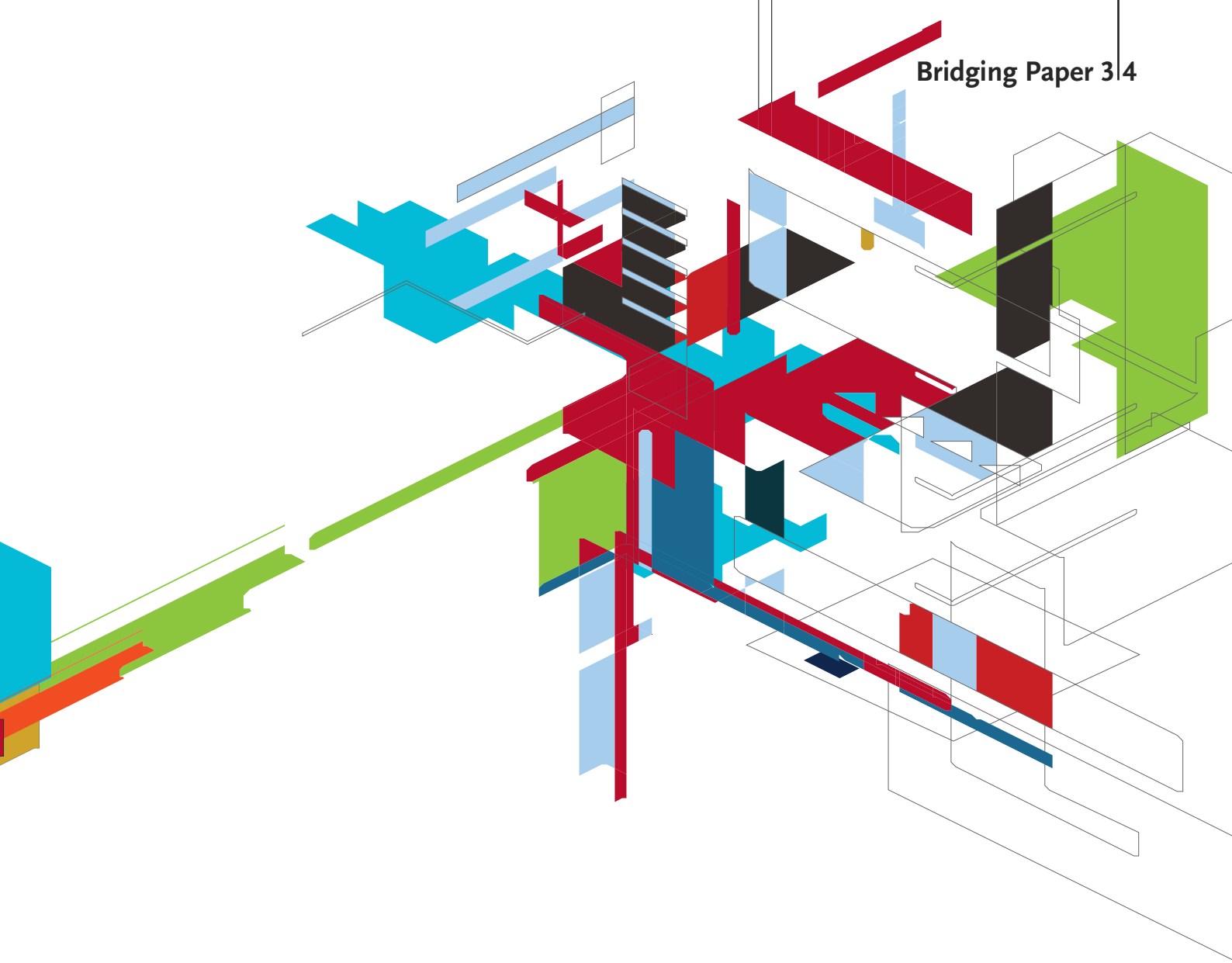

3 Approaches to Low Carbon Energy and Development

Bridging Concepts and Practice for Low Carbon Climate Resilient Development

Matthew Lockwood and Catherine Cameron

The IDS–DFID Learning Hub aims to improve knowledge and information flows between DFID practitioners and experts in the field of low carbon climate resilient development. It is a new approach that combines practitioner learning networks, knowledge management capacity and reflective learning processes with bespoke research and analysis. The Hub has four interconnected 'learning cycles' (*Approaches to planning for climate change; tackling poverty in a changing climate; low carbon energy and development; and difficult environments*). Each cycle hosts a learning event which are safe, supported spaces for DFID staff who work on climate change and development to share individual learning and skills; engage experts in dialogue; develop new ways of thinking and working together; identify where there are knowledge and learning gaps and contribute to the co-creation of a common knowledge base around 'low carbon climate resilient development'. All the learning cycles are linked through various inputs and outputs that create an ongoing flow of knowledge and will lead to the development of theories of change for Low Carbon Climate Resilient Development.

This is the third Bridging Paper from the Hub's third learning cycle; *low carbon energy and development*.

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Contents

Acronyms

ADB	Asian Development Bank
AECF	Africa Enterprise Challenge Fund
CCS	carbon capture and storage
CDC	UK Government Development Finance Institution
CIC	Climate Innovation Centre
COP	Conference of the Parties
CP3	Climate Public Private Partnership
DANIDA	Danish International Development Agency
DECC	Department of Energy and Climate Change
DRC	Democratic Republic of the Congo
EU ETS	European Union Emissions Trading Scheme
FCO	Foreign and Commonwealth Office
GACC	Global Alliance for Clean Cookstoves
GERES	Groupe Energies Renouvelables, Environnement et Solidarités
GoB	Government of Bangladesh
GVEP	Global Village Energy Partnership
GW	gigawatt
IFC	International Finance Corporation
KfW	Kreditanstalt für Wiederaufbau (German Development Bank)
LCD	Low carbon development
LED	Light Emitting Diode
LIC	Low-income country
MAC	Marginal abatement cost
MDB	Multilateral Development Bank
MDG	Millennium Development Goal
MDTF	multi-donor trust fund
MIC	Middle-income country
MIGA	Multilateral Investment Guarantee Agency
$MtCO_2e$	Metric Tonne Carbon Dioxide Equivalent
NGO	Non-governmental organisation
NORAD	Norwegian Agency for Development Cooperation
ONGC	Oil and Natural Gas Corporation
OPIC	Overseas Private Investment Corporation (US Government Development Finance Institution)
PAT	Perform, Achieve and Trade
PV	Photovoltaic
R&D	Research and Development
RBF	Results-based financing
REACT	Renewable Energy and Adaptation to Climate Technologies
SME	Small and medium-sized enterprises
SREP	Scaling up Renewable Energy Programme
SSA	sub-Saharan Africa
T&D	Transmission and Distribution
TWh	terawatt hour
UKCCU	UK Climate Change Unit
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

1 Introduction

The third cycle of the Learning Hub aimed to bring together theory and practice on low carbon development (LCD). LCD is increasingly on the development agenda, not only for fast growing emerging economies where there is some urgency about getting onto lower carbon development trajectories (Hepburn and Ward 2010), but also for the least developed countries (see for example, Bowen and Fankhauser 2011).

There are an increasing number of frameworks for low carbon development, low carbon growth and green growth being put forward (Pye *et al*. 2010; World Bank 2010; Crawford 2010). There has been a recent surge of interest in 'green growth', with statements and reports from the OECD (2009), the UN[1], and the UNEP (2011) as well as numerous specific national or regional initiatives (for example, in Denmark, New Zealand and South East Asia), an ongoing green growth project in the World Bank, and most importantly, individual country strategies that appear to have real ownership.[2]

However, despite the growth in analytical frameworks and strategy documents, low carbon development is still a relatively new area for donors and developing country governments. Resources for low carbon development programming or policy engagement are growing, and there is the potential for leveraging even larger amounts of private finance, but there is also a need to learn what works and what doesn't, in which contexts. Donors are typically trying to strike the right balance across three dimensions:

1. **First, a low carbon development agenda implies some kind of balance between two objectives: poverty reduction and carbon abatement. For the UK government in particular, both global poverty reduction and global carbon emissions reduction are cross-government goals, which should be jointly owned by all departments.**

2. **Second, a related challenge emphasised by participants in the Learning Hub event in Jakarta, is getting the balance right in programming in any particular country between attention to factors that are specific to mitigating carbon emissions, and attention to weaknesses in underlying institutions, policies and practices.**

3. **Third, limited resources and the fact that emissions come from many sources means that choices need to be made about where to focus effort. There are imperatives to reduce poverty and carbon emissions quickly, and discrete projects can deliver significant results. However, ultimately the low carbon development agenda is about putting the whole economy on a different growth path, and this transformation requires major political and policy changes. A balance must be struck between these objectives, levels of ambition and timescales over which such changes occur.**

Technical frameworks and advice for supporting low carbon development are increasingly available, based partly on growing experience in developed countries. However, during the Learning Hub event the emerging experience of participants highlighted several areas where technical frameworks are not enough to guide decision-making:

- As the deadline for reaching the MDGs draws nearer, there is often a pressure on donors to produce immediate results, as noted above. But at the same time, some of the big opportunities for low carbon development involve longer-term policy engagement and an indirect chain to poverty reduction impacts, dependent on complementary changes. A stronger empirical evidence base and indicators of success will help to strike the balance between the two imperatives.
- A good understanding of the country-specific political economy and relevant narratives about poverty reduction and economic growth co-benefits really matters for low carbon development programming.
- There is already an excessive proliferation of vertical funds in climate finance, and donors should guard against becoming dependent on these. Where programming goes through the multilateral development banks (the main public actors on low carbon energy, for example), it is important to understand as much as possible about what they do and hold them to account.
- Private finance will have to play a major role in delivering low carbon infrastructure (and potentially halting deforestation). Donors need to develop a detailed practical understanding of the role of private finance in low carbon energy investments, how best to leverage it and how to work in partnership with different private sector actors.

The *low carbon development* learning cycle held the potential to cover a wide range of areas, including low carbon energy, deforestation, low carbon agriculture, cities, and transport. However, in the Learning Hub event in Jakarta, the discussion and contributions focused heavily on low carbon energy. This output reflects that focus.

This paper bridges the concepts and review of the state-of-play set out in the background paper for the learning event, with the learning outcomes from the third cycle. In the next section it lays out some of the core challenges for getting developing countries onto a growth and development path in which energy comes from low carbon or renewable sources.

It then goes on to review experience and lessons in the areas mentioned above in sections three to six:

- how to aim for transformation of energy systems and manage risk;
- why political economy matters and what to do about it;
- the trade-offs in working through vertical funds and with the MDBs, and how to handle them, and;
- how to leverage private finance.

Section seven concludes by setting out the critical dimensions of low carbon development programming and policy engagement that emerged through the dialogue between DFID, DECC and FCO practitioners, advisers and the authors.

