# Rural Electricity Access via Solar PV Microgrids

## Assessing Social Impact: An EASE Project Policy Brief

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## KEY POINTS

1. Decentralised Energy Resources such as microgrids can provide rapid access to sustainable energy for rural populations.
2. Improved access to clean, modern energy will not immediately or automatically result in poverty alleviation, and improvement in health, education, and gender-related issues.
3. A holistic approach to microgrid development - underpinning other local development initiatives with energy supply – is recommended to create lasting socio-economic impacts.

## CONTEXT

Access to clean, modern energy sources is considered fundamental to address development issues related to poverty, education, gender inclusion and equality, health, and the environment. However, over 700 million people worldwide, mainly in rural areas, still lack appropriate access to energy. In line with the world ambition to shift away from traditional energy sources, decentralised renewable energy systems (such as microgrids) are consistently promoted as a cheaper and more accessible alternative to a centralised grid.

## BACKGROUND

Rural Energy Access through Social Enterprise and Decentralisation (EASE) is a project carried by the University of Strathclyde in partnership with Community Energy Malawi (CEM) and United Purpose (UP). The main objective is to provide renewable energy and sustainable economic development for rural communities in Malawi through microgrid deployment, addressing energy poverty and its implications and supporting the Government of Malawi in achieving energy for all as per the 2030 target. The EASE project is aiming to contribute to UN's SDGs 3 (Health), 4 (Education), 7 (Energy), 8 (Economic growth), and 13 (Climate Action). The project started in October 2018 with five years duration and funding provided by the Scottish Government International Development Strategy. The main objective is to install microgrids and energy hubs in the targeted communities, operating under a social enterprise business model that provides energy access for households and businesses.

789 million people lack access to energy globally (UN, 2020). Researchers recognise that most of this population live in rural areas and that this deficit is concentrated mainly in the Asia-Pacific and Sub-Saharan Africa (SSA). Currently, SSA is home to the 20 countries with the lowest electrification rates (World Bank Group, 2019, p.4).

The research findings focus on the remote and impoverished community of Mthembanji, which has minor prospects for other electrification solutions. Due to the lack of developed road infrastructure, trade, or industry in Mthembanji, the project also presents an opportunity to understand if the microgrid technology alone can significantly impact a complex of social issues.

## PROJECT RESULTS

### Energy access

Surveys conducted in 2019 in Mthembanji show that energy access seems to directly correlate with participants' expectations for happiness, opportunities, and economic development. However, most households indicated that they could not meet their energy needs, including enough light for doing household chores or studying/ working at night or entertainment. The current energy sources were too expensive and unreliable, and did not allow community members to pursue their business venture ideas.

The follow-up survey in 2021 indicated that since the microgrid installation (in 2020), the percentage of energy devices used and owned decreases and some devices are entirely replaced by the microgrid (Figure 1). This impact could be influential to numerous aspects of the community's life, including reducing environmental impact and pollution.

In 2019 70% of all respondents felt unhappy with their energy access.

In 2021 85% of all respondents are happy with their energy access.

For 80% of the respondents, the microgrid has contributed to improvement in their household's quality of life.

Households are much more satisfied with their home lighting and can entertain or perform work/ study activities in their homes at night. Supply of energy infrastructure, availability, convenience, environmental and health impact of the energy source has improved. Participants in the survey are generally satisfied with the quality of the service and the project; they consider it a good development, transforming the life in the community and bringing an urban feel to it.

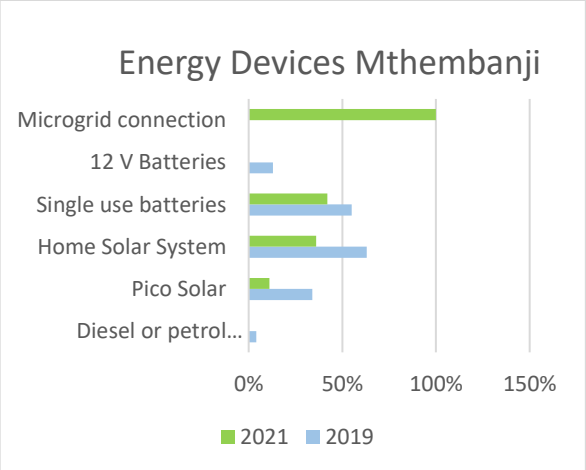


*Figure 1: Comparison in energy devices owned 2019 vs 2021*

### Economic aspect

The survey and focus group discussions conducted in 2021 show that 93% of the respondents believe that the grid has resulted in new job opportunities in the community. The FGD answers mention people being employed as microgrid site agents or by local businesses and that existing businesses can afford to operate longer hours thanks to the microgrid connection. However, the survey shows that only 16% of the households use the microgrid connection for income-generating activities, and participants increasingly feel insecure in their income. In 2019, 50% felt insecure and 37% secure, compared to 2021, when 76% are insecure, and only 13% feel secure in their finances.

