

FINANCING DECENTRALIZED RENEWABLE ENERGY FOR THE LAST MILE

*What funding sources
and instruments can be applied?*

DISCUSSION PAPER

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This background discussion paper seeks to explore the opportunities to unlock finance for Decentralized Renewable Energy (DRE) solutions that impact the 'last mile', thereby providing an impetus to the work on accessing affordable credit for DRE. The paper is a work-in-progress and is based on a rapid desk review of literature and the experiences of key organizations in the sector^a, to better understand what has worked and what opportunities are worth exploring in the future. The author would like to thank Divyam Nagpal (University College London), Nipunika Perera and Kevin Johnstone (IIED), Rita Poppe and Eco Matser (Hivos) for their inputs that helped inform and strengthen this discussion paper.

While this is not an exhaustive piece of research, it is an attempt to revitalize the discussion on the types of sources and instruments that could help address the challenge of financing DRE for the 'last mile' where affordability is a major constraint. Hivos welcomes comments and feedback on the instruments, sources and opportunities suggested here, including the practical feasibility of realizing these opportunities.

a. These include: SEforAll Initiative; partners of the Brooklyn Coalition comprising the governments of the Netherlands, Kenya and Nepal, private sector companies SELCO and Schneider Electric, and Civil Society Organizations Hivos, ENERGIa and SNV; and other organizations such as the International Institute For Environment and Development (IIED), Practical Action, Catholic Agency for Overseas Development (CAFOD), Overseas Development Institute (ODI), SNV Netherlands Development Organization, Oil Change International amongst others.

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1. INTRODUCTION

1.1 OVERVIEW OF ENERGY ACCESS FINANCING

One of the key barriers to delivering energy solutions for the rural and urban poor is the limited access to finance at the local and national levels and insufficient targeted finance flows at the international level. Historically, investments in energy access have been more successful at meeting the needs of urban and semi-urban communities through grid-based electricity than the needs of far-flung rural and urban poor communities. This is evidenced by the fact that of the \$30.2 billion committed for electricity access in 2015-16, \$24.3 billion was allocated to finance grid-connected generation¹. While there is increasing attention and interest in enabling greater investments to poorer communities across regions for energy access, the specific options and mechanisms to be used in varying contexts are still being tested and yet to be clearly defined.

The International Energy Agency (IEA) estimates that 70% of sub-Saharan Africa will be electrified through distributed energy solutions. Other research has also indicated that decentralized electricity solutions would be the least cost solution for the large majority of unconnected populations across countries such as Bangladesh, Kenya, Togo². The marginal cost of connecting dispersed users to the national grid will be expensive and is often prohibitively high for distribution companies in many countries faced with the electricity access challenge³. Despite the potential for DRE to address energy access, analysis indicates that of the total energy access finance tracked in 2015-16, only 1.3% was directed towards off-grid/ Decentralized Renewable Energy (DRE)^b solutions, including mini grids, solar home systems and pico-energy products⁴.

Even with increased commitments from international development organizations^c, Development Finance Institutions (DFIs)^d and investors to finance DRE solutions, there are challenges specific to the 'last mile':

- High transaction costs incurred by DFIs and International development organizations in financing smaller volumes or smaller ticket sizes⁵
- Mismatched expectations on what are acceptable and realistic returns on investments in energy enterprises that are focused on the 'last mile' where affordability is a constraint⁶
- Siloed perspectives of national governments and international organizations, preventing a more integrated approach where energy interventions are financed as part of other development projects
- Low risk appetite amongst national banks, local financial institutions to lend to the 'last mile', which may also be a consequence of limited understanding among local financiers of DRE financing and risk mitigation mechanisms^{7/8}.

While the exact amount is debated, there is overarching consensus that the amount of finance required is quite large and there is a substantial gap between what is needed and the existing financing flows. Based on the tiers/ levels of energy service being targeted, the estimates for electricity access range from \$2bn to \$55bn annually⁹. These will change based on changes in expectations of end users (tiers and consumption levels), appliance efficiency and the possibilities of powering more appliances to bring about larger development benefits beyond the household.

b. "Decentralized renewable energy is recognized as renewable energy (solar, wind, small hydro) distributed... through mini-grids and off-grid installations". For the purposes of this paper, it also includes systems that can be integrated with the grid in the future. Modified based on the definition in the SDG7 Policy brief, submitted at the HLPF 2018, available here: <https://sustainabledevelopment.un.org/content/documents/17589PB24.pdf>.

c. For the purposes of this paper, International development organizations includes the list of bilateral and multilateral organizations (for example: UN agencies, European Union, GIZ, DfID, DANIDA, USAID and so on) involved in channelling development aid and Official Development Assistance (ODA). In this paper, Non-Governmental Organizations (NGOs) are not included in this category.

d. Development Finance institutions: According to the OECD (Organization for Economic Cooperation and Development), national and international development finance institutions (DFIs) are specialised development banks or subsidiaries set up to support private sector development in developing countries. (For example: World Bank, African Development Bank, Asian Development Bank, European Investment Bank, KfW (Germany), AFD (France) and so on).

Against this background, the paper highlights certain instruments and financing sources with the potential to meet the needs of the 'last mile'. It includes examples of where they have been used before in the energy delivery value chain- consumer credit, enterprise finance or strengthening the energy ecosystem or enabling environment. Based on this, it aims to initiate discussion and action going forward on the specific role and types of financing required from key stakeholders- including governments, international development organizations, DFIs, private foundations and investors.

1.2 DEFINING THE 'LAST MILE'

Since this paper focuses on enabling energy access to the 'last mile', it would be ideal to clearly define this segment. However, various organizations in the energy access sector are still grappling with questions of what constitutes 'last mile' and investment in this segment¹⁰. To arrive at some common understanding for the purposes of this paper, it is worth reviewing the characteristics of 'last mile' communities^{11/12}:

- Geography- areas beyond the reach of the grid or that are under-served
- Socio-economic characteristics of the community- including low income, high vulnerability, exclusion
- Scarcity of resources- including low levels of energy consumption
- Not a homogenous group- consists of sub-groups with varying socio-cultural characteristics, levels of willingness to pay and ability to pay for energy access

Additional work is required to characterize sub-groups within the 'last mile', to develop customized financing options for each taking note of accessibility to and affordability of credit.

Investments in energy access for the 'last mile' would require support for three main categories of stakeholders: energy end-users, energy providers (such as enterprises) and ecosystem developers or organizations involved in strengthening the ecosystem (such as Civil Society Organizations (CSOs), technology and system innovators, financiers, local government agencies and so on). These stakeholders and their specific credit needs are discussed in the next section on 'Demand'.

1.3 AIM OF THE PAPER

The purpose of this paper is to explore and outline a range of financing options that can enable better delivery and maintenance of DRE solutions for the 'last mile', thereby accelerating the efforts on energy access provision. It does so by conducting a desk review of the literature and organizational experiences to identify various financing sources and instruments that could be deployed to meet the energy access needs of the 'last mile' using DRE solutions.

It also seeks to identify sources of finance in other development sectors that have the potential to integrate energy into nexus projects.

While this is not an exhaustive piece of research of what exists and what works best, it is an attempt to begin a discussion on what types of sources and instruments could help address the challenge of financing DRE provision for the 'last mile'.

Given the complex nature of the cooking sector, with behavioural aspects and other motivations affecting the adoption of clean cooking solutions, this paper chooses to focus on DRE for electricity and outlines examples and recommendations for the same. However, the recommendations, potential sources and instruments presented here could also be reviewed, adapted and applied to the clean cooking sector^e.

Section 2 provides a brief outline of the type of financing needs to be met and reviews the mechanisms or instruments that are most suited to meeting the needs of the 'last mile'. Section 3, a key focus of the paper, provides an overview of the potential sources of financing, with examples of where they have been used or have the potential to be used in financing energy access interventions. It then discusses key opportunities for using these sources, with a note on the current gaps and potential next steps. The paper ends with a set of overarching recommendations critical to strengthening the energy ecosystem or enabling environment and ensuring sustainability for the financing deployed.

e. Leveraging the efforts of existing organizations and alliances focused on clean cooking, including the Clean Cooking Alliance, Modern Energy for Cooking Services (MECS), Global LPG partnership and others.

2. DEMAND SIDE: NEEDS AND INSTRUMENTS

In order to set the context for the type of financing required, it is worth reviewing the specific financing needs of the key stakeholders. This is followed by a description of the instruments and mechanisms with the most potential to meet these needs given affordability constraints. Additional details on the typical target group for each instrument, typical source of finance and their value-add in meeting the needs of the 'last mile' are also discussed.

2.1 ENERGY FINANCING NEEDS OF KEY STAKEHOLDERS

The key stakeholders requiring finance for energy access are broadly categorized into (a) Energy End users (b) Energy providers and (c) Ecosystem/ Enabling environment actors. An overview of their needs for finance are summarized in Table 1 below^f.

