

Sharing the load:

Public and private sector
roles in financing pro-poor
energy access

Emma Wilson, Neha Rai and Sarah Best

Discussion Paper

August 2014

Energy

Keywords:

Access to energy, investment,
inclusive business, public-private
partnerships

About the authors

Dr Emma Wilson (corresponding author) is a Principal Researcher and Team Leader of IIED's Energy and Extractive Industries Team, in the Sustainable Markets Group. She works on a range of energy issues, from inclusive business models for decentralised energy access, to corporate responsibility and meaningful community engagement in relation to large-scale oil and gas projects. Contact: emma.wilson@iied.org

Neha Rai is a Senior Researcher in IIED's Climate Change Group. Within CCG she is mainly involved in a programme of work focussing on climate finance, governance, political economy, and monitoring and evaluation of climate-resilient development.

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

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

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, business models, market failure, consumption, investment and the economics of climate change.

Working in collaboration with partner organisations and individuals in developing countries, the Climate Change Group has been leading the field on adaptation to climate change issues.

Acknowledgements

We are grateful to Lucy Symons of Village Infrastructure and Raffaella Bellanca (independent) who worked with us on earlier briefing papers related to this one. We are also grateful to the interviewees who contributed to those previous papers. We are also very grateful to Andrew Barnett of The Policy Practice, Andrew Scott of ODI, Rob Byrne of IDS, Charlie Miller of SolarAid, Alastair Livesey of Africa Power and Amal-Lee Amin and Paula Rolffs of E3G who reviewed various drafts of this paper. The paper was funded by a grant from the UK Department for International Development.

First published by International Institute for Environment and Development (UK) in 2014

Copyright © International Institute for Environment and Development

All rights reserved

<http://pubs.iied.org/16560IIED>

ISBN: 978-1-78431-000-4

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

For further information please contact: International Institute for Environment and Development (IIED), 80–86 Gray's Inn Road, London WC1X 8NH, United Kingdom. newbooks@iied.org, www.iied.org/pubs

Citation

Wilson, E., Rai, N., and Best, S. (2014) *Sharing the Load: Public and private sector roles in financing pro-poor energy access*. IIED, London.

Edited by

Holly Ashley

Disclaimer

This paper represents the views of the authors and not necessarily those of IIED.

Increasingly the private sector is expected to finance access to modern energy services in developing countries. Yet governments and donors still have much to learn about working with business, while low-income markets are unfamiliar and risky for private investors. In this report we present some innovations and challenges in financing pro-poor energy access. We highlight the need to identify those population segments (low-income, subsistence or extreme poverty) that can be reached most effectively by public, private and combined finance models. Governments and donors should target support, incentives and policy reform to channel private investment to where it works best. This will allow them to target public finance more effectively at the poorest, who cannot be reached by market-based interventions.

Contents

Executive summary	5
What is the problem?	5
Incentivising private investment	6
Understanding optimal public and private roles	6
1 Introduction	8
1.1 Understanding optimal public and private roles	10
1.2 Methodology	10
1.3 Structure of the paper	11
2 Energy markets and the financing landscape	12
2.1 The evolution of low-income energy markets	13
2.2 Base-of-the-pyramid markets	14
2.3 Key finance gaps: small-scale enterprise and end-user finance	15
2.4 Key barriers to private sector investment	16
3 Public and private roles in financing energy access	17
3.1 Angel investors: seeking security of investment	18
3.2 Innovative payment technologies: reducing investment risk	19
3.3 Crowdfunding: opening doors for mainstream investment	20
3.4 Business innovation hubs: early-stage investment and capacity building	21
3.5 Carbon finance: voluntary markets showing potential to support energy access	22
3.6 Development cooperation: stimulating renewable energy markets	23
3.7 Public–private partnerships: channelling donor finance into renewable energy	24
3.8 National development banks: operating as financial intermediaries	25
3.9 Financial intermediation agencies: sharing risk to support innovation	26
3.10 Climate Investment Funds: indicating future potential to fund energy access	27
4 Conclusions and recommendations	28
4.1 Incentivising private investment	29
4.2 Understanding optimal public and private roles	30
References	33
Acronyms and abbreviations	38
Glossary	39

Executive summary

Donors, governments and businesses need to become more strategic about how the public and private sectors collaborate in financing pro-poor energy access. Between US\$65 and US\$86 billion a year of additional investment is required to achieve the UN's goal of universal energy access by 2030 (Pachauri *et al.*, 2013). Expectations of the private sector are high, not because private investors and businesses are necessarily best placed to deliver this goal, but because governments simply do not have enough funds to do it by themselves. Governments and donors need to understand more about how to stimulate large- and small-scale private investment to deliver development goals – and when to target public funds to meet the needs of the most vulnerable. Donors and NGOs have undermined markets in the past, for example by giving out free products and services (Sireau, 2011), while governments are often sceptical of business and fail to provide a supportive enabling environment (Rai, 2013a).

We use ten case studies to explore the following questions:

- What are the public and private sectors currently doing to incentivise private investment in pro-poor energy access?
- How can policymakers, investors and practitioners improve their understanding of optimal public and private roles in financing energy access for the poor?

What is the problem?

Public and private finance for energy access is often directed towards large-scale infrastructure and on-grid distribution, where commercial viability and returns are assured. Decentralised and low-income markets tend to be neglected, especially by commercial investors, as they represent long-term, low-return and high-risk investments. Underserved low-income markets, including energy markets, have begun to show growth potential, with increasing interest among impact investors seeking a social as well as a financial return (Saltuk *et al.*, 2013). It is becoming easier to showcase

successful and innovative energy delivery models in developing countries.¹ But it will be some time before these markets mature.

Market-based efforts to target poor consumers with low-cost modern energy services frequently end up serving less poor customers or businesses, because they can afford to pay for goods and services, thus ensuring sustainability of the financial model (Pueyo, 2013; Bellanca and Wilson, 2012). Yet these private businesses can make a valuable contribution to development outcomes by serving populations that, while not living in acute poverty, still lack access to modern energy services (*ibid.*). Social entrepreneurs and public-private partnerships (PPPs) are more likely to succeed in delivering energy services to the poorest as they are driven by social as well as business objectives (Sovacool, 2013; Sireau, 2011). Yet even hybrid models need to be self-sustaining, especially if they seek private finance such as loans for scaling up their activities.

More public funds are becoming available for energy access, from the Climate Investment Funds (CIFs) and the Green Climate Fund, to public pension funds and sovereign wealth funds. Public funds have the advantage of being 'patient' – i.e. they do not seek high, short-term returns so can be used for longer-term investments. A key challenge is knowing what instruments are available within developing countries to distribute large-scale finance and how these instruments might channel funds to serve the poor (Kaur *et al.*, 2014). A further challenge is how local small and medium enterprises (SMEs) and micro-enterprises could secure access to such finance. Of course, access to finance is not the only issue facing innovators in low-income energy markets. Policy reform, capacities, expertise and end-user awareness are also critical – as this paper also illustrates.

¹ See also the Ashden Awards website (www.ashden.org) and Global Village Energy Partnership (GVEP) International website (www.gvepinternational.org) and IIED's access to energy publication series (www.iied.org/improving-people-s-access-sustainable-energy).

Incentivising private investment

The private sector needs consumers to pay for goods and services (with or without a government subsidy) to cover costs and risks. Engaging closely with end users enables businesses to design products and business models to make goods and services affordable and desirable, thus stimulating 'willingness to pay'. Private sector initiatives frequently rely on government and donor funds for start-up and scale-up activities, research and development, and monitoring and evaluation. However, they generally fail to reach the poorest who simply cannot afford to pay anything and/or who live in remote areas where economies of scale are impossible.

Our research has identified three key areas where the public and private sector are innovating to attract more private finance into low-income energy markets, and where more work is needed.

1. **De-risking markets:** Innovations include pay-as-you-go payment models, based on mobile phone technology; investor-recipient relationship-building; combined investment-leverage and policy-reform programmes using donor finance (soft loans and grants); establishment of national financial intermediary institutions.
2. **Accelerating innovation:** Donor finance and NGO partnerships are widely used in the early stages of enterprise development and market building. Business innovation hubs and crowdfunding platforms provide capacity building and access to finance, from 'the crowd' to more mainstream investors.
3. **Demonstrating and validating business models:** Award programmes play an important role in demonstrating innovation. There is a need for more independent analysis of business models, their context and effectiveness, and robust indicators of investment security and development impact.

Understanding optimal public and private roles

Our research has identified two key areas for action and improvement. The first is the need for greater collaboration and dialogue between policy-makers and planners to enhance mutual understanding and identify optimal roles, the second is the need to fill certain knowledge gaps, which could strengthen that collaboration and mutual understanding.

Collaboration: The public and private sectors need to collaborate more on planning to attract more private finance into pro-poor energy markets. To identify optimal roles, they could start by identifying the population segments (low-income, subsistence or extreme poverty) that public, private and combined efforts can reach most effectively. Governments and donors should then target support, incentives and policy reform to channel private finance to where it works best, while also targeting public finance more effectively at the poorest, who cannot be reached by market-based interventions.

A framework for targeting efforts at the 'base of the pyramid' (BoP)² would include:

- a non-profit approach to serve the extreme poor
- a cost-recovery approach for the subsistence market segment, and
- a commercial approach targeting the upper low-income market.

Knowledge gaps: Investors and practitioners complain of too little knowledge-sharing, be that due to competition within public and private financing models, reluctance to be open about failure, or simply a lack of funds or time. There has been little independent, systematic analysis of the financing and business models that can reach poor communities, or of the optimal (and complementary) roles of the public and private sector.

² See Section 2.2

Our study identified the following research gaps:

1. Market analysis and segmentation:

Understanding where public or private sector, or combined interventions are more effective in delivering modern energy services to different population segments (low-income, subsistence or extreme poverty).

2. Delivery model analysis: To clarify the effectiveness and risks of different models for donors and investors. This would include analysis of the enabling environment and socio-cultural context as well as the business model itself, as suggested by Wilson *et al.* (2013), to determine what works where.

3. Developing and testing indicators of impact, aimed at assessing both investment risks and the pro-poor development impact of energy access interventions – i.e. how to measure what works. There is a need to make sense of various different indicator-setting and impact measurement initiatives, with a view to assisting independent validation of business models.

4. Productive uses: Understanding whether and how a focus on energy for productive uses for poorer communities might reduce poverty and increase the viability of an energy delivery model in the eyes of investors.

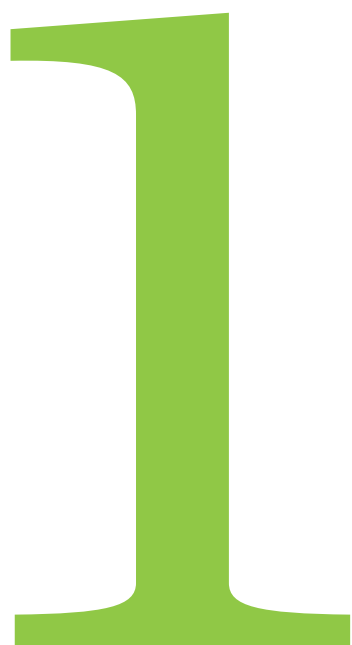
5. Identifying regulatory barriers to new finance innovations, such as crowdfunding and pay-as-you-go technologies, in developing countries; systematic research of these barriers, and work with governments to reform the regulatory systems.

6. Exploring the potential of the diaspora and local populations to finance energy access. This includes: the potential to target remittances in investment initiatives; access to education and transfer of ideas; direct engagement with local communities; demonstrating new technologies.

7. Understanding alternative public sector options for reaching the poorest, including social protection programmes, disaster relief programmes and support for grassroots initiatives such as community savings funds.

We are keen to collaborate with the public and private sector to build understanding about the issues raised in this report, and with the research community to explore these research gaps.

Introduction



The private sector is expected to play a key role in generating the required investment to achieve the UN's goal of universal energy access by 2030 (see Box 1). Pachauri *et al.* (2013) suggest that US\$65–86 billion per year of additional investment is required (along with dedicated policies). Yet governments and donors still have much to learn about how to catalyse private sector investment in delivering development goals. Expanding access to the grid using traditional fossil fuels and large-scale hydropower is a standard investment model for governments and can attract large-scale private investment, but excludes many of the poorest living in hard-to-reach rural areas, or those who cannot afford the high cost of grid connections or standard tariffs, not to mention up-front capital outlay for equipment.

In this paper we focus on how to attract private finance into decentralised energy access (e.g. micro-grids and solar lighting products) for low-income communities. We focus more on the scale of the finance rather than any specific technology or service.³ Investment in low-income energy markets is often more about investment in SMEs, micro-enterprises, social enterprises⁴ and community utilities. The required investment may be very small scale, perhaps a few thousand dollars. Thus these are low-income markets that mainstream investors tend to avoid, and low levels of investment that many feel are not worth the transaction costs.

Scott and Seth (2012) identify three key areas for pro-poor infrastructure development: finance, capacity building and policy reform. In practice there is much overlap between these three areas. We focus primarily on finance as our entry point for this paper, though the other areas frequently appear as key components of our case studies. Rolffs *et al.* (2014) observe the tendency to consider energy finance in terms of 'financing renewable energy hardware', while indigenous technological capacities and social contexts of implementation are given much less importance, attributing this to the failure of past policy approaches. They also cite Watson *et al.*'s (2012) conclusion that political and cultural barriers to electricity access are less studied than economic and technical barriers. Wilson *et al.* (2013) also highlight the need to incorporate analysis of the socio-cultural context and enabling environment in studies of the effectiveness of energy delivery models. With this paper we do not intend to provide political economy analysis to frame our case studies. However, we have tried to highlight aspects of the enabling environment and local socio-cultural context that are relevant to the models we illustrate.

