Energy for all

Better use of subsidies to achieve impact

DISCUSSION PAPER

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Cover photo: Small PV panel provides Hari Chandran and his family with the energy they need to run two LED cluster bulbs and a mobile phone charger.
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Financing the energy access gap

Significant progress has been made in improving access to electricity, but 789 million people worldwide still go without. The gap for cleaner cooking is even greater: 2.8 billion people worldwide cannot cook cleanly and safely.[2] The reliability of energy delivery is also still a massive challenge.

Weak policy and regulatory frameworks are some of the contributing factors to energy access deficits, but the funding gap is enormous: only a quarter of the US$51 billion investment required for universal rural electrification, and only 0.73% of the US$4.4 billion required for scaling up cleaner cooking solutions was met (in 2017).[4]

The energy finance scenario is complex and varies widely from country to country — from costly investment for extending the grid to inefficient and loss-making electricity utilities and mini-grid developers relying on grants. Indeed, decentralised renewable energy (DRE) solutions often offer a cheaper way to extend energy services, complementing grid extension efforts. But meeting the diverse needs of DRE systems requires finance flows from public and commercial actors and better approaches to propel and guide markets, with policy and regulatory instruments that can adapt as markets evolve.

Establishing cleaner cooking-solution supply chains can be a major undertaking requiring extensive distribution channels of liquid fuels or electricity systems, major investment and enforceable safety regulations. The end-user cost of improved stoves has also been a major constraint.

Surrounding these finance challenges and opportunities are radically different enabling environments — policies, regulations and supporting institutional structures — that vary widely by country, subsector and technology.

Despite a shift in discourse from subsidies to enabling new markets, subsidies are still a critical financing instrument for many countries in light of the urgent need to electrify and boost access to cleaner cooking solutions for the poorest and most remote communities. Indeed, subsidies have enabled rural electrification in many countries, and most utilities feeding urban citizens are buoyed by subsidies.

While both cleaner cooking and electricity access remain unaffordable for the poorest families attaining SDG 7 remains a distant vision. A mix of both demand-side and supply-side subsidies will be needed to achieve energy access for all by 2030, and there will need to be an increased focus on targeting these at decentralised renewable electricity services and cleaner cooking, especially for rural areas.

Unpacking subsidies

Subsidies can take many shapes and forms and are used across diverse contexts. They remain a critical financing instrument for many countries, as they work towards universal electrification and expanding access to cleaner cookstoves for the poorest and most remote communities.

Governments grant demand-side subsidies to make energy products and services more affordable to low-income households. They provide supply-side subsidies to reduce the service providers' costs to reach the most remote communities, and often to jumpstart markets that may not grow organically. But there are many challenges in delivering subsidies — including how they achieve targeted impacts and avoid market distortion — and few examples in the energy sector of how they have adapted over time to shifting markets, enabling policies and other factors.

Donor subsidies in the form of grants for companies developing ideas and market activation activities have been crucial to establishing **'commercial markets'** for DRE — markets where end-users desire and can afford products and companies can deliver them. Reaching unserved populations must involve different approaches: in **'remote potential markets'** where end-users can pay but live remotely, supply-side subsidies are needed to extend products and services; in **'non-remote potential markets'** where people can't afford the energy service but are within product and service distribution areas, they can be targeted with demand-side subsidies; and in **'non-commercial markets'** where end-users cannot afford and cannot be reached because of high costs, demand-side subsidies are required to close the affordability gap, and supply-side subsidies to encourage energy companies to operate there.

These market types are not neatly separated — non-commercial markets of remote poor people can exist in the same communities as remote potential markets, and urban informal settlements — locations of non-remote potential markets — can be mixed together with commercial markets. In short, they are organic, overlapping, and constantly shifting and evolving.

Subsidies are not a silver bullet; they cannot expand commercial markets into non-commercial areas on their own. A mix of financing, along with market activation activities, and supportive policies and regulations are needed to kickstart commercial finance and scale up DRE fast. This means aligning energy access approaches with banks' strategic interests. For example, Equity Bank in Kenya introduced group lending facilities for DREs, tapping into the bank's aim to expand its customer base. Even in countries where demand-side subsidies are widespread, such as Nepal and Bangladesh, commercial financing can help ween energy companies off subsidies, and thus direct public money towards those who cannot afford energy access.

Financing DRE with subsidies

Although subsidies are often considered a public finance burden, many low-income and marginalised populations cannot be reached without them. This paper offers case studies and learning from demand-side and supply-side subsidy programmes in different contexts. Expanding DRE is critical if universal energy access is to be achieved, and the lion's share of investment and subsidies in high-impact developing countries — those with the biggest universal energy target gaps — have focused on large-scale grid infrastructure.

Demand-side subsidies: lessons from Nepal

The government of Nepal has used subsidies for decades, not only to increase access to energy for the poorest and most remote communities, but also to stimulate private sector investment for DRE.

Since the early 1970s the government has provided subsidies for installing renewable energy technologies (RETs). A series of subsidy policies for renewable energy in 2009, 2013 and 2016 aimed to increase RETs for the most remote and marginalised communities. The 2016 policy tried to leverage credit and commercial investments through subsidies but did not succeed.

Regardless, these subsidies have enabled the Nepalese DRE market to grow and made significant progress in extending energy access. But many companies operating in the sector continue to rely on subsidies to operate. Meanwhile, the government continues allocating subsidies for DRE, aiming for complete electrification by 2023/24. The case study highlights key lessons from their subsidy delivery model and policy interventions. It demonstrates that demand-side subsidies are a critical part of the equation to achieve universal energy access but need better targeting by understanding the needs and challenges of the most marginalised groups. One subsidy programme intending to reach such groups through geographic targeting did not improve take up among target households and indeed higher-income households benefited more from subsidy schemes.

Looking ahead, the government needs a long-term strategy for the energy sector, aligned with both on-grid and off-grid plans. A mix of supply-side and demand-side subsidies are needed to reach targets but to maximise their benefits they should be used in combination with other instruments such as access to affordable credit for more affluent households. Nepal's clean cooking sector is especially in need of better planning and financing.

Supply-side subsidies: lessons from results-based finance

Results-based finance (RBF) — a supply-side subsidy from governments and donors to service providers once they achieve pre-defined results — has gained popularity as a subsidy instrument in Africa over the last five years.

RBF has been used by donors and governments to increase energy access by shifting most of the working capital burden and delivery risk to energy product and service providers. The paper shares learning from Energising Development (EnDev) programmes that have used RBF across several contexts to extend supply chains, improve standards, and build markets.

EnDev's recent conclusions[51] provide clues to the future of RBF: it is an important financial tool to activate new markets but alone is not sufficient to establish long-term market viability. To unlock RBF payments, companies tend to invest in operational expenditures rather than capital investments, which stimulates short-term growth but does not necessarily

nurture the necessary longer-term investments. So a combination of RBF and commercial financing is needed to enact longer-term market growth.

Recommendations

This discussion paper aims to contribute to the subsidy debate by highlighting the critical components required to achieve energy for all. It offers guidance on four key areas of policy and action:

Adjusting and targeting subsidies for affordability

- **Donors and governments must harness demand-side subsidies to reach the poorest and most marginalised households.** A huge affordability gap for millions of people remains, and if we have any chance of reaching Sustainable Development Goal 7 (SDG 7) — universal access to energy by 2030, subsidies for DREs must fill this gap by better targeting households in need.
- **Define demand-side subsidies with a better contextual understanding of local needs and factors that influence uptake of DREs.** This should include comprehension of public finance availability.
- **Address data gaps with more systematic engagement at the local level.** Better data is needed to focus limited public finance at lower administrative levels to reach the poorest and most remote households.

Enhancing end-user access to credit financing

- **Provide higher-income households who do not need subsidies with other affordable financing options such as end-user credit.**
- **Leverage partnerships to push commercial finance for energy solutions further** such as strategic partnerships between energy companies and banks.

Risk identification and management

- **Identify and manage risks in subsidy models, such as** inefficiency, lack of sustainability, low end-user awareness, and limited local company capacity.

Unlocking commercial finance for energy company growth

- **Ensure subsidy programmes are packaged with affordable commercial finance,** for example using project or programme funding to link subsidies with commercial finance.

Future direction

Subsidies have been used to extend the grid to achieve universal electrification across the globe. And DRE offers a new paradigm to reach more people faster. Despite advancements in DRE driving down the cost of rural electrification, a huge affordability gap remains. Many markets still need government and donor support to grow more rapidly, supporting companies to extend supply.

Critical questions remain unanswered: how subsidies can successfully adapt to evolving socio-economic and political conditions or how 'exit strategies' can be designed to remove subsidies if they become ineffective.

With the need for a COVID-19 recovery and with SDG 7's 2030 deadline closing in there is even greater urgency. There is much to learn from the wealth of experience of using subsidies in South Asia and Africa — these and other lessons must be built on to ramp up efforts to reach universal energy access. IIED will continue to work with in-country partners of the Green and Inclusive Energy programme (GIE) and other stakeholders to explore how subsidies can be successfully targeted and managed through exit strategies to ensure that the typical concerns of market distortion and public finance waste can be mitigated.

1. FINANCING THE ENERGY ACCESS GAP

In the last decade, significant progress has been made in increasing access to electricity— reducing the number of unelectrified people from 1.2 billion in 2010 to 789 million in 2018. Those households who are still unable to access modern energy solutions are mostly low-income and marginalised, with a majority of them living in sub-Saharan Africa. The gap for access to clean cooking solutions is far greater: 2.8 billion people still cannot cook cleanly and safely — a number that has essentially remained static.[2] Beyond access, reliability of energy delivery remains a huge challenge.

There are many factors contributing to deficits of energy access such as weak policy and regulatory frameworks, as well as a lack of enforcement of existing regulations. Other factors include payment indiscipline of the various parties and financial non-viability of operations.[3] Indeed, the funding gap for energy access remains enormous. According to finance flows monitored in 2017,[4] only a quarter of the estimated annual investment of US$51 billion required to meet universal electrification went towards new electricity access for households, and less than 1% of the required annual investment of US$4.4 billion went to improving access to clean cooking.

Historically, almost all money and political will has been directed to extending centralised grids, which is a costly proposition, averaging US$800—2,000 per customer, and often much more in less-dense, rural areas.[5] Countries that have gained the most access in recent years — including Bangladesh, Cambodia, India, Kenya, Myanmar, Nepal, Rwanda, and Tanzania — have done so through a combination of grid extension and installing 'off-grid systems' like mini-grids and stand-alone systems or solar home systems (SHS).[5] Their relative success involved engaging utilities and private companies using different funding models, finding ways to reach end-users and address challenges across technologies. However these players are not always working in close collaboration. Meeting these varying needs requires finance flows from public and commercial actors and better approaches to propel and guide markets, ideally policy and regulatory instruments that can adapt as markets evolve.

A World Bank working paper highlights that many electricity utilities are run inefficiently and make losses, and they are buoyed by 'implicit subsidies' — where the full operating costs of production and capital depreciation are not recovered, and taxpayers periodically bail them out.[3] Mini-grid developers continue to rely on grants to fund projects, though aggregation of mini-grid projects may be starting to unlock affordable debt financing in Tanzania and Sierra Leone[6,7] through longer-term infrastructure financing. This is more suited to their business model with 10–15-year payback timelines.[8] In addition, the World Bank's Energy Sector Management Assistance Program (ESMAP) projects that the sector will accumulate US$25 billion in profits by 2030,[5] which could yet attract significant flows of finance from investors.