TABLE 1
FINANCING NEEDS OF KEY STAKEHOLDERS^f

TARGET GROUP AND STAKEHOLDERS	INDICATIVE LIST OF TYPICAL FINANCING NEEDS
ENERGY END-USERS EXAMPLES	
<ul style="list-style-type: none"> Households Small enterprises and local livelihoods (including agriculture) Health, education and community institutions 	<ul style="list-style-type: none"> One-time down payment for energy system (margin money/ deposit for loan; connection fee) Ongoing payments for energy system (loan instalments or tariff) Annual maintenance fee and service payments Purchase of efficient appliances/equipment (particularly in the case of small enterprises, local livelihoods and health, education and community institutions) Replacement of batteries or specific components post the warranty period (within the lifetime of the larger asset) Upgrading energy system (higher tariff, electricity bill or loan for additional generation capacity) Start-up capital for livelihoods/ enterprises resulting from energy access (productive use of energy)

table continues on next page ▼

^f Modified based on the table summarizing financing needs presented in Kaijage, E., Nyagawa, S., Best, S., Cosmas, R., Temba, S., Mtwanga, B., Mahanga, N. (2017) Money is Power: Tracking finance flows for decentralised energy access in Tanzania. IIED Working Paper. IIED, London.

TARGET GROUP AND STAKEHOLDERS	INDICATIVE LIST OF TYPICAL FINANCING NEEDS
ENERGY PRODUCERS	
<ul style="list-style-type: none"> • For-profit enterprises- micro, medium and small-sized • NGOs engaged in service delivery 	<ul style="list-style-type: none"> • Seed capital for early stage innovation and R&D on product-service-systems • Pilots and demonstration projects to prove the service model • Working capital for operations • Consumer finance/ credit to address affordability gap of end-users • Internal capacity building and training • Credit for growth and expansion • Capital for diversification of products and solutions and upgrading technology to meet consumer needs • Credit or fee to enable servicing in distant/ remote areas
ECOSYSTEM/ ENABLING ACTORS	
<ul style="list-style-type: none"> • Financial institutions and intermediaries including local banks, MFIs, organizations/ platforms involved in aggregation • National government • NGOs and CSOs • Technology innovators • Training institutions (including actors working on nexus development issues) 	<ul style="list-style-type: none"> • Concessional finance to extend credit to energy end-users and producers, • Capacity building and training (of technical, financial and operational actors) • Technical assistance, field-based innovation and incentives to support energy producers in meeting needs of end-users • Market development (feasibility studies, resource mapping etc.) • Policy and regulatory arrangements (reforming policy, designing and implementing laws for product standards, regulating electricity tariffs etc.)

2.2 POTENTIAL INSTRUMENTS AND MECHANISMS TO MEET NEEDS⁹

While the financing needs vary for the different stakeholders, common elements exist. Access to affordable, low-cost financing under favourable terms is found to be critical for all. Public finance plays a crucial role in delivering such financing, however it is limited in nature given the magnitude of the investments needed to reach universal access. Public financing instruments that maximise efficiency and effectiveness, while also catalysing private capital (when possible) are critical to meet the needs of different stakeholders. Examples of the use of such instruments, including revolving funds, credit enhancement schemes, subsidies and aggregation exist and, if deployed in the right contexts, have the potential to meet some of the needs of key stakeholders discussed in Table 1. While many of these may not have been tried at scale, these instruments and mechanisms provide an opportunity to impact the 'last mile', through infusion of soft capital and blending various forms of capital. Table 2 provides additional details on the instruments including key stakeholders involved, the value-add and some examples of where they have been used before.

a. Revolving Funds:

A revolving fund can be created to address small and large credit needs (for energy end users or energy enterprises). It is particularly relevant in communities and contexts that have limited access to formal financial institutions and/or have inadequate credit flowing through their informal savings-credit channels¹⁴.

This would need an initial infusion of grants (or extremely low-cost loans) with an operational budget for local institutions to manage the funds. By using grant capital and providing loans at low interest rates and longer tenures (in comparison to Micro Finance Institutions (MFIs) or banks), it is able to improve credit access for energy while also taking into account affordability constraints. Based on the examples provided in Table 2, depending on the country context, the size and purpose of the fund, interest rates could be as low as 3-8%, with tenures ranging from 4 months to 24 months^{15/16}. A percentage of the interest payment would be used to cover the administrative expenses of the local institutions.

As repayments begin to come in and the corpus replenishes, loans can be extended to additional number of households/ enterprises.

⁹ While there are subtle differences between the terms 'instruments' and 'mechanisms' for financing, this paper uses them interchangeably.

Depending on the context within the community, these revolving funds can be used to access DRE systems and efficient appliances for households, small businesses/ local livelihoods or be used by energy providers to cover the capital cost of specific energy access projects.

b. Concessional debt and credit enhancement options (guarantees) through financial institutions:

Accessing credit at concessional rates can address affordability challenges faced by households and small businesses in purchasing DRE solutions. Concessional debt is also required by energy enterprises and providers to expand to new areas and begin operations. It is important to have strong local financing institutions to help energy users and providers access concessional finance.

Typically, concessional finance has been used for large scale projects by DFIs and international development organizations. But there is an opportunity to also use it for smaller ticket size financing for 'last mile' households and enterprises. However, a key aspect to address here is the transaction costs involved in facilitating concessional debt, which may also need to be covered through soft-funding sources.

Credit enhancement options, such as guarantees, can be an effective way to engage with households and small businesses that have so far lacked access to formal financial institutions. Guarantees can allay the concerns of investors and financiers and help 'last mile' energy users develop a credit history which could unlock financing for other household needs as well.

c. Subsidies on DRE systems and tariffs:

Grid connected electricity as well as more traditional sources such as kerosene and diesel benefit from overt as well as hidden subsidies, in comparison to DRE systems. While the introduction and removal of subsidies is controversial and motivated by a number of social and political factors, there is now some interest in finding the right ways to design and implement subsidies for DRE systems. Defining the population that would benefit from such subsidies is a critical element. Criteria such as the quantity of energy consumed, the type of energy source, the location of recipients, and the socio-economic background of recipients needs to be considered in building energy safety nets¹⁷.

This could include moving away from kerosene subsidies to consider Direct Benefits Transfer (DBT) or energy subsidies/ vouchers that provide customers the option to choose their preferred energy solutions. It could include subsidies on connection costs or electricity tariffs for micro-grids. They could also be channelled through local financial institutions as concessional credit to make DRE solutions more affordable.

Research has shown that subsidies could shape sustainable markets if designed appropriately for local contexts, available for an extended period with clear timelines and plans for phase-out, structured to avoid crowding out private investment and include a process of standardization for quality assurance, and support beyond finance¹⁸. There is ongoing research, with a focus on at least 3 countries to understand more about energy safety nets, the mechanisms that have been used and what impacts they have and could have in the future¹⁹.

d. Aggregation:

Aggregation is a promising avenue to explore to attract more funding into the sector. Aggregation pools investor money and can

blend public and private financing to channel large volumes of funding into enterprises and end-users that have smaller financing needs. Aggregation can reduce risk by spreading investments across projects and portfolios, which is not necessarily a new concept, but newer to this specific sector²⁰.

By pooling together smaller loans and assets from DRE projects and enterprises, aggregation can create larger investment products that meet the needs of investors seeking bigger investments such as DFIs, international development organizations and investors²¹. This enables local energy companies to access debt for projects. New investment products can be created, and new markets stimulated by aggregating small loans into more attractive, large investment opportunities and combining them with incentives such as results-based financing²².

Beyond finance, organisations and platforms can use aggregation to build the capacity of key stakeholders, enforce product and performance standards and establish platforms for information sharing²³. Aggregation can reduce the transaction costs associated with doing business with many smaller projects or companies. Typically, organisations that use aggregation look for common elements in companies or projects to standardise such as geographical location, business model, or technology type.

e. Results-based financing (RBF):

Some international development organizations, working with CSOs have introduced RBF as a mechanism to overcome the challenges faced by energy providers in reaching a wider base of end users in rural areas²⁴. This includes the issues of high transaction costs involved and limited access to working capital for energy providers.

The use of RBF is contingent on the ability to measure desired outcomes and attribute these outcomes to the programme²⁵. Payments are made after results have been achieved and verified. One RBF programme has spoken of specific incentives for (1) reaching certain types of communities or households and businesses with low income (2) After sales servicing (3) establishment of local sales agents and resellers and so on²⁶. It is important to ensure the RBF programme is structured well, with the right conditions about the target end-user and expected outcomes. There is evidence to suggest that it needs to be viewed as part of a larger energy access market development programme and one among a host of tools to enable energy access for the 'last mile'²⁷.

In this discussion on instruments, it is important to speak of equity. While equity, more broadly, is a critical instrument for enterprises in any sector, a large infusion of patient equity is particularly important to enabling 'last mile' energy access. Given the nature of the market and the nascent energy ecosystem, energy providers and enterprises need to undertake a number of non-revenue generating activities as part of energy provision²⁸.

Patient equity has characteristics such as longer-time horizons, lower expectations of Internal Rates of Return (IRR), higher tolerance for risk and the larger goal of maximizing social rather than financial returns^{29/30}. While Table 2 does not discuss it in greater detail, it is worth noting that patient capital, and patient equity in particular, is required at various stages in the growth of an energy enterprise from the initial planning stage, through testing and refining the business model to scaling up the enterprise.