BOX 1: DEFINING UNIVERSAL ACCESS TO MODERN ENERGY SERVICES

Universal access is about energy services that are **available, affordable, adequate, reliable, safe and targeted at the needs of poor people** (IEA, 2012). Access is for the household (e.g. lighting, cooking) or community (e.g. healthcare, schools) or 'productive use' (e.g. food production, manufacturing). A key challenge is to ensure that development goals are met through the energy access. Many of the initiatives outlined in this paper provide only basic energy services, such as small-scale lighting, which are not necessarily going to 'bring people out of poverty'. Yet for some households, reliable solar lanterns can make a big difference, allowing children to study in the evening and market stalls to operate later, while creating business opportunities for solar lighting entrepreneurs. Nonetheless, Bazilian and Pielke (2013) make a valid point that those delivering energy access need to focus on interventions that provide greater development opportunities. 'Energy for productive uses' is rising up the energy access agenda.⁵ However, compared to the household sector, there are few examples of sustainable energy projects (electrical, mechanical or thermal) serving productive uses for people on a low income (Best, 2014). This is a key challenge for investors and development practitioners seeking to generate livelihoods opportunities through energy access, either to meet development goals or to generate local capacity to pay for goods and services.

³ Diesel generators are often the go-to technology for decentralised power generation, though they can be noisy and dirty, and lock people into fossil fuel supply chains, which may be illegal and inequitable. On the other hand, diesel supply chains generally require no external donor intervention to set them up, though they may rely on government subsidies. Renewable energy systems are expensive to start up and may be seen as providing an inferior service (lower power output), but can be flexible for decentralised power generation and do not require fuel payments, though they do require ongoing operation and maintenance services (Isoun *et al.*, forthcoming).

⁴ Definitions of 'social enterprise' vary, and we use the term here to refer in broad terms to an organisation (e.g. a business, co-operative or charity) that trades for a social and/or environmental purpose and may be for-profit or not-for-profit. For a more detailed discussion see Rogerson *et al.* (2013).

⁵ See glossary for a definition of productive uses of energy.

1.1 Understanding optimal public and private roles

Public and private sector roles in delivering energy to the poor are increasingly intertwined and it is essential to build mutual understanding and collaborate on strategic planning. Government and donor finance is important in nurturing new markets for decentralised and renewable energy technology, early-stage enterprise development, and technological and market research, which commercial entities may see little incentive to provide (see Sections 3.1 and 3.4).

Many of our case studies involve public–private partnerships (PPPs). The traditional notion of a PPP (where the government sets a service standard and monitors performance, while a private company raises capital and builds and operates a project), does not capture the range of innovations emerging on the ground. Sovacool (2013) identifies numerous partnership types, for various activities from developing new technologies to mobilising community involvement with diverse partners, including for-profit companies, local government, development banks, rural energy service companies (ESCOs), community-based organisations and co-operatives.

Increased public–private collaboration may require overcoming mutual mistrust. The politics of ‘state control’ in some countries, particularly those with ‘developmental state’ ideologies, may discourage private investment. In countries such as Ethiopia and Bangladesh, governments prefer to engage with state-owned companies over nurturing or engaging with private business. Governments often believe that the private sector is unprepared to take the lead and therefore their inputs should be complementary to public sector leadership (Rai, 2013b; Rai *et al.*, 2014).

The government role in building an enabling environment for business is key, and is reflected in some international programmes (see Sections 3.6 and 3.7). Governments can shape tariff and tax systems, including VAT; tackle fossil fuel subsidies (IISD, 2014); reduce import duties on renewable technologies; introduce feed-in tariffs; and offer co-investment, loan guarantees and other de-risking instruments (The GIIN, 2014; Nelson and Shrimali, 2014; Wassbein *et al.*, 2013; Koh *et al.*, 2012). The notion of building a ‘green economy’ has taken root in several countries, and is a useful entry point to consider how to optimise finance directed at low-carbon development (Banda and Bass, 2014) (see Section 3.8).

Scott and Seth (2012) highlight a key challenge in understanding the appropriate use of official development assistance (ODA), as it shifts from lending to stimulating private investment. Climate finance is also becoming an option for financing low-carbon energy access initiatives, for example with the roll out of the Climate Investment Funds (see Section 3.7). National pension funds and sovereign wealth funds have huge potential for investing in low-carbon investments and renewable energy in developing country contexts (Africa Growth Institute, 2014). The challenge in all these cases is how these large amounts of money are channelled and spent nationally and locally.

Private companies also need to build development-related skills and engage with government as they implement social investment (community development) projects (Tait *et al.*, 2013). Examples include Enel’s programme in Brazil, where customers exchange recyclable urban waste for reduced electricity bills (Bellanca and Wilson, 2012); and decentralised energy projects in the Niger Delta supported by oil companies (Shaad and Wilson, 2009).⁶ The Shell Foundation, Renewable World and SolarAid (see Section 3.3) were set up by energy companies and aim to stimulate energy markets and business innovation in pro-poor energy access.⁷

In this paper we use a selection of case study examples of public and private sector innovation to explore the following questions:

- **What are the public and private sectors currently doing to incentivise private investment in pro-poor energy access?**
- **How can policymakers, investors and practitioners improve their understanding of optimal public and private roles in financing energy access for the poor?**

1.2 Methodology

The paper is based largely on a desk review of literature, though it also draws on a set of 41 interviews held in 2012 and 2013 by IIED’s Energy Team and research partners on the role of the private sector in delivering universal energy access (see Bellanca and Wilson, 2012; Wilson and Symons, 2013).⁸ Thanks to a small DfID grant, the Energy Team was able to team up with IIED’s Climate Change Group, which has been studying public-sector energy access programmes, notably the Scaling-up Renewable Energy in Low-Income Countries Programme (SREP). This collaboration allowed for conceptual thinking around public and private sector

⁶ See also: <http://livingearth.org.uk/projects/gas-to-power-2>

⁷ For more on these organisations, see www.shellfoundation.org; www.solar-aid.org and www.renewable-world.org

⁸ See transcripts of some of the interviews here: www.hedon.info/IIED+survey+role+of+Biz+in+SE4All

roles. Our lists of barriers and key challenges are based on the literature review and our interview responses. Our case studies aim to illustrate the relative roles of public and private sector finance. They were not selected against any strict criteria, merely to illustrate particular innovations. We stopped short of providing any assessment of the effectiveness of individual initiatives against a set of economic or social criteria. The process of review of various iterations of this paper was also an opportunity for engagement and in some cases in-depth discussion with experts in the field.

1.3 Structure of the paper

Section 2 sets the scene by outlining the nature of energy markets and the financing landscape. Section 3 explores the interplay between public and private finance through a series of contrasting case studies illustrating innovations, some led by the public sector and some by the private sector, including social entrepreneurs. As this is a discussion paper, we pose questions throughout, aimed at encouraging the reader to think and possibly contribute to an ongoing dialogue. The conclusions and recommendations (Section 4) focus specifically on how better to understand optimal public and private sector roles, and we identify a set of research gaps.

IIED is already feeding into debates around the UN Sustainable Energy for All initiative (SE4ALL) and the post-2015 Sustainable Development Goals. We also propose to use the key findings of this report in our engagement with national governments on climate finance and adaptation planning, and we hope to engage more with research partners to explore the research gaps identified in this paper.

Energy markets and the financing landscape

2

There is considerable international momentum around energy access, with the 2012 launch of the UN Sustainable Energy for All Initiative (SE4ALL), which targets three goals relating to energy efficiency, promoting renewable energy, and achieving universal energy access by 2030. The UN Decade of Sustainable Energy for All (2014–2024) is currently running. Energy was prioritised in the Istanbul Programme of Action for least developed countries, and features strongly in debates around the post-2015 Sustainable Development Goals.⁹

These initiatives are bold in the levels of funding they seek to mobilise, and their expectations of the private sector. Are these expectations unrealistic? In 2009, at the Copenhagen Conference of the Parties, developed countries committed to mobilising US\$100 billion in climate finance per year by 2020 to help developing countries cut greenhouse gas emissions and adapt to climate change. Much of this was expected to come from the private sector, but an Overseas Development Institute (ODI) study suggests that only about 20 per cent of funds have been from the private sector (Whitley, 2013).

In 2012, SE4ALL registered 150 voluntary commitments from governments, donors, businesses and NGOs in the run up to the Rio+20 Summit, worth the equivalent of US\$320 billion. (These may or may not be 'additional' to what signatories had already planned, and they may or may not materialise.) An analysis by the International Energy Agency (IEA) in that same year highlighted that pledges for 'access' were much lower than those for the renewable energy and energy efficiency goals – just 10 per cent of the total (IEA, 2012). Of those earmarked for energy access, most were from multilateral development banks (MDBs), followed by governments, with the private sector some way behind. Cross-sector analysis on priority SE4ALL actions for companies found most opportunities lay in energy efficiency (49 per cent) and renewables (38 per cent), with just 13 per cent for energy access (Accenture/UN Global Compact, 2012).

Development finance and climate finance are sourced both from bilateral and multilateral sources. Bilateral sources tend to be OECD countries that provide official development assistance (ODA) through instruments such as grants, concessional loans and investment guarantees. Multilateral sources include the World Bank and regional development banks that use credits, grants and risk guarantees. The International Finance Corporation (IFC) lends to the private sector and local funding institutions and also provides risk guarantees.

The Multilateral Investment Guarantee Agency (MIGA) and others provide political risk insurance to stimulate foreign direct investment (OECD/IEA, 2011).¹⁰

2.1 The evolution of low-income energy markets

Low-income energy markets are immature, but there are opportunities to attract private sector investment. Over US\$36 billion is spent annually on kerosene lighting, with US\$10 billion spent in sub-Saharan Africa – though of course this includes not only the poor but the wealthier who also use this source of lighting (The Economist, 2012). (Indeed the transition of this wealthier band to alternative low-carbon energy sources may stimulate markets and bring down costs.) With the falling cost of solar PV, off-grid developers say that stand-alone renewable energy systems such as solar home systems (SHS) can compete with kerosene in certain cases on a life-cycle basis (ibid).¹¹ But it is not all about the cost of the technology and the available cash in the market.

The impact investment landscape is evolving, with impact-oriented funds increasingly demonstrating market-rate returns, and increasing investment in clean energy technology (Saltuk *et al.*, 2013), while institutional investors are also starting to show an interest in impact markets (Saltuk *et al.*, 2014). Impact investors focus more on energy-related investments in developed country markets than emerging markets, and tend to seek competitive returns on energy investments, rather than below-market rates of return which they may seek in healthcare, for instance (Palandjian, 2010; Saltuk *et al.*, 2013 and 2014).

The evolving low-income energy sector can be compared to the early years of microfinance. Microfinance is currently a top target sector for impact investors (Saltuk *et al.*, 2014). Yet in its early years, microfinance depended on grants, soft loans and guarantees from donors and philanthropists, receiving about US\$20 billion in subsidies over two decades before becoming commercially attractive to investors (Palandjian, 2010). The Grameen Bank took 17 years to break even, but it overcame many barriers for subsequent players, who took much less time to attract commercial investment, thus helping to establish the enabling conditions and validate the business model for all players in the sector.

⁹ Energy access was notably missed when the Millennium Development Goals were agreed in 2000 (Practical Action, 2013).

¹⁰ Some of the recent discussions on private sector engagement in development co-operation are useful here: www.nsi-ins.ca/wp-content/uploads/2013/09/Mapping-PS-Engagement-in-Development-Cooperation-Final.pdf; www.iadb.org/intal/intalcdi/PE/2013/10792.pdf

¹¹ An exception is decentralised small-scale diesel generators and diesel markets. Given the problematic nature of this sector (e.g. links to oil theft in the Niger Delta) and the differences with other decentralised energy sources, we have not included diesel generators in this analysis, though they compete with renewable options in markets.

Emerging energy markets can learn much from the microfinance sector, not least some of the challenges faced by 'classical' microfinance as a financing instrument. David Hulme and Paul Mosley (1996) provided some early evidence on how microfinance does not necessarily benefit the poorest, due to high interest rates, and a lack of entrepreneurial skills. Efforts to replicate the successes of Grameen Shakti (Bangladesh) and Selco (India) by establishing microfinance initiatives to support energy access in sub-Saharan Africa have also been criticised for not necessarily benefiting the poorest, and sometimes having a negative impact (Rolffs *et al.* 2014). Yet there is evidence that microfinance can empower women, while schemes that include capacity building and link to productive uses can provide some benefit (*ibid.*). Several of our case studies include an element of microfinance.

In the low-income energy markets, there are no such dramatic market-changing players as Grameen Shakti. SolarAid's social enterprise, SunnyMoney, does seek to shape and open up markets for future businesses and investors, by testing out and demonstrating new market approaches, such as pay-as-you-go technologies (see Section 3.2) and crowdfunding (see Section 3.3). There are also plenty of examples of efforts to catalyse markets through 'loss leader' interventions or 'catalytic first-loss capital' (CFLC) (GIIN, 2013). Martin (2013) sees CFLC as a key area for ODA and philanthropic resources.

Another key influence on low-income energy markets is the uptake of mobile phones. While Asia is the largest mobile phone market, sub-Saharan Africa is the fastest-growing market, with 64 per cent penetration in 2012, and an average annual growth rate of 44 per cent since 2000 (Pueyo, 2013). As a result, more people have access to mobile phone networks than electricity in sub-Saharan Africa (*ibid.*). For example, by 2010 the number of mobile phone subscribers in Kenya was double the number of people connected to the grid or SHS owners (Rolffs *et al.*, 2014). Investors in low-income energy markets see the expansion of mobile phone use as both a driver for electricity demand and a catalyst for technology development that can transform energy delivery models (Levinson, 2012).

2.2 Base-of-the-pyramid markets

In their widely-cited paper 'The Fortune at the Bottom of the Pyramid', Prahalad and Hart (2002: 1) suggest that multinational corporations (MNCs) could make significant profits if they targeted the four billion people 'at the bottom of the world economic pyramid'¹² with affordable products and services. Low per-unit profit margins would be compensated by the sheer numbers of 'aspiring poor' making up that potential market (*ibid.*). An oft-cited example is Hindustan Unilever revising its business model to sell affordable sachets of shampoo to poor consumers in India. Over the years, the base-of-the-pyramid (BoP) paradigm has evolved, with Stuart Hart's BoP Protocol that focuses on partnerships and the 'co-creation' of innovative business models with local partners (Simanis and Hart, 2008). The BoP paradigm began to focus less on MNCs, seeing all sizes and types of business, not only MNCs, as able to target BoP markets (WRI, 2007; Kandachar and Halme, 2008). The BoP terminology has been brought into the language of development assistance (GIZ, 2013; DfID, 2012). Increasingly, low-income energy markets are being assessed as potential BoP markets (IFC and World Bank, 2010; Cheung *et al.*, 2010; Ashoka and Hystra, 2009).