Meanwhile, distributors of off-grid SHS require large amounts of affordable debt to pay for inventory and consumer finance through pay-as-you-go (PAYG). Shifting inventory into cash can take up to three years from manufacture to final end-user payment, which can create mismatched credit terms and reduce financing sources to those who are 'specialist' financiers in the off-grid space. Among other challenges are the mismatches between input costs and revenues in local currency and the working capital and accounts receivable in hard currency.[9] Some distributors and banks are moving towards partnerships, for example, Equity Bank in Kenya has partnered with SHS and cookstove distributors to expand their reach. The partnerships leverage their respective distribution networks and joint marketing to increase efficiencies and reach strategic goals.[10] Younger companies need injections of grants and seed capital to test business models, and equity rounds to nurture, expand, and confirm those ideas. Commercial debt usually drives the expansion of distribution. But in many contexts, off-grid companies are unable to secure the grants, equity, or debt they need to continue growing and reaching new end-users, especially domestic companies.

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In contrast, cleaner cooking solutions require far-reaching distribution channels or access to sometimes extensive infrastructure for liquid fuels or electricity systems. Adaptation of these cooking solutions is also influenced by cultural and personal preferences, as well as complicated household decision making processes and gender dynamics. Further compounding this is the fact that finance flows into cooking solutions have been marginal at best, with only US$32 million of US$4.4 billion needed to reach everyone by 2030 being invested in 2017 (0.73%),[4] an abysmally low amount. Among other issues, the cost of cleaner cooking solutions[11] has also been a major constraint to increasing access. But these solutions require huge investments in vast distribution networks and other enforceable regulations around safety, especially for LPG (liquefied petroleum gas).

Both cleaner cooking and electricity access remain unaffordable for the poorest families. As a result, to achieve SDG 7 — universal access to energy by 2030 — will likely require a mix of demand and supply subsidies for electricity and cooking to accelerate progress. **Demand-side subsidies** can make it more affordable for the poorest to purchase products or services, and **supply-side subsidies** can lower the cost and risks of company investments to reach the most remote communities.

The global energy sector's discussion around subsidies for cookstoves[12] and electricity[13] is not new, but the recent discourse has been controversial, with many investors, donors, and companies arguing that the rapidly decreasing costs of delivering off-grid solutions means that rural electrification can be delivered without subsidies.[14] More recently, a consensus has been emerging that different types of subsidies are needed, especially to reach poor households and to bridge the existing affordability gap.[15,16,17] In line with this, energy safety nets[18] are seen as a potential way to leverage social assistance mechanisms. Our research shows that in Malawi such programmes, while mixing demand and supply subsidies, have delivered hundreds of thousands of improved cookstoves (ICS) to the most vulnerable households through the government's Social Cash Transfer Programme (SCTP).[19]

Surrounding these financing challenges and opportunities are radically different enabling environments: policies, regulations, and supporting institutional structures. These vary by country, by sub-sector and associated technologies — for example, rooftop solar versus mini-grid versus cookstoves. Support such as capacity strengthening and building financing drivers such as aggregators are also key activities that have helped develop the DRE sector.[6] Much of this has been supported by grants and government programmes, but more public and private financing has also been flowing in recent years.

Box 1: Moving money with aggregators

In 2019, in its publication *Moving more money: can aggregation catalyse off-grid financing?*,[6] IIED studied three technical and financial intermediaries in Asia and Africa: Infrastructure Development Company (IDCOL), Alternative Energy Promotion Center (AEPC), and SunFunder. These 'aggregators' successfully bundled different funding and financing sources and provided mixes of financing to enterprises that then delivered thousands of energy systems to millions of end users. These aggregators are largely risk averse and sometimes slow to respond to market changes. Their ability to pool donor money and aggregate private companies has helped accelerate energy access in their contexts. IDCOL and AEPC mixed grants, subsidies, and credit — vital combinations for both energy enterprises and households — enabling them to reach more marginalised geographies. Under the Kenya Off-grid Solar Access Project (KOSAP), SunFunder has been offering loans alongside a dedicated grant facility; an innovative approach that may allow this commercial aggregator to reach poorer households through partnerships. Aggregators remain a promising mechanism to channel investments to the hundreds if not thousands of companies needed to deliver on SDG 7.

To add to the ongoing discourse around subsidies and energy access, this discussion paper brings together findings from different contexts — with a focus on decentralised electrification and clean cooking — unpacking some challenges and opportunities around using **subsidies**; highlighting lessons from **results-based financing**; exploring the need and attempts to access **commercial finance**; and identifying important **enabling environment** factors that can channel and sustain finance for delivering access to energy. The paper does not seek to address the complex topic of subsidies comprehensively, but does offer emerging lessons around subsidies that may be useful for stakeholders who are striving to increase energy access and to achieve SDG 7. These stakeholders include donors, governments, policymakers, community-based organisations — and perhaps those companies currently sceptical about including subsidies as part of their business model.

2. UNPACKING SUBSIDIES

A subsidy is simply a sum of money that a government or donor grants to a sector to increase availability and/ or reduce costs of delivering products (eg cookstoves and electricity products) and services (eg electricity and cooking fuels). Subsidies can take many shapes and forms. Governments grant demand-side subsidies to increase the purchasing power of households; in this case, their ability to pay for cooking or off-grid solutions. Governments also provide supply-side subsidies to reduce the service providers' costs; in this case supplying cooking or off-grid solutions to poorer households or remote communities, often to jumpstart markets that may not grow organically.

2.1 The changing discourse on subsidies for decentralised renewable energy

Several examples of the supply-side and demand-side subsidies are noted in Table 1 below.

Table 1: Examples of supply-side and demand-side subsidies

	Examples
Supply-side subsidies **Aim:** Government or donor provides benefits to businesses by reducing their costs or risks	Tax exemptions, grants, concessional debt facilities, risk-sharing instruments, RBF, guarantees
Demand-side subsidies **Aim:** Government or donor provides benefits to the end-user by reducing prices. The benefits can be given directly to the end-user or to the business with the expectation that the business will then reduce costs to the end-user	Cash transfers, freely distributed products, interest subsidies for end-user loans, vouchers, end-price/ capital subsidies

Donors and governments have trialled subsidies in different forms for off-grid and cooking solutions across a range of contexts. In South Asia, for several decades subsidies for DRE have played a prominent role in increasing energy access and building markets. However there have been challenges around how these subsidies were delivered, including how they achieved targeted impacts and avoided market distortion in the long term — as detailed in the Nepal case study in the next section. Few examples exist of subsidies that have adjusted over time — responding to different states of market maturities, enabling policies, political dynamics, and different funder priorities and ideologies. But there are some examples, for instance, IDCOL's SHS programme in Bangladesh gradually phased out its supply-side subsidy 'institutional development grant' by 2013 and reduced the demand-side subsidy 'capital buydown grant'. IDCOL and its donors agreed that growing competition among its suppliers and increased demand had reduced the price of SHS, thereby offsetting the reduction in subsidies. In 2013, an independent evaluation study by IDCOL for the World Bank concluded that the demand-side subsidy should be kept at US$20 per SHS and made available only for small SHS (up to 30 Watts), which tend to be purchased by the poorest households. However, there have been no subsequent assessments to ascertain what impact the phase-out may have had on poorer groups of potential customers.[6] Other subsidy schemes have remained stubbornly intransigent in the face of changing conditions.

In contrast, mobilisation of public money as subsidies for cooking and off-grid electricity has been less widespread in sub-Sharan Africa. One popular subsidy tool used in many African countries over the last decade is RBF. In this case, RBF has been used as a supply-side subsidy that governments and donors use to pay service providers once pre-defined results are achieved — for example selling a certain number of SHS. RBF is often accompanied by language such as 'non-distorting', 'efficient', and 'market enabling'. Indeed, use of the term 'subsidy' within this context went out of fashion for many funders and governments. The discourse is now about enabling new markets so that they can eventually become fully commercial.

The explicit and implicit on-grid schemes mentioned above have dwarfed any off-grid schemes in terms of popularity and subsidy amount. The off-grid sector in many sub-Saharan African countries, for example, has had far fewer interventionist finance policies. This is despite DRE solutions often offering a cheaper way to extend energy services, complementing grid extension efforts, and being key in achieving universal energy access in high-impact developing countries — those with the biggest universal energy target gaps.

2.2 Understanding supply-side and demand-side subsidies

Despite their challenges, and whether named as such or not, subsidies remain a critical financing instrument for many countries. This is in view of the need to electrify and increase access to cleaner cooking solutions for the poorest and most remote communities who are considered low-demand and/or high-risk for commercial financing options. Choosing how and when to use subsidies is complex.

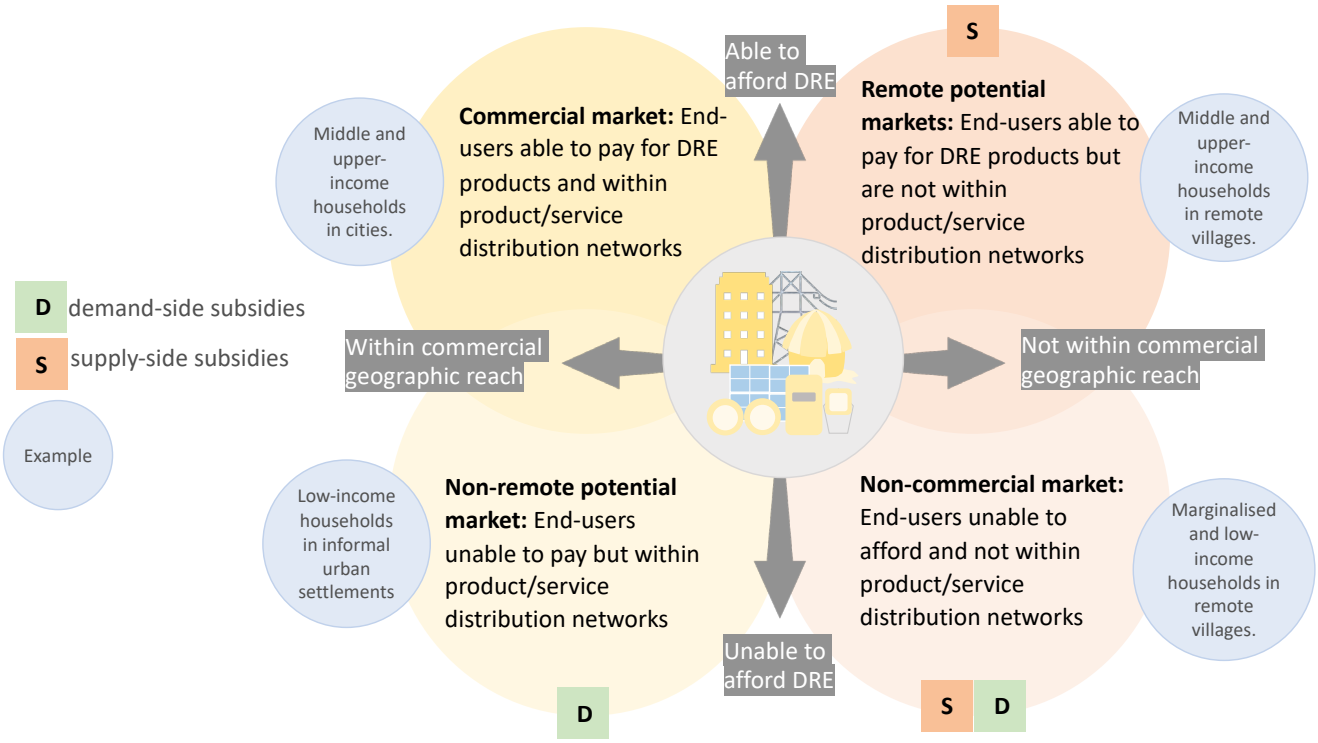
Figure 1[20] is adapted from Open Capital Advisors illustrating four market segments based on ability to pay and geographic reach of distribution channels for off-grid products. It also builds on recent thinking by Lighting Global, the Global Off-grid Lighting Association (GOGLA), and ESMAP[21,22] on using subsidies to unlock the 'commercial potential' of the off-grid solar sector.

