



Unlocking climate finance for decentralised energy access

Neha Rai, Sarah Best and Marek Soanes

Working paper

June 2016

Sustainable markets

Keywords:

Energy access, climate change, finance, renewable energy

About the authors

Neha Rai is a Senior Researcher with the Climate Change Group at IIED. Based in the UK, she leads IIED's work on climate finance. Her areas of technical expertise include in-country work on Green Climate Fund, the political economy dynamics of international financing, decentralised energy access and local-level financing.

Sarah Best is a Senior Researcher on energy and mining in IIED's Sustainable Markets Group. She currently works on: access to energy and the productive uses of energy; the impacts of large-scale extractives projects; and strengthening the voices of citizens in energy and mining debates.

Marek Soanes is a consultant with IIED. He currently works on climate finance, particularly Green Climate Fund and local finance research with IIED.

Contacts

Neha Rai, Senior Researcher, IIED, neha.raiiied.org

Sarah Best, Senior Researcher, IIED, sarah.bestiiied.org

Marek Soanes, Consultant to IIED,
marek_soanes@hotmail.com

Eco Matser, Global Coordinator Climate, Energy and Development, ematserhivos.org

Produced by IIED's Climate Change Group and Sustainable Markets Group

The Climate Change Group works with partners to help secure fair and equitable solutions to climate change by combining appropriate support for adaptation by the poor in low and middle income countries, with ambitious and practical mitigation targets.

The Sustainable Markets Group drives IIED's efforts to ensure that markets contribute to positive social, environmental and economic outcomes. The group brings together IIED's work on market governance, environmental economics, small-scale and informal enterprise, and energy and extractive industries.

Partner organisation

Hivos is an international organisation that seeks new solutions to persistent global issues. With smart projects in the right places, Hivos opposes discrimination, inequality, abuse of power and the unsustainable use of our planet's resources. Counterbalance alone, however, is not enough. Hivos's primary focus is achieving structural change. This is why Hivos cooperates with innovative businesses, citizens and their organisations – sharing a dream with those organisations of sustainable economies and inclusive societies.

Acknowledgments

This paper came out of a background paper commissioned by HIVOS to inform their climate and energy work. IIED would like to thank Rita Poppe (Hivos), Eco Matser (Hivos) and Paul Steele (IIED) for commissioning or reviewing the work. We are particularly grateful to our external reviewer, Christine Eibs Singer, for her comments and advice.

This paper has been produced with the generous support of Hivos and the Mott Foundation.

To reproduce the graphics in this report, please credit IIED/Hivos.

Published by IIED, June 2016.

Rai, N, Best, S and Soanes, M (2016) Unlocking climate finance for decentralised energy access. IIED, London.

Product code: 16621IIED

ISBN: 978-1-78431-359-3

Printed on recycled paper with vegetable-based inks.

Photo caption: A micro hydro power plant in the Mhakuhou River on Sumba, Indonesia

Photo credit: Josh Estey.

International Institute for Environment and Development
80-86 Gray's Inn Road, London WC1X 8NH, UK
Tel: +44 (0)20 3463 7399
Fax: +44 (0)20 3514 9055
email: info@iied.org
www.iied.org

 @iied

 www.facebook.com/theliied

Download more publications at www.iied.org/pubs

Contents

Acronyms	5
Executive Summary	6
PART ONE	10
1 Introduction	10
1.1 Background	10
1.2 Study aims	12
1.3 Research parameters	12
1.4 Research method	12
2 Financing needs for decentralised renewable energy access	14
2.1 Scale of the finance needs for energy access and for decentralised energy	14
2.2 Who needs finance and for what?	16
3 The scale of climate finance flowing to decentralised energy access	20
3.1 Available climate finance	20
3.2 Where are funds flowing?	21
3.3 Flow of climate finance to decentralised energy access	23
3.4 Countries receiving energy finance	25
PART TWO	28
4 Finance barriers	28
4.1 General barriers	28
4.2 Climate finance barriers	29
5 Innovative country examples	31
5.1 Bangladesh	31
5.2 Nepal	33
5.3 Lessons from Bangladesh and Nepal: enablers for targeting finance towards decentralised energy access	34
6 Recommendations and conclusions	35
References	38
Annexes	41
Annex 1: Research methodology	41
Annex 2: Country income group classification	44

List of figures, tables and boxes

Figure 1: Overview of climate financing allocation for energy	7
Figure 2: Decentralised energy access – finance needed and current allocation from climate funds	7
Figure 3: Status of international public climate finance	21
Figure 4: Approved climate by focus area, funding instrument and income group of recipient countries (2003–2015)	22
Figure 5: Distribution in climate finance per international climate fund and climate change focus between 2003 and 2015	22
Figure 6: Percentage of climate finance flowing towards energy projects	23
Figure 7: Average approved climate finance for decentralised vs grid tied technologies	24
Figure 8: Approved climate finance by energy technology type for utility and all decentralised scale energy projects between 2006 and 2015	25
Figure 9: Energy finance distributed by income groups and funding type in USD	26
Figure 10: Approved energy finance for low income countries (in USD million)	26
Figure 11: Funnel approach to 'data' analysis	42
Figure 12: Framework for cross-country analysis	42
Table 1: Definitions and search words used to identify projects under the category 'Energy supply and Generation'	13
Table 2: Estimates of total investment needs to reach universal access	15
Table 3: Additional financing needs for grid-based and decentralised energy	16
Table 4: Example of finance needs and instruments by actor	17
Table 5: International climate funds reported within the CFU database and used within this study	43
Box 1: International public finance for energy: skewed toward large-scale grid extension	11
Box 2: Examples of working capital requirements in solar off-grid lighting sector	18

Acronyms

ABPP	Africa Biogas Partnership Programme	LDCF	Least Developed Country Fund
ADB	Asian Development Bank	LED	Light Emitting Diode
AECF	Africa Enterprise Challenge Fund	MDB	Multi-lateral Development Bank
AEPC	Alternative Energy Promotion Centre	MDG	Millennium Development Goal
AF	Adaptation Fund	MDG-F	MDG Achievement Fund
AfDB	African Development Bank	MEM	Ministry of Energy and Minerals (Tanzania)
ASAP	Adaptation for Smallholder Agriculture Programme	MIC	Middle Income Country
		MW	Megawatt
CBFF	Congo Basin Forest Fund	ODA	Official Development Assistance
CDM	Clean Development Mechanism	OECD	Organisation for Economic Cooperation and Development
CEM	Clean Energy Ministerial	PPCR	Pilot Programme for Climate Resilience
CFU	Climate Funds Update – Database	REA	Rural Energy Agency (Tanzania)
CHP	Combined Heat and Power	REACT	Renewable Energy and Adaptation to Climate Technologies
CIF	Clean Investment Fund	REDD	Reducing Emissions from Deforestation and Forest Degradation
CTF	Clean Technology Fund		
FCPF	Forest Carbon Partnership Facility	SCCF	Special Climate Change Fund
FIP	Forest Investment Programme	SE4All	Sustainable Energy for All
GCCA	Global Climate Change Alliance	SME	Small and Medium Sized Enterprise
GCF	Green Climate Fund	SPV	Special Purpose Vehicle
GEEREF	Global Energy Efficiency and Renewable Energy Fund	SREP	Scaling Up Renewable Energy in Low Income Countries
GEF	Global Environment Facility	UK ICF	UK – International Climate Fund
GOGLA	Global Off Grid Lighting Association	UN	United Nations
ICCTF	Indonesia Climate Change Trust Fund	UNFCCC	United Nations Framework Convention on Climate Change
ICFI	International Climate and Forest Initiative (Norway)	UN-REDD	United Nations Programme on Reducing Emissions from Deforestation and Forest Degradation
IDCOL	Infrastructure Development Company Limited		
IEA	International Energy Agency		
IKI	International Climate Initiative (Germany)		
IPCC	Intergovernmental Panel on Climate Change		
LDC	Least Developed Country		

Executive Summary

Achieving energy access for everyone requires more and better targeted investment, but what role does climate finance play in filling the funding gaps?

The International Energy Agency (IEA) and the Sustainable Energy for All initiative (SE4All) estimate that nearly USD 50 billion a year is needed to achieve universal access to electricity and clean cooking facilities by 2030 (IEA, 2011, 2012, SE4All 2015a). More funding for decentralised renewable energy services, such as solar home systems, mini-grids and clean cooking facilities, is a particular priority. The IEA has estimated that an additional USD 23 billion is needed each year to 2030 specifically for energy access through decentralised energy (IEA, 2011). Could this funding gap be partially filled by climate finance?

This background paper asks: *To what extent is international public finance for climate change targeting decentralised energy access for the poor?*

The research examines data from the Climate Funds Update (CFU)¹ database which covers public finance for all major international climate funds and is the only dataset currently available which enables us to assess what share of climate finance goes to decentralised renewable energy in developing countries.

Key findings:

Available climate finance

- The total approved² international public climate finance, as recorded in the CFU database, reached a total USD 14.1 billion between 2003 and November 2015.
- This is much lower than the OECD's recent estimate of annual public climate finance going to developing countries of USD 40.7 billion average for 2013/2014³ (OECD, 2015). One reason for this large difference is because the CFU covers specific climate funds, whereas the OECD covers all development projects with climate-related objectives.⁴

Flows of climate finance to decentralised energy access

- The energy sector is already a big recipient of climate funds: of the USD 14.1 billion approved climate finance about 40 per cent (USD 5.6 billion) has been earmarked for energy projects and programmes.
- However, only a small share of international climate funds is going toward decentralised energy. Of the USD 14.1 billion total, just over 3 per cent (USD 475 million) has been allocated for decentralised energy specifically – that is equivalent to USD 51 million annually on average between 2006 and 2015 (the period for which energy finance data is available). Figure 1 provides an overview of how climate financing for energy is allocated.
- If we assume this pattern of energy-sector spending applies to the OECD's higher estimate international public climate finance flows to developing countries, about USD 1.2 billion out of the USD 40.7 billion would be allocated toward decentralised energy access on an annual basis. This USD 1.2 billion is only just over 5% of the USD 23 billion annually required for decentralised energy access.

Contribution to decentralised energy access finance gap

- International public climate finance is making only a small contribution to the overall financing needs for providing energy access to everyone by 2030.
- The IEA estimated in 2011 that USD 23 billion in additional financing⁵ is needed for decentralised energy access (IEA, 2011). Yet the current amount of international public climate finance (as per the CFU database) which is allocated to decentralised energy (on average USD 51 million per year) represents just 0.2 per cent of the annual amount the IEA says is needed (see Figure 2).

¹ www.climatefundsupdate.org/

² Approved funds are those which have been deposited into an international climate fund and set aside for a specific project or programme. Only a share of approved funds have been released and spent on those projects/programmes. This report also uses the terms 'allocated' and 'earmarked' to refer to 'approved' funds

³ Most recent OECD figures on public climate finance allocated to developing countries is calculated as USD 39.7 billion in the year 2015" Source: OECD DAC Statistics, June 2015

⁴ The CFU database represents a proportion of cumulated climate finance between 2003–2015 based on information received from 26 multilateral, bilateral, regional and national climate funds regulatory monitored by the CFU. OECD figures on the other hand cover all climate finance on an annual basis. But the OECD figures include all development projects with climate-related objectives as reported by member countries to the OECD. The figures are not climate finance that is new and additional to climate aid.

⁵ The IEA calculated that overall annual finance needs to achieve energy for all was USD 48 billion/year. Given the existing and planned financing, IEA identified a shortfall of USD 34 billion per year. This USD 34 billion additional financing needs are split across grid electricity (11 bn), mini-grid electricity (12.2 bn), off-grid electricity (7.4 bn), LPG (0.9), biogas systems (1.8) and advanced biomass cookstoves (0.8bn).

Figure 1: Overview of climate financing allocation for energy

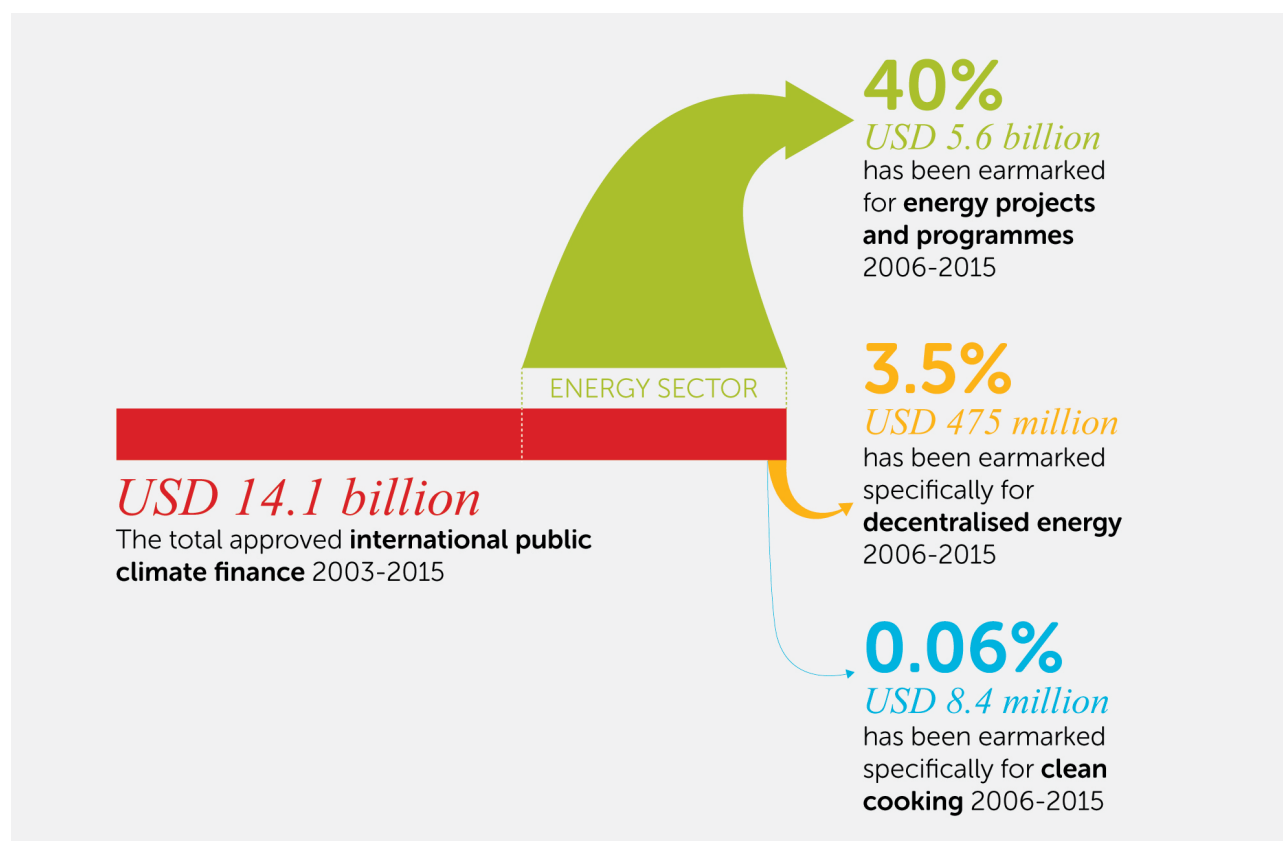
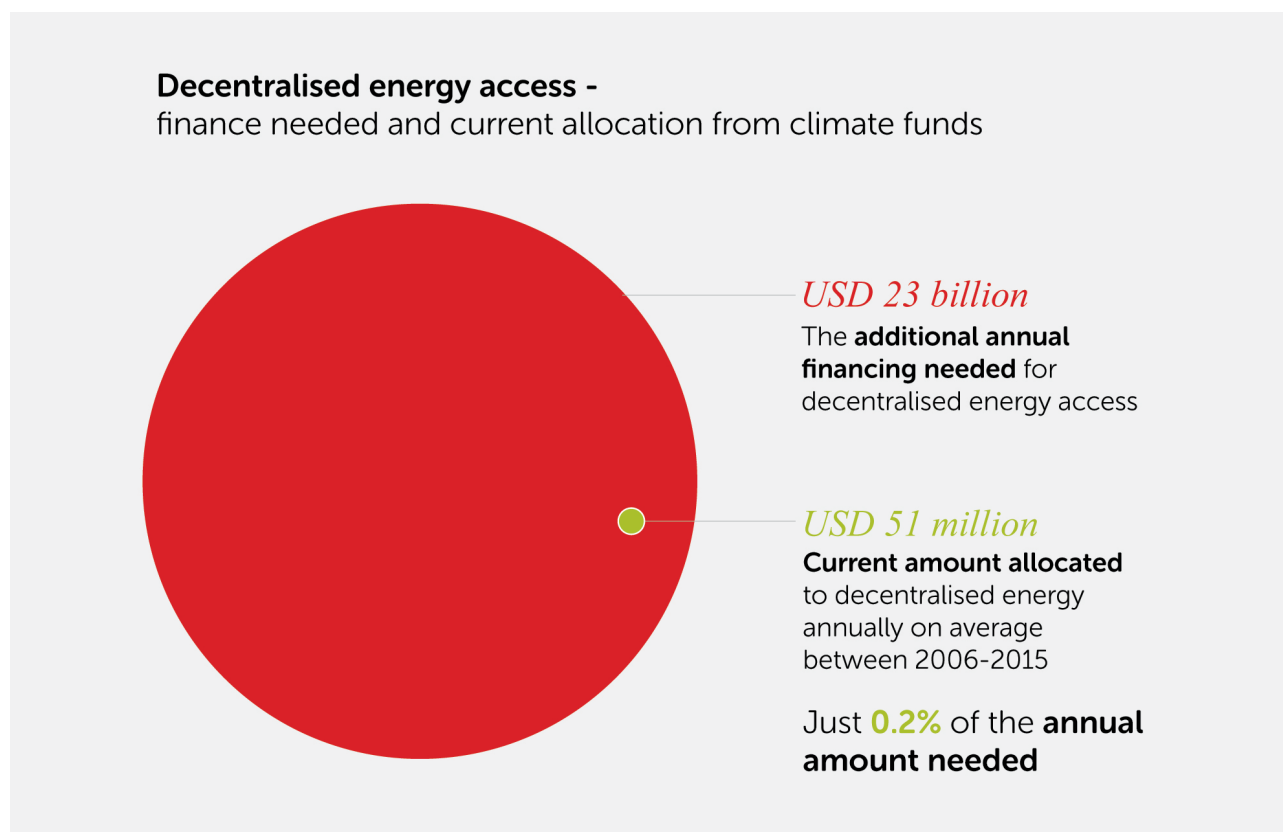


Figure 2: Decentralised energy access – finance needed and current allocation from climate funds



- Even if we use the larger OECD figure of USD 1.2 billion on decentralised energy access, this is only just over 5% of the total required to reach USD 23 billion.