1 www.greengrowth.org/index.asp (accessed 26 February 2012).
2 Generally, there seems to be interest from developing country governments in the green growth concept, which places emphasis on new economic opportunities and other co-benefits of a low carbon growth path rather than on abatement, and also includes a broader set of sustainability concerns (see section 3.3). Green growth strategies take as their starting point the growth ambitions of countries and seek to find low carbon or less resource-intensive paths to that growth. They seek general growth policies that can be amended to produce the growth path with lower emissions. In theory, this approach may well either avoid or minimise the short-term costs of low carbon and resource-efficient investment, while still yielding as many, if not higher benefits over a longer timescale. Green growth seems to be an important driver in China and in many other Asian countries, who are not just investing in low carbon technologies such as wind, LED lighting, solar PV and electric vehicles, but are also seeking to shift the sectoral balance of growth towards services, investing in rail as well as roads, and investing in schemes such as car-sharing schemes.

2 The challenges

The challenge of low carbon energy in developing countries is two-fold. First, there is an urgent need to expand access to modern forms of energy to poor people. Although there is no specific MDG for energy, there are a number of ways in which access to modern forms of energy is essential or important for achieving the MDGs (Table 1). Second, there is the need to ensure that this energy comes from low carbon sources, typically in political contexts in which emissions reduction is not a priority aim.

Table 1 The contribution of energy to the MDGs

MDG	Energy's contribution
1 Poverty and hunger	Lighting for activities when it is dark, powering factories, transporting goods and materials, pumping drinking water and cooking (energy is required to cook 95% of staple foods for human nutrition).
2 Education	Lighting for schools and home study, energy for computers in schools.
3 Gender equality	Reduces time spent by women and children (especially girls) cooking and collecting firewood, water, and goods from markets.
4 Child health	Reduces smoke from cooking (indoor air pollution contributes to 36% of all acute respiratory infections in children), computers to raise awareness.
5 Maternal health	Reduces smoke from cooking, lighting for care after dark, refrigerating vaccines, sterilising equipment, transport to health centres, computers to raise awareness.
6 HIV/Aids and diseases	Lighting for care after dark, refrigerating vaccines, sterilising equipment, transport to health centres, computers for medical training.
7 Environmental sustainability	Reduces number of trees cut down for fuel, reduces emissions from burning fuel.

Source: Modi *et al.* (2005).

It is critical then, to ensure that climate change interventions contribute to reinforcing the pathways of poverty reduction and to helping people get out of or avoid pathways of poverty reproduction. Newsham *et al.* (2011: 5).

2.1 The energy access challenge

The energy access problem (that is, both access to electricity and to modern forms of energy for cooking and heating) is huge and urgent. It is estimated that:

- **20 per cent of the world's population – around 1.4 billion people – still lack access to electricity (IEA 2010b).**
- **Three billion people cook on coal and traditional biomass (such as wood and manure) (IEA 2010b).**
- **Universal access to electricity will require an additional 950 TWh of generation a year by 2030 across the developing world (IEA 2009). In sub-Saharan Africa, this will require a ten-fold increase in generating capacity (Bazilian *et al.* 2011a).**

The nature of the challenge varies by region and country. Access is particularly low in sub-Saharan Africa (less than 30 per cent of households in 2005, even fewer if South Africa, where 75 per cent have access, is excluded), compared with South Asia (65 per cent) and Latin America (~60 per cent) (Eberhard *et al.* 2011). South Asian grid access in 2009 was still just over 50 per cent in rural areas, and in India over 400 million people are without access.[3]

> There is a need to examine how low carbon resilient development can mitigate the negative impacts of climate change and address challenges to poverty reduction through extending the penetration of and affordability of access to resilient gateway systems (power, water, communications and transport). Hedger *et al.* (2011:8).

Universal access to modern energy is now increasingly high on the international agenda:

- **2012 will be the UN's International Year of Sustainable Energy for All**
- **The UN Advisory Group on Energy and Climate Change has called for a goal of universal energy access by 2030**
- **The UNDP's *Human Development Report 2011* calls for Universal Access to Energy focusing on 'clean' energy.**

Access is expected to be reached through two different routes: the extension of grid electricity generated in large-scale power plants and off-grid, small-scale, 'decentralised' electricity. The IEA estimates that off-grid expansion will play a major role in meeting universal access in sub-Saharan Africa and India by 2030, with 60–65 per cent of new generation occurring either in mini-grids or in standalone systems (IEA 2010a). A decentralised electricity supply is most attractive in remote or sparsely settled areas where grid infrastructure is an expensive option. Deichmann *et al.* (2011) emphasise that it is difficult to make generalisations because spatial factors vary so much between countries. However, even where grid electricity may be the cheaper option, there are nevertheless reasons why decentralised technologies are used and are preferable from a longer-term perspective, to avoid high carbon lock-in (Unruh 2000; Vogt-Schilb and Hallegatte 2011; Strand 2010).

The two routes raise different sorts of issues and policy challenges. They also typically involve different kinds of actors. Low carbon energy programmes and investments especially need an understanding of private sector investors and firms. But the private sector covers a wide range of scales. Typical delivery agents for cookstoves or household solar PV kits are social enterprises and SMEs. By contrast, grid electricity usually involves major infrastructure investments with a 40+ year lifetime made by major utilities and institutional investors. SMEs will tend to be more hampered by high transaction costs and lack of access to capital, while larger low carbon energy investors will be much more concerned with the credibility and stability of policy frameworks, risk and the cost of capital.

2.2 Small-scale low carbon energy

In sparsely populated rural areas or where conventional power sectors are badly managed, small-scale, decentralised energy solutions can be the most viable – and least cost – option, particularly for lighting and cooking. In terms of technologies, small-scale solar, wind, micro-hydro and biomass gasification are perceived to have the most potential to support basic access in developing countries (See Box 6, section 6.1).

> Decentralised and renewable methods of energy production with less geographic exposure offer a more resilient system of achieving basic electrification for many places; the adaptive capacity of households would be increased too.
> Hedger *et al.* (2011:20).

Improved cookstoves are also very important for transforming efficiency. The sector has recently been re-energised, partly because of the climate issue and the possibility of carbon finance (at least in theory) and the involvement of some major corporates, including Shell, Bosch Siemens, Phillips and BP. At the same time, two recent initiatives have increased momentum: the Global Alliance for Clean Cookstoves (GACC) and the government of India's re-launched programme on improved cookstoves. A new wave of producers, coming through in the last 5–10 years, appears to be more successful than previous generations, although some are still at the pilot stage.

Small-scale low carbon energy products also have developmental co-benefits. The best documented are the health benefits from reduced indoor air pollution due to improved cookstoves, particularly benefiting women and girls (WHO 2011). Potential outcomes from access to electricity include improved educational outcomes, increased micro-enterprise productivity, and transformations in mobile phone use (see, for example, Energising Development (2010); Khandker *et al.* 2009a, 2009b).[4] Solar pumps are also a big potential win-win technology.[5] However, the evidence base for the impacts of modern energy provision on developmental outcomes in most areas remains thin. It is an area where more research is needed.

It is also important to recognise the limits to some small-scale technologies, and that there are, in effect, degrees of energy access. Thus, a solar PV home kit with a peak output of a few 10s up to 100 watts will provide power for lighting, TV or mobile charging, but this is quite different from the power demands of activities such as agro-processing which are likely to have much greater transformation potential through increasing income and diversifying rural livelihood opportunities. Such loads will require a much larger supply, for example provided through a mini-grid from small-scale hydro or biomass gasification.

Common delivery organisations for small-scale renewables are SMEs or social enterprises, sometimes working in partnership with an NGO (this model seems more prevalent in South Asia than in Africa). They face several barriers, especially in scaling up:

- **Business model**: Some enterprises have developed successful business models, involving sales purchased on credit, with micro-finance provided by the retailer or a partner NGO, to overcome the relatively high upfront cost of renewable and low carbon technologies.[6] However, others need support in working out a viable way to deliver products.
- **Finance**: Another key barrier to scaling up is difficulty in accessing working capital. Many small enterprises are working in countries with weak local financial sectors, and find it difficult to access capital to buy products in bulk, or make larger investments. Transaction costs, low market prices for carbon and conventional project risk have all been barriers to a greater role for carbon finance. Signs of progress are emerging through new programmatic carbon finance and innovative lending vehicles (see www.energyincommon.org and Box 8 in section 6.1).

- **Technology**: Although technology costs are falling and overall economic returns can be good, renewable energy still typically involves a high upfront capital cost. Where costs have come down, as in the case in recent years for solar lighting or solar home systems,[7] product quality can also sometimes be a problem, which threatens growing markets by eroding consumer confidence. Standards are often lacking or not enforced. This was one motivation for the establishment of the Lighting Africa initiative (www.lightingafrica.org), which places emphasis on quality assurance mechanisms. Another key issue is design. Getting improved cookstove design right for a mass market has been a perennial 'valley of death' challenge, with many initiatives failing to provide products which actually displace traditional practices (Rai and McDonald 2009; World Bank 2011a).
- **Policy**: Policy and regulation is typically unsupportive. Many countries have support policies for grid connected renewables but no support to standalone technologies. Renewable power sources are sometimes competing with fossil fuel alternatives that enjoy subsidies – that is, kerosene for lighting, and diesel for generators – although against this, high oil prices are currently working in favour of small-scale renewables.
- **Markets**: High information costs are another barrier. Policymakers and consumers are often unaware of technologies, their prices and availability. Under-developed supply chains regularly act as a brake on market expansion. The wider environment for SMEs, including macro-economic stability, currency stability, infrastructure, skills and training, or even property rights, may also present barriers in some countries.

Mini-grids are systems that use renewable energy, and serve one or more communities, but operate independently of the national or regional grid.

The most difficult part of the small-scale low carbon energy agenda is also the part with the biggest potential for win-win effects – mini-grids based on renewable energy, and especially technologies using agricultural waste such as crop residues that also generate extra revenue streams for farmers. Examples of co-benefits for poverty reduction through diversifying livelihoods and income generation opportunities are detailed in Box 1. Such projects produce more power and are more controllable than solar PV, but are far more complex than selling products, requiring a higher degree of technological expertise and management. There has been mixed experience with this more complex technology and there is uncertainty about potential for sustained expansion due to the challenges of remote operations, maintenance and investment. This matters because of the key role that mini-grids are expected to play in the future. The longer-term challenge for donors is to build on the success of areas like solar PV to support the development of mini-grids.

