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Energy access, energy for all, energy consumption, climate change mitigation, climate resilience

## Policy pointers

**To advance productive use(s) of energy (PUE),** cross-sectoral barriers need to be addressed by first understanding the socio-cultural and economic contexts and building on existing social and market structures.

**Governments and energy developers** should build PUE into energy projects and delivery business models from the outset, and include explicit plans to ensure that the poorest and most vulnerable people will benefit.

**To build demand, PUE interventions** must be driven by the needs and desires of communities and the businesses they can run.

**Financiers should leverage their COVID-19 recovery funds** to synergise economic development with PUE.

## Productive uses of energy for resilient livelihoods in LDCs

Productive use(s) of energy (PUE), especially when powered by renewables, can support more sustainable and resilient livelihoods in Least Developed Countries, by bringing immediate opportunities to community services and value chains in rural areas. But simply providing energy systems does not necessarily drive demand or development. Holistic thinking and integrated approaches are needed to unlock this potential. This means providing support such as financing, skills development, business inputs and market linkages; exploiting near-term opportunities in well-established value chains; and dismantling longer-term structural issues that prevent equitable uptake of PUE in rural areas. The COVID-19 pandemic offers an imperative and an opportunity to promote PUE, given the influx of financing to help small businesses — key energy users — stay afloat and build their resilience to future shocks.

Energy is a critical enabler for development. Achieving Sustainable Development Goal (SDG) 7 — universal energy access — is essential to achieving most other SDGs. But around the globe, 759 million people have no access to electricity.<sup>1</sup> This is an enormous barrier to enabling households and small businesses to thrive in remote and poorer communities, where access to energy and other services is lowest. Many rural electrification projects have found that focusing on meeting household and community lighting needs is not enough. The commercial return on investment tends to be very low, given minimal overall demand for power from residential customers. PUE — which focus on electricity for income generation and the direct production or provision of goods and services — can stimulate some demand (making energy infrastructure investments more viable) and develop greener, more resilient livelihoods.

Highlighting examples from Bangladesh, Ethiopia, Malawi and Uganda, this briefing explores how

PUE can be employed in diverse contexts within the Least Developed Countries (LDC) Group.

### PUE in diverse contexts

**Capturing agro-processing value within rural economies.** In Ethiopia and Uganda, as in most LDCs, agriculture is the backbone of rural communities and represents a huge opportunity for local and national economies in terms of revenue and jobs (see Table 1). Rural communities capture only a small proportion of this value; most of the profits generated are retained by urban businesses and don't reach smallholders.<sup>2</sup> A 2020 assessment of six agricultural value chains in Ethiopia (irrigation for horticulture, grain milling, injera baking, bread baking, milk cooling and coffee washing) suggests that electrification linked to productive activities could deliver US\$4 billion in annual economic value by 2025.<sup>2</sup> PUE can enable more of this value to be captured within rural communities themselves — supporting irrigation, which improves crop yields, replacing expensive fossil fuel generators, which saves money, and

## Promoting productive use of energy means investing in energy access while also supporting people and communities

increasing secondary processing in rural areas.<sup>2</sup> Cold chain offers particular opportunities for PUE to support rural livelihoods: the Uganda Off-Grid

Energy Market Accelerator found that refrigerating milk could reduce spoilage for farmers, although the viability of different-sized refrigeration units depends on yields and aggregation.<sup>3</sup>

### Delivering cleaner, more reliable services to rural

**communities in Malawi.** Mulanje is a rural district in Malawi, where many everyday community services are provided manually or — if available — with support from polluting fossil fuel generators. Since 2016, social enterprise Mulanje Energy Generation Agency (MEGA) has been supplying communities with affordable and more reliable<sup>4</sup> electricity through a micro-hydro-powered mini-grid. The mini-grid supports maize mills, carpentry, welding and workshops, and a bakery. It allows these businesses to provide more consistent services while also lowering their operating costs — which can improve affordability for communities and strengthen livelihoods.<sup>5,6</sup> In Mulanje, mini-grids can be an economically viable means of providing electricity for productive uses thanks to its high population density. Meanwhile revenue from electricity sales contributes to the cost of operation and maintenance.