Drilling deeper into climate finance for energy access

- Most of the USD 5.6 billion of international public finance allocated for energy is going toward large-scale energy and to high and middle income countries.
- Over half (USD 2.8 billion) is supporting grid-connected projects ('utility-scale'), with the remainder split across sub-sectors including buildings, industry, transport and decentralised energy.
- Clean cooking projects receive a very small share of funding – around 0.1 per cent of approved energy finance is going toward clean cooking solutions (USD 8.4 million).
- High and middle income countries have been allocated about USD 5.3 billion out of the total of USD 5.6 billion spend on energy; for low income countries it is less than USD 300 million.
- By technology-type, the solar, wind and geothermal sectors are the biggest recipients of approved climate finance earmarked for energy.

What is stopping climate finance supporting decentralised renewable energy?

- One blocker is that international climate funds do not have the right instruments or design elements that would enable them to prioritise decentralised energy access. This suggests that climate finance architecture needs to be reformed to support decentralised energy access. In addition, energy access projects need to look for a range of other funding sources.
- The data shows the biggest international climate funders are the clean technology funds (CTFs) which are using concessional loans to finance utility-scale projects in middle income countries. This suggests that climate funders are looking for viable projects that will assure returns from credit-based investments – yet as an emergent sector where business models are still being proven, decentralised energy projects are less bankable. Decentralised energy start-ups and providers need a range of financial instruments, not just loans. They need working capital, grants, subsidies and consumer finance to build business models and make services affordable; start-ups also need smaller fund sizes and less bureaucracy than is typical of international funds.

- The nature and mandate of the particular funding agencies that channel climate finance, such as multilateral development banks (MDBs), also determine the type and scale of funded projects. MDBs are experienced in using credit-based instruments in investable projects that have lower transaction costs. Investing in utility-scale projects offer better returns from loans and lower transaction costs when compared with funding large numbers of small decentralised projects.
- Specific design features of international climate funds can also discourage investment in small-scale decentralised projects. For example, the results frameworks of various mitigation funds assign higher weight to metrics of 'greenhouse gas emission reductions' and 'leveraging co-finance'; thus incentivising large-scale investments in middle income countries which are better able to demonstrate the achievement of such metrics.
- International climate funds also face a range of general blockers which affect all types of investment in low income energy markets, such as policy frameworks which favour grid-based energy or fossil-fuels over decentralised energy and renewables.

Lessons at the country-level

Although barriers exist, countries are designing mechanisms to overcome the challenges to supporting decentralised energy access. The Infrastructure Development Company Limited (IDCOL) in Bangladesh and the Alternative Energy Promotion Centre (AEPC) in Nepal provide lessons on key enablers in those countries. In Bangladesh and Nepal these include:

- **Policy framework:** high-level policies, such as decentralised energy targets, tax holidays and fiscal targets, provide critical tools and incentives to invest in decentralised energy access.
- **Dedicated special purpose agencies,** like IDCOL and AEPC, are useful for drawing down resources from donors and governments, channelling funds to different small-scale renewable energy projects and actors, and providing holistic support services to build new energy markets.
- **Diverse financial instruments for different energy actors:** Agencies provide a range of grants and affordable loans for users, investors, providers and suppliers, which have helped households to switch to cleaner fuels, and encourages investment.
- **National banks** such as central banks and development banks are also able to use their regulatory roles to encourage private sector investment.

Recommendations

The analysis focuses mainly on understanding funding flows rather than examining reform options. However, the following are potential priorities for policy-makers and practitioners:

1. Improve targeting of international climate finance for decentralised energy access in low income countries by:

- Mapping out how current funding priorities can address the full range of energy needs
- Earmarking public finance through climate funds for decentralised energy and low income markets, particularly through the Green Climate Fund. Earmarking of public finance is also important for low income countries, as middle income nations are more capable of raising private finance
- Adjusting the design features of climate funds, particularly the investment criteria, risk appetite and results frameworks
- Promoting more appropriate instruments, including a balance of loan and grant funding to ensure early stage and small-scale decentralised energy projects are supported
- Channelling funds through entities with strong experience or capacities to fund smaller-scale projects, such as country-level special purpose agencies.

2. Strengthen the national enabling environment to incentivise decentralised energy access

- Use climate and development finance to support the necessary policy and regulatory reforms which incentivise decentralised renewable energy and low income energy markets
- Strengthen institutions for managing climate finance in low income countries.

3. Fill knowledge gaps and share lessons among low income countries

While Nepal and Bangladesh have had success in funding decentralised energy, the experiences from other low income countries are less well-known. There is a need and opportunity to:

- Support research and communication so that national stakeholders understand better the range of finance gaps, needs and potential sources for decentralised energy access
- Support research and lesson-sharing around other innovative mechanisms and enablers for channelling international funds to the decentralised renewable energy sector.

PART ONE

1

Introduction

1.1 Background

Today 1.1 billion people lack access to electricity (15 per cent of the world's population) and 2.9 billion lack access to modern cooking fuels (41 per cent of the population) (IEA and World Bank 2015). The access deficit is overwhelmingly rural⁶ and concentrated in sub-Saharan Africa and South Asia, as well as East Asia for cooking.⁷

The IEA and SE4All estimate that nearly USD 50 billion a year⁸ is needed between now and 2030 to achieve universal access to energy (IEA, 2011, IEA, 2012, SE4ALL, 2015). These financing estimates are only indicative and other studies have calculated both higher and lower amounts.⁹ Where experts do agree, however, is that there is a gap between the finance required and what is currently available; and that increased funding to support decentralised energy – such as solar home systems or mini-grids – is a priority because it is too

costly to address access deficits by rolling out large-scale grid infrastructure. The IEA has estimated that additional funding of USD 23 billion per year up to 2030 is needed for decentralised energy systems¹⁰ (IEA 2011).

Nearly half (45 per cent) of funding for energy access will need to come from bilateral and multilateral sources, according to the IEA (IEA, 2013). Public finance, both international and domestic, is crucial for tackling the energy access challenge. The private sector sees low income energy markets as carrying high costs and risks and low returns. Public finance can bring down these risks and thereby attract additional sources of private finance, as well as fill in the funding gaps that the private sector cannot reach, such as very poor populations who cannot afford to pay a commercial rate for energy services.

Renewable energy can offer real opportunities to supply people on a low income with modern energy.

⁶ According to current measures of energy access, electrification rates in urban areas are 96 per cent versus 72 per cent in rural areas. The figures for access to non-solid cooking fuels are 87 per cent and 27 per cent respectively (IEA and World Bank 2015).

⁷ By population, the ten highest access-deficit countries for electricity are India, Nigeria, Ethiopia, Bangladesh, Congo, DR, Tanzania, Kenya, Uganda, Myanmar and Sudan. For access to non-solid fuels the top 10 are India, China, Bangladesh, Nigeria, Pakistan, Indonesia, Ethiopia, Congo DR, the Philippines and Myanmar.

⁸ The International Energy Agency has put investment requirements at around USD 48 billion (IEA 2011) or USD 49 billion (IEA 2012) per year to 2030. SE4All calculated this at USD 49.4 billion per year (SE4All 2015a).

⁹ A 2014 report from the Sierra Club put the figure at only USD 14bn per year (Craine *et al.* 2014) while Pachauri *et al.* (2013) pitched it much higher at between USD 65–86 billion per year.

¹⁰ Decentralised energy refers to a system where energy production occurs at or near the point of use, irrespective of size, technology or fuel used. It is distinct to large, central power stations and grid networks, distributing power across long distances. It encompasses mini-grids or micro-grids supplying electricity into a small distribution network as well as standalone systems providing mechanical, thermal or electrical power. Examples of the latter include diesel generators, solar water pumps or a solar home system. Decentralised electricity generation can be connected to a central grid, for instance a mini-grid that feeds into the grid.

Renewable resources, such as solar and water, are often abundant in areas where poor people live and the technologies do not require much maintenance. While the upfront costs can be higher than alternatives such as diesel generators, the operating costs are very low. Decentralised energy – which refers to any system where energy production occurs at or near the point of use – is particularly effective for extending access because it can be deployed more rapidly and cheaply than the conventional model of a centralised power plant and grid extension (Bhattacharyya, 2013, Javadi *et al.*, 2013). Many types of clean and renewable energy are suited to decentralised provision, such as solar home systems, mini-grids powered by small-scale hydro or biogas for cooking.

Climate finance is one potential finance stream for the energy access sector. The volumes of climate finance promised, and the sectors it targets, appear at first glance to align well with energy access finance needs. The world's governments have committed to mobilise USD 100 billion annually in public and private sources by 2020 to help developing countries mitigate and adapt to climate change. Clean energy and energy efficiency are key sectors for mitigation. Even though poor people have minuscule carbon footprints, the types of decentralised renewables being used to expand access to energy do fit the broad adaptation goals of climate finance. For instance, on the mitigation side, solar home systems can replace fossil fuels such as kerosene or diesel; while for adaptation, access to modern energy is one of many interventions that could help improve people's resilience¹¹.

There are concerns that current flows of development finance for energy are not reaching poor people and rural areas where energy access deficits are greatest. Development finance often goes toward large-scale projects such as grid extension projects, which are likely to primarily benefit industry, urban populations and export markets. Box 1 details research findings on energy sector financing by multilateral development banks. The risk is that international public climate finance, which is managed by the same institutions and subject to similar incentives and barriers, will follow the same pattern. Multilateral Development Banks (MDBs) are taking steps to increase investments in energy access, but they can do more to scale-up and to prioritise decentralized energy in low-income countries.

Climate finance is certainly being used to invest in clean energy such as wind, solar and geothermal. Recent climate investments, however, seem to prioritise large-scale investments over pro-poor decentralised projects. Investments in grid-based, large-scale wind and geothermal in Kenya and Ethiopia under the Scaling up Renewable Energy Programme (SREP) – which sits under the World Bank-led Climate Investment Funds (CIFs) – is one such example (Rai *et al.* 2015).

Since mitigation finance is designed to protect the climate, there is inevitably a drive to direct funds towards projects delivering very significant emissions reductions. This is likely to favour large projects – for instance in industry or centralised power plant generation – over small-scale energy access projects, because poor people's energy consumption and corresponding

BOX 1: INTERNATIONAL PUBLIC FINANCE FOR ENERGY: SKEWED TOWARD LARGE-SCALE GRID EXTENSION

A study by the Sierra Club and Oil Change International examined spending by multilateral development banks 2011–2014 and found that, on average:

- around 10 per cent of the World Bank's energy funding targeted energy access, and of this 10 per cent, one fifth was spent on off-grid or mini-grid clean energy deployment
- the African Development Bank's dedicated 26 per cent of its energy portfolio to energy access, but almost none of this (0.2 per cent) was directed to off-grid or mini-grid solutions.
- the Asian Development Bank directed 27 per cent of energy spending toward energy access, of which 7.5 per cent was for off-grid and mini-grid spending.

Multilateral Development Banks (MDBs) are taking steps to increase investments in energy access, but they can do more to scale-up and to prioritise decentralized energy in low-income countries. The campaign coalition, Power for All, recommend that MDBs accelerate spending on quickly-deployed, decentralized renewable energy through: (1) using energy access opportunity cost assessments in funding decisions, (2) using "super funds" of aggregated capital dedicated to decentralised renewable energy, and, (3) mobilizing dedicated, fast-track national energy access intermediaries to quickly and nimbly deliver funds.

Sierra Club and Oil Change International 2016;
Power for All, 2016

¹¹ A hypothetical example is where a supply of energy and equipment provides vulnerable people with additional means to earn money and thereby cope with climate-related shocks and changes to their livelihoods.

carbon footprint is relatively lower. Bundling lots of small-scale projects together may be a solution, though this is not yet happening in a significant way (SE4all 2015a). The expectations that carbon markets could fund energy access have not been met so far due to challenges in the approval processes, the transaction costs associated with small projects, the need to achieve significant carbon savings and the collapse in the price of carbon (Wilson *et al.* 2014).

Given these concerns and the fact that climate finance is likely to grow in the near future, it is useful to review the data to assess how far climate finance is currently going towards decentralised renewable energy and energy access projects.

1.2 Study aims

The study was commissioned by Hivos as part of the organisation's policy and advocacy work on climate change, green energy and energy access. The study provides an overview of present climate finance flows towards decentralised energy access projects in order to gauge its potential for providing energy access to the poor, to identify what barriers exist and to consider how such barriers might be overcome. The primary question we address is: **To what extent is international public finance for climate change targeting decentralised energy access for the poor?**

Sub questions include:

- What are the financing needs for scaling up decentralised renewable energy access in developing countries?
- How is international public climate finance addressing decentralised renewable energy access for the poor?
- What are the key barriers and enablers affecting the flow of climate finance for decentralised energy access for the poor?
- How can we improve climate finance so it targets energy access for the poor?

Snapshots of country-level experiences are included, particularly to elicit lessons on the likely enablers for channelling climate finance for decentralised energy.

1.3 Research parameters

We use data analysis and a literature review to assess how international climate finance is targeting decentralised energy finance. Our main unit of enquiry is climate funds which we analyse by interrogating the Climate Funds Update (CFU) database. The CFU is

an independent website¹² that provides information on international climate finance initiatives designed to help developing countries address the challenges of climate change.

The rationale for focusing on this funding source is that international public funds are expected to be the largest source of energy access financing in the near future (IEA 2011). Also, the data on international public climate finance flows is significantly better than data for the private sector or developing country government investments.

The CFU database covers public finance for all major international climate funds. This includes funds such as the World Bank administered Clean Technology Fund (CTF) and the Global Environment Facility (GEF), which represent the largest sources of international public finance for climate mitigation in developing countries, as well as the EU's Global Energy Efficiency and Renewable Energy Fund (GEEREF) and the World Bank's Scaling up Renewable Energy Program (SREP), which provide mitigation financing on a smaller scale.

The CFU database is the only centralised information source available which allows an assessment of what share of CFU-recorded finance is going towards decentralised energy access because the database categorises the financial allocation per sector and project. By comparison, data on climate-related spending by national developing governments or by the private sector is either not available, not tracked in a uniform way, or highly dispersed across many information sources and diverse actors. The total **approved finance** data from the CFU database is therefore used to understand the flow of climate finance; however it should be borne in mind that this data is cumulated since 2003 and only provides a picture of a proportion, and not the total, of climate finance flows.

1.4 Research method

The research involved a review of the energy access and climate finance literature, both globally and in selected developing countries, together with an analysis of spending allocations recorded in the CFU database between its start in 2003 and October 2015. Although the overall flow of finance was analysed between these time periods, the energy finance data was only available from 2006–2015.

The CFU data review was used to understand the volume and share of climate finance for energy access across countries (see Annex 1 for a detailed methodology including a list of funds included in the

¹² www.climatefundsupdate.org

CFU database). Energy projects were categorised into three types: energy efficiency, energy supply and generation and other energy projects combining energy efficiency and supply. Within the category 'energy supply and generation' we used search words to classify projects and programmes into utility-scale and decentralised energy projects. By utility-scale we mean all projects and renewable energy technologies that are connected to the grid. Decentralised energy projects comprise three categories: those which specify off-grid energy projects, those which specify mini-grids, and other small and distributed energy which could potentially be grid connected (but require a deeper review of project documents to ascertain the precise scope) (See Table 1).

The **literature review** was used to understand the financing needs for scaling up decentralised renewable energy access within developing countries, to identify key barriers and lessons in selected low income countries. The **country examples** focus on Nepal and Bangladesh. The main purpose of the country examples is to understand positive examples of climate finance delivering energy access and to elicit lessons learned.

The two countries have strategic importance for influencing climate and energy debates for several reasons: they are larger recipients of climate finance within the low income country category; they have country representation on boards of international climate funds and have engaged in SE4All; and they have experience in using international finance for energy access.