Yet a decade on, although the term BoP is still current, 'the fortune remains elusive' (Gunther, 2014) while the 'bottom billion' remain without goods and services. By their nature, BoP models need to target areas where it is easier to achieve economies of scale. According to Simanis (2012) the level of market penetration required to make a success of a BoP business is usually a challenge in low-income countries where populations are not always urban, often less densely populated, or scattered across regions. Studies indicate that BoP models frequently end up serving wealthier customers or businesses, rather than the poorest, because they can afford to pay for goods and services, thus ensuring sustainability of the financial model (Pueyo, 2013; Wilson *et al.*, 2008). Nonetheless, as part of an overall development strategy, private businesses can make a valuable contribution to positive socio-economic outcomes, by serving populations that, while not living in acute poverty, still lack access to modern energy services (*ibid.*). Kasturi Rangan and others (2011) suggest that businesses targeting the base of the pyramid should tailor their strategies to meet the needs of different market segments: **low-income, subsistence** and **extreme poverty**, as illustrated in Table 1 below.

¹²In the 2002 paper, Prahalad and Hart estimate the income of the 4 billion at the bottom of the pyramid to be US\$1,500 per year, based on purchasing power parity. The 'bottom billion' lives on less than US\$1 per day.

Table 1: Base-of-the-pyramid market segments

MARKET SEGMENT	DESCRIPTION
Low income US\$3–5/day as of 2011	Some secondary education and skills to enter job market. Semi-regular incomes (e.g. construction workers, petty traders). People operate in formal and informal markets. Tend to live near more well-off populations who offer employment. Often own bicycles, televisions, mobile phones. Aspire to better housing, healthcare, access to credit.
Subsistence US\$1–3/day	Poorly educated and skilled. Can afford one meal per day with poor nutritional content. May assist in petty trade in slums. In rural areas, might be farm hands during sowing and harvesting. As consumers and producers, tend to operate in informal markets. No access to bank accounts or formal credit; vulnerable to exploitation by loan sharks. Strive to improve their circumstances; need employment and simple consumer items.
Extreme poverty Less than US\$1/ day – the ‘bottom billion’	Limited education, poor health, few marketable skills; lack food, adequate shelter, clean water. May have been displaced by conflict or natural disaster. May live in barter economies; may be bonded labourers. Women may walk long distances on insecure paths to gather water or firewood. Precarious daily existence precludes participation in markets as consumers or producers. Some benefit from aid or government relief.

Source: Kasturi Rangan et al. (2011: 3)

The examples in this paper tend to serve the low-income and subsistence markets, as do most published case studies of BoP business models and pro-poor energy delivery models. SolarAid (2014a) state that 90 per cent of the customers of their solar products social enterprise, SunnyMoney, live below the poverty line, which could be either of the categories ‘subsistence’ or ‘extreme poverty’. The poverty line is generally taken to be around US\$1.25 or 2/day (World Bank, 2014a).¹³

2.3 Key finance gaps: small-scale enterprise and end-user finance

In this analysis we focus on two particular finance gaps:

- **Enterprise finance for small-scale entrepreneurs:** Local social entrepreneurs and small-scale enterprises are at the forefront of delivering renewable energy to marginalised populations and outlying regions. There is a lack of **affordable** finance (start-up capital, working capital, both debt and equity) from traditional institutions such as local banks.¹⁴ Other factors include the small scale of the required finance and the lack of validated business models to attract public or private finance.

The high cost of capital for these enterprises in turn translates into a high cost of products and services, rendering them less affordable to low-income end users. Investors – including those with a social purpose – require proof of returns before they can finance energy services or renewable enterprises operating in low-income markets.

- **End-user finance and affordable payment schedules:** End-user payments are a key source of ongoing finance for energy enterprises, so it is essential that target customers are able to pay for the goods and services – and this may require some assistance. People on low incomes often do pay for low-quality energy services, such as kerosene (often subsidised by the government). Yet cash flow is often irregular e.g. from harvest sales or *ad hoc* remittances. In recent years, there has been a considerable evolution in technology and business model design targeting end-user payment capacity, resulting in innovative pay-as-you-go (PAYG) schemes which allow end users flexibility in payment schedules, and real-time monitoring (RTM) technology to ensure reliability and predictability of payment for the business (a key risk-mitigation aspect for investors). It still remains a challenge to reach the poorest even with these technologies (Pueyo, 2013).

¹³ See also alternative measurements, such as the Multidimensional Poverty Index (www.ophi.org.uk/wp-content/uploads/OPHI-MPI-Brief.pdf) and their critics (www.iied.org/multidimensional-poverty-index-another-underestimate-urban-poverty).

¹⁴ A recent report by Ashden and Christian Aid (2014) highlights a particular need for working capital.

2.4 Key barriers to private sector investment

Our literature review and interviews highlighted several key barriers to effective public and private sector financing of pro-poor energy services:

1. **Political and economic risks, uncertainties and strong state control:** Economic and political instability and the risk of conflict increase investors' anxiety. Political risks are often higher in the poorest countries. Government perceptions of the private sector are also important.
2. **Weak or obstructive enabling environment:** This might include tax and subsidy regimes (e.g. fossil fuel subsidies or import duty) or a lack of clear regulation (e.g. in relation to land rights).
3. **Lack of appropriate mechanisms and institutions to channel finance towards low-income consumers and small-scale enterprises,** especially where large-scale finance needs to be targeted at small-scale enterprises or local banks and microfinance institutions.
4. **Lack of capital available at low cost for local businesses:** Regulatory, market and technological risks increase the cost of capital available to businesses via standard routes, such as local banks. A particular issue for emerging distribution enterprises is a physical lack of collateral. Where finance is available, local entrepreneurs often do not know or find it difficult to take advantage of opportunities.
5. **Low returns for investors:** Poor people are unable to pay much for modern energy services, they consume less, and they may be costly to reach. Investments in consumer finance facilities and energy enterprises are often longer term, higher risk, and generate a lower financial return.
6. **Investment security:** The risk of non-payment by enterprises and/or end users is a key deterrent for investors.
7. **Investment size:** The sums of finance required – often a few thousand to a few million dollars – are typically too small for mainstream investors, banks and even donors. So the transaction costs per beneficiary are high, which leads to high interest rates and the exclusion of the poorest.
8. **Shortage of proven business models and good quality business plans:** Investors 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 through the delivery model.
9. **Short-termism:** Commercial investors may be unwilling to spend time building the relationships and market demand required to generate a decent return on investment in under-developed markets.
10. **Lack of market builders and pioneers:** An immature market requires pioneers to overcome barriers and build the market (as Grameen Bank did for microfinance). There are some examples of market pioneers, but they have yet to transform markets in the way that microfinance did.

In the next chapter, we explore ten examples of public and private sector innovation in attracting private investment in pro-poor energy access. These illustrate different scales and levels of impact, and different timescales – some long-running, some more recent, others still in the early roll-out stage. In all of the case studies, some form of public sector support is required to stimulate private finance, although most of the models aspire to longer-term financial sustainability, without the need for ongoing public sector support. Many cases include an element of microfinance for end users or entrepreneurs. Several of them are public–private partnerships. The examples illustrate the related roles of the public and private sectors and the need to be strategic in planning the interplay of the two.

Public and private roles in financing energy access

3

3.1 Angel investors: seeking security of investment

Growth in impact investment is being driven by angel investors who can respond to smaller, one-off deals, co-investment and phased investments, and early-stage, higher-risk investments. Angels work closely with the enterprises that they invest in, as a key risk-management strategy. Village Infrastructure is a social enterprise using investment from angel investors to deliver solar lighting services to low-income communities in Ghana, using a microfinance facility for entrepreneurs (see Box 2).

Village Infrastructure aims for a sustainable business model in the long term, so has a strong focus on risk guarantees, due diligence, and ensuring that investors see a return on their investment. Some observers criticise this kind of model as it leaves the end users shouldering the cost of paying off the loan. Nonetheless, the model demonstrates how the risk of non-payment can be reduced by replicating people's existing payment routines (cost, flexibility and regularity).¹⁵ This is critical not only for investors, but also for the long-term sustainability of the service. This model also illustrates the essential role of donor finance in the early stages of business-model development, to support start up and scale up.

Angel networks like Toniic or Go Beyond allow angels to co-invest and share activities such as due diligence, research into new deals, and monitoring of investment portfolios.¹⁶ The Global Impact Investment Network (GIIN), supported by the Rockefeller Foundation, has an Impact Reporting and Investment Standards initiative (IRIS) to assist investors in tracking and communicating their environmental, social and financial performance.¹⁷ Such efforts are critical to understanding what models work and reducing the perceived risk of investment. Due diligence is important, though it is worth noting that research commissioned by Ashden and Christian Aid (2014) revealed that some entrepreneurs feel overwhelmed by the onerous due diligence requirements of social investors.

Question

How can project developers balance investment security for investors with affordability to end users, while avoiding excessive due diligence requirements for local enterprises?

BOX 2: VILLAGE INFRASTRUCTURE USES FINANCE FROM ANGEL INVESTORS IN A MICROFINANCE FACILITY

Village Infrastructure's delivery model includes a solar charging station (solar panels for charging lamps) that is set up in the village market or school, run by a local entrepreneur. A typical station serves around 50 households within a 1 km walking distance, which charge their lights every 2–3 days. Customers pay the entrepreneur the equivalent of the cost of kerosene per week to charge their lamps – which give a cleaner, stronger light than kerosene. As with paying for kerosene, if they cannot afford to charge their solar lamps one week, then they go without, making paying for solar energy just as flexible.

The entrepreneur takes out a loan from Village Infrastructure's microfinance facility (funded by angel investors) to pay for the lamps and panels, using the income from the equipment rental to pay off this loan, while retaining a small personal profit.

Village Infrastructure runs the projects together with local field partners – spending time in the field building relations. They monitor the microfinance facility to ensure both the principal and interest are returned to the investors. The loans are repaid over time and are covered by initial risk guarantees in case of default. The business model provides adequate returns to the investors, while also covering some of Village Infrastructure's overheads. Village Infrastructure also uses donor finance for some of its operating costs, particularly for starting up new activities.

Sources: www.villageinfrastructure.org; Village Infrastructure co-Founder Lucy Symons (2013).

¹⁵ Models such as this work better in rural areas where the cost of kerosene is higher.

¹⁶ For more information on Toniic and Go Beyond, see: www.toniic.com and www.go-beyond.biz

¹⁷ For more information on IRIS, see: <http://iris.thegiin.org>

3.2 Innovative payment technologies: reducing investment risk

End users' ability to pay is a critical factor in the success of an energy enterprise. The challenge is to make services and products affordable, but also to understand the constraints on payment, such as irregular cash flow. There has been considerable innovation in recent years in pay-as-you-go (PAYG) and real-time monitoring (RTM) technologies, which help low-income customers to pay, while reducing risk for entrepreneurs and investors by ensuring ongoing payment (Rolffs *et al.*, 2014, Pueyo, 2013).

The penetration of mobile phones in developing countries and the success of mobile phone payment initiatives, notably M-Pesa in sub-Saharan Africa, have opened up opportunities for this kind of innovation (Rolffs *et al.*, 2014). The PAYG models use scratchcards or mobile phone technology. Real-time monitoring uses machine-to-machine (M2M) technologies, which allow for remote management of off-grid systems in the way pre-paid meters are used with on-grid systems (Pueyo, 2013). Some of these

emerging models have been well studied, including M-KOPA, Mobisol, Azuri Technologies, Eight19 and Access Energy (Rolffs *et al.*, 2014; Pueyo, 2013; Bellanca, 2012a). The Ashden Awards showcase innovative energy enterprises in the UK and globally.¹⁸ Azuri Technologies (Kenya) was a winner in 2013, while Off Grid: Electric (Tanzania) was a winner in 2014 (see Box 3).

Pueyo (2013: 22) notes that 'even though a higher share of the population is reached by PAYG business models enabled by RTM technologies than by traditional up-front payment models, the poorest strata of society are still left behind'. However, SolarAid see PAYG technology as potentially transforming energy access for its customers (most of whom live below the poverty line), based on its use with solar lanterns (not SHS) (SolarAid, 2014b).

Question

Can PAYG technology enable expansion of energy access to poorer markets that could not previously be reached? What are the challenges of reaching the poorest using this technology?

BOX 3: NEW TECHNOLOGY MODELS ARE 'SELLING SERVICES NOT GADGETS'¹⁹

Azuri Technologies in Kenya uses the widely used Indigo scratchcard system for electricity payments. Customers pay a small fee of around US\$10 for installation of a home lighting system. The scratchcards cost around US\$1.50 per week (cheaper than kerosene). Sending a text message generates a one-off passcode which is entered into an Indigo unit to operate the lighting system for a week. Customers can charge their mobile phone and have 8 hours of clean light for two rooms. They can pay off the cost of their unit and upgrade to a more powerful system (via the so-called Indigo 'energy escalator'). However, users can get off the escalator at any point and are not committed to a long-term debt. The Indigo system is also available in other sub-Saharan African countries including Tanzania, Rwanda, South Sudan, Zimbabwe, Nigeria and South Africa, with a total of 20,000 customers. Azuri has received grants from USAid and the Africa Enterprise Challenge Fund (AECF) and has secured working capital from private investors.

