Climate Compatible Growth

COP27 POLICY BRIEF SERIES

Improving access to renewable energy in rural Sierra Leone

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Summary

In Sierra Leone, just 5% of the population in rural areas has access to electricity. To increase access to energy and stimulate economic growth, UNOPS is implementing the Foreign, Commonwealth & Development Office (FCDO) funded Rural Renewable Energy Project (RREP) on behalf of the Ministry of Energy (MoE), Sierra Leone. Our impact evaluation shows that the project increased access to cleaner energy in rural communities through off-grid solar electricity. However, more needs to be done to ensure transformative impacts. Mini-grids are more likely to be transformative when rural entrepreneurs have increased access to productivity-enhancing technologies that require electricity. To increase agricultural value-add and productivity, a combination of both electricity access and productive inputs are likely required.

Key Policy Recommendations

- Invest in longer-term impact evaluations. The benefits of rural electrification take time to manifest. Changes in on farm and off-farm work, and further up the value chain, require investment. Households also need support for investment in appliances for economic activities.
- Increase access to productive electrified assets. Self-employed individuals were not more likely to use electricity in their businesses. A deeper understanding of the barriers to the adoption of productive electrified assets is needed as well as design interventions.
- Promote productive use of electricity at community health clinics and schools. Schools and community health clinics have increased access to electricity. Complementary investments are, however, necessary.
- Improve capacity of mini-grids. Limited system capacity is a fundamental and binding constraint to productive use of energy systems, limiting demand during “peak hours". In addition, many mini-grids are too small to carry more heavy appliances, limiting the potential for energy to be transformative.

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Policy motivation

Although electricity is recognized as a key determinant of long-term economic growth [1], access to electricity remains limited in many countries. In particular, people in rural communities have more limited or no access at all to electricity. In Sierra Leone, just 5% of the rural population is connected [2].

Policymakers and international donors have made universal access to electricity a priority. 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 [3].

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 a Rural Renewable Energy Project (RREP) project worth about GBP 40 million. This project – funded by the UK Foreign, Commonwealth & Development Office (FCDO) – is an ambitious electrification effort that aims to provide access to off-grid solar electricity in up to 97 communities in Sierra Leone. The Table below includes an overview of connections and beneficiaries of RREP.

BENEFICIARY TYPE	PROJECT TARGET	ACHIEVEMENT (AS OF JULY 2022)
Households	24k electrified households	17.4k connected households
Community health centre (CHC) Patients	around 70k patients per year in 97 connected CHCs	around 270k patients in 97 connected CHCs
School students	27k students from 130 electrified schools	37.7k students from 140 connected schools
Businesses	2k electrified businesses	19k electrified businesses

Table 1. Number of RREP beneficiaries

The project's implementation is being conducted in multiple phases. This policy brief brings insights from an impact evaluation of the first and second phase of the project, which provided communities across Sierra Leone with access to off-grid solar electricity through the construction of 94 mini-grids [4].[1]

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, we interviewed 6,010 households across 194 communities to understand how access to electricity had impacted their livelihoods.

Key findings

ENERGY ACCESS AND USE

The results show that households are beginning to benefit from electrification.

The connection rates were high: 65% of respondents in communities with mini-grids in the first phase of the project were connected. A typical connection fee was 150,000 Leone (approximately $13.64), and households spent ~30 cents USD on average per day on electricity consumption.

[1] For a short video introduction to the project, see *https://www.youtube.com/watch?v=Wj3uJwHkNW0 [5]*

Households were 43 percentage points more likely to have light through the mini-grid. So far, 35% of households in second phase communities are connected; this take up rate is encouraging.

Compared to households that are not connected to the mini-grids in the same communities, connected households were more likely to be male, have larger households, be self-employed, own more electrical appliances, and be more food secure.

Respondents in communities with access to the mini-grids change their energy use: **households are less likely to use diesel generators for lighting**. Connected households are also less likely to cook with charcoal, and they spend less money on fossil fuels overall.

However, it will take time for this transition to have a substantial impact on the environment and livelihoods as the observed changes are small.

INCOME AND ASSETS

There were no substantial changes in labour and income due to RREP. 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 are observed at this stage. Neither are there differences between cash and food crops planted, harvested, and sold.

The results on employment and income should be considered intermediaries, as the time between mini-grids becoming operational and the survey was quite short in some communities (or electricity was not provided yet).

GENDER EQUALITY

We found strong evidence of gender inequality. Fewer female-headed households were connected to the mini-grids than male-headed households. Average profit for men per month in self-employed businesses was about twice the average profit for women. However, this earnings gap can largely be explained by differences in occupations: women typically have lower-earning occupations (such as petty trading) compared to men.