Research limitations

- The CFU database represent only a proportion of climate finance based on information received from 26 multilateral, bilateral, regional and national climate funds regularly monitored by CFU. Data from the OECD DAC tracker¹³ for climate finance gives a more holistic overview of climate finance on an annual basis. However, OECD figures are considered over optimistic by some developing country governments (Arun, 2015). The OECD figures include all development projects with climate-related objectives as reported by member countries to the OECD and not climate finance that is new and additional to development aid. Furthermore, the OECD figures do not provide a detailed breakdown of data to report on energy spends.
- The search words used to identify specific decentralised projects and programmes may underestimate financial flows. This is because in our methodology we categorised according to project title; however, some projects may not mention the key words in their title, but still have components targeted towards decentralised energy. To get the highest level of accuracy would require an in-depth review of all the project documents. However, given the limited scale of this study, we only reviewed a limited number of projects.
- The data analysis is carried out depending on data availability from CFU database which may vary for different sectors. For example, energy data within the CFU database is available from 2006–2015 while the overall climate finance data is reported between 2003–2015.

Table 1: Definitions and search words used to identify projects under the category 'Energy supply and Generation'

CATEGORY	SEARCH WORD	TECHNOLOGY TYPE
Utility-scale	On-grid large renewable energy technologies/programmes, or grid extension projects, often government run	Large geothermal, wind energy programmes, large scale biomass
All decentralised	All the below	All the below
Decentralised Off-grid	Specifically mentioned off-grid energy projects and household energy projects	Solar lanterns, clean cook-stoves, micro-off grid hydro, off-grid solar PV such as solar home systems and solar irrigation pumps
Decentralised Mini-grid	Specifically mentioned mini-grid energy technologies, especially rural and village projects	Small hydro mini-grids for rural energy, hybrid community mini-grids
Decentralised Other	Small, distributed but potentially grid connected	Small-hydropower, decentralised biomass, rooftop solar PV,

¹³ <http://www.oecd.org/dac/stats/climate-change.htm>

2

Financing needs for decentralised renewable energy access

2.1 Scale of the finance needs for energy access and for decentralised energy

There are several different estimates on the investment needs to achieve universal energy access. The IEA and SE4All calculate that nearly USD 50 billion a year is needed between now and 2030 (IEA 2011; 2012; SE4All 2015). This research uses the IEA/SE4All figures as a reference point because they have a lot of traction in public debates. However, it is important to recognise that these figures are only a broad estimate and that other studies have calculated the amount needed to be either much lower or higher. Table 2 provides a summary of different estimates on the overall investment needs.¹⁴

The variation in financing assessments stems from different assumptions people make around investment costs, access rates, how much poor people consume and technologies selected. The methodologies used face a number of limitations, for instance by focusing only on capital costs not recurrent costs, or not disaggregating costs across generation, transmission and distribution, or between countries. Craine *et al.* (2014) argue that the IEA figures significantly overestimate the needs, as well as being unrealistic given current investment levels. Using different assumptions, Craine *et al.* (2014) assess that it will cost just USD 14 billion a year for 15 years to provide electricity services for everyone. Their lower figure takes account of cost savings from efficiency gains, for instance replacing incandescent lights with LED lights and using energy efficient fans and fridges, which mean

¹⁴ Investment needs refer to the total funding required and include existing funding flows. For instance, the IEA (2011) calculated total investment needs of USD 48 billion. Investment levels at the time were estimated at USD 9.1 billion and anticipated to increase to USD 14 billion without significant new policies being introduced, leaving an investment shortage of around USD 34 billion.

Table 2: Estimates of total investment needs to reach universal access

GOAL	INVESTMENT NEEDS ESTIMATES (USD BILLION/YEAR)		PERIOD	SOURCE
	ELECTRICITY	COOKING		
Universal energy access	45	4.4	2010–2030	SE4All (2015)
Universal electricity access	14		2015–2030	Craine <i>et al.</i> (2014)
Universal energy access	12–279	18–41	2010–30	Bazilian <i>et al.</i> (2014)
Universal energy access (incremental) (a)	65–86		2011–30	Pachauri <i>et al.</i> (2013)
Universal energy access	44.5	4.5	2011–30	IEA (2012)
Universal energy access	48		2010–2030	IEA (2011)
Universal energy access	15	71	2010–30	IASA (2012)
Universal energy access	48		2010–30	Dobbs <i>et al.</i> (2011)
Universal energy access	35–40 (b)	39–64 (c)	2010–30	AGECC (2010)
Universal electricity access	~55			Saghir (2010)
Universal electricity access	42.9		2005–30	World Bank (2006)

Sources: adapted from (Bazilian *et al.*, 2014) and (WorldBank and IEA, 2015).

(a) Pachauri *et al.* (2013) calculate the incremental cost above the current trends to achieve universal energy access by 2030 in rural areas only, reported in 2005 USD.

(b) Based on IEA (2009).

(c) Estimates include the capacity development costs of multiple supply options in USD billions/year: improved cook stoves (11–31), biogas (30–40) and LPG (7–17).

households consume a lot less energy (than the IEA assumes) for the same level of service.¹⁵

Whatever the precise figure, all the assessments show that there needs to be a significant scaling-up in investment from current levels, particularly in sub-Saharan Africa and developing Asia. There also needs to be increased funding to support the spread of decentralised energy, such as solar home systems or mini-grids in rural areas, because it often does not make economic sense to extend the main grid (IEA and World Bank, 2015)¹⁶.

The evidence base on how much money is needed for decentralised energy is quite limited. While most financing assessments do distinguish between electricity and cooking, often they do not separate out the shares of grid, mini-grid and off-grid funding, or consider the different costs of these technologies across different regions (IEA and World Bank 2015). In this report we use an estimate by the IEA which calculates that an additional funding of USD 34 billion per year up to 2030 is needed for universal energy access. This further breaks down into USD 11 billion for on-grid electricity and USD 23 billion for mini-grid and off-grid electricity, together with various standalone cooking technologies and fuels (see Table 3).

¹⁵ Craine *et al.* (2014) critique IEA figures for assumptions around poor energy efficiency leading to high energy demand, and limitations in their cost-modelling of off-grid solutions which, in turn, reduce the projected utilisation of off-grid solutions. The bulk of the cost saving identified by Craine *et al.* comes from a reduced cost estimate of USD 500/household for standalone off-grid, compared to IEA costs of USD 2,000–2,500 for similar requirements. Following the multi-tier framework, Craine *et al.* define access as Tier 2, plus 2 hours agro-processing per day.

¹⁶ For fast-growing urban populations, it is expected that their needs will be met via grid electrification (IEA and World Bank 2015).

Table 3: Additional financing needs for grid-based and decentralised energy

	INVESTMENT NEEDS (USD BILLION/YEAR)
Total needs	48
Current (in 2009)	9.1
Business-as-usual projections	14
Additional financing needed	34
Electricity	
On-grid	11
Mini-grid	12.2
Off-grid	7.4
Cooking	
LPG	0.9
Biogas systems	1.8
Advanced biomass cookstoves	0.8
Total additional financing needed for decentralised energy (electricity and cooking)	23

Source: IEA 2011

2.2 Who needs finance and for what?

The financing needs for expanding decentralised, renewable energy access are extremely varied and go far beyond payment for technology hardware. They include several actors who need finance for different purposes and who use different financial instruments, depending on what is most relevant to their needs. Key actors which are the target for energy access funding are **energy users, energy providers and governments**. Financial intermediaries, like local banks, are also relevant.

The different sources of finance that are available, or potentially available, for decentralised energy are similarly diverse. They include seed investors, impact investors, private foundations, venture capitalists, development finance institutions, carbon finance providers, national or local banks, private foundations, MDBs, bilateral donors, host country governments and national power utilities (Differ, 2014). International climate finance will interact with some of these other institutions, for instance providing finance to a host country bank or government to onward lend or invest.

Mapping the finance landscape for decentralised energy is very complex so this section only briefly highlights some of the key financing needs referenced in the literature (also summarised in Table 4 below).

2.2.1 Energy users

People living in poverty do already pay for energy services, such as kerosene (often subsidised by the government), but traditional energy sources are often low quality and there are still big affordability barriers to people paying for energy. Poor people's cash flows are often irregular, for example, from harvest sales or ad hoc remittances, and some types of renewable energy alternatives (eg solar home system) have much higher upfront costs than traditional fossil fuel alternatives. Added to this is the cost of purchasing equipment to run off a new energy supply, such as fridges, power tools, or televisions.

There has been a lot of progress with end-user financing in recent years. Innovative pay-as-you-go (PAYG) schemes, which offer pre-paid energy linked to mobile payments and smart-meters, provide end users with flexibility in payment schedules, while the development of very low-cost solar lighting products (eg lanterns) have helped reduce costs. Households on as little as USD 1–3 per day income can often afford

Table 4: Example of finance needs and instruments by actor

ACTOR	FINANCE NEEDS	FINANCIAL SOURCE OR INSTRUMENT
Energy user	Paying for new energy products or service eg grid connection, monthly tariffs Paying for related energy equipment eg fridges, TV, power tools, hairdryer Paying for fuel, maintenance and repairs	Personal savings Local savings group Government provided subsidy (eg lifeline tariffs, connection subsidies) Loan eg from microfinance institution Retailer finance scheme eg pay-as-you-go, pay-to-own.
Energy provider	Seed capital for early stage research and enterprise development eg concept design, feasibility analysis, piloting Working capital eg to buy inventory Investment capital for growth period Solutions to address customer affordability gap	Grants Concessional Loans Market-rate loans Equity Credit guarantees Working capital fund Consumer subsidy / business model innovation Risk mitigation instruments eg political risk insurance Results-based financing
Financial institutions	Concessional finance to channel finance to energy providers and users Risk guarantees and risk mitigation instruments Capacity development Demonstrable and investable models	Grants Concessional loans Credit guarantees
National government	Policy and regulatory development: identifying and reforming policy, laws and regulations needed to attract investment eg feed-in-tariffs, product standards Capacity building and training eg energy ministry officials, regulators, universities Market development eg resource mapping, feasibility studies, business development services Reforms to wider enabling environment eg rule of law, infrastructure, property rights	Grants and loans from development finance institutions Domestic taxes

Source: prepared by authors

a solar lantern, while those on USD 3–5 a day can pay for a small solar home system that run three to four lights, charge a phone, or run a radio. Off-grid solar enterprises at the forefront of these innovations have been supported by grant finance in their early stages.

Reaching the very poorest with off-grid solutions still remains a challenge. At the same time, low-income households want to improve the amount and quality of

energy services they access over time. At the first level of access, households expect to access technologies such as solar lanterns, small solar home systems or an improved cookstove. But as they step up beyond this first level, people want energy for productive activities, such as processing crops. The higher power systems needed for productive activities are more expensive and beyond many poor people's means.

Mini-grids, which are proposed as a key solution for rural energy access, pose a particular affordability challenge. A report from the University of California estimates that the costs of solar PV mini-grids would have to reduce by about 60 per cent to make tariffs affordable for people living on USD 3–5 day¹⁷ and at the same time be viable investments for private capital (LIGTT 2014). This view is backed up by a recent survey of finance needs among mini- and micro-grid developers who ranked their three top challenges as: limited availability of subsidies, the technology costs, and national tariff regulations which limit their ability to charge commercially viable rates (UN Foundation and SE4All 2015).

The ongoing affordability challenge means that additional financial assistance is required for some low income energy users. This may directly target the end-user and come from government-funded consumer subsidies, small loans (eg microfinance), or local savings groups (Wilson *et al.* 2014). Alternatively, public funding can be used to support innovation in energy technologies and delivery models to address cost barriers.

2.2.2 Energy providers

Energy providers requiring funding are not a homogenous group: there are many different types of organisations involved in supplying decentralised renewable energy to poor populations. A mixture of social enterprises, small and medium-sized enterprises (SMEs), NGOs and hybrid partnerships – involving public, private and civil society sectors – have been particularly active. The term ‘providers’ also spans a very wide range of functions in the supply chain: design, manufacturing, power generation, distribution and re-sale (importers, wholesalers, retailers), installation, and service repair. It is worth noting that traditional players, such as large public or privately-run energy utilities, have thus far played a small role in providing decentralised energy. Also, while some large private companies, such as the oil companies Total and Shell, have experimented with low income energy markets – sometimes as part of their corporate social responsibility programmes – they are often able to finance small projects through their own budgets. As such it is the smaller, early-stage enterprises and SMEs that find it particularly challenging to access financial assistance (Differ 2014).

Providers’ financing needs vary according to the stage of business development, technology, size of operation and local context. One particular funding gap reported by energy start-ups is working capital, since providers have to pay for their inventory, rent and staff often well before they receive money from customers (Ashden and Christian Aid 2014). More broadly, providers need start-up and growth capital so they can cover spending until their sales income becomes positive. In the start-up phase, decentralised energy providers are focused on activities like developing the delivery model, technology research and development, or securing community buy-in and legal permissions for larger infrastructure. These all require significant staff time and therefore capital outlays. Box 2 provides examples of the different size of working capital needs for different off-grid providers.

BOX 2: EXAMPLES OF WORKING CAPITAL REQUIREMENTS IN SOLAR OFF-GRID LIGHTING SECTOR

A survey commissioned by the Global Off-Grid lighting Association (GOGLA) with industry representatives operating in the off-grid lighting market provided real-world examples of typical working capital requirements:

- **A small, single-country African distributor needs about USD 250K** in working capital.
- **A medium-sized design, engineering and manufacturing company needs USD 500–USD 1 million** working capital.
- **One of the largest players** in the industry that covers the whole value chain (manufacturing to end-user financing) **needs USD 5 million** working capital.

AT Kearney and GOGLA 2014

At the very early stage, finance will typically be in the form of small grants and moving to concessional and commercial debt and equity as the business model is proven and the enterprise starts to grow and scale up (CEM 2015). A recent survey of finance needs among 130 organisations involved in off-grid lighting found a shift in demand from grant funding toward debt and equity funding (compared to two years previously), which the report’s authors see as an indicator of a more established decentralised energy sector (AT Kearney and GOGLA 2014).

¹⁷ The assessment found either cost of electricity needs to be reduced by 60 per cent, or the combined energy efficiency of the basic portfolio of electrical appliances needs to improve by 60 per cent. The analysis applies only to the 1.4 billion people living on USD 3–5 per day; the affordability gap for the 2.6 billion people living on less than USD 3 per day is much higher (LIGTT 2014).

2.2.3 Government and the enabling environment

Financing gaps are not only resolved by more finance for either end-users or energy providers; in many instances, it is as much about improving the policy and enabling environment to build low-income energy markets, make projects more attractive to investors and ensure the energy service becomes economically viable. It also involves building the capacity of domestic institutions, such as ministries and local government, to manage and spend climate finance (UNDP, 2012).

Interventions by government and other stakeholders to improve the enabling environment are extremely wide-ranging. They include, for example, reducing import duties and introducing feed-in-tariffs, strengthening the local skills base, introducing business development coaching, or making citizens more aware of what a quality energy product is. These market development activities also require funding and as such, funding from bilateral or multilateral donors provided for national governments is often targeted at building the enabling environment, rather than investing in specific projects or technologies.

One critical aspect of the enabling environment is the lack of affordable finance available from traditional institutions, such as local banks. In-country financial institutions often lack the data (default rates) or sector knowledge to provide loans or other forms of financial support to decentralised energy providers. Over-exposure to national utilities and a lack of access to the debt capital market also limits new lending to the decentralised energy sector. Lack of support from local banks in the local currency is another issue (AT Kearney and GOGLA 2014). The high cost of capital offered by local banks will be prohibitive for many energy SMEs and in any event will translate into a higher cost for products (ie so they become in turn less affordable to low income end users). A key role for public funders is therefore providing low-cost concessional finance to financial intermediaries so that they are able to on-lend or invest. The public sector can also deploy risk mitigation instruments such as risk guarantees and state collaterals to ensure risky investments will be viable for the private sector. In addition, policy and capacity support can further enable an inexperienced private sector to engage with novel technologies, markets and actors.

