Innovative Financing Models for Energy Poverty Alleviation

Tools for Strategic Approaches

▪ Silvia Araya ▪ Edda Dankmeyer ▪ Pierre Naviaux ▪ Petra Perreca ▪

Final Project

July 2009
International Master in Sustainable Development & Corporate Responsibility
EOI - Escuela de Negocios, Madrid, Spain

A. ACKNOWLEDGEMENTS

Throughout these three months many people have assisted us during various stages of the project. We would like to particularly acknowledge the following people, since without them, writing this thesis would have been impossible.

To our tutor Mariano Molina Martín, Project Manager at ENRESA and collaborator at Energía sin Fronteras, thank you for guiding us throughout this project, for our weekly meetings and brainstorming sessions, and for sharing your experience in important energy issues.

Thank you to our IMSD teachers, most importantly to Sean Ansett, Maryse Labriet and Leda Stott for the very valuable insights you provided us in this Master course, respectively in CSR, CDM and Development.

Thank you to Julio Eisman, Director of Fundación Acciona Microenergía, for taking the time to discuss small-scale energy projects and their financing.

We are grateful to Christian Merz, Sustainability Manager at OSRAM GmbH, for taking the time to give us an in depth insight into the off grid project in Kenya.

Our sincere thanks to our Program Director Eva Curto Izquierdo and the EOI staff, especially María Lopez and Charlotte Francon for their daily support and care during this year.

We would also like to thank Michele Perreca for helping us elucidating some Excel mysteries.

Finally, we would like to give a special thanks to our families for their support and to our wonderful IMSD colleagues.

LIST OF ACRONYMS

AC- Alternating current
AREED- Africa Rural Energy Enterprise Development
ATE- ABB's The Access to Electricity program
BoP-Bottom of the Pyramid
BREED- Brazil Rural Energy Enterprise Development
CBOs- Community Based Organizations
CDM- Clean Development Mechanism
CDM_SAT-The Clean Development Mechanism Self-Assessment Tool
CEPE- Centre for Energy Policy and Economics
CESI- Clean Energy Development Initiative
CER- Certified Emission Reduction
CREED- China Rural Energy Enterprise Development
CSR- Corporate Social Responsibility
CSR PAT- The Corporate Social Responsibility Project Assessment Tool
DC- Direct Current
DMSP - Defense Meteorological Satellite Program
DNA- Designated National Authority
E+Co- Energy through Enterprise
ECS- Electrical Cooperative Societies (community-based energy committees which manage micro-hydro schemes, Sri Lanka)
ELSAT-The Energy Lending Self-Assessment Tool for micro financing.
ERPA- Emission Reduction Purchase Agreement
EsF- Energías sin Fronteras
ESMAP- Energy Sector Management Assistance program
EUEI- European Union Energy Initiative for poverty eradication and sustainable development
FHI- Food for the Hungry International
GEF- Global Environment Facility
GDP- Gross Domestic Product
GHG- Greenhouse gas
GS- Grameen Shatki
GTCs- Grameen Technology Centers
HDI- Human Development Index
IEA- International Energy Agency
IMF- International Monetary Fund
KfW- German promotional bank for worldwide sustainable development
MDGs- Millennium Development Goals
MFIs- Microfinance Institutions
MNCs- Multinational corporations
MOU- Memorandum of Understanding
M-US- Micro-utility system
NGO- Non-Governmental Organization
NOx- Nitrogen Oxide
ODA- Official Development Assistance
OECD- Organization for Economic Cooperation and Development
OLS- Operational Linescan System
O-Hub- Osram Hub
pCDM- Programmatic CDM
PoA- Program of activities
PV- Photovoltaic
RCCs- Rural Credit Cooperatives
REED- Rural Energy Enterprise Development
RET- Renewable Energy Technologies

SEEDS- Sarvodaya Economic Enterprise Development Services, Sri Lanka
SEEP- Small Enterprise Education and Promotion Network
SD- Sustainable Development
SHSs- Solar Home Systems
SMEs- Small & Medium Enterprises
tCO_2- ton of carbon dioxyde
TNC- The Nature Conservancy
UN- United Nations
UNEP- United Nations Environment Programme
UNFCCC- United Nations Framework Convention on Climate Change
W- Watt (**MW-** Megawatt)
Wp- Watt-peak
Wt- thermic Watt
WB- World Bank
WEC- World Energy Council
WEO- World Energy Outlook
WTP- Willingness To Pay
WWF- World Wide Fund for Nature

B. TABLE OF CONTENTS

C. INTRODUCTION

Energy and electricity are highly overlooked commodities in the developed world. On the other hand, in the developing world, 1.6 billion people remain without access to electricity and 2.5 billion people do not have modern energy services to fulfill basic needs such as cooking and heating. If no extraordinary measures to promote electrification in poor countries are taken and current trends stay as they are, approximately 1.4 billion people, i.e. 22% of today's world population, will still not have access to electricity by 2030. In order to enable change, an approximate total investment of US$5.665 trillion is needed in developing countries between 2001 and 2030, while prospects of alleviating global energy deprivation through traditional public and private schemes are disturbingly low.

The urgency of this challenge increases with the recognition of energy as a pre-requisite for the achievement of the Millennium Development Goals. Additionally, providing energy to all world citizens is not only a matter of funding, it is also a question of appropriate implementation in order for improvements to be sustainable in the long-term and have a genuine impact on the lives of billions of people currently living "off-the-grid". Ground-breaking interventions such as innovative and flexible business and financing models are imperative if society is to eradicate world energy poverty.