### Strengthening resilience to climate shocks and stresses.

For more remote, less well populated areas, the cost of mini-grid infrastructure can be prohibitive. In these communities, equipment that uses solar to operate independently of larger energy infrastructure offers more viable solutions. Standalone solar irrigation is gaining particular traction as a productive use of electricity,<sup>7</sup> and is both a climate mitigation solution (as it replaces diesel pumps) and a resilience strategy for areas experiencing water scarcity as a result of the climate crisis. Smallholder farmers across the four countries discussed are acutely vulnerable to climate change impacts and many are already experiencing droughts and extended dry seasons. Research finds that solar irrigation in Bangladesh is not only reliable but also more affordable than fossil fuel irrigation and results in higher yields during the dry season.<sup>8</sup>

## Barriers to PUE

PUE has the potential to advance rural livelihoods and economic development. But simply installing energy systems where there are gaps rarely stimulates demand for energy or local development.<sup>9</sup> End-users in rural communities face multiple barriers to using energy for productive activities. These barriers vary by context but there are similarities across the four contexts and the LDC Group, with additional barriers facing women.<sup>10</sup>

Rural and remote communities tend to have less well-developed infrastructure, public services and economic connections (see Table 1 for statistics). Without the necessary appliances and equipment, technical skills and after-sales support, financing, business inputs and market links, businesses and communities will struggle to successfully leverage the efficiency, savings and wider opportunities offered by electricity access, and countries will miss out on the potential of PUE to enhance livelihoods and development.

Affordability is also key to who will benefit and how. The cost of electrical appliances and equipment is a significant barrier for many rural businesses and smallholder farmers, and a lack of economic connections and services also means more limited access to financing. Moreover, many rural entrepreneurs are averse to debt. Debt financing is only likely to be a viable solution for entrepreneurs with existing assets and resources, unless coupled with concessional financing or as grants.

## Strategies to support PUE

**Bridging the affordability gap.** Uganda and Bangladesh have subsidy programmes to help smallholder farmers purchase solar water pumps. In Uganda, the Micro-scale Irrigation Program offers farmers a 25% subsidy for petrol pumps and a 75% subsidy for solar pumps, with financing available to cover the non-subsidised portion. The programme bulk procures the pumps from pre-qualified suppliers, which generates savings and helps to ensure equipment quality. As at March 2021, 16,000 farmers have expressed interest in the programme, a fifth of whom are women.<sup>11</sup> In Bangladesh, the government-owned Infrastructure Development Company Limited (IDCOL) works with private companies to build and operate solar irrigation pumps. The company

Table 1. Key country stats, by population size

Country	Population (millions)	People without electricity access			Agriculture, forestry and fishing, value added (% of GDP)	Agriculture (% of total jobs)
		Total (%)	Urban (%)	Rural (%)		
Bangladesh	163	8	2	11	13	38
Ethiopia	112	52	7	64	34	67
Uganda	44	59	29	68	23	72
Malawi	19	89	55	96	23	76

contributes 15% of the total cost, with IDCOL offering 50% on grant and 35% through a concessionary loan. Farmers pay the company in instalments for pumped water.<sup>12</sup> In Malawi, the MEGA's mini-grid business and financing model aims to keep electricity tariffs affordable.<sup>13</sup>

### **Building awareness, confidence and skills.**

Examples from Malawi, Bangladesh and Uganda all highlight the importance of providing farmers and businesses with additional support to help them better take advantage of electrification. IDCOL worked with agriculturists to support farmers to learn and apply good agricultural practices to enable higher yields. Many rural entrepreneurs are eager to learn and their efforts are key to enabling rural livelihoods. Community Energy Malawi raised awareness of their mini-grid project in Sitolo Village among the community and offered skills development for entrepreneurs, who were then better able to take advantage of the mini-grid's electricity and had more confidence to invest in their businesses — for example, by buying appliances.<sup>5,6</sup> Some evidence suggests that psychological approaches that enhance personal initiative (rather than traditional business skills) show better results and that ongoing mentorship or guidance is important.<sup>14,15</sup> Finally, Futurepump (a solar irrigation company working in Uganda, Ethiopia and Malawi) recently announced an industry-leading ten-year warranty on its systems. This can help de-risk farmer investments and offers long-term support, which may lead to greater uptake of systems — and benefits.<sup>16</sup>

### **Taking a deliberate and integrated approach.**

In Uganda, the Utilities 2.0 project and the government's Promotion of Mini-Grids for Rural Electrification (Pro Mini-Grids) project both incorporate productive use within the mini-grid business models, ensuring revenues cover operating costs. Support activities can include trainings for entrepreneurial skills, appliance financing and sensitising communities on the benefits of electricity. Indeed, as part of the Pro Mini-Grids programme, mini-grid developers must submit a productive use strategy.<sup>17</sup> These ongoing programmes could offer lessons for energy access efforts across Uganda and elsewhere. The Ethiopian government's National Electrification Program (NEP) 2.0 lays out a plan to target and electrify geographic clusters that have the "highest potential for the production of commodities for which Ethiopia has a comparative advantage."<sup>18</sup> By concentrating a package of PUE support on existing successful value chains, the strategy could help to rapidly expand productive uses.