Developing a **'commercial market'** where one has not existed before has been the goal of many donor programmes. Under normal market conditions with sufficient demand, companies would raise external finance to enter new geographic areas themselves. However, with low initial demand and risks perceived as high, some programmes have encouraged companies to enter into **'remote potential markets'**, that are generally more geographically remote, through supply-side subsidies. Customers generally pay the same price as established markets in urban centres to avoid 'distorting the market', the term often used by donors and private companies.

Depending on its design, RBF can incentivise or stimulate either supply or demand, but much of its use has been focused on supply-side subsidies to encourage companies to explore remote potential areas. Then there are those households that cannot afford the energy service, some already in commercially serviced areas — for example villages close to urban areas. These are known as **'non-remote potential markets'**. Demand-side subsidies such as pricing subsidies or interest rate subsidies on repayments can target these households. For example, Shell and d.light targeted existing SHS customers in Kenya, Uganda, and Nigeria that were struggling with payments during the COVID-19 pandemic by using data to compare current and pre-COVID-19 customer payments, and gave a subsidy to targeted households that had good payment histories prior to the pandemic but subsequently struggled with payments.[23]

Other potential customers live in remote potential markets and are sufficiently poor as to be considered **'non-commercial'**. To reach these households a demand-side subsidy may be needed to close the affordability gap, as well as a supply-side subsidy to encourage the energy companies to operate there, especially if the poorest households are to move towards energy access that can be used productively to increase household income. Further, there may be overlap between commercial and non-remote potential markets, and between remote potential and non-commercial markets, which Figure 1 shows using intersecting circles. However, overlap would not exist between commercial and remote potential markets.

Figure 1: Market and affordability segments for understanding subsidies



Source: Adapted from Open Capital Advisors,[20] building on recent thinking by Lighting Global, the Global Off-grid Lighting Association (GOGLA), and ESMAP.[21,22]

As part of the Energy Change Lab's PUE work, an entrepreneur demonstrates how to operate different appliances in Ikondo, Tanzania (© Rahim Hussein)

Many context-specific challenges arise when designing a subsidy, for example: When to apply it? What form should it take? How long should it last? What will have the biggest impact and the best value for money? For example, a supply-side subsidy to enter what is perceived as a remote potential market is only useful if (a) companies really will not operate there in the absence of the subsidy, and (b) the market will sustain over time — otherwise the subsidy will likely target more affluent people who are 'first movers', and more likely to afford such systems without a supply-side subsidy. There remains a large affordability gap for many households in remote communities for both cookstoves and electricity, which simply cannot be overcome through supply-side subsidies.

Demand-side subsidies such as price subsidies are often implemented with a broad-brush approach aimed at specific remote areas, in which there is a range of affluence and poverty. Targeting precisely is not without its challenges. Broad subsidies often benefit the affluent more — especially with tariff subsidies (common in the on-grid sector) where larger end-users can receive greater benefit. Similarly, higher-income people who are often better linked politically tend to benefit from capital subsidies or end-user price subsidies.

In South Asian countries like Nepal and Bangladesh, there is a long history of subsidy use within the DRE sector which has actively targeted the demand-side through end-user price subsidies (reducing the capital costs of DRE systems). They offer useful lessons on what has worked well and what has not. The evidence still demonstrates that certain groups of end-users cannot be reached without subsidies, despite the fact that the term has become unpopular and they are often considered a public financial burden.

2.3 Need for commercial finance

Subsidies on their own will not support the expansion of commercial markets into non-commercial areas; markets are far more complex than any simple solution allows. A mix of financing, and supportive policies and regulations are needed to enable the growth of commercial financiers and to fuel a more rapid expansion of DRE solutions. Aligning energy access goals with the strategic interests

of commercial banks is one way to bring them on board. For instance, Equity Bank in Kenya started its lending into DREs through its group lending facilities, where individuals form groups and guarantee loans to each other, in this case loans for small energy products. This tapped into the bank's strategic desire to expand its customer base, and they have since expanded their offerings linked to DRE.[24,6] Even in countries like Nepal and Bangladesh where demand-side subsidies are prevalent, their markets have local energy enterprises and cooperatives, but enabling commercial financing remains a critical step to ween them off subsidies and towards markets that work sustainably. This applies especially now, as tax revenues reduce the fiscal space for subsidies as a consequence of the economic shutdowns of COVID-19. In addition, subsidies often involve complex and time-consuming delivery and approval processes, and are sometimes paid in instalments. This means companies require commercial loans to pre-finance and cover working capital needs until subsidy payments reach them. Lack of affordable financing could therefore deter the private sector from taking part in certain subsidy interventions.[6] But commercial financing for DREs in both Nepal and Bangladesh remains limited. Ideally donors and governments should leverage the power of subsidies with commercial financing to build out markets that are self-sustaining.

Globally, commercial finance has been more readily available to some energy companies than others — in particular, internationally owned companies operating in countries like Kenya that have more mature off-grid markets. These companies have usually had access to concessional finance from overseas, have better equity backing, have access to mentors, are typically more established with stronger financial and management structures, and often have greater influence with donors. That is not to say that these companies do not face challenges — many are required to make a rapid 2–3-year return on investment, which has fostered unsustainable growth models.[25] And their investments and efforts have certainly paved the way for the sector to grow. However, many domestic companies operating in the same markets as big international players cannot even access affordable finance to grow their businesses. And these local companies are vital to sustaining healthy competition and underpinning the gains of the last decade.

3. DEMAND-SIDE SUBSIDIES: LESSONS FROM NEPAL

Subsidies have been central to the development of DRE in Nepal since the 1970s,[26] and have been supported by the government of Nepal (GoN), donors and development financial institutions (DFIs) who acknowledged that national grid extensions alone were not going to reach everyone. They saw demand-side subsidies as a way to reach communities without access to electricity or cleaner cooking solutions, particularly the poorest and the most remote. At the outset of these programmes, the primary focus was lowering the purchase price or capital costs for its end-users to bridge the affordability gap. The government hoped that this would simultaneously stimulate private sector investments in off-grid renewable energy.[26]

The GoN and donors have funded multiple subsidy programmes over several decades. Many donors have also contributed in the form of technical assistance grants that helped stimulate the DRE sector. These covered activities such as training support to end-users and technicians; demand aggregation by working with local non governmental organisations (NGOs); monitoring and quality assurance; and lobbying for policy changes. These initiatives have activated supply from companies and demand for their services, with long-term subsidies building demand for energy services and products among some of the poorest and most remote populations. And this in turn has resulted in opportunities for and interest from private, local companies to enter the sector. But the subsidy programmes have lacked mechanisms that recognise and account for changes in market dynamics, and now many private companies rely on subsidies as part of their business model. If the government and donor money ceases for whatever reason, it may cause major disruption to the sector, and hinder energy access-for-all targets.

This case study highlights key lessons from Nepal's subsidy delivery model and policy interventions funded by the government and donors. The findings and analysis are drawn from field surveys of 360 households in eight urban and rural municipalities in three provinces: Province 5 (Gulmi and Palpa districts); Gandaki Province (Nawalpur District); and Bagmati Province (Sindhuli and Kavrepalanchowk districts). The geographies covered varied from hilly to lowland areas. The household surveys included female-headed and male-headed households, and various social and ethnic groups. In addition, stakeholder consultations were carried out with a range of actors from government, energy companies, financiers and community support organisations (CSOs). These local engagement activities were carried out by Practical Action Nepal.[27]

3.1 Enabling environment

In the early 1970s the GoN provided subsidies and loans for improved water mills and micro-hydro mini-grids.[28] This was followed in the early 1980s with capital subsidies for micro-hydro mini-grids to reduce the costs of specialised equipment for hilly and remote mountainous districts. These areas incurred much higher investment costs due to the difficult topography, and consequently little appetite from private companies to invest. After installing these mini-grids, companies handed the infrastructure over to communities who then owned and managed them. Similarly, subsidies for SHS were introduced in the late 1990s to reduce equipment costs to end-users. These initial demand subsidies used a percentage of the total equipment costs but did not necessarily verify sales or system power output. To address this risk a Subsidy Policy and Delivery Mechanism was introduced in 2000 to reflect quality and actual power generation, confirmed through a verification process. Additional funding subsidised the greater transportation costs associated with more remote locations.[28] Capital subsidies for biogas and ICS were introduced through various programmes in the mid-1990s.[4]

The Subsidy Policy has gone through several iterations since. The government adopted a Rural Energy Policy in 2006, and updated this with the Nepal Renewable Energy Subsidy Policy in 2009, 2013 and 2016. These policies provide direction and implementation guidelines aimed at increasing RETs for the most remote and marginalised communities. The Subsidy Policy 2016 and 2013 specifically mentioned 'additional subsidy' amounts by defining 'target beneficiary groups' and remoteness. The current subsidy policy (2016) identifies 'target beneficiary groups' as ''women-led households with dependent children, earthquake victims from earthquake affected districts, endangered indigenous community identified by the government and Dalit''.[29] The same policy

defined 'remoteness' in three categories: very remote, remote and accessible.

The 2016 revision of the subsidy policy emphasised leveraging credit and commercial investments through subsidies, which has not happened as hoped. This policy also extends subsidies to energy companies that can own, operate, and manage off-grid energy systems by inputting commercial investments into projects (eg mini-grids, solar water pumps, larger productive use of energy such as for hotels).[6]

This long-standing promotion of RETs in Nepal using subsidies, and the government's recognition of the need for specific policies early on, has helped the country make significant progress on extending energy access to some of the most remote areas. Data from the Central Bureau of Statistics (CBS) in 2011 show that the proportion of households using electricity as their primary source of lighting increased from 40% to 67% between 2001 and 2012.[26] Around 10% of the overall electrification in 2008 was from off-grid RETs.[30] According to the World Bank's Multi-Tier Framework surveys,[31] by 2017 around 95% of the population (total population 29 million) had access to electricity — around 71.7% connected to the national grid and 23% connected to off-grid RETs. In addition to increasing access through grid extensions, this progress was enhanced by improvements to grid reliability following the National Electricity Authority's (NEA) work on effective load management between 2017 and 2018, which minimised load shedding for most of the country.[32,33] The 2019/2020 annual progress report by NEA[34] states that 86% of total household have access to its electricity infrastructure.

Despite this progress in electrification, firewood remains the most widely used source of cooking fuel with 73.5% of households depending on wood, supplementing it with animal waste and crop residue. The primary cooking solution used by households varies: 47.6% use locally produced traditional stoves, 26.3% use LPG, 15% cook on open fires, 8.9% use improved biomass stoves, 2% use biogas stoves and a tiny portion uses electric and solar cookers.[31]

3.2 Overview of subsidy delivery model

The GoN set up the AEPC in 1996 as the national executing agency for the planning and implementation of renewable energy programmes. Through various donor driven initiatives, AEPC adopted subsidy delivery as its primary financial instrument. IIED's analysis (2019)[6] highlighted that under the most recent multi-donor subsidy driven programme, the National Rural and Renewable Energy Program (NRREP) operationalised by AEPC disbursed around US$80 million as subsidies via its financial intermediary Central Renewable Energy Fund. The NRREP received a total of US$141 million, and around 57% of this financing came from government budget allocations.[35,6] The subsidy delivery models commonly used as per the subsidy policies are summarised below. They involve two key approaches. Figures 2 and 3 show the subsidy flow to the end-users.