The overall goal of this project is to create awareness about the main challenges for world energy access and to assist agents of change in driving a paradigm shift in our society: the alleviation of energy poverty. The specific objectives of this study are:

1. To gain a better understanding of the worldwide energy access and financing *status quo*, as well as the relation between sustainable energy and international development.
2. To examine small-scale modern energy access projects implemented through innovative business models and financing schemes, and analyze their potential in helping breach the energy access and financing gaps.
3. To design and propose specific tools that create added value and help determine best options and suitability for the implementation of each mechanism presented: Corporate Social Responsibility (CSR), Clean Development Mechanism (CDM), and Microfinancing.

For the purposes of this study, financing schemes of energy access projects were assessed at two different levels: 1. Project funding and 2. Product/Service financing.

A comprehensive analysis of the partnerships, contexts, characteristics, prospects, challenges, and impacts associated with energy poverty alleviation projects in regards to CSR, CDM and Microfinance; as well as a thorough literature review and interviews with relevant actors in the field were carried out. Case studies were chosen according to qualitative criteria, rather than geographical distribution or variety of actors. Findings were analyzed and organized, subsequently serving as the basis for the design of a set of tools for strategic approaches, which are presented in this document.

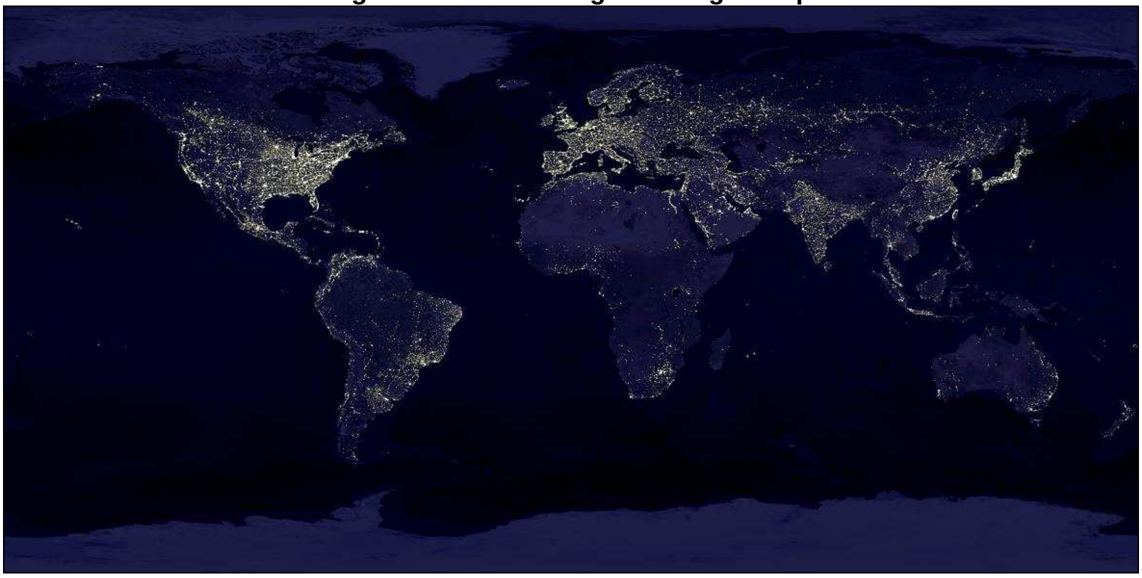
These proposals are intended to offer an insight, raise questions, promote debate concerning pertinent issues, and serve as practical tools for key practitioners, decision makers and other relevant stakeholders. They have been designed for self assessment, and are aimed at serving as a guide, not to provide exact answers or scientific measures of performance, since the uniqueness of each project calls for individual adaptations and the appropriate evolution to meet users' needs and expectations.

1 Sustainable Energy for Development

1.1 The Energy Access Challenge

Energy and electricity are highly overlooked commodities in the developed world. Indispensable for everyday activities as they are, to a point where it is hard for some to imagine how life would be without them, access to energy and electricity are considered so basic in high-income countries that they are often taken for granted, and just regarded as '*a given*'.

Figure 1.1 World's Lights at night map



Source: Imagery by NASA and the US Geological Survey

Figure 1.1 is a composite image created with data from the Defense Meteorological Satellite Program (DMSP) of the United States Department of Defense. The brightest areas of the map show the most urbanized parts of the world as they appear at night. Some of the darker areas are unpopulated, like the taiga and boreal forests of Canada and Russia, but some are not. In 2009, after more than one century of the invention of the modern electric light, there are still inhabited regions of the world that remain unlit.

Many are unaware of the vast world energy access gap. Few of those who are conscious, possibly too few, give it enough thought. Today, approximately1.6 billion people live without access to electricity and about 2.5 billion rely on inefficient, polluting and often unreliable traditional fuels as their primary source of energy. Most energy and electricity-deprived people live in extreme poverty, the majority in rural, isolated areas in the developing world.[1]

Figures 1.2 and 1.3 show the share of population without access to electricity by region in 2005. 99% of the world's population without access to electricity lives in developing and emerging countries. Africa is the continent with the lowest overall electrification rate (37.8%), and where 35% of the world's electricity-deprived live (554 million people). The breakdown of figures for urban and rural electrification rates in Sub-Saharan Africa is nothing less than alarming: 58.3% and 8% respectively. Although Asia's overall electrification rate is much higher (72.8%), the region's elevated number of inhabitants (3,418 million) makes it the

[1] GNESD(2007), Reaching the Millennium Development Goals and beyond: access to modern form of energy as a prerequisite, *available in* www.gnesd.org accessed May 15, 2009

continent with the most people living without electricity (930 million, or 58% of the world's total).

