Review of available information on how the CDM can produce greater benefits for poor people

Jeremy Doyle
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Report summary

This report has been produced in response to an Evidence on Demand Help-Desk request. It supports a proposed DFID project business case to increase the flow of international carbon finance to Least Developed Countries (LDCs) – with a focus on Africa – to support poor peoples' access to clean energy.

The report highlights the major barriers and reflects the broader market context in which Clean Development (CDM) projects operate. Conventional barriers to private sector investment in clean energy access are as important as CDM-specific barriers. There is some project evidence but no systematic analysis that CDM projects improve energy service affordability within CDM project boundaries. There also evidence but no systematic analysis of poor peoples' and community involvement in the selection of technologies through the CDM. Findings take account of the voluntary carbon market, which usually aim to show high sustainable development benefits, including energy access.

Relevant recommendations for supporting benefits for poor people and communities through the CDM include:

- Collaborate with other market-based mechanisms;
- Identify "positive lists" to simplify CDM additionality assessments;
- Encourage the increased development of projects with high co-benefits, e.g. household-level service projects;
- Stimulate collaborative and local technology innovation;
- Enhance the CDM accounting of suppressed demand for energy services;
- Simplify CDM procedures for household-level services and public services;
- Introduce a new grant scheme and expand the existing loan scheme; and
- Finance CDM institutional capacity in under-represented countries.

Acronyms

ACP	African, Caribbean and Pacific countries (associated with EU)
CDCF	Community Development Carbon Fund
CER	Carbon Emissions Reductions
CDM	Clean Development Mechanism
CO_2	Carbon dioxide
DFID	Department for International Development
DOE	Designated Operational Entity
DNA	Designated National Authority
EE	Energy Efficiency
EU	European Union
GHG	Greenhouse Gas
GS	Gold Standard
KP	Kyoto Protocol
NGO	Non-governmental Organisation
O&M	Operation and maintenance
PDD	Project Design Document
PV	Solar Photovoltaic
SHS	Solar Home System
TA	Technical Assistance
tCO_2e	Metric tonnes of carbon dioxide equivalent
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VCM	Voluntary Carbon Market
IFC	International Finance Corporation
MDB	Multilateral Development Bank
WB	World Bank

SECTION 1
Introduction

Overview

The Clean Development Mechanism (CDM) is a market mechanism of the UN Framework Convention on Climate Change (UNFCCC) Kyoto Protocol, agreed in 1997, to reduce greenhouse gas emissions (GHGs). But the mechanism is currently in crisis.[1] The price of Certified Emissions Reductions (CERs) has fallen from a pre-economic downturn high of US$20 to little more than US$3. Falling industrial activity in the North and too-generous emissions quotas has cut demand for CERs.

The CDM aims to reduce emissions and at the same time support sustainable development (SD). Host countries approve CDM projects based on national SD criteria. According to available literature, the broad SD impacts of the CDM remain unclear. But there is some agreement (although views are mixed) that the CDM has broadly met its basic aims: establishing an international project creation and trading mechanism for catalysing reduced emissions, investment in clean energy, technology transfer and sustainable development.[2]

SD indicators from 4,000 CDM projects mostly cite stimulation of the local economy (job creation, poverty alleviation). Reduced pollution, promotion of renewable energy and energy access also feature strongly. Despite depressed CER prices, statistics reveal that 2011 showed an increase in CDM activity in LDCs, including in Africa. Programmes of Activities (PoAs) allow for smaller projects to proceed, are increasingly being developed and seem suited to African countries. [3]

Project Objectives

This report is the response to an Evidence on Demand Help-Desk request. It supports a proposed DFID project business case to increase the flow of international carbon finance to Least Developed Countries (LDCs) – with a focus on Africa – to support poor peoples' access to clean energy. Within the above context, this paper interprets available public information to examine specific aspects of the CDM:

- What are the barriers preventing the CDM from supporting clean energy access[4] for poor people and communities (Section 2);
- CDM project experience, including whether they have improved the affordability of services for poor people and communities and involved communities in technology choices (Section 3); and
- What would make the CDM more effective in delivering such benefits (Section 4).