1. End-user price subsidy stand-alone systems such as SHS, biogas and ICS: a demand-side subsidy is delivered to the end-user through a private company who would act as the intermediary. End-users receive a direct reduction on the retail price. (See Figure 2)
2. Capital subsidy for micro-hydro or solar mini-grids: a demand-side subsidy delivered to community members who would come together as a community developer and apply to AEPC for a subsidy. Private companies are contracted to build and hand-over the mini-grids to communities to operate and manage (see Box 3 for more details). The communities receive a direct reduction of the capital costs of the mini grids which otherwise they would have had to input as equity or through a loan. (see Figure 3)

Subsidies include a maximum ceiling value. And although they differ by technology and geography based on remoteness, on average they cover 40% of capital costs.[29] Biogas, ICS and SHS are largely owned by individual households and their funding mix consists of subsidy, end-user loans from commercial banks or micro-finance institutions (MFIs) and household's own financing. Mini-grids (micro-hydro and solar) were traditionally community owned and managed where the communities contributed with a mix of equity (in-kind contributions or 20-30% financing) and commercial loans (30%). In some instances, the local governments supported the communities with additional grants, making the mini-grid systems almost entirely subsidised.

It is also important to note that the solar energy sector benefited from import tax reductions, a form of supply-side subsidy imposed by the government, for systems tested and approved by AEPC through the national Renewable Energy Test Station. This supply-side support also may have been a contributing factor to growth of the solar market in Nepal.

Despite progress in subsidy provision, there has been slow progress in commercial lending to energy end-users. Many financial institutions have significantly limited credit portfolios for off-grid RETs as they consider the sector highly risky. Box 2 presents an avenue taken by the government to encourage end-user lending from commercial banks. This is often quoted in fiscal policies as a positive way forward but the impact of these interventions needs further investigation.

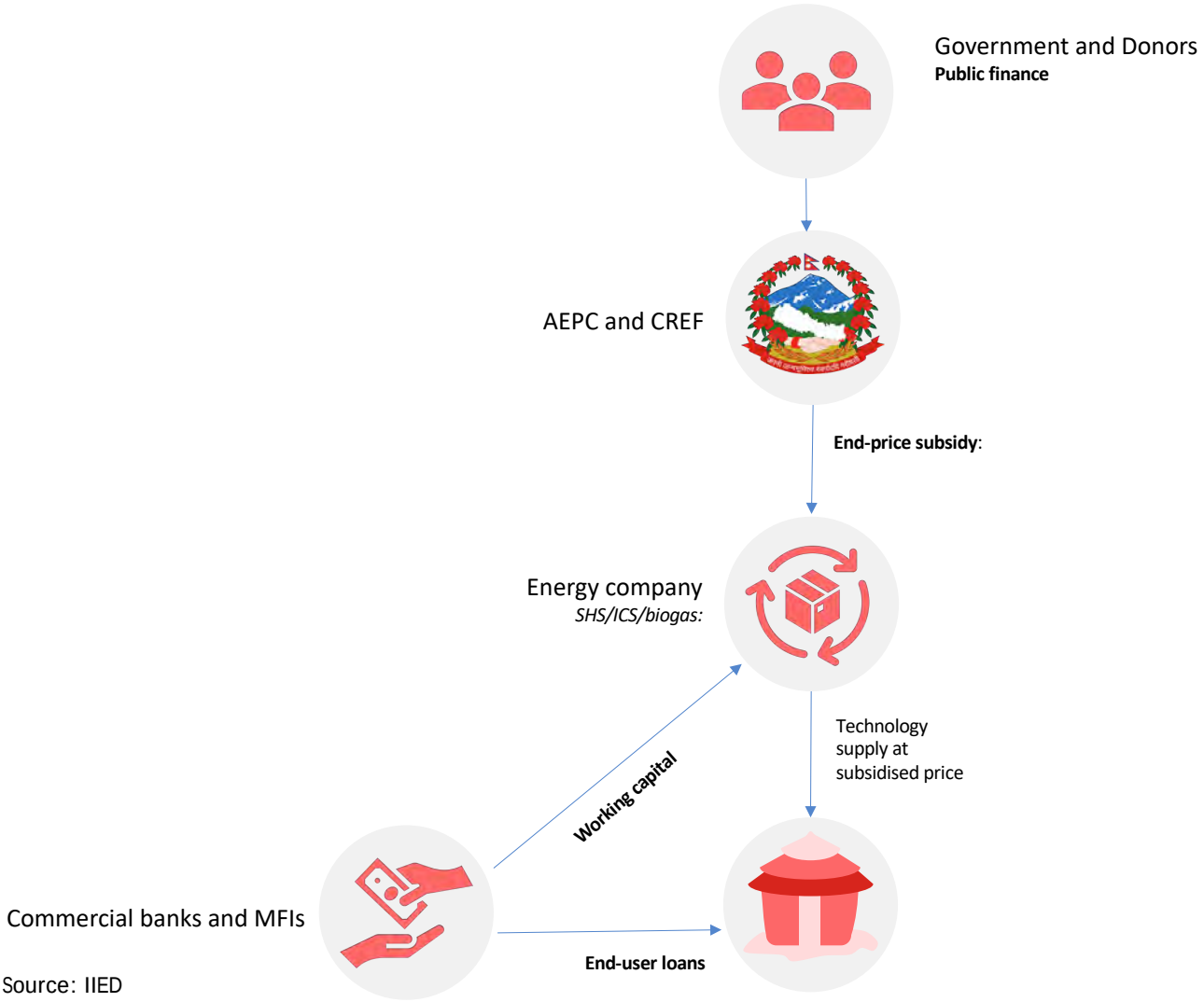
Box 2: Government-initiated push for banks to lend to energy end-users

Nepal's central bank, The Nepal Rastra Bank, set a special loan requirement through two lending directives — Deprived Sector Lending and Productive Sector Lending Unified Directives (2013). Under the Productive Sector Lending Directive commercial banks, development banks and finance companies are required to lend a certain percentage to a productive sector which includes agriculture, energy and tourism, and cottage and small industries. Energy includes hydro power and renewable energy. The Deprived Sector Lending Directive requires a certain percentage of lending to low-income and marginalised individuals and communities.[36] And under the Deprived Sector Lending, loans can also be extended to the energy sector including SHS, solar cooker, solar dryer, solar pump, biogas, ICS, and, wind energy.[37,38]

Commercial banks also provide wholesale loans to local financial institutions such as MFIs, for energy lending to meet the Deprived Sector Lending requirements.[39] While there is some analysis on how these directives provide an opportunity for end-user financing,[39,36] there is limited analysis on the actual impact of both directives on increasing lending to the energy sector. Failure to meet these directives results in penalties to the commercial banks, and some stakeholders interviewed highlighted that penalties are sometimes preferred over the risks and costs for loans.

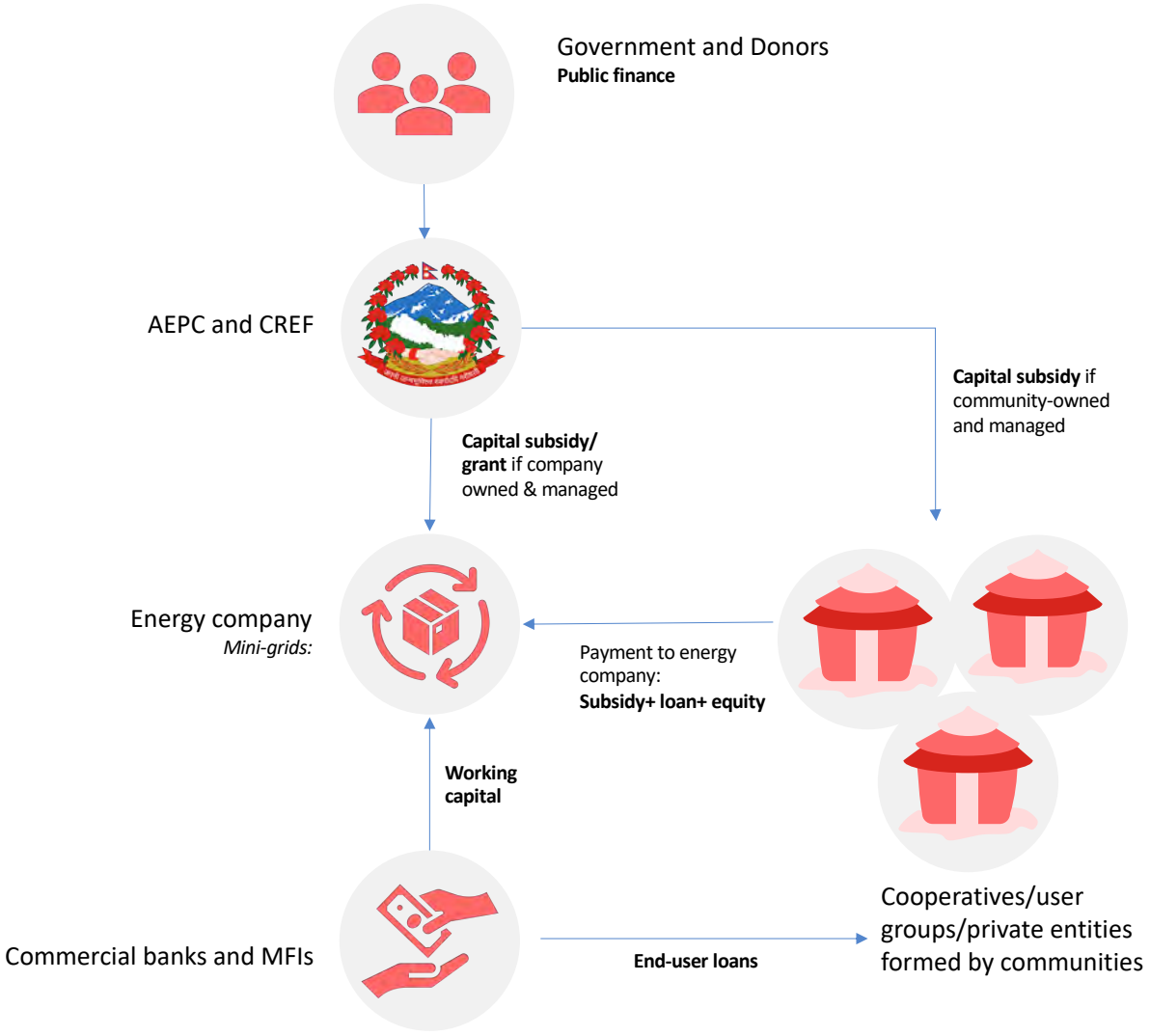
Understanding these challenges in detail would require evidence-based research, and the engagement of commercial banks to create a more commercial market where end-users have access to affordable credit options.

Figure 2: End-user price subsidy delivery model for SHS, ICS, Biogas



Source: IIED

Figure 3: Capital subsidy delivery model for micro-hydro or solar mini-grids



Source: IIED

Although donor funding for Nepal's DRE sector has reduced since the completion of NRREP in 2017, the government, with energy justice as its priority, continues allocating subsidies for DRE. It does this through several programmes in remote areas,[40] aiming to achieve universal electrification targets (according to Nepal's 15th Plan) by 2023/2024.[41] The Himali and Uccha Pahadi Solar Mini Grid Installation Program and the Ujyalo Nepal Program plan to provide a minimum of 100W electricity to each household without electricity in remote municipalities. They plan to do this by subsidising 90% of the capital costs from federal government budgets and 10% investment as equity from local government or representatives from the local cooperative. The government is also considering subsidies for promoting clean cooking solutions in the low-land Terai region by replacing traditional dung cakes used as fuel.[42,40] Several donors are also financing mini-grids, including the World Bank and Asian Development Bank (ADB). See Box 3 for key lessons on the subsidy delivery model for mini-grids used in Nepal.

3.3 Key lessons from Nepal

Decades of delivering subsidies with donor and government support have undoubtedly generated many lessons for future demand-side subsidy interventions in Nepal and beyond. The lessons below do not provide a comprehensive analysis of how subsidies changed over time and factors that may have contributed these changes, but they offer an overview of successes and limitations in both creating markets for DRE, and reaching target groups.

