



Access to electricity has long been viewed as an essential ingredient for economic growth, and international development efforts continue to prioritize efforts to expand power grids. The seventh Sustainable Development Goal is dedicated entirely to access to affordable, reliable, sustainable, modern energy. In 2017, the World Bank alone invested \$1.4 billion in electricity infrastructure. This document presents evidence on the effects of programs to increase access to electricity, particularly on women and youth, responding to a question from the West African Development Bank/Banque Ouest-Africaine de Développement (BOAD). Most of the evidence comes from a recent high-quality systematic review on the socio-economic effects of electricity access interventions in low- and middle-income countries, which draws from 126 individual studies of 89 separate interventions. Additional evidence is drawn from studies in Ghana, Kenya, Nigeria, and Tanzania.

What are the effects of increased access to electricity, particularly on women and youth?

Key Findings

On average, increased access to electricity leads to:

- A substantial increase in the amount of time students spend studying at night, as well as small increases in school enrollment and other education measures;
- An increase in household income and a decrease in poverty;
- An increase in time spent on paid work and decrease in time spent on collecting traditional fuels like firewood; and
- An increase in paid work by women under some circumstances.

All effect sizes are small except with respect to study time at night.

In some projects, the number of households who choose to connect to new electrical lines is far lower than anticipated, limiting impacts.

Key Recommendations

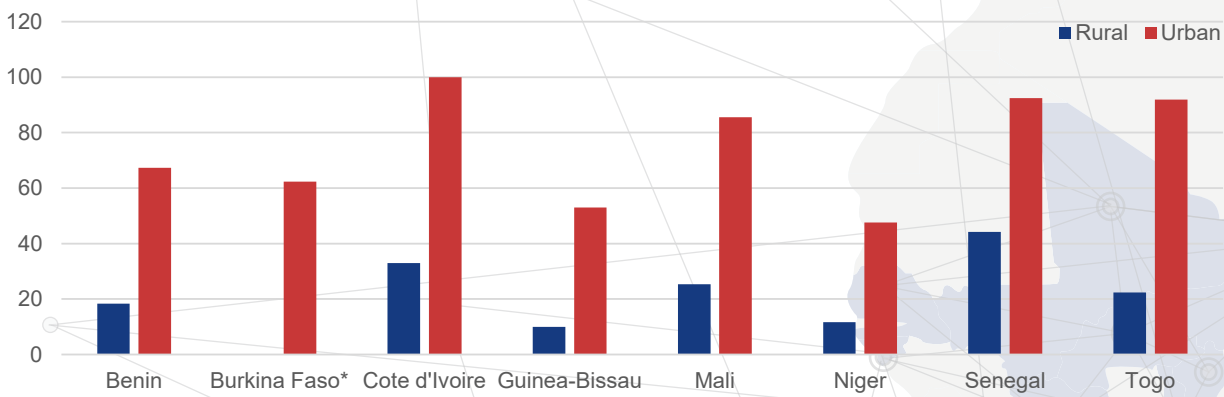
- Where possible, interventions should target multiple constraints, such as availability, reliability, and affordability.
- Projects should be planned based on expectations of modestly-sized positive economic impacts from electrification.

What are the effects of increased access to electricity, particularly on women and youth?

Background

In Sub-Saharan Africa, electrification efforts have made progress in recent years, with electricity access expanding faster than population growth since 2015, according to the World Bank. Nonetheless, in West Africa, more than 50 percent of the population lacks access to electricity, with wide variation by country (see chart). In 2020, the World Bank approved \$300 million in financing to support a public policy initiative to facilitate the electricity trade in Burkina Faso, Côte d'Ivoire, Guinea, Liberia, Mali and Sierra Leone. That program works through the West Africa Power Pool, an ECOWAS agency which aims to integrate national electricity system into a reliable regional electricity market. Also, USAID's Power Africa program aims to connect 60 million new homes and businesses in Sub-Saharan Africa to electricity by 2030. Some such efforts work to expand electrical grids, while other interventions aim to increase electricity access via micro-grid or off-grid installations, often powered via solar power.

Percent of population with access to electricity (WB 2018)



Details of interventions

Several types of programs to increase access to electricity were included among the 89 interventions in the systematic review on which this brief is based. All types of interventions provided new or improved electricity access in low- or middle-income countries, although the details varied widely.