TABLE 2
INSTRUMENTS: KEY STAKEHOLDERS,
VALUE-ADD AND EXAMPLES

INSTRUMENT	KEY STAKE HOLDERS			VALUE-ADD FOR THE 'LAST MILE'	EXAMPLES OF THEIR USE (FOR ENERGY OR OTHER DEVELOPMENT INTERVENTIONS)
	TYPICAL SOURCES OF FINANCE	TYPICAL INTER-MEDIARIES	TARGET GROUP	VALUE ADD	EXAMPLES
REVOLVING FUNDS	<ul style="list-style-type: none"> • Private foundations • International development organizations' and DFI grant funding • Government budgets • CSR funding 	<ul style="list-style-type: none"> • Community-Based Organization (CBO) • Local cooperative/ Village energy committee • MFIs and local banks (in case of larger amounts) 	<ul style="list-style-type: none"> • Energy users • Energy providers 	<ul style="list-style-type: none"> • Operates where formal financial institutions are inaccessible owing to lack of credit history • Helps develop credit history and enables communities to become 'bankable' in the long term • Supports local community in building a corpus to support further financing (of DRE systems or related appliances and capacity) 	<ul style="list-style-type: none"> • Established as a revolving fund, Hivos-Triadodos Fund, began by investing in MFIs to facilitate small loans to entrepreneurs in developing countries and has expanded to support renewable energy and sustainable agriculture initiatives^h • Technical assistance from ADB-for rural community-based energy in Mindanaoⁱ, used to provide microcredit to households to cover the cost of electrical connections, purchase of appliances and fund livelihood enhancement activities • Innovative Clean Energy Finance for Cambodian Farmers enabled small enterprises in agri-food sectors to access clean energy finance^j • Thailand Energy Efficiency Fund^k, used by participating banks to extend credit to companies undertaking projects on Energy efficiency and Renewable energy • SELCO Foundation intervention with CBOs in India^l, used to extend loans for Solar Home Systems to households in remote areas

^h. Details available here: <https://www.hivos.org/program/hivos-triados-fund/>

ⁱ. Details available here (Page 56): <https://www.adb.org/sites/default/files/project-document/179701/44132-012-tacr-01.pdf>

^j. Details available here: <https://www.reeep.org/projects/innovative-clean-energy-finance-cambodian-farmers-nexus>

^k. Details available here: https://unfccc.int/sites/default/files/fs-unep_thai_eerf_finaL_2012.pdf

^l. Details available here: <https://selcofoundation.org/wp-content/uploads/2017/06/GIZ-Innovation--Replication-Case-Study-Booklet.pdf>

INSTRUMENT	KEY STAKE HOLDERS			VALUE-ADD FOR THE 'LAST MILE'	EXAMPLES OF THEIR USE (FOR ENERGY OR OTHER DEVELOPMENT INTERVENTIONS)
	TYPICAL SOURCES OF FINANCE	TYPICAL INTER-MEDIARIES	TARGET GROUP	VALUE ADD	EXAMPLES
CONCESSIONAL DEBT AND CREDIT-ENHANCEMENT (GUARANTEES)	<ul style="list-style-type: none"> • Private foundations • International development organizations • DFIs • Government budget (including subsidies and tax revenue) 	<ul style="list-style-type: none"> • Commercial banks • Cooperative banks • MFIs • Crowdfunding platforms • Organization or platforms that use aggregation 	<ul style="list-style-type: none"> • Energy users • Energy providers • Energy ecosystem actors (particularly local financial institutions and governments) 	<ul style="list-style-type: none"> • Interest subsidies and waivers on down-payments make loans more accessible and affordable • Longer repayment periods enhance affordability by reducing the amount to be paid on a monthly basis; can be accommodated within the monthly cashflow of the energy provider or user • Credit guarantees mitigate the risk of payment defaults for lenders and investors • Enhance creditworthiness of projects/ customers and help improve access to capital for energy providers and users who lack credit histories 	<ul style="list-style-type: none"> • Hivos-Triadós fund referred to above also provides concessional debt • SELCO, with support from the Renewable Energy and Energy Efficiency Partnership (REEEP), developed a programme providing interest subsidies and credit guarantees to support communities that lacked bank accounts and credit worthiness to access bank loans for DRE systems^m • IDCOL's concessionary loans for solar irrigation pumps and solar mini grids, with tenures of around 10 years at annual interest rates of 6%, was far lower than commercial banksⁿ • The Indian government's National Solar Mission in the initial stages included an interest subsidy to support un-served households in accessing bank loans for solar home systems.

m. Details available at: <http://www.selco-india.com/public/pdf/households.pdf>

n. Details available at: <http://pubs.iied.org/16651IIED>

INSTRUMENT	KEY STAKE HOLDERS			VALUE-ADD FOR THE 'LAST MILE'	EXAMPLES OF THEIR USE (FOR ENERGY OR OTHER DEVELOPMENT INTERVENTIONS)
	TYPICAL SOURCES OF FINANCE	TYPICAL INTER-MEDIARIES	TARGET GROUP	VALUE ADD	EXAMPLES
SUBSIDIES ON DRE SYSTEMS AND TARIFF CONCESSIONS	<ul style="list-style-type: none"> • National government budget (including subsidies and tax revenue), • International development organizations • DFIs • Private foundations (in rarer cases) 	<ul style="list-style-type: none"> • National and local government agencies • National, Commercial and Cooperative banks • Organizations or platforms that use aggregation • Energy providers (tariff subsidies on electricity from micro/mini grids) 	<ul style="list-style-type: none"> • Energy users 	<ul style="list-style-type: none"> • Reduces the cost at which DRE is accessible and makes it more cost competitive to current unreliable fuels such as kerosene, diesel etc. • Critical to ensure that subsidies are well-targeted, implemented with clear timelines, indicating how long it is available for and phase-out process • Initial research suggests this increases electricity consumption, with communities using more appliances or for longer hours⁹ 	<ul style="list-style-type: none"> • CrossBoundary in Tanzania worked through 2 mini-grid companies to reduce the tariffs for end users by 50% and 75%, and saw an impact on electricity consumption (higher demand)⁹ • IDCOL and AEPC models have facilitated access through subsidy mechanisms for various types of DRE systems- micro-hydro, solar home systems, solar microgrids and solar irrigation pumps⁹ • The Indian government's National Solar Mission for the off-grid sector has seen various subsidy schemes- interest and capital subsidies to enable rural households and farmers to access solar home systems and solar water pumps
AGGREGATION	<ul style="list-style-type: none"> • International Development organizations • DFIs • Impact investors and angel investors • Debt capital and venture capital funds • Commercial Banks • National Government budgets (for example- Bangladesh and Nepal) • Private foundations 	<ul style="list-style-type: none"> • Financial intermediaries • Mandated national agencies (E.g.: IDCOL, AEPC) 	<ul style="list-style-type: none"> • Energy users • Energy providers • Ecosystem/ enabling environment actors 	<ul style="list-style-type: none"> • Channels large DFI and development aid funding into many smaller ticket-size loans (thereby giving access to finance for small energy providers by reducing the cost of capital) • Uses intermediaries such as MFIs and NGOs, who are closer to the local community, thereby enabling doorstep financing • Develops product performance standards to protect the interests of end users and supports awareness raising in 'last mile' communities • Helps identify and implement capacity building for smaller enterprises and communities, and enables sharing of learnings within the sector 	<ul style="list-style-type: none"> • Financial intermediaries such as SunFunder, ResponsAbility, Acumen, pool together projects, enterprise credit needs and develop portfolios that larger investors can invest in • IDCOL (Bangladesh) and AEPC (Nepal) successfully pooled together larger investments from DFIs and international development organizations and enabled access to credit to small energy enterprises, end user households and actors supporting capacity building

INSTRUMENT	KEY STAKE HOLDERS			VALUE-ADD FOR THE 'LAST MILE'	EXAMPLES OF THEIR USE (FOR ENERGY OR OTHER DEVELOPMENT INTERVENTIONS)
	TYPICAL SOURCES OF FINANCE	TYPICAL INTER-MEDIARIES	TARGET GROUP	VALUE ADD	EXAMPLES
RESULTS-BASED FINANCING	<ul style="list-style-type: none"> • International development organizations • Private foundations 	<ul style="list-style-type: none"> • CSOs and NGOs (to coordinate implementation and monitoring) 	Energy providers	<ul style="list-style-type: none"> • Financially incentivises implementers to focus resources on activities that ensure inclusivity and maximize impact of DRE provision in vulnerable or geographically remote communities^r • Learnings from previous RBF programmes suggest including incentives to financial institutions or energy providers to enable credit access for households to purchase DRE solutions^s • Potential to ensure reliable access to servicing and maintenance of DRE systems (through support for training and creation of local agents) 	<ul style="list-style-type: none"> • EnDev's RBF programme works through a range of CSOs and implementers. The facility encompasses 15 projects, covering a wide range of technologies^t.

