

Tackling Energy Poverty

An estimated 1.1 billion people rely on low-quality fuels or lack access to basic services, demonstrating that energy poverty is a persistent problem. But energy poverty has many root causes. This Voices piece discusses the key barriers to providing universal access to secure, clean, and affordable energy and how these could be overcome.

Energy Poverty as a Sociotechnical Challenge



Benjamin Sovacool
University of Sussex

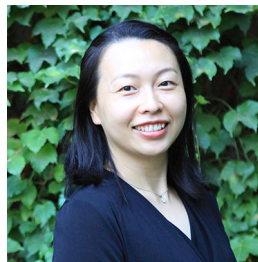
Energy poverty represents one of the grand challenges of this century, and it involves expanding modern energy access to literally hundreds of millions of households while also attempting to minimize greenhouse gas emissions and provide energy services that are affordable and just.

One reason that energy poverty persists as such an astounding problem—one that is linked to the deaths of about four million people per year from exposure to indoor air pollution—is that it cuts across the usual distinctions we have in research and policy about supply and demand, as well as society and technology. Addressing it means sound technical and physical science about changing sources of pollution—this is where physicists, fuel scientists, and engineers can design cooking devices or energy systems that are more efficient and less damaging.

But addressing energy poverty also means making changes to the living environment. This requires building specialists, architects, designers, and sociologists and anthropologists who understand household arrangements and dynamics. Lastly, it requires behavioral and usage changes that cut across food preparation, fuel collection and drying, gender practices, and reduced exposure to smoke. For that, we need the involvement of behavioral science and other social sciences.

Society's best chances of providing universal energy access and eliminating energy poverty depend on interdisciplinary, transdisciplinary, and sociotechnical approaches that harness these diverse approaches and ways of knowing together. More needs to be done to facilitate this type of research.

Reduce without Environmental Harm



Wenjia Cai
Tsinghua University

Access to energy is one of the basic human needs. So is the need for a clean environment. However, reducing energy poverty has strong interlinkages with addressing environmental grand challenges. For example, using fossil fuel subsidies to reduce energy poverty usually distorts the energy market and creates air pollution and contributes to climate change. Addressing the air and climate problems through coal phaseout and shifting to renewable energy sometimes increases the utility bill for low-income families and drives up energy poverty.

China has had some success in fulfilling these two needs together. The installation of solar panels on the rooftops of low-income families' houses has provided additional annual income and alleviated both income poverty and energy poverty. China has also withdrawn a dramatic amount of fossil fuel subsidies and used the money to switch energy sources for heating from coal to gas or electricity. Both of these measures have improved access to modern energy services and reduced environmental impacts at the same time.

I think these experiences should be more widely considered in other countries, but if we want to improve people's lives while protecting our planet, the clock is ticking. For the 1.1 billion people still in energy poverty, first using fossil fuels to supply energy and then replacing them with renewables is a detour that our planet cannot afford. We must act right now and leap toward a clean and sustainable energy system for all.

Beyond the North-South Binary



Stefan Bouzarovski
University of Manchester

We need to break down the simplistic binaries and stylized assumptions that surround energy poverty. This includes the idea that energy poverty in the Global South is distinctive from a related set of circumstances in the Global North, often termed "fuel poverty." Whereas the former is commonly understood as an issue of access to modern energy infrastructure, the latter is often connected to the poor energy efficiency of residential dwellings and the low affordability of energy. However, the consequences of domestic energy deprivation in any given setting are the same—energy services will fail to reach socially and physically necessitated levels, leading to detrimental impacts on human health and well-being in the first instance. Indeed, we find that infrastructural energy access is a common challenge in the Global North, whereas issues of energy affordability and efficiency are widespread in the Global South. It is thus more useful to focus on the context-sensitive pathways that lead to inadequate energy services.