3

The scale of climate finance flowing to decentralised energy access

Climate finance implies the flow of public and private finance channelled by a range of actors and institutions towards adaptation and mitigation actions. Countries need significant amounts of climate finance to both reduce greenhouse gas emissions and also cope with climate change. To address these needs, the Cancun Agreement sought commitments in the range of USD 100 billion 'new and additional' climate finance to developing countries annually by 2020. Since then, countries have committed USD 30 billion between 2010 and 2012 as Fast Start Finance (FSF), with most developed nations managing to exceed their funding targets in the early days. The second wave of pledged funding comes through the Green Climate Fund, where developed countries have pledged USD 10.3 billion towards a range of adaptation and mitigation actions. The flow of funds is gradually increasing, but the approval and disbursement of dedicated finance remains slow. The distribution of available global finance also varies geographically as well as by scale and type of

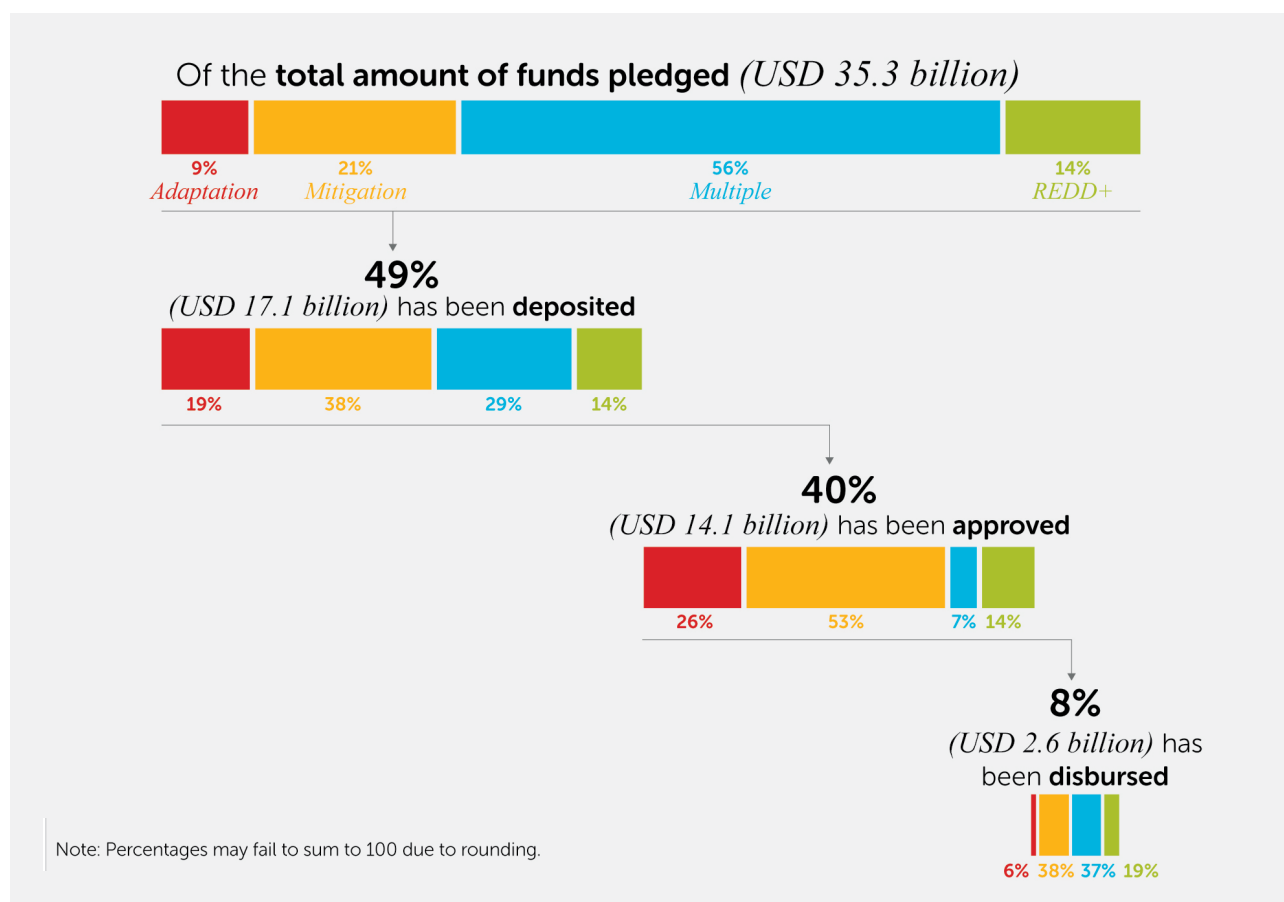
projects. The section below sketches out the scale of public finance available for addressing climate change issues and the extent to which the money is channelled towards decentralised energy access projects in developing countries.

3.1 Available climate finance

The total '**pledged**' international public finance, as recorded in the CFU database, reached a total of USD 35.3 billion between 2003 and November 2015. Of the total amount of funds pledged, around 40 per cent (USD 14.1 billion) has been approved for spending and 8 per cent (USD 2.6 billion) disbursed. Figure 3 shows the amount of climate finance pledged,¹⁸ approved, and disbursed until November 2015. The average annual flow of approved finance reached around USD 1.2 billion in 2015.

¹⁸ Pledged funds are verbal or signed commitments from contributing countries towards a particular fund. Deposited funds – money physically paid into a fund representing a country's commitment; Approved funds have been set aside and approved to a specific project or programmes. Disbursed funds are those that have been released and spent on different projects.

Figure 3: Status of international public climate finance



This cumulative USD 14.1 billion figure or annual average amount of USD 1.2 billion is clearly lower than the OECD's recent estimate that USD 40.7 billion in public climate finance is going to developing countries each year. The OECD figure is based on calculated finance for all development projects which contain climate-related objectives, as reported by member countries to the OECD. The CFU figures represent only a proportion of climate finance, since they are based on information received from the 26 multilateral, bilateral, regional and national climate funds which are annually monitored by the CFU.

3.2 Where are funds flowing?

According to the CFU database, mitigation projects receive the largest amount of approved climate finance across the developing countries. This trend is particularly strong in emerging economies. Around 53 per cent of approved finance for mitigation is used for general mitigation projects such as energy supply and generation etc., while 14 per cent is approved for forestry and REDD+ projects. Financing for adaptation represents a quarter of total approved

funds. Figure 4 shows how mitigation and adaptation finance is distributed across recipient countries from different income groups, and the type of funding instrument used.

With mitigation projects significantly concentrated in the upper middle income economies of Asia and Latin America, the total available finance in sub-Saharan Africa and Small Island States is low.

Figure 5 shows how climate finance is distributed across different focus areas, funds and funding instruments. It shows that, of all the approved finance, the Clean Technology Fund (CTF) – a funding programme within World Bank's Climate Investment Funds – channels the largest share (i.e. 30 per cent) of mitigation finance to developing countries. The main financial instrument it uses is concessional loans. Grant-based funding instruments for mitigation are predominantly being channelled through the Global Environment Facility and the two bilateral funds of Germany (IKI) and the UK (ICF); these three funds contribute around 36 per cent of the mitigation finance. The UNFCCC's Least Developed Country Fund (LDCF) and the CIFs Pilot Programme of Climate Resilience (PPCR) constitute the most significant adaptation arms of climate funds.

Figure 4: Approved climate by focus area, funding instrument and income group of recipient countries (2003–2015)

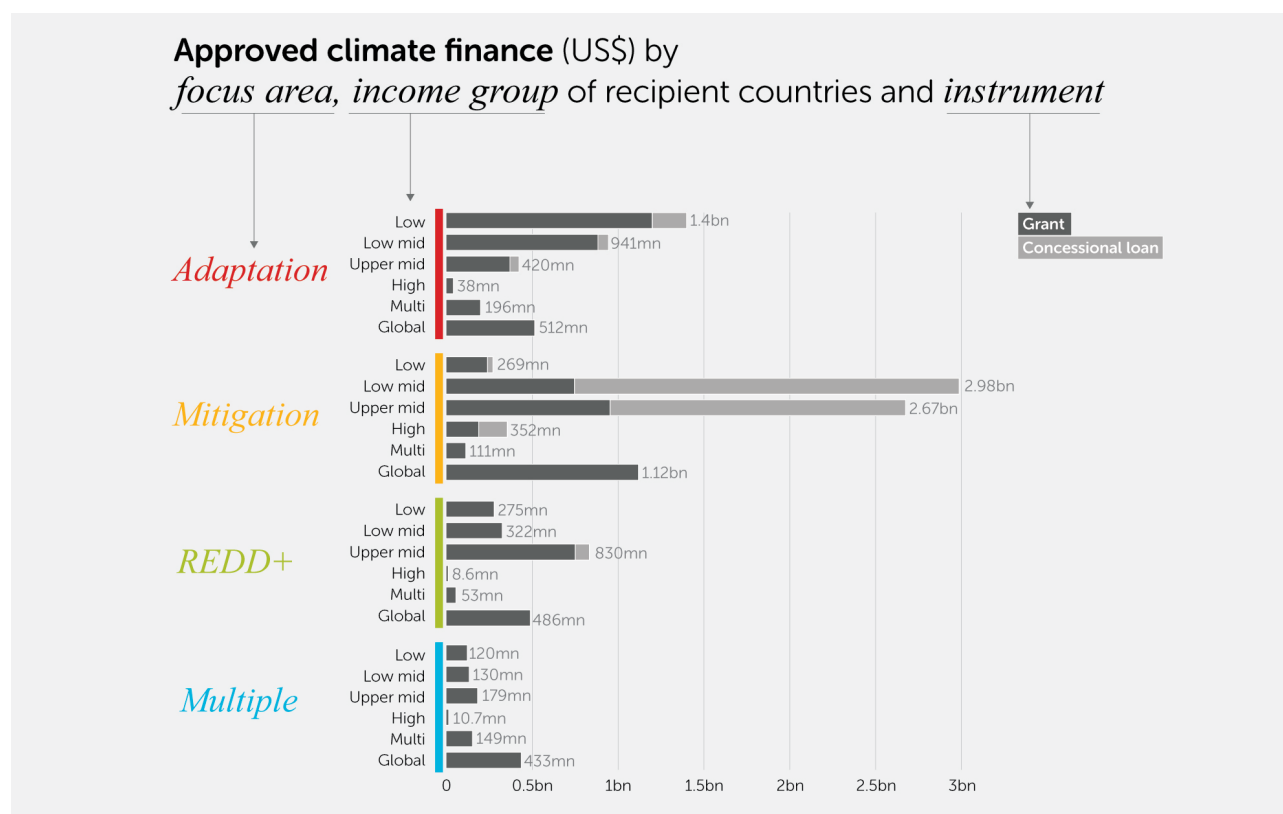
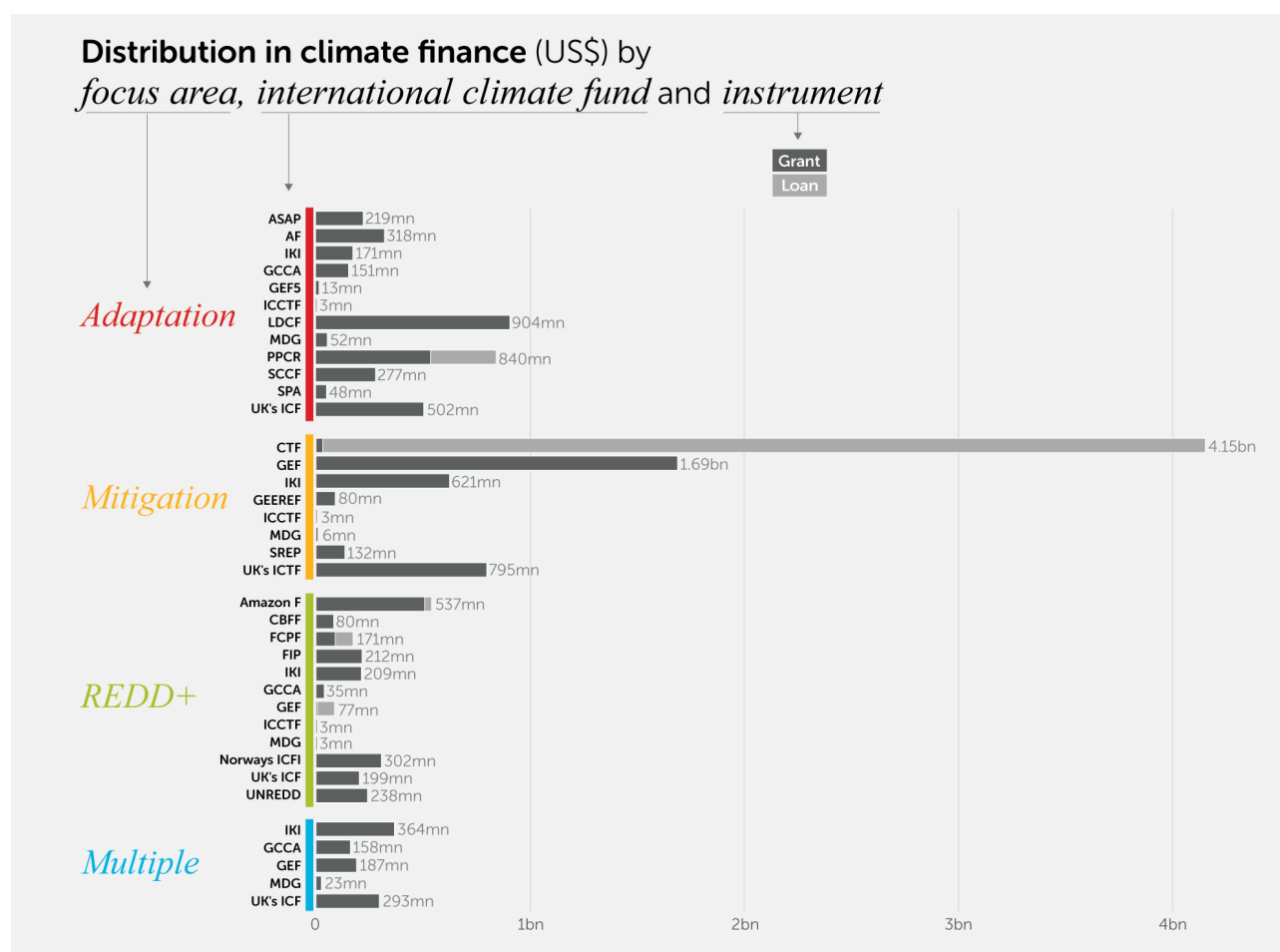


Figure 5: Distribution in climate finance per international climate fund and climate change focus between 2003 and 2015



For the purpose of this analysis we will focus on the major mitigation funds to examine what proportion of mitigation finance is flowing for energy access projects.

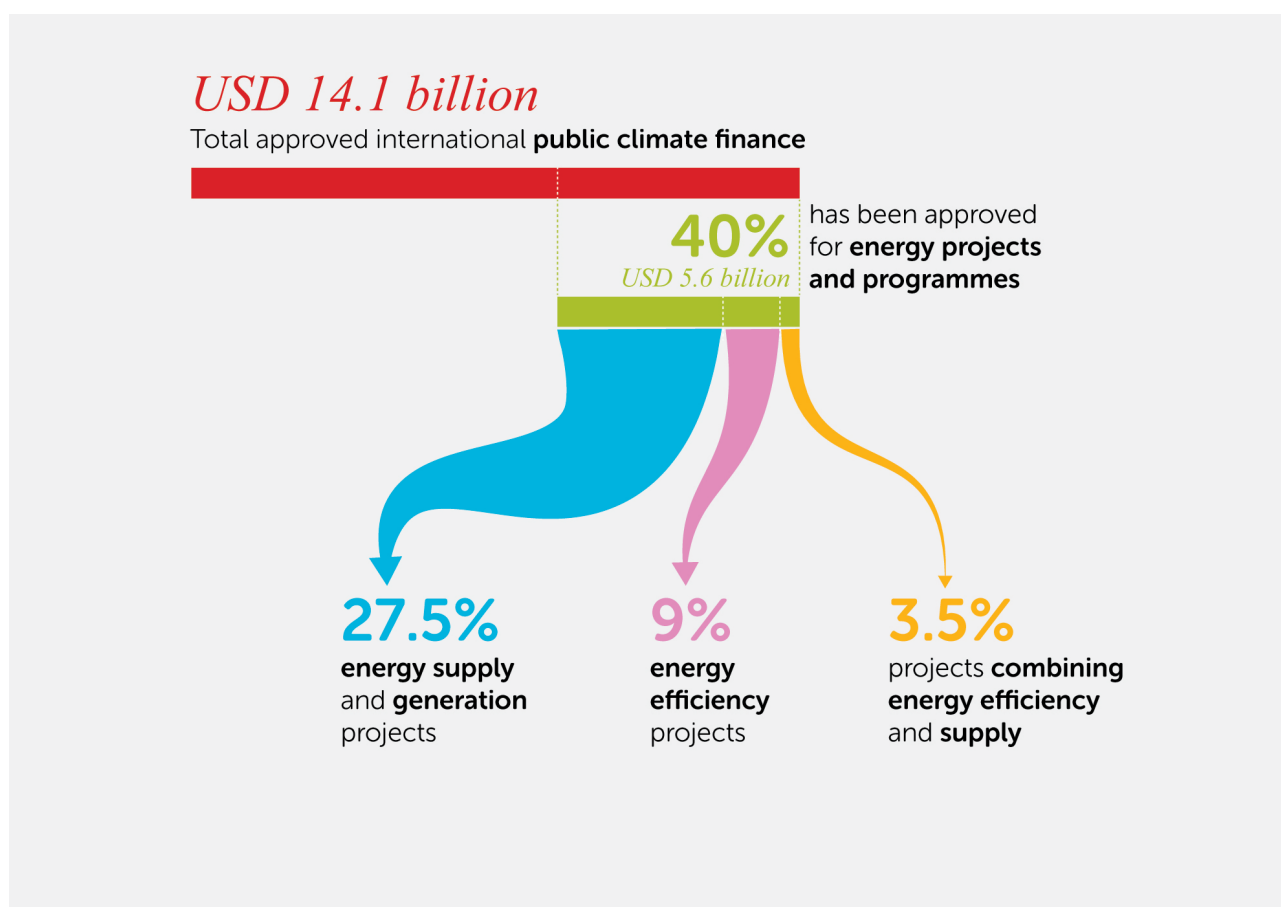
3.3 Flow of climate finance to decentralised energy access

The energy sector is a big recipient of climate funds. Of the USD 14.1 billion approved climate finance, about 40 per cent (USD 5.6 billion) has been approved for energy projects and programmes up to 2015 (Figure 6). Most energy projects are funded through mitigation projects, but REDD+ and adaptation focused finance also covers around 1 per cent of the total climate finance flow from international climate funds to energy projects. The energy projects are categorised into three types: energy efficiency, energy supply and generation, and energy projects combining energy efficiency and supply. Of the three categories, the majority of funding goes toward projects under 'energy supply and generation' (around USD 3.8 billion) (Figure 6).

