

Improving access to renewable energy in rural Sierra Leone

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Key Policy Recommendations

1. **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. We recommend pursuing a deeper understanding of the barriers to the adoption of productive electrified assets, and design interventions that could help overcome these barriers.
2. **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.
3. **Improve communication between stakeholders.** Increase communication between key stakeholders, to ensure there are no misconceptions regarding the scope and goals of the project, provide transparency over tariff structures and mini-grid governance.

Summary

In Sierra Leone, just 5% of the population in rural areas has access to electricity. Government of Sierra Leone supported by UNOPS increase access to electricity as part of the Rural Renewable Energy Project. Our impact evaluation shows how the project increased access to cleaner energy in rural communities through off-grid solar electricity. However, more needs to be done to ensure a 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.

Energy Access in Rural Sierra Leone

The Main Text of the policy brief.

Policy motivation

Although electricity is recognized as a key determinant of long-term economic growth, 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.

Polymakers 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, 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 a Rural Renewable Energy Project (RREP) project worth over 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 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 97 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, 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.

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 is 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 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 in some communities limited (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. This earnings gap can be explained by differences in occupations: women have lower-earning occupations such as petty trading.

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

Few government (assisted) schools had invested in connecting to the mini-grid: just 14 schools in first phase communities and 55 in phase two communities.

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.** 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 incentives remain needed.

Policy recommendations

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 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 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. We need a deeper understanding of the barriers to the adoption of productive electrified assets, and 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 minigrids.** 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 heavy appliances, limiting the potential for energy to be transformative.

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More information is available via Levine et al (2022) "Rural Renewable Energy Project in Sierra Leone: Impact evaluation Report", see <https://www.theigc.org/wp-content/uploads/2022/06/Levine-et-al.-Final-Report-2022.pdf>

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