Off Grid: Electric in Tanzania offers an entry-level service of two lights and a phone charger, costing US\$0.19 / day. Customers pay using mobile money; the regular payments also help them build a credit history. The service is designed to respond to user needs, with flexible payments, the opportunity to upgrade the service, and good support from the customer care team and trained local agents. Over 10,000 households (about 45,000 people) are customers. Off Grid: Electric is financed mainly through equity investment, supplemented by debt and grants. The most recent equity round raised US\$7 million from impact investors, including Vulcan Capital, SolarCity and the Omidyar Network.²⁰ Off Grid: Electric has also received grants and loans from AECF, the Energy and Environment Partnership for Southern and Eastern Africa (EEP) and others.

Sources: Azuri (2014); Rolffs et al. (2014); Pueyo (2013); Bellanca (2012a); Ashden (2014b); Venturebeat (2014)

¹⁸ See: www.ashden.org/ashden_awards

¹⁹ Quote from head of expansion, Off Grid Electric, Tanzania (Ashden, 2014a). See video here: www.ashden.org/winners/OffGrid14

²⁰ Existing investors include Jasmine Investments, Givia Pty, The World We Want Foundation, Segal Family Foundation, Mulago Foundation, Serious Change LP, Frank McCrea, and BW-JVE Investments (Venturebeat, 2014).

3.3 Crowdfunding: opening doors for mainstream investment

Crowdfunding involves selling small amounts of debt or equity to large numbers of investors ('the crowd'). Crowdfunding is working for low-income markets in developing countries, currently based on zero-interest loans, administered via online platforms such as Kiva, Microplace, Milaap (in India), Ray's Fund, and SunFunder.²¹ Crowdfunders have the flexibility to offer smaller deals and phased investment; they invest in early-stage enterprises and innovative business models.

The model is that individual investors make payments to local partners via the crowdfunding platform; the partner makes repayments to the crowdfunding platform which, in turn, repays the investors. Crowdfunders often respond to the appeal of a story, such as the notion of helping a particular school in Africa to provide light for its pupils. Importantly, crowdfunding can also lead to more mainstream investment and can reduce risk for later investments from impact investors and institutional investors (Friggins, 2013; Wilson, 2013). SunFunder is a crowdfunding platform enabling mostly developed

Question

What do governments of developing countries need to do to free up the potential of crowdfunding and other 'bottom-up' sources of finance for their societies?

country investors to invest in developing countries (see Box 4).

There is growing interest in supporting the growth of crowdfunding investment in developing countries. For example, Von Ritter and Black-Layne (2013) propose that the new Green Climate Fund considers support for microfinance and crowdfunding under its Private Sector Facility, with national-level institutions and guarantees for crowdfunding investors, and concessional finance for green technologies.

Crowdfunding platforms that support activities in developing countries tend to raise funds from people in the developed world and – for reasons of regulation and transaction costs – are not currently making use of the untapped potential of domestic private capital in target countries. In the UK, Abundance Generation (another Ashden Award winner in 2014),²³ uses a

BOX 4: SUNFUNDER FINANCES PIONEERING EARLY-STAGE PROJECTS THROUGH CROWDFUNDING

Established in 2012, SunFunder runs energy access projects in developing countries, focusing mostly on solar products such as lanterns. So far they have reached over 117,000 people.²² A key SunFunder partner is SunnyMoney, a solar micro-franchise enterprise set up by SolarAid. For example, a US\$10,000 loan to SunnyMoney was funded in 2013 by 86 individuals allowing SunnyMoney to deliver 780 solar-powered lights to 3,900 people in Chadiza District, Eastern Zambia, which is not connected to the grid. SunnyMoney's solar schools programme trains teachers (as trusted community members) to sell the products and provide after-sales maintenance and advice. SunFunder focuses on partners who can demonstrate that their model works but who struggle to access sufficient funding to scale up their activities.

Due diligence is an essential risk-mitigation strategy, and SunFunder builds close relationships with their local implementing partners through regular calls and visits. Initially, SunFunder offers a one-year financing term, which allows time to assess the risk of loan repayment. SunFunder experts inspect the technology and talk to people in the market about what is working and what isn't. Investors are interested in development impact, so partners also track how many people are reached by the projects and how much money they are saving (SunFunder, 2013a).

SunFunder cannot currently offer interest on the loans, but instead offers investors 'impact points' on top of the return of their capital, which can then be reinvested into further projects. Crowdfunding is just one option along a spectrum of finance options for decentralised energy access, and SunFunder views itself as a solar finance company for the off-grid sector, not merely a crowdfunding platform. It seeks to partner with other impact investors and eventually to attract mainstream investment as markets evolve.

Sources: personal communication with Ryan Levinson (2013), founder and CEO of SunFunder; Wilson, 2013; SunFunder (2013b); <http://sunfunder.com>

²¹ See the respective websites at: www.kiva.org; www.microplace.com; www.facebook.com/RaysFund?ref=stream; and <http://sunfunder.com>

²² According to the November 2013 figures on its website. See: <http://sunfunder.com> for latest figures.

²³ See Webster (2014) and Ashden (2014c).

'debt crowdfunding' model to fund the St Briavels wind turbine on the English–Welsh border in the UK, allowing local communities to invest in their own wind farm – something that may eventually expand in developing country contexts (Friggens, 2013).

3.4 Business innovation hubs: early-stage investment and capacity building

In recent years there has been an evolution in the work of enterprise support networks and innovation hubs, such as Embark, Ennovent, S³IDF and Impact Investment Exchange Asia (IIX).²⁴ These entities are dedicated to providing enterprise support, including market research and business planning. Such hubs can provide debt and equity to entrepreneurs who have no access to traditional sources of capital due to high perceived risk or restrictive loan terms (Bellanca, 2012d). And like crowdfunding platforms, they can also assist with access to more mainstream finance, linking entrepreneurs with investors.

One of the early innovators, E+Co, was a US-headquartered not-for-profit financial institution founded in the early 1990s that invested in small enterprises providing clean energy to BoP customers (ibid). E+Co made around US\$40 million of investments in over 250

enterprises, including Selco in India (Prahalad, 2006). In 2012, E+Co was restructured into a for-profit entity, Persistent Energy Partners, and its innovation hub activities were discontinued, a cited key challenge being how to finance technical assistance for entrepreneurs (Bank, 2012). Yet other entities continue to promote the E+Co model. An example is the Small-Scale Sustainable Infrastructure Development Fund (S³IDF), a US-based NGO working in India (see Box 5).

The innovation hub model is useful in different contexts relating to a range of funding sources. For example, Nexus-Carbon for Development adopted the 'innovation hub' model to provide technical and financial support to local enterprises seeking access to carbon finance (Boiling Point, 2014). Corporate social investment funds are also used to support innovation hubs. For example, Schneider Electric set up the Business, Innovation and People at the Base of the Pyramid Programme (BipBop), which provides access to equipment, finance and skills through technical and business training (WBCSD, 2012).

Question

How can public and private finance combine to fund enterprise innovation hubs sustainably? What are the challenges associated with dependency of these hubs on donor finance?

BOX 5: ACCELERATING INNOVATION: S³IDF

The Small-Scale Sustainable Infrastructure Development Fund (S³IDF) employs its 'Social Merchant Bank Approach'[®] (SMBA) to support small-scale enterprises that meet basic infrastructure needs and provide opportunities for economic advancement. The SMBA includes the use of a grant fund and a revolving fund. The grant fund is used to support enterprises throughout the business development process, from the identification of successful entrepreneurs, the choice of technology combinations, the design of supply and service chains, to the formulation of business plans. S³IDF then leverages philanthropic and development capital from its revolving fund to mobilize co-financing from local financial institutions, encouraging them to lend to traditionally "un-bankable" entrepreneurs who lack collateral by demonstrating the viability of the business models and applying de-risking support to reduce the perceived risk. To facilitate local financing, S³IDF utilizes a menu of "gap-filling" co-financing options: debt (primary and secondary), equity, and partial guarantees or other credit conditioning instruments. The model has been able to reach the working poor (for example, as customers, employees, and/or asset owners) through a variety of enterprises, ranging from pay-per-use communal cooking facilities at hospitals for the relatives of patients to solar-charged batteries that are rented out to nighttime street vendors to illuminate their goods. S³IDF's business development services rely on philanthropic support, as they are highly tailored to specific local conditions and require high levels of expertise, which generally cannot be recovered by charging the micro- and small-scale due to, among other realities, the lower ability to pay among target customers. A key issue that the SMBA addresses is not lack of finance, but a perceived lack of projects to be financed. As Andrew Barnett, an advisor to S³IDF, observes: 'Energy proposals are often not recognized by financial institutions as feasible due to their lack of knowledge on how these projects actually work.' A key aspect of S³IDF's role is to convince financial institutions and investors that they should lend and invest.

Sources: <http://s3idf.org/>; interview with Andrew Barnett of the Policy Practice: http://www.hedon.info/IIED+SE4All+Interview_ThePolicyPractice+ABarnet?bl=y (Bellanca, 2012c).

²⁴ For more on these organisations see: <http://embarkenergy.com>; www.ennovent.com; <http://s3idf.org>; www.asiaix.com

3.5 Carbon finance: voluntary markets showing potential to support energy access

Carbon finance can be from public or private sources and comprises the public-funded Clean Development Mechanism (CDM) and the parallel voluntary market. Under the CDM, projects in the developing world can generate Certified Emission Reductions (CERs) which can be bought up by high-emitters in emissions trading schemes such as the European Union's Emissions Trading Scheme (*EU ETS*). Under the voluntary market, individuals and organisations can offset their emissions by buying Verified Emission Reductions (VERs). The Gold Standard is a certification standard for voluntary and CDM markets, established in 2003 and considered the benchmark for quality and rigour. It encourages development co-benefits for communities, though these are limited, as the finance is targeted primarily at emissions reductions (Godfrey Wood, 2011).

There have been great hopes of using carbon finance to support private sector energy access initiatives. However, the collapse of the price of carbon has

affected trading schemes and the CDM, though some initiatives, including the Gold Standard, have retained demand for their products, with voluntary markets demonstrating more potential than the CDM (Boiling Point, 2014). Two examples of energy access initiatives using carbon finance are illustrated in Box 6 below.

It has proven difficult to unlock carbon finance due to the burdensome process of securing approval, particularly in the regulated (CDM) market. Other challenges include the high transaction costs involved in accrediting small projects, falling carbon prices and the need to achieve significant carbon savings (to secure credits) from poor people who are very low energy users and emitters. However, the above examples demonstrate that carbon finance can be used to stimulate and maintain energy access initiatives that deliver pro-poor 'co-benefits'.

Question

What are the longer-term prospects of carbon finance to support pro-poor energy access?

BOX 6: IMPACT CARBON AND PROYECTO MIRADOR USE CARBON FINANCE TO SUPPORT ENERGY ENTERPRISES

Impact Carbon has been working in Uganda with a stove manufacturer, Ugastove, supporting the manufacture of quality stoves and expanding distribution capacity through (voluntary market) carbon finance via the Gold Standard.²⁵ Sales have grown to nearly 50,000 stoves a year, and the challenge now is distribution to people in remote locations (the 'last mile'). Innovation research and technical assistance have been supported by grants, but day-to-day operations are financed by stove sales and carbon finance. Upfront capital is required to get the project started, including subsidising the stove price to the end user. Carbon finance supports social marketing campaigns to increase demand; awareness-raising about improved technologies to increase willingness to pay; and capacity building for local partners. With economies of scale, the cost of manufacturing can come down and carbon revenues can eventually become less critical to the business model.

In Honduras, a combination of finance has kept Proyecto Mirador going. The local beneficiary donates their own time and locally available materials to the construction of the stove in their home – something which engenders a sense of ownership. Proyecto Mirador finances other costs through carbon credits sold via the Gold Standard. However, these take five years to come in, so they use what they call 'donated equity', largely from two private foundations, to fill the gap. Proyecto Mirador is a non-profit organisation so the foundations are not looking for a return on their investment. However, the model is such that each cook stove pays for itself, while the additional capital from the foundations is only required for scaling out the model.

Sources: Bellanca (2012b); Ecofys (2006); Boiling Point (2014)

²⁵ Another example of an Impact Carbon project is the Kenyan Jiko Stove www.relwa.org/sites/default/files/Kenya-Stoves-Assessment-web.pdf

3.6 Development cooperation: stimulating renewable energy markets

A growing trend in donor finance for development and renewable energy is donors' shift away from unsustainable subsidies (e.g. for one-off installations of SHS that subsequently fall into disrepair due to lack of maintenance) towards the creation of a sustainable market for renewable energy, with strategies to reduce funding inputs over time as programmes reach scale and markets mature (IRENA, 2013).

Zambia's Solar PV Energy Service Companies (ESCO) project was one such example funded by the Swedish International Development Cooperation Agency (Sida) and managed by the Ministry of Energy in Zambia from 1999 to December 2005, with technical assistance from the Stockholm Environment Institute and the University of Zambia (Lemaire, 2009). The project was a pilot to explore how to bring affordable energy to rural households, and focused on Zambia's Eastern Province, where the rural electrification rate was about 2 per cent (see Box 7).

The main advantage of ESCOs is that the maintenance is done by qualified technicians who have an incentive to monitor the systems closely (Lemaire, 2009; Mfuné and Boon, 2008). Lemaire (2009) emphasises that the Zambian scheme worked because the end users were relatively wealthy, with regular incomes and thus able to pay for the energy services. Schools and similar public institutions were considered less reliable customers, while small-scale farmers and some smaller entrepreneurs were unable to pay for the services (Mfuné and Boon, 2008). However, Mfuné and Boon also point out the important role that the rural elite has played in demonstrating the applicability of solar technology in rural settings, which, they argue, helped the solar market to evolve in that region.

Question

Should donor programmes target small-scale pilots such as these (supporting enterprise innovation and demonstrating technology)? Can the poverty outcomes of this type of intervention be improved?