[1] CDM Policy Dialogue (2012a)
[2] Bumpus (2012)
[3] UNFCCC (2012a), Burian (2011)
[4] The definition of "energy access" for the purposes of this report is based on the UN Secretary General's Sustainable Energy for All (SE4ALL) Global Tracking Framework – see SE4ALL (2012). It includes energy services for three user groups; households (electricity and cooking services), enterprises, and community services.

SECTION 2
Barriers to CDM projects

Description of CDM barriers

Barriers to the deployment of clean energy and other technologies for poor people and communities run deeper than carbon finance considerations. Conventional market barriers in developing countries are equally if not more important than CDM specific barriers.

There is a large and increasing body of evidence showing the range of barriers preventing improved access to energy in particular. The UN Sustainable Energy for All Initiative has raised the sector's profile and intensified efforts to assess the way forward.[5] Markets for the poor, including energy, typically have a high risk profile with low returns. Financing costs, corruption, policy and the lack of end-user finance consistently emerge as conventional barriers preventing progress. [6]

Regarding the role of the CDM, there is more evidence on the general barriers to implementing CDM projects than on those that specifically relate to benefits for poor people or energy access. The table below outlines commonly cited CDM-specific barriers. [7]

Table 1 - Barriers to CDM implementation

Technology Barriers	Technology not known Technology availability Technology reliability Adaptation of technology to suit local conditions Infrastructure requirements Scale of operations
Financial Barriers	High cost of technology Finance availability Transaction costs
Institutional Barriers	Capacity of DNA Large time lag for registration Frequent changes in UNFCCC methodology Change in local government policy
Market Barriers	Resource pricing Technology replication potential
Other Barriers	Lack of trained manpower to manage, operate and maintain equipment Limited number of DOE and verification agencies Lack of awareness amongst stakeholders Low Research and Development capacity

Of all the various barriers identified, aside the low price of CERs, there is some evidence that the main CDM barriers are:[8]

[5] IEA (2012)
[6] Wilson (2012), Watson (2011)
[7] UNEP (2010), CDM Policy Dialogue (2012b)
[8] UNEP (2010)

a) Bureaucracy/complexity of the CDM;

b) High CDM transaction costs; and

c) The need for project scale (to be economically viable).

Programmes of Activities (PoAs) attempt to overcome these critical barriers and have started to meet with some success in terms of the number and range of project types.

CDM barriers in the context of energy access benefits for poor people and communities

It is clear that the evaluation of barriers for Clean Development Mechanism (CDM) implementation is extremely challenging.[9] Assessing the barriers in relation to a specific CDM sub-sector (clean energy for households and communities) is even more difficult. To the author's knowledge a systematic assessment beyond small groups of countries or specific technologies has not been completed.

Of the evidence available, for instance in the sub-sector relating to cookstoves, impacts at scale through stove programs are possible through the CDM, but can introduce mutually supported impediments: that is progress towards one set of program objectives, directly compromises progress towards other objectives.[10]

Yet barriers to market development are very different locally. Analysis should cover a wide range of factors at a country level to determine the way forward, including Perceived Corruption Index, Doing Business Ranking and abatement costs/potentials.[11]

Much evidence on to increasing energy access for poor people and communities relates to "conventional" financing, policy and capacity barriers, with carbon finance (including CDM), a relatively minor or apparently irrelevant consideration.[12] It is likely that this absence of attention reflects the historical lack of CDM projects in energy access as well as low future expectations of carbon prices and thus project activity.

It is likely though, that the three main barriers - a) to c) above - may be especially important for energy access type CDM projects which by nature are small scale, distributed and already face major conventional project and/or market risks that are prevalent in developing country contexts.

