



Photo: Waheed Awonuga/UNOPS

IGC



 UNOPS



Improving access to renewable energy in rural Sierra Leone

Madison Levine (Wageningen University), Niccolo Meriggi (IGC Sierra Leone), Mushfiq Mobarak (Yale University), Vasudha Ramakrishna (Yale University), Lennart Sattlegger (Wageningen University), Maarten Voors (Wageningen University), Ariful Islam (UNOPS), Sellu Kallon (Wageningen University), and Julia Liborio (IGC)

- In Sierra Leone, only about 5% of the population in rural areas have access to electricity.
- The United Nations Office for Project Services (UNOPS) is supporting the Government of Sierra Leone to increase access to electricity through the Rural Renewable Energy Project (RREP) with funding from the UK's Foreign, Commonwealth and Development Office (FCDO).
- This policy brief investigates findings from an impact evaluation of the project, which provided communities across 14 districts of Sierra Leone with access to off-grid solar electricity.
- The findings show that the project has been successful in increasing access to clean energy in rural communities. However, more needs to be done to ensure electricity has a transformative impact on people's livelihoods.
- The brief points to policies which can improve the implementation of the programme in Sierra Leone and elsewhere, contributing to better access to electricity and its productive use in rural communities.

JUNE 2022

Impact evaluation partners



Read the full impact evaluation report [here](#).

www.theigc.org

IGC DIRECTED BY



IGC FUNDED BY



Policy motivation for research

Although poor access to electricity is recognised as a constraint to long-term economic growth, it is still the reality for many people across the globe, particularly in rural communities. In Sierra Leone, just about 5% of the rural population have access to electricity (World Bank, 2020). Policymakers, donors, and international development organisations have made universal access to electricity a priority in the country.

As part of its Medium-Term National Development Plan for 2019-2023 (MTNDP), the Government of Sierra Leone highlights access to electricity as a key priority, outlining policies focused on increasing electricity generation, transmission, and distribution, increasing investment in low-cost renewable energy, and ensuring rural electrification, among others.

In this context, the United Nations Office for Project Services (UNOPS) is supporting the government's goal of ensuring universal access to electricity by implementing the Rural Renewable Energy Project (RREP) project worth over GBP 40 million. This project – funded by the UK Foreign, Commonwealth and Development Office (FCDO) – is an ambitious electrification effort that provides access to clean solar energy in up to 95 communities in Sierra Leone.

The project's implementation is being conducted in phases. This policy brief brings insights from the impact evaluation of the first and second phases of the project, which provided communities across 14 districts of Sierra Leone with access to clean solar energy through the construction of 94 mini-grids.

Overview of the research

The findings are based on data collected during baseline (2019) and endline (2021) surveys to evaluate RREP's impact on key development outcomes. To do this, a representative sample of households in communities where mini-grids have been installed was compared with a representative sample of households in statistically similar communities where no mini-grid was installed. In total, the impact evaluation team interviewed 6,010 households across 14 of Sierra Leone's 16 districts to understand how access to electricity had impacted their livelihoods.



Photo: Waheed Awonuga/UNOPS

Key findings

Energy access and use

The results show that in communities selected by the project and where the project has been active since 2019, households are beginning to benefit from the electrification.

The connection rates were high: 65% of respondents in first-phase communities were connected. A typical connection fee was SLL 150,000 (approximately \$13.64). Households paid approximately USD 0.30 on average per day on electricity consumption.

Households in communities with access to the mini-grid were 43 percentage points more likely to have light through the mini-grid. So far, 35% of households in second-phase communities have been connected. Given that less than half of the RREP communities are electrified, this percentage is encouraging.

Compared to households that are not connected to the mini-grids in the same communities, connected households were more likely to:

- Have a male household head
- Have more adults living in the household
- Be self-employed
- Own more electrical assets (freezers, mobile phones, radios, electric fans, stereo systems, televisions, etc.)
- Spend more on food and less likely to skip meals

We find that respondents in communities with access to mini-grids change their energy use: households are more likely to have access to light and less likely to use diesel generators for lighting.

Connected households are also less likely to cook with charcoal and more likely to cook using energy from the mini-grid, and spend less money on fossil fuels.