These instruments need to be viewed as part of the larger set of financing options to improve access to energy solutions. Before replication, it is worth reviewing the conditions under which each of these have worked. Each of them are context specific- some may work better in contexts where local financial institutions are already well-established but are risk averse while dealing with the 'last mile', while others may be better suited to areas that have a dearth of well-functioning financial institutions. The application of specific instruments is also dependent on the needs of stakeholders and the sources of financing available.

o. Research from Crossboundary Mini Grid Innovation Lab. Here, the funding sources include other soft funding beyond those listed as typical sources. Additional details available here: <https://www.energy4impact.org/news/reducing-tariffs-unlocks-electricity-demand-rural-mini-grid-customers-new-research-finds>

p. Additional details available here: <https://www.energy4impact.org/news/reducing-tariffs-unlocks-electricity-demand-rural-mini-grid-customers-new-research-finds>

q. IDCOL: Infrastructure Development Company Limited, Bangladesh; AEPC: Alternative Energy Promotion Center, Nepal. Details available here: <http://pubs.iied.org/16651IIED>

r. Based on learnings in the development sector and articulated in this blogpost: <https://nextbillion.net/when-and-how-results-based-financing/>

s. Lessons learned on RBF financing in energy access, available here: <https://storage.googleapis.com/e4a-website-assets/Lessons-Learned-Results-based-Financing-for-Energy-Access.pdf>

t. Additional details available here: https://endev.info/images/b/b6/Factsheet_EnDev_RBF_EN.pdf

3. SUPPLY SIDE: SOURCES OF FINANCING

The section above outlines the need for financing and the types of instruments that have a strong potential to meet the needs of the ‘last mile’. In order to unlock and deploy finance, it is important to review the potential set of financing sources available. While some of these are already being used or explored for DRE financing, others are yet to be capitalized on, particularly with the ‘last mile’ where affordability and access to formal financing are challenging.

3.1 SUMMARY OF POTENTIAL FINANCING SOURCES

This section outlines the supply side options by identifying sources and types of funding that could be used. A broad categorization of the sources of finance is presented in the table below^u:

TABLE 3
CATEGORIZATION OF SOURCES OF FINANCE

	DOMESTIC	INTERNATIONAL
PUBLIC	<ul style="list-style-type: none"> • National and sub-national governments (budgets, including subsidies and taxation), • National public banks 	<ul style="list-style-type: none"> • Bilateral and multilateral development aid organizations (International development organizations) • Development Finance Institutions (DFIs) <p>(including climate finance providers and those financing other development needs)</p>
PRIVATE	<ul style="list-style-type: none"> • Commercial banks and Cooperative banks • Household savings • Capital invested directly by entrepreneurs 	<ul style="list-style-type: none"> • Private foundations and philanthropies^v
	<ul style="list-style-type: none"> • Impact investors • Corporates and project developers • Venture capital • Crowdfunding 	

^u. Modified based on the categorization from Sustainable Energy for All (SEforALL) and the Climate Policy Initiative (CPI) (2018). Understanding the Landscape – Tracking Finance for Electricity and Clean Cooking Access in High-Impact Countries.

^v. While there are domestic private foundations that invest in energy access projects in-country, a mapping of foundation funding by SHINE in 2018 indicated that most private foundations and philanthropies are based outside of the country where the energy access project is developed or constructed.

A summary of the financing sources and their linkages to energy and DRE financing are presented in the table below. National banks are discussed as sources as well as intermediaries channelling finance (from investors and end-user savings/ deposits). Similarly, Micro Finance Institutions (MFIs) are intermediaries that are also featured in the summary table on sources given their role in providing doorstep financing to end-users.

TABLE 4
SUMMARY OF FINANCING SOURCES AND POTENTIAL FOR DEPLOYMENT

SOURCE OF FUNDING AND INTERMEDIARIES INVOLVED	LINKS TO ENERGY AND DRE FINANCING	EXAMPLES OF WHERE THE SOURCE HAS BEEN USED/ COULD BE USED FOR ENERGY FINANCING ^w
PUBLIC DOMESTIC SOURCES (GOVERNMENT BUDGETS, TAXATION AND SUBSIDIES)		
Energy budget	<ul style="list-style-type: none"> Rural electrification plans and programmes that have an off-grid or DRE component Subsidies for DRE/ Off-grid solutions as part of promoting energy access 	<ul style="list-style-type: none"> India's National Solar Mission (off-grid component) Nepal's National Rural Renewable Energy Programme (through AEPC)
Education budget	<ul style="list-style-type: none"> Purchase of efficient Information Communication Technology (ICT) appliances/ Audio visual aids Powering ICT appliances (usually using diesel gensets) 	<ul style="list-style-type: none"> Kenya: Programme for solar powering schools^x Jamaica: Solar systems in schools to reduce dependency on fossil fuels (National Education Trust Limited (NET) on behalf of the National Ministry of Education, Youth and Information)^y
Health budget	<ul style="list-style-type: none"> Solar rooftop systems for healthcare centers- lighting, cold chain facilities and basic equipment Efficient cold chain and basic equipment 	<ul style="list-style-type: none"> India: Solar powered primary health centers (State National Health Mission in partnership with Chhattisgarh state RE agency- CREDA^z)

^w. The examples under Public sources include projects and programmes funded through energy departments but the examples are meant to be indicative of the types of projects that could be part-funded through nexus ministry budgets

^x. Details available here: https://www.rea.co.ke/index.php?option=com_content&view=article&id=7&Itemid=149. While this programme was funded through the REA budget, it is an indication of the type of projects that can part-funded through Education budgets, including support for operational expenditure.

^y. Details available here: <https://moey.gov.jm/120-million-allocated-solar-project-schools>

^z. CREDA: Chhattisgarh state Renewable Energy Development Agency. Again, while this may have been supported by the Renewable energy agency, it is an example of the type of solutions that could be part-funded through Health budgets.

SOURCE OF FUNDING AND INTERMEDIARIES INVOLVED	LINKS TO ENERGY AND DRE FINANCING	EXAMPLES OF WHERE THE SOURCE HAS BEEN USED/ COULD BE USED FOR ENERGY FINANCING
PUBLIC DOMESTIC SOURCES (GOVERNMENT BUDGETS, TAXATION AND SUBSIDIES)		
Agriculture budget	<ul style="list-style-type: none"> Subsidized solar water pumps coupled with water conservation measures to address the issue of unreliable grid-based electricity and replacement of diesel-pumps 	<ul style="list-style-type: none"> India: National Solar Mission- solar water pump subsidies Rajasthan state (India): Solar water pumping programme run through the State horticulture department
Local level planning	<ul style="list-style-type: none"> Use of local level planning funds to undertake integrated energy planning and bottom-up assessment of community needs 	<ul style="list-style-type: none"> Kenya and Nepal (as part of devolution and decentralization) Nepal: Municipal energy planning, including GIS mapping^{aa} Kenya: County energy planning
Government funds for Youth, Women development	<ul style="list-style-type: none"> Capitalize on low interest loans to youth groups and women's groups to enable purchase of DRE systems 	<ul style="list-style-type: none"> Kenya: Uwezo funds, Youth Enterprise fund, Women's Enterprise fund^{bb} India: Loans to Self Help Groups (SHGs) and Joint Liability Group (JLGs); Differential rate of interest (DRI) scheme
Government funds for Private sector and enterprise development	<ul style="list-style-type: none"> Access funds for SME creation and development- for Productive use of energy (PuE) to complement design and installation of mini-grid systems Low interest loans to purchase efficient appliances for PuE 	<ul style="list-style-type: none"> India: Loans from Micro Units Refinance and Development Agency (MUDRA), Small Industries Development bank of India (SIDBI) Kenya: Uwezo funds, Youth Enterprise fund, Women's Enterprise fund

^{aa} Presentation by Satish Gautam of RERL-UNDP: https://energypedia.info/images/9/98/Experiences_from_Nepal-_RERL-_Satish_Gautam.pdf

^{bb} Details available here: <http://www.uwezo.go.ke/home>, <http://www.youthfund.go.ke/>, <https://www.wef.co.ke/>