Although a significant part of climate funds goes to energy projects, only a small share is being channelled to decentralised energy. Figure 7 shows how the USD 5.6 billion in approved energy funding is allocated between utility-scale, decentralized and other energy projects (meaning projects targeting energy needs in sub-sectors such as buildings, transport and industry).¹⁹

Based on our calculation of finance channelled to energy projects listed in the CFU database, IIED estimates that out of the USD 14.1 billion total, about 3.4 per cent (475 million) has been approved for decentralised energy specifically. That is equivalent to USD 51 million annually on average between 2006 and 2015; a small contribution to the overall financing needs for providing energy access to everyone by 2030. Approved funding split between off-grid (eg solar home systems), mini-grid and "other" decentralised energy projects. A deeper look at energy funding flows show that clean cooking services – such as improved cookstoves projects – are receiving only a very small share: around 0.14% of total approved energy funds (USD 8.4 million).

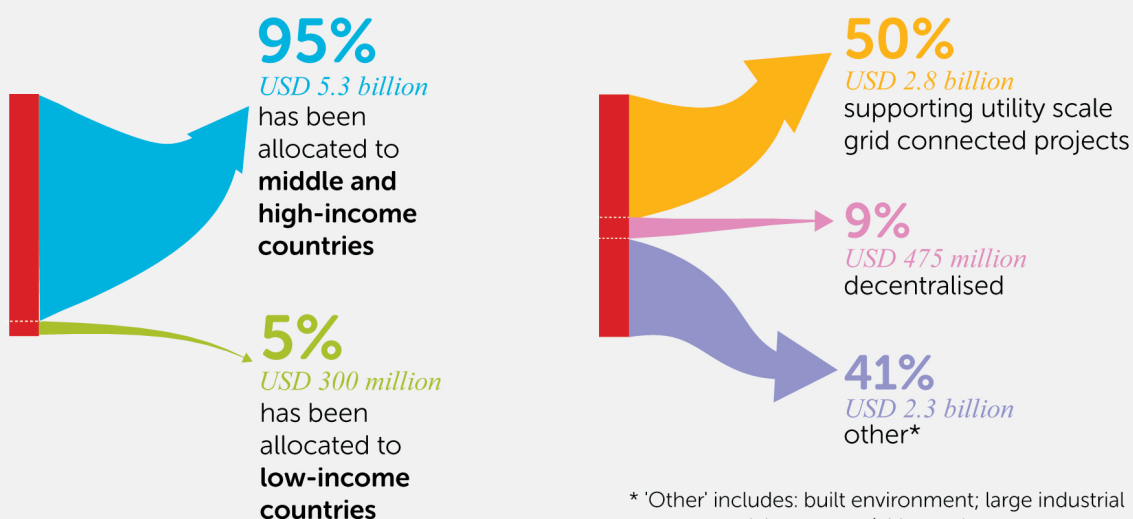
Figure 6: Percentage of climate finance flowing towards energy projects



¹⁹ We categorise "other" as including energy projects related to the following sub-sectors: transport/cities; industrial/commercial; built environment; SMEs; and a final category of 'unknown' where the sub-sector was unclear.

Figure 7: Average approved climate finance for decentralised vs grid tied technologies

Of the **USD 5.6 billion** international public finance allocated for energy projects and programmes...



* 'Other' includes: built environment; large industrial or commercial; transport/cities; unknown.

Note: Percentages may fail to sum to 100 due to rounding.

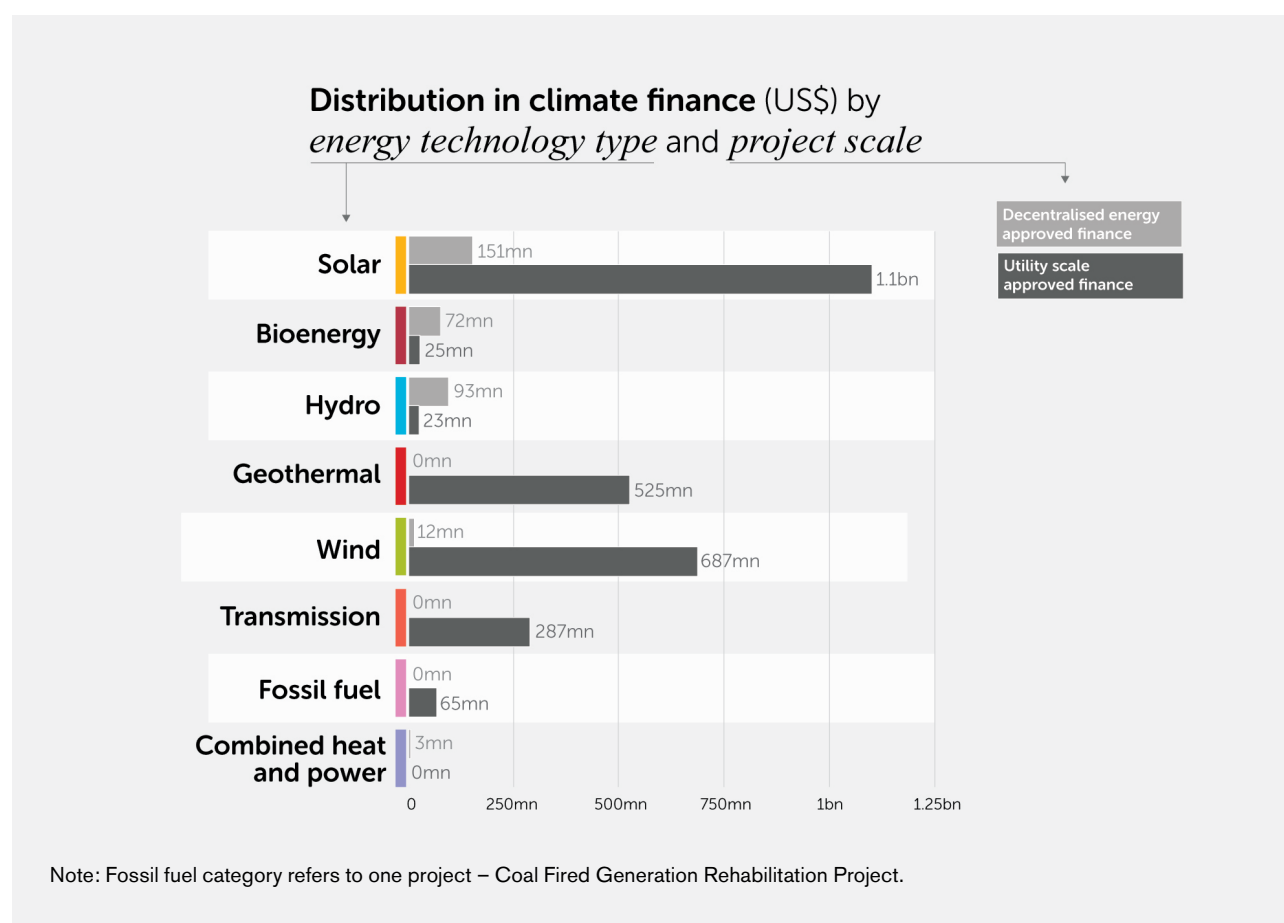
As noted earlier, the IEA estimated that USD 23 billion in additional financing is needed for decentralised energy access (IEA 2011). The average annual allocation of USD 51 million represents just 0.2 per cent of the annual amount in additional financing the IEA says is needed.

Digging deeper into the climate finance data, we analyse where funds are getting channelled to, if not for decentralised energy. Most of the USD 5.6 billion approved for energy is going towards large-scale projects in middle income and high income countries which receive USD 5.3 billion out of the total USD 5.6 billion spend on energy. By contrast, low income countries are receiving less than USD 300 million of the overall energy spending. Over half of energy funding (ie USD 2.8 billion) is supporting grid-connected projects ('utility-scale') (Figure 6).

Technologies such as solar, wind and geothermal are by far the biggest recipients of approved climate finance for the energy sector. Solar offers opportunities for small-scale and large-scale systems (IPCC, 2012) and also assures cost competitiveness against fossil fuel alternatives (BNEF, 2015, Javadi *et al.*, 2013); hence receiving maximum energy finance for both grid connected and decentralised energy projects.

Grid-tied 'utility-scale' projects are further accessing funds through geothermal and wind-based technologies while decentralised energy finance is being spent on bioenergy and micro, mini and small hydropower technologies. Figure 8 shows the major technology sub-sectors that receive climate finance for small scale decentralised energy access and utility-scale projects.

Figure 8: Approved climate finance by energy technology type for utility and all decentralised scale energy projects between 2006 and 2015



3.4 Countries receiving energy finance

As discussed previously, high and middle income countries are the largest recipients of energy finance, particularly utility-scale projects funded through concessional loans (Figure 9). Amongst the lower middle income group, much of this finance (nearly USD 1.6 billion) is received by Morocco, India, Egypt and Ukraine, who are accessing concessional loans from the World Bank's CTF. Amongst the higher middle income group, countries such as South Africa, Mexico, Thailand and Turkey are the largest recipients of loans from the CTF and this is being spent on grid-connected energy.

Low income countries have received less than USD 300 million in energy finance, of which almost half (USD 118 million) is estimated to focus on decentralised energy solutions including mini-grids and off-grid energy. Figure 10 shows the distribution of energy finance

allocated specifically for energy supply and generation in low-income countries (USD 180 million²⁰), and the breakdown down between utility-scale and various types of decentralized energy projects. It shows that Nepal is by far receiving the largest share of total decentralised energy finance amongst the low income country group, followed by Tanzania and Bangladesh. Most projects are funded via the GEF trust fund (implemented through UN agencies) and the SREP.

Overall, climate finance is making a small contribution to estimated energy access financing needs in low-income countries. The World Bank has developed a country-level investment needs model called the ACCESS Investment Model (AIM), which assesses the investments required to achieve different levels of electricity access²¹. Take the case of Tanzania. The CFU data shows that between 2003 and 2015, approximately USD 8.1 million of climate finance had been approved for energy funding in Tanzania – all for mini-grid spending. Yet the AIM model estimates

²⁰ Low income countries are receiving a total of USD300 million energy finance, but the country level data in figure 10 (total USD 180 million) does not include other forms of energy finance such as money spent on built environment, industries, transport, etc.

²¹ AIM uses the multi-tier access framework which has 5 levels, ranging from very low-capacity supply technologies, such as a solar lantern, to high-capacity technologies such as the central grid (IEA and World Bank, 2015; pp 65–80).

Figure 9: Energy finance distributed by income groups and funding type in USD

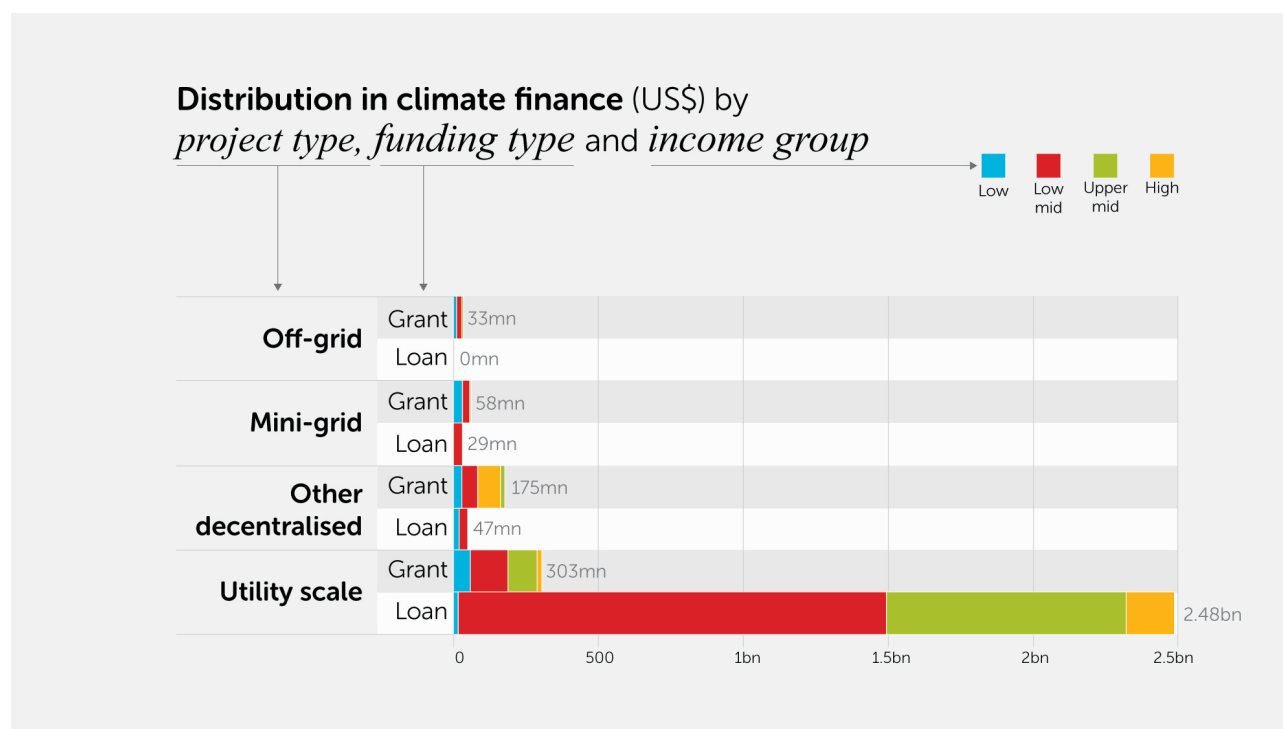
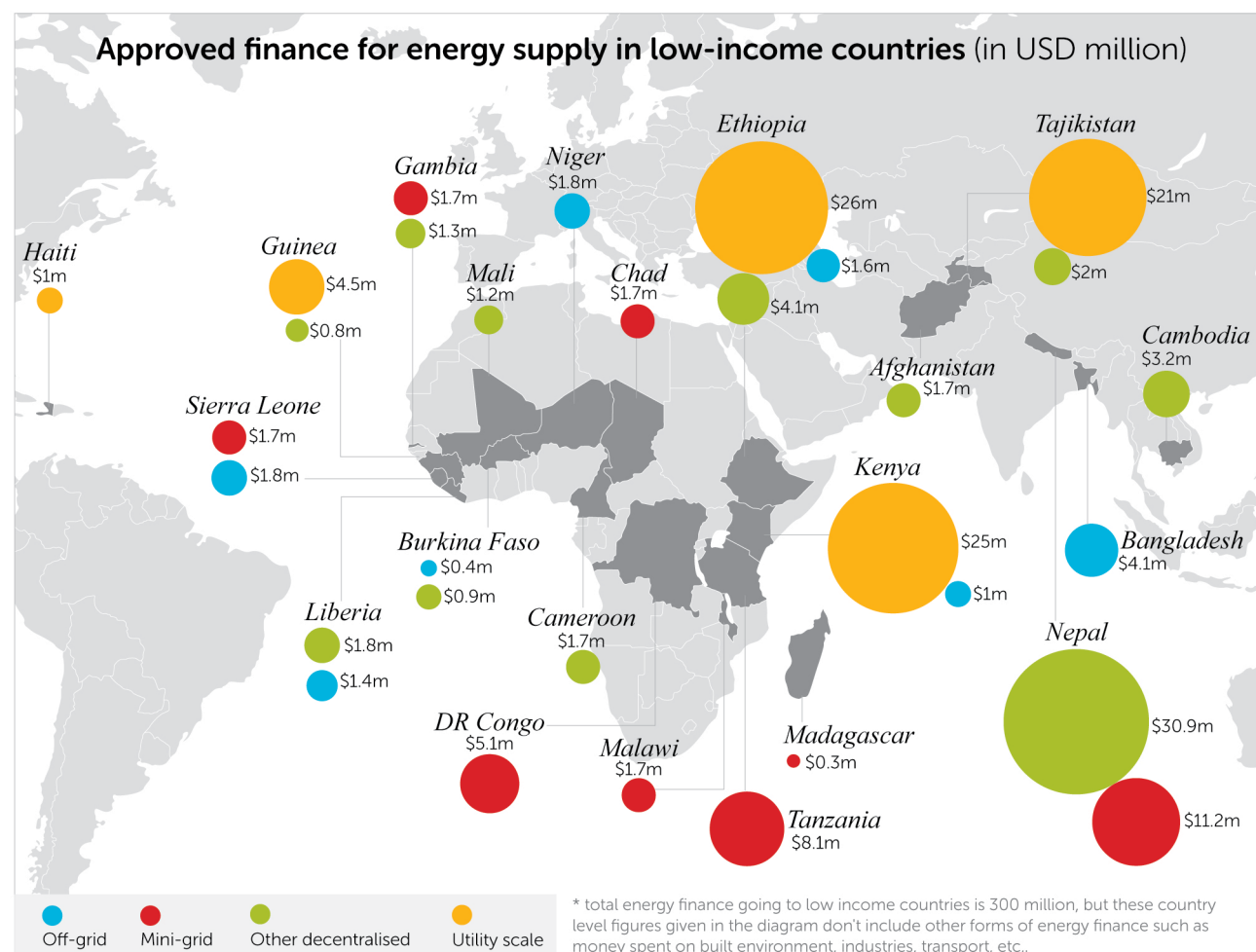


Figure 10: Approved energy finance for low income countries (in USD million)



that Tanzania has annual average electricity access investment needs of USD 65 million to USD 2.1 billion. To provide everyone with tier 3, which is the minimum needed for many productive activities, such as food processing, storage and irrigation, the AIM model estimates that around USD 475 million is needed each year. (For further information on country-level electricity access investment needs, see Table A2.6, chapter 2 of IEA and World Bank, 2015)

Even though total decentralised energy finance is small, it is worth noting that most funding for decentralized projects are funded through grants. It is also striking that nearly 90 per cent of the total grid-tied energy investments in low income countries are spent across three countries: Ethiopia, Tajikistan and Kenya, and that these are mostly through grant-based funding. The use of grants can be viewed as positive given grants are

often appropriate instruments for pre-commercial, decentralised renewable energy markets in low-income countries. At the same time, instruments should be flexible and fit-for-purpose. So as markets evolve, more scaled-up finance through concessional resources is needed, even in decentralised low-income markets. Middle income countries are less in need of grant based public finance as they can potentially raise significant capital from private sources of finance.