1. Targeting and delivering efficient demand-side subsidies is difficult and complex

Nepal used a subsidy that targeted the 'remoteness' of communities to reach underserved areas and this helped push energy products and services to these communities. Indeed, IIED's own analysis in 2019[6] showed that AEPC issued around 359,000 subsidies for SHS during NRREP (2012 2017). Of this, about 35% went to some of the areas defined as 'very remote'. However, a majority of around 64% went to areas defined as 'accessible'. Around 45% of the subsidised SHS were purchased by women— though this does not

necessarily reveal if women use or benefit from SHS in their households.

Another limitation is that while remoteness is associated with poverty, households within remote communities vary significantly in income and circumstances — and some are more marginalised than others due to social status, caste, religion, gender etc. In other words, targeting by remoteness may be useful to a degree, but more granular impact data and indicators are needed to monitor and ensure subsidy effectiveness. Despite the top-up subsidies for remote areas — to cover increased transportation costs — more affluent households in more accessible areas are likely to benefit first and most from the subsidy scheme.

Surveys carried out as part of this research investigated levels of access to energy across eight municipalities in three provinces (only targeting the 'more accessible' areas due to research limitations). At the time of the survey most of the 360 households surveyed (almost 77%) had access to the national grid, and only around 7% relied on kerosene as their primary source for lighting. Around 93% of the households had access to electricity via the national grid, SHS and micro-hydro mini-grids. The survey analysis showed that social exclusion was based less on gender, and more on social groups or castes. Again, this highlights the importance of obtaining more granular impact data to highlight vulnerable and marginalised groups, and ways to effectively target them.

Marginalisation based on caste is still very apparent in the surveyed areas despite the additional subsidy allocated for disadvantaged social groups (eg lower castes). Although prioritised for additional subsidies in the subsidy policies, adoption of RETs by Dalits, who are among Nepal's most marginalised social groups and poorest populations, is still low compared to dominant and affluent social groups such as Brahmin, Chhetri and Thakuri (BCT) and Janajatis. For example, more than 15% (10 out of 63) of the surveyed Dalit households do not have access to electricity compared to 1.8% (3 out of 164) BCT households.

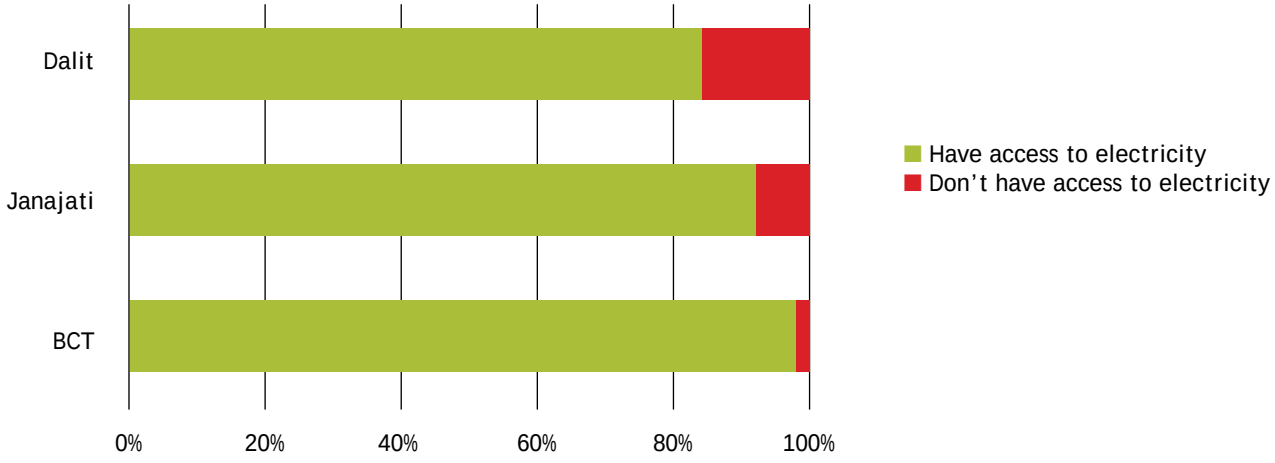
Similarly, 91% (57 out of 63) of the surveyed Dalit households were not using ICS for cooking, and 95% (60 out of 63) have not adapted biogas for cooking.

Slightly lower proportions of female headed households have access to electricity and cleaner cooking compared to male headed households. But surprisingly, the gaps are not huge. Around 92% (61 out of 66) of surveyed female headed households and 94% (276 out of 294) of male headed households had access to electricity via the grid, SHS or micro-hydro mini-grids. Regarding cleaner cooking only 27% (18 out of 66) of the female headed households had an ICS compared to 36% (106 out of male headed households). Similarly, only 7.6% (6 out of 66) of female headed households had biogas for cooking, compared with 9.2% (27 out of 294) male headed households.

These findings confirm that as energy companies entered poor and remote regions, wealthier and/or more affluent groups benefited from subsidies, compared to the most marginalised groups. A study by the Renewable Energy for Rural Livelihood (RERL)[43] programme on feasibility and targeting for mini-grids in rural areas shows that wealthier groups often had greater demand for electricity because they were more aware of the technologies and financing options as a result of better connections to politicians, government officials and markets.

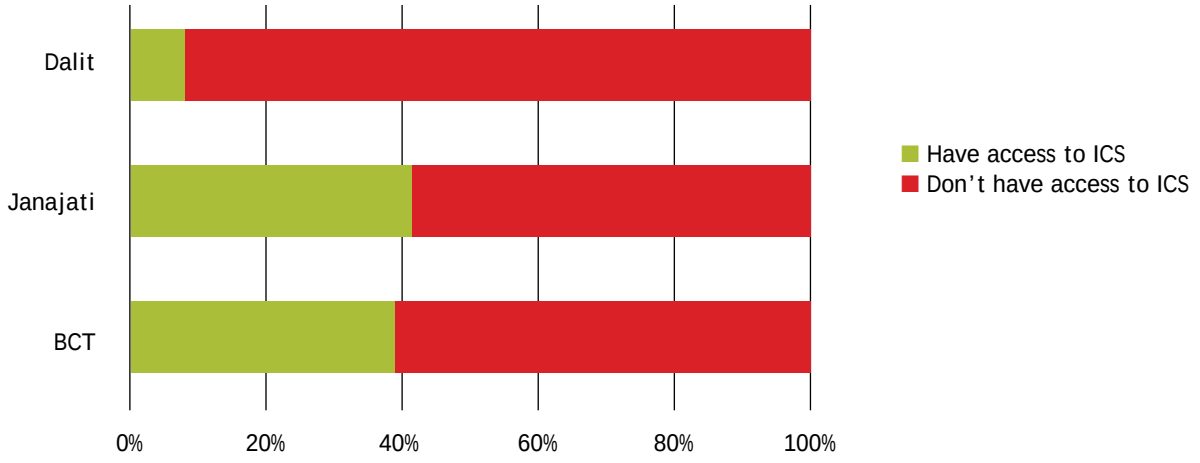
To some extent the 'additional subsidy' that targeted more marginalised groups made subsidies more inclusive. But these findings show that allocating subsidies with time restrictions (such as programme timelines) and using an

Figure 4: Access to electricity among surveyed households by social group



Source: IIED based on surveys carried out for the 'Effectiveness of Subsidy to Increase Energy Access in Nepal' study in 2019 (unpublished) under the GIE programme

Figure 5: Access to ICS among surveyed households by social group



Source: IIED based on surveys carried out for the 'Effectiveness of Subsidy to Increase Energy Access in Nepal' study in 2019 (unpublished) under the GIE programme

approach where benefits are extended to anyone unserved with electricity or clean cooking within a geography, may still exclude the poorest and most marginalised groups. Therefore, despite decades of subsidy allocations using public financing to reach these groups, this goal has not been achieved. This also may highlight the need to bundle other activities with subsidy provision such as subsidy awareness campaigns and support for enterprises to carry out these campaigns.

2. The subsidy delivery mechanism has improved over time to provide more transparency and to some extent has helped quality assurance, but complexities and inefficiencies have resulted in increasing initial up-font cost to end-users

Although they have improved, the complex or hard-to-administer subsidy delivery systems have increased transaction costs, delayed finance delivery and enabled malpractice which has affected the price offered to the end-user.[6] As shown in Figures 2 and 3 energy companies act as intermediaries in the subsidy delivery process by ensuring that the end-users receive the RETs at a subsidised rate. Stakeholder interviews carried out for this research highlighted that additional costs are often added to the RET retail price by the private sector to compensate for the additional administrative costs, delayed payments, long procedures and verification delays incurred by them in the subsidy release process. Therefore, end-users do not access RETs at least-cost. To address some of these issues AEPC is now in the process of introducing a Market Rated Price for different technologies. It does this by requesting quotations from energy companies through an open consultation process and setting a minimum average price point for bidding processes. The bidding process will be carried out using a 'reverse auction' approach — where the winning energy company will be the one with the lowest value bid, although this is yet to be defined and tested. The subsidy policy and subsidy delivery mechanism will also need to be reviewed and adjusted accordingly.[44]

Despite these challenges, AEPC's subsidy delivery mechanism has helped ensure quality of the RETs. It required companies to meet certain criteria to qualify and used a technical standard to verify quality as part of the subsidy disbursement process. To enforce government standards the Renewable Energy Test Station was used to certify and approve equipment imported. AEPC and private sector associations also took the lead in training technicians, making it a minimum criterion for subsidies.

Some stakeholders argued that the quality control effort and pre-qualification of energy companies were limited in value. In the long term they became obsolete, hindering innovation and limiting competition due to lack of strict monitoring protocols which were often spurred by unhealthy practices from the private companies and institutions involved.[6]

3. Long term provision of demand-side subsidy led to a growth in local energy companies, but many struggled to self-sustain once those subsidies were withdrawn

Nepal's DRE market predominantly consists of local companies operating under an Engineering, Procurement and Construction (EPC) business model, which depends on the availability of subsidies. Companies act as vendors who are procured by AEPC to deliver energy systems and services.[6] In most instances AEPC conduct pre-feasibility and detailed feasibilities studies prior to procurement processes (through technical assistance funding from donors) and require companies to undertake a site assessment to validate the feasibility studies. The number of SHS companies that qualified for AEPC subsidies increased from 15 to 92 between 2001 and 2012 showing impressive sector growth, stimulated by the availability of subsidies. However, IIED's research in 2019[6] showed that the heavy reliance on subsidies resulted

in companies downsizing when donors withdrew financing from NRREP in 2017. SHS companies who had diversified into the urban market also faced challenges when the sole utility, the Nepal Electricity Authority, moved to improve the grid's reliability and accessibility. In addition, delays in subsidy delivery, along with onerous and time-consuming processes meant many companies were facing working capital challenges, at times committing to high interest rate loans on personal collaterals until payments were received. Box 3 below presents lessons from the delivery model used for micro-hydro mini grids in Nepal.

3.4 Looking forward for Nepal's energy sector

The government needs a long-term strategy and clear objectives for the energy sector — aligned with both on-grid and off-grid plans and assessments for electrification and cooking.

The Local Government Operations Act 2017, National Planning Commission Directive 2019 and the 2020 Electricity Bill (currently in parliament) aim to ensure that local governments hold energy subsidy delivery functions for solar and hydro energy systems below 3 megawatts (MWs), rural electrification and domestic and community biogas.[4] However, to avoid any overlap and duplication of effort, the relevant policies and targets need to clarify roles and responsibilities within the energy sector. The new Electricity Act and the Renewable Energy (Development and Promotion) Act under development provide an opportunity to set a clear trajectory for planning and financing the sector. While the government's commitment to target subsidy allocations

Box 3: Lessons from subsidies for micro-hydro mini-grids[6,4]

Nepal's subsidy delivery model for micro-hydro mini-grids traditionally involves community members coming together as a group and applying to AEPC for a subsidy. They then work through AEPC to contract a private company to build and service the micro-hydro mini-grid. The community contributes a mixture of sweat equity and cash, and may also seek grants from the local government or NGOs. While this model has contributed to significant growth of micro-hydro mini-grids in Nepal (over 2000), it has faced many complications. Where the community provided sweat equity by contributing to civil construction of micro-hydro schemes, poor construction often led to the user groups and cooperatives not being able to achieve the targeted power generation — thus impacting subsidy payments from AEPC. An over-reliance on grants for financial closure delayed projects. In addition, donor funding for technical assistance to support project due diligence and processing declined from 2017 onwards resulting in many micro-hydro companies struggling to remain in the market. This has been exacerbated by other issues, such as the shrinking market as electricity access inches towards 100% through national grid extension and community rural electrification programmes. In addition, public procurement guidelines are complex leaving some companies unable to bid, and with limited public funds for technical assistance, there is an insufficient pipeline of projects.