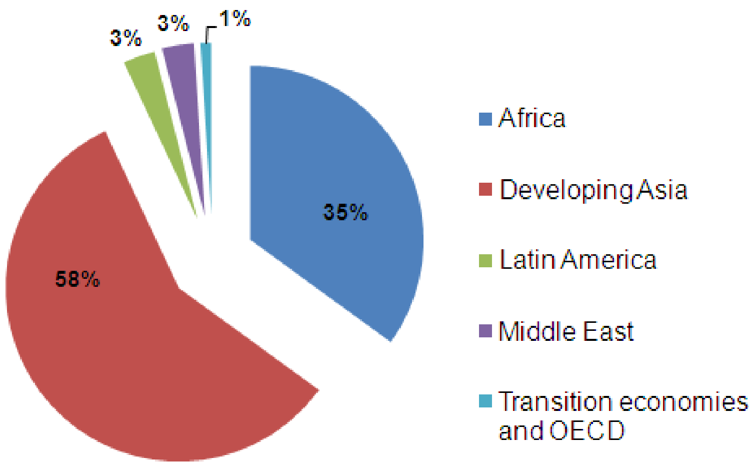
Figure 1.2
Electricity Access in 2005, by Region

	Population (millions)	Population w/o electricity (millions)	Electrification rate		
			Overall electrification rate (%)	Urban electrification rate (%)	Rural electrification rate (%)
Africa	891	554	37.8	67.90	19.0
North Africa	*153*	*7*	*95.5*	*98.7*	*91.8*
Sub-Saharan Africa	*738*	*547*	*25.9*	*58.3*	*8.0*
Developing Asia	3418	930	72.8	86.4	65.1
China & East Asia	*1951*	*224*	*88.5*	*94.9*	*84.0*
South Asia	*1467*	*706*	*51.8*	*69.7*	*44.7*
Latin America	449	45	90.0	98.0	65.6
Middle East	186	41	78.1	86.7	61.8
Developing countries	**4943**	**1569**	**68.3**	**85.2**	**56.4**
Transition economies & OECD	**1510**	**8**	**99.5**	**100.0**	**98.1**
WORLD	**6452**	**1577**	**75.6**	**90.4**	**61.7**

Source: IEA World Energy Outlook (2006)

Latin America also has higher electrification rates than the Middle East, yet 2 million more people living without electricity. The sum of the figures for both these regions represents approximately 6% of the world's total electricity-poor.

Figure 1.3
Electricity Deprivation by Region (2005)

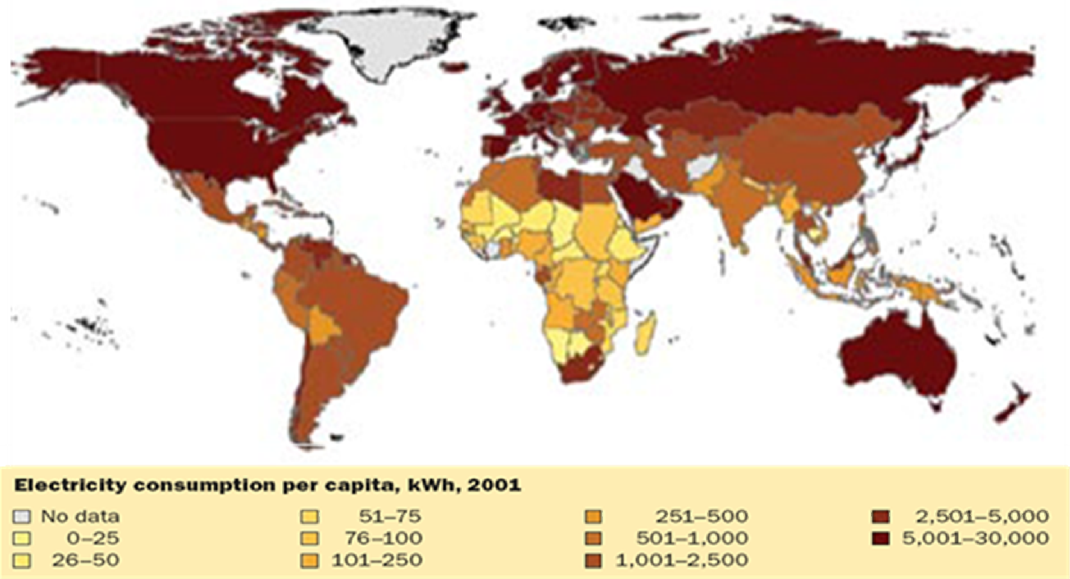


Data from IEA World Energy Outlook, 2006

Just as electrification rates vary among regions, and partially as a consequence thereof, so do electricity consumption levels. Electricity use is proportionate to the level of the socio-economic development of populations. Figure 1.4 displays world electricity consumption per capita by country in 2001. Sub-Saharan Africa shows the lowest per capita kWh consumption levels.

As will be analyzed, innovative initiatives are imperative; otherwise approximately 1.4 billion people (22% of the world's population) will still not have access to electricity by 2030.

Figure 1.4 World energy use per capita, by country



Source: UNDP, 2004

Moreover, almost 85% of the global population that uses unsustainable biomass for cooking purposes lives in rural areas: over 1,700 million live in Asia and 575 million in Sub-Saharan Africa.[2]

Several reasons explain why many communities do not have access to electricity and reliable energy services. The traditional electricity connection requires a grid infrastructure. In many cases, a village's remote geographical location may determine whether it is connected to a power grid or not; since, as it becomes more expensive, logistically challenging, and therefore financially unattractive for governments and private sector to invest, they reconsider extending the electric grid to serve these types of areas. This prevents people, no matter their socio-economic level, although usually on the poorer end of the income scale, from being able to access electricity. **Remoteness and/or scattered location** therefore act as a filter which influences the process through which one village is selected to be electrified before another.

A study published by the Centre for Energy Policy and Economics (CEPE)[3] on India´s regional disparities in electrification proves that the **economic structure** can also play a significant role in village electrification. Electrification rates remain higher in states which do not depend on agriculture, but are instead driven by industrial activities. On the other hand, agricultural activities may sometimes result in an important driver for rural electrification as electricity is needed to power machinery, for irrigation and crop processing, etc.[4]

---

[2] Chowdhary, S. et al. (2007), *Using Microfinance to expand the access to Energy Services: summary of findings,* USA: The SEEP Network, www.seepnetwork.org, May 2nd, 2009.