In Malawi, 71% of the population lives below the international poverty line of $1.90 per day (UN Malawi, 2020, p.42).

### Gender aspect

The research indicates that there is little gender-specific impact generated because of the microgrid. Women do participate more in entertainment activities, and benefit of better lighting and security in their homes, however, the general position of the woman in terms of decision-making abilities, income-generating activities and improved educational or health incomes has not been improved.

### Education

Given the short time in which the microgrid is operational in Mthembanji and other factors influencing the educational sector, it is difficult to estimate the intervention's impact on the educational outcomes. The research shows that the material setting has changed, and now there are opportunities for learning practices to evolve. Electrifying schools and homes can change learning and study practices, enhancing the education children receive and their results in the long run. The focus groups show the community's perception that the microgrid has already contributed to improved school grades of their children.

### Health

Improved energy access can contribute to improved human health in three ways. First, it can ameliorate the conditions in hospitals and health centres: lighting, ventilation, cool storage for vaccines and blood banking. Second, improved energy access can allow new ways for accessing health information (TV, radio, mobile phone, internet). Third, it can allow for clean home cooking solutions, which will reduce the use of traditional fuels and exposure to harmful indoor pollution.

In 2021 95% of the respondents said that they do not believe the microgrid has an impact on their health; all FGD participants also supported the results. While the microgrid technology, in general, can create health impact, this cannot be achieved in this community due to the wider lack of health facilities.

Nearly 4 million deaths per year are attributed to household air pollution, of which half are in children aged under five (WHO, 2018).

## CONCLUSIONS

The findings presented in this research support an argument against the outdated assumption that improved access to clean, modern energy will automatically result in poverty alleviation, and improvement in health, education, and gender-related issues. The microgrid technology indeed can contribute towards socio-economic impacts but cannot create them on its own.

Microgrid projects for rural electrification cannot contribute to poverty alleviation on their own, as energy provision alone is insufficient to stimulate production practices or increase households' income.

Small-scale energy interventions can lead to productive uses, unlocking various positive outcomes. However, the success is subject, amongst other things, to quality human capacity building and training, information provision, support from the government and other local partners. The supply of road infrastructure, proximity to markets, and potential customers' purchasing power are fundamental for establishing new income-generating activities.

## RECOMMENDATIONS

- **Socio-economic impact** is a complicated matter that has no simple formula for positive results. Energy (and other) projects should decide from the start on the impact they aim to achieve. Projects must spread over multiple areas to address poverty in its whole, and **partnerships** should be actively pursued in order to secure successful **multidisciplinary** scope, and achieve sustainable results.
- One of the biggest challenges that projects struggle with is **financing**. Microgrid developers may be required to focus on economic sustainability rather than a holistic approach to community development, or may indeed end up competing with other development actors for funding (e.g. creating a funding choice between improving local energy supply or education services). A more effective approach could be to encourage layering of funding and investment on energy infrastructure structured around social return on investment.
- **Collaboration** as already mentioned is crucial, but not only between projects; collaboration is needed between project developers and community members, local NGOs, local government, and agencies. The focus should be of creating **a community of collaboration** where projects can tap-in the knowledge base of already running or completed projects and share/ lend expertise or experts, including local social scientists to support socio-cultural understanding and enable deeper understanding of social impact.
- Microgrid projects operating in impoverished communities, should be actively **supported by governments** to reduce the burden on households and guarantee the operation and expansion of the infrastructure. As with all other routes to achieving improved energy access, appropriate subsidies are required to stimulate investment and to support more affordable tariffs whilst maintaining sustainable business models for developers.

## Next Steps for EASE

The EASE project promotes practice based learning and the following actions are currently being implemented, informed by the findings of this policy brief and wider programme research.

- Conducting community **training on Productive Uses of Energy** utilising microgrid electricity supply. The trainings will be delivered in collaboration with Jubilee Enterprises (previously Social Enterprise Academy Malawi)
- **Implementing agricultural anchor loads** for the microgrid. Innovative rice milling machines will be deployed, allowing farmers to save money on transport costs and adjust the agricultural value chains to foster local economic development.
- Engaging with agricultural experts to **foster routes to market** for rice farmers.
- Engaging with microfinance institutions to **increase appliance availability** though appliance loans.
- Engaging with **gender experts** to investigate delivery model interventions in order to increase social impact for women and girls at the microgrid site.
- Continual analysis of financial sustainability outlook and customer ability and willingness to pay in order to **make tariffs as affordable as possible** (building on existing low cost service tariffs and day-time discounts for business customers).
- Investigating options for **expanding the system** to incorporate higher demand and more customers.