BOX 7: ZAMBIA'S SOLAR PV ESCO PROJECT DEMONSTRATES POTENTIAL OF SOLAR TECHNOLOGY

The Zambian ESCO project responded to concerns that solar panels were too expensive for the average household to afford. The intent was to facilitate access to commercial credit, but this turned out to be impossible due to the interest rates in Zambia, which were 40–65 per cent at the time. So the Zambian government and SIDA shared the initial capital cost of the SHS. The SHS were then lent to private ESCOs who installed them for a connection fee (US\$4.2 in 2010) – a fraction of the cost of installation. The ESCOs were given 20 years to repay the loan (subsequently reduced to 10 years). The ESCOs charged customers a monthly fee to maintain their systems. The fee is greater than the highly subsidised Zambian tariff for grid electricity, but as this was not available in the region, the fee compared favourably with previous monthly expenditure on kerosene, candles and batteries.

Households do not own the SHS, so they do not have the technical burden of maintenance which is often neglected due to affordability or lack of skills. As of 2010, there were three ESCOs operating with 400 customers. In addition to households, businesses such as motels, shops and restaurants also reported benefits from the programme. Customers appear satisfied with the quality of the service, citing extended study time and expanded business hours as key benefits.

Source: Ellegard et al. (2004); Lemaire (2009); Mfuné and Boon (2008); Climate Parliament (2010); HEDON (2010); Intelligent Energy Europe (2006)

3.7 Public–private partnerships: channelling donor finance into renewable energy

The Infrastructure Development Company Limited (IDCOL) is a formalised public–private partnership established by the government of Bangladesh in 1997 to attract private sector investment into the renewable energy sector. In 1998 it was licensed by Bangladesh Bank as a non-bank financial institution. IDCOL is predominantly financed by development partners, including the Global Environment Facility (GEF), the Asian Development Bank (ADB), GIZ and others (see Box 8).

The cost-recovery modality of the SHS scheme was criticised for excluding the poorest who could not pay the high repayment costs of loans and could only afford cook stoves and solar lanterns due to their low upfront costs (Kürschner *et al.*, 2009). In response,

Question

What lessons can be learnt from IDCOL to inform public policy and donor programmes? Are some elements of success strongly dependent on the specific Bangladesh context?

IDCOL made some changes, for example by partnering with Grameen Shakti, which offers low-interest loans. Other microfinance institutions also tried charging lower upfront costs and recovering them over longer payback periods. In some cases, the government made initial down payments on behalf of the poorest (*ibid*). Smaller SHS (5 Wp to 10 Wp per household)²⁶ have been introduced at a lower cost. A sample study of the impact of smaller SHS revealed that around 83 per cent of users in the sample were living below the poverty line (Brossman, 2013).

BOX 8: IDCOL USES A PUBLIC–PRIVATE PARTNERSHIP MODEL TO ATTRACT PRIVATE INVESTMENT

The basic IDCOL model is that multilateral agencies provide loans and grants to the government of Bangladesh, which provides loans and grants to IDCOL. IDCOL has teamed up with 47 ‘partner organisations’ (POs), which are responsible for selling and installing solar home systems for customers. The POs include microfinance institutions, NGOs and private sector entities – Grameen Shakti is one of them. IDCOL offers POs (a) soft loans which the POs extend to households in the form of microcredit to purchase the technology and (b) grants to enhance their institutional capacities and to enable them to sell SHS at a subsidised price.

The grants are intended to decrease over time to promote competition amongst POs. IDCOL extends loans to POs at a rate of a 6–8 per cent for 5–7 years and does not require collateral or security for the loan. IDCOL also sets technical specifications for renewable energy equipment. In 2005, IDCOL achieved its initial target of 50,000 SHSs (three years early), and by October 2013 had installed 2.6 million, reaching about 12 million people. IDCOL has been credited with increasing the spread of SHS in Bangladesh, and is considered one of the most successful programmes of its kind. It has also inspired replication in other countries: it has provided knowledge support to Uganda, Sudan, Ghana, Ethiopia and Guinea among others.

Source: Amin et al. (2014); Haque (2013)

²⁶ Wp refers to the ‘watt-peak’ (Wp) rating or the power generated under standard conditions. SHS generally use modules between about 10 Wp and 100 Wp rating.

3.8 National development banks: operating as financial intermediaries

The role of national development banks as financial intermediaries is critical in 'developmental states' where economic development and markets are strongly governed and steered by the public sector. Multilateral agencies such as the IFC, which have mandates to work directly with the private sector, may have limited opportunities to catalyse the private sector without the cooperation of a national development bank, due to national regulations (Rai *et al.*, 2014). The Development Bank of Ethiopia (DBE), for example, acts as financial intermediary for the country's Rural Electrification Fund, which provides loans to private enterprises and NGOs to implement decentralised energy projects (see Box 9).

National development banks have a unique role to play in channelling 'green finance' such as climate finance, given their local market knowledge, relations

Question

What capacity-building efforts do national development banks need and how can this be delivered in time for governments to take advantage of expected increases in financial flows?

with local financial institutions and understanding of barriers and risks, as well as their ability to take more financial risks. However, as opportunities expand with flows of climate finance, it will be important to build the internal capacities of the banks to understand the international finance, to develop readiness strategies for mobilising and intermediation, and to monitor impacts of interventions (Amin *et al.*, 2014).

BOX 9: THE DEVELOPMENT BANK OF ETHIOPIA CHANNELS PRIVATE FINANCE TO ENERGY ENTERPRISES

In 2013, the World Bank granted US\$40 million to Ethiopia to support private sector renewable energy projects. Of this total, US\$20 million will be channelled via the DBE to the Rural Electrification Fund to private companies to incentivise private investment in renewable energy. The funds will be released over a period of five months in 2014 once issues such as lending rates have been agreed. If successful, the remaining US\$20 million will be disbursed.

This is the first time that DBE loans will be used as working capital for renewable energy businesses. This initiative is part of Ethiopia's Climate Resilient Green Economy strategy, which seeks to mobilise US\$15 billion per year to 2025 to reduce greenhouse gas emissions, increase climate resilience and promote low-carbon development. As the country's 2013 federal budget was about US\$9 billion, the needs of this programme has spurred efforts to attract private sector investment. Ethiopia's involvement in SREP (as outlined in Section 3.8) is also part of this strategy.

Sources: Ayalew (2013); Fikreyesus et al. (2013); Devex (2011)²⁷

²⁷ For more on Ethiopia's Climate Resilient Green Economy Strategy, see: <http://mptf.undp.org/factsheet/fund/3ET00>

3.9 Financial intermediation agencies: sharing risk to support innovation

Governments in some low-income countries (often supported by donors) have established special-purpose agencies to speed up the development and deployment of renewables by bringing together public and private investment. These intermediation mechanisms (a) provide public subsidies to renewable energy developers in the early stages and (b) create an enabling environment for credit financing so that the subsidies can be phased out in the long run. The enabling environment is built using financial de-risking instruments, such as public loans and guarantees; commercial lending incentives, such as long-term, low-interest loans; and capacity building of private investors in a nascent industry.

Nepal has long experience of offering government subsidies to private enterprises to encourage investment in decentralised energy, with the aim of encouraging the private enterprises to cater to underserved populations without the subsidies once the market is sufficiently mature. The Central Renewable Energy

Fund of Nepal (CREF) was established in 2013 and offers an alternative model, allowing a gradual shift from subsidies to credit (see Box 10). CREF is funded by the government of Nepal along with development partners, including the Danish, Norwegian and UK development agencies (Danida, Norad and DfID) among others. The management of the credit facility is the responsibility of a private commercial bank, whose role is to incentivise private banks to lend to enterprises and end users. CREF has an estimated budget of US\$115 million over five years (Danida, 2014; Government of Nepal, 2012).

The CREF model is a 'step up' from traditional subsidies, with the gradual phasing out of subsidies and replacement with credit facilities. Although the programme is yet to show results, the design departs from traditional ways of meeting rural electricity needs. A key concern is whether this approach will deliver benefits to the poor given the handling role being played by a commercial bank.

Question

What safeguards should be incorporated into the CREF model to ensure that the programme delivers benefits to the poor?

BOX 10: CREF AIMS TO FACILITATE THE SHIFT FROM SUBSIDIES TO CREDIT

CREF has two principal activities: 1) providing subsidies to qualified renewable energy technology installers; and 2) facilitating provision of credit funding (from qualified partnering banks) to developers, households and communities that wish to deal in or acquire renewable products. Funds from the government and development partners are channeled through the treasury to a national commercial handling bank for:

Wholesale lending for renewable energy technologies: The handling bank appraises and provides loans (low interest, long term) to pre-qualified partnering banks that in turn provide credit to renewable projects (implementers or end users). A technical appraisal agency and the commercial partner bank appraise the bankability of the project. The mechanism encourages risk sharing: the handling bank takes on the risk of lending to the partner bank, which takes on the risk of lending to the renewable projects.

Subsidy fund management: The handling bank manages and disburses the subsidy fund in line with government's subsidy policy. The technical appraisal agency is responsible for appraising the subsidy applications from qualified renewable energy technology installers.

Investment management: CREF funds that are not used for subsidy or credit financing are reinvested, allowing the handling bank to retain surpluses and thus ensuring the sustainability of the fund in the long run.

Source: Rai et al. (2013:15)

3.10 Climate Investment Funds: indicating future potential to fund energy access

Climate finance – for mitigation or adaptation – is a potential source of funding for energy access projects, if they involve renewable energy technologies. Kaur and Geoghehan (2013) observe that climate finance programmes – though based as yet more on pledges rather than actual investment – are already stimulating changes in national planning processes to meet post-2015 as well as climate change goals. A key challenge will be how the finance reaches the ground to deliver modern energy services.

The World Bank's Climate Investment Funds (CIFs) aim to bridge the financing and learning gap between now and the next international climate change agreement, and to stimulate private sector investment in renewable energy in developing countries.²⁸ There are two multi-donor CIFs – the Clean Technology Fund and the Strategic Climate Fund. The Scaling up Renewable Energy in Low-Income Countries Programme (SREP) is one of three programmes under the Strategic Climate Fund. SREP is being introduced in Ethiopia, Honduras, Kenya, the Maldives, Mali and Nepal. SREP

proposes a combination of finance, policy reform and capacity building to achieve its aims. A key advantage for investors is that the credit rating and due diligence procedures of MDBs reduce the risk of the investments (see Box 11).

By creating an enabling environment, SREP aims to leverage 20–50 per cent of the programme's finance from private sector investment. Investment plans for the Maldives, Nepal and Kenya have ambitious targets to leverage private sector investment alongside SREP finance. However, in 2013 an independent evaluation of the CIFs anticipated that just 10 per cent of co-financing was likely to come from the private sector (ICF, 2013). Engaging the private sector in novel, risky projects is not easy irrespective of substantial risk guarantees and donor finance, while local banks may find that they face liquidity challenges down the line that they did not expect at the start (Ayalew, 2013).

Question

How can large-scale multi-donor programmes such as SREP meet their own expectations of stimulating private sector co-investment? What are the barriers and how can they be overcome?

BOX 11: SREP AIMS TO CREATE AN ENABLING ENVIRONMENT TO LEVERAGE PRIVATE INVESTMENT

Through SREP, implementing MDBs and country governments propose a range of instruments across the target countries to stimulate private sector involvement in scaling up renewable energy technologies.

- **Credit enhancement through risk guarantees** for lenders investing in renewables (i.e. investors providing loans to SMEs).
- **Direct access to capital (debt or equity)** to commercial banks at low interest and longer tenures to incentivise lending to local renewable companies.
- **Reform of national policy instruments**, for example the introduction of feed-in tariffs (FITs), relaxation of import duties on renewable products, and independent power purchase (IPP) agreements structured around cost recovery tariff arrangements.
- **Support for a portfolio of demonstration projects and new business models** in technologies such as solar PV and small-scale hydro, to attract private investment by proving commercial viability.
- **Capacity building** and building-up the experience of private enterprise, developers and financial institutions involved in funding renewable energy technologies (RETs).

Sources: Rai et al. (2014); Rai (2013b)

²⁸ The CIFs comprise two distinct funds: the Clean Technology Fund and the Strategic Climate Fund www.climateinvestmentfunds.org/cif

Conclusions and recommendations

4

This paper has highlighted selected public and private sector innovations in attracting private finance to pro-poor energy access. Below we summarise our conclusions and recommendations relating to the two key questions that we formulated during the course of the study:

- What are the public and private sectors currently doing to incentivise private investment in pro-poor energy access?
- How can policymakers, investors and practitioners improve their understanding of optimal public and private roles in financing energy access for the poor?

4.1 Incentivising private investment

Our research has identified three broad areas where the public and private sectors are innovating to attract more private finance into low-income energy markets, and/or where more needs to be done: de-risking markets; accelerating innovation; and demonstrating and validating business models.

4.1.1. De-risking markets

A key aim with most of the models we have highlighted is reducing risk or the perception of risk for investors – even impact investors are looking for **security** of investment. Two interlinked risk areas are: the ability of loan recipients to repay their loans; and the ability of end users to pay for products and services. Village Infrastructure's model seeks to reduce risk for angel investors by creating a payment schedule for end users that is comparable in cost and flexibility to users' previous practice of paying for kerosene. The end-user fees go to the entrepreneur to pay off his microfinance loan (financed by angel investors). The emerging pay-as-you-go (PAYG) models, based on mobile phone payments and scratchcards, also ensure regular end-user payments, while the flexibility and low levels of payment enhance affordability for low-income customers.

A key risk-mitigation strategy, employed by angel investors, crowdfunding platforms and innovation hubs, is to get to know and build relations with the loan recipients, implementing partners and/or end users. This obviously takes time and is not something that mainstream investors have the time to do. Professional networks of impact investors, such as the GIIN and Toniic, provide the opportunity to share due diligence, monitoring and lesson learning. Ashden and Christian Aid (2014) warn against excessive due diligence requirements for small enterprises.

With the Zambian ESCOs project, donors and the Zambian government took on the initial risk of

purchasing the SHS, then transferred this risk to the ESCOs to redeem over a longer time scale. The Scaling Up Renewable Energy Programme (SREP) – a programme of the Strategic Climate Fund that is still in the development stages – seeks to establish a supportive enabling environment, with risk guarantees, access to credit, and introduction of policies such as feed-in tariffs. The credit rating and due diligence procedures of the MDBs involved are also expected to reduce investment risk.

