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RESEARCH AGENDA ON ELECTRICITY ACCESS AND PRODUCTIVE USE

Marc Jeuland, James Morrissey, and Jonathan Phillips

Developed in conjunction with over 60 attendees at the Electrification & Development Convening on 21 February 2019 in Washington, DC, with special insight from Dr. Robyn Meeks, Dr. T. Rob Fetter, Dr. Catherine Wolfram, Dr. Arif Mamun, and Dr. Duncan Chaplin.

On February 21, 2019, Duke University's Energy Access Project and Oxfam cohosted a meeting of approximately 60 energy practitioners and researchers to discuss the role of electricity access in spurring productive use. A motivation for this convening was a paper, produced by Oxfam,[1] which had been confounded by the mixed findings on the impact of electrification on productive use. This note provides a summary of the research agenda that emerged from these interactions. But first, what do we mean by productive use, why hold a meeting with this specific focus, and whose perspectives were represented?

What is productive use?

A broad definition of productive use was discussed, encompassing consumption of any energy services that could increase net income. This definition accommodates enhanced generation of net revenue from existing and/or new activities that can use electricity as an input (e.g., establishment of new energy-dependent businesses or net income benefits from reallocation of time savings); increased savings (e.g., a decrease in energy-related coping costs or other losses); and higher quality of human capital that later translates into greater net income (e.g., via education or health channels, or enhanced labor productivity).

What is the state of knowledge on this subject?

Four research experts (Taryn Dinkelman – Notre Dame; Robyn Meeks – Duke University; James Morrissey – Oxfam; and Catherine Wolfram – UC Berkeley) presented their interpretation of the state of knowledge concerning the role of energy access in delivering productive use. Overall, these experts were generally in agreement about the mixed findings of this literature. Their comments further highlighted that productive use impacts appear to vary with targeting and business models, the reliability of electricity; the availability of complementary services, and features of the local economic context. Unfortunately, there is very little

WHY FOCUS ON PRODUCTIVE USE?

It should be noted from the outset that though we acknowledge the importance of energy for delivering improvements in general well-being, this convening focused on tracking productive use in the context of investment in energy access, which is valuable for at least three reasons:

(1) Delivering electricity is expensive; income generation is therefore vital to enhancing affordability, cost recovery, financing, and scaling up.

(2) Governments and donors are typically co-investors in such interventions, with the explicit goal of spurring economic development and higher incomes.

(3) Even when large capital infusions are justified for other reasons, sustainability requires maintenance and upgrading of energy systems over time, and thus continued investment.

comparative or synthetic work that explores these aspects systematically, which provides the basis for articulating the following research agenda. The sentiments of the four experts were largely confirmed by a number of other leading researchers who were at the event.

Is practice-oriented research on this question needed?

Practitioners also weighed in on their interpretation of the evidence during a round table discussion of the research evidence. Seeding this conversation were: Allison Archambault – Earthspark International; Jake Cusack – CrossBoundary; Caroline McGregor – SEForAll; and Kate Steel – Nithio.

Clear from this discussion was that delivering energy access in the low-income settings where it is most needed remains extremely difficult, reflecting the general development challenge confronting such locations (which are rural, disconnected, and lacking in many necessary infrastructures). Implementers have little ability to support research given that their own margins and human resources are stretched so thin. But research is clearly needed to help guide the design and targeting of enhanced interventions.

Can we sketch out a practice-oriented research agenda on electricity and productive use?

Round table and small group discussions produced a list of research questions that appear worthy of attention.

(1) It seems clear that delivering electricity access alone is insufficient for delivering productive use benefits—quality of electricity supply, complementary services, and supportive contexts matter. As such, 1) which complementary services are most effective for realizing productive use? and 2) what contextual factors matter most, and can an understanding of these be used to target interventions to locations and/or sectors most likely to see success?

This question has to do with the locations or contexts that should be targeted if productive use is to be expected, e.g., locations with markets, roads, banks/microcredit facilities, communications infrastructure, or where general economic opportunities exist. Alternatively, should energy access be bundled with other investments, and how? It also relates to donors and funders desire to better understand the role of energy —and the degree to which service quality attributes such as reliability or capacity matter—as an input to firms' production processes.

(2) Can demand forecasting be improved to the point that targeting can be effectively implemented—at both the settlement and household level?