SOURCE OF FUNDING AND INTERMEDIARIES INVOLVED	LINKS TO ENERGY AND DRE FINANCING	EXAMPLES OF WHERE THE SOURCE HAS BEEN USED/ COULD BE USED FOR ENERGY FINANCING
PUBLIC DOMESTIC SOURCES (GOVERNMENT BUDGETS, TAXATION AND SUBSIDIES)		
VAT and import duty exemptions for DRE systems	<ul style="list-style-type: none"> • Reduce prices of systems for end-users by having exemptions on Value Added Tax (VAT) and import duty for DRE systems and components 	<ul style="list-style-type: none"> • Kenya, Tanzania, Rwanda: Import duty and VAT exemptions on solar modules, solar charge controllers, solar inverters and specific appliances were introduced across the East African community at different points in time^{cc\} • Latin America: A number of Latin American countries have tax exemptions on renewable energy systems and components^{dd}
Taxation on carbon emissions, fossil-fuel based generation	<ul style="list-style-type: none"> • Use the funds to subsidize DRE systems • Develop facilities/ programmes that can help leverage commercial capital by using these funds as risk guarantees 	<ul style="list-style-type: none"> • Tanzania: Rural Energy Fund (partial funding from levies on grid-based generation)- used to support rural electrification plans of REA, including off-grid • India: National Clean Energy Fund (created by levying taxes on coal)- used by Indian govt to fund/ subsidize solar off-grid programmes • Europe: Countries such as the Netherlands and Norway have funds created using revenues from oil and gas exploration, and dedicated for infrastructure development
Subsidies on kerosene/ diesel/ electricity	<ul style="list-style-type: none"> • Reallocate subsidies for kerosene through Direct Benefits Transfer, energy vouchers for households to use on DRE • Extend subsidized electricity tariffs to include mini-grids as well 	<ul style="list-style-type: none"> • Sub-Saharan Africa: Green Mini Grids programme (supported by the AfDB) lays out guidelines to governments on subsidizing tariffs or operational expenditure for mini grids • Peru: Energy vouchers • Indonesia: Kerosene reduction programme- subsidies to support the purchase of LPG stoves and fuel^{ee} • India: Programme providing subsidy for LPG (through the Indian Government)

cc. Some countries have gone back and forth about re-introducing VAT and import duties on solar system components. In Kenya, Value Added Tax (VAT) exemptions on solar products was introduced in 2014. However, there were indications in the June 2018 budget that VAT would be reintroduced on solar products. <https://www.businessdailyafrica.com/analysis/columnists/Tax-on-solar-kits-undermines-push-for-clean-energy/4259356-4721336-10h4isbz/index.html>

dd. Details available at: https://energypedia.info/wiki/Examples_of_Legal_Texts_and_Regulations_to_Lift_Import_Duties_for_PV_Products#List_of_energy_supply_equipment_exempted_from_Value_Added_Tax

ee. Details available at: <https://www.seforall.org/sites/default/files/EF-2018-UL-SEforALL.pdf>

SOURCE OF FUNDING AND INTERMEDIARIES INVOLVED	LINKS TO ENERGY AND DRE FINANCING	EXAMPLES OF WHERE THE SOURCE HAS BEEN USED/ COULD BE USED FOR ENERGY FINANCING
PUBLIC INTERNATIONAL SOURCES + PRIVATE PHILANTHROPIES AND FOUNDATIONS ^{ff}		
Energy access sector focussed funding ^{gg}	<ul style="list-style-type: none"> • Support innovation- technical, financial, social/delivery model- and private sector capacity to reach the 'last mile' • Grants to innovators and affiliates working with SMEs and energy enterprises on PuE solutions including appliance efficiency • Use Results-Based Financing (RBF) mechanisms to support energy providers reach the 'last mile' • Support service models aiming to provide maintenance for the 'last mile', complementing end-user contribution • Strengthen the ecosystem and enabling environment for DRE <ul style="list-style-type: none"> • Support business development of SMEs to catalyse energy utilization and PuE • Direct grants to ecosystem developers/ smaller foundations, CSOs, CBOs • Invest in energy enterprises (no or low return expectations) • Subsidize tariffs for end-users on mini-grid systems • Enable financial leverage <ul style="list-style-type: none"> • Invest in equity funds (for energy providers) with low or no return expectations • Match funding for government programmes • Risk guarantees for commercial bank lending to enterprises and end users lacking credit worthiness • Provide technical assistance to private sector on project preparation and feasibility studies specifically in communities that are part of the 'last mile.' 	<ul style="list-style-type: none"> • Grants from bilateral donors such as USAID, GiZ, DfID, DANIDA, SEEDA • Grants from philanthropies such as Packard Foundation, MacArthur foundation, Ikea Foundation, Mott Foundation, DOEN Foundation, Good Energies Foundation • Facilities and programmes such as Efficiency for Access^{hh}, Mini grid innovation labⁱⁱ (Crossboundary in partnership with Rockefeller foundation), EnDev's RBF programme^{jj}, Renewable Energy and Energy Efficiency Partnership (REEEP), US-India Clean Energy Facility (US-ICEF), ResponsAbility^{kk}

^{ff}. While in the original categorization, private foundations are listed under 'Private international sources', the possibilities for deployment of their funds are similar to those of Bilateral and Multilateral donors, while having the ability to take greater risks

^{gg}. These could be grants from any of the organizations listed above, but the volume of funding would affect how accessible the grant is for last mile communities.

^{hh}. Details available at <https://efficiencyforaccess.org/>

ⁱⁱ. Details available at: <https://www.sun-connect-news.org/press/details/news///press-release-crossboundary-in-partnership-with-the-rockefeller-foundation-launches-the-mini-grid-i/>; <https://www.crossboundary.com/wp-content/uploads/2019/08/CrossBoundary-Innovation-Lab-Innovation-Insight-Appliance-Financing-Final-07-Aug-2019-1.pdf>

^{jj}. Details available at: https://endev.info/content/Results-Based_Financing

^{kk}. Details available at: http://www.responsability.com/sites/default/files/2018-01/Energy_Access_Financing_EN.pdf

SOURCE OF FUNDING AND INTERMEDIARIES INVOLVED	LINKS TO ENERGY AND DRE FINANCING	EXAMPLES OF WHERE THE SOURCE HAS BEEN USED/ COULD BE USED FOR ENERGY FINANCING
PUBLIC INTERNATIONAL SOURCES + PRIVATE PHILANTHROPIES AND FOUNDATIONS		
Funding for cross-sectoral activities	<ul style="list-style-type: none"> • Explore funding for design, delivery, appliances and capacity building in development projects across agriculture, health, education, humanitarian sectors that have energy links 	<ul style="list-style-type: none"> • Bill and Melinda Gates foundation – funding for Solar powered maternal health kits • UNDP and IRENA- support for solar powered health solutions • Habitat for Humanity- possibility of combining DRE for households and efficiency as part of design of homes • Ikea Foundation- support for energy access in refugee camps
Financial inclusion	<ul style="list-style-type: none"> • Capitalize on financial inclusion support programmes for women and youth 	<ul style="list-style-type: none"> • UNCDF- MicroLead programme- mobilizing women’s savings; YouthStart Programme^{ll} to mobilize youth savings and enabling entrepreneurs’ access to credit^{mm}
Humanitarian aid	<ul style="list-style-type: none"> • Energy access provision in refugee settlements- replace diesel generators with DRE solutions 	<ul style="list-style-type: none"> • UNHCR funding for energy access in refugee settlements (including through programmes such as the Moving Energy Initiative, Renewable Energy for Refugees and so on)
Climate finance	<ul style="list-style-type: none"> • Mitigation funding 	<ul style="list-style-type: none"> • Green Climate Fund (GCF)- local energy access projects proposed under the GCF at country level
Loans from DFIs	<ul style="list-style-type: none"> • Low interest loans blended with grants to platforms/ organizations that use aggregation and local banks in-country (to provide concessional loans to energy enterprises and end-users in local currency) 	<ul style="list-style-type: none"> • AfDB’s Facility for Energy Inclusion (FEI); WB financing to organizations such as IDCOL that use aggregation • Loans for national electrification programmes including WB financing for Kenya Off-Grid Solar Project (KOSAP)

^{ll}. Details available at: <https://www.uncdf.org/youthstart/homepage>, <https://www.uncdf.org/microlead/homepage>

^{mm}. UNCDF supports energy access through its CleanStart programmes. There is no clear information on the integration of the energy and financial inclusion programmes.

SOURCE OF FUNDING AND INTERMEDIARIES INVOLVED	LINKS TO ENERGY AND DRE FINANCING	EXAMPLES OF WHERE THE SOURCE HAS BEEN USED/ COULD BE USED FOR ENERGY FINANCING
PRIVATE INTERNATIONAL SOURCES + PRIVATE DOMESTIC SOURCES + NATIONAL BANKS (PUBLIC DOMESTIC SOURCES)		
Seed funders and Impact investors	<ul style="list-style-type: none"> Equity investments with low or single digit return expectations, and longer-term exit strategies to support energy enterprises establish themselves 	<ul style="list-style-type: none"> Stichting DOEN, Acumen, Good Energies Foundation Bamboo finance, Villgro, LGT Venture philanthropy, CDC Group, Kawisafi Ventures, ResponsAbility, Energy access ventures
MFIs (financed by Investors and banks), local, national banks and aggregation platforms	<ul style="list-style-type: none"> Working capital lines of credit, asset financing etc. using blended finance, or with flexible terms around credit guarantees to make debt more accessible for energy enterprises serving the 'last mile' Loans for end-users to access energy systems 	<ul style="list-style-type: none"> MFIs such as FINCA (Global) ESAF, Saija, SKDRDP (India)ⁿⁿ are providing micro financing for energy access solutions, while aiming to provide affordable rates of interest. MFI networks and intermediaries such as Pamiga^{oo} and Arc Finance^{pp} can be used as channels to encourage and potentially incentivize lending for DRE solutions Organizations such as SunFunder (structure funds) and IDCOL (provide concessional loans) that use aggregation^{qq} Indian Banks such as RBL, Syndicate Bank that extend loans for solar systems^{rr}
Crowdfunding platforms	<ul style="list-style-type: none"> Mechanism to bring together funding from multiple sources Includes donations, reward and debt and equity campaigns to raise funding for DRE projects^{ss} 	<ul style="list-style-type: none"> Bettervest, Trine, M-Changa, Energise Africa^{tt}
Corporate Social / Environmental Responsibility	<ul style="list-style-type: none"> Work with corporates to allocate their CSR spending on energy access provision Enable more countries to adopt CSR mandates, for e.g.: allocating 2% of corporate average net profits for social development 	<ul style="list-style-type: none"> Worldwide: Schneider Electric (through the Schneider Electric foundation) has support efforts on training and energy solutions for the 'last mile'^{uu} India: CSR spending is mandatory under a new section of the Indian Companies Act 1935 (India)- used by Indian energy providers to reach 'last mile' customers/ subsidize SHS products