Another failure of this model was lack of sustainability: there were no incentives for the private sector to support communities to ensure the systems were delivered and maintained. Many communities were left to manage the system without the required technical knowledge and skills, which resulted in many schemes deteriorating. Communities also tended to set impossibly low tariffs, which resulted in communities not being able to pay back their loans, undermining the confidence of commercial banks to lend to the sector.

A lack of focus on productive use of energy also meant that the mini-grids were heavily under-utilised, reducing the systems' sustainability even further. In addition, enterprise development suffered from the funders' focus on monitoring the impact through the number of households electrified and kilowatts generated.

To address these challenges, the community-owned model has evolved since the NRREP programme. In subsequent programmes such as the ADB-funded South Asia Subregional Economic Cooperation (SASEC) programme, the total project financing (subsidy, loans and equity) is provided prior to starting construction of mini-grids, and the construction is carried out by the energy company, with AEPC having the responsibility to monitor and supervise. In addition the SASEC programme is collaborating with the RERL project (focused on technical assistance) to conduct post-installation support, community mobilisation, tariff, management, etc.[45] In the MGEAP (initiated in 2019 and currently under project development phase), companies are allowed to function as an Energy Services Company (ESCO), where the model is shifting from a pure demand-side subsidy to a supply-side subsidy. The MGEAP financing model includes 60% subsidy and 30% concessionary loan to the mini-grid developer, which can be a private company, local government or a community-led cooperative, and 10% as equity from the mini-grid developer.

Chitang micro-grid installation, Nepal (© Gham Power)

towards the most remote populations is impressive, there is a need for better coordination of government financing and ongoing donor funding (eg Mini-Grid Energy Access Project (MGEAP) funded by the World Bank). The government should also introduce a financing framework which allows commercial financing into the sector — to reduce dependence on subsidies. Greater clarity on what kind of subsidies will be used going forward, who they will target and how they will be phased out, would help private sector companies diversify their business models and adjust appropriately by seeking funding from commercial investors. Further analysis on reallocation of cross-subsidies to rural end-users is needed.

In line with this, the UK's Foreign, Commonwealth and Development Office's (FCDO) NREP has initiated an internal policy review and technology cost study to support development of provincial level energy policies for three provinces: Province 2 and 5 and Karnali. This aims to look beyond the current subsidy policies for DRE and provide guidance on both on-grid and off-grid energy systems including legal considerations, licensing, permits, transparency. This should help capture lessons on federal policies and forge better links to local level policy and planning.[45]

Supply-side subsidies (eg concessional finance and subsidies for companies, RBF for remote servicing) are needed but should be combined with demand-side subsidies to reach the most marginalised communities. Supply-side subsidies in the form of grants have now been introduced for mini-grids in Nepal through the World Bank's MGEAP programme, encouraging more private sector-owned and managed systems. This would be an opportunity to address several key challenges faced in the community-owned and management model through better financial management and providing long-term maintenance and repair. The mix of grant, equity and concessional debt should keep the tariffs to rural communities low and ensure that the supply is not completely subsidised for everyone. However, some

community groups may still require subsidies for connection and tariffs to increase their energy consumption. This would require targeted interventions for the poorest and most marginalised groups. We discuss potential ways of targeting in the next section.

Subsidies for mini-grids are essential, but require an integrated delivery model to ensure long-term sustainability. In addition to the donor-funded supply-side incentive, the government continues to provide subsidies for mini-grids through several upcoming programmes. Stakeholder interviews for this research highlighted that some local governments who manage these subsidies are looking to use the community-ownership model — a potential repeat of previous mistakes (see Box 3) — if operation, management and maintenance aspects are not integrated into the delivery model. While the goal of central and local government is now energy justice and inclusion, it is crucial that ongoing maintenance is included in the delivery model. This requires both local technical capacity and efficient governance structures to ensure the tariffs are set appropriately and that management is transparent.

In addition, rapid grid extensions produce uncertainty for mini-grid projects and potential connection to the grid is complex. For example, the NEA is reluctant to sign power purchase agreements with MHPs and documentation required is the same as for large hydro projects.

Nepal's clean cooking sector requires far more attention to planning and financing. Promotion of clean cooking solutions such as expansion of LPG, electric cooking and ethanol is an area of growing interest. Some of the stakeholders surveyed highlighted that plans to increase the generation capacity (via investments into large hydropower) and the expected electricity surplus due to low domestic consumption or demand gives an opportunity to increase the uptake of electric cooking, a solution that could be more cost-effective than LPG.[45] This requires further analysis to understand regional power relationships and plans for electricity export, but there are several pilot programmes that target urban and peri-urban communities who are willing and able to purchase appliances and electric stoves such as induction cookers — indicating a potential consumer group that may require access to loans and not full subsidies.

4. SUPPLY-SIDE SUBSIDIES: EMERGING LESSONS FROM RESULTS-BASED FINANCING

Within the framework of making official development assistance more accountable and achieving better value for money,[46] governments and donors have broadly used RBF in sectors such as education and health to shift much of the risk and upfront capital burden from government to service providers. RBF is a broad term that can cover different types of financing mechanisms, but generally, the funder releases RBF payments once pre-defined results are achieved and verified. In theory, if RBF facilities are designed to be flexible in approaches to delivery, this incentivises service providers to be innovative and efficient to achieve the desired results, resulting in better value for money. RBF has gained traction in the energy access space in the last few years as a promising way to accelerate market growth, incentivising energy access providers to enter new geographic markets or pushing them towards communities and households that may not be able to afford or access these services otherwise. In short, it is seen as a more effective and accountable way to deliver SDG 7.

Below are key lessons from several pilot projects of the RBF facility of the EnDev partnership. In addition, we share insights from discussions with stakeholders implementing RBF interventions: the KOSAP, the SCTP in Malawi, and the use of the Vulnerability Access Index (VAI) for targeting in Tanzania.

4.1 Addressing financing risks

In the energy sector RBF has been used by donors and governments to shift most of the working capital burden and delivery risk on to product and service providers. Companies must pre-finance the delivery of products such as solar lights or ICS, which usually means they need access to affordable working capital to expand distribution channels to reach different types of customers. If energy companies fail to deliver the results, they must still pay back working capital loans to banks. In that case, donors and governments have only expended money on the administration of the facility, though this can also be an expensive burden. For example, the EnDev RBF facility in Tanzania earmarked 65% of funds for companies and 35% for project administration.[47]

To protect end-users, RBF facilities have been used to push standards, requiring companies to sell products and services that only meet certain minimum specifications. EnDev's RBF facility in Tanzania uses a minimum threshold based on the Tanzania Bureau of Standards specifications and Lighting Global's quality assurance (now VeraSol) standards. The implementing partner Netherlands Development Organisation (SNV) prescribed a minimum brightness of 25 lumens and a minimum run time of four hours,[48] which ensures that products deliver a certain level of performance to customers. After-sales services are also bundled into the scheme such as warranty and troubleshooting.

Some RBF programmes suffer from payment delays to energy companies, which causes cashflow issues. RBF payments are released upon verification of the delivery of the service or product to the end-user. Since RBF payments come after delivery of products or services, it requires companies to secure working capital to pre-finance the delivery. Delays in verification led to cash flow issues in the SCTP in Malawi, as United Purpose, the implementing NGO relied on the RBF payments as part of their business plans in extending the reach of cookstoves to households.[49] The KOSAP programme in Kenya provides a forecasted amount to help companies address pre-financing bottlenecks.[50]

Companies with large, existing distribution and retail channels have a distinct advantage, allowing them

to leverage existing finance sources and distribution channels to deliver products more quickly and cheaply. Equally, these companies can likely secure the cheaper working capital needed to expand operations to achieve the RBF results. This can be seen in facilities like KOSAP, where no domestic company met the RBF prerequisites, but larger international companies did.[50,51] So, although designing an RBF facility without these supporting components is simpler and cheaper, it tends to favour larger companies. This usually means that less-developed domestic companies are unable to access these opportunities — opportunities which could be transformative for them. There are ways to mitigate this, for example, to limit the impact of larger companies on RBF payments, EnDev's RBF facility in Tanzania successfully capped individual company sales (see below).[47]

But RBF facilities can also be designed to alleviate financial bottlenecks companies face in delivering results. Incentives paced at smaller increments could help domestic companies who generally have difficulty accessing working capital. Some of EnDev's RBF facility released payments on completion of results before product or service delivery to the end-user, such as payment for the successful importation of products into the country.[52] However, this could add to the administrative costs of an RBF Facility. Such a design must align with the strategic interests of the government or donor for building 'local content'. For example, KOSAP is built on a US$150 million loan to the Kenyan government, which gives it a universal access mandate as well as a local content mandate. As a result of learnings from the initial RBF rounds, KOSAP is now exploring how it can enable domestic companies to access the RBF Facility.[50] The EnDev programme unblocked some financial bottlenecks since some companies used the RBF payments as a sort of guarantee to secure the working capital financing needed to expand their distribution channels.[52] This could also be useful in attracting interest from banks that have not entered the off-grid space yet.

4.2 Building DRE markets

In EnDev's experience, only specialised energy companies with their own distribution or retail channels applied for their RBF facility, rather than more mainstream companies or distribution channels. EnDev suggests that many of these nascent markets still require heavy marketing to establish consumer awareness and trust in cooking and energy products. Consequently, only specialised companies were willing to invest in the marketing activities needed to stimulate sales to reach the RBF sales targets and unlock payments.[52]

An assessment in Tanzania found that the RBF facility played an important role building the market, due to its associated marketing activities. However, some companies never managed to hone these skills, relying on the programme itself to build demand while they concentrated on delivery. EnDev states that this may have contributed to one company's struggle to meet sales targets.[53] Demand building and marketing activities remain crucial to many nascent DRE markets, suggesting that some RBF facilities need to support companies or renewable energy associations by providing additional technical assistance or incentivise marketing activities. This will bring additional costs but may enable more sustained market growth.

Likewise, RBF facilities have capped the number of incentive payments to ensure that no single company can dominate the available capital in the RBF fund. In the Tanzania RBF facility, firms are limited to EUR 250,000 total RBF payments and become ineligible for additional incentives as prescribed by the programme.[53] This ensures a level of competition between firms and limits the comparative advantage of larger firms, who have access to more affordable capital and are poised to quickly benefit from the RBF Facility.

4.3 Achieving impacts

Measuring delivery of products or connections does not always equate to achieving impact. For example, ICS are often touted as using less firewood, thus reducing deforestation and releasing less carbon. But a pilot in India found no statistical difference in firewood consumption between households that used an ICS versus those that used a three-stone fire.[54] As a result the RBF facility supporting these cookstove designs, in this case carbon finance, may not be delivering the assumed impact thanks to a fundamental design failure. This highlights the importance of aligning verification with the desired results or more preferably outcomes and impacts; acknowledging that simple delivery of systems does not mean that those systems are used.