3 See www.iea.org/weo/electricity.asp (accessed 26 February 2012).
4 See also NORAD's project on the impact of electricity on gender relations at www.norad.no/en/thematic-areas/energy/gender-in-energy (accessed 26 February 2012). 500 million people worldwide have a mobile phone but no access to the electricity grid. According to Safaricom, Africa's largest mobile provider, the largest problem they face is that such users leave their phone switched off much of the time. A handset typically costs $0.10 to charge, many times what a grid consumer pays. Small solar and kinetic chargers (hand crank or other mechanical devices) can provide electrical charge to mobile handsets and/or small lights.
5 See www.sciencedaily.com/releases/2010/01/100104151923.htm (accessed 26 February 2012) for a study of their impact in Benin.
6 New links are also emerging, with some companies finding ways to merge energy, payment systems and other sector operations, reducing costs further. Examples: www.grundfoslifelink.com (accessed 26 February 2012) and www.gsma.com/green-power-for-mobile/ (accessed 2nd March).
7 The price of crystalline silicon solar PV modules has fallen from over $3.5 per watt in 2007 to $1.5 per watt in 2011 (a fall of over 15 per cent a year) (*Financial Times*, 5 September 2011). This fall is partly due to a decrease in the supply of silicon, but also oversupply of panels as Chinese firms entered the global market.
8 See www.guardian.co.uk/environment/2011/jul/14/india-coal-rush (accessed 26 February 2012).
9 See http://pdf.wri.org/powering_up_executive_summary.pdf (accessed 26 February 2012).
10 India has just started a Perform, Achieve and Trade (PAT) scheme, designed to enable the aluminum, cement, paper, and textiles industries, power plants and railways, to save some 19 GW of energy and reduce emissions by 98 $MtCO_2$ a year.
11 Regulation is most effective when well-designed to avoid perverse incentives, not politically difficult and when enforcement costs are low, as with the case of the phase-out of incandescent light-bulbs, which is now increasingly common in the developing world.
12 See http://industrytracker.wordpress.com/2010/08/26/td-losses-in-india-aggravate-the-power-problem/ (accessed 26 February 2012).
13 China is to pilot an emissions trading scheme that will include the power sector in five regions, but the other countries currently have no carbon price.

Box 1 Win-wins – mini-grids and power from agricultural waste

Husk Power Systems – Bihar is one of the most poorly-served states in India when it comes to electricity. Husk Power is connecting remote villages in Bihar to a clean, reliable electricity supply, which provides better light, harnesses a widespread waste product and costs less than alternatives. Husk Power's 65 plants gasify rice husks and other biomass waste to supply electricity to around 180,000 people and, by replacing kerosene, they cut greenhouse emissions by over 8,000 tonnes of CO_2 a year. The company is growing rapidly, aiming for over 2,000 plants in operation by the end of 2014.

Abellon Clean Energy – In Gujarat, one of India's most industrialised states, factories spew out black smoke and farmers burn their crop waste to clear the land, thus further polluting the air. Three years ago the founders of Abellon Clean Energy saw the opportunity to tackle both of these problems, by replacing the coal and lignite used in factories with a fuel made from the farmers' crop waste. They now have a thriving business which gives 8,500 local farmers a small income for the use of their crop residues such as cotton stalks and cumin stems. Along with sawdust from nearby saw-mills, these residues are made into pellets and sold to local industries. Poornakumba, an NGO set up by Abellon, works with local university experts to train and advise farmers on more sustainable farming, and coordinates the collection of crop residues. Abellon currently produces around 65,000 tonnes of pellets per year for large industrial customers and provides over 215 local jobs. These pellets not only save around 110,000 tonnes of CO_2 per year, but produce less dust and smoke so factory workers find them easier to handle, as well as providing a safer and healthier working environment. The company aims to treble sales in India over the next five years, and to expand into international markets.

Source: www.ashdenawards.org/international_2011.

2.3 Decarbonising grid electricity

The other aspect of the low carbon energy and development challenge lies in the rapid expansion of *high* carbon energy capacity, especially in the Asian emerging economies and in South Africa. In contrast, sub-Saharan Africa (outside of South Africa) could see a significant increase in electricity generation and provision with relatively little increase in carbon emissions, as 93 per cent of its hydro-power resource remains unexploited (Eberhard *et al*. 2008).

The main and urgent issue here is heavy dependence on coal for power generation. Over half of total Indian electricity demand is met from coal. In China, reliance on coal for power generation is even greater, at 95 per cent in 2009. The IEA's 2009 reference scenario, reflecting current policy, involves an additional 1,500 Mtoe (Million tonnes of oil equivalent) of coal being consumed across Asia by 2030, largely in power generation (IEA 2009). According to recent reports, in 2010 India approved plans for 173 coal-fired power stations, expected to provide an extra 80–100 gigawatts (GW) of capacity[8]. In the mid-2000s, China was completing 70–80 GW of new coal plants a year, but this has now fallen to around 30 GW expected to be completed this year (NETL 2011). Because large-scale power stations are very long-lived investments (with lifetimes of 40–50 years for a typical coal plant), lock-in to a high carbon economy poses a major challenge (Unruh 2000, 2006).

Historically, in both Africa and South Asia, provision of energy by state-owned companies has been skewed towards wealthier households and to urban areas, and often subsidised at the expense of other pro-poor spending. In some Indian states, for example, up to 50 per cent of spending went to electricity subsidies in the mid-2000s (Joseph

2010: 504). A lack of incentives, weak capacity and politically driven pricing meant that these utilities lacked the finance and ability to expand capacity, increase the efficiency of transmission and distribution (T&D) and improve reliability of supply (see, for example, Eberhard 2008). Many commercial and industrial companies have responded to this situation by investing in their own 'captive' power, which may also feed back into the grid. This is often high carbon, either small coal plant or diesel powered generators.

The differences between countries and regions mean that policy challenges also differ (see also AEA Technologies 2011). In rapidly growing countries using a large amount of low-cost coal for power generation (for example, China, India, Indonesia, South Africa, and to some extent, Vietnam), the challenge is to minimise emissions from existing power plants and urgently find affordable low carbon alternatives for investment in new capacity. There are a number of different types of response, all of which are likely to be necessary:

- Improve end-use efficiency in electricity use. There are a range of possible responses, including support to an energy services market,[9] revolving funds, 'white certificate' (energy efficiency) trading schemes,[10] market transformation schemes with energy labelling and aspirational targets, or regulation[11]. Net energy and carbon savings, especially in the commercial and industrial sectors, may be smaller than expected because of the rebound effect – improvements in energy efficiency, especially in industrial and commercial sectors, makes an activity cheaper, freeing up resources which will be spent either on more of the same activity or on another activity which also uses energy (since almost all activities do) (Sorrell 2007).
- Increase efficiency in generation, transmission and distribution. There is considerable potential for efficiency improvements in many South Asian countries, especially India. The efficiency of India's coal-fired generating plants is particularly low by world standards, at about 25 per cent (IEA 2010b), – which partly reflects the fact that India's coal supply is not well suited to high efficiency ultra super critical coal plant technology – and although they have improved somewhat since the mid-2000s, transmission and distribution losses are still almost 30 per cent, way above international standards.[12]
- Invest in alternative, low carbon generation technologies, including renewables.
- Develop carbon capture and storage (CCS) as a further option for these countries.

Power sector reform may be a route to some of these outcomes. In both Africa and South Asia, there is a long history of power sector reform, which has been only partially implemented in most cases (Besant-Jones 2006). There has been some unbundling of the power sector in most countries, but state-owned utilities still dominate in most, co-existing with independent power producers. However, in countries and regions with rapid economic, and especially industrial growth, sharp increases in power demand is driving a new wave of reforms (see section 4).

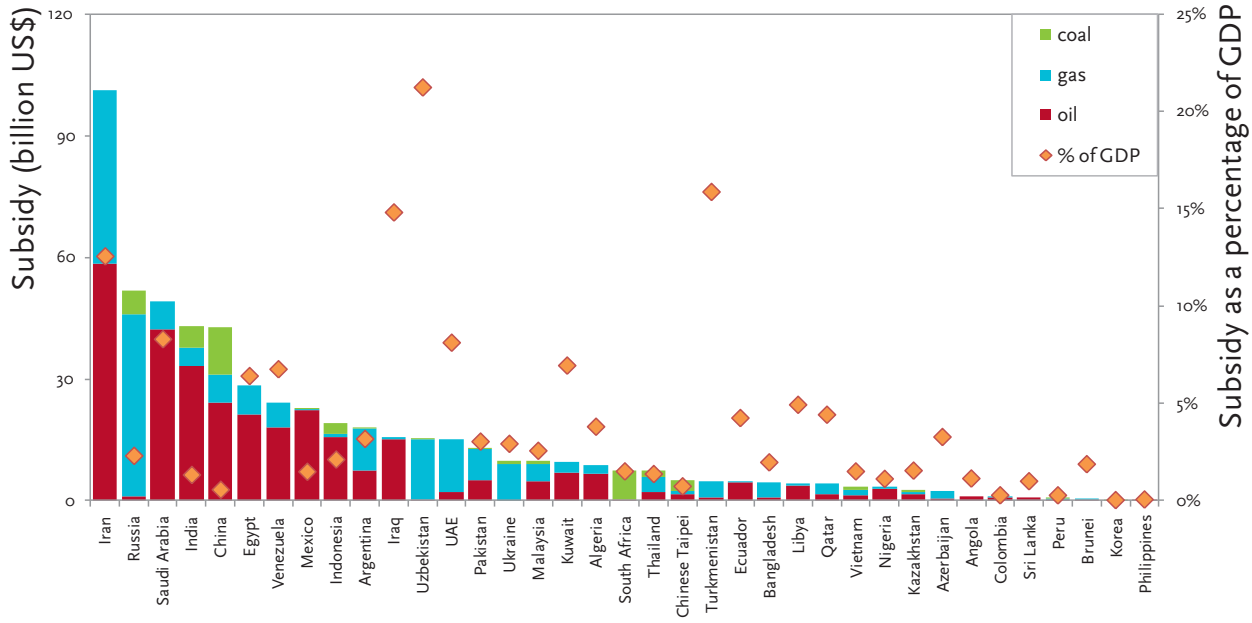
In sub-Saharan Africa (excluding South Africa) and some South Asian countries like Nepal, the small scale of electricity generation, and its relatively low carbon intensity, means there is little existing high carbon plant to be concerned about (SSA contributes only 1.5 per cent of global energy-related emissions (AEA Technologies 2011), and the priority is expansion of low carbon generation at an acceptable cost. One possibility is hydro-power, but large-scale schemes are controversial, because of the dangers of producing methane, displacement of people, and the risk that climate change may affect rainfall and river flow patterns (see for example, Urban *et al.* 2011), so a sustainable expansion would have to be carefully thought through. There is renewed interest in hydro-power in some countries, including Ethiopia, Ghana, Sudan and the DRC, with increasing involvement of Chinese companies, but institutional and coordination problems remain significant factors, and some plans for large-scale investments may not be realised.

2.4 Fossil fuel subsidies

The policy challenge is heightened by the absence of a carbon price in most countries,[13] and this absence means that public finance has a crucial role in supporting low carbon energy investments.

In some middle-income countries there is *negative* carbon pricing, in the form of fossil fuel subsidies (see Figure 1). Globally, energy subsidies stood at $558 billion in 2008, almost all in non-OECD countries. Much of the expenditure is concentrated in Iran and Russia, but some other emerging economies also have significant subsidies, especially for oil and electricity in China, India, Indonesia, and for electricity in South Africa.