nn. Details available here: <https://finca.org/>, http://arcfinance.org/project_area/microfinance/,

oo. Details available here: <http://www.pamiga.org/index.php?lg=en>

pp. Details available here: <http://arcfinance.org/>

qq. Details available here: <https://pubs.iied.org/16651IIED/?k=i>

rr. Details available here: RBL: <https://in.usembassy.gov/usaaid-rbl-bank-announce-75-million-loan-guarantee-clean-energy-projects/>; Syndicate Bank: <https://medium.com/energy-access-india/indian-enterprises-are-banking-on-solar-loans-for-sustainable-energy-access-to-tribal-hamlets-712057bf16d3>

ss. Details available here: <https://www.energy4impact.org/file/1697/download?token=CLBAAi7Q>

tt. Details available here: <https://www.energy4impact.org/file/2067/download?token=N0BdMcEu>, <https://www.energy4impact.org/file/1697/download?token=CLBAAi7Q>

uu. This paper does not comment on the sustainability of the models through which solutions have been deployed, but merely notes that funds have been allocated as part of Corporate Social Responsibility (and through the Foundation) for energy access provision

SOURCE OF FUNDING AND INTERMEDIARIES INVOLVED	LINKS TO ENERGY AND DRE FINANCING	EXAMPLES OF WHERE THE SOURCE HAS BEEN USED/ COULD BE USED FOR ENERGY FINANCING
PRIVATE INTERNATIONAL SOURCES + PRIVATE DOMESTIC SOURCES + NATIONAL BANKS (PUBLIC DOMESTIC SOURCES)		
Household savings	<ul style="list-style-type: none"> • Savings in banks, cooperatives, other assets • Credit access as part of informal/ group savings-credit facilities 	<ul style="list-style-type: none"> • Kenya: Group savings and lending, SACCOs (Savings and Credit Cooperatives) • Nigeria: ROSCAs (Rotating Savings and Credit Associations) • Tanzania: VICOBA (Village Community Banks) • Self Help Groups/ Joint Liability Groups in India • Nepal (AEPIC): community contributions are used as equity for mini-gridS
End user savings from avoided expenditure on alternate sources	<ul style="list-style-type: none"> • Replacing expenditure on or using savings from avoided diesel/ kerosene costs to pay for DRE solutions (monthly/weekly basis) • These savings are also used for maintenance 	<ul style="list-style-type: none"> • Typically, households and small businesses use this mechanism to pay (at least partially) for DRE solutions

The table above is not an exhaustive list but is an initial attempt at providing an overview of the types of sources that can be capitalized to a greater extent, particularly in the context of financing DRE for the 'last mile'.

3.2 KEY INSIGHTS ON SOURCES: OPPORTUNITIES, GAPS AND WAY FORWARD:

Based on the sources listed in Table 4, a list of opportunities on utilizing and capitalizing on the most relevant sources is outlined in the following paragraphs. The current constraints and gaps as well as some of the immediate steps towards realizing these opportunities are also listed below. The broader aim of this section is to hone-in on some of the sources and determine ways in which they can be accessed, utilized and leveraged.

a. Funds available for nexus interventions

Opportunity: Identify synergies that allow the usage of funds available for nexus interventions, particularly through existing budgets, subsidies and programmes at national and international level

The energy sector has largely depended on funding that is earmarked for energy specific projects- with the primary aim of adding to generation capacity in gigawatts and megawatts. Much of this financing has also been focused on fossil fuel-based, centralized electricity projects, which typically meet the needs of urban and peri-urban centers with growing demand and ability to pay³¹. There is an urgent need to meet the basic energy needs, including of reliable, good quality lighting and mobile charging of remote communities in the 'last mile' that are unlikely to benefit from grid extension in the near future. While doing so, it is also important to consider the growing energy needs of households, addressing energy gaps for community services (e.g.: education, access to water, street lighting and healthcare) and capitalizing on opportunities for supporting new income-generating activities and improving productivity in existing livelihoods (e.g.: Small and Medium-sized Enterprises (SMEs), agriculture including livestock).

A key step towards realizing this is to expand the financing pool to include funds allocated for other development activities that have an energy access component. At the national level, this would be sectoral ministries in-charge of education, healthcare, rural development, youth and women and livelihood promotion. At the international level, this would include development aid organizations' and DFI commitments to nexus sectors. Public service sectors such as healthcare and education and sectors directly linked to livelihood such as agriculture and SME development would be good starting points given their significance and the energy access linkages. Some clear linkages include:

- Improving service provision across health facilities and educational institutions by ensuring access to reliable electricity to run critical healthcare appliances, lighting and audio-visual aids in schools
- Providing opportunities for increasing local value-added for farm products by coupling DRE solutions with post-harvest processing and market access activities
- Addressing climate change implications on irrigation and food security by combining DRE solutions with water supply and conservation measures in agriculture

- Promoting SME development and job creation by enabling Productive uses of Energy (PuE)
- Developing technician training courses on DRE systems that can be disseminated through vocational training centers, thereby building the local human resource capacity for long-term maintenance.

While the humanitarian sector is extremely politically sensitive and any energy interventions will require buy-in from various agencies, there are important opportunities here to reduce the costs incurred by agencies and communities in accessing energy. It also presents a space for innovations, such as modular DRE solutions built to cater to the needs of temporary communities and refugee camps with flexible financing mechanisms^{vv}.

At the national level, prior to approaching nexus ministries, there must be a clearer sense of the process by which such funding would be allocated and, if and what, the role of energy ministries/ departments should be in this process. i.e. technical advisor/ aggregation platform/ implementer etc. This would also include exploring what types of costs could be borne by nexus ministries, for e.g. part-funding of capital costs and complete funding of operational costs. This can supplement capital funding from the energy ministry, while ensuring the energy ministry has oversight over all DRE projects to support coordinated energy planning, maintenance etc. It is also worth noting that the utilization of this type of financing for energy access can only be realized when there's an increased awareness amongst the various developmental agencies about the interlinkages between energy access and their specific portfolios, as well as a willingness and commitment to coordinate efforts, identify the right mechanisms and ensure funds are allocated for the 'last mile'. It would also be worth exploring opportunities for coordination at sub-national level through local governments.

Gaps: Up until now, actors in the energy sector have mainly tracked budgets and expenditures of ministries directly responsible for energy provision. i.e. Ministries of Energy, Environment, Renewable energy promotion, Rural Electrification Agencies. There is limited understanding of budgets for existing or upcoming programmes at national and international levels, where electricity access is a pre-requisite, and maintenance directly impacts long term sustainability of the programme and the confidence of end-users.

For example, funds may be allocated and Information and Communications Technology (ICT) and appliances may be purchased for schools and health centers, but in the absence of reliable electricity supply they lie largely unused. In some cases, a specific budget is also allocated in projects to cover the cost of diesel generators. DRE solutions can be designed to cater to these needs and supplied with efficient appliances, resulting in better use of the same funding.

^{vv} Some initial research into possible financing mechanisms to enable energy access for displaced people has been undertaken by the Moving Energy Initiative (MEI): <https://www.chathamhouse.org/publication/innovative-financing-humanitarian-energy-interventions>

On the other hand, there is also limited understanding among non-energy actors- government and non-government- of the role that energy plays in achieving other Sustainable Development Goals (SDGs). This combined with hesitations and perceived risks about DRE solutions, and their operational models makes it difficult to tap into existing development fund sources within the government.

Potential next steps towards realizing this opportunity would be to:

- Map the nexus programmes of the government at country level and of international development organizations that have an energy link (For example: ICT in schools, healthcare equipment, diesel for irrigation pump sets, generators for schools, hospitals and other community centers, SME development that can promote PuE and local livelihoods).
- Explore the institutions managing the nexus programme funds, the process for accessing such funds and the volume of financing available
- Engage with specific government ministries, based on the mapping, to develop mechanisms for collaborative funding of energy solutions in nexus sector programmes
- Undertake capacity building and advocacy to increase willingness and commitment amongst developmental agencies and organizations

While exploring this opportunity, it would also be important to address questions around the flow of funding, the institutions involved and the best delivery model to support nexus applications. Addressing these could help clarify the role of the energy ministry/ department (advisor/ aggregation platform and coordinator/ implementer and so on).

b. Financial inclusion programmes

Opportunity: Strengthen mechanisms for financial inclusion that enable savings, deposits and access to concessionary finance to individual households, thereby increasing the pool of finance for energy solutions

Financial inclusion aims to create inclusive growth by bringing households in remote and rural communities into the fold of formal banking or savings-credit institutions³². While this is often a priority at the national level, international institutions such as UNCDF^{ww} and World Bank are also working towards greater financial inclusion and setting indicators for its achievement. Plugging DRE into this scenario can bring about the following positive outcomes: (1) borrowing for energy solutions can lead to actual utilization of savings and credit facilities (2) households can benefit from subsidies or concessionary terms afforded to account holders, first-time borrowers or borrowers below a certain income level (3) reaching out to the 'last mile', including identification of potential end-users, collection of payments and servicing can be built by leveraging the existing financial agent networks.