### **Incentivising public and private cooperation.**

Expanding energy access for productive use

requires activities and expertise beyond energy system design and installation. This will require ongoing collaboration between public and private stakeholders, including ministries of agriculture, energy and trade. Governments will play a key role in supporting these PUE activities. For example, the Ethiopian government's NEP 2.0 plan is considering lifting tariffs on some specific productive use appliances.<sup>18</sup> This could reduce PUE costs but further effort or incentives may be needed to push distribution chains deeper into rural areas. Targets set by the government — like IDCOL's target of 10,000 solar water pumps by 2027 — can also encourage private investment by setting market expectations and demonstrating government support.<sup>19</sup>

## **Recommendations**

PUE is not a panacea but, where coupled with efforts to enable economies, it can further universal energy access and sustainable development. It will be vital to monitor efforts to promote PUE — in particular who's benefiting — and to anticipate potential unintended negative impacts, for example, on ecosystems as a result of excessive water pumping<sup>12</sup> and COVID-19 (see Box 1).

### **To advance PUE, cross-sectoral barriers need to be addressed by first understanding the socio-cultural and economic contexts and building on existing social and market structures.**

PUE means investing in technologies, but alongside this, supporting people to leverage the income and productivity benefits that technology can offer. It is therefore critical to develop holistic approaches that address the social, cultural and economic factors preventing or enabling uptake of technological solutions in each context, such as gender dynamics and trust. Building on existing delivery infrastructure, such as well-functioning micro-finance institutes, builds long-term partnerships to support sustainable economic development. Governments are already considering more supportive subsidies and policies, balancing cost and universal access. But many of these cross-cutting barriers are deeply entrenched; overcoming them will depend on sustained engagement across stakeholders.

### **Governments and energy developers should build PUE into energy projects and delivery business models from the outset and include**

#### **Box 1. COVID-19 and rural livelihoods**

As with most shocks, the poorest and most vulnerable people have been worst affected by COVID-19. In Bangladesh, Ethiopia, Malawi, Uganda and elsewhere, business revenues and household incomes have fallen. Micro-, small- and medium-sized enterprises have been most affected and less able to pay for business goods and services, including energy. Effects on agriculture have been uneven, with export-linked crops hit the hardest.

**explicit plans to ensure that the poorest and most vulnerable people will benefit.** Enabling productive use activities from the start will support broader uptake, while making energy system investments more sustainable. Plans to reach and benefit the poorest and most vulnerable people should be explicit. Working through existing systems and structures could be one way to deliver PUE activities and more targeted support for poorer communities. For example, although not specific to PUE, Malawi has had great success in delivering solar lights and cookstoves through its Social Cash Transfer Programme. Governments must continue looking at policies and regulations that can better support energy systems and productive use. Ethiopia's NEP 2.0 is a good example of integrating grid and off-grid planning, while considering PUE within the plan itself.

**To build demand, PUE interventions must be driven by the needs and desires of communities and the businesses they can run.** To advance productive use, it's important that energy delivery projects are useful. Public and private efforts to encourage PUE should engage communities and stakeholders to understand the social, cultural and environmental context and develop approaches that respond to their wants and needs. One tool that can be used to guide this process is the Energy Delivery Models approach, which IIED is using in Kitui County, Kenya. The approach enables diverse stakeholders to work together to understand end-users' energy needs, to design delivery infrastructure and to account for revenues and costs.<sup>20</sup>

**Governments and energy developers should maximise initial opportunities for PUE within existing value chains and services.**

Governments and energy developers can realise

near-term benefits from electrification by identifying opportunities to build on established, well-functioning and well-connected value chains. This could include replacing existing generators or by electrifying specific parts of the value chain where greater value can be captured within communities. For example, the Rocky Mountain Institute found immediate applications for electrification within Ethiopia's maize and wheat milling, which could halve energy costs and double profits.<sup>21</sup> MEGA in Malawi supported entrepreneurs who were already operating and had existing customer bases, so they could benefit straight away.

**Financiers should leverage their COVID-19 recovery funds to synergise economic development with PUE.** Governments, multilateral banks and others are providing financing and funds to micro-, small- and medium-sized enterprises to shore up jobs as the pandemic continues.<sup>22</sup> And, beyond the shorter term, efforts are also underway to 'build back better' from COVID-19 to improve resilience to future shocks. Micro-, small- and medium-sized enterprises are key productive users of energy, which in turn offers the potential for more sustainable and resilient livelihoods. This moment presents an opportunity to step up support to PUE through already committed grants, concessionary financing, subsidies and more, especially in rural areas, and to support a greener recovery. Targeted funds will be particularly important to ensure that poorer and more marginalised groups, including women, can overcome barriers to PUE and better benefit.

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