Financial intermediary institutions, such as the Central Renewable Energy Fund of Nepal (CREF) seek to attract private investment through targeted subsidies that are phased out and replaced by credit facilities. This enables governments and donors to mitigate investment risks, and avoid dependency on public sector support. National development banks play a key financial intermediary role for multilateral agencies such as the IFC in strongly government-controlled markets.

A particularly effective PPP is IDCOL in Bangladesh, which reduces risk by offering soft loans and grants to enterprises and end users, and involving a combination of public, private and NGO players. The initiative has also proven to be responsive to concerns about reaching poorer end users, and revised its approach to reduce upfront costs, lower interest rates and extend payback periods.

4.1.2. Accelerating innovation

Accelerating innovation often means channelling finance to those enterprises that would not otherwise gain access to sufficient funds to grow their ideas and expand their business. It also means building capacities among those businesses to receive and use the finance effectively. Business innovation hubs, such as S3IDF, Embark and Ennovent provide a combination of capacity building and access to finance. Their aim is to nurture and grow enterprises so that they are eventually able to attract finance from angel investors and mainstream investors. Donor finance often plays a key role in supporting the capacity-building services of such hubs.

Crowdfunding also attracts private finance (from 'the crowd') to innovative projects that could not attract finance in another way. The platforms provide considerable visibility for these projects while also shouldering risk. Like innovation hubs, crowdfunding platforms such as SunFunder work with their implementing partners to build scale and capacity to enable them to attract more mainstream finance.

Donor finance is critical for models such as Village Infrastructure to support new business model development and scaling up. Ultimately, such models aim to be self-sufficient and no longer dependent on donor funds, but in the shorter term the combination of public and private finance is essential. The developers

of PAYG technologies have benefitted from enterprise development grants from USAid, the Africa Enterprise Challenge Fund and others, which were essential to develop their technologies and business models. Now they are expanding their activities with a combination of market-based activities, and partnerships with social enterprises such as SunnyMoney, to build and expand markets.

4.1.3. Demonstrating and validating business models

Investors and practitioners complain of too little knowledge sharing, be that due to competition within public and private financing models, reluctance to be open about failure, or simply a lack of funds or time.

Observers have noted the need for support for systematic independent third-party analysis of business models and their effectiveness, helping donors and investors to understand enterprise development in low-income markets, assess risks and understand the opportunities of investing in and supporting these models. The innovation hub S3IDF often needs to educate investors on the viability of the enterprises they support.

SREP includes support for a portfolio of demonstration projects and new business models in technologies such as solar PV and small-scale hydro, to attract private investments (by proving their commercial viability). The Ashden Awards are one of several awards programmes that help to demonstrate and validate the business models of energy access enterprises. Ashden provides a support structure for Ashden Award alumni, enabling them to meet and learn from one another, while case studies are available online for shared learning.

Agreeing on standardised indicators of impact is a key step in ensuring an effective framework for analysis – though of course these would need to be supplemented by context-specific indicators. Impact investment networks such as GIIN can work with the public sector on such indicators. The World Bank's Global Tracking Framework is also a valuable indicator-development initiative (World Bank, 2014b). As private sector involvement in low-income energy markets increases, it is worth noting that donors tend to be better at monitoring and recording experience than the private sector (Rolffs *et al.*, 2014), though investors also make heavy demands on their loan recipients for data and due diligence (Ashden and Christian Aid, 2014). There is a real need for independent research and for sharing experience, not only via research papers that take time to prepare and publish, but also in more immediate formats such as blogs.

4.2 Understanding optimal public and private roles

Government, donors, investors and businesses need to develop a more sophisticated and nuanced understanding of who can play what kind of role in a particular context, and use this as the basis for collaborative planning. It is important to know where private sector for-profit businesses can make the most impact on meeting energy access needs for different population segments (low-income, subsistence or extreme poverty). Public-private partnerships and social enterprises can often combine public and private finance and values to serve low-income markets. But there may still be significant populations who cannot be reached by market-based interventions. These require a different approach – perhaps based on social protection programmes (MRFCJ, 2013), community funds (Smith *et al.*, 2014), or disaster relief programmes (Boiling Point, 2011).

A framework for targeting government and donor efforts at the 'base of the pyramid' might include:

- a non-profit approach to serve the extreme poor,
- a cost-recovery approach for the subsistence market segment, and
- a commercial approach targeting the upper low-income market.

Following Kasturi Rangan and others (2011), we suggest that much more work be carried out at the local level in low-income countries to understand the different segments of low-income energy access markets, and to develop strategies to target public and private finance and support to those segments where they can be most effective (see Table 2).

Table 2: Market segmentation and energy access – public and private roles

MARKET SEGMENT	PUBLIC/PRIVATE ROLES IN ENERGY ACCESS
Low income US\$3–5/day	<p>Strategy: Commercial or cost-recovery approach</p> <p>End users may use mobile phones and TVs, and want household electricity connections. They may have some experience of credit, so could use credit-based payment schemes, which might be government supported. Local women’s groups may set up savings schemes. They may also live close to populations on higher incomes, so could benefit from initiatives targeted at those populations, which subsequently open to them when costs are reduced as the market is established. Employment opportunities may increase if energy access initiatives target productive uses, e.g. if local enterprises and farms expand and take on more workers.</p> <p>Energy enterprises will be looking for subsidies, grants and capacity building in the early stages of development, but as they mature they could benefit from the gradual replacement of subsidies and grants e.g. with low-interest capital or risk guarantees. Enterprises might focus on sales of small-scale solar products and efficient stoves, and perhaps SHS to the wealthier bracket of this segment.</p>
Subsistence US\$1–3/day	<p>Strategy: Cost-recovery approach</p> <p>End users use simple consumer items and public services. They want better job prospects, health services and education. They have no access to bank accounts or formal credit, but may use government-supported soft-credit programmes for stoves or solar lanterns. Labour opportunities may open up e.g. on nearby farms due to increases in productive uses of energy. PPPs promoting efficient cooking technology might save women time and improve family health. Community-level programmes might increase health and education e.g. solar lighting for schools or solar water pumps, though may require government-subsidised payment schemes.</p> <p>Energy enterprises are likely to be social enterprises seeking to recover their costs while delivering a social benefit. They may plan to grow as markets evolve. They will benefit from subsidies, grants, soft loans and capacity building.</p>
Extreme poverty Less than US\$1/ day – the ‘bottom billion’	<p>Strategy: Non-profit approach</p> <p>End users: Precarious daily existence precludes participation in markets as consumers or producers. The ‘bottom billion’ of people living in extreme poverty are unlikely to benefit from private sector energy access initiatives or public–private partnerships, and should be the main focus of government social protection programmes and international aid programmes (e.g. support for community funds or by incorporating energy access into disaster relief).</p>

A key conclusion of this paper is that optimal public and private roles are not always clear cut, and both public and private sector players need to engage and collaborate more to improve their understanding of how they can contribute effectively to pro-poor sustainable energy access. Our study identified the following specific research gaps:

1. Market analysis and segmentation:

Understanding where public or private sector, or combined interventions are more effective in delivering modern energy services to different population segments (low-income, subsistence or extreme poverty).

2. Delivery model analysis: To clarify the effectiveness and risks of different models for donors and investors. This would include analysis of the enabling environment and socio-cultural context as well as the business model itself, as suggested by Wilson *et al.* (2013), to determine what works where.

3. Developing and testing indicators of impact, aimed at assessing both investment risks and the pro-poor development impact of energy access interventions – i.e. how to measure what works. There is a need to make sense of various different indicator-setting and impact-measurement initiatives, with a view to assisting independent validation of business models.

4. Productive uses: Understanding whether and how a focus on energy for productive uses for poorer communities might reduce poverty and increase the viability of an energy delivery model in the eyes of investors.

5. Identifying regulatory barriers to new finance innovations, such as crowdfunding and pay-as-you-go technologies in developing countries; conducting systematic research of these barriers; and working with governments to reform the regulatory systems.

6. Exploring the potential of the diaspora and local populations to finance energy access: This includes: the potential to target remittances in investment initiatives; access to education and transfer of ideas; direct engagement with local communities; and demonstrating new technologies.

7. Understanding alternative public sector options for reaching the poorest: These include social protection programmes, disaster relief programmes, and support for grassroots initiatives such as community savings funds.

Five questions to stimulate further thought

1. *Are expectations of the private sector to deliver energy for development too ambitious, in terms of volume of expected investment?*
2. *Is there a limit to what the private sector can do to deliver development goals, especially in reducing poverty? Should there be more focus on productive uses?*
3. *What should governments and donors be doing to support private enterprise and attract private finance, while also ensuring that the poorest still have a safety net and the opportunity to improve their access to modern energy services?*
4. *What kinds of forum will be most appropriate for building dialogue between the public and private sectors at the international, national and local levels?*
5. *What role can civil society organisations play in ensuring that the process of attracting and channelling private finance towards energy access is inclusive and equitable?*

This paper contributes to an ongoing dialogue between governments, donors, researchers, end users and practitioners on the topic of financing energy access. We are keen to work with public and private sector entities to build understanding, and to explore these research gaps and build greater coherence and collaboration within the research community working on these issues.

References

- Accenture/UN Global Compact (2012) *Sustainable Energy for All: The business opportunity*. See www.accenture.com/SiteCollectionDocuments/PDF/Accenture-Sustainable-Energy-for-All-The-Business-Opportunity.pdf#zoom=50
- Africa Growth Institute (2014) 'PIC shifts emphasis to "developmental" portfolio.' See www.africagrowth.com/news_article242.htm (accessed 15 July 2014).
- Amin, A., Dimsdale, T. and Jaramillo, M. (2014) *Designing Smart Green Finance Incentive Schemes: The role of the public sector and development banks*. E3G, London. See www.e3g.org/news/media-room/designing-smart-green-finance-incentive-schemes2
- Ashden (2014a) 'Off Grid Electric: Mobile money powers solar expansion in rural East Africa.' Ashden website. See www.ashden.org/winners/OffGrid14 (accessed 16 July 2014).
- Ashden (2014b) *Case Study Summary: Off Grid Electric, Tanzania*. Ashden, London. See www.ashden.org/files/Off%20Grid%20front%20page%20finalist.pdf
- Ashden (2014c) 'Abundance Generation: Crowdfunding powers a sustainable energy revolution.' Ashden website. See www.ashden.org/winners/Abundance14 (accessed 16 July 2014).
- Ashden and Christian Aid (2014) *Lessons on Supporting Energy Access Enterprises*. See www.christianaid.org.uk/images/Ashden-Christian-Aid-Energy-Access-Enterprises-Report.pdf
- Ashoka and Hystra 2009) *Access to Energy for the Base of the Pyramid*. Ashoka and Hystra. See www.ashoka.org/sites/ashoka/files/Ashoka-HYSTRA_Access_to_%20Energy_for_the_BOP.pdf
- Ayalew, M.M. (2013) 'Ethiopia must rethink finance to achieve 2025 vision.' IIED blog, 1 October 2013. IIED, London. See www.iied.org/ethiopia-must-rethink-finance-achieve-2025-vision (accessed 15 July 2014).
- Azuri (2014) 'Affordable solar power is now only an SMS away.' Azuri website. See www.azuri-technologies.com/indigo/how-it-works (accessed 16 July 2014).
- Banda, T. and Bass, S. 2014) *Inclusive Green Growth in Zambia: Scoping the needs and potentials*. IIED, London. See <http://pubs.iied.org/16558IIED>
- Bank, D. (2012) 'E+Co avoids liquidation, barely, and emerges persistent.' *Huffington Post*, 3 October 2012. See www.huffingtonpost.com/david-bank/eco-avoids-liquidation-ba_b_1932503.html (accessed 16 July 2014).
- Bazilian, M. and Pielke, R. (2013) 'Making Energy Access Meaningful.' *Issues in Science and Technology*, Summer 2013. See http://sciencepolicy.colorado.edu/admin/publication_files/2013.22.pdf
- Bellanca, R. (2012a) 'Interview with Seena Rejal, Eight19 Ltd on Role of Business in the Sustainable Energy for All UN Initiative.' Household Energy Network (HEDON) website, April 2012. See www.hedon.info/IIED+SE4All+Interview_Eight19+SRRejal?bl=y (accessed 15 July 2014).
- Bellanca, R. (2012b) 'Interview with Evan Haigler of Impact Carbon on Role of Business in the Sustainable Energy for All UN Initiative.' Household Energy Network (HEDON) website, April 2012. See www.hedon.info/IIED+SE4All+Interview_Impact+Carbon+EHaigler?bl=y (accessed 15 July 2014).
- Bellanca, R. (2012c) 'Interview with Andrew Barnett The Policy Practice on Role of Business in the Sustainable Energy for All UN Initiative.' Household Energy Network (HEDON) website, April 2012. See www.hedon.info/IIED+SE4All+Interview_ThePolicyPractice+ABarnet?bl=y (accessed 15 July 2014).
- Bellanca, R. (2012d) 'Interview with Christopher Aidun, E+Co on Role of Business in the Sustainable Energy for All UN Initiative.' Household Energy Network (HEDON) website, April 2012. See www.hedon.info/IIED+SE4All+Interview_EandCo+CAidun (accessed 16 July 2014).
- Bellanca, R. and Wilson, E. (2012) *Sustainable Energy for All and the Private Sector*. IIED issues briefing, London, UK. See <http://pubs.iied.org/G03383>
- Best, S. (2014) *Growing Power: Exploring energy needs in smallholder agriculture*. IIED: London. See <http://pubs.iied.org/16562IIED>
- Boiling Point (2014). 'Access to Finance: Subsidies, investments and carbon funding.' *Boiling Point* 62, HEDON, Chislehurst, UK. See www.hedon.info/View+issue&itemId=13034
- Boiling Point (2011) 'Energy in Conflict and Emergency Relief.' *Boiling Point* 59, HEDON, Chislehurst, UK. See www.hedon.info/View+issue&itemId=9064

