

Shining a light on electricity reliability in Sub-Saharan Africa

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More than one billion people do not have access to electricity, and gaining access is a critical part of improving economic and human health outcomes in developing countries, where electrification rates can be as

less than 10%. Recognizing this need, the United Nations (U.N.) established access to electricity as one of the Sustainable Development Goals. The U.N. has also stated that electrification efforts around the world should increase the use of renewable energy resources and reduce the environmental impacts of energy production and use. While significant efforts are focused on expanding access to populations that have never had an electricity connection, unreliable delivery of electricity to existing customers can lead to additional consumer costs, limited economic benefits, and increased environmental impacts from production and consumption.

In Sub-Saharan African countries, people with an electricity connection experience electricity outages for hundreds or even thousands of hours each year. In Nigeria, for example, insufficient generating capacity, poor conditions in existing power plants, and problems in the transmission and distribution networks lead to power outages that leave consumers without electricity for over half of the hours annually. When the electricity goes out, many homes and businesses turn on diesel-powered back-up generators to replace some of the lost electricity. In our paper in *Nature Sustainability*, we evaluated how reliance on diesel-based backup generators during electricity outages affects air pollutant emissions, fossil fuel use, and consumer costs in Sub-Saharan African countries.

Air pollution is a silent killer in Sub-Saharan Africa. Recent estimates suggest that [poor air quality](#) leads to an additional 450,000 infant deaths in the region. While there are many sources of air pollutants that affect air quality, including biomass burning, vehicle emissions, and emissions from fossil-fueled power plants, diesel backup generators are also likely contributing to poor air quality in Sub-Saharan Africa. Using the limited data available about power outages and demand for electricity in sub-Saharan Africa, we developed a first-order estimate of the air emissions from these backup generators. We found

that reliance on backup diesel generators can lead to increased air emissions in all of the countries in our analysis. Our results suggest that, in some countries, air emissions resulting from reliance of backup generators can be even larger than annual emissions from centralized [power plants](#). We also found that use of backup diesel generators increases fossil fuel energy consumption by a factor of 1.5–1,000 compared with current grid levels throughout the region. In all the countries included in our analysis, electricity from backup generators is more expensive than the electricity from the grid, which costs customers relying on backup generators millions of U.S. dollars per year.

The impacts of increased pollution on human health and development depend on the background pollutant concentrations (how dirty is the air to begin with?) and the exposure (how dirty is the air where people live and work?). When detailed data about these factors become available, researchers can estimate the health impacts of the emissions we estimated from backup generators. However, our results suggest that emissions from [backup generators](#) can be significant and merit further attention from policymakers and stakeholders. Additionally, increasing electricity reliability becomes even more important as the local electricity grid gets cleaner. While providing a connection to electricity to those who do not currently have access is an important step towards meeting the Sustainable Development Goals, our work highlights that it is also important to ensure that those who already have a connection have reliable delivery of electricity. We hope future energy access development efforts and investments will also improve [electricity](#) reliability, which can improve sustainability and economic outcomes and help achieve the U.N. Sustainable Development Goals.

More information: DeVynne Farquharson et al. Sustainability implications of electricity outages in sub-Saharan Africa, *Nature Sustainability* (2018). [DOI: 10.1038/s41893-018-0151-8](https://doi.org/10.1038/s41893-018-0151-8)

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