DISABILITY

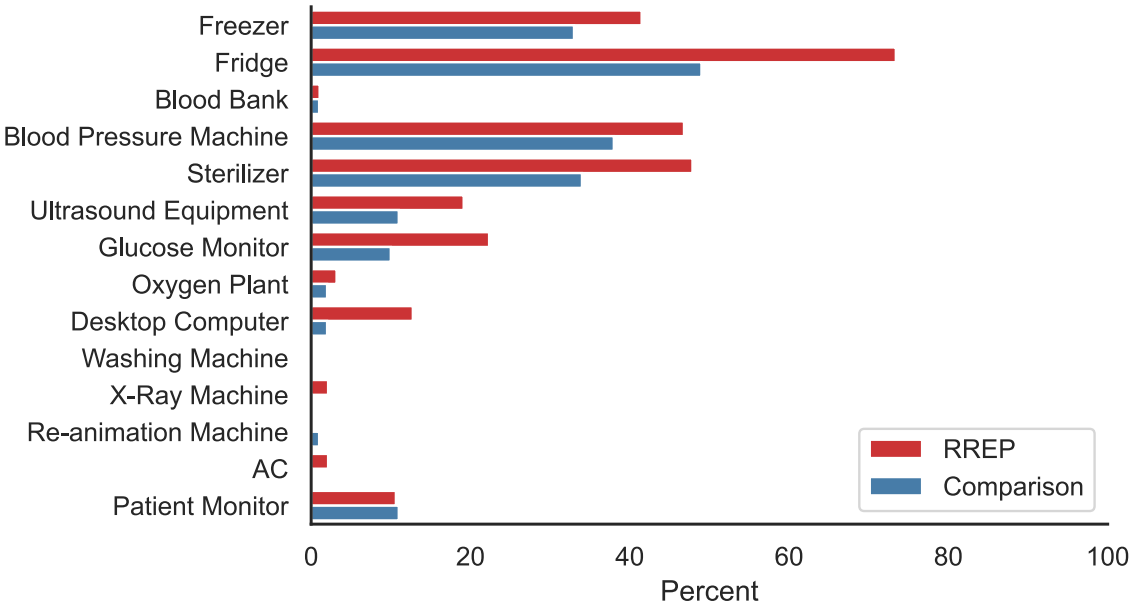
There were no differences for households with disabilities. Respondents with disabilities in RREP communities were no more or less likely to be connected to the mini-grids, nor use cleaner energy sources in their homes.

EDUCATION

RREP communities had significantly more students attending the national exams – signaling potential future improved educational outcomes. However, better resources and teacher incentives remain needed at schools to boost impacts.

HEALTH

RREP has electrified every clinic in the first phase communities and around 61% in second phase communities. This has had a substantial positive impact on electricity access. **Among clinics in communities that benefited from the first phase of the rural electrification programme, 78% had at least 10 hours of electricity per day, compared to just 37% in other communities**. These clinics also have a higher number of working appliances (such as freezers and fridges), as can be seen in **Figure 1**. By providing light throughout the day, the mini-grids enabled clinics to remain open and deal with emergency patients at night. There is, however, no change in the total number of patients that seek out the clinic for treatment. More resources at clinics and incentives for health staff remain needed.



Note: Data are from comparing clinic inventory records during 2021 of clinics in 54 villages with a mini-grid and 54 villages without a mini-grid.

Figure 1. Percent of Clinics Owning Types of Working Appliances

Policy recommendations

This policy brief presents early findings from a project across Sierra Leone to provide with access to off-grid solar electricity. The early impacts of investments in off-grid energy access are limited. Complementary investments are needed for energy to be transformative.

1. **Invest in longer-term impact evaluations.** The benefits of rural electrification take time to manifest. Changes in on farm and off-farm work, and further up the value chain, require investment. Many households lack savings or access to credit markets to invest in appliances needed to start new economic activities.
2. **Increase access to productive electrified assets.** While we observe high rates of connection to mini-grids, self-employed individuals are not more likely to use electricity in their business. A deeper understanding of the barriers to the adoption of productive electrified assets is needed as well as design interventions that could help overcome these barriers.
3. **Promote productive use of electricity at community health clinics and schools.** Schools and community health clinics have increased access to electricity. Complementary investments are, however, necessary to fully reap the benefits of electrification.
4. **Improve capacity of mini-grids.** In addition to affordability, limited system capacity is a fundamental and binding constraint. Systems cannot meet demand during “peak hours” and they are about to reach the saturation point. In addition, the systems are often too small to carry more heavy appliances, limiting the potential for energy to be transformative.

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