Although the middle income group of countries is the largest recipient of grid-tied energy finance, it has also received finance for decentralised energy, in particular India and Ukraine for mini-grid and other decentralised energy projects. These are funded through programmes such as the GEF, using both grants and concessional loans.

PART TWO

4

Finance barriers

What are the key barriers affecting the flow of international public climate finance toward decentralised energy access?

The factors that stop climate finance from being channelled toward investments in decentralised energy access can be divided into two types:

- **General barriers** that hold back all types of public and private investment from reaching low income energy markets and decentralised, renewable energy in developing countries. These barriers are very wide-ranging and cover issues such as market development, maturity of business models, and political risk factors.
- **Specific barriers** within the structure and practice of climate spending, for example in terms of particular funds' goals, instruments and governance, or country-preparedness for receiving climate finance.

There is significant overlap between the two: for instance, the high transaction costs involved in channelling finance into lots of small projects (as opposed to a few large projects) are a general barrier, but also one with which specific climate funding streams grapple.

4.1 General barriers

The general barriers listed below apply both to public and to private sector funders, though clearly issues around investor returns are particularly important to private sector funders.

- **High risks (actual and perceived):** political instability, regulatory uncertainty, currency risk, low investor returns, an unproven business model and unreliable cash flows (creating concerns of non-payment). Sometimes the perception of risk is linked to a lack of sound investor knowledge of the markets.
- **Investor returns and short-termism.** Investments in low income energy markets are often longer term, higher risk, and generate a lower financial return. Commercial investors may be unwilling to spend time building the relationships and market demand required to generate a decent return, requiring more 'patient' forms of capital instead.
- **Investment size and transaction costs.** The sums of finance often required by energy enterprises in their start-up phase – often a few thousand to a million dollars – are often too small for mainstream investors, banks, or even international donors. The transaction costs of funding many small projects are high because of the due diligence and bureaucracy involved. There is a lack of aggregators able to package up many

small projects as a way of lowering overall financing costs or helping to obtain finance.²² For energy providers, particularly SMEs, the time it takes them to apply for and receive funding, particularly from public institutions and social investors, is a critical barrier.

- **Policy and regulatory environment.** In many developing countries, the policy and rules around decentralised energy can be unfavourable or confusing. A lack of clarity on grid extension plans creates uncertainty, whilst tax and subsidy regimes may favour large-scale or fossil fuels. Governments may also send the signal to investors that small-scale, decentralised energy projects are of low priority.
- **Shortage of proven business models and good quality business plans.** Funders are looking for proven business models and well-developed business plans, a clear understanding of risks and returns, and an indication that risks are being managed. While there are market pioneers on energy access, many providers still need to prove their business model and to demonstrate scalability and replicability, which takes time. Some practitioners complain about a shortage of business support services which could help address this (CEM 2015; SE4all 2015; Wilson *et al.* 2014; AT Kearney and GOGA 2014).

4.2 Climate finance barriers

Three specific climate finance barriers relate to: (i) the types of finance instruments used; (ii) the types of agencies used as intermediaries; and (iii) the priority results targeted by particular funds. This suggests that the climate finance architecture needs to be reformed.

- **Preference for loans versus grants.** The finance needs of the decentralised energy access sector require a mixture of grants, loans and equity, both concessional and commercial. But at the early stage of innovation and policy development for the sector – which equates with the period assessed in this study (2003–2015) – there is a particular need for grant financing.

Based on our analysis of funding trends, we propose that one of the key barriers is that international climate funds have been using loans rather than grants, and this makes it harder to prioritise decentralised energy access in low income countries.

Grant-based instruments were traditionally used by most UNFCCC-operated funds. As Figure 8 shows, of the total approved climate funding that is flowing to decentralised energy, the main financial instrument is still grants rather than loans. However, this is from a low base and the total available scale of grant-based climate finance is limited. Multilateral Development Banks, which are the main channels for non-UNFCCC operated funds, instead favour loan-based instruments owing to their long standing expertise in channelling debt-based instruments, as well as donor preference for credit-based finance (as grant-based finance is limited). This creates a bias toward countries and projects which assure returns – specifically middle income countries and large-scale projects.

The data from international climate funds show the largest international funders are the Clean Technology Funds which are using concessional loans to finance utility-scale projects in middle income countries. This suggests that public funders have a low risk appetite (Ritchie and Usher, 2011). It is likely that as an emergent sector where business models are still being proven, decentralised energy projects, particularly in low income countries, are considered less viable for concessional financing. The risk of potentially indebting low income economies may also be a factor which diverts debt-based instruments to middle income economies.

- **Approaches of financial intermediaries.** The type of agencies that channel funds also determine what type of project gets funded. The data from international climate funds show that a substantial amount of funds are being channelled through MDBs and UN agencies, with MDBs covering almost all of approved concessional loans and therefore utility-scale projects. The MDBs operate like banks and have a long record in using concessional finance for development activities. MDBs also have a stronger inclination to invest in large-scale projects because of higher transaction costs in funding lots of small decentralised projects and they are less familiar with this sub-sector.
- **Priorities of funds' results frameworks.** A third design feature which is likely to discourage investment in small-scale decentralised energy projects relates to the results frameworks of various mitigation funds. The GEF Trust Fund (GEF 2014) and the Clean Technology Fund (CIF 2013a) give high weight to parameters such as greenhouse gas abatement

²² Aggregation is a generic term which refers to financial clustering mechanisms that allow projects to be bundled together. The SE4All Finance Committee report (SE4All 2015a) sees aggregation as one of four key interventions that could scale-up finance for sustainable energy, generating an extra USD 25 billion annually. Practical examples are at the early stage. The off-grid solar company M-Kopa uses aggregated payment history metrics from their client base to receive USD 10 million from a local bank in Kenya to support their operations (SE4All 2015a).

and leveraging co-finance. These factors further incentivise large-scale investments in (higher-emitting) middle income countries, which offer more abatement potential than decentralised renewable energy access in (lower-emitting) low income countries (Steele *et al.* 2015).

This is not the case for all funds: some results frameworks, such as the GCF's mitigation window and the SREP do include requirements to increase access to mini-grid and off-grid energy supply to households and communities (CIF 2012; GCF 2014). The GCF's results framework specifically states that energy access results will only qualify if from mini or off-grid energy, although GHG reductions and co-financing still remain core mitigation outcome criteria (GCF 2014). At this early stage, it is hard to say how well the GCF criteria are working, and further monitoring will be required. There is also an opportunity for cross-learning from the experience

of funds which have tried to target energy access in their results frameworks. For instance, the GEF Trust Fund during its third replenishment (GEF 3) also included results criteria tied to off-grid electrification. However, because these projects resulted in fewer GHG emissions reductions, GEF 3 was deemed less successful as a result, so that indicators have been moved back towards on-grid and larger biomass energy solutions (Nakhouda 2013).

To sum up, there are many barriers which stop international public finance being channelled into decentralised renewable energy access. These require interventions at many levels, particularly in terms of reforming the overall policy and enabling environment in developing countries, but also in the way climate funds themselves are designed. The next section looks at positive examples from Bangladesh and Nepal to identify possible enablers to help channel more climate finance to energy access.

5

Innovative country examples

A wide range of countries are designing mechanisms to incentivise decentralised energy access. The examples from Nepal and Bangladesh which are profiled here identify two main public financing channels for promoting decentralised energy investments:

- Special purpose agency
- Central and national development banks.

Both use specific models to incentivise the flow of finance to low income markets, and a combination of financial intermediaries and instruments to promote inclusive investment. The main features are summarised below.

5.1 Bangladesh

Energy access financing needs and policy

In Bangladesh, around two-fifths of the population is not connected to the grid. Currently only 62 per cent of the population has access to electricity, and domestic generation figures are among the lowest in the world, at 321 kilowatt hours per person per year (Islam, 2014). Up to 70 per cent of Bangladesh's commercial energy generation comes from natural gas and the remainder from imported oil. Gas is in short supply, however, giving further impetus to the government's renewable energy push. Access to electricity is also a major part of Bangladesh's response to the Millennium Development Goals (Khandker *et al.*, 2014). With a population of more than 150 million, the government has been struggling to provide electricity access to its entire

population. Also, access to cleaner fuel is low, with nine out of ten people still relying on polluting biomass-based fuels, causing a risk to their health (Acharya, 2013).

It is in this context that Bangladesh has developed a diverse set of policies to encourage wider energy access, the most recent of which is the government's vision of 'electricity for all by 2021' (GoB, 2011). A dedicated renewable energy policy has been in place in Bangladesh since 2009. The policy set a target of generating 5 per cent of the country's electricity (800 megawatts per year) from renewable sources by the end of 2015 and 10 per cent by the end of 2030. Solar energy is expected to contribute about 500MW towards the 2015 target (GoB, 2011). To implement these policies and achieve energy access ambitions, the investment needs within the country run high.

In Bangladesh, low-carbon policies and programmes are principally aimed at widening access to energy. Bangladesh's government is encouraging communities to use solar home systems in one of the world's largest decentralised energy projects. Nearly 4 million homes now use one of the systems disseminated via IDCOL – Bangladesh's Infrastructure Development Company Limited – enabling them to reduce expensive costs associated with use of dirtier fuels such as diesel or kerosene (Haque, 2016). Solar irrigation pumping systems are another programme, but relatively newer that aims to help farmers enhance productivity by investing in solar run irrigation. Two primary agencies that are encouraging these initiatives are the country's Central Bank and Infrastructure Development Company Limited (IDCOL).

Role of IDCOL: A special purpose agency

Bangladesh channels funds for off grid renewable energy through a donor-funded special purpose agency IDCOL which benefits decentralised communities in rural areas. Key design features of IDCOL that help channel finance include:

- A holistic approach supporting a range of energy technologies, needs and actors.
- A mixture of finance instruments, including grants and loans, targeting users, providers and financial intermediaries.
- Interventions to build the market for off-grid energy, not just individual projects.
- Ability to channel large amounts of finance into lots of small-scale projects through a single agency.

IDCOL provides financial support for renewable energy technologies such as solar home systems, solar irrigation pumps, domestic biogas, solar mini-grids, solar-powered telecoms, a biogas-based electricity project, a biomass gasification project and improved cooking stoves (Islam 2014).

Under the refinancing scheme of IDCOL, the buyers (households) of the solar home system programme are given a capital buy-down grant of USD 20 for a product costing USD 193. The buyer makes a down payment of USD 17 to the PO. A loan at an interest rate of 15–20 percent is acquired by the buyer from a partner organisation to cover the remaining USD 176. IDCOL then refinances 70–80 per cent of this to the partner organisation, such as an SME, private company or a micro finance institution, at a concessional rate of 6–9 percent, once the product is installed (Asaduzzaman *et al.*, 2013, Rai *et al.*, 2015). This arrangement enables households to adopt renewable energy solutions by providing them with both grant assistance and access to credit. The involvement of partner organisations, meanwhile, is incentivised by concessional loans from IDCOL that enable them to lend on to households at a profit, as well as by institutional development grants also provided by IDCOL.

The farmers, who are primary owners of solar irrigation pumps, are the main recipients of direct grants and loans of the irrigation programme. They receive up to 50 per cent of the total project cost in the form of grants which is relatively high. This is necessary because the systems are quite large, cost more and the market is less mature than for solar home systems. Apart from financial assistance, IDCOL also offers a range of services to deliver decentralised energy projects. These crucial market-building measures include capacity support, quality control and training for partner organisations.

The way IDCOL aggregates many projects together helps to overcome one of the major barriers discussed earlier, ie funders' reluctance to fund small-scale energy projects because of the administrative costs. Having a single agency with a mandate to work with several local projects helps in managing the high transaction costs, which funders would have experienced if they dealt with each project separately.

Another key feature of IDCOL is that it works with a range of intermediaries, including, but not limited to, private companies which supply energy equipment. For example, microfinance institutions and NGOs are often sought as inclusive intermediaries specifically because they have a close connection with – and knowledge of – low income and rural communities. Particular assets include their local market knowledge, their relationships with relevant agencies, groups and individuals, and their understanding of the barriers and risks specific to these markets. The fact that such organisations have offices in rural areas and experience in running microcredit schemes mean they are well equipped to manage credit disbursement and collection, and after-sales services. IDCOL has used microfinance institutions to assess household energy needs, and to install and service solar home systems (Rai *et al.*, 2015).

In addition to an effective energy delivery model and suitable intermediaries, enabling low income and off-grid populations to access affordable low-carbon energy also depends on the availability of appropriate financial instruments. As noted earlier, grants help in pre commercial markets, to encourage activities that are less commercially viable in early stages (Rai *et al.*, 2015, Steele *et al.*, 2015). IDCOL uses grants to subsidise products (for example by reducing the upfront costs), offer capacity support and make loans concessional in their terms.

Role of the Central Bank of Bangladesh

Apart from IDCOL, the Central Bank of Bangladesh is also incentivising investment in renewable energy through commercial banks, microfinance institutions and NGOs. It is a domestic institution with a national mandate to provide finance to novel sectors that remain un-catered for by mainstream banks.

The Central Bank of Bangladesh was the first central bank in the world to dedicate resources to green projects. In 2005, it set up a refinancing scheme advising commercial banks on finance for green energy, including solar home systems and biogas systems in off-grid areas. The 'green banking' circular developed by the Central Bank requires commercial banks to allocate 5 per cent of credit to environmental investments, including decentralised energy. The Bank also offers an incentive in the form of access to low interest capital

for commercial banks under its refinancing scheme, to ensure their lending to green investments generates sufficient profits (Rai *et al.* 2015). It supported implementation by encouraging banks to channel their lending through microfinance providers with good rural links while also developing their own branch networks, which would have the longer-term effect of further reducing the cost to the end user. Under the same scheme, commercial banks also provide finance for solar irrigation pumps directly to farmers' cooperatives, which are able to access favourable rates by combining their members' collateral.

The example of the Central Bank of Bangladesh, which was the first to take this kind of step, shows how a strong regulatory approach can be used to channel finance to marginalised communities via commercial banks and the private sector.

Both the models have specific unique features which makes them successful in scaling up energy access. For example the holistic 'one-stop' model of IDCOL provides a range of services along with finance. Central banks are a regulatory authority and therefore they cannot provide the similar level of support, but they have their own added advantage. They provide the regulatory push and a clear policy signal for engaging commercial actors that are typically focused on mainstream markets. Their ability to mandate the private sector to invest in novel renewable sectors is a plus.

5.2 Nepal

Energy access financing needs and policy

Despite the fact that Nepal has substantial potential to generate energy from a wide range of renewable energy sources, including micro-hydro, large-scale hydro, solar, wind and biogas; only 56 per cent of the population has access to some form of electricity. The picture is worse in rural areas, which house nearly 80 per cent of the country's population (Steinbach *et al.*, 2015). Acknowledging the current energy needs of the country, the government of Nepal has pledged to increase its renewable energy capacity from 1 per cent of its main energy supply in 2010 to 10 per cent by 2030 (CIF 2013b). Nepal's Rural Energy Policy (2006) and its Subsidy Policy for Renewable (Rural) Energy (2013) provide the core policy direction for delivering renewable energy technologies to the rural poor.

To promote the use of small-scale renewable energy, in 1996 the country set up the Alternative Energy Promotion Centre (AEPC) as a lead agency for off-grid renewable technologies. Below we examine how AEPC and its Central Renewable Energy Fund are creating

enablers for financing energy access in rural areas of Nepal. Key design features include:

- Aggregating and channelling diverse government and donor funds for renewables.
- Combining finance with market-building efforts through support in policy and planning.
- A specific fund to channel grants and loans for small-scale renewable energy via commercial banks and micro-finance institutions.
- Providing finance support for energy users (as well as providers) through grants, loans and individual contributions.

Alternative Energy Promotion Centre (AEPC)

AEPC is a central agency set up in Nepal to integrate renewable energy projects under a single umbrella institute. Under the Ministry of Science, Technology and Environment (MOSTE), AEPC has a specific mandate to promote technologies that generate up to 10 megawatts of renewable energy. Acting as a technical intermediary between the donors / governments and other financial intermediaries – banks, microfinance institutions (MFIs), private technology providers, nongovernmental organisations (NGOs) and District or Village Development Committees (DDCs or VDCs) – the agency channels finance for renewable energy investment to households and communities. Apart from financing, AEPC also provides support in policy formulation, planning, and facilitating the implementation of policies and plans (Steinbach *et al.*, 2015).

A Central Renewable Energy Fund (CREF) has been established by AEPC to steer funding for decentralised renewable energy through commercial banks and microfinance institutions. Both AEPC and its CREF mechanism use an incentive-based phased subsidy approach to encourage investments in small-scale renewable energy projects. In the early stages, subsidies are provided to financiers and developers to promote the uptake of renewable energy technologies, but in an environment that sets up a shift towards credit financing in the longer term.