[3]CEPE was established in Zurich in 1999. Its aim is to research and provide training on energy policy and economics, both from the side of energy supply and energy demand. Through its research and advisory activities, CEPE points out opportunities, risks, and obstacles related to developments in energy technology and industry; supports necessary transformations; and contributes to energy innovations in business and technology. www.cepe.ethz.ch

[4] Kemmler Andreas (2006), Regional disparities in electrification of India – do geographic factors matter?, CEPE Working Paper No. 51, *available in* www.cepe.ethz.ch, accessed June 1, 2009.

Other roots of energy poverty and unequal access distribution at national and global levels include **corruption** and **lack of political will**, the **economic instability** of energy poor countries, as well as **feeble deregulation and the subsequent privatization processes** of public utilities in developing countries, which took place as part of structural adjustment programs promoted by international financial institutions since the late 1970s.

The policies promoted were a combination of government spending cuts, privatization of government services and assets, deregulation of business activities, and the support of free markets and competitiveness. What occurred was a shift of ownership and control from the public to the private sector in the name of economic efficiency and growth, with the idea that economic incentives would drive investment. However, in many cases, the precedence of financial interests over socio-economic priorities and poor transition planning only worsened the energy gaps.[5]

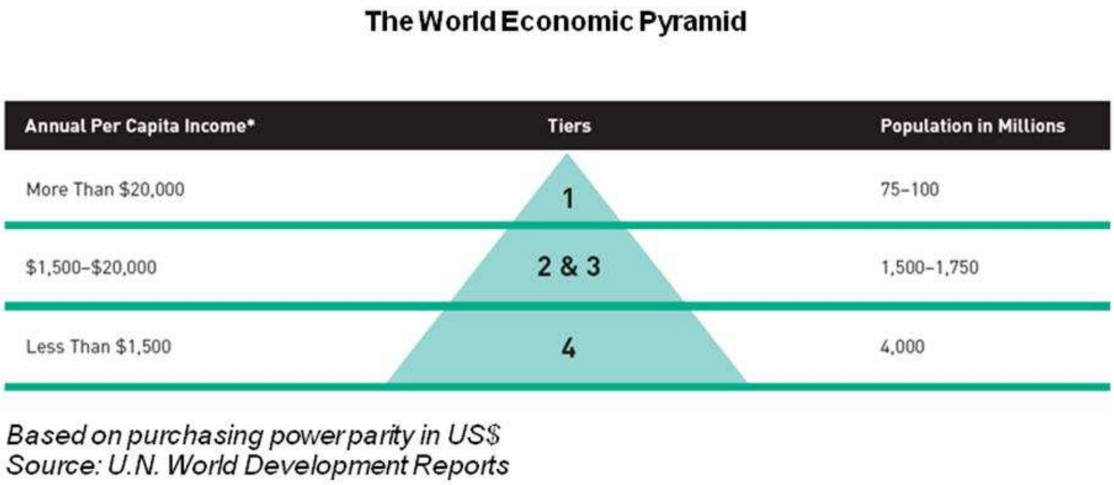
For example, private companies operating in the new free markets did not benefit from tariffs or direct subsidies for operating in remote, scattered, and/or scarcely populated rural areas as public utilities used to. Their inability to recover high initial investments raised connection costs and prices, up to a point that discouraged both companies and low income private users from doing business together.[6] Multinational companies, the first to take advantage of these processes, were more interested in short term earnings than the welfare of the local communities or innovative approaches that required medium to long term thinking to potentially create new and profitable market niches. This left the poorest of the poor, the *bottom of the pyramid,* virtually untapped.

---

[5] Sharon Beder (2005),Critique of the Global Project to Privatize and Marketize Energy, *available in* University of Wollongong, //www.uow.edu.au/arts/sts/sbeder/ accessed May 20, 2009

[6] Energía sin Fronteras. (2005), *Reformas Eléctricas y electrificación rural. Evaluación y buenas prácticas en los procesos efectuados en el mundo.* Madrid, NP.

Figure 1.5: Bottom of the Pyramid[7]



Over a billion people, approximately $^1/_6$ of humanity, live on less than US$1 a day.

About $^2/_3$ of the world's population, approximately 4 billion people, currently barely survive with less than US$1500 dollars per year, the minimum necessary to lead what is considered a decent life. These people represent the so-called '*bottom of the pyramid*'; they are traditionally not targeted by companies due to their extremely low buying power.

The majority of the '*worldwide*' businesses we know are aimed at only about 100 million customers. The overwhelming majority of the top 200 multinational corporations in the world are based in developed countries, and their products are considered to satisfy the needs of people that are already involved in the economic spiral.

New paradigms have and continue to appear that contribute to move beyond '*profit*' as the sole driver for company priorities. Profit is fundamental to maintain the business, but involving the poor, the previously invisible '*bottom of the pyramid*', in the identification of consumer interests and needs, can bring forward a series of 'win-win opportunities' to open markets of overwhelming opportunities, while helping to alleviate poverty.

[7] Prahalad, C.K., Hart, Stuart L., "The Fortune at the Bottom of the Bottom of the Pyramid," Strategy and Business 26, no. 1 (2002):1-14.