Communities across the world access credit for purposes ranging from more productive needs such as education and local enterprise development to less productive but familial/contingency needs

such as weddings, funerals and medical expenses. These may be met by channels such as money lenders, as well as less risky informal credit-savings groups. Sampling the deposits and lending of such groups and cooperatives (particularly those used by communities in the 'last mile') to understand their volumes and conditions of financing could be useful to enable financial inclusion. Over time, with the right guidelines and clear eligibility conditions for the groups, they can be linked upward to formal banking institutions thereby capitalizing on existing structures to increase the communities' access to larger volumes of capital at potentially lower costs^{xx}.

Gaps: At present, most communities without access to banks depend on local, unlicensed moneylenders which limits the volume of credit they can access and makes them susceptible to unregulated interest rates and conditions on their borrowing. Where financial inclusion programmes are active, there are still gaps in the collective understanding of the levels of outreach and usage of financial services and the extent to which these services meet needs of individuals or communities. This understanding could provide a clearer picture for whether and how DRE financing can be customized as part of the larger financial inclusion plans in a region.

Potential next steps:

- Track the coverage and success of financial inclusion programmes, including outreach of services, usage, customization and financial agent network in communities that are geographically or socio-economically the 'last mile'; Review the lessons learnt from previous experiences of local financial intermediaries financing energy solutions (such as FINCA-Brightlife in Uganda)
- Map the non-banking credit facilities used by communities, including Savings and Credit Cooperatives (SACCOs), Village Community Banks (VICOBAs), Micro finance institutions (MFIs); study existing credit-savings groups and cooperatives to determine limitations and advantages, and their specific application in enabling end-user financing for DRE solutions
- Create a relationship between local financial institutions, local government and energy providers to enable DRE financing to be linked to existing or planned financial inclusion schemes

c. Accessibility of development aid and DFI funding for concessional finance

Opportunity: Make development aid and DFI funding more accessible through loans, concessional credit and investments to 'last mile' enterprises and local financial institutions

Funding from International development organizations and DFIs are deployed as loans, as grants and technical assistance or as blended finance. The main constraint has been in linking these flows to the DRE needs of the 'last mile'. Towards this end, it is crucial to use instruments and mechanisms that can make international development organizations' and DFI funding more accessible to energy users and energy providers, through local financial institutions, aggregation platforms etc. While outlining the value that this funding can play, it is important to clarify the

^{ww} Details available at: <https://www.uncdf.org/microlead/homepage>, <https://www.uncdf.org/youthstart/homepage>

^{xx} The evolution of the Self Help Group (SHG) movement in India provides a blueprint of how this could work

conditions and set realistic expectations in terms of transaction costs, returns on DRE businesses or the lack thereof while delivering to the 'last mile', type of metrics required to gauge field impact and so on.

While there are instances of DFIs parking funds with local financial institutions to enable concessional credit in local currency, there has been limited utilization, in part because of a lack of capacity and limited exposure for local financiers to understand DRE solutions, business models and risk mitigation measures.

It would be useful to explore financing of initiatives that promote Productive use of Energy (PuE), where the returns may still be lower than market rates in the short term but the investment could stimulate local economic growth in the medium to long term. Availability of reliable energy access can increase productivity in agricultural production and processing, and in the operations of SMEs, while also attracting potential entrepreneurs to establish businesses.

Gaps: While increasing amounts of ODA flows and resources from DFIs have been allocated towards promoting energy access, much of this goes directly to governments for on-grid electrification projects and upgrading grid infrastructure. Between 2014 and 2017, only about 2% of all energy finance from Multilateral Development Banks (MDBs) went to off-grid and DRE solutions that are most likely to meet the needs of the 'last mile' and close the access gap in rural areas³³. The same research also concluded that over 90% of finance for fossil-fuels from MDBs during that same period did not address energy access needs.

The reasons frequently cited for not being able to invest in DRE solutions include high transaction costs, perceived risk and low returns from DRE businesses, and perceptions of weak management at the local level³⁴. The current capacity and willingness of DFIs to invest in and lend to initiatives that serve remote and rural communities is limited and needs to be addressed. This is also true in the case of International climate finance with the added challenge of metrics such as GHG emissions and leveraging co-finance which are weak in the case of DRE solutions compared to utility scale projects.

Potential next steps:

- Explore and track the extent of funding from DFIs and international development organizations that has been directed to sub-national level to unlock local commercial bank funding, local savings, pension funds and thereby create leverage³⁵
- Work with climate financiers and intermediaries, including the Green Climate Fund (GCF) to revisit the design of climate financing and success metrics to incentivise allocations for 'last mile' DRE
- Identify opportunities for national level aggregation platforms or organizations who can channel public finance using different financing instruments, particularly learning from IDCOL and AEPC examples. This also includes obtaining high-level buy-in from the government and strong donor backing³⁶

- Facilitate interactions between local level energy providers, local financial institutions and DFIs to enable better dialogue and understanding of issues such as the cost of capital and the conditions under which credit can be extended to the 'last mile' at affordable rates;
- Review the willingness to pay for affordable and reliable energy access, of key sub-groups within the 'last mile' and undertake advocacy and capacity building on accommodating these within existing facilities that have energy access mandates
- Linked to the previous point, explore options and determine the financial implications for International development organizations and DFIs to channel resources in smaller volumes, for example, through organizations or platforms that can undertake aggregation at a country level (including transaction costs, concessions and subsidies on systems, enabling environment support and so on for DRE solution provision)
- Build the capacity of local financial institutions that have received DFI funding to stimulate actual utilization and disbursement to communities and local enterprises
- Identify interests and the mandates of different development aid flows and DFIs to collaboratively fund specific energy access needs in a specific country, thereby avoiding duplication and inefficiencies (including joint programmes, aggregation platforms, joint financing vehicles, joint platforms etc.)

d. Incentives linked to taxation and subsidies

Opportunity: Reduce taxes and import duties on clean energy systems and components; and tap into environmental tax revenue and subsidies for fossil-fuels to innovate on and deliver DRE solutions for the 'last mile'

At the policy level, it is important to do away with VAT and import duties on DRE solutions that can reduce the cost of systems for the poor. However, care must be taken to ensure that the benefits of reduced taxation and duties accrue to end users. All this while also ensuring that stringent quality standards are maintained for the subsidized DRE systems. Although not a foolproof solution, CSOs and industry bodies monitoring and evaluating progress on energy access can help in ensuring that subsidies are properly targeted by having checks on energy enterprises. This coupled with a shift of subsidies from fossil-fuel based sources to subsidies on DRE and modern, reliable energy solutions, if done effectively, would increase access to DRE solutions.

Some countries have proactively instituted legislations that levy carbon taxes or taxes on coal production and seek to use the fund pool created as a result for environmental initiatives, including climate change adaptation and mitigation. While such funds are rare and hard to come by, it would be worth monitoring them in countries where they exist. Allocating these resources to deliver (or subsidize the delivery of) DRE solutions for individual households and communities in the 'last mile' avoids the construction of fossil-fuel intensive energy systems to supply reliable electricity in these regions, thereby justifying the use of environmental management funds.

Gaps: Policies on removing VAT and import duties have implications on the country exchequer, not to mention the complications involved in preventing misuse, as certain components of DRE systems such as batteries and wiring have applications beyond the DRE solution. In the case of subsidies, it is acknowledged that the use of public funding to subsidize the costs of fossil fuels creates an uneven playing field for clean energy solutions, despite the latter likely being more cost effective for end users and governments in the long run. However, changes in subsidies are often controversial decisions with political implications for the government in power and would need a strong buy-in at the highest levels before being implemented.

Legislations on levying carbon taxes and taxes on coal production or electricity generation exist only in a select set of countries. Funds created using carbon/ coal taxes tend to be used for environmental conservation and management where energy access may feature as a lower priority, if at all.

Potential next steps:

- Understand the motivations and the process behind exemptions on VAT and import duties for clean energy systems and components in countries where they have been enacted; Determine if these are replicable in other contexts
- Calculate the likely implications/ losses or gains for the government exchequer (beginning with a select set of focus countries) as a first step towards building out the case for changes in policy; Explore the quantum of funds available from sources such as carbon taxes/ coal taxes in countries that have provisions for these and high incidence of energy poverty
- Undertake advocacy with country governments to determine if and how the provisions around subsidies and taxation could allow for their use in delivering DRE solutions

e. Funding for energy access innovation and leverage

Opportunity: Unlock broader development sector funding to complement energy access funding, and increase its usage in results-based financing, leverage and on-ground innovation

Private foundations and international development organizations are already engaged in providing grant funding, debt and concessional capital to the energy access sector. To complement this, it would be useful to pursue a nexus approach and engage with international development organizations, charities and philanthropies that fund other areas of development with an energy link, including education, healthcare, humanitarian aid, agriculture and livelihoods.