This CREF is embedded within a commercial bank, the Global IME Bank. It provides subsidies for qualified renewable energy installers and loans through commercial partnering banks to suppliers, manufacturers, installers and communities. Like IDCOL, AEPC is managing a very significant volume of funds. The National Rural Renewable Energy Programme (NRREP), which is funded by the government of Nepal and bilateral and multilateral development partners was launched by AEPC in 2012 to fund the installation

of renewable energy technologies such as micro- or mini-hydropower, solar home systems, institutional solar power systems and improved cook stoves. Similar to the IDCOL approach AEPC/ CREF funds the communities using both grants and credit. The arrangement includes a combination of a NREEP grant (40%), a loan by the Global IME Bank (40%) and 20% of equity share by households and village (Steinbach *et al.* 2015).

5.3 Lessons from Bangladesh and Nepal: enablers for targeting finance towards decentralised energy access

In both Bangladesh and Nepal, a wide range of incentives have encouraged policymakers, practitioners, investors and communities to develop renewable energy projects in decentralised rural areas.

Policy enablers at the top of the value chain:

policy enablers such as policy targets, fiscal targets have incentivised actors further down the value chain in both Bangladesh and Nepal. Bangladesh's core policy objectives are to bring 'electricity for all' by 2021 and generating 10 per cent of electricity from renewable sources by 2030. The government is also keen on reducing its dependence on imported diesel and natural gas, and agricultural subsidies, all of which pointed to renewable energy. As a result new incentives were created to encourage renewable investments such as reduction in import tariffs and lower taxes on renewable energy products (Rai *et al.*, 2015).

Economic enablers for a range of energy access actors – investors, providers, support services and users:

A positive policy signal has incentivised potential investors including commercial banks, microfinance institutions and suppliers to invest in decentralised renewable projects. For example, access to concessional finance by commercial banks in Nepal and Bangladesh for on-lending to suppliers or microfinance institutions. The regulatory requirement for Bangladesh commercial banks to invest a proportion of their lending to 'greener project' also offers a policy incentive.

Actors lower down the value chain such as microfinance institutions, NGOs and suppliers in Bangladesh and Nepal have been encouraged to engage in the renewable energy market by the provision of low interest credit. Suppliers and manufactures of Bangladesh also see benefits of engaging in this market due to available tax holidays and exemptions on local production and use of renewable products. End-users finally receive financial benefit in the form of grants and microfinance loans.

Regulatory push by central banks: National banks are also able to use their regulatory roles to encourage private sector investment. The green banking circular of Central Bank of Bangladesh, for example, mandates commercial banks to allocate 5 per cent of their lending to green investments. Such regulatory push in combination with financial incentives such as low cost loans encourages mainstream banks to explore untested territories that rest outside their comfort zones

Dedicated agencies to aggregate funds and projects:

Dedicated 'special purpose vehicles' (SPVs) – or agencies – are very useful as they have specific capacities and a mandate which enables them to draw down resources from donors and governments and channel them to lots of small-scale projects and actors. This model works well in case funders or investors are reluctant to channel funds to many small decentralised energy projects due to high transaction costs. In addition, the one-stop-shop role model of the special purpose agency is not limited to finance, but also includes a variety of services aimed at helping to create markets and delivery networks. These provide access to capital, quality assurance, after-sales services, training and institutional support; thus offering a package of services that support and sustain the market and environment for decentralised energy projects.

From these examples we see that enablers can be structured to prioritise the needs of the poor. This involves measures such as setting policy targets to shape the choices of actors involved in different aspects of funding, delivering and consuming energy, using specific types of instruments to attract and support investment from suitable financiers and suppliers.

6

Recommendations and conclusions

Our research has investigated **to what extent international public finance for climate change is targeting decentralised energy access for the poor.**

The analysis shows that while the energy sector is a big recipient of climate funds, these are mainly going to large-scale grid-connected projects in middle income countries and only a small share is going towards decentralised energy. **In fact, just over 3 per cent (USD 475 million) of the total USD 14.1 billion in approved climate finance (2003–2015) has been approved for decentralised energy.** While the precise finance needs for decentralised energy are still being debated, the current funding levels make barely a dent on the IEA's estimate that to achieve universal energy access an additional USD 23 billion is needed each year (2010–2030) for decentralised energy.

Climate funding arrangements need to be reformed. Given the pivotal role of international public finance in general for energy access, and the expected increase in climate funding, we recommend serious efforts are made to improve the design of climate funding arrangements, both internationally and nationally.

At the same time, SMEs, social enterprises and NGOs at the forefront of providing energy services for the poor will need to look for a wide range of funding sources, not just climate funds.

The limitations of the study have not allowed a comprehensive review of barriers and enablers; however, some initial recommendations based on the literature review and country case studies are proposed below.

Improve design of international climate funds to target decentralised energy access in low income countries

1. **Map out how current international climate funding priorities address the full range of decentralised energy finance needs.** Many bilateral and multi-lateral donors and agencies are already investing in renewable energy and decentralised energy access, some of which is channelled via the climate funds studied here; others are part of broader development finance. Some agencies have published strategies or reviews of their energy spending which give a clearer idea of where money will flow; others do not. It would be useful to have a coherent map of what finance needs the major climate funds are targeting, how this fits in with the wider landscape of multi-lateral/ bilateral finance, and what public finance needs are still under-prioritised. Mapping the landscape is complicated, but it could provide a baseline to help guide decisions about how to reform climate funding. It could help address risks that funds are prioritising a small number of areas/actors, with other finance needs left unmet.

2. Earmark publically-funded climate funds for decentralised energy – particularly through the Green Climate Fund.

Getting the institutional arrangements right for the GCF is particularly important given the volumes of climate finance it is likely to channel. At present the GCF does not ring-fence funding for particular sub-sectors (like decentralised renewable energy for low income populations) or countries (such as low income countries with high energy access deficits). Past trends from international funds also show that most public finance has gone to middle income countries that are more capable of leveraging finance from private sources and from domestic public budgets. There is anecdotal evidence that the lack of caps or earmarking creates incentives for countries to propose projects with the biggest financial tickets – like large-scale infrastructure – in order to try and access the maximum funding possible. This is likely to squeeze out smaller-scale decentralised energy investments in low income countries with lower capital requirements. The GCF could explore whether such perverse incentives exist and routes around it, such as issuing specific calls for proposals on decentralised renewable energy or for small-scale projects in lower income countries.

3. Adjust the design features of climate funds to align better with decentralised energy access goals. One of the likely reasons why funding is biased towards large-scale energy projects in middle income countries is because of the potential in those countries for demonstrating impacts through large-scale greenhouse gas abatement, leveraging co-finance and reduced risks by assuring returns of investment. Three areas where the design features could be amended:

- a) Investment criteria:** The investment criteria of climate funds could consider ways to prioritise social development criteria over economic efficiency, particularly for decentralised projects that are less bankable than large-scale projects.
- b) Risk appetite:** The risk frameworks of funds could have higher risk appetite for investment in decentralised energy projects. For example, within the ceiling of anticipated non-performing loans (NPLs), funds could raise the share of NPLs favourable to low income countries; or find other measures which increase the share of funding for low income countries and of decentralised technologies, which are perceived as higher risk or take longer to accrue a return on the investment.

c) Results frameworks: The results framework of bilateral and multilateral climate funds should be adjusted to give more emphasis to socio-economic development outcomes. This could follow best practice thinking on ‘multi-tier’ energy access measures developed in the SE4All Global Tracking Framework (IEA and World Bank 2015). This multi-tier approach goes beyond simplistic notions of the existence of a grid connection or cooking stove to instead set goals for energy services to be the right quality, affordability and reliability and serve a range of household, community, and productive activities.

4. Promote appropriate financial instruments:

Successful approaches could include combining grants with loans in new areas of investment, with grants then being substantially phased out as markets mature. The current trend shows an over-emphasis on credit-based instruments which tend to be focused on large-scale utility projects because loans are expected to be returned. Grants can be increased to develop capacities for decentralised energy, and concessional loans and guarantees can be used to make this sector more profitable for mainstream investors.

5. Channel funds through entities that have experienced funding through smaller projects:

Channelling funds through multilateral bodies incentivises ‘business-as-usual’ investment in large-scale investments because of the banks’ existing experience, and the perceived lower administrative costs compared to investing in lots of small-scale projects. International climate funding mechanisms could prioritise funding agencies that have a track record and experience with channelling funds to smaller-scale projects, such as dedicated special purpose vehicles. Supporting lots of smaller scale players, projects and technologies – which is what is needed to solve the access problems – requires a different financing infrastructure which may be complicated, expensive and exploratory at first, but ultimately can deliver where large-scale infrastructure has failed over many decades.

Strengthen the national enabling environment to incentivise decentralised energy access

6. Use climate and development finance to support policy reforms which incentivise decentralised renewable energy access: This is a very significant change that needs to happen as it is the basis for freeing up all types of funding, innovation and investment. Developing country governments need to continue to press ahead with wide-ranging reforms that create an attractive environment for investing in decentralised renewable energy and energy access. This covers a very wide range of interventions from reforming tax, tariff and subsidy regimes, to developing the sector skills base, improving product quality and shifting away from a focus on grid extension and toward off-grid and mini-grid solutions.

7. Strengthen institutions for managing climate finance in low income countries: Some countries are more prepared than others to receive climate finance. Channelling climate finance toward decentralised renewable energy access depends on governments having a strong climate plan which makes this sector a priority, and the institutional set-up (nationally and locally) to direct those funds effectively.

Fill knowledge gaps and share lessons among low income countries

8. Support research and communication so stakeholders understand the full range of finance needs, gaps and appropriate sources:

The finance needs for the energy access sector are very varied among energy users, providers, financial institutions and governments. All stakeholders need to get more precise about where the most significant gaps are with respect to decentralised pro-poor energy, and which of these would be appropriate for international public climate finance to help fill. Finance needs will vary by country and context, but some of the general gaps identified in the literature include the need among energy start-ups and SMEs for small- to medium-sized funds (less than Euros 1 million), including working capital and early stage innovation grants.

9. Support research and lesson-sharing among countries on finance enablers: While Nepal and Bangladesh have had success in funding decentralised energy, the experiences from other low income countries are less understood. Also, many low income countries are at a relatively early stage of preparing climate funding plans and the institutional set-up. In some countries, such as Tanzania, which has received climate funding for decentralised energy access, there is a lack of accessible data or available analysis on how this has been spent and the lessons learned; in others, such as Kenya, there are experiences with setting up new types of funding arrangements which can target decentralised energy – such as the Kenya Climate Innovation Centre. It would be useful to conduct an in-depth analysis of these experiences in order to share lessons and identify options for policy and practice change.

References

- Acharya, J (2013) *Increasing access to energy: Bangladesh*. Asian Development Bank. Publication Stock No. ARM135352. www.adb.org/sites/default/files/publication/30185/bangladesh-increasing-access-energy.pdf [Accessed 20 April 2016]
- AECF (2016a) About REACT Window. [Online]. 2016. Available from: www.aecfafrica.org/windows/react-window
- AECF (2016b) Portfolio. [Online]. 2016. Available from: www.aecfafrica.org/about-aecf/portfolio
- AfDB and CIFs (2015) Renewable Energy in Africa: Tanzania Country Profile. [Online]. Available from: www.afdb.org/fileadmin/uploads/afdb/Documents/Generic-Documents/Renewable_Energy_in_Africa_-_Tanzania.pdf
- AGECC (UN Secretary-General's Advisory Group on Energy and Climate Change) (2010) *Energy for a Sustainable Future*. New York. www.unido.org/fileadmin/user_media/Services/Energy_and_Climate_Change/EPP_IPublications/AGECC_Report.pdf
- Arun, S. 2015. India questions OECD claim on climate finance. The Hindu [Online]. Available: <http://www.thehindu.com/news/national/oecd-report-on-climate-change-fund-flows-flawed-finance-ministry/article7930104.ece> [Accessed June 3, 2016]
- Asaduzzaman, M, Muhammad Yunus, AK, Enamul Haque, AKM, Abdul Malek, A, Sharmin, N and Hossain, MA (2013) *Power from the Sun: An Evaluation of Institutional Effectiveness and Impact of Solar Home Systems in Bangladesh*. Report submitted to the World Bank, Washington, DC.
- Ashden and Christian Aid (2014) *Lessons on Supporting Energy Access Enterprises*. www.christianaid.org.uk/images/Ashden-Christian-Aid-Energy-Access-Enterprises-Report.pdf
- AT Kearney and GOGLA (2014) *Investment and Finance Study for Off-Grid Lighting*. www.gogla.org/sites/www.gogla.org/files/recource_docs/investment-study-vol-2.pdf
- Bazilian, MR, Economy, P, Nussbaumer, E, Haïtes, K. K, Yumkella, M, Howells, M, Takada, D, Rothman, S and Levi, M (2014) 'Beyond Basic Access'. In Halff, A. Sovacool, B and Rozhon, J (eds) *Energy Poverty: Global Challenges and Local Solutions*, 180–208. Oxford, UK: Oxford University Press. www.oxfordscholarship.com/view/10.1093/acprof:oso/9780199682362.001.0001/acprof-9780199682362-chapter-9
- Bhattacharyya, SC (2013) *Financing energy access and Off-grid Electrification: A review of status, options and challenges*. Institute of Energy and Sustainable Development, De Montfort University. OASYS SOUTH ASIA Research Project Peer-reviewed Published Papers (pre-publication version) (Renewable and Sustainable Energy Reviews, 20, April: 462–73, 2013) www.dmu.ac.uk/documents/technology-documents/research-faculties/oasys/project-outputs/peer-reviewed-journal-articles/pj7-financing-energy-access-rser-paper.pdf
- BNEF (Bloomberg New Energy Finance) (2015) *Wind and solar boost cost-competitiveness versus fossil fuels*. <http://about.bnef.com/press-releases/wind-solar-boost-cost-competitiveness-versus-fossil-fuels/>
- CEM, 2015. Public-Private Roundtables at the Sixth Clean Energy Ministerial. Report presented at the Clean Energy Ministerial (CEM), 27–28 May 2015, Merida, Mexico. http://www.cleanenergyministerial.org/Portals/2/pdfs/CEM6-Roundtables-Summary_Report.pdf
- CIF (2012) Revised SREP Results Framework.
- CIF (2013a) Revised CTF Results Framework.
- CIF (2013b) Scaling-up renewable energy in low income countries program: Nepal fact sheet. www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/SREP_Nepal.pdf
- CFU (2015) Climate Funds Update Database, Overseas Development Institute, <http://www.climatefundsupdate.org/> (last accessed 15th November 2015)
- Craine, Stewart, Mills, E and Guay, J (2014) *Clean Energy Services for All: Financing Universal Electrification*. Sierra Club. Available at: www.sierraclub.org/sites/www.sierraclub.org/files/0747_Clean_Energy_Services_Report_03_web.pdf