Some newer RBF designs are incorporating impact into the pre-defined results and verifications. For example, the Off-Grid Fund for Zambia collates solar energy system data in real-time as a component of sales verifications for the release of RBF payments,[55] which requires appropriate technology to be built into the service or product. For cookstoves, this is possible on newer systems that release cooking gas in small, PAYG increments. However, cheaper biomass cookstoves without such technology would require deeper impact studies to verify that households are indeed benefiting from cookstoves through better outcomes such as healthier households and reduced firewood. Many of the EnDev funds use minimum system specifications to offer a 'minimum' impact, and verification surveys help define the impact more clearly, but this also depends on how households use the energy product or service.

RBF offers opportunities to incentivise ongoing maintenance challenges facing energy companies — the theory being that companies are required to provide ongoing after-sales services. However, this is not automatic. An assessment of an RBF facility in Tanzania found challenges around failed systems, poor responses to callouts for repair, and inadequate maintenance services. SNV discussed these findings with several companies, who found the feedback quite useful and adjusted how they handled customer service accordingly.[47] Lessons from

Nepal highlight that designing disbursement schedules with instalment payments could be an option for building in components like maintenance through RBF.[49]

4.4 Reaching the poorest

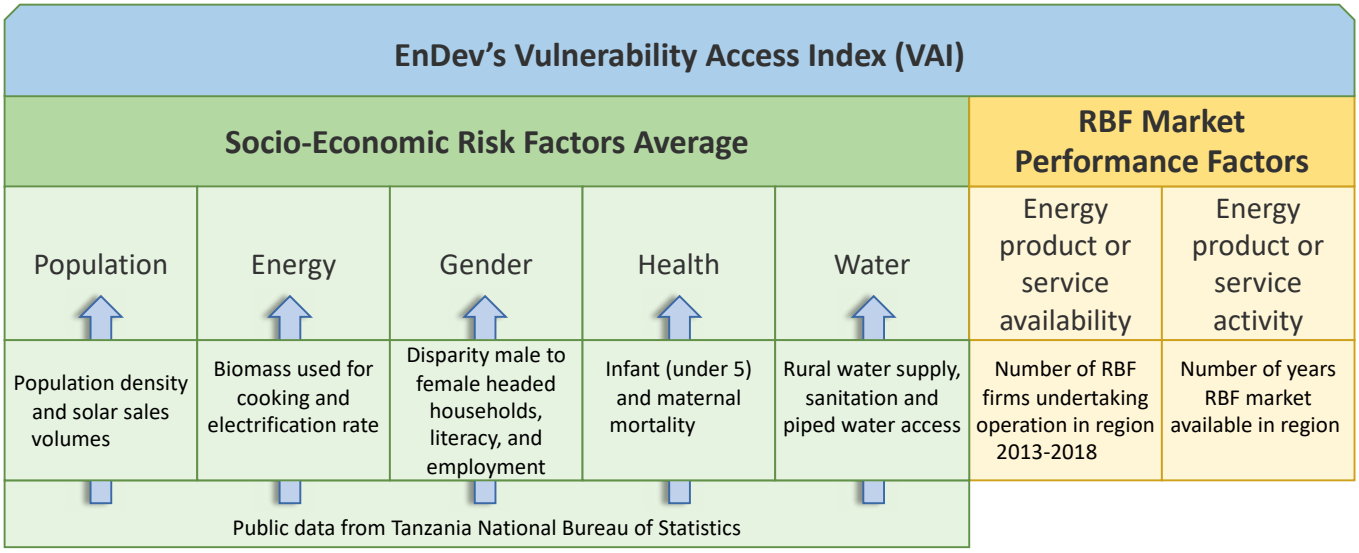
Many RBF funds are designed generically to 'build markets', but EnDev's experience in Tanzania shows how a targeted RBF might be used to reach more vulnerable households. EnDev used a VAI to identify and target regions with greater levels of socioeconomic vulnerability and less access to energy technologies. Figure 6 highlights the five socioeconomic indicators used to identify vulnerable regions using publicly available government data. Bundled with two market indicators, regions with higher VAI scores received larger payment incentives, and vice versa. Initial assessments show that that some sales have shifted to these areas because of the RBF incentive, but more research is needed as to the type of household being reached and their level of vulnerability.[49] Indeed, with pressure on companies to deliver short-term sales numbers, they may aim for higher-income households in RBF targeted areas. Without combining demand-side subsidies to decrease the affordability gap, RBF programmes that focus on supply-side will likely continue reaching higher-income households in targeted areas.

In Malawi, a government 'safety nets' programme has reached some of the most vulnerable households, linked with RBF facilities. Through the SCTP, these vulnerable households are offered a package of support that includes a cookstove and solar light voucher. EnDev and Irish Aid have supported programmes that link into that distribution channel, while simultaneously offering sales to higher-income households in the same communities. The programmes offer results-based payments to the implementing NGO, United Purpose, after verification of delivering free cookstoves and pico solar lights through the SCTP, and regular sales to other households. EnDev uses its own regional fund to make the payments, while Irish Aid has a programme linked into carbon financing — another type of RBF. By mixing supply and demand subsidies, these programmes are reaching some of the poorest households, while building markets for these products through regular sales. The poorest households cannot afford any type of cookstove — even the cheapest 'improved' stove at US$2 — and therefore demand-side subsidies are crucial to bridging the affordability gap and reaching these households. These cheaper ICS may be affordable for comparatively higher-income households in rural communities. However, 'cleaner' cookstoves, those that burn liquid fuel or electricity, require huge investments in vast fuel distribution networks, and are unlikely to find long-term customers in dispersed rural areas. These programmes do show how demand and supply subsidies have been successfully packaged together to stimulate sales, while reaching some of the most vulnerable households in the country.[19]

4.5 Looking forward for results-based financing

RBF generates a lot of data from delivery verification of energy products and systems. Sharing market intelligence would be highly beneficial for stakeholders involved across the sector on who is being reached and, perhaps most importantly, who is not. Energy companies can use this data to help build business cases to convince banks to lend; investors can get a clearer grasp of how their money is impacting households; and governments can better

Figure 6: The seven indicators from EnDev's Vulnerability Access Index *(VAI)* to target vulnerable regions



Source*:* adapted from Tanzania National Bureau of Statistics[56]

As part of the Energy Change Lab's PUE work, a welder demonstrates welding techniques to community members in Matembwe, Tanzania (© Napoleon Frank)

understand energy access needs across districts, which can help with planning and targeting future funding or subsidies.

RBF can be an effective tool, but it must be bundled with other supporting activities and financing to stimulate longer-term growth. In a recent global EnDev survey, more companies used RBF payments to expand operational expenditures (expanding distribution channels, increasing marketing, etc) rather than capital investments (scaling production, staff training and capacity development, etc).[51] In other words, companies invested money in areas that helped achieve the short-term goal of unlocking RBF payments. EnDev states that this implies that the RBF facility failed to stimulate company capital investments at scale, which can reduce costs and provide money for long-term growth. The survey reveals that 65% of surveyed companies think it is 'unlikely' or 'highly unlikely' that market growth can be sustained by itself after the RBF programme. EnDev concludes that RBF alone is not sufficient to jumpstart sustainable energy markets, and that affordability of products and services remain key challenges that must be tackled.[51] EnDev also notes that linking companies to affordable commercial finance remains critical for any type of scale up. Partnering with governments to design a longer-term, phased approach may allow facilities to begin tackling the ongoing structural issues that many companies face, such as difficult regulatory environments and limited access to commercial debt financing. Without the supporting environment and additional financing linkages, RBF will not be able to help transform energy access as it is expected to.[52]

5. RECOMMENDATIONS FOR SUBSIDIES GOING FORWARD

The rich set of lessons and experiences outlined above offer insights for other country contexts and stakeholders working to rapidly expand energy access. They build on recent reports such as TearFund's, which looks at sustainable subsidies through the wider lens of building market systems, reinforcing that both demand and supply subsidies are necessary to reach everyone with energy access.[17] Similarly, a recent report by Africa Clean Energy Technical Assistance Facility and Open Capital Advisors present a framework on how governments can design demand-side subsidies to ensure that no one is left behind — focusing on off-grid solar in sub-Saharan Africa.[57] This shows growing appetite for using better designed subsidies as a key part of the access 'puzzle'. This discussion paper aims to contribute to this debate by highlighting the critical components — in particular increasing the use of demand-side subsidies to reach the poorest — while better targeting them and planning for the long term so as to include commercial finance and private sector stakeholders. Below, these lessons are brought together into a set of recommendations.

5.1 Adjusting and targeting subsidies

1. Enable demand-side subsidies to reach the poorest, most marginalised communities and bridge affordability gaps. Alongside several other studies and IIED's own research, we can confirm that demand-side subsidies have been crucial in addressing the affordability challenges affecting many energy access projects. The lowest-income households simply cannot afford off-grid energy — a crucial enabler of livelihoods and income. Experience from Nepal shows how long-term use of subsidies to stimulate demand facilitated viable energy product/service delivery. Nepal's success in increasing access numbers illustrates how demand-side subsidies have an important contribution to make. However, it also highlights the need for a mechanism to appropriately (and fairly) adjust subsidies as markets develop. Indeed, theoretically, competition and efficiency gains should reduce the costs of supplying energy services and products — which should cut prices — and reduce the need for further subsidies. However, none of this is automatic, and mechanisms must consider market conditions, with a special focus on bridging the affordability gap.

- **Target financing instruments appropriately to adapt to households' ability to pay by understanding the target groups better.** Not everyone needs or should receive subsidies — the analysis shows that a universal price reduction was available for anyone in Nepal without access to electricity or modern cooking solutions. A better designed subsidy would have targeted more affluent households with credit-based approaches (see recommendation 4), which reduces the drain on the public coffers; and targeted demand-side subsidies to those families who cannot afford energy products and services (see recommendations 2 and 3). The targeting of the most vulnerable households in Malawi shows how RBF can be wrapped into other programmes as an incentive to support delivery of cookstoves (and pico lights). Combined with demand-side subsidies to make systems affordable for the poorest households, this shows how a comprehensive programme can reach some of the most vulnerable households, while being buttressed by commercial distribution.[19]

2. Define demand-side subsidies based on a comprehensive analysis of multi-dimensional factors that take finance availability and needs of end-users into consideration. Context is key: there is no one formula for setting demand-side subsidies. Nepal's experience shows that geographic targeting has been helpful but has also resulted in leaving the most marginalised people behind — resulting in a waste of already limited public funding. It is important to:

- **Understand public finance availability and limitations.** Demand-side subsidy design and planning require good

Solar powered irrigation system for small-holder farmers, Nepal (SunFarmer, Nepal)

understanding of long-term public finance availability (government budget forecasts and other public finance sources) to ensure sustainability of subsidies as well as coordination across programmes and between grid and off-grid (with a mindset of least-cost electrification planning).

- **Understand local needs and factors that influence uptake of DRE.** This requires more data and more localised planning that can assess factors that affect DRE uptake among the most marginalised groups — such as willingness to pay, ability to pay (including income variations, ability to earn an income), migration (for example Dalits in Nepal tend to migrate more frequently),[58] ability to meet subsidy requirements such as identity verifications (and how this may affect subsidy access for the poorest households), education levels and awareness of RETs.

Availability of data (eg on resource availability, income, energy expenditure, ability to pay, marginalisation) remains one of the key challenges at the local level. Some potential options for meeting these data gaps are discussed below.