The complexity associated with energy access benefits for poor people and communities extends to the understanding of abatement potential. CDM is only likely to be feasible where there is a combination of reasonably large national/regional abatement potential, coupled with the right investment conditions, including higher market prices for CERs.

[9] Burian (2011)
[10] Bumpus (2011)
[11] Burian (2011)
[12] IEA (2012), SE4ALL (2012), Watson (2011), Practical Action (2012), UNDP (2011a), UNDP (2011b), UNEP (2009), BNEF (2012), Wilson (2012) Addy-Nayo (2012) and others.

SECTION 3
CDM project experience

Types of CDM projects implemented

The majority of studies on the impact of the CDM agree that it has a positive impact on sustainable development in the host countries. Yet it is well documented that the CDM has had a very limited impact on increasing access to energy services. This is thought to be changing with the growth of programmes of activities (PoAs) focused on basic energy services and efficiency. [13]

In short, energy access sectors have been generally under-represented amongst the full range of industrial, chemical, transport, energy and agriculture CDM projects as shown below.

Table 2 – Registered CDM Projects in clean energy access sub-types[14]

Type	Sub-type	No registered projects	No kCERs issued
Energy Distribution	Connection of isolated grid	1	316
Energy Efficiency: Households	Lighting	30	89
	Stoves	9	46
	Lighting, insulation and solar	1	-
Energy Efficiency: Service	Water pumping	1	-
	EE public buildings	3	-
Methane Avoidance	Domestic manure	16	181
Solar	Solar PV[15]	149	94
	Solar lamps	1	-
	Solar water heating	6	-
	Solar cooking	17	104
	Total clean energy access	234	830
	Total (all CDM projects)	5,547	1,154,664

There is also some experience in voluntary carbon market (VCM), which operates in parallel to the "compliance" CDM market. In 2011, Africa became the third-largest supply location for transacted credits – attracting $US 60m to projects in the region. This reflects voluntary buyers' consistent demand for Africa-based projects, and the broader carbon markets' intensifying focus on sustainable development objectives.[16]

In the VCM, demand for emissions offsets is discretionary and there is a stronger buyer preference for renewable energy projects: positive development impacts are easily

[13] Spalding-Fletcher (2012)
[14] Reference - CDM Pipeline data (www.CDMpipeline.org) – updated 1 January 2013. Relevant sub-types with no registered projects are not included in table 1.
[15] Includes utility and community/household projects
[16] Peters-Stanley (2012)

understood and saleable.[17] This is less the case in the compliance (CDM) market, where the market has typically focused on the most economic, large scale projects in middle income countries.

Project examples

In the absence of analysis in the literature on affordability and technology choices, the following selected examples[18] serve to illustrate the range of existing CDM projects that deliver at a household or community level.

These examples aim to show the range of implemented CDM activities relevant to the scope of this report. The examples highlight whether there is evidence for a) improved affordability for households[19] and b) local technology selection. Evidence is largely taken from the project development phase (CDM PDD documents) rather than from impact assessments, which are generally not yet available.

First of all, there is good evidence that **improved cookstoves** have shown a large abatement potential and low abatement costs. For some countries the net present value is positive (DRC, Malawi, Mozambique, Senegal, Tanzania and Uganda).[20] This may improve sustainable use of natural resources (fire wood) and could even become self-reliant in the medium-term.

This sector might be suited for regional cooperation (transnational PoAs) or a regional carbon facility.[21] At the domestic level, biogas projects and solar water heaters have also featured in past CDM projects. Table 3 provides examples:

Table 3 – Examples: improved cookstoves, solar water heaters and biogas

Country/project	***Type/sub-type***	***Improved Affordability***	***Local Technology Selection***	***Reference***
Nigeria: Efficient woodstoves (GS project)	EE Households /stoves	Yes	No	PDD
South Africa: Kuyasa Low-cost Urban Housing Energy Upgrade Project	EE Households/ Lighting & insulation & solar	Yes	No	PDD, Addy-Nayo (2012)
Nepal: Biogas support programs 1-4 (GS project)	Methane Avoidance /Domestic Manure	No	Yes	PDD
China: Federal Intertrade Pengyang Solar Cooker Project	Solar/ solar cooking	Yes	No	PDD

The first project in this list (Nigeria) is explored in more detail in the box below.