Grant funding and concessional capital can be used in different ways to impact delivery of DRE for the 'last mile'.

Firstly, they can be used to support private sector actors moving into new geographies or reaching new user segments through mechanisms such as targeted subsidies and Results-Based Financing

(RBF). Since the cost of reaching the 'last mile' is often a constraint preventing energy enterprises from meeting the energy needs of these communities, RBF tools can provide the financial cushion required for enterprises to take that leap. However, it is critical to ensure that the financing comes with conditions that ensure long-term sustainability of these systems, through some form of continued presence of the enterprise in the region.

Secondly, grants can be used to leverage commercial capital and enable lending. Through local financial institutions, grants can be used as risk guarantees, interest subsidies, down-payments on loans, seed funding for revolving funds and so on to enable lending for end-users who lack credit worthiness or have challenges around affordability. Here, there would typically be a need for a platform/ organization undertaking aggregation and ecosystem facilitator to connect the funder, the local financial institution and the end-users.

Grants can also contribute to creating blended finance at a larger scale with DFIs, thereby reducing their risk in lending to the energy access sector. Grants, in the form of technical assistance, also help build the capacity of the stakeholders involved on the ground, including local institutions, intermediaries, enterprises and households, to ensure longer term sustainability. They also help fund monitoring and evaluation of projects and sharing of learnings from these interventions.

Finally, their role in enabling innovation is critical, particularly where the chances of failure are extremely high. This includes projects aimed at developing energy systems for refugee communities, piloting productive use appliances and strengthening local SMEs, solutions for healthcare and education as well as innovative models to make household energy more affordable. For such projects, grants are critical in developing the technology, in exploring financial model options, as well as working out the social and operational aspects.

Gaps: International development organizations' funding flows often face issues of transaction costs and volumes. In the recent past, some organizations have shown a preference for market-based approaches and direct support to the private sector^{yy}. While this is a useful step in building the capacity of enterprises to serve rural energy needs, without adequate safeguards, it could result in meeting their business metrics through low-hanging fruit, without reaching communities in the 'last mile'. Private philanthropies are more flexible when it comes to usage of funds, however their resource pool is limited. Beyond the private philanthropies that fund energy access, very little is known within the sector about philanthropies that work on nexus issues.

Potential next steps:

- Identify international development organizations and private foundations operating in countries of interest that fund nexus issues; Explore programmes that are being funded to identify those with a link to energy provision, and develop a map of energy sector stakeholders- particularly energy providers and facilitators that are or would be interested in working in those geographies

^{yy} DfID's Transforming Energy Access partnership has a large focus on enterprise led innovation and support for enterprises in the market. Details available at: <https://www.carbontrust.com/tea/>

- Link private foundations interested in instruments such as blended finance and concessionary loan support with DFIs, aggregation platforms and on-ground ecosystem facilitators
- Initiate discussions and develop opportunities to socialize private foundations that support other development sectors on the importance of energy access and its role in their funding portfolio
- Initiate interactions on potential opportunities at country-level where interested DFIs can provide grant funding into planned facilities, concessionary loan schemes, results-based financing options, aggregation platforms focused on 'last mile' energy provision.

4. RECOMMENDATIONS AND CONCLUSIONS

In addition to specific measures and opportunities to utilize the various funding sources listed above, there is a need for actions that strengthen the energy ecosystem, including the capacity of financiers and key stakeholders. These can create a strong base for specific financing opportunities to be tried out and replicated if deemed successful.

4.1 OVERARCHING RECOMMENDATIONS

The recommendations provided below range from aspects of understanding affordability and defining communities in the 'last mile' to strengthening local financial institutions and improving national energy planning efforts such that financing opportunities that are realized are sustainable in the long-term.

1. Understand affordability amongst sub-groups within the 'last mile' and improve metrics for impact measurement

While the 'last mile' is typically defined in terms of geographical remoteness and socio-economic criteria, it is important to note that it is not a homogenous group. In order to determine the best ways of financing DRE for the 'last mile', there must be an understanding of the sub-groups that constitute the 'last mile'.

Characterizing the sub-groups based on economic aspects such as income levels, energy expenses as a percentage of total household/business expenditure, livelihoods and cash flow patterns, existing financial linkages/ credit access, as well as socio-cultural aspects such as vulnerability, age, gender etc. will help clarify the affordability levels of each. This can help to develop more tailored, customized financing options, and form the basis of determining what sources and mechanisms would best suit a specific sub-group. These criteria should also inform the metrics to be used while evaluating impact of energy access for the 'last mile'. NGOs, energy enterprises, investors should work closely with community representatives to define these metrics that better capture the end-user experience and impact. These can then be used by policy makers, investors, DFIs and international development organizations to make more effective and targeted investments³⁷.

2. Invest in strengthening local financial institutions and building the capacity of financiers at various levels to understand the specific needs of the energy access sector

An overarching need is the strengthening of local financial institutions at the country level to enable more access to affordable credit for communities in the 'last mile'. Building the capacity of financiers at various levels- MFI lenders, bankers at the national level, development organizations' and DFI staff at the international level, fund managers and so on- is a first step towards ensuring there is a clear understanding of the specific needs of the energy access sector³⁸.

It would also be important to use current knowledge around the constraints faced by financiers to design the capacity building in a way that addresses them. These could include addressing perceived risks associated with DRE solutions and business models (using guarantee mechanisms and building track records for households and enterprises for example), mechanisms of dealing with smaller ticket sizes, associated transaction costs and so on.

3. Invest in building the capacity of other stakeholders to reach the 'last mile' and strengthen the links with productive uses of energy

Strengthening financier capacity is part of a larger effort to create a strong local ecosystem for energy provision where various stakeholders are well-equipped to address the need. This includes strengthening local enterprises – both energy and non-energy and building technical and operational human resource capacity on the ground. Given that geographical remoteness is one of the facets of many 'last mile' communities, the local ecosystem plays a critical role in ensuring community awareness, sustainable usage and maintenance of energy access solutions³⁹.

Support to establish and grow local businesses and small enterprises will also play a role in productive utilization of energy solutions, making it more viable for energy enterprises to serve these regions while also improving efficiency and increasing income among the small businesses. Growth of small businesses

like agro-based processing can also improve the income of local farmers through value-add. While exploring options to finance DRE solutions, as evidence has shown, it would also be important to understand the financing requirements of local Small and Medium Enterprises (SMEs) that would potentially access these solutions and the efficient appliances required for these SMEs to operate⁴⁰.

4. Advocate for impact investment and increased patient capital in the sector

Patient capital is critical at all stages of the growth of social enterprises, in the form of both equity and debt. Capital that has long-time horizons, higher tolerance for risk, adjusted expectations on IRRs and focused on maximizing social impact is essential to bringing DRE to the 'last mile' in an affordable and timely manner while providing enterprises the freedom to customize delivery models and solutions for different communities. In the wake of recent news about the insolvency of a leading Pay As You Go (PAYG) solar enterprise from East Africa, serious questions need to be asked about the type of capital accessible to enterprises and the type of investments required for enterprises to address the needs of the 'last mile'^{zz}. Private finance does not seem to be doing the trick in this space.

It is also important that this patient capital be inclusive and accessible to more local enterprises. Lessons from the past must be used to advocate within the sector to investors as well as enterprises on setting realistic expectations and emphasizing the importance of patient investments- debt and equity- to enable energy access to the poorest.

5. Advocate for increased government commitments to DRE as part of energy programmes and mobilization of additional funding for energy access

While it is important to continue identifying sources that can finance energy access solutions, it is also essential to ensure that existing sources of financing for rural electrification and energy access are allocated for DRE. This is particularly true for the 'last mile', where it may be expensive to extend the grid or electricity utilities lack the incentives to provide reliable supply through the grid.

Facilitating long-term electricity planning by public institutions would require making longer term commitments on public financing allocations for energy access. Financial allocations are a strong indication of political commitment to the issue and can provide confidence to investors and donors. Mobilizing more volumes of funding to address SDG7 at the national level will also involve working closely with DFIs to develop instruments/ channels for delivering end-user and enterprise financing to meet the needs of the 'last mile'.

4.2 CONCLUDING REMARKS

With the 2030 Agenda for Sustainable development in mind, it is a crucial time to reflect on the untapped financing sources that would accelerate progress towards SDG7 particularly for the 'last mile', while also supporting the achievement of other SDGs. This paper has sought to lay out some existing financial instruments, potential financing sources and opportunities with an indication of the immediate next steps involved in exploring them to sustainably finance DRE solutions. This is by no means an exhaustive list.

It will be important as part of the next steps to arrive at a clearer understanding of the 'last mile' and their sub-groups in order to better customize the financing required for each. The overarching recommendations on building a strong local ecosystem and strengthening local financial institutions will play a critical role in ensuring that any financing that is accessed and deployed can result in providing energy solutions that are sustainable and improve the wellbeing, income and opportunities for communities in the 'last mile'.

^{zz} Details available here: <https://www.ft.com/content/8832bffc-f319-36fa-a720-fadaaf86e4f4>

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