Many practitioners and scientists in the field also find themselves having to challenge the idea that energy poverty is a subset of income poverty and can be resolved through social welfare interventions alone. There is a growing consensus that we are in fact talking about a distinctive form of material deprivation that is systemically embedded in numerous forms of injustice and, as such, necessitates addressing the interplay between energy-sector regulation, housing, and social policies, as well as the political recognition of vulnerable groups. One-dimensional approaches will not work.



Innovation Begins at Home

Vijay Modi
Columbia University

Populations in many countries of Sub-Saharan Africa find themselves unable to affordably utilize the benefits of electricity and clean cooking. This is especially true in rural areas. But if we are to bring electricity to these communities, we must learn what the barriers are and engage with them to help implement the solutions that work for their needs.

My own work in Sub-Saharan Africa taught me that ideas developed through listening, iterating, and improvising with local communities and institutions stuck. Through such dialog we learned that even the poorest were credit worthy if payment systems could adapt to charging only for use, allowing for variability in consumption, eliminating fixed fees, and keeping upfront costs to a minimum. Local, lean, and transparent zero-transaction cost payments are also important. Robust automation could achieve this at low operations and maintenance. Modular (not bespoke) and incremental (build-as-you-grow) infrastructure would keep upfront capital expenditure low. The community came up with ideas to achieve this: helping to dig trenches, using locally available polyvinyl chloride pipe to snake wire, slashing distribution-wire costs, and creating co-operatives to bank funds for maintenance and emphasizing transparent accounting systems.

It is important to work alongside communities. Doing so can lead to innovations that meet their needs, such as micro-grids with time-of-day pricing, lean demand-side management, prepaid metering, and on-bill appliance financing. In my work, this was done at less than \$1/month for these features. Utility grids are also learning from these home-grown lessons.

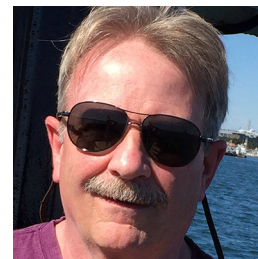
More Money and Better Policies

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Energy is increasingly recognized as a crucial driver for achieving a range of development goals. It helps improve the delivery of vital services such as health and education, yet there is a long way to go to achieve energy access for all.

In addition to the huge numbers of people who have no access to electricity, nearly three billion lack clean and safe cooking facilities. Most live in remote areas where off-grid technologies can play a crucial role in helping women, children, and men move out of poverty. But, as our research shows, more money and better policies are key to making this possible, and energy systems need to be tailored to local contexts and people's needs.

Even though some accessible, clean, and green off-grid technologies (such as mini-grids) are being used across Africa and Asia, they need more long-term and flexible investment so they can develop and expand. More public money needs to be channeled more effectively in order to help attract and increase private finance. Subsidies and technical assistance are critical for companies in developing countries to expand their services to people who live in poorer, more distant areas and cannot be reached otherwise. Quality-control mechanisms are also essential for gaining people's confidence and developing stronger markets, so investments give returns to investors and, most importantly, to the people.

Out of Sight, Out of Mind

Loren Lutzenhiser
Portland State University

US energy costs have always contributed to poverty, and for the poor, every month's utility bill can be a source of household crisis. Low-income "energy assistance" (bill subsidy) and home weatherization programs have existed since the 1970s, but they have never been funded to serve more than a small fraction of the eligible population. So, energy poverty is endemic but largely invisible in the US.

People move in and out of poverty with age and other life circumstances, but there is also a large multi-generational population locked into poverty—one that is always facing unaffordable energy costs and presenting a persistent problem for governments and energy companies.

Much of my research has focused on California, where aggressive new climate-change goals (e.g., decarbonization) mean the transition to an energy system with vast new amounts of decentralized renewable (solar and wind) supply, as well as a very flexible demand side that can rapidly shift the usage and storage of energy.

This "highly dynamic" future can work for the young, affluent, and well connected. Sub-grid networks, apps, and micro-markets are exciting for some, but in California, 25% of the population lives in officially designated environmentally disadvantaged communities (based on poverty, toxic exposure, and health risks). In those areas, "smart house connectivity," "distributed grid communications," and adaptive protocols for charging electric vehicles could just as well be ideas from another planet. Back in the real world, emerging plans to implement that future with "dynamic prices" and "policy nudges" could very well create new burdens for the poor.