Figure 1 Fossil fuel subsidies – by economy and as a share of GDP, 2008



Global subsidized consumption of fossil fuels amounted to US$ 557 billion in 2008. Of the countries surveyed this represents 2.1% of GDP (PPP) on average
Source: IEA (2008). www.iea.org/files/energy_subsidies_slides.pdf

The literature on fossil fuel subsidies shows that in most cases they are not pro-poor. The IEA estimates that of $22.5 billion spent by India on fossil fuel subsidies in 2010, less than $2 billion benefited the poorest 20 per cent of the population. Ratios for Indonesia, Thailand, Pakistan and South Africa were similar, and only slightly better for China (IEA 2011: 40). The majority of the benefit is captured by wealthier households and subsidies take up fiscal resources that could be spent on pro-poor public services. At the Jakarta learning event, UKCCU in Indonesia estimated that in 2011 Indonesia will spend $21 billion on energy subsidies. This is more than the combined government budget for health, education, social security and defence. It is estimated that 40 per cent of the subsidy goes to the 10 per cent richest households, and 90 per cent goes to the richer half of the population. In some Indian states in the mid-2000s, as much as 50 per cent of the state budget went on subsidies to (largely coal-fired) electricity (Joseph 2010). Reform of such subsidies is discussed in section four.

The combination of challenges explored above – increasing energy access, whether on-grid or off-grid, while ensuring that energy is produced in a low carbon way, and at the same time tackling politically difficult issues such as fossil fuel reform – demands a response that involves careful analysis and planning, political awareness and effective and efficient use of finance. The rest of this paper looks at some of the issues involved in making that response work.

For footnotes for this chapter see page 10.

3 Approaching low carbon development

At the outset it is important to acknowledge that getting developing countries onto a low carbon development path is a new challenge – unlike more established areas such as the delivery of health or education outcomes. A frequent statement in discussions at the Jakarta event was: 'We don't know what we are doing'. At the same time, however, the 'development' element of LCD is crucial. In some settings, low carbon development will be difficult not so much because of factors that are specific to mitigating carbon emissions, but because basic institutions, policies and practices are so weak that any kind of development is difficult.

This section explores the inter-related issues for thinking about low carbon development identified in the introduction. It reviews the challenge of balancing multiple objectives, transforming economic growth paths and linking these challenges to what is needed for delivery – understanding political economy, getting public finance delivery right, and leveraging private finance.

3.1 Identifying priorities

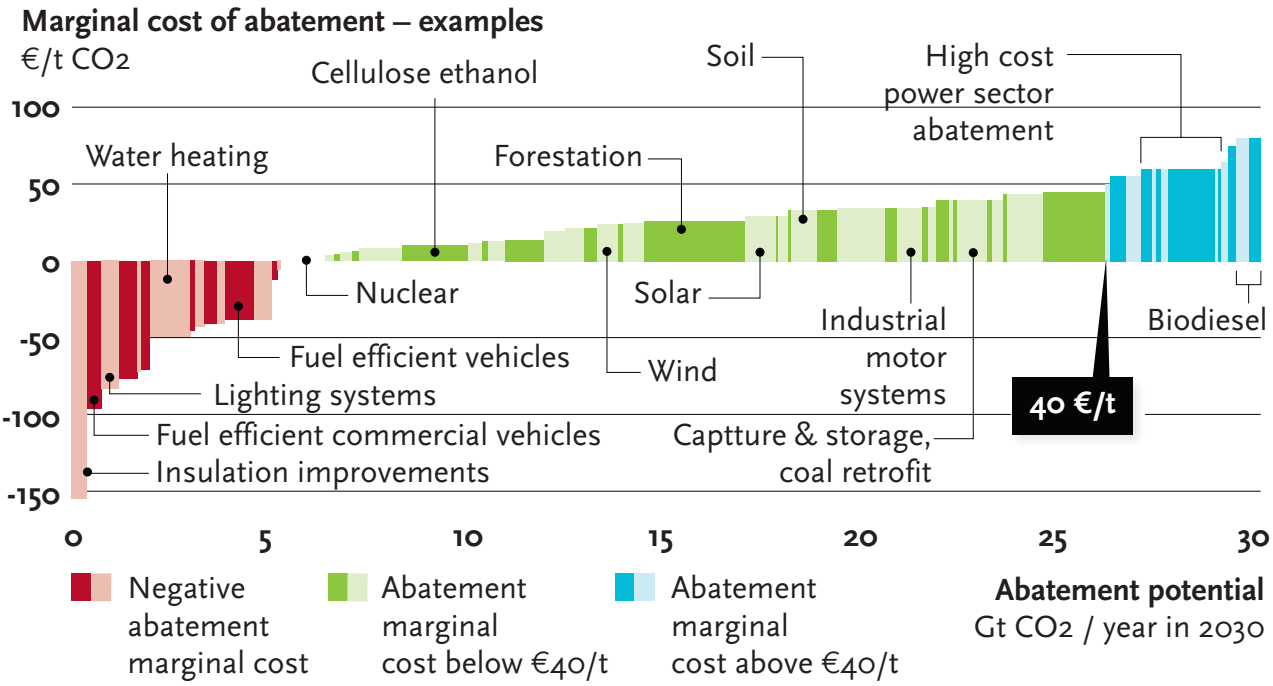
The most basic low carbon development issue facing policymakers is where to place limited resources in addressing an economy-wide problem. A widely used tool for analysis in this approach is the marginal abatement cost (MAC) curve (see Box 2). For example, the UK Climate Change Committee makes frequent use of both economy-wide and sectoral MAC curves in its reports on how to meet the UK's carbon budgets. A number of MAC curves for emerging economies were developed by McKinsey in the run-up to the 2009 Copenhagen COP summit.[14]

The content and shape of the MAC curve will depend partly on whether a country has a lot of forest cover, but also on the sectoral pattern of emissions, which is related to the stage of development a country is at. Lower-income countries use relatively little energy, and typically about half of their emissions tend to come from agriculture (or forests if relevant). By contrast, in fast growing diversifying middle-income countries, especially if dependent on fossil fuels for electricity generation and industrial energy, a much higher proportion of emissions and abatement opportunities (~70–80 per cent) come from the energy, industry and transport sectors.

MAC curves are a very useful starting point for guiding strategy, but there are several reasons why they may over- or under-state potential abatement and abatement costs. Typically they do not include policy costs, and experience from the developed world shows that these may be significant (Helm 2009). They do not always reflect hidden costs or transaction costs, especially for apparently cheap options like energy efficiency measures (Ekins *et al*. 2011). Energy efficiency also suffers from the rebound effect (Sorrell 2007), so that energy efficiency measures may produce smaller than

Box 2 The marginal abatement cost curve

The MAC curve lines up all the types of abatement opportunity in the economy or in a sector, in order of their net costs over some defined lifetime (see figure below for the global MAC curve). The metric for prioritising policies and projects under this approach is the cost of abatement, in $/tCO$_2$. This abatement cost is the *additional* cost of undertaking the measure relative to business as usual. For energy measures, this means that the cost is sensitive to fossil fuel prices. An increase in oil, gas and coal prices will shift down the abatement costs of energy measures, including energy efficiency.



Source: Vattenfall (2007)

anticipated overall energy and carbon savings (although they do lower the energy and carbon intensity of growth, and make industries more competitive, especially energy intensive ones). On the other hand, experience from existing policies where MAC curves have been used to indicate a starting point for abatement measures, including the EU ETS and the UK's Climate Change Agreements, has shown that cost-effective potential can be higher than initially thought. There are also reasons why more expensive abatement measures sometimes make sense, especially where a longer time perspective is being taken, because doing what is cheapest first may lock an economy into higher carbon options later (Vogt-Schilb and Hallegatte 2011).

In addition, decisions about where to focus effort has to take into account a range of other factors, including: what is politically feasible; what will bring in investment from other donors, civil society organisations and the private sector; and what can be funded through institutional routes that deliver quick results and have low fiduciary risk. Each of these is explored in detail in sections 4 to 6.

3.2 Balancing emissions reduction and poverty reduction

The low carbon development agenda implies some kind of balance between two objectives: poverty reduction and carbon abatement. In the case of the UK, both poverty reduction and global carbon

emissions reduction are cross-government goals, jointly owned by all departments.

It is important to acknowledge that there are some real short-term trade-offs between these objectives in some cases – for example, after increasing the end-use efficiency of electricity, the cheapest way of extending access to electricity to many poor households in South Africa is currently still likely to be via high carbon coal-fired power generation in the absence of carbon pricing to address externalities and technology policies to bring down costs of alternatives, such as renewable energy. These alternatives will be lower carbon, but because of their high financial cost fewer poor people will be served by electricity as a result of choosing them. In some cases, notably growing biofuels and investment in large-scale hydro-electric schemes, there may also be direct negative impacts on some poor people, through displacement from land (see, for example, Matondi *et al*. 2011; World Bank 2011b).

> We must still bear in mind that the new impetus for making growth low-carbon is not automatically going to be pro-poor. It should take into account questions of equity and leave sufficient space for material and non-material aspects of well-being. Newsham *et al.* (2011:26).

However, there are also many potential win-win opportunities (see section 2.2). These will include some low carbon energy interventions in rural areas where providing conventional grid electricity is costly or where there are strong co-benefits other than carbon emissions, including providing improved cookstoves, solar PV lighting, solar irrigation pumps, and energy from agricultural waste (AEA Technologies 2011). Some of these interventions will also provide benefits specifically for women and girls, as detailed in Table 1 on the MDGs.

Such interventions can provide both emissions reductions and direct poverty reduction benefits, but the effects, especially on emissions may also be small, since poor people, almost by definition, use very little energy. By comparison, interventions with a much bigger carbon impact, such as improving energy efficiency in the industrial sector, may also lead to reduced poverty through greater competitiveness and employment creation, but only indirectly, and these effects may be hard to quantify or will have a large error margin.

Similarly, investing in grid-connected[15] renewable energy is still, in most cases, an expensive way to reduce emissions and expand energy access, but it will contribute to bringing down the costs of longer-term options for emissions reduction. It should also help countries gain familiarity with, and even build industrial and innovative capacity in, technologies that will be needed for a future low carbon path. However, benefits for poor people will be indirect and again have a wide range of uncertainty.

The point that the poverty benefits of some low carbon development policies or investments are indirect and dependent on complementary policies or measures, implies that there is more than one kind of 'win-win', and it is useful to think about interventions in this way (see Table 2 for an illustrative categorisation).

This way of thinking also focuses attention on the complementary policies or project design features needed. One example given in the Learning Hub LCD event was investments in city-level projects that combined recycling with energy-from-waste. Such projects may remove the livelihoods of people scavenging on waste sites, so it is important to provide new and better alternatives, such as secure employment sorting recyclables. Another example would be the explicit linking of efficiency savings in power sector reform projects to specific pro-poor spending programmes (Box 3).

