

How electricity changes lives: a Rwandan case study

February 26 2018, by Jörg Peters And Dr Maximiliane Sievert



Credit: AI-generated image ([disclaimer](#))

More than 1.1 billion people in developing countries lack access to electricity. Some [590 million](#) live in Africa, where the rural electrification rate is particularly low at only 14%.

A lack of access to [electricity](#) hampers development. It affects

everything from people's ability to learn to the creation of enterprises and the provision of public services like health care. This lies behind the United Nation's [goal](#) of countries achieving universal access to electricity by 2030.

But the investment requirements to meet this goal are enormous. According to the [International Energy Agency](#) investments worth \$640 billion will be needed if the UN goal is going to be met. About \$19 billion is required every year in sub-Saharan Africa alone.

In spite of the importance of electrification, little evaluation has been done on the socioeconomic impact of investments into providing power. We set about plugging this gap in our [paper](#) that focuses on Rwanda. We looked at the effects of electrification on [households](#), firms, health centres and schools in [rural areas](#).

Rwanda has [implemented](#) one of the most comprehensive electrification programmes in the world. In 2009 only 6% of Rwandans had access to electricity. The government's aim is to lift this [to 70%](#) by 2018.

We studied the connection behaviour and electricity consumption patterns of households and looked at socioeconomic outcomes – such as education, income and health. We also explored the effects of electrification on the uptake of appliances as well as on rural firms and on health centres.

We found that electrification had wide-ranging effects on the living conditions of households whose daily lives were made easier on a range of fronts. We also found that the supply of power had some positive effects on certain businesses and clinics. Overall, our research confirms the importance of electrification has for the rural poor.

Yet, in our final analysis we had two major reservations. The first was

that the provision of electricity hadn't significantly improved the economic lives of people – which is often used to justify the massive costs involved in expanding the grid to all areas of the country.

The second insight was that, given people's very low levels of consumption (households consume on average around 2 kWh per month per person which is less than 6% of the electricity an average US-American consumes per day), it would make much more sense to extend electricity coverage by promoting off-grid solutions such as solar. This would lead to governments and citizens getting much more bang for their buck.

These reservations aside, our research showed how electricity in the home changes lives, sometimes in the most unexpected ways.

Impact on household level

Among the households we studied we found that lighting consumption had more than tripled among connected households around two years after connecting to the [electricity grid](#).

We also found that having electric lighting yielded significant benefits for households who have done away with torches, wick and hurricane lamps. For example, kids' study time at home increased by between 19 and 44 minutes after nightfall, although the total time children study did not increase. The reason is that children shift their study time from daytime to nighttime, which nonetheless is an important indication for increased flexibility.

Electricity also had an impact on access to information. The most frequently bought electrical appliances after connection were TVs, radios and mobile phones.

Another major effect of electrification was that it significantly reduced expenditures on energy. The average amount that connected households spent on grid electricity was 1,500 FRW (about \$2) per month after they had replaced traditional energy sources like kerosene and batteries. And they no longer needed to spend money on charging their mobile phones outside their homes. In total, they reduced expenditures on energy by around \$2.50, which is an equivalent of about 4% of their total monthly expenditure.

Impacts on enterprises and health centres

Another major impact was that it extended people's average waking hours by nearly an hour. We found that people were awake for 50 minutes per day more on average because they had better access to lighting and entertainment devices.

People didn't necessarily use this additional time to pursue income generating activities. In fact, we didn't find that electrification affected how people, many of whom were farmers, generated income.

We found that it had only a tiny effect on micro enterprises like mills, hairdressers, copy shops and welding shops. Mills were the main beneficiaries of being connected to the grid. Most switched from diesel engines to electricity. And new mills emerged because input costs were dramatically reduced and productivity increased.

Hairdressing shops also benefited for cost and convenience reasons. They used electricity for razors, phone charging services and radio or TV to entertain. Before grid electricity they had used power sources such as car batteries which were expensive and cost a lot to run.

Small kiosks, bars and restaurants mostly used electricity for lighting and in a few cases for radio, TV or refrigeration. Electricity meant that they

were more attractive to customers.

Overall, we observed only a slight increase in business activities in connected communities. Some enterprises emerged while existing operations marginally extended their operating hours or their range of products and services.

In the case of health centres, those that had been connected to the grid said their work had improved. According to answers to an open question, the main use of grid electricity was for lighting (100%), followed by use for medical machines (79%) and for administrative tasks (43%). Nearly 30% cited medicine storage and sterilising.

The most important benefit was that it reduced costs. Centres that weren't connected paid three times more for power because they used diesel.

A mixed solution

Our research showed that electricity is highly appreciated by rural communities in Rwanda, often leading to cost reductions and increases in convenience. But it does not significantly transform economic activities and income generation in rural areas.

The fact that electricity consumption levels are generally very low raises the political question of whether the high investment cost of on-grid electrification is justified compared to the lower cost of off-grid solutions. Especially the cost of off-grid solar technologies have decreased considerably in recent years and, while their performance is obviously lower, they still [improve the living conditions quite substantially](#).

These observations suggest that instead of rolling out the grid to every

rural village, on-grid investments could be concentrated in certain thriving rural regions with high business potential to create industrial zones where firms could relocate to. Off-grid solar could serve as a bridging technology for the majority of rural areas, potentially accompanied by subsidies to ensure access for the poor who cannot afford paying [cost covering prices](#). Such an integrated on-grid-off-grid strategy would enable industrial development and at the same time achieve broad access to electricity at relatively low cost.

This article was originally published on [The Conversation](#). Read the [original article](#).

Provided by The Conversation

Citation: How electricity changes lives: a Rwandan case study (2018, February 26) retrieved 24 April 2024 from <https://phys.org/news/2018-02-electricity-rwandan-case.html>

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