Renewable Energy and Poverty



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Institute for Advanced Sustainability Studies

The good news is that renewable energy sources—those that would be needed to ensure the provision of clean energy services—have become very cheap over the past decade or so. Photovoltaic costs have fallen by 80%, for instance. Underpinned with decentralized, community-level networks, universal access could become a reality even in areas that have long remained “off grid.”

The bad news is that despite falling costs, many energy-poor households still don't profit from advances in renewable energy technology. A main problem here is the lack of demand pull, particularly in least developed countries (LDCs), where the low-income environment prevents attractive business cases. A case in point is Africa: the continent with some of the strongest population growth and hence future incremental energy demand has the lowest per-capita investment in energy supply by global comparison.

This not only risks perpetuating energy poverty but also bears the risk of an uneven energy transition. A way forward would be to rethink low-carbon technology transfer and how it can complement market forces in making the most of renewable technology for the energy poor. Much will depend on the design of tech transfer initiatives: do they predominantly focus on diffusing the “hardware” (e.g., getting solar panels to LDCs), or do they also transfer skills? If the latter is the case, it allows building up local capacity and economic added value, thus not only ensuring energy access but also fighting poverty.

Bridging the Affordability Gap



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Global Distributors Collective, Practical Action

Affordability continues to be a fundamental barrier to universal energy access. The upfront costs of energy solutions are still prohibitive even though people who are energy poor often pay a high price for their energy sources, such as kerosene, diesel, and candles.

In the electricity sector, off-grid systems (mini-grids and standalone systems) represent the least-cost and fastest solution for the majority of unconnected people, but in most countries, subsidies are overwhelmingly targeted toward fossil fuels and grid extension. Off-grid solutions are expected to be delivered by the market alone, and there is no incentive for private companies to serve the poorest and most remote populations.

Affordability is also a challenge in the cooking space. Improved biomass stoves—the focus of most clean cooking programs—are still too costly for the poorest consumers, as are cooking fuels such as biogas and bioethanol. Women play a particularly important role in the widespread adoption of clean cooking solutions, and this exacerbates the affordability challenge because women are on average poorer and less able to access finance.

The costs of renewable energy technologies are coming down, and innovative financing models such as “pay as you go” are enabling consumers to pay for their energy use in installments. However, the affordability gap remains significant. What's needed is more and smarter public financing to subsidize energy access and facilitate consumer financing without distorting the market. Without this, energy access will remain out of reach for those at the last mile.

Energy Poverty in Developing Economies



Kamil Kaygusuz
Karadeniz Technical University

Energy poverty, “an inability to access modern energy facilities,” is an issue particularly affecting those in developing economies. Rising energy costs and falling household incomes are contributing factors such that ~40% of the population in such countries is unable to adequately heat or cool their homes, and many rely on highly polluting sources. A lack of access to reliable, clean energy adversely affects welfare through both low energy consumption and pollutive fuel consumption—tackling the issue requires transforming our energy systems.

Increasing energy efficiency through massive renovation efforts across poor countries and switching to citizen and community-owned renewable energy production have a key part to play. Global energy policies must ensure that people, particularly in low-income households, can be part of and benefit from the transition to renewable energy without being left to foot the bill. In achieving affordable clean energy for all, equality is paramount.

Energy poverty is not an isolated issue. Ensuring that those who need it have access to affordable and energy-efficient homes, increasing social assistance rates, and providing a living wage to the working poor can all contribute to the elimination of energy poverty. In the absence of such initiatives, the research proposes four possible ways to move vulnerable households out of energy poverty: (1) increase income, (2) regulate energy pricing, (3) reduce home energy usage with energy efficiency, and (4) use domestic renewable energy sources such as biomass, small hydropower, and solar energy.