However, it is also important to recognise that conventional power sector reform is not specifically aimed at mitigating carbon emissions, and that, while it can lead to emissions reductions, it does not always do so. A recent review by the World Bank of experience of reform across 19 countries and three Indian states, for example, finds that partial unbundling of generation, transmission and distribution, has

Table 2 Illustrative categorisation of LCD interventions

	Lifetime additional costs	Mitigation potential	Potential net benefit to poor	Route	How far do poverty reduction benefits rely on complementary policies?	Win-win?
Industrial and commercial energy efficiency	Negative–low	Large in MICs	+ large in long run	Indirect, via competitiveness and growth	High – inclusiveness of growth policy	Indirect
REDD	Low	Large in rainforest nations	+/- large in long run	Direct, via access rights to forest resources; indirect, via mitigation	High – climate system	Indirect/ trade-off
Biofuels	Low	??	+/- small –medium	Direct via incomes or land rights		Direct/ trade-off
Improved cookstoves	Low	Small	+ medium	Direct, via fuel costs, health effects	Low	Direct
Small-scale renewable energy	Low–medium	Small–medium	+ medium –large	Direct, via increased productivity, education, health effects	Low	Direct
Large-scale renewable energy	Medium–high	Medium–large	+/0 medium –large	Indirect, via mitigation, but direct if grid expansion	High – climate system	Indirect/ trade-off
Power sector reform	Low	Medium–large	+ medium –large	Indirect – via fiscal effects	High – pro-poor fiscal decisions	Indirect
Urban waste-to-energy	Low	Small–medium	+/- small	Indirect – via fiscal decisions and mitigation	High – pro-poor fiscal decisions and climate system	Indirect
Urban mass transport	Low	Small–medium	+/0 small	Direct – via travel costs and health impacts	Low	Direct?

Box 3 Power sector reform in Madhya Pradesh

One at least partially successful example of power sector reform is Madhya Pradesh (ADB 2011). Despite a reduction in the provision of free electricity in the state, reform over the course of the last decade has produced some desirable outcomes. Investment by the state-owned utility more than doubled capacity from 4 GW to 8.35 GW between 2002 and 2009, with another 4.5 GW of independent power producers' capacity expected to become available by 2013, all of which has improved reliability of supply. Transmission losses halved, and although distribution losses were still high by the end of the period, they had reduced. Carbon savings from these reduced losses are estimated to be around 1 $MtCO_2e$/yr. Reduced subsidies from improved efficiency freed up £30 million a year for other purposes.

led to higher carbon emissions, as has the introduction of private ownership in generation (ESMAP/PPIAF 2011). In the Indian context this can be easily understood; in the absence of effective carbon pricing, coal-fired power generation remains the most competitive investment for independent power producers. One possible response is to make cleaner investments attractive to independent power producers. Green Africa Power is a new multilateral mechanism being developed to mobilise private investment for the construction of power plants in Africa based on renewable energy. The facility is to be a not-for-profit company that buys electricity produced by independent power producers for a price that reflects real costs, which is then resold to African national utilities.

3.3. Aiming for transformational change

One strong theme that came out of the Learning Hub LCD event was the recognition that getting countries onto a low carbon development path will require transformation. While transformation is an ill-defined term – for low carbon development transformation can be characterised in terms of catalysing large-scale change that is permanent, rather than incremental changes – some characterise it as the next 'industrial revolution' (Stern 2011). This perspective recognises that development is path-dependent, and that many countries are characterised by 'carbon lock-in' (Unruh 2000, 2006) – an interlocking set of institutions in energy, transport, industry and the built environment driven by economies of scale, technological complementarity and network effects.

Escaping carbon lock-in requires not only new technologies, but also multiple inter-related institutional changes, including functioning carbon pricing, decarbonised power generation and low carbon public transport, all driven by clear government policy showing strong political commitment, giving confidence to investors, and based on strong public support.

Achieving transformational change is closely tied up with understanding, working within and changing the political economy of climate policy in a country (see section 4).

> Adaptation can also be – and might also need to be – thought of in terms of transformation of the system, not of maintaining its resilience. Newsham *et al.* (2011:17).

A central challenge is making the case for change – that is, getting political leaders interested in LCD in the first place. Climate change as a political driver suffers from the limitation that its worst effects are distant in time, whereas many solutions (for example, renewable energy technologies) typically not only have higher costs but higher upfront costs. Making the case may often involve using messages that resonate better with policymakers and politicians (because they give higher priority to them), such as improving energy security, competitiveness, reducing pressure on budgets (for example, by reducing fossil fuel subsidies) or creating jobs.

Many governments will be more open to framings (such as 'green growth') that emphasise these benefits rather than placing the attention on international emissions reductions targets. This was the case shared by DFID from Vietnam where 'low carbon development' was associated by the Vietnamese government with international targets but 'green growth' was associated with industrial opportunities. As well as changing the message, it may also help to change the messenger. One of the UK's most effective interventions in high-level influencing in India was also very low cost – organising a visit from Lord Turner, chair of the UK's Climate Change Committee, provided a credible voice who could share, in detail, the experience of how the UK has approached decarbonisation. Business leaders can also be important messengers in a way that traditional donors cannot. International businesses with a commitment to slowing deforestation, such as Unilever, have made a difference to awareness and actions in countries like Indonesia.

Demonstration can also be a powerful instigator of transformational change, and in many cases DFID country offices are attempting both to learn-by-doing and to demonstrate the benefits of low carbon alternatives – for example, the UK Climate Change Unit in Indonesia wants to catalyse the expansion of geothermal energy through demonstration by backing a particular project. Decentralised energy technologies in particular hold out the prospect of the democratisation of energy and the breaking of parastatal control, somewhat like the way in which mobile phones transformed communication by working around centralised control of landlines.

Transformation will also require innovation. There is a strong case for increasing support to low carbon innovation, both globally and within developing countries, especially in technologies of particular use in poor countries. Innovation generally is undersupplied by the private sector, because even with intellectual property protection, such as patents, the social benefits of innovation exceed the private benefits (Jaffe *et al*. 2004).[16] Similar, but even more serious market failures apply to the process by which existing technologies are learned about and adopted in developing countries (Rodrik 2004). Innovation can be quite a complex process (Grubb 2004; Foxon 2004) involving social entrepreneurs, companies, government, public, research institutes and others in a 'national innovation system', which generates and determines domestic capacity and the skill base for innovation and learning in a country. Support to innovation involves thinking about the whole innovation process and the national innovation system. A common problem is that the phase of the process with highest risk for companies is not the R&D phase, or the scale-up of a tested technology in an established market, but the so-called 'valley of death' in between, moving from demonstration phase through early commercialisation. It is here that overall costs can rise sharply but where there is as yet little or no market experience. This can also be the stage where it is hardest to obtain private finance. This problem applies to low carbon innovation as well.[17]

For most developing countries, the key issue is how *local* innovation can be supported – that is, adoption and adaptation of existing technologies to local contexts, but also innovation in areas that are important for poor people and where the private sector in developed countries will not be active. A mechanistic 'technology transfer' approach is not helpful – the processes involved in learning to adapt technologies for local use share many of the characteristics of the innovation process described above (Watson *et al* 2010). Policy is better directed towards strengthening this capacity than towards supporting the importation of particular technologies. Current policy ideas for low carbon technology development include the idea of a network of technology or innovation centres (Box 4).[18]

Many people in the donor community recognise the transformational challenge at the heart of low carbon development, but are also under considerable pressure to deliver attributable results within a short timeframe, especially as the deadline for the MDGs approaches. Under these circumstances, investing in capacity building and policy engagement with a potentially transformative but indirect chain to impacts involves a risk. This tends to drive investment in projects with direct results (or spending on capital-intensive projects), rather than work for institutional, governance or policy change (which may involve relatively little spend). It can also drive staff in bilateral agencies to

Box 4 Climate Innovation Centres

At the Cancun COP in 2010, the UNFCCC agreed to a Technology Mechanism with plans for a Climate Technology Centre and Network. These plans were fleshed out at the Durban COP in December 2011. In parallel, a number of actors, including the Indian government, DFID, infoDev, UNEP, the Energy Centre Netherlands and the Carbon Trust, have been developing different models for Climate Innovation Centres (CIC). These centres may include adaptation and wider sustainable technologies, as well as low carbon technologies, according to local demands. The CIC concept is being piloted in India, Ethiopia and Kenya (where it is being backed with $9m by DANIDA). Support will likely be for the demonstration, diffusion and pre-commercial deployment of technologies with the private sector at its centre. CICs may also act as information hubs, and create a marketplace for investors. A key issue currently being negotiated is where the CICs will sit, and how far they will be independent of (or at arms' length from) government control. In Kenya, the private sector is wary of the potential for corruption and misallocation of CIC resources if there is too much government control.

route spending via the MDBs, who often have large infrastructure projects worked up and ready to go.

In this context, a key message from the Hub learning event was the importance of seeing climate funding as a means to an end – a concern to spend and achieve immediate results should not crowd out long-term and riskier approaches. The approach of the UK is that it is right to take risks if the expected payoff is large, and if there is some evidence about likely success and the nature of risks. In other words, taking risks is necessary for learning, and in a new area like low carbon development learning is necessary.

However, this approach also points to the need for better evidence on the results chains for potentially transformative projects, and better indicators of what transformation, including in capacity, looks like. Transformative projects like power sector reform can have a huge impact. For example, in the case of Madhya Pradesh (see Box 3), carbon savings from transmission and distribution losses are estimated to be around 1 $MtCO_2$ a year, equivalent to five million solar lanterns replacing kerosene, and some £30 million a year was released for potential pro-poor spending. More evidence about such numbers, and the complementary policies that actually lead to pro-poor, low carbon outcomes, will be needed to support the case for taking risks in transformational investments.

A transformational approach to low carbon development also raises the issue of whether conventional measures of development and especially economic growth are fit for purpose in an era when environmental limits (especially those of climate change and biodiversity loss) are increasingly under pressure. There is good theoretical thinking and practical work on indicators of genuine investment and growth that take such pressures into account (see for example, Dasgupta 2004, 2007), but most donors have not yet fully integrated them into their thinking.

Finally, the transformational approach to low carbon development requires thinking and acting beyond the conventional development agenda. The UK has been innovating with the creation of cross-governmental Climate Change Units in India, Brazil and Indonesia, involving departments of energy, climate change, international development and foreign policy, which have been successful in bringing these agendas together. The UK's new International Climate Fund also involves cross-government decision-making on investments.

14 See www.mckinsey.com/en/Client_Service/Sustainability/Latest_thinking/Costcurves.aspx (accessed 26 February 2012).
15 Off-grid renewable energy, especially in areas that could not credibly be served by the grid, is different, as additional cost against the base case (for example, kerosene lamps) is lower and because a new service is being offered.
16 The Stern Review gives figures of private returns to R&D of 20–30 per cent, compared with social returns of around 50 per cent and recommends a doubling in global public R&D on low carbon technology. Studies of US data suggest that the social return to R&D by firms is between two and three-and-a-half times higher than the private return (Margolis and Kammen 1999; Bloom *et al*. 2005).
17 See BERR/BIS/DEFRA (2007).
18 Other mechanisms being piloted and adopted include innovation prizes and challenge funds (including the REACT fund in East Africa). Prizes seem to work well, both globally (for example, X Prize Foundation's successful commercial air space prize which launched Virgin Galactic) and locally. The Global Village Energy Partnership has been running competitions in Latin America and East Africa for new small-scale low carbon energy technology ideas (DFID Caribbean is funding a window for Caribbean entrepreneurs). Winning these prizes can raise the profile of the entrepreneurs (as with the Ashden Awards) but can also offer other support to scaling up, including capital, training or business model development.