- Brossman, M. (2013) 'Off-grid Rural Electrification and Fighting Poverty: A comparative impact assessment of solar home systems and small solar home systems in rural Bangladesh.' MA Human Geography International Research Project, University of Tübingen, Institute of Geography.
- Cheung, R., Delio, E., Lall, S., Bairiganjan, S., Fuente, D. and Singh, S. (2010) *Power to the People: Investing in clean energy for the base-of-the-pyramid in India*. World Resources Institute. See www.wri.org/publication/power-people
- Climate Parliament (2010) 'Renewables: Solar panels made affordable for the rural poor.' Climate Parliament website, 3 November 2010. See www.climateparl.net/cp/102 (accessed 16 July 2014).
- Danida (2014) 'Renewable energy.' Denmark in Nepal, Ministry of Foreign Affairs of Denmark website. See <http://nepal.um.dk/en/danida-en/programmes/rural-energy> (accessed 16 July 2014).
- Devex (2011) 'Electricity Access (Rural) Expansion Project Phase II in Ethiopia: Procurement of Photovoltaic System for 25,000 Rural Homes.' Devex website. See <http://tinyurl.com/wb-pv2-ethiopia> (accessed 16 July 2014).
- DfID (2012) *Access to Safe Water for the Bottom of Pyramid: Strategies for disseminating technology research benefits*. Technology Packaging Study, DfID, London. See <http://r4d.dfid.gov.uk/pdf/outputs/water/60930-TechnologyPackagingStudies.pdf>
- ECOFYS (2006) *The gold standard: Premium quality carbon credits. The gold standard: Project Design Document for Gold Standard Voluntary Offset projects*. See <http://climatecare.org/wordpress/wp-content/uploads/2013/07/090324-PDD-UGASTOVES-reg.pdf>
- Ellegard, A., Arvidson, A. and Nordström, M. (2004) Rural People Pay for Solar: Experiences from the Zambia PV-Esco project. A case study. Stockholm Environment Institute (SEI). See www.sciencedirect.com/science/article/pii/S0960148103003823
- ESMAP (2008) *Maximising the Productive Uses of Electricity to Increase the Impact of Rural Electrification Programs*. The World Bank, Washington DC. See <https://openknowledge.worldbank.org/handle/10986/17538>
- Fikreyesus, D., Kaur, N., Kallore, M.E. and Ayalew, L.T. (2013) *Public Policy Responses for a Climate Resilient Green Economy in Ethiopia*. IIED, London. See <http://pubs.iied.org/10066IIED>
- Friggins, S. (2013) 'Can investment crowdfunding deliver Sustainable Energy for All?' IIED blog, 20 October 2013. See www.iied.org/can-investment-crowdfunding-deliver-sustainable-energy-for-all
- HEDON (2010) 'Rural Energy Service Companies (ESCOs) Project – Solar Home Systems.' HEDON website. See www.hedon.info/RuralESCOSolarHomeSystemsZambia (accessed 16 July 2014).
- Hulme, D. and Mosley, P. (1996), *Finance Against Poverty*. London, Routledge.
- GIIN (2013) *Catalytic First-Loss Capital*. Issue Brief October 2013, Global Impact Investing Network (GIIN), London, UK. See www.thegiin.org/binary-data/RESOURCE/download_file/000/000/552-1.pdf
- GIZ (2013) *Connect the BOP: A guide to leveraging ICT for inclusive business*. GIZ. See www.giz.de/Wirtschaft/de/downloads/GIZ_Connect_the_BoP_Webversion.pdf
- Government of Nepal (2012) *National Rural and Renewable Energy Programme Nepal: Programme document*. See <http://nepal.um.dk/en/~media/Nepal/Documents/NRREP%20Programme%20Document-May%202012.pdf>
- Godfrey Wood, R. (2011) *Carbon Finance and Pro-Poor Co-Benefits: The Gold Standard and Climate, Community and Biodiversity Standards*. IIED, London. See <http://pubs.iied.org/15521IIED>
- Gunther, M. (2014) 'The base-of-the-pyramid : will selling to the poor pay off?' *The Guardian* website, 22 May 2014. See www.theguardian.com/sustainable-business/prahalad-base-bottom-pyramid-profit-poor?CMP=tw_t_gu (accessed 15 July 2014).
- Haque, N. (2012) 'IDCOL Renewable energy initiatives.' Presentation by Nazmul Haque, Director & Head of Investment, IDCOL in Climate Investment Funds (CIF) Pilot country meeting, Nairobi, Kenya, 2012.
- Haque, N. (2013) DCOL Solar Home System Program.' Presentation made at the Global Conference on Rural Energy Access: A Nexus Approach to Sustainable Development and Poverty Eradication, Addis Ababa, Ethiopia, 4–6 December 2013.
- ICF (2013) 'Independent Evaluation of the Climate Investment Funds: Interim CIF Evaluation.' Submitted to, Evaluation Oversight Committee for the Independent Evaluation of the Climate Investment Funds.
- IEA (2012) Key World Energy Statistics. International Energy Agency (IEA), Paris. See www.worldenergyoutlook.org/publications/weo-2012/#d.en.26099
- IFC and World Bank (2010) *Solar Lighting for the Base of the Pyramid: Overview of an emerging market*. Lighting Africa Initiative, IFC and World Bank. See <http://allafrica.com/view/resource/main/main/id/00020464.html>

- IISD (2014) 'Fossil-fuel subsidies.' International Institute for Sustainable Development's Global Subsidies Initiative (GSI) website. See www.iisd.org/gsi/fossil-fuel-subsidies (accessed 16 July 2014).
- Intelligent Energy Europe (2006) *Case study: Energy Service Companies (ESCOs) in Zambia*. See <http://deafira.net/Reports/Zambia%20Case%20Study%20Report.pdf>
- IRENA (2013) 'IOREC 2012 International Off-Grid Renewable Energy Conference: Key findings and recommendations.' International Renewable Energy Agency (IRENA). See www.irena.org/DocumentDownloads/Publications/IOREC_Key%20Findings%20and%20Recommendations.pdf
- Kandachar, P. and Halme, M. (eds) (2008) *Sustainability Challenges and Solutions at the Base of the Pyramid: Business, technology and the poor*. Greenleaf Publishing, Sheffield, UK.
- Isoun, M. (forthcoming) *Staying power: Can communities sustain solar-powered water projects in the Niger Delta?* IIED, London.
- Kaur, N., Rwirahira, J., Fikreyesus, D., Rai, N., and Fisher, S. (2014) *Financing a transition to climate-resilient green economies*. IIED Briefing Paper. IIED, London. See <http://pubs.iied.org/17228IIED>
- Kaur, N. and Geoghehan, T. (2013) *How climate finance can support sustainable development*. IIED Briefing Paper. See <http://pubs.iied.org/17169IIED>
- Kasturi Rangan, V., Chu, M. and Petkoski, D. (2011) 'Segmenting The Base of The Pyramid.' *Harvard Business Review*, June 2011. See www.aquaforall.nl/documents/aqua4all/downloads/harvard_business_review_-_segmenting_at_the_bop_and_gain.pdf
- Koh, H., Karamchandani, A. and Katz, R. (2012) *From Blueprint to Scale: The case for philanthropy in impact investing*. Monitor Group, Mumbai, India. See www.mim.monitor.com/blueprinttoscale.html
- Kürschner, E., Diehl, E., Herman-Fried, J., Hornikel, C., Rosenbusch, J. and Sagmeister, E. (2009) *Impacts of Basic Rural Energy Services in Bangladesh: An assessment of solar home system and improved cook stove interventions*. SLE Publication Series S238. Humbolt-Universität Zu Berlin, Berlin.
- Lemaire, X. (2009) 'Fee-for-Service Companies for Rural Electrification with Photovoltaic Systems: the Case of Zambia.' *Energy for Sustainable Development* **13**, 18–23.
- Levinson, R. (2012) '5 reasons why the off grid solar revolution will be driven by cell phones.' *GIGAOM* website, 7 December 2012. See <http://gigaom.com/2012/12/07/5-reasons-why-the-off-grid-solar-revolution-will-be-driven-by-cell-phones> (accessed 15 July 2014).
- Levinson, R. (2013) Personal communication with Ryan Levinson, founder and CEO of SunFunder, 10 Jun 2013.
- Martin, M. (2013) *Making Impact Investible*. Impact Economy Working Papers 4, Geneva. See www.impacteconomy.com/download/Impact%20Economy%20-%202013%20-%20Making%20Impact%20Investible.pdf
- Mfuno, O. and Boon, E.B.K. (2008). 'Promoting Renewable Energy Technologies for Rural Development in Africa: Experiences of Zambia.' *Journal of Human Ecology* **24**, 175–189. See: <http://tinyurl.com/mfuno-boon-2008>
- MRFCJ (2013) *Meeting the Energy Needs of the Poorest: A role for social protection*. Second Edition, Mary Robinson Foundation Climate Justice (MRFCJ). See www.mrfcj.org/pdf/2012_05_02_Meeting_the_energy_needs_of_the_poorest_MRFCJ_Position_Paper.pdf
- Nelson, D. and Shrimali, G. (2014) *Finance Mechanisms for Lowering the Cost of Renewable Energy in Rapidly Developing Countries*. Climate Policy Initiative, San Francisco. See: <http://climatepolicyinitiative.org/publication/finance-mechanisms-for-lowering-the-cost-of-renewable-energy-in-rapidly-developing-countries>
- OECD/IEA (2011) *Energy For All: Financing access for the poor*. World Energy Outlook 2011.
- Practical Action (2013) *Beyond the Millennium Development Goals: It's not just what, but how*. Practical Action. See <http://practicalaction.org/beyond-the-millennium-development-goals>
- Pachauri, S., van Ruijven, B.J., Nagai, Y., Riahi, K., van Vuuren, D.P., Brew-Hammond, A. and Nakicenovic, N. (2013) 'Pathways to achieve universal household access to modern energy by 2030.' *Environmental Research Letters* **8**. See <http://iopscience.iop.org/1748-9326/8/2/024015/article>
- Palandjian, T.P. (2010) *Investing for Impact: Case studies across asset classes*. The Parthenon Group and Bridges Ventures, London, UK. See www.parthenon.com/ThoughtLeadership/InvestingforImpactCaseStudiesAcrossAssetClasses
- Prahalad, C.K. (2006) *The Fortune at the Bottom of the Pyramid*. Pearson Prentice Hall. See http://books.google.co.uk/books/about/The_Fortune_at_the_Bottom_of_the_Pyramid.html?id=R5ePu1awfIoC
- Prahalad, C.K. and Hart, S. (2002) *The Fortune at the Bottom of the Pyramid*. *Strategy + Business* **26**. See www.strategy-business.com/article/11518?pg=all (accessed 15 July 2014).

- Pueyo, A. (2013) Real time monitoring technologies for pro-poor access to electricity, Theme 7, Evidence Report 12, Brighton: Institute of Development Studies
- Rai, N. (2013a) Climate Investment Funds: Understanding the PPCR in Bangladesh and Nepal. IIED, London. See <http://pubs.iied.org/17151IIED>
- Rai, N. (2013b) 'Scaling up renewable technologies: incremental or transformational change.' IIED blog, 8 July 2013. See www.iied.org/scaling-renewable-technologies-incremental-or-transformational-change (accessed 15 July 2014).
- Rai, N., Kaur, N., Fikreyesus, D. and Kallore, M.E. (2013) *Climate Investment Funds: Scaling up Renewable Energy Programme (SREP) in Ethiopia – a status review*. IIED, London. See <http://pubs.iied.org/10053IIED>
- Rai, N., Greene, S., Neupane, S., Bhusal, R., Tesfaye, L. and Kallore, M. (2014) *What can the Green Climate Fund learn from SREP's role in engaging the private sector?* IIED, London. See <http://pubs.iied.org/17212IIED>
- Rogerson, A., Green, M. and Rabinowitz, G. (2013) *Mixing Business and Social: What is a social enterprise and how can we recognise one?* ODI Working Paper December 2013, ODI, UK. See www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/8755.pdf
- Rolffs, P., Byrne, R. And Ockwell, D. (2014) Financing Sustainable Energy for All: Pay-as-you-go vs. Traditional solar finance approaches in Kenya, STEPS Working Paper 59, Brighton: STEPS Centre (attached)
- Saltuk, Y., Idrissi, E.L., Bouri, A., Mudaliar, A. and Schiff, H. (2014) *Spotlight on the Market: The impact investor survey*. JP Morgan and the Global Impact Investing Network (GIIN), London, UK. See www.thegiin.org/binary-data/2014MarketSpotlight.PDF
- Saltuk, Y., Bouri, A., Mudaliar, A. and Pease, M. (2013) *Perspectives on Progress: The Impact Investor Survey*. J.P. Morgan and the Global Impact Investing Network (GIIN), London, UK. See www.jpmorganchase.com/corporate/socialfinance/document/130107_Perspectives_on_Progress.pdf
- Scott, A. and Seth, P. (2012) *Infrastructure Services Post-2015*. ODI, London. See www.odi.org.uk/publications/6891-infrastructure-services-post-2015
- Shaad, B. and E. Wilson (2009) *Access to Sustainable Energy: What role for international oil and gas companies? Focus on Nigeria*. IIED, London. See <http://pubs.iied.org/16022IIED>
- Simanis, E. (2012) 'Reality check at the bottom of pyramid.' *Harvard Business Review*.
- Simanis, E. and Hart, S. (2008) *The Base of the Pyramid Protocol: Toward next generation BoP strategy* (2nd edition). Cornell University, NY. See www.stuartlhart.com/sites/stuartlhart.com/files/BoPProtocol2ndEdition2008_0.pdf
- Sireau, N. (ed.) (2011) *Microfranchising: How social entrepreneurs are building a new road to development*. Greenleaf Publishing, UK.
- Smith, B., Brown, D. and Dodman, D. (2014) *Reconfiguring Urban Adaptation Finance*. IIED, London. See <http://pubs.iied.org/10651IIED>
- SolarAid (2014a) 'Kenya celebrates VAT exemption for solar.' 23 May 2014. See www.solar-aid.org/kenya-celebrates-vat-exemption-for-solar (accessed 15 July 2014).
- SolarAid (2014b) 'Is pay-as-you-go solar set to transform energy access?' 18 June 2014. See www.solar-aid.org/is-pay-as-you-go-solar-set-to-transform-energy-access (accessed 15 July 2014).
- Sovacool, B. (2013) 'Expanding renewable energy access with pro-poor public private partnerships in the developing world.' *Energy Strategy Reviews* 03: 2013 1(3), 181–192. See <http://tinyurl.com/sovacool-b-2013>
- Symons, L. (2013) Co-Founder Village Infrastructure, personal communication, 18 November 2013.
- SunFunder (2013a) 'We and SunnyMoney celebrate first project being 100% repaid.' *SunFunder* website, 1 November 2013. See <http://blog.sunfunder.com/post/65719925569/we-and-sunnymoney-celebrate-first-project-being-100> (accessed 16 July 2014).
- Venturebeat (2014) 'Off Grid Electric gets \$7M to "light Africa in a decade" (exclusive).' *Venturebeat.com*, 21 March 2014. See <http://venturebeat.com/2014/03/21/off-grid-electric-gets-7m-to-light-africa-in-a-decade-exclusive> (accessed 16 July 2014).
- Tait, L., Wlokas, H.L. and Garside, B. (2013) *Making communities count: maximising local benefit potential in South Africa's Renewable Energy Independent Power Producer Procurement Programme (RE IPPPP)*. IIED, London. See <http://pubs.iied.org/16043IIED>
- The Economist (2012) 'Lighting the Way - Energy Technology: Cheaper and better solar-powered electric lights promise to do away with kerosene-fuelled lanterns.' *The Economist Technology Quarterly* Q3, 1 September 2012. See www.economist.com/node/21560983 (accessed 22 July 2014).
- Von Ritter, K. and Black-Layne, D. (2013) *Crowdfunding for climate change: a new source of finance for climate action at the local level?* The European Capacity Building Initiative, Oxford. See www.eurocapacity.org/downloads/CF4CC_2.pdf