Households are more likely to have access to light and less likely to use diesel generators for lighting.

However, it will take time for this transition to have a substantial impact on the environment and livelihoods. There's not yet a significant reduction in the use of other high-emissions energy sources, such as kerosene or firewood for both cooking and lighting.

Income and assets

In the period between the baseline and endline surveys, there were no substantial changes in labour and income due to the project. Given the short timeline and the disruptions to business activities across all communities caused by the COVID-19 pandemic, it is not surprising that few effects were observed at this stage. Neither are there differences between cash and food crops planted, harvested, and sold.

It is important to note that the results on employment and income should be considered intermediaries, as the time between mini-grids becoming operational and the survey was in some communities limited (or electricity was not provided yet), and observing effects on these outcomes takes time.

Gender equality

The research found strong evidence of gender inequality. Fewer female-headed households were connected to the mini-grids than male-headed households. This may be related to differences in income and wages. The average profit for men per month in self-employed businesses was about twice the average profit for women. This earnings gap can be explained by differences in occupations: the research found that women were more likely to work in low-earning occupations such as petty trading (39.4% report self-employed) compared to men (23.8%).

Disability

There were no differences in the effects of electrification for households with disabilities. Respondents with disabilities in RREP communities were no more or less likely to be connected to the mini-grids, nor use clean energy sources in their homes. There were some substantial income and asset differences across disability but these persisted from the baseline survey.

Education

Government and government-assisted schools were surveyed and those in RREP communities have had the opportunity to connect to the mini-grid. Unlike community health centres, schools are expected to pay for electricity connections. Few schools in RREP communities had invested in connecting to the mini grid in the early stages of the evaluation. Over the years, there has been a slight increase and now there are 140 schools across both phases that have eventually connected.

RREP communities had significantly more students attending the national primary school examination – this could be a signal of improved educational outcomes for these students in the future, but they may not happen without the necessary complementarities at the school level such as better resources and teacher incentives.

Health

Most community health centres in the sample were electrified in 2017 to enable Ebola containment efforts. Since then, the RREP has electrified every centre in the first phase communities, and around 61% in second phase communities. This resulted in a substantial positive impact on electricity access.

Among health centres that benefited from the first phase of the rural electrification project, 78% had at least 10 hours of electricity per day, compared to just 37% in other communities. By providing light throughout the day, the mini-grids enabled health centres to remain open and deal with emergency patients at night.