4

Understanding the political economy

Having a good understanding of the political economy in a country was the most frequently cited prerequisite for low carbon development programming and policy engagement at the Learning Cycle 3 event (see Box 5 for the example of Indonesia). Political economy encompasses not only actors and interests (including material and political interests) but also the ideas or ideologies that legitimise actions and policies (Tanner and Allouche 2011). It also involves thinking about how coalitions can be formed to produce change, and how the political settlement within a country's elite will affect the likelihood of pro-poor outcomes.[19]

There are a number of reasons why such an understanding is important for LCD. The first, as noted in section 3 above is that it is needed to guide engagement with political elites. In some cases, key decision-makers in national governments are already keen to take action on climate change, and especially in moving to a low carbon development path. But as a recent study of climate finance in the Asia-Pacific region noted, 'it is arguable for some countries in the region, [that] were it not for the international focus on climate change...it is unlikely that climate change would feature yet as an issue', and that 'the lack of any real domestic political salience means that policy development, coordination and implementation may be constrained' (OECD 2010). Similar conclusions apply to some African countries

> A political economy approach to planning will be a key component in ensuring transformative change. Hedger *et al.* (2011:24).

(OECD 2011). There is also a risk that climate finance will appear as an opportunity for unproductive rent-seeking.

A second example is the politics of fossil fuel subsidy reform; a big issue for a number of countries, including India, Indonesia and Nigeria. Where they are significant, fossil fuel subsidies are the single biggest inhibitor of investment in energy efficiency. Because even basic goods are transported, removal of subsidies will increase almost all prices, but the benefits of most subsidies are heavily skewed to wealthier groups. It is precisely because of this that reform is difficult. However, high fossil fuel prices are also putting pressure on subsidy policies, as spending balloons; in India, for example the government is reported to be considering requiring ONGC, the largest crude oil supplier in the country to cover more of the subsidy to relieve pressure on state budgets.[20]

Box 5 The political economy of low carbon development in Indonesia

The Indonesian government accepts in principle that climate change poses a risk to the successful development of the country, and has set a target for reductions in emissions by 2020 of 41 per cent from a business-as-usual growth path. However, at the same time, economic growth still dominates the agenda, with the aim of achieving a growth rate of 7 per cent per year by 2014. The growth rate target will not be sacrificed – both targets will have to be met at the same time.

However, the political economy of Indonesia presents some severe challenges to achieving such an outcome. There are large fossil fuel subsidies largely going to a politically important middle class, and some strong vested interests. Rent-seeking is ubiquitous and observers estimate that on average, it makes up 30–40 per cent of project costs – higher than other places in Asia.

In the power sector there is a single dominant company, and limited opportunities for external investors. The Indonesian economy is based on natural resource extraction, and high returns in existing sectors (of 25–40+ per cent within 3–5 years) means competition for finance is severe. Long-term projects (and thinking) do not survive easily.

Indonesia is the third largest forest nation in the world, and also has peat forests that are a massive store of carbon but are vulnerable to fires and land use change. The governance problems are huge – politicians use access to rainforest as patronage, and there is a lack of clear land tenure. There are also big gaps between high-level rhetoric and the ability to deliver, which in Indonesia is often quite decentralised. An example is the statement by Indonesia's president in 2011 that he would spend the rest of his term ensuring that the country's tropical rainforest is protected. However, given the nature of decentralisation in Indonesia, and the fact that local politicians control licences to develop forest tracts, this statement may well not lead to much real change on the ground. Change needs to happen simultaneously from the bottom up and at the centre.

A recent study for the Global Subsidies Initiative suggests four key points for reformers:

i. **Powerful interests that benefit, have to be compensated, or reform has to be inoculated from their opposition.**
ii. **Transparency about cost and purpose of subsidy usually aids reform.**
iii. **If subsidies are unavoidable, better design can often reduce negative impacts.**
iv. **Having better administrative tools (to replace broad spectrum subsidies as a blunt instrument) aid reform (Victor 2009).**

One example of reform, at least temporarily successful, comes from Ghana (see Box 6). Another is India, where fossil fuel subsidies are a huge issue, and where some reduction in subsidies was introduced several years ago, with attempts to offset impacts on poorer people through cash transfers. Parity with subsidies for fossil fuel energy has also been an important strategy by the Ministry for New and Renewable Energy, in getting support for both on-grid and off-grid renewable generation.

A third example is power sector reform. India again provides an important example of how political economy is important for understanding policy change. Power sector reform in India has been difficult because large groups of politically important consumers – better-off farmers in rural areas – have long received heavily subsidised or free electricity. Despite some cross-subsidisation from higher prices for industry, this situation has led not only to heavy fiscal pressures on state budgets but also a lack of resources for investment and, consequently, high transmission and distribution losses and unreliable power supply. The government has responded by a hybrid strategy, allowing businesses to invest in their own 'captive' capacity, which can also feed back into the grid and provide extra supply to the

Box 6 Fuel subsidy reform in Ghana

In the early 2000s, two attempts to phase out liquid fuel subsidies failed in the face of popular opposition. However, as global oil prices continued to rise, fiscal pressure from subsidies also tightened. In 2004, Ghana was spending around 3 per cent of GDP – well in excess of health spending – on subsidising fuels and maintaining the state-owned refinery. In 2005, the government embarked on a new round of reform. However, this time it built a political strategy. A poverty and social impact analysis was undertaken to reveal the extent to which wealthier Ghanaians benefited from the existing subsidy structure, and the results were used in debates on the issue. Comparisons with neighbouring countries were published in the press. There were discussions with trade union leaders. A number of steps were taken to compensate poorer households, including eliminating school fees, capping bus fares, and more resources for rural health care and electrification. A cross-subsidy for kerosene was maintained. This round of reform was more successful, in that there were no street protests. However, as global prices spiked in 2007 and 2008, the government froze prices, and after elections in 2008, the policy was reversed.

Source: Laan *et al.* (2010: 11–14).

network (Joseph 2010). However, the rapid growth of industry in India in recent years, and the continuing fiscal pressures also mean that there is greater willingness for more fundamental reform to improve performance.

Yet another important area for OECD donors is understanding the political economy of the role of China in the energy sector. In both Asia and Africa, Chinese companies (both state-owned and privately owned) and China as a donor play an increasingly large role in infrastructure. This can be both in high carbon infrastructure (for example, coal-fired power generation in Vietnam) and low carbon infrastructure (for example, large-scale hydro in Ethiopia or geothermal in Kenya). These Chinese actors use different tools and have a different approach from the MDBs, and their investments and relationships are often highly politicised. China can also move fast – offering to close decisions on infrastructure projects within months as opposed to years (often because environmental and social impact assessments are not undertaken). Their loan offers can look attractive, but countries may subsequently pay higher rates through power purchase agreements. There may be a role for more traditional donors here in helping developing country governments ensure that impact assessments are done – one example shared by participants came from the DRC where DFID assisted the government in undertaking environmental impact assessments of Chinese-financed road building projects – or in supplying technical capacity on power purchase agreements, for example.

There are a range of other areas where a good understanding of political economy is important for low carbon development, from assessing risks of corruption at project cost level, to understanding gaps between statements at the top and delivery on the ground, (see Box 4) and understanding energy investments in contexts where members of the elite 'straddle' both politics and business, so policy and personal interests may become entwined.[21]

The political economy of low carbon development is important, not only for the effective delivery of public climate finance, but also for understanding how the private sector, and especially investors, assess risk. We now turn to these two issues in turn.

19 For some case studies see the IDS Bulletin special issue on the political economy of climate change (42.3, May 2011). For a summary of DFID research on political economy see www.dfid.gov.uk/Documents/CABI/Politics%20of%20Poverty%20Feature%20-%20June%202010%20(2).pdf (accessed 2nd March 2012). For more detail on the political economy of African institutions see http://institutions-africa.org/ (accessed 26 February 2012).

20 See www.businessweek.com/news/2011-09-20/india-said-to-consider-doubling-ongc-s-fuel-subsidy-bill.html (accessed 26 February 2012).

21 For example, there is comment in Kenya that the prime minister's enthusiasm for mitigation policies is linked to family business interests in renewable energy.

5 Deploying climate finance

The likely absence of a carbon pricing signal to drive lower carbon investments in most developing countries in the next few years means that official climate finance for low carbon development has a crucial role to play, both in itself and for leveraging private finance (see section 6).

A range of estimates for the financing requirements for low carbon development exist. The High Level Advisory Group on Climate Change Financing projects an annual financing requirement of $100 billion by 2020, of which about half would be needed for mitigation. The 2010 World Development Report estimates that mitigation in developing countries could cost $140–170 billion a year between now and 2020 (World Bank 2010, ch. 6). The IEA estimates that the additional clean energy investment required for developing and emerging countries to achieve the 2°C target will be almost $200 billion by 2020 (IEA 2009). In addition, estimates of the investment costs of providing universal energy access range from $48 billion–150 billion annually between now and 2020 (IEA 2011; Bazilian *et al*. 2011a).

By comparison, pledges under the range of current global climate change funds total around $35 billion. Pledges for fast-start financing for the period 2010–12 stand at about $29 billion.[22] Public finance for renewables in developing countries has risen sharply in the last five years, but in 2009 was still less than $6bn.[23] Thus while public finance will be important, it cannot come close to meeting all needs. It is widely recognised that private finance flows for investment in low carbon development are essential, especially for low carbon energy (see section 6).

Within public finance for low carbon development, there are a set of inter-related delivery issues that are particularly relevant for bilateral donors. Public climate finance is still being delivered largely within the context of official aid frameworks, so the principles of the Paris Declaration on aid effectiveness – ownership by recipients; alignment to recipient priorities and institutions; harmonisation (between donors); managing for results (for poor people) and mutual accountability – would be expected to be important.

However, the recent final report of the Evaluation of the Paris Declaration found that climate finance flows 'will create many of the same challenges as have other forms of aid – perhaps even more – and yet there is very little coherent thinking or planning about adapting and applying lessons and good practices in effective aid to these new financing flows' (Wood *et al*. 2011). Recent OECD-funded reviews of climate financing in five countries in the Asia-Pacific region and six African countries found problems in a number of the Paris Declaration themes (OECD 2010, 2011):

- In some, but not all countries, there is little ownership of climate change as an issue, and so financing is largely supply driven, rather than demand led. No country had a dedicated forum for dialogue on climate financing involving donors, government, civil society, and the private sector. There may be lessons to learn here from the Poverty Reduction Strategy Paper experience, which at its best did help to build ownership.

> But PRSPs were established before climate change entered into the mindset of national financial planners and the lack of connection between them and NAPAs has been criticised. Hedger *et al.* (2011:22).