- Differ (2014) *Getting there is half the fund – Catalysing private sector involvement in small-scale RE/EE projects in developing countries*. www.differgroup.com/Portals/53/Getting%20there%20is%20half%20the%20fund.pdf
- Dobbs, R, Oppenheimer, J, Thompson, F, Brinkman, M and Zornes, M (2011) *Revolution: Meeting the World's Energy, Materials, Food, and Water Needs*. New York: McKinsey Global Institute.
- GCF (2014) Annex VIII : Mitigation and adaptation performance measurement frameworks.
- GEF (2014) Results Frameworks for GEFTF, LDCF and SCCF.
- Government of Bangladesh (GoB) (2011) *Power and Energy Sector Road Map: An update*. Finance Division; Ministry of Finance.
- Haque, N (2016) IDCOL's Innovative Inclusive Financing Mechanism for Climate Resilient Development in Bangladesh. Presentation. Climate Finance Training Program Dhaka, Bangladesh. 31 Jan-04 Feb 2016.
- IEA (2013) Financing energy access. Available at: www.worldenergyoutlook.org/resources/energydevelopment/energyforallfinancingaccessforthepoor/
- IEA (2012) World Energy Outlook 2012. Available at: www.iea.org/publications/freepublications/publication/world-energy-outlook-2012.html
- IEA (2011) World Energy Outlook 2011. Available at: www.iea.org/publications/freepublications/publication/weo-2011.html
- IEA (2009) World Energy Outlook 2009. Paris.
- IEA and World Bank (2015) Sustainable Energy for All 2015 – Progress Toward Sustainable Energy (June), World Bank, Washington, DC. Doi: 10.1596/978-1-4648-0690-2 License: Creative Commons Attribution CC BY 3.0 IGO <http://trackingenergy4all.worldbank.org/~media/GIAWB/GTF/Documents/GTF-2105-Full-Report.pdf>
- IIASA (International Institute for Applied Systems Analysis) (2012) *Global Energy Assessment: Toward a Sustainable Future*. Cambridge, England, and Laxenburg, Austria: Cambridge University Press and IIASA. www.iiasa.ac.at/web/home/research/researchPrograms/Energy/Home-GEA.en.html
- IPCC (2012) Renewable Energy Sources and Climate Change Mitigation – Special Report of the Intergovernmental Panel on Climate Change.
- Islam, SMF (2014) Financing Renewable Energy in Bangladesh, Presentation by Deputy CEO of Infrastructure Development Company Limited (IDCOL) at ESI Africa.
- Javadi, FS, Rismanchi, B, Sarraf, M, Afshar, O, Saidur, R, Ping, HW and Rahim, NA (2013) Global policy of rural electrification. *Renewable and Sustainable Energy Reviews* 19, 402–416. doi:10.1016/j.rser.2012.11.053
- Khandker, SR, Samad, HA, Sadeque, ZK, Asaduzzaman, MM, Yunus, M and Haque, AKE (2014) 'Solar powered homes: experience in off-grid rural Bangladesh'. In: Bank, W (ed.) *Solar powered homes: experience in off-grid rural Bangladesh*.
- LIGTT (2014) *50 Breakthroughs: Critical Scientific and Technological Advances Needed for Sustainable Global Development*. LBNL Institute for Globally Transformative Technologies, Berkeley, CA, USA.
- Nakhooda, S (2013) *The effectiveness of climate finance: A review of the Global Environment Facility*.
- OECD (2016) DAC Stats. [Online]. 2016. Available from: www.oecd.org/dac/stats/final2014oda.htm Accessed 2nd April 2016
- Pachauri, S, van Ruijven, B, Nagai, Y, Riahi, K, van Vuuren, D, Brew-Hammond, A and Nakicenovic, N (2013) *Pathways to Achieve Universal Household Access to Modern Energy by 2030*. Environmental Research Letters 8 (2). http://iopscience.iop.org/1748-9326/8/2/024015/pdf/1748-9326_8_2_024015.pdf
- Power for All, 2016. Decentralized Renewables: The Fast Track to Universal Energy Access Available at powerforall.org
- Rai, N, Iqbal, A, Zareen, A, Mahmood, T, Muzammil, M, Huq, S and Elahi, N (2015) *Financing inclusive low-carbon resilient development: Role of Central Bank of Bangladesh and Infrastructure Development Company Limited*. Country Report. Available at: <http://pubs.iied.org/10139IIED.html>
- Ritchie, D and Usher, E (2011) *Catalysing Early Stage Investment: Addressing the Lack of Early-Stage Capital for Low-Carbon Infrastructure in Developing Economies*. UNEP report.
- Saghir, J (2010) *Energy and Development: Lessons Learned*. Paris: International Energy Agency.
- Sustainable Energy for All. 2014.
- SE4All (2015) *Scaling up Finance for Sustainable Energy Investment*. Report of the SE4All Advisory Board's Finance Committee – 2015. www.se4all.org/sites/default/files/SE4All-Advisory-Board-Finance-Committee-Report.pdf

Sierra Club and Oil Change International (2016) *Still Failing to Solve Energy Poverty: International Public Finance for Distributed Clean Energy Access Gets another "F"*. www.sierraclub.org/sites/www.sierraclub.org/files/uploads-wysiwig/1281%20Energy%20Scorecard_06_web.pdf

Steele, P, Rai, N and Ntantumbo, I (2015) *Beyond loans: instruments to ensure the poor access climate and development finance*.

Steinbach, D, Acharya, S, Bhusal, R, Chettri, R, Paudel, B and Shrestha, K (2015a) *Financing inclusive low-carbon resilient development: The role of the Alternative Energy Promotion Centre in Nepal*. Country Report. Available at: <http://pubs.iied.org/10140IIED.html>

Steinbach, D, Kaur, N and Rai, N (2015b) *Financing inclusive low-carbon resilient development in the least developed countries*. IIED Working Paper. <http://pubs.iied.org/10147IIED.html>

UN Foundation and SE4All (2015) *Investing for Energy Access: 2015 Directory of Investment and Funding Opportunities*. Produced with the SE4All Practitioners' Network. <http://energyaccess.org/wp-content/uploads/2015/12/InvestmentDirectory2015.pdf>

Wilson, E, Rai, N and Best, S (2014) *Sharing the Load: Public and private sector roles in financing pro-poor energy access*. IIED, London. Available from: <http://pubs.iied.org/16560IIED.html>

World Bank (2015) International Development Association Project Appraisal Document on a Proposed Credit in the Amount of SDR XX Million Proposed for SCF-SREP Grant in the Amount of US\$7.5 million and a Proposed Guarantee to US\$200 million to the Republic of Kenya. [Online]. Available from: www-cif.climateinvestmentfunds.org/sites/default/files/Kenya_KEMP_f%C4%B1nal.pdf

World Bank (2006) *An Investment Framework for Clean Energy and Development: A Progress Report*. Washington, DC: World Bank. <http://siteresources.worldbank.org/DEVCOMMINT/Documentation/21046509/DC2006-0012%28E%29-CleanEnergy.pdf>

Annexes

Annex 1: Research methodology

The CFU data review was used to understand the volume and share of climate finance for energy access across countries. Using a funnel approach (explained below), we used data to identify:

- a) **The scale of energy finance.** How much climate finance is being channelled through the core mitigation funds (see Table 5).
- b) **The scale of available energy finance by country income levels and by fund type.** Which countries are receiving the maximum and minimum amount of mitigation finance, by fund type (see Table 5) and by income classification (low, lower middle, upper middle and high income).
- c) **Sectors and sub-sectors targeted by the core mitigation funds.** The volumes of climate finance flows by sectors and sub sectors and by country groupings, to identify the countries that are receiving the maximum finance for energy generation and supply.
- d) **'Energy Access' projects funded by mitigation funds.** Within the CFU database all financed energy projects were investigated based on search words for decentralised energy projects and some down to their project design documents to identify how much finance is being approved for 'utility scale' and 'decentralised energy' projects.

Given the cross-cutting nature of energy, many projects were found within other sectors, from agriculture and forestry to industry and tourism. As a result, some energy projects were defined as adaptation and REDD+ focused, although the vast majority were for mitigation purposes primarily.

First, all projects were classified broadly as per CFU classification into energy efficiency, energy supply/generation, multiple energy focus, or non-energy projects.

All energy projects were then categorised more specifically, enabling decentralised and small-scale projects to be compared against utility and large scale projects. Based on the available information decentralised energy projects were split into several categories: off-grid (eg clean cooking stoves and solar lanterns etc.), mini-grids (where specifically stated), multiple off/mini-grid (where part of a larger energy plan) and 'other' decentralised (those estimated too small to be utility-scale but where insufficient information was supplied to classify further). Utility-scale projects were defined on the basis of their technology size, deemed only feasible under large programmes. Many other energy categories also exist, including those for industry, transport and within the built environment.

- e) **A meta-analysis across country income groups** was then performed to identify trends across countries with diverse income levels. Trends were analysed to explain interactions between key sources of funds, agencies engaged in deploying those funds, income levels of countries, instruments used, and income levels of recipient countries (see Figures 11 and 12). This analysis was used to identify patterns and correlations between specific types of funds, implementing agencies, particular types of projects and countries. For example, are large scale energy projects being favoured over small scale and off-grid projects? And is energy efficiency in higher income countries being favoured over energy access in countries with low income countries?

Figure 11: Funnel approach to 'data' analysis

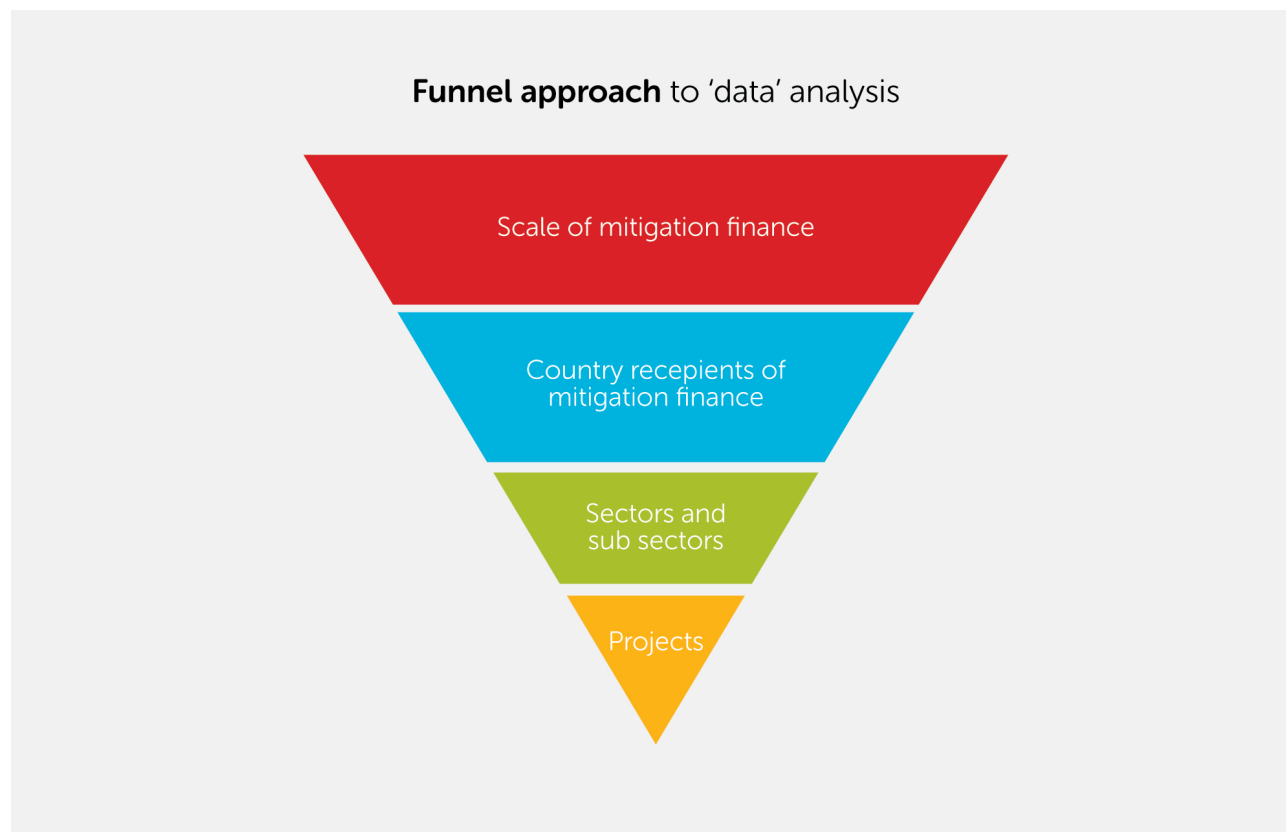


Figure 12: Framework for cross-country analysis

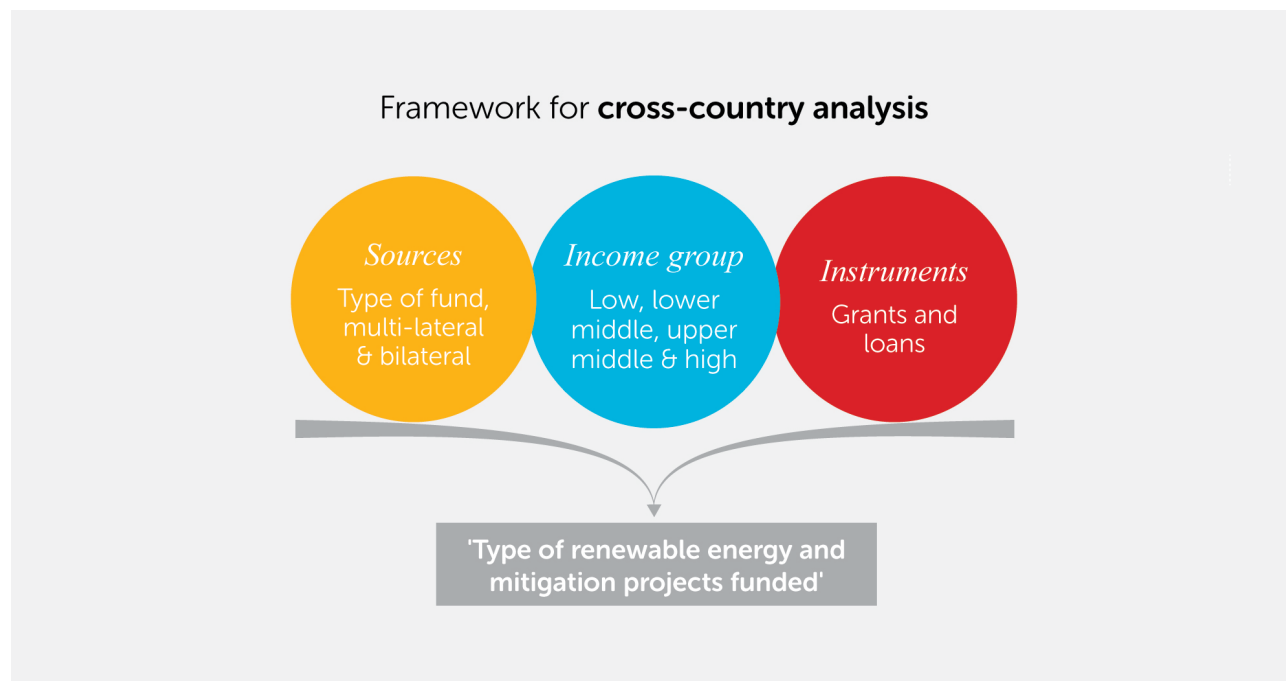


Table 5: International climate funds reported within the CFU database and used within this study

CLIMATE FUND	FUND TYPE
Adaptation for Smallholder Agriculture Program (ASAP)	Multilateral
Adaptation Fund (AF)	Multilateral
Amazon Fund	Multi Donor National
Clean Technology Fund (CTF)	Multilateral
Congo Basin Forest Fund (CBFF)	Multi Donor Regional
Forest Carbon Partnership Facility (FCPF)	Multilateral
Forest Investment Program (FIP)	Multilateral
Germany's International Climate Initiative (IKI)	Bilateral
Global Climate Change Alliance (GCCA)	Multilateral
Global Energy Efficiency and Renewable Energy Fund (GEEREF)	Multilateral
Global Environmental Facility trust funds (combined)	Multilateral
Green Climate Fund (GCF)	Multilateral
Indonesia Climate Change Trust Fund (ICCTF)	Multi Donor National
Least Developed Countries Fund (LDCF)	Multilateral
MDG Achievement Fund (MDG)	Multilateral
Norway's International Climate and Forest Initiative (ICFI)	Bilateral
Pilot Program for Climate Resilience (PPCR)	Multilateral
Scaling Up Renewable Energy Program (SREP)	Multilateral
Special Climate Change Fund (SCCF)	Multilateral
UK's International Climate Fund (UK's ICF)	Bilateral
UN-REDD	Multilateral

Source: CFU 2015

Annex 2: Country income group classification

LOWER INCOME COUNTRIES	LOWER MIDDLE INCOME COUNTRIES	UPPER MIDDLE INCOME COUNTRIES
Afghanistan	Armenia	Algeria
Bangladesh	Bhutan	Argentina
Burkina Faso	Cameroon	Belarus
Cambodia	Cape Verde	Brazil
Cameroon	Cote d'Ivoire	China
Chad	Djibouti	Colombia
DR Congo	Dominica	Ecuador
Ethiopia	Egypt	Fiji
Gambia	Ghana	Jamaica
Guinea	Guyana	Jordan
Haiti	Honduras	Kazakhstan
Kenya	India	Lebanon
Liberia	Indonesia	Maldives
Madagascar	Kiribati	Mauritius
Malawi	Kyrgyz Rep.	Mexico
Mali	Mauritania	Montenegro
Nepal	Moldova	Namibia
Niger	Mongolia	Peru
Sierra Leone	Morocco	Serbia
Tajikistan	Nigeria	Seychelles
Tanzania	Pakistan	South Africa
Afghanistan	PNG	St. Lucia
Bangladesh	Philippines	Suriname
Burkina Faso	Solomon Is.	Thailand
Cambodia	Sudan	Tunisia
Cameroon	Timor Leste	Turkey
Chad	Ukraine	Venezuela
DR Congo	Vietnam	Serbia
Ethiopia	Yemen	Seychelles
		South Africa
		St. Lucia
		Suriname
		Thailand

Achieving energy access for everyone requires more and better targeted investment, but what role does climate finance play in filling the funding gaps? This paper examines data on the major climate funds to assess what share of international public finance goes toward energy access and compares this to overall finance needs for the sector. It highlights the flow of climate finance to decentralised energy, which is a key priority for achieving universal access, and identifies key funding blockers. The experiences from Bangladesh and Nepal provide lessons on how climate funds and national policy could be reformed so that climate funding is better targeted at decentralised energy access in low-income countries.

IIED is a policy and action research organisation. We promote sustainable development to improve livelihoods and the environments on which these livelihoods are built. We specialise in linking local priorities to global challenges. IIED is based in London and works in Africa, Asia, Latin America, the Middle East and the Pacific, with some of the world's most vulnerable people. We work with them to strengthen their voice in decision-making arenas that affect them – from village councils to international conventions.

Hivos is an international organisation that seeks new solutions to persistent global issues. With smart projects in the right places, Hivos opposes discrimination, inequality, abuse of power and the unsustainable use of our planet's resources. Counterbalance alone, however, is not enough. Hivos's primary focus is achieving structural change. This is why Hivos cooperates with innovative businesses, citizens and their organisations – sharing a dream with those organisations of sustainable economies and inclusive societies.



International Institute for Environment and Development
80-86 Gray's Inn Road, London WC1X 8NH, UK
Tel: +44 (0)20 3463 7399
Fax: +44 (0)20 3514 9055
email: info@iied.org
www.iied.org



Knowledge
Products