1.2 The Energy Financing Challenge

According to the International Energy Agency's (IEA)[8] Reference Scenario in its 2003 World Energy Outlook (WEO), at least US$16 trillion[9] are required in the years 2001-2030 to meet financing needs for global energy infrastructure, including expanding supply capacity and renovating currently installed capacity. Of this US$16 trillion, almost $^{1}/_{3}$ (approximately US$5 trillion) will need to be invested in the electricity sector in developing countries: primarily for power generation and transmission and distribution grids, but also off-grid generation and mini-grids for isolated, less populated areas. However, under this scenario no extraordinary measures to promote electrification in poor developing countries are foreseen. Therefore, 22% of the world's population will still remain in electricity exclusion. "1.4 billion people will still lack access to electricity in 2030- only 200 million fewer than today".[10]

Under its Electrification Scenario, the IEA estimates that an additional US$665 billion in investment will be required to achieve 100% global electrification. Consequently, to meet the IEA's projected energy demand and 100% power access by 2030, a total investment of approximately US$5.665 trillion will be required in developing countries, in the period 2001-2030. Rural supply will represent slightly under $^{2}/_{3}$ of the total additional supply needed to end electricity deprivation. 80% of the additional investment will be almost equally split between Africa and South Asia. Although Africa will require a greater volume of the supply (>25%) than South Asia (18%), the isolation of the latter's rural population increases average electricity access costs.[11]

There is a common misconception that electricity substitutes the use of biomass. However, poor families usually use electricity in a selective way, mostly for lighting and to power small communication devices. The transition from fuels like wood and charcoal to more modern and greener fuels for cooking and heating as income increases is gradual, rather than immediate.[12]

Figure 1.6 is a model included in the IEA's WEO 2002 to exemplify this.

Therefore, in the provision of access to modern energy services for the poor population of developing countries, electricity will definitely require the most significant investment, but access to other important cleaner energy sources must not be disregarded. However, no specific figures were found regarding an approximate required investment amount for the transition towards cleaner energy sources for cooking and heating at a global scale.

[8] IEA is an intergovernmental organisation created in 1974, which acts as energy policy advisor to its 28 OECD member states in their effort to ensure reliable, affordable and clean energy for their citizens. Its mandate incorporates the "3 Es" of balanced energy policy making: energy security, economic development and environmental protection. Current work focuses on climate change policies, market reform, energy technology collaboration and outreach to the rest of the world. www.iea.org

[9] "*Future investment needs are subject to many uncertainties, including macroeconomic conditions, energy prices, environmental policies, geopolitical factors, technological developments and the pace and impact of market reforms*." (IEA, 2003).

[10] IEA. (2003), *World Energy Investment Outlook*, Paris: OECD/IEA, page 39.

[11] Ibid.

[12] Van Aalst, Paul, et al. (2003), *Development Capital for Energy Access: opportunities to reach the energy poor*, Amsterdam: EUEI, Finance Working Group.

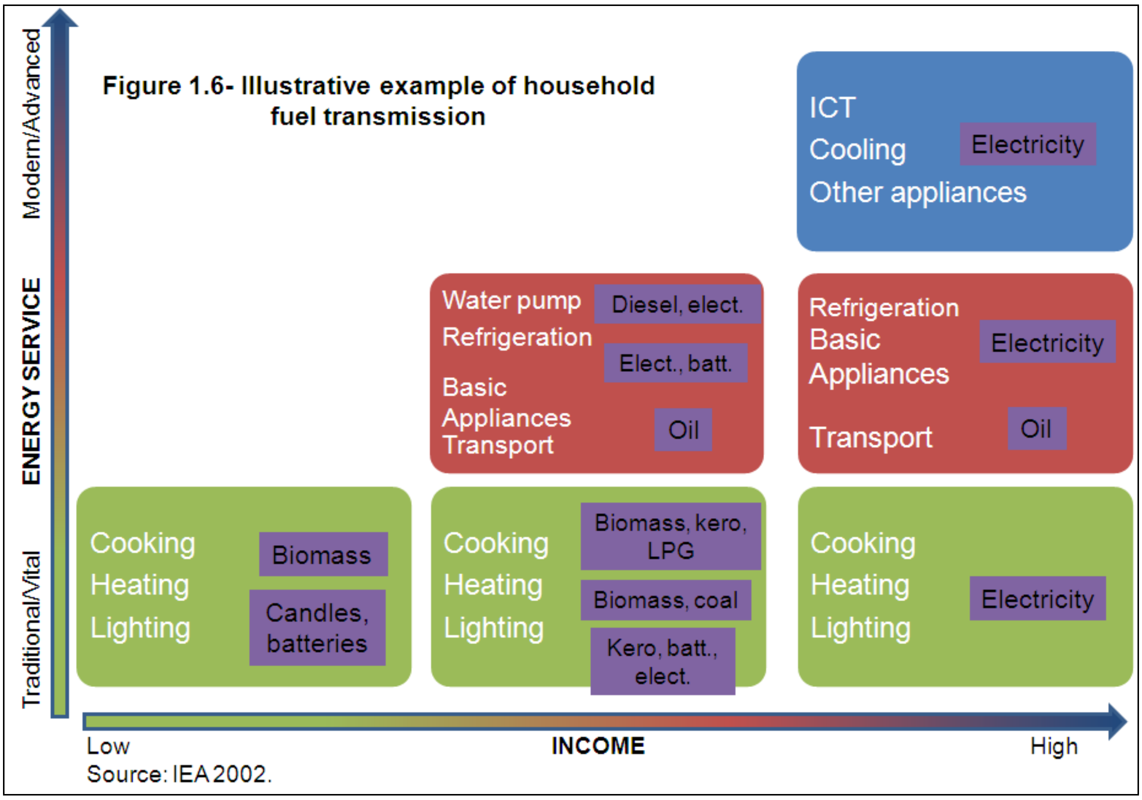


Figure 1.6- Illustrative example of household fuel transmission

An overall view of the recent international landscape in regards to the sector is not promising. Figure 1.7 was constructed with data from the Organization for Economic Cooperation and Development (OECD) to track European equity investment[13] and Official Development Assistance (ODA[14]- grants and loans), including that by the European Commission (EC); and figures from the World Bank's (WB) registers regarding private flows to the energy sector in developing countries.