- In Africa, responses to climate change only become coherent when politically important ministries become engaged. Which ministries these are varies, but in many circumstances climate finance may flow to environment ministries, which are often politically marginal. Effective use of climate finance requires a combination of elements – overall vision and policy, action plans, targets and budgets, functioning institutional arrangements and a mechanism of accountability, that was found nowhere in Africa. This weak country capacity means it is hard to integrate climate finance into local budgets. Where capacity is stronger and fiduciary risk is lower, 'direct access' arrangements, such as routing finance through a national development bank, would offer more alignment (similarly to direct budget support), but there is limited experience with this approach.

- There was role confusion in governments as to who oversees climate funding. Mechanisms for donor coordination at country level existed but were not functioning fully. A particular concern is that the overall picture of financial and investment flows to developing countries is already complex, with a high risk of fragmentation and increasing administrative and institutional requirements (Atteridge ***et al***. 2009). Public sources are at risk of adding to that complexity – it is estimated that within five years there may be as many as 100 special climate change funds (OECD 2010).

The OECD reviews of climate finance cited above made a number of recommendations to international funders. Many of these are familiar from long-standing discussions of the aid relationship, including: fitting disbursement cycles to recipients' budget processes; using domestic reporting systems where possible, simplifying and streamlining where not; delivering funding according to schedule; having formal agreements to harmonise funding; and delegating to local offices if at all possible. Others are more specific to climate finance – mapping, publishing and updating information on all climate finance for each country; establishing pooled funding mechanisms, such as country-level multi-donor trust funds (MDTFs) for climate change finance (see Box 7), and starting from the recipients' priorities. At the global level, the recommendation is to clarify the definitions of what is climate change finance and how to 'earmark' it; to work harder at ensuring there is a clear division of labour between institutions at the global level; and to rationalise funding channels, ideally into single mechanisms for each region.

However, while some of the Paris Declaration principles are clearly important for delivering climate finance, a simple, mechanical application is unlikely to work. One issue is that many recipient governments are strongly of the view that climate finance should take the form of mandatory flows under a UN agreement, and should not be considered part of the aid architecture at all. Another is that, while coordination is desirable, a degree of competition between climate finance providers may also be a good thing.

At the same time, the experience with some of the mechanisms suggested by the Paris Declaration agenda, such as MDTFs, shows the challenges involved.

Box 7 The Bangladesh Climate Change Resilience Fund

One response to donor fragmentation has been the country-level multi-donor trust fund (MDTF) – intended to coordinate donor and government decision-making, building on existing frameworks to produce greater coherence, a reduction in reporting burdens and increased transparency and accountability. They cover a wide range of issues. DFID has played a leading role in setting up two climate MDTFs in Indonesia and Bangladesh. In Bangladesh, the experience so far has been mixed – it has taken time to get government ownership, and there has been some controversy over the role of the World Bank, who administer the Fund. There are also some features of the Bangladesh Climate Change Resilience Fund (and indeed other GoB funds) that do not work well for low carbon development finance in particular – it is heavily adaptation focused, has no engagement with the private sector, and makes it difficult to programme relatively small projects, such as small-scale renewable energy in the early phase of scale-up. This is driving DFID financing in other directions, including the bilateral programme and regional (for example, ADB) routes.

Sources: http://mdtf.undp.org/overview/funds; Alam *et al*. (2011); DFID Bangladesh (2011).

The Bangladesh example throws up a more general dilemma for bilateral donors – how far should they channel financing for low carbon development through the multilateral development banks (MDBs), especially in the form of sector specific vertical funds, and how much should they programme bilaterally?[24] MDTFs were originally conceived of as a transitional mechanism to bridge from project finance to direct budget support, and efforts to make them work better should not be abandoned.

The advantages of working through MDBs include being able to contribute to making big opportunities happen, having access to specialist expertise, and to people already being familiar with low carbon investments. Where a bilateral is small in comparison with other donors (for example, DFID in Vietnam), working through a multilateral offers the prospect of more influence and access. However, such funds can also be slow to spend, attribution of impact is diluted, and any one bilateral will have less influence over how the money is spent once the basic decision is taken.

One alternative is for bilaterals to learn-by-doing themselves, developing their expertise and capacity in parallel, and learning how to channel finance directly to new partners, especially in the private sector. Some countries will have their own bilateral development investment agencies (for example, in the case of the UK, the CDC) that may be a useful alternative partner. A middle ground would be for bilaterals to continue funding low carbon programmes through the MDBs, but continue close engagement throughout programme life, and seek to hold the MDBs to greater account.

Each of these routes has risks, but all should be considered within the context of a given country programme. This is also an argument for diversifying channels of funding. As one participant in the Jakarta event put it: 'if we only use one channel – if we fail we fail big'. One key factor in any particular case will be the political economy of the relationships between government, civil society, the private sector and donors.

22 See www.wri.org (last updated May 11th 2011).
23 The World Bank Group (including IFC and MIGA), partly through SREP, had a five-fold increase in 2009 with $1.38bn committed to new renewables, although fossil fuel lending jumped in 2010 and now far exceeds renewable and energy efficiency lending.
24 See Isenman and Shakow (2010) for a wider discussion.

Working with the private sector and leveraging private finance

The private sector, both within developing countries and globally, plays a key role in low carbon development. Private firms, especially small and medium-sized enterprises (SMEs) are playing an increasing role alongside NGOs in providing access to electricity in rural areas, via smaller scale renewable technologies, and to improved cookstoves that reduce wood and charcoal use.

At the same time, private finance will be needed for larger scale investments in clean energy. Low carbon private finance flows are already substantial, especially in low carbon energy investment (Liebreich 2011). New investment in renewable energy globally in 2009 was $162 billion, quickly catching up with investment in fossil fuel-based capacity at around $215 billion. However, a large proportion of investment is going to just two countries – China and the USA – with $47 billion and $21 billion in asset finance in clean energy investment in 2010 respectively. By comparison, even other emerging economies are lagging behind, including Brazil with $7 billion, India with $3.2 billion and Mexico with $2.3 billion. Relative to estimated needs, either for low carbon energy or for wider energy access, flows to most developing countries are still very small, so a key policy issue is how large flows of private finance for low carbon investments can be leveraged through smaller flows of public finance. These roles mean that understanding of, and engagement with, the private sector in these areas is becoming important for donors. This is a relatively new experience, and so, again, there is much learning to be done, including the recognition that the private sector is not homogenous and different firms have different priorities, especially in relation to policy.

6.1 Working with SMEs in small-scale low carbon energy

There are a range of barriers facing firms and organisations in the small-scale low carbon energy sector. A basic one is the lack of business models. Although there are some success stories (see Box 8), very often the private sector is not interested in understanding consumer willingness to adopt low carbon goods and services, and do not have an awareness of low carbon opportunities in rural areas.

In particular, there are in reality very few scalable business models. This is partly a matter of access to capital but with low levels of immediate demand for electricity and limited willingness to pay, there is a more basic problem of commercial viability. Achieving scale is

important just in terms of energy access goals, but it is often also seen as helping to bring costs down. However, for technologies using biomass, including crop residues, there are also concerns that scale-up will increase biomass prices and so raise costs as projects multiply.

Donors are responding by experimenting with different kinds of support to business model development, partly with the aim of encouraging more market entry and greater competition. This approach is based on the premise of a certain level of entrepreneurship, which may not be present everywhere. In Indonesia for example, where much economic activity is about extracting rents from natural resources, innovation is often lacking. Experiments include establishing partnerships between private sector firms and CSOs, paying for market analysis showing poor peoples' willingness to pay,[25] developing micro-credit options, and an element of reward for business models that can deliver (see Box 9 for a programme in India that combines some of these elements). The REACT (climate change) window in the Africa Enterprise Challenge Fund (AECF) offers grants and loans as co-finance for new business models in Burundi, Kenya, Rwanda, Tanzania and Uganda. REACT is open for business ideas in renewable energy, adaptive climate technologies (small-scale irrigation, drought resistant crops, etc.) and also for applications from financial institutions that wish to expand their lending in these areas. Multi-donor funded GVEP International and the Dutch Rural Energy Foundation have piloted a new credit model in Uganda, supporting a solar hire-purchase scheme.

A second major barrier to scaling up is access to finance. In many countries, the banking sector is weak, and where it is stronger, banks are unfamiliar with the sector and risks are perceived to be high. This means that while large firms (such as India's Tata) can offer solar PV products at scale because they can access capital, SMEs cannot.

Accessing finance for small-scale energy for scaling up through donors and NGOs has therefore played a critical role. These have provided start-up funds, helped lower transaction costs for SMEs trying to access carbon finance, and provided scale-up investment to drive innovation and mitigate risk.[26] A particularly interesting concept here is micro-equity (as opposed to micro-credit), where donors might take a stake in an enterprise. This not only directly provides capital to projects that can have multiple benefits for poor households, but also de-risks project finance by sending a signal to other potential investors that the investment is relatively safe because a public body has taken a share. Risk can be lowered further by donors making their equity stake subordinate to others' (that is, first in, last out).

However, a key issue that donors are still wrestling with, across all interventions in low carbon finance, is how to avoid giving *excessive* subsidy or risk mitigation to the private sector.

Box 8 Low carbon energy for the poor – success stories

In India, Grameen Shakti is on track to deliver five million solar systems and five million improved stoves by 2015 (see www.gshakit.org). In Africa, if barriers are tackled, solar portable lighting could reach 8 per cent penetration of off-grid consumers by 2015. GERES in Cambodia has produced and sold 1 million improved stoves with a 22 per cent cut in fuel wood consumption per stove. Toyola Energy in Ghana has sold over 150,000 improved charcoal stoves, (see www.ashdenawards.org/winners/toyola11). Christian Aid has partnered with social enterprise d.light (see www.dlightdesign.com/home_global.php) on microfinance to bring solar lighting to rural India. d.light reports serving over one million customers in 40 countries.

In addition to co-benefits through reduced pollution, improved health, and electrification of homes, these markets offer non-traditional livelihood opportunities, particularly useful for women, where they have been trained, for example, as so-called 'barefoot engineers'.

Box 9 Supporting innovation in business models for small-scale low carbon energy in rural India

DFID India is starting to explore two different ways to support the development of viable business models for off-grid renewable energy provision. One is through grants for product and business innovations. The grants are made to civil society organisations to develop partnerships between private sector firms, communities and government, and may be used for activities such as capacity building, training, research and community mobilisation. The aims are to help build supply chains, demonstrate commercially viable business models, and generate evidence to influence policy and regulation.

The second approach is 'results-based financing', or RBF. This model, which DFID is also trying to develop in several other countries, pays SMEs or other delivery agents for reaching a set of agreed outcomes. The idea of this approach is to incentivise the scaling up of viable business models, flexibility and innovation. It also aims to maximise value for money through a reverse auction mechanism. RBF allows a targeting of business models on poorer areas. However, given that the firms involved have to carry the cost of financing the product or service, a complementary element involves ensuring that they can also access upfront financing cheaply.

RBF is an innovative approach for DFID. It raises the challenge of how to design a programme that is new and risky, and therefore ideally has points for evaluation, learning and adjustment, before moving on to the next stage. Details of the proposed India programme are yet to be finalised and agreed with the Indian government.

