to

59% of the households that have purchased solar products on PAYG basis live on less than \$3.20 per day⁵. County governments can provide consumer financing for households that are below that level. The financing can take the form of subsidies or direct cash transfers. Development partners in collaboration with the county governments of Kilifi and Garissa are implementing a programme that gives a cash-transfer for households to purchase solar products¹³. KOSAP is also providing subsidies for solar companies to reach the remote communities in the 14 counties.



Irrigation using a solar pump | Photo credit: Future Pump



Powering Agriculture

The availability of portable solar-powered irrigation pumps has created an opportunity for small scale farmers to harvest rainwater during the rainy season and use it for irrigation during the dry season^{14,15}. Solar irrigation allows farmers to have up to four cropping cycles per year, increased yields, better prices for their produce especially during the dry season and improved livelihoods¹⁶. The purchase of solar irrigation pumps has been shown to boost women and youth involved in farming¹⁰. However, two main challenges limit their adoption. Limited awareness of the technology and the high up-front cost¹⁷. The solutions to these challenges include, awareness to address the information gap and consumer financing through pay-as-you-grow or credit from financial institutions. Besides solar pumps, there are solar dryers with the potential of increasing incomes. Dried produce can fetch better prices in other markets and can continue to be sold when the fresh produce runs out. Counties can enhance food security by integrating solar water pumps and driers in agricultural extension services. In Nyamira County, the government with the support of non-governmental organizations, distributed 40 solar driers to organized groups in the region. The Mapema Women Group in Keeroka uses

their solar drier to dry traditional vegetables, which they later sell at a higher price when the supply for such vegetables is low in the market¹⁸.



Powering Business

Economic opportunities are limited in off-grid trading centres due to lack of power. This problem can be addressed through stand-alone solar that powers small businesses like barber shops, salons, refrigeration for cold drinks, grain milling hotels and entertainment. These businesses remain open for longer hours translating to increased sales and higher income. The county government can drive the uptake of stand-alone solar by advocating for the adoption of technologies like solar water heaters for residential and commercial buildings.

Commercial solar drying preserves perishable foods like fish, fruits and vegetables. Azuri Health Ltd is one of the companies in Kenya solar drying mangoes and pineapples that are distributed through local supermarkets¹⁹. In Isiolo County, the Ewaso Ng'iro North Development Authority in collaboration with University of Nairobi launched a solar tunnel drier that preserves meat for a year²⁰. The solar tunnel can also be used to dry vegetables, fruits and herbs.

Social Services

Besides productive use, solar enhances service delivery and improves the quality of life at the community level. The Rural Electrification and Renewable Energy Corporation - RREC (formerly Rural Electrification Authority) has been deploying stand-alone solar and mini-grids in areas earmarked for off-grid electrification. Through the Government's Digital Learning Programme, the Corporation has been electrifying schools through grid extension and solar in off-grid areas²¹. Counties should provide legislation that allows the delivery of social services to be enhanced through the integration of solar. For instance, the Government of Ghana plans to have all public offices installed with solar as a measure to reduce government expenditure on electricity bills.



A community water point with a pre-paid meter that enables users to pay a small amount of money to take care of operations and maintenance. | Photo credit: Maji Milele



Powering Health

Universal healthcare cannot be achieved without access to energy. Solar power offers an opportunity to reliably and sustainably power health-care. Rural health centers with solar power enjoy storage of vaccines, night time maternal deliveries, water heating, enhanced security and better motivation for the staff. Narok County with the support of the Solar Energy Foundation used solar to power 10 health centers, including Najile Dispensary in June 2016. The dispensary now has longer opening hours, women and children no longer walk long distances for vaccinations and pregnant mothers can deliver at night²².

to pay the monthly bills, solar is a viable solution. Once the installation is done, the recurrent costs reduce significantly.