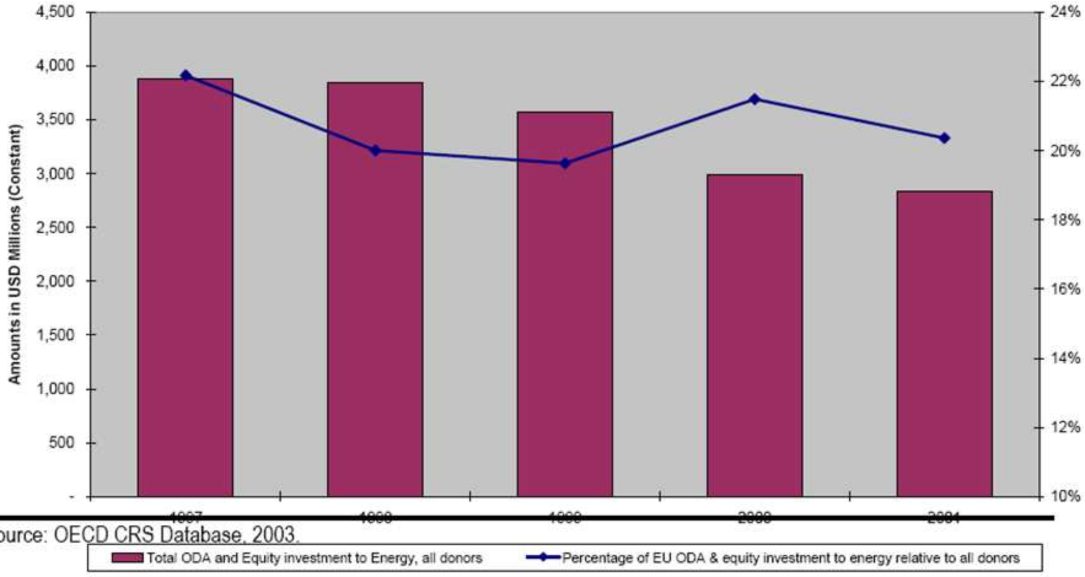
Although the graph does not reveal all EC funding to the energy sector in developing countries (only that to African, Caribbean and Pacific countries was reported in the study this information was extracted from), there is a clear trend of decline in funding for the sector, from just US$4 billion in 1997 to less than US$3 billion in 2001.[15]

[13] *Equity investment is defined by OECD as: direct financing of enterprises in the recipient country which does not (as opposed to direct investment) imply a lasting interest in the enterprise.* OECD. (2002), *Reporting Directives for the Creditor Reporting System,* DCD/DAC 2002 21. Paris: OECD.

[14] ODA is defined by OECD as grants and loans which meet the following conditions: 1.Are provided by official agencies; 2. the primary objective of the transaction must be the economic development and welfare of developing countries; and 3. Transactions must be concessional in nature and carry a grant element of at least 25%. (OECD CRS database, www.oecd.org/dac/stats/crs/crsguide).

[15] Van Aalst, Paul, et al. (2003), *Development Capital for Energy Access: opportunities to reach the energy poor ,* Amsterdam: EUEI, Finance Working Group.

Figure 1.7
Total flows to the energy sector (ODA & Equity Investment) from all donors, and % from EU member states (including EC)
(1997-2001)

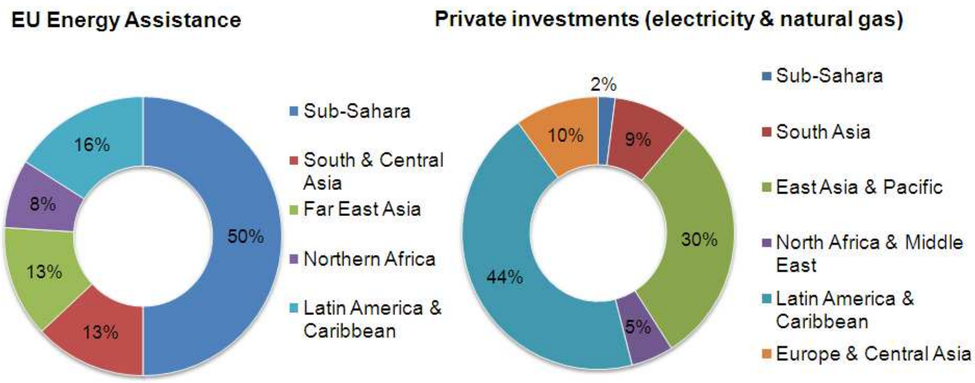


Source: OECD CRS Database, 2003.

In regards to allocation by region, 50% of EU energy assistance flows went to sub-Saharan Africa, the region with the lowest urban and rural electrification rates. Asia, with the highest number of energy-poor people, got approximately half of that (26% figure 1.8). Of these flows, most were disbursed as loans. In terms of energy sub-sectors, most resources were directed to power generation from non-renewable sources.

Although figures are not entirely comparable due to differences in regionalization criteria, it is evident that private investments follow different trends. Latin America, which only received 16% of total EU assistance, absorbed the majority of private funds (44%), whilst Sub-Saharan Africa, benefitting from half of EU's financial cooperation, only received 2% of all private investments.

Figure 1.8
Energy financing flows to developing countries, by region (1997-2001)



Data from: OECD CSR database & WB database, 2003

International aid and private investment in the energy sector for developing countries, as well as public investment in these countries have so far proven to have been insufficient. As mentioned before, with structural adjustment reforms, donor and national public expenditure in developing countries decreased under the assumption that the energy sector would no longer be a priority issue for them, since it was assumed that the private sector had countless incentives to invest in energy. However, economic instability and poorly designed electricity reforms interfered with these forecasts and the rise of private investment did not last very long.