An important issue relating to both business models and finance is the viability of mini-grids. Mini-grids are systems that serve one or more communities but which operate independently of the national or regional grid. Such grids, typically attached to technologies such as a diesel generator, a micro-hydro scheme or a Stirling engine using gasified biomass, offer much larger amounts of controllable power than a solar PV home kit, and will be needed for applications such as agricultural crop processing which are needed for the diversification of rural economies, an essential element of most successful poverty reduction strategies in creating higher productivity employment.

However, mini-grids and associated power sources require a greater degree of technological expertise and management, as well as higher capital costs. They ultimately also need a higher level of demand for electricity. There has been mixed experience with this more complex technology and there is uncertainty about potential for sustained expansion due to the challenges of remote operations, maintenance and investment. This uncertainty matters because of the key role that mini-grids are expected to play in the future. In its results-based financing (RBF) pilot programme, DFID may include some micro-hydro mini-grid schemes, which should help donors learn more.

DFID is intending to pilot a RBF approach in Rwanda for the delivery of solar lanterns, micro-hydro in mini-grids and institutional biogas.

Finally, it is particularly important to assess what is working for the scaling up of improved cookstoves, because they are an obvious potential win-win intervention. A previous generation of improved cookstoves initiatives fared badly, because there was too much emphasis on technical design, often taking place in labs, and not enough on behavioural aspects, desirability and affordability. The sector has been re-energised, partly because of the climate issue and the possibility of carbon finance (at least in theory) and the involvement of some major corporates, including Shell, Bosch Siemens, Phillips and BP. At the same

time, two recent initiatives have increased momentum: the Global Alliance for Clean Cookstoves (GACC) and the government of India's re-launched programme on improved cookstoves. A new wave of producers, coming through in the last 5–10 years, appears to be more successful (see examples in Box 8), although some are still at a pilot stage. According to studies by GVEP and the World Bank, experience points to a number of factors critical to scaling up the use of cookstoves (Rai and Macdonald 2009; World Bank 2011a):

- **Getting the product right for the specific market, with user involvement in design, is important.**
- **Donor support has been important for supporting large-scale commercialisation, although different actors should be aware of all actions in the market and avoid undermining each other.**
- **Small-scale renewable energy funds offer a good model for supporting cookstoves.**
- **Social entrepreneurs are able to reach the poorest, often using links to micro-finance.**

6.2 Leveraging private sector finance

The issue of finance for low carbon energy goes beyond provision of off-grid low carbon energy products through SMEs and CSOs, and applies more widely to expanding power grids in a low carbon way, and helping industry make the transition to a low carbon development path.

A basic problem is that in many countries, including all LICs, the financial sector is thin and underdeveloped. Even good projects find it hard to obtain loans, and equity is even harder. Many projects will be dependent on foreign finance.

Beyond the sheer availability of finance, there is the question of how to encourage investment into low carbon opportunities. Investors make decisions on the basis of risk-adjusted returns, and so there are two potential problems with securing finance for low carbon investments in developing countries:

1. The first is that returns are not high enough. In the absence of carbon pricing, at least in the short term, support policies for low carbon energy, including energy efficiency trading schemes and feed-in tariffs for renewable energy, or even just grants, will be essential to attract private capital. In countries where alternative uses of capital have very high returns and short payback periods,[27] it may also be necessary to complement support mechanisms with additional financial tools, such as subordinated equity.
2. The second is that risk is too high. Even with a supportive policy framework, many potential low carbon projects in developing countries will look too risky to attract backing, either at all, or only at a prohibitively high cost of capital.

There are a range of real or perceived risks that raise the cost of capital for potential projects, or make it unavailable (see Table 3), including those generic to developing countries such as political risk, currency risk and counterparty risk, and those more specific to low carbon investments, such as policy and regulatory risk, technology risk, execution risks (especially where supply chains are undeveloped) and unfamiliarity risks reflecting the fact that investors may not know anything about the kind of project or the associated business model (which itself may not be tested) and that acquiring that knowledge takes time and incurs a cost.

Public finance can be used to leverage private finance by addressing these risks. The emphasis on risk reduction avoids problems of excessive subsidy. There are a number of approaches, including guarantees or insurance to reduce risks for debt financing, and keystone and subordinated stakes for equity financing. In a keystone approach, a public institution (for example, an MDB or donor) takes an initial equity stake in a project, to give confidence to private sector investors, and signal the viability of the project. In a subordinated equity approach, the public institution puts in equity on a first in, last out basis, ensuring private investors that repayment of their stake will receive priority over that of the public institution.

Table 3 Matching type of leveraging tool to type of risk and context

General vs. specific to low carbon investments	Type of risk	Example of de-risking/leveraging tool	Nature of environment
Low carbon specific investment risk	Unfamiliarity risk	Equity funds, advanced market commitments	Politically stable, strong institutions
	Technology risk	Subordinated equity fund, demonstration projects	
	Execution risk	Equity pledge funds	
	Policy or regulatory risk	Policy insurance	
	Currency risk	Forex liability facility	
	Counterparty risk	Loan guarantees	Politically unstable environment, dysfunctional institutions
Generic investment risk	Political risk	Loan guarantees	

Source: Adapted from Brown and Jacobs (2011).

Reducing equity risk is a particularly effective way of leveraging private finance, because a small stake can not only bring in other equity, but that equity can then be used as the basis of attracting debt. Most infrastructure projects will be financed by a mix of equity and debt in a ratio of between 20/80 or 30/70. Thus, while definitions vary, these mechanisms can be expected to leverage in between two and ten times the volume of private capital. Different risk reduction mechanisms are suitable for different types of risk and different contexts (see Table 3).

Loan guarantees and policy insurance will be needed in politically unstable contexts where institutions and regulatory oversight are weak. In more stable contexts, equity mechanisms will be appropriate for mitigating technology and unfamiliarity risks (both of which should diminish over time for low carbon investments). Technology risk can also be helped through publicly funded demonstrations and procurement, getting technologies through the 'valley of death' inherent in the innovation process. Execution risk (and other risks more broadly) can also be reduced through public policies, such as improving infrastructure in general.

Many of these approaches are in widespread use, especially by the MDBs (for example, through the World Bank's Clean Technology Fund, which in June 2011 was providing $4.35 billion in funding in 12 countries).[28] The ADB's Clean Energy Fund and Clean Energy Financing Partnership Facility currently leverage total finance of $1.1 billion from investments of $80 million. The UK is working with the ADB to share risks with a commercial lender in India to provide lower cost loans to Indian solar farm developers. This is expected to stimulate an estimated £265 million of private sector investment in solar power capacity. Other actors active on leveraging private finance for renewable energy include Germany's KfW and the US's OPIC. A new proposal to maximise the potential for leveraging private finance for low carbon investments is the Climate Public Private Partnership (CP3) (see Box 10).

Currently almost 80 per cent of public climate finance currently goes to mitigation, excluding

reforestation and avoiding deforestation (which receives 6 per cent), much of which is focused on energy.[29] The large funds, including the Hatoyama International Climate Fund ($11 billion) and the Clean Technology Fund ($4.5 billion), support a mix of large-scale energy efficiency and renewable energy projects, with the majority of funding going to the latter. The Hatoyama Fund is quite heavily focused on China and India, and while the Clean Technology Fund is more widely disbursed, none of it flows to low-income countries.[30] Unleveraged private finance in low carbon investments in developing countries is likely to flow to MICs, especially Asian MICs and to China in particular, and to the energy and industrial sectors, so public finance leverage is currently reinforcing market based flows. There is therefore a strong case for bilaterals to focus their efforts on leveraging private finance into a wider range of countries, and encouraging global climate funds to do likewise.

Box 10 CP3

DFID, together with the ADB and the IFC, has launched a Climate Public Private Partnership (CP3) Fund that aims to tackle a number of risks and other barriers to private finance simultaneously. DFID and the MDBs will act as strategic equity investors, attracting private institutional partners, buying into projects via a Fund investment platform. At the same time, CP3 will coordinate the use of existing risk mitigation instruments to leverage in additional debt. DFID will also provide technical assistance to support project development. The aim is to use a small amount of public finance to leverage in private equity finance, and then in turn, private debt. CP3 is expected to mobilise investments that will generate more than 7,000 megawatts of clean, reliable energy.

Source: Brown and Jacobs 2011; www.dfid.gov.uk/News/Latest-news/2012/Private-investment-to-help-tackle-climate-change/.

25 In many urban and peri-urban areas where there are distribution lines, willingness to pay for electricity is likely to be low, as households may be accessing it illegally for free.
26 Shell Foundation (2010) notably reports scale-up success by supporting only new ventures.
27 In Indonesia for example, investors expect an internal rate of return in the region of 25–40 per cent, with capital payback within 3–4 years.
28 See Clean Technology Fund Semi-Annual Report 2011, www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF%204%20Semi-Annual%20Report%20on%20CTF%20Operations%20june2011%2068.pdf (accessed 26 February 2012). This excludes a conditional investment of $250 million in Nigeria and includes a regional CSP project.
29 See www.climatefundsupdate.org (accessed 12 January 2012).
30 Data from www.climatefundsupdate.org/ (accessed 26 February 2012).

7 Critical dimensions of low carbon energy and development

Identify opportunities within poverty reduction strategies for reducing carbon emissions at low cost and assess political and institutional feasibility

Tools such as marginal abatement cost curves are important to guide identifying opportunities, but understanding political economy, leverage and the best way to deliver climate finance will also have a major bearing.

Seek poverty outcomes through direct and indirect pathways

Some interventions will directly reduce both poverty and emissions. However, there may also be some big opportunities for emissions reduction that also have major potential benefits for poor people, but which have an indirect pathway to impacts, and need complementary policies or planning.

Recognise risk and invest in innovation to achieve transformation

Successful low carbon development will transform an economy, but will involve taking risks. Risky interventions should be taken where there is a good chance of success, but there could be a better evidence base to make such judgements, and better indicators to measure political and institutional transformations as well as the outcome of tonnes of carbon abated.

Develop a good understanding of the political economy

A good understanding of the political economy of development is key, for engaging governments on the importance of LCD, for power sector or fossil fuel subsidy reform, for minimising project corruption risk and for distinguishing rhetoric from ability to deliver.

Identify the right balance of funding mechanisms – via MDBs, vertical funds and direct funding – for your context

There are pros and cons on both sides. MDBs have specific expertise, may have greater traction with governments and often have large projects ready to go, but can also be slow to disburse, and hard to hold to account. Direct funding allows learning and innovation, but carries other risks.

Address the constraints faced by SMEs in scaling up markets for low carbon energy

In some places it may be the lack of a scalable business model, in other places this may exist, but financing is the problem, or access to technological skills and supply chains. Working directly with the private sector is a way to accelerate learning.

Use the full range of tools to mitigate the risks preventing private finance being invested in low carbon development

There is a range of mechanisms for reducing risk and improving the flow of finance for low carbon investments in developing countries. Donors have increasing knowledge about finance and risk, and the MDBs have considerable experience but all public institutions have a shortage of deal-makers.

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