- Waissbein, O., Glemarec, Y., Bayraktar, H. and Schmidt, T.S. (2013) *Derisking Renewable Energy Investment: A framework to support policymakers in selecting public instruments to promote renewable energy investment in developing countries*. United Nations Development Programme (UNDP), New York, USA. See <http://tinyurl.com/undp-deriskingrenewableinvest>
- WBCSD (2012) *Business Solutions to Enable Energy Access For All*. World Business Council on Sustainable Development (WBCSD), Geneva. www.wbcsd.org/Pages/EDocument/EDocumentDetails.aspx?ID=14165&NoSearchContextKey=true
- Watson, J., Byrne, R., Morgan Jones, M., Tsang, F., Opazo, J., Fry, C. and Castle-Clarke, S. (2012) 'What are the major barriers to increased use of modern energy services among the world's poorest people and are interventions to overcome these effective?' *CEE Review* 11 2004, Collaboration for Environmental Evidence. See www.environmentalevidence.org/SR11004.html
- Webster, C. (2014) 'Abundance Generation wins "Gold" Ashden Award.' *The Abundance Blog*, 22 May 2014. See <http://blog.abundancegeneration.com/2014/05/abundance-generation-wins-ashden-award> (accessed 16 July 2014).
- Whitley, S. (2013) *Five early lessons from donors' use of climate finance to mobilise the private sector*. ODI. See www.odi.org.uk/opinion/7268-climate-finance-private-sector-donor-lessons
- Wilson, E. (2013) 'How crowdfunding offers the fast route to decentralised energy.' IIED blog, 7 August 2013. See www.iied.org/how-crowdfunding-offers-fast-route-decentralised-energy (accessed 15 July 2014).
- Wilson, E., Godfrey Wood, R. and Garside, B. (2013) *Sustainable energy for all? Linking poor communities to modern energy services*, IIED: London. See <http://pubs.iied.org/16038IIED>
- Wilson, E. and Symons, L. (2013) *Stimulating Quality Investment in Sustainable Energy For All*. IIED policy brief. See <http://pubs.iied.org/17156IIED>
- Wilson, E., Zarsky, L., Shaad, B. and Bundock, B. (2008) 'Lights On or Trade Off? Can base-of-the-pyramid approaches deliver solutions to energy poverty?' In (eds) Kandachar, P. and Halme, M. *Sustainability Challenges and Solutions at the Base of the Pyramid: Business, Technology and the Poor*. Greenleaf Publishing, Sheffield, UK.
- World Bank (2014a) 'Poverty and equity.' *World Bank* website, <http://povertydata.worldbank.org/poverty/region/SSA> (accessed 16 July 2014).
- World Bank (2014b) 'SE4ALL Global Tracking Framework.' *World Bank* website, www.worldbank.org/en/topic/energy/publication/Global-Tracking-Framework-Report (accessed 16 July 2014).

Acronyms and abbreviations

AECF	Africa Enterprise Challenge Fund
ADB	Asian Development Bank
BoP	Base of the pyramid (or bottom of the pyramid) (see also glossary)
CDM	Clean Development Mechanism
CERs	Certified Emission Reductions
CFLC	Catalytic first-loss capital
CIFs	World Bank's Climate Investment Funds
CREF	Central Renewable Energy Fund of Nepal
CSO	Civil society organisation
DBE	Development Bank of Ethiopia
EU ETS	European Union's Emissions Trading Scheme
GEF	Global Environment Facility
GIIN	Global Impact Investing Network
GIZ	German Society for International Cooperation (<i>Deutsche Gesellschaft für Internationale Zusammenarbeit</i>)
IEA	International Energy Agency
IDCOL	Infrastructure Development Company Limited
IFC	International Finance Corporation
IRIS	Impact Reporting and Investment Standards initiative
MDB	Multilateral development bank
MIGA	Multilateral Investment Guarantee Agency
MNCs	Multinational corporations
NGO	Non-governmental organisation
ODA	Official development assistance
PAYG	Pay as you go
PPP	Public-private partnership
RETs	Renewable energy technologies
RTM	Real-time monitoring
S3IDF	Small-Scale Sustainable Infrastructure Development Fund
SE4ALL	UN Sustainable Energy for All initiative
SHS	Solar home systems
SMEs	Small and medium enterprises
SREP	Scaling Up Renewable Energy in Low-Income Countries Programme
VERs	Verified Emission Reductions

Glossary

Angel investors

Angel investors (also known as business angels) are wealthy individuals who provide capital for early-stage enterprises in exchange for debt or ownership equity.

Base of the pyramid

The term 'base of the pyramid' (BoP) refers to the four billion people living on low incomes at the 'base of the world economic pyramid'. Prahalad and Hart (2002) first suggested that multinational corporations could make large profits by selling affordable products and services to people at the 'bottom of the pyramid'. Since then the paradigm has evolved and is often referred to in relation to pro-poor business activity, with people living at the BoP increasingly seen not only as customers but also as business partners.

Clean Development Mechanism (CDM)

The CDM, as defined in Article 12 of the Kyoto Protocol, allows a country with an emission-reduction or limitation commitment under the Protocol (an Annex B Party) to carry out emission-reduction projects in developing countries. CDM projects generate certified emission reduction (CER) credits, equivalent to one tonne of CO₂ per credit, which can be sold and can be counted towards meeting Kyoto targets.

Climate Investment Funds (CIFs)

The World Bank's CIFs aim to bridge the financing and learning gap between now and the next international climate change agreement, and to stimulate private sector investment in renewable energy in developing countries. The CIFs comprise two funds: the Clean Technology Fund and the Strategic Climate Fund (see SCF below). See www.climateinvestmentfunds.org/cif

Corporate social investment

Corporate social investment is money spent by companies on development projects, both nationally and for the benefit of host communities in places where they are operating. It may be in the form of grants to civil society groups, capacity building for local workers, enterprise support or infrastructure development. Social investment might be mandatory (i.e. required in a contract with the host government) or voluntary (i.e. allocated according to company policy and international good practice).

Crowdfunding

Crowdfunding involves selling small amounts of debt or equity to large numbers of investors ('the crowd'), via

crowdfunding platforms, which are generally Internet-based, and allow potential investors to select a project to support. Debt crowdfunding may or may not generate interest on the loans.

Energy delivery models

In general the term 'energy delivery model' relates to the combination of technology, finance and management required to supply energy services to end users. This includes sourcing energy resources, conversion and processing, distribution (of products or power) and relations with end users. Energy delivery models are generally analysed together with the enabling environment (e.g. regulations) and socio-cultural context (e.g. cultural norms) within which they operate (Wilson *et al.*, 2012).

Feed-in tariffs

A feed-in tariff (FIT) is a policy mechanism to accelerate investment in electricity from renewable sources by offering producers long-term contracts with a guaranteed purchase price that reflects the cost of power generation. The tariff may be reduced over time, so as to encourage efficiencies.

Global Tracking Framework

The Global Tracking Framework, led by the World Bank and the International Energy Agency (IEA), charts the course towards achieving the goals of the UN Sustainable Energy for All initiative (see below). The first Global Tracking Report (2013) describes the energy status of countries with respect to access, efficiency, renewable energy and energy consumption, with recommendations for meeting the targets (World Bank, 2014b).

Gold Standard

Established in 2004, the Gold Standard is a certification standard for voluntary and CDM markets, considered to be the benchmark for quality and rigour. Gold Standard certified projects have reportedly taken 20 million tonnes of carbon out of the atmosphere, and helped to reduce illness from indoor air pollution and dirty water, save water and conserve biodiversity. See www.goldstandard.org

Green Climate Fund

The Green Climate Fund (GCF) is part of the architecture of the UN Framework Convention on Climate Change. It was set up in 2011 to transfer money from developed countries to assist developing countries

with climate change adaptation and mitigation. The GCF aims to support projects, programmes, policies and other activities. Despite progress in negotiations, there are still no firm pledges from developed countries to donate to the fund. See <http://climatemarkets.org/glossary/green-climate-fund.html>

Innovation hubs

'Innovation hubs' is one term used for organisations that provide support to small-scale enterprises, including market research, business planning, early-stage finance (debt or equity), capacity building and investor introductions, to enable businesses to attract more mainstream finance. Innovation hubs may also be called *inter alia* business incubators, innovation accelerators or financial intermediaries.

Impact investing

Impact investing is a type of socially responsible investing typically made into enterprises or funds to generate a measurable social and/or environmental impact alongside a financial return, which may range from below-market rates to above-market rates. Investments may be private equity, venture capital or debt and can be made in both emerging and developed markets. See www.thegiin.org

Microfinance

Microfinance is a source of loans and other financial services for entrepreneurs and small businesses lacking access to banking and related services. The two main microfinance mechanisms are: relationship-based banking for individual entrepreneurs and small businesses; and group-based models, where several entrepreneurs come together to apply for loans and other services as a group.

Productive uses

Experts argue that energy access initiatives need to support 'productive uses of energy' in order to improve livelihoods. The World Bank defines 'productive uses' of electricity as those that 'support any activity that will generate revenue to the user' (ESMAP, 2008: 14). Best (2014) defines 'productive uses' of energy as those that directly increase incomes or add value to goods and services, while acknowledging that energy for other uses, such as health services, is also critical for livelihoods.

Pro-poor energy access

This term refers to provision of energy products and services (e.g. electricity, clean cooking technology, heating) to people living in poverty. In line with the definition of universal energy access (see below), the definition presupposes access to **modern** energy services.

Public-private partnerships

Following Sovacool (2012) we use the term 'public-private partnership' (PPP) in this report to refer to a broad assortment of relationships among public and private organisations to deliver pro-poor energy access. The term describes partnerships between national governments and other public sector entities (such as national governments, city councils and municipalities) with actors outside the public sphere.

Scaling-Up Renewable Energy in Low Income Countries Programme (SREP)

SREP sits under the Strategic Climate Fund (see below), which is one of the Climate Investment Funds (see above). SREP aims to demonstrate the social, economic and environmental viability of low-carbon energy pathways, create new economic opportunities and increase energy access through the production and use of renewable energy. See: www.climateinvestmentfunds.org/cif/node/67

Strategic Climate Fund (SCF)

The SCF is one of two Climate Investment Funds (see above). SCF supports three targeted programmes: the Forest Investment Programme to support developing countries' efforts to reduce emissions from deforestation and forest degradation; the Pilot Programme for Climate Resilience (PPCR) to demonstrate ways to integrate climate risk and resilience into core development planning; and the Scaling-Up Renewable Energy in Low Income Countries Programme (SREP) (see above).

Sustainable Energy for All initiative (SE4ALL)

The UN's Sustainable Energy for All Initiative (SE4ALL) was launched in 2012, and the decade of SE4ALL began in 2014. SE4ALL has three targets for 2030: to ensure universal access to modern energy services; to double the rate of improvement in energy efficiency; and to double the share of renewable energy in the global energy mix. See www.se4all.org

Universal energy access

Everyone has access to some form of energy, be it an open fire or the sun's rays, food or human labour. Universal energy access broadly means delivering access to **modern energy services** to the global population. These are often defined in contrast to 'traditional' energy services, such as burning wood in open fires for cooking, or using candles for lighting. Thus they may include clean cooking technologies and fuels, or good-quality and safe lighting for homes.

Increasingly the private sector is expected to finance access to modern energy services in developing countries. Yet governments and donors still have much to learn about working with business, while low-income markets are unfamiliar and risky for private investors. In this report we present some innovations and challenges in financing pro-poor energy access. We highlight the need to identify those population segments (low-income, subsistence or extreme poverty) that can be reached most effectively by public, private and combined finance models. Governments and donors should target support, incentives and policy reform to channel private investment to where it works best. This will allow them to target public finance more effectively at the poorest, who cannot be reached by market-based interventions.

IIED is a policy and action research organisation. We promote sustainable development to improve livelihoods and protect 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 the decision-making arenas that affect them – from village councils to international conventions.



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

Funded by:



This research was part-funded by UK aid from the UK Government, however the views expressed do not necessarily reflect the views of the UK Government.



Knowledge
Products