Today, general and energy-specific constraints still hinder advances. Like in other sectors, macro-economic and political instability, as well as regulation and governance issues in developing countries exacerbate risks in areas such as investment in infrastructure, foreign exchange, contracts, finance, and operations (e.g. producing cost-effectively, technical losses, theft, etc.).

On the other hand, energy is a complex matter at the policy level; institutionally; technically; and in that it only brings about tangible results and benefits if combined with additional, costly investments, as well as behavioral change of the people and society. For example, a power generation plant does not serve a purpose on its own. Instead, it requires a transmission and distribution infrastructure for people to access electricity at their homes; the system needs to be managed, operated and maintained efficiently; and people not only need to learn how to make use of this electricity, but also have expenses regarding light bulbs, stoves, cell phones, etc. Moreover, the prerequisite is the willingness and ability to pay for the service. Therefore, investments in energy are a less attractive public spending option for governments than simpler, more material and visible services (e.g. roads, bridges, housing, etc.).[16]

Rural electrification is a particularly difficult dilemma for many governments. Rural electricity plans are generally more expensive to implement than urban or peri-urban plans. The conventional model involving centralized utilities, large-scale power plants and transmission systems has largely failed to reach the rural population, above all the poor. In many countries national monopoly utilities are incapable of extending services due to limited economic resources. In the past, most subsidized rural electrification plans have been operated by high-cost, centralized public utilities charging tariffs which do not cover all costs. Misdirected subsidy policies, political interference and the distortion of commercial incentives create an even more difficult situation. Frequently, this is in combination with an institutional structure and policy environment which are not conducive to private investment in decentralized rural settings. Therefore, despite a steadily growing demand, the supply response is inadequate and rural electrification rates in many developing countries remain alarmingly low.[17]

The financing gap to achieve 100% energy access is extremely evident and prospects of alleviating global energy deprivation through traditional public and private business and financing models are disturbingly low. However, investment in energy infrastructure having been recently re-upgraded in the international community's priority ranking shows signs of a general realization that providing energy access to the poor requires a combination of public and private financing, as well as the recognition that energy services are a pre-requisite for the achievement of the MDGs. These are powerful drivers to overcome the above-mentioned challenges.

[16] Van Aalst, Paul, et al. (2003), *Development Capital for Energy Access: opportunities to reach the energy poor ,* Amsterdam: EUEI, Finance Working Group.
[17] ABB. (2005), *Access to Electricity*- White Paper on ABB's initiative for Access to Electricity.

1.3 Access to Sustainable Energy as a Precondition for the Achievement of the MDGs

The year 2000 can be considered a milestone for the '*International Development'* world. It was the year that the United Nations Millennium Declaration was adopted. The document outlines peace, security and development concerns in the areas of environment, human rights, and governance. It also gives special emphasis to Africa's needs and makes a fundamental, real-time commitment to the Millennium Development Goals (MDGs). The MDGs are eight goals through which world leaders promised to take action to help developing countries alleviate poverty; improve health; and promote peace, human rights, gender equality and environmental sustainability.

Figure 1.9 Millennium Development Goals[18]

Goal 1. Eradicate Extreme Poverty and Hunger
- Halve, between 1990 and 2015, the proportion of people whose income is less than $1/day
- Halve, between 1990 and 2015, the proportion of people who suffer from hunger

Goal 2. Achieve Universal Primary Education
- Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling

Goal 3. Promote Gender Equality and Empower Women
- Eliminate gender disparity in primary and secondary education, preferably by 2005 and in all levels of education no later than 2015

Goal 4. Reduce Child Mortality
- Reduce by two thirds between 1990 and 2015, the under-age five mortality rate

Goal 5. Improve Maternal Health
- Reduce by three quarters the maternal mortality ratio
- Achieve universal access to reproductive health

Goal 6. Combat HIV/AIDS, Malaria, and Other Diseases
- Have halted by 2015 and begun to reverse the spread of HIV/AIDS
- Achieve by 2010, universal access to treatment for HIV/AIDS for all those who need it
- Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases

Goal 7. Ensure Environmental Sustainability
- Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources
- Reduce biodiversity loss, achieving by 2010, a significant reduction in the rate of loss
- Halve by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation
- By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers

Goal 8. Global Partnership for Development
- Address the special needs of least developed, landlocked, and small island developing states
- Develop further an open, rule-based, predictable, non-discriminatory trading and financial system
- Deal comprehensively with developing countries' debt
- In cooperation with pharmaceutical companies, provide access to affordable, essential drugs in developing countries
- In cooperation with the private sector, make available benefits of new technologies, particularly information and communications