[17] PAC (2009)
[18] Only examples of "registered" CDM projects are used. Independent references are used where available, otherwise the project PDD is used for reference
[19] "Improved affordability" here means direct beneficiaries of the project, not wider effects on market prices
[20] Arens (2011)
[21] Burian (2011)

Box 1 - Making cookstoves affordable and saving and woodfuel costs in Nigeria

In February 2012, the UNFCCC approved the Programme of Activities (PoA) 2067 in Nigeria for improved cookstoves using biomass. The PoA could disseminate up to 100,000 cookstoves over the next 5 years, yielding emission reductions of up to 250,000 tCO_2e annually. The first of three registered CDM Programme Activities (CPAs) under the PoA 2067 has a target of 15,000 SAVE80 stoves in use through to the end of 2017.

Like most clean energy technologies, the SAVE80 stove is relatively costly for the user to buy (EUR 120). Users do not usually have cash or access to credit making it unaffordable for average Nigerian households. Similar activities in the region have been implemented with grants, (e.g. UNHCR provided finance for SAVE80 systems to refugee camps in Chad). This CPA will reduce the cost of the stove for the user, through the CDM. The project also offers favourable payment terms for users. The stoves use 80% less wood fuel than a traditional stove, substantially cutting user fuel costs.

Sources:
http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/7R1B09HSJV3FKIZYCA4D6XQOETP5GN/view
http://ccap.org/climate-finance-works-in-nigeria/;
http://www.environewsnigeria.com/2012/10/07/save-80-stove-curbing-desertification-carbon-emission/

As much as 55% of all new electricity generated by 2030 will need to come from off-grid and mini-grid sources to achieve universal energy access.[22] Therefore **rural electrification, including solar home systems, solar lamps and other decentralised electricity systems** are of major interest. See examples in table 4:

Table 4 – Examples: household and community electricity

Country/project	***Type/sub-type***	***Improved Affordability***	***Local Technology Selection***	***Reference***
India D.Light rural lighting project	Solar/Solar PV	Yes	No	PDD
Rwanda: Electrogaz Compact Fluorescent Lamp (CFL) distribution project	EE Households/ lighting	Yes	No	PDD
Guyana: Hinterland Electrification Program.[23]	Photovoltaic	Yes	Yes	PDD, IIED (2009)

Energy for **community services and productive uses** can include water supply, industrial processes and so on. The importance of such projects is not simply in the services they provide, but also in terms of boosting incomes to sustain energy services in future.[24]

[22] IEA (2011)
[23] BNEF (2012) Note: this example is linked to Low Carbon Development Strategy (LCDS) and REDD programme supported by government of Norway, linked to a carbon price but not a CDM project
[24] Practical Action (2012)

Table 5 - Examples: energy for community services and productive uses

Country/project	*Type/sub-type*	*Improved Affordability*	*Local Technology Selection*	*Reference*
Bangladesh: Improving Kiln Efficiency of the Brick Making Industry	EE Industry/building materials	Yes	Yes	PDD
Rwanda: Natural Energy Project: Water Treatment Systems for Rural Rwanda	Solar/water disinfection	No	No	PDD
Pakistan: Community-Based Renewable Energy Development in the Northern Areas and Chitral (NAC)[25]	Hydro/run of river	No	Yes	PDD

Carbon standards

Several initiatives, including most prominently the Gold Standard (GS) and the Community Development Carbon Fund (CDCF) have been launched to support voluntary and compliance market projects that meet specific sustainable development criteria. The GS label rewards best-practice projects while the CDCF focuses on promoting CDM activities in underprivileged communities. [26]