Powering Water Access

Solar power used to lift water from boreholes and wells reduces the drudgery of fetching water for women and girls. The installation of five solar powered water pumps in Nyadhiwa, Homa Bay County has reduced this kind of suffering for women in seven villages²⁶. They also enjoy better flow of water. The water pumps are serving 700 households that now access clean drinking water. In some villages, community water points have been enhanced by the installation of pre-paid water meters such that some money is collected for operation and maintenance, hence ensuring sustainability of such projects²⁷.



Powering Education

Access to electricity enables lighting, extended study hours, and use of information and communication technologies. Electrification through solar contributes to improved learning, enhanced security, cost savings and provision of hot water in schools²³. Solar installed in rural schools that have no access to the grid leads to digital literacy in line with the new competency-based curriculum in Kenya²⁴. Development partners have already set up solar-powered computer laboratories or digital learning centres in some public schools²⁵. For schools connected to the grid that are not able

Community Services



Enhancing Security in Public Spaces

Street lighting enhances security, reduces crime, and creates more time for social economic activities^{28,29}. It also improves security in market centers enabling traders to operate for longer hours leading to higher sales. The Government of Homabay County has already installed over 740 solar market and streetlights³⁰. However, mechanisms to prevent vandalism of the solar panels should be put in place during installation³¹. Solar powered traffic lights enhance safety in off-grid towns.



Other Services

When electricity is combined with internet access citizens have better access to information and government services. The Government of Kenya launched e-citizen in 2015 making it possible for citizens to access a variety of government services through the internet. Solar powered digital centers increase access to these services in off-grid areas.

Conclusion

Solar is driving social economic development in off-grid areas as shown by the examples above. Some counties have also made steps by deploying solar at various levels. At policy level, Marsabit, Nakuru and Turkana Counties have integrated solar in their County Integrated Development Plans. Kitui and Makueni Counties have trained personnel on energy planning.

Kitui County further supported the distribution of improved cookstoves to low income households as one of the activities in their Energy Master Plan. There are different activities that County governments and other stakeholders can undertake and contribute towards the socio-economic development of their counties (See Table 1).

Table 1: Stakeholders and possible interventions

STAKEHOLDER	POSSIBLE INTERVENTIONS
County government	<ul style="list-style-type: none"> ○ <i>Policy and regulations</i>: integrating stand-alone solar into County Integrated Development Plans (CIDPs) and The Energy Master Plans. ○ <i>Budgeting</i> for stand-alone solar in annual budgets especially for lighting public spaces like markets, street lighting, health facilities and schools. ○ <i>Licensing</i>: Business permits for companies opening offices at local level. ○ Consumer protection: collaboration with enforcement agencies (Kenya Bureau of Standards) to protect consumers from sub-standard solar products and haphazard disposal of electronic waste. This protects consumers from exploitation and build-up of e-waste. ○ <i>Consumer awareness</i>: education campaigns where consumers engage with service providers and learn more about the range of solar products available and their benefits. ○ <i>Training</i>: supporting the training of young people to easily carry out repairs and installation of solar lights and appliances
Civil Society Organisations	<ul style="list-style-type: none"> ○ <i>Consumer awareness</i>: education campaigns where consumers engage with service providers and learn more about the range of solar technologies available and their benefits. ○ Integrating stand-alone solar in livelihood interventions e.g. agriculture, education and health. ○ <i>Investment</i>: providing support to electrify schools, health centres and installing solar water pumps for community water points. ○ <i>Training</i> of solar technicians so that installations and repairs are readily available at community level. ○ <i>Providing incentives</i> for vulnerable and poor households to acquire solar solutions as opposed to 'give-aways' which distort the market. Civil Society Organisations can partner with private companies to develop incentives that do not distort the market.
Stand Alone Solar (SAS) Companies	<ul style="list-style-type: none"> ○ Providing high-quality solar products ○ Building agent networks ○ After sales services ○ What Corporate Social Responsibility can SAS companies do?

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