Expansions of electrical grids represented a majority of the evaluated programs. Programs to provide off-grid or decentralized power, often via solar panels, were the second most common intervention type. (The review did not include interventions based on very small “specific-use” solar technologies, like those to providing households with solar-powered lights or phone chargers.) Other intervention types included programs to reduce blackouts, implement regulatory reforms, or reduce the cost of electricity.

The quality of electrical connections varied widely from one place to another, both before and after the interventions. In some places, households got new grid connections to high-quality power grids. In other places, such as Nigeria, households got new connections to grids which experienced regular blackouts. Other types of programs, like small household solar installations, only provided enough electricity for lights and small appliances.

These interventions were conducted in Africa, Asia, and Latin America, with the largest numbers of studies coming from South Asia and Sub-Saharan Africa. Numerous studies were conducted in a handful of countries: India (17 studies), Bangladesh (8 studies), Kenya (6 studies), and Ghana (5 studies).

The Ghana, Nigeria and Tanzania studies investigated expansions of those countries' electrical grids. As noted above, Nigeria's electrical grid provides relatively irregular power: more than half of rural connected households reported that blackouts occur every day. The Kenya study investigated the effects of subsidized household-level connections to the electrical grid.

Findings

The largest effect of electricity access programs was the substantial increase in the amount of time that students spent studying at night. Electricity interventions also slightly increased the fraction of youth enrolled in school, the amount of time they studied during the daytime, and the number of years they stayed in school.

Household incomes rose slightly after programs to increase electricity access, with increases in both farm and non-farm income. Household poverty levels also fell slightly. Relatedly, the amount of time people spent on paid work rose slightly after the implementation of electricity access programs.

One key mechanism by which electricity access led to higher incomes was by increasing the amount of time women could devote to paid work after a reduction in the time they spend on household chores. In particular, the review found a significant decline in the amount of time households spent collecting traditional fuels such as firewood. However, this mechanism was blocked in contexts where social norms or gender discrimination prevented women from working, according to the review.

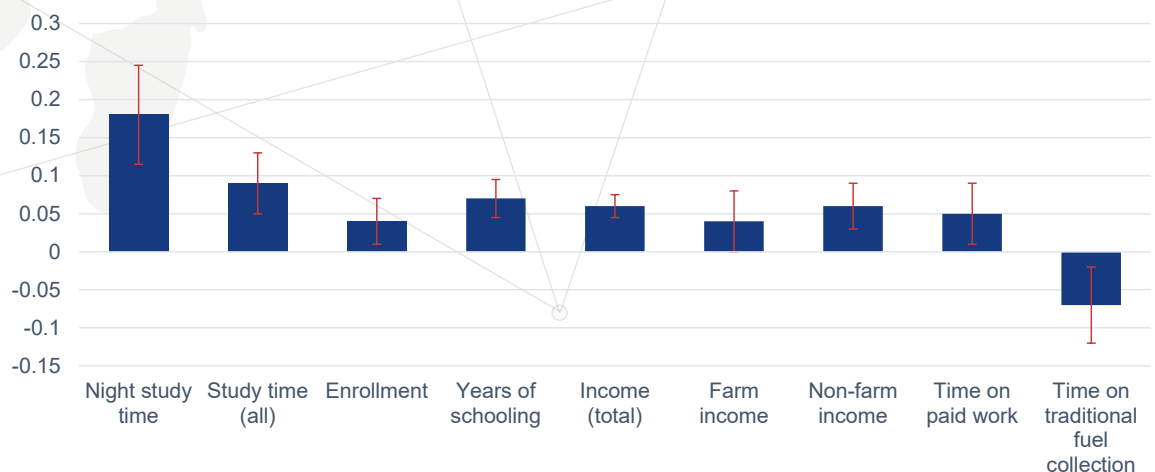
A gender-focused analysis on expanded grid access in Nigeria found that in that context, only men's working hours increased, not women's. This finding may be a result of the low quality of the Nigerian electricity grid, according to the study's authors. With daily blackouts, electricity is unlikely to be able to replace traditional fuels like firewood, nor to reduce the women's burden of housework more generally.

For women, the review's findings suggest that electricity access programs led to a small increase in household decision-making power, although the magnitude of the effect was very small.

Data from Ghana matches the results from the overall review: access to the electric grid led to increased wage labor, less use of wood as a fuel, higher rates of school enrollment for children, and lower rates of child employment.