The GS "list" only allows **renewable energy and end-use energy efficiency projects**.[27] The aim is to focus efforts on projects that are seen as most important for climate change mitigation and most likely to contribute to sustainable development, screening out project types that are seen to have a limited potential to contribute to these objectives. The GS "list" may be considered arbitrary and ignore broader sustainable development goals. Furthermore, in some cases, the additional cost of GS accreditation does not pay off economically.[28]

The evidence for the effect of these schemes is mixed, with analysis usually based on small samples. However, there is the GS and CDCF projects have been found to performed better on social criteria while regular CDM projects perform better on economic criteria.[29]

Assessments of these schemes, much like other assessments in relation to CDM experience cover a wider range of project types than those of interest in this report (clean energy access). The limited lessons learned should be taken in context.

Making technologies more affordable and community involvement in technology selection

There is project evidence, for example in some of those projects listed in tables 3-5 that individual CDM projects have often served to subsidise direct participants in the projects. For example, in Nepal, depending on the system size and location, a biogas plant costs between US$251 and $393. The high up-front investment cost is a barrier for poor farmers, making

[25] Domestic electricity access and community/productive uses
[26] UNFCCC (2012a)
[27] The GS reports 45m tonnes CO2e issued/pending, with 99 registered projects, of which 40% are compliance (CDM) projects and 60% are voluntary market projects (data April 2012 - http://www.cdmgoldstandard.org)
[28] Sterk (2009)
[29] UNFCCC (2012a)

the subsidy an essential economic incentive. Subsidies, supported by the CDM, ranged from US$67 to US$113 per unit.[30] Also see box 1 above.

But there is little analysis to show that CDM projects themselves have had a significant impact on the broader affordability of energy products and services outside of the project boundary.

Other factors are more usually cited for driving changes in costs of access to clean energy services, including national policy, finance, regulation, industrial development and trade policies.[31] It is very likely that CDM projects have enabled some private sector actors to test and enter markets that would be uneconomic without carbon finance. As an example, in India, international solar lamp manufacturer D.Light has plans to sell one million solar systems in the Indian states of Uttar Pradesh and Bihar, where as many as 89% of rural households use kerosene for lighting. The company claims that the required price level can only be achieved through additional revenues from the CDM project activity.[32]

In respect of technology selection, some projects, as indicated above, highlight community involvement in the selection of technology. This typically occurs as an aspect of CDM project developers' normal market research and business planning processes. There is evidence of the involvement of consumers and other stakeholders in the approval of proposed technologies through the CDM project design process and this is often referred to in PDDs. Yet products and services made available through CDM projects are as demand-driven (or not) as any other market in developing countries.

Each year, the poor spend $37 billion on poor-quality energy solutions to meet their lighting and cooking needs. There is good evidence of service demand and some evidence of new thriving energy technology markets – with and without the benefits of CDM finance. International social enterprises, SMEs, domestic conglomerates and multinational companies are selling superior energy access options to households spending as little as US$2 on lighting and US$1.50 on fuels per month.[33] These companies are providing solar lanterns, solar home systems, improved biomass cookstoves as well as community min-utilities and grid-based electrification for new customers in previously un-served urban areas. Amongst these, the solar lighting market (often replacing kerosene lighting) is a particularly strong example with sales in sub-Saharan Africa growing by more than 300% in 2008-2012 and CDM projects in Morocco and India.[34]

[30] See Project design documents (PDDs) for BSP Nepal, e.g. https://cdm.unfccc.int/Projects/DB/DNV-CUK1132671435.09/view

[31] Watson (2011)

[32] Reference D.Light project PDD at http://cdm.unfccc.int/Projects/DB/TUEV-SUED1245158196.62/view

[33] IFC (2012)