This question speaks to the fact that issues of demand and demand growth lie at the heart of sustainability challenges. It effectively asks whether recent methodological and/or data advancements create scope for improving prior efforts at demand forecasting. The question is central to ensuring that electrification technologies are properly targeted, suitably designed (i.e., to appropriate capacity), and coupled with necessary wraparound services to support productive uses, avoiding unnecessary costs associated with over-design. The relationship between capacity and reliability and productive use must be better characterized to consider the extent to which these energy system attributes aid or harm productive use potential, and to inform decisions about grid vs. distributed generation strategies.

(3) What scope is there for subsidies to address issues of limited demand, or costs that exceed willingness-to-pay?

Subsidies can increase demand by reducing the price of electricity and can help secure markets by decreasing private investors' risks. Yet use of subsidies also raises important questions about governance and institutional design to avoid unintended consequences and detrimental long-term impacts. For example, some institutional arrangements may raise risks of poor infrastructure quality and sustainability. Importantly, understanding if and how subsidies can be designed to work better is lacking.

(4) How can energy access interventions be designed to facilitate productive use? In other words, are some specific pricing and technology packages more effective than others, and if so, why?

This question pertains to the other long-standing issue surrounding energy access and sustainability: pricing. The effects of tariffs on capital accumulation should be tested and innovated upon, for example, via packaging with appliances or complementary business development services. Opportunities to do this in the context of SHS and mini-grids are tremendous, given current promoters' semi-systematic tinkering and learning-by-doing deployment strategies. Learning requires more systematic testing.

(5) What is the appropriate time horizon over which productive use benefits become manifest, and more importantly, what are the implications of this lagged response for sustainability?

Evidence suggests that productive use benefits do not occur immediately. In the long run, there is a high degree of correlation between energy consumption and income, but little of this evidence is causal. This has important implications for how governments and donors should intervene to support new investments, given short- and medium-term threats to cost recovery and maintenance. The complex transition dynamics of energy access interventions are poorly understood.

(6) What are the distributional implications (or unintended consequences) of energy access strategies that aim to prioritize productive use, through specific targeting or design strategies?

This question raises the thorny issue of how historic problems of regressivity can or should be avoided in the context of energy access. Realizing productive uses likely requires 1) additional investments in wraparound services, 2) targeting better off areas and individuals, and 3) provision of subsidies to those better off segments of society over longer periods. There is some evidence of electricity access driving welfare improvements among the poorest, however, these have proven hard to sustain and scale given their limited impacts on income and price. There is thus a need to understand the impacts of electrification on the welfare of the poorest and most marginal groups relative to those of other potential investments that might be easier to sustain.

An additional dimension of this question is that different practitioners and donors may have different energy access philosophies—differential emphasis on economic development versus social welfare, for example. What are the potential risks of these organizations working at cross purposes?

(7) How should energy access work aim to engage with or alter existing institutional structures and incentives in delivering energy for productive uses?

Given the noncompetitive nature of the sector and the continued need for subsidies, governments have an essential role in the success of energy access interventions. Specific country cases focus on the enabling environment of laws and regulations, tariffs, etc., and their effects on utility and nonutility actors, but systematic comparative work is needed to inform attempts at institutional reform. Should practitioners work within existing frameworks or attempt to influence and reform them? Does the answer to this question depend on the extent to which those frameworks deviate from best practices?

COORDINATION AND FUNDING IS NEEDED TO MOVE THIS AGENDA FORWARD

A key theme to emerge in the discussion was the need for researchers and practitioners to move forward in close coordination in identifying and executing targeted interventions that test models for supporting productive use. While businesses and other implementers have a genuine appetite to partner with researchers in testing approaches for spurring productive use and to share those findings, resources are a critical constraint. With businesses in the sector frequently operating on the knife's edge of profitability, funding from development partners will be critical to supporting the researcher-practitioner collaborations that can deepen understanding of linkages between energy access, productive use, and income generation.

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[1] Morrissey, James, "Linking Electrification and Productive Use," Oxfam Research Backgrounder series (2018). https://www.oxfamamerica.org/explore/research-publications/linking-electrification-and-productive-use/.

Author Affiliations

Marc Jeuland
Faculty Director, Energy Access Project
Duke University

James Morrissey
Senior Researcher, Energy, Climate and Poverty
Oxfam America

Jonathan Phillips
Director, Energy Access Project
Duke University

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