3. Address data gaps with more systemic engagement at the local level. Opportunities for better targeting of subsidies exist in countries like Nepal where in the new federalised structure, local governments manage subsidies, and Kenya where planning has been devolved to local governments. Other opportunities include working with networks of local CSOs and engaging with local communities through systematic linking with existing programmes. By recognising and integrating pre-existing marginalisation in different contexts, financing instruments can be designed to target those who require demand-side subsidies the most. Funding should be allocated for planning processes which are systematic, participatory, and inclusive to address the exclusion and under representation of marginalised communities from political processes. Some ongoing processes being trialled include:

- **Engaging with existing planning mechanisms.** Local governments in Nepal already use participatory planning each year, which provides an entry point to integrate energy. The FCDO funded NREP is currently developing data-driven and evidence-based baselines to indicate current energy scenarios in three provinces. These aim to support provincial and local governments to make better informed decisions in their budgetary and planning processes, and support the local governments to collect, use and monitor data. However, to avoid politicisation and further exclusion of marginalised groups it is important to integrate more systematic approaches to energy planning into existing processes.
- **Using participatory and inclusive planning tools to co-generate data in a systematic way.** In Kenya IIED and CAFOD are using a participatory planning process for

county energy planning using the Energy Delivery Model Planning Toolkit. They engage with key stakeholders including community members, from the start to understand priority needs, build ownership and develop solutions that are tailored to the local contexts. They use delivery models and financing options specific to target groups. So far, cross-ministerial engagement has helped accumulate and pool data on multiple sectors (eg water, health, agriculture), and build understanding among key ministries on energy as an enabler for meeting sectoral priorities. This also highlighted various socio-economic and cultural dynamics that are critical when designing finance delivery models — such as subsidies for vulnerable groups. This is an ongoing project and learning will be shared.

- **Using the data produced through verification of RBF systems.** RBF schemes require extensive verification from a third party to validate sales delivery and household usage to unlock RBF payments. The data could be used to help address data gaps on the ground and give richer detail of impacts in households across different districts. This could in turn help inform government policies and subsidies to fine tune energy access efforts.

Mechanisms and tools that use existing data and government structures to deliver energy services and products to poorer and more remote households can help target subsidies more appropriately and precisely. For example:

- **Target RBF through a vulnerability assessment.** EnDev's RBF in Tanzania used a VAI based on state census data to target regions that have socio-economic vulnerability and less access to solar products. Initial results show that the VAI has successfully nudged sales towards vulnerable regions that may not have been reached otherwise. The tool could be adapted from regional to district, and even at ward levels, to better target vulnerable communities, although getting accurate data at lower administrative levels can be challenging.
- **Government safety net programmes can be an efficient way to increase access for the poorest households.** In Malawi the RBF programme differentiated incentives by aligning with the national SCTP which targeted the most vulnerable 10% of households. Defining which households to include involved extensive data collection and engagement with local authorities. Households are reviewed every four years, and those exiting the programme are additionally incentivised with a lump sum payment.[59] The RBF project distributed vouchers as a direct demand-side subsidy to 80,000 of these households to access free ICS. Catalysing the market for ICS was a secondary objective where RBF incentives were given to reach non-SCTP households in non-commercial markets.[52] Alignment with SCTP could be a more coordinated and efficient way to provide targeted demand-side subsidies.[49]

5.2 Enhancing end-user access to credit financing

4. More affluent households may also need access to affordable financing:

- **Encourage partnerships and add end-user credit** to the financing mix by partnering with commercial banks and/or MFIs to reach more affluent households who do not require subsidies and businesses. Credit financing approaches can include demand-side subsidies (eg interest subsidy to the end-user) or supply-side subsidies (eg concessional loans to suppliers). In countries like Nepal, where mobile money penetration is low, there are opportunities to leverage the long-standing relationships with MFIs. The UN Capital Development Fund has piloted several successful financing approaches through partnership models with energy companies, MFIs and commercial banks. One model promoted a partnership between commercial banks and MFIs, supporting them with technical assistance and wholesale credit to catalyse consumer energy lending.[60,61] Further opportunities exist with GoN's mandate to open at least one bank branch in every municipality. Equity Bank in Kenya has successfully partnered with energy companies, extending consumer loan packages to more customers while promoting partner energy products and services within their branch offices.[62]

5. Leverage partnerships to push commercial finance further. Partnerships in Kenya between financial institutes and cookstove distributors offer lessons on expanding access to consumer financing for cookstoves. The Kenya Union of Savings and Credit Cooperatives (KUSCCO) partnered with a cookstove distributor and experimented with a loan tenor of six months with 6% interest to its Savings and Credit Co-operative Societies (SACCOs), and with on-lending capped at 10% for individuals taking loans for cookstoves. KUSCCO and stove distributors leverage each other's networks for marketing, and SACCOs aggregate demand and bulk purchase. While impressive in selling 13,000 cookstoves, this facility had not scaled as the small loan sizes deterred individuals from going through the complicated loan process, among other challenges.[63] Streamlining loan processes would be crucial to reducing these barriers to reach more households with cooking solutions. For example, Equity Bank in Kenya reduced the seven-page loan application to a single page, used its mobile money platform to automate the process, and reduced processing time to 24 hours. Equity also leveraged its network of 30,000 agents in small retail shops with the cookstove distributor's expertise, and incentivised agent sales.[63] But given limited household appetite for smaller cookstove loans as well as transaction costs, achieving consumer loan sizes smaller than US$10 — Equity Bank's minimum — may not be viable. Through its partnerships on consumer financing, Equity Bank has been convinced of the DRE business case and is now offering loans to DRE businesses.[13]

5.3 Risk identification and management

6. Actively identify and plan for risks across the subsidy delivery models. Revisit risk analysis on a regular basis to align with changing market conditions. Key risks emerging from this research include:

- **Inefficiency — delays in payments and bureaucracy can lead to unintended outcomes such as price fixing.** Some stakeholders from Nepal highlighted that additional costs are often added to the retail price by the RET companies to make up for costs incurred by them in the subsidy release process, due to lengthy application processes, delayed payments, and lengthy verification processes. In other words, companies are passing on some of the costs of subsidy schemes to end-users.
- **Sustainability — some companies may only be involved for the period of subsidy availability, thus long-term maintenance and warranty opportunities could be affected.** This was an initial criticism of RBF, which KOSAP is attempting to address by paying out in smaller numbers of instalments.
- **Unfair competition — pre-qualified companies selected with opaque criteria and not periodically reviewed and updated can lead to poor value for money and malpractice.** Having systematic processes will improve quality control, but also means if selection processes and standards are not updated periodically, they can hinder innovation and make certain players stronger — resulting in malpractice as learnt in Nepal.
- **End-user awareness — energy customers often do not know what to expect, and what recourse mechanisms there are.** It is important to integrate awareness raising activities for end-users on availability of subsidies and quality of products. Some stakeholders[64,45] argued that lack of knowledge of subsidy availability may have prevented more marginalised communities from accessing them. Similarly lack of understanding of quality and value of energy products/services prevents communities from holding institutions and companies to account on products they deliver. Dedicated awareness raising campaigns among lower-income social groups need to be integrated into subsidy delivery programmes.
- **Local company capacity — international companies are better resourced and capacitated to access subsidies, risking leaving local companies behind.** Integrate technical assistance into subsidy programmes to encourage more local companies to benefit from subsidies through capacity building interventions and facilitate policy dialogues that can support market activities. RBF experience shows that more local companies need support to access RBF. This could also include engagement with wider stakeholders such as commercial banks to increase lending to end-users.

Further research and analysis are needed to better understand these drivers and identify other risks to programme success.

5.4 Unlocking commercial finance for energy company growth

7. Ensure subsidy programmes are packaged with affordable commercial finance to achieve longer term sustainability for energy products and services. For example, in Nepal's subsidy programme and in RBF facilities, companies must pre-finance the distribution costs of services and products to secure subsidy payments from the government. A lack of affordable commercial financing for these working capital needs, in addition to instalment payments, ties up capital and hinders companies from scaling up activities. Access to more affordable working capital could allow energy companies to deliver more quickly and efficiently. And reducing these subsidies over time, while strengthening links to affordable commercial financing, would enable companies to ween their business plans off subsidies, towards regular market sales. This could lead to greater transparency and reduced subsidy misuse, for instance by reducing inconsistencies, and mitigating the price-fixing of DRE technologies.

One way of achieving this is using project funding to link subsidies with commercial finance. The cookstove sector in Malawi has been developed through decades of donor funding. But recent politics and a pandemic are threatening aid budgets. With many cookstove enterprises reliant on external funding, donors and implementors must strive to connect projects with sustainable financing through commercial banks. Unlocking affordable debt for businesses is important if their operations are to expand to reach more markets and achieve lower unit costs. Donors and projects may need to consider additional instruments — guarantees to reduce perceived lending risk and technical assistance to complement and nurture financing linkages, for example.[65]

6. FUTURE DIRECTION FOR SUBSIDIES

Debates on subsidies are not new; nearly every country has used them to provide energy access. But how the subsidy instrument is used and how it is adapted (or not) to a rapidly changing context varies considerably, and is influenced by many factors including politics, investor attitudes and discourse, and available data on effectiveness. Subsidies are clearly needed; despite off-grid technologies driving down the cost of rural electrification, a huge affordability gap remains, and many markets still need support to grow more rapidly. There is greater urgency now with the need for a COVID-19 recovery and SDG 7's 2030 targets closing in — even more so in energy for cooking where progress has been slow.

This paper has highlighted that subsidies are not a 'silver bullet'; indeed they have often been sub-optimal or in some cases damaging, but they have an important role to play. There is much for sub-Saharan Africa to learn from the successes and failures of South Asian countries like Nepal and Bangladesh on how to design subsidies effectively, including increased use of demand-side subsidies for decentralised energy service delivery; better targeting; consistent communication and engagement with market players; and linking to commercial finance to achieve longer-term sustainability. Equally there are promising examples in African contexts — combining subsidies with other supporting policy and regulation to encourage a healthy private sector and market growth, for example.

Subsidy schemes also need to better consider long-term sustainability, and for this exit strategies need to be developed with processes to monitor and adjust implementation plans, policies, and methodologies — ensuring the typical concerns of market distortion and public finance waste can be mitigated. But lessons on how subsidies can be used effectively and can be adapted or phased out to enable energy access, are currently lacking. As seen from Nepal's experience, long-term subsidy programmes have enabled the DRE market to grow, but also limited the programmes' ability to phase out subsidies. A comprehensive analysis of policy changes or programme design elements would be required to define appropriate exit strategies for specific subsidy programmes. This should include an analysis of the political economy and power dynamics of stakeholders to provide useful lessons for other countries. In addition, compiling lessons from other sectors such as agriculture that have received subsidies for many years would garner insights for the energy sector.

IIED will continue to work with in-country partners of the GIE programme and other local stakeholders in the countries studied, as well as broader policy and advocacy audiences, ensuring that new lessons on financing are incorporated to drive forward efforts in reaching energy access for all.

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ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
AEPC	Alternative Energy Promotion Centre
BCT	Brahmin, Chhetri and Thakuri
CSO	Community Support Organisations
DRE	Decentralised renewable energy
EnDev	Energising Development
ESMAP	Energy Sector Management Assistance Program (World Bank)
FCDO	Foreign and Commonwealth Development Office
GIE	Green and Inclusive Energy
GoN	Government of Nepal
IDCOL	Infrastructure Development Company (Bangladesh)
ICS	Improved cookstoves
IIED	International Institute for Environment and Development
KOSAP	Kenya Off-Grid Solar Access Project
KUSCCO	Kenya Union of Savings and Credit Cooperatives
LPG	Liquefied petroleum gas
MFI	Microfinance institution
MGEAP	Mini-Grid Energy Access Programme (World Bank)
NEA	National Electricity Authority
NGO	Nongovernmental organisation
NREP	Nepal Renewable Energy Programme
NRREP	National Rural and Renewable Energy Program
PAYG	Pay-as-you-go
RBF	Results-based finance
RET	Renewable energy technologies
RERL	Renewable Energy for Rural Livelihoods
SACCOs	Savings and Credit Co-operative Societies
SASEC	South Asia Sub-regional Economic Cooperation
SCTP	Social Cash Transfer Programme
SDG	Sustainable Development Goal
SHS	Solar home systems
SNV	Netherlands Development Organisation
VAI	Vulnerability Access Index

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