[34] http://www.economist.com/node/21560983; http://www.lightingafrica.org/african-lighting-market-records-explosive-growth-ifcworld-bank-study.html

SECTION 4

Increasing community and household benefits

CDM and Sustainable Development

CDM reform work includes enhancing its sustainable development (SD) outcomes. The way SD is treated is much broader than the subject of this report: clean energy access for poor people and communities. Yet the proposed options are important and would of course have a significant bearing on clean energy access. It is notable that social benefits from CDM projects tend to be cited (or possibly required of projects) less often than economic and environmental benefits in all countries.[35]

Options under discussion for improving SD benefits[36] are not within the scope of this paper, yet the potential to deliver clean energy access for poor people and communities will inevitably be shaped by how SD indicators are addressed under CDM reform.

Relevant recommendations related to energy access for communities and households

There is significant potential for carbon finance to support clean energy access for communities and households. The sectors with significant potential (within the Africa and LDC context) are agricultural residues, forest residues and the distribution of energy efficient cooking stoves.[37] These offer major potential household and community benefits. Yet few of these types of project have been implemented to date (see table 1), LDC countries usually have higher priorities than least cost emissions abatement[38] and there is limited systematic evidence of the emerging household and community benefits.

The current status of the CDM is very challenging due to low demand for CERs and low CER prices. As described in previous sections, experience both in CDM projects and in the debate relating to universal energy access,[39] shows that conventional project risk/return issues are pivotal in determining the willingness of the private sector to invest.

The most authoritative recommendations on changes to the CDM include those of the recent High-Level Panel (HLP) on the CDM Policy Dialogue, which in 2012 recommended 51

[35] UNFCCC (2012a)
[36] Boyd et al (2009), Spalding-Fletcher (2012)
[37] UNFCCC (2012b) Also Burian (2011) – potential in 11 LDC countries in sub-Saharan Africa across 16 CDM major CDM sectors. Assessments differ, but usually find similarly large theoretical potentials in sectors linked to household and community levels.
[38] UNFCCC (2012b)
[39] The unabated impact of providing universal energy access would increase global emissions by only around 1%. The broader sustainability benefits of clean energy access may nevertheless be significant UNFCCC (2012a, b), IEA (2011)

actions across 12 areas to address the crisis in international carbon markets and to make the CDM fit for the future.[40]

The recommended actions are comprehensive for all CDM project types. However, the following recommended actions are particularly relevant to the scope of this paper (numbering in brackets is as per the HLP report, bold text added by author):

Set robust standards to enable linking and harmonization (3)

- Actively seek opportunities for **collaboration with other market-based mechanisms**, including…at the national level, around common functions such as standard-setting, accreditation, registration and issuance, capacity-building, and communication (3.2)

Implement standardized methods for assessing additionality (5)

- Identify **positive lists** to simplify additionality assessments for project types and contexts where there is a low risk of non-additionality (5.2)

Strengthen co-benefits and enhance the scope of energy technology (7)

- Encourage the increased development of projects with high co-benefits (e.g. **household-level service projects**), including through simplifying requirements, standardizing registration and issuance procedures, and using positive lists (7.1).
- Stimulate collaborative technology development and **local technology innovation** (7.4).

Encourage greater access to the CDM for underrepresented regions (8)

- Enhance the accounting of suppressed demand for energy services, so as to **increase the potential for participation in the CDM in low-income countries** with currently low levels of emissions. (8.2)
- Accelerate the development of standardized parameters, including baselines, and **simplified procedures for household-level services (e.g. electrification, water purification, sanitation, cooking) and public services (mass transport, lighting and municipal renewable energy programmes)** (8.3)
- Introduce a **new grant scheme** and expand the existing **loan scheme** to further reduce financial barriers to the implementation of CDM projects (8.4)
- Mobilize finance towards **building capacity** for hosting CDM projects in underrepresented countries. (8.5)

[40] CDM Policy Dialogue (2012b)

SECTION 5
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