Figure 1: Hours of electricity in phase-one health centres

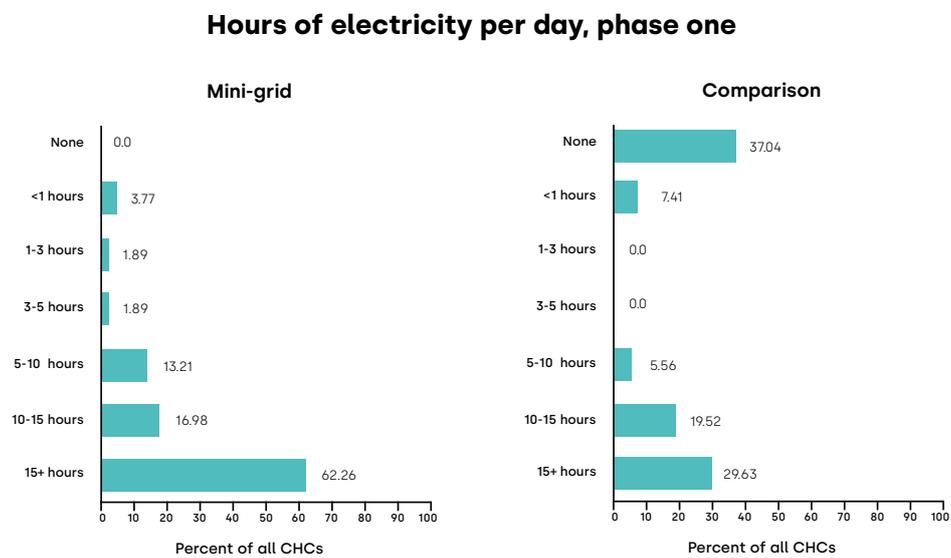


Figure 2: Hours of electricity in phase-two health centres

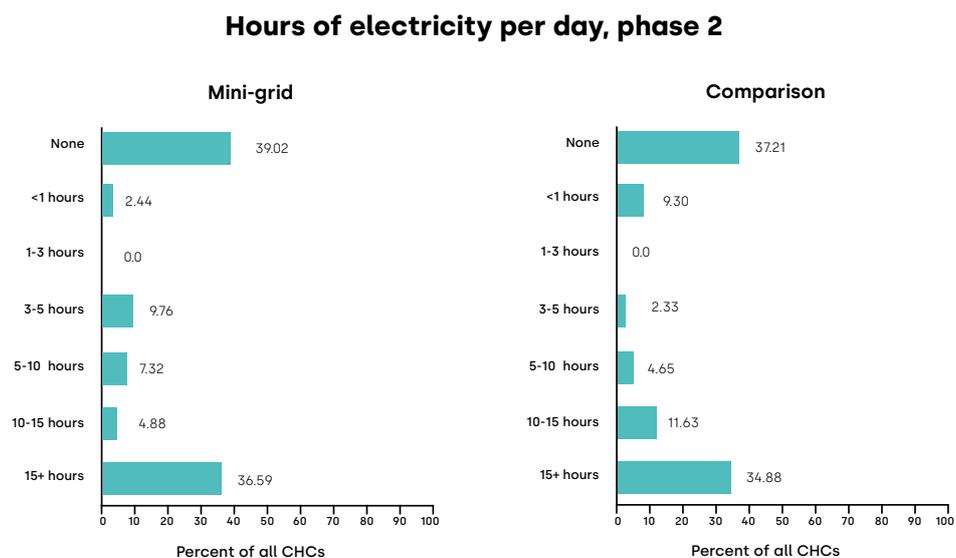




Photo: Waheed Awonuga/UNOPS

Among clinics in communities that benefited from the first phase of the rural electrification project, 78% had at least 10 hours of electricity per day, compared to just 37% in other communities.

Policy recommendations

Below are five recommendations targeted at both policymakers and UNOPS for continuation of work on the RREP and future projects.

- 1. Invest in longer-term impact evaluations.** The benefits of rural electrification take time to manifest. Changes on farm, off-farm, and further up the value chain require investment. Households lack savings to invest in multiple important appliances needed to start new economic activities. Lack of access to credit markets, poor public infrastructure, and technological familiarity all take time to catch up to improvements in energy infrastructure.
- 2. Increase access to markets and productive electrified assets (e.g., freezers, mobile phones, radios, electric fans, stereo systems, televisions, etc).** While we observe high rates of connection to mini-grids, self-employed individuals in RREP communities are not more likely to use electricity in their business. Therefore, we recommend pursuing a deeper understanding of the barriers to the adoption of productive electrified assets, and design interventions that could help people in electrified communities overcome these barriers. To make full use of the new technologies, farmers may also need better market access.
- 3. Promote productive use of electricity at community health clinics and schools.** Schools and community health clinics have increased access to electricity. Therefore, they can operate specific devices that might increase the quality of their infrastructures and allow them to operate longer hours. Complementary factors which may be necessary for reaping the benefits of electrification should also be investigated.

4. Provide clarity and education on the mini-grid tariff structure.

Based on focus group discussions, people find the tariff structure rather unclear, and the cost of the unit of electricity too expensive. Government and mini-grid operators should continue ongoing sensitization in communities to reiterate the tariff structure and service fees with community members and continue to listen to their complaints. While government and other stakeholders may not be able to change the price per unit of electricity, it might be worthwhile to provide incentives for the distribution and adoption of energy-efficient devices, so that they can become more affordable to beneficiaries.

5. Improve communication with stakeholders. As UNOPS hands over the mini-grids to operator companies, we recommend increasing the quantity and detail of communication with key stakeholders in these communities. This will ensure there are no misconceptions regarding the scope and goals of the project. There was confusion in RREP communities about the operators' responsibilities and the tariffs and fees for mini-grid use, and surrounding communities also expressed disappointment because their communities were not selected for the programme. Communication will ease any potential future difficulties.