In electricity access programs in Kenya and Tanzania, many fewer households opted to connect to the grid than had been anticipated. A recent program in Kenya offered highly subsidized household electric connections, costing \$171 USD, which is less than half the usual cost of a connection. Nonetheless, fewer than 24 percent of eligible households chose to connect to the grid at the subsidized price. In Tanzania, after a grid expansion program, only one third the number of households originally expected to connect to the grid had actually done so.

Changes in selected outcomes after increased electricity access



Recommendations

Where possible, electricity access interventions should address multiple constraints, including connectivity, reliability, and cost. As suggested by the evidence from Nigeria, connections to highly unreliable electric grids may not yield benefits for women. In contrast, in other contexts with more reliable electricity, the evidence suggests that women do benefit from a reduced burden of household chores.

Projects should also be designed and implemented with the expectation that they will lead to modest gains in income and educational measures. Studies from a range of contexts have found these improvements, but the gains for each individual household were not large in size. Policy decisions should take the small size of benefits for each household under consideration.

Planned expansions of the electrical grids should take into account the low numbers of household-level connections which have been observed in some cases, as in Kenya and Tanzania. Effects of grid expansion programs are limited if small numbers of households connect. Project planning should include a careful analysis of households' willingness and ability to pay for electrical connections.

Evidence quality, strengths and limitations

The strength of the evidence base from which these findings are drawn is the relatively large number of studies included in the systematic review, including the substantial number from contexts similar to West Africa. This sizeable collection of studies lends credibility to the review's findings. The primary limitation of the evidence is the large variation in the types of interventions and the quality of the electricity which was provided. Some programs provided just enough electricity to power lights and charge phones, while others provided connections to robust central power grids. At the moment, it is difficult to understand how the effects of these diverse interventions might differ.

Additional findings from Benin and Liberia will become available in the near future, as impact evaluations are currently being conducted about electricity access expansion programs in the region.

What is the WACIE helpdesk?

The WACIE helpdesk, a partnership between 3ie's WACIE program and IDinsight, provides rapid synthesis and evidence translation to help policymakers in West Africa understand what evidence exists for specific policy questions. The helpdesk can also connect interested policymakers with further resources to meet additional needs. It is staffed by the WACIE Secretariat in Cotonou and the IDinsight regional office in Dakar, with engagement from the wider 3ie and IDinsight technical staff and other experts as needed.

To submit a policy question, or for additional information, contact wacie@3ieimpact.org.

What is WACIE?

The West Africa Capacity Building and Impact Evaluation (WACIE) program, a partnership between 3ie and the Government of Benin, was launched to help build evaluation capacity in the eight countries that comprise the West African Economic and Monetary Union (WAEMU): Benin, Burkina Faso, Cote d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal and Togo. Program goals include increasing evaluation capacity in targeted countries, ensuring that policymakers have access to relevant evidence and promoting take-up of high-quality evidence by relevant stakeholders.

This Rapid Response brief is primarily based on the following Systematic Review

Nicholas Moore et al. 2020. *Effects of Access to Electricity Interventions on Socioeconomic Outcomes in Low- and Middle-Income Countries*. Systematic Review Report, Asian Development Bank and 3ie.

More information, including a brief summary of the systematic review, is available here:

<https://www.adb.org/documents/systematic-review-impact-access-electricity-household-welfare>

Additional findings are based on the following papers:

G. Akpandjar and C. Kitchens. 2017. From Darkness to Light: The Effect of Electrification in Ghana, 2000–2010. *Economic Development & Cultural Change*. 66(1). pp. 31–54.

D. Chaplin, A. Mamun, A. Protik, J. Schurrer, D. Vohra, K. Bos, H. Burak, L. Meyer, A. Dumitrescu, C. Ksoll, and T. Cook. 2017. Grid Electricity Expansion in Tanzania by MCC: Findings from a Rigorous Impact Evaluation. Report submitted to the Millennium Challenge Corporation. Washington, DC: Mathematica Policy Research.

K. Lee, E. Miguel, and C. Wolfram. 2020. "Experimental evidence on the economics of rural electrification." *Journal of Political Economy* 128.4: 1523-1565.

C. Salmon, and J. Tanguy. 2016. "Rural electrification and household labor supply: Evidence from Nigeria." *World development* 82: 48-68.




The International Initiative for Impact Evaluation (3ie) promotes evidence-informed, equitable, inclusive and sustainable development. We support the generation and effective use of high-quality evidence to inform decision-making and improve the lives of people living in poverty in low- and middle-income countries. We provide guidance and support to produce, synthesise and quality assure evidence of what works, for whom, how, why and at what cost.


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