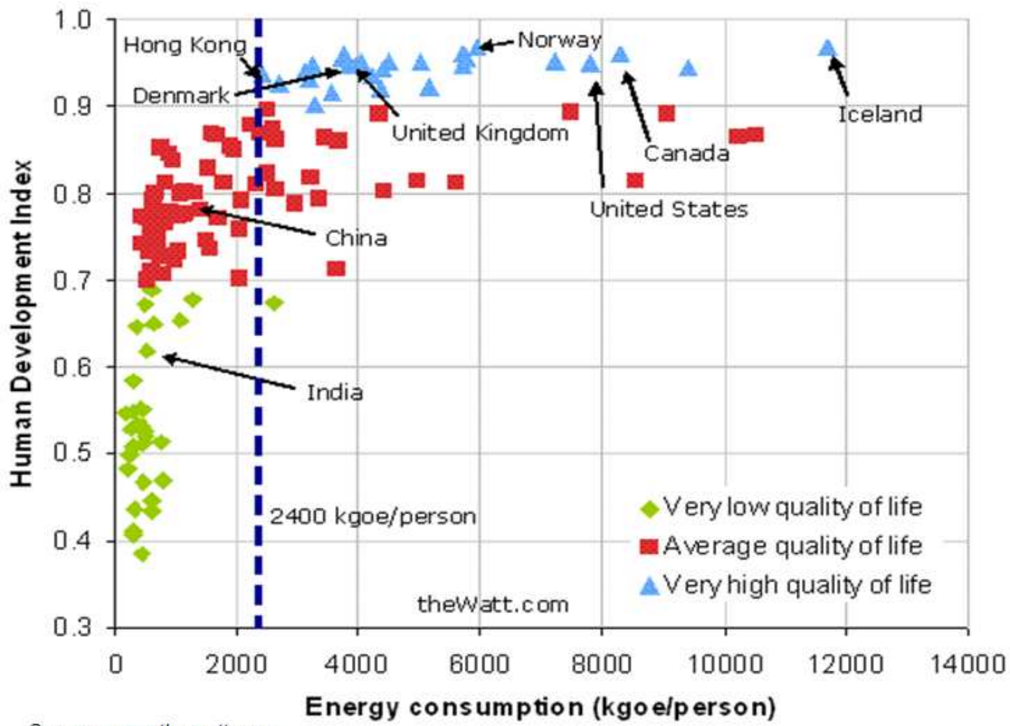
[18] www.un.org/millenniumgoals/

Although none of the eight goals tackles access to energy explicitly, energy and electricity undoubtedly play a crucial role and are interlinked with human development. The intention of this section is to explain why energy access is universally considered a *sine qua non* requisite in order to achieve all eight MDGs.

The Human Development Index (HDI) is an indicator that includes three different spheres: an economic dimension as a means to have a decent standard of living, measured by GDP per capita (in purchasing power parity- PPP, US$); living a long and healthy life at birth, measured through life expectancy (in years); and access to education, measured by adult literacy (%, ages 15+), and enrolment in primary, secondary and tertiary levels (%).

Figure 1.10 shows the strong correlation between a country´s HDI value and energy consumption. Having energy services readily available results in quality of life benefits (as measured by HDI) for the population.

Figure 1.10 Correlation between the HDI and Energy Consumption



Source: www.thewatt.com

At the local level, energy brings about **environmental benefits** (e.g. reduced use of firewood and fossil fuels cuts down GHG emissions), **health benefits** (e.g. transition to sustainable energy technologies improves indoor air quality, which is one of the main causes of eye and respiratory disease), **facilitates** the **provision** of **quality basic social services** to the community (e.g. schools can provide better and healthier studying conditions for youth; clinics have better lighting during evening consultations, can utilize more modern equipment and are able to refrigerate vaccines), **safety benefits** (e.g. reduced risk of fire), **economic benefits** (e.g. increased productivity, extended work hours and improved business opportunities), **improved communications** (e.g. phones, radio, etc.) and **entertainment**.

GOAL 1. ERADICATE EXTREME POVERTY AND HUNGER

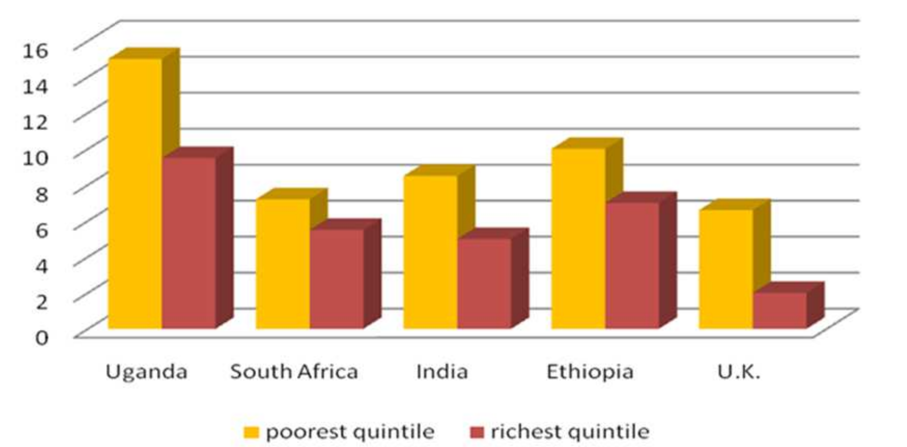
Modern energy services allow a more efficient use of resources, increase productivity and drive economic growth. For instance, access to modern forms of energy and the use of electricity allows the possibility to power appliances and machinery that facilitate and reduce the time required for certain tasks. It extends working hours through the reallocation of time that was previously used to harvest and collect fuel wood, fetch water, etc. which primarily are duties for women. Furthermore, it provides better quality of lighting to work with after dark. It enhances income-generating activities, for example, checking orders or market prices of farm goods by mobile phone. Finally, it generates employment and entrepreneurial opportunities, for example, the provision of phone services for the communities using mobiles, community TV stations, selling modern energy products and services (micro-utility schemes), etc.

Energy is also fundamental to the food industry. It can be used to refrigerate goods and is necessary for food processing activities, making provision safer and available for a longer amount of time.

Access to sustainable energy sources also reduces the high cost linked with the inefficient use of traditional, often unreliable and polluting energy sources. People in developing countries, especially the poor, pay proportionally much more than people in developed countries do to access energy. The quality and dependability of the service is lower in the former than in the latter, as their main sources include batteries, candles, kerosene, fire wood and charcoal. Due to the high cost and the consequent prioritization, poor households tend to consume minimum amounts of energy, which are used only for indispensable activities, which consequently influences their quality of life.

Figure 1.11 considers a sample of four countries: Uganda, South Africa, India and Ethiopia. The graph compares total energy expenditure as a share of income of poor households, to that of the United Kingdom. According to these figures, in 2002, poor families in developing countries spent up to 15% of their income in energy products and services, using about 80% of the total energy expenditure to buy fuels for cooking and heating and the remaining 20% on fuel and batteries for lighting purposes.[19]

Figure 1.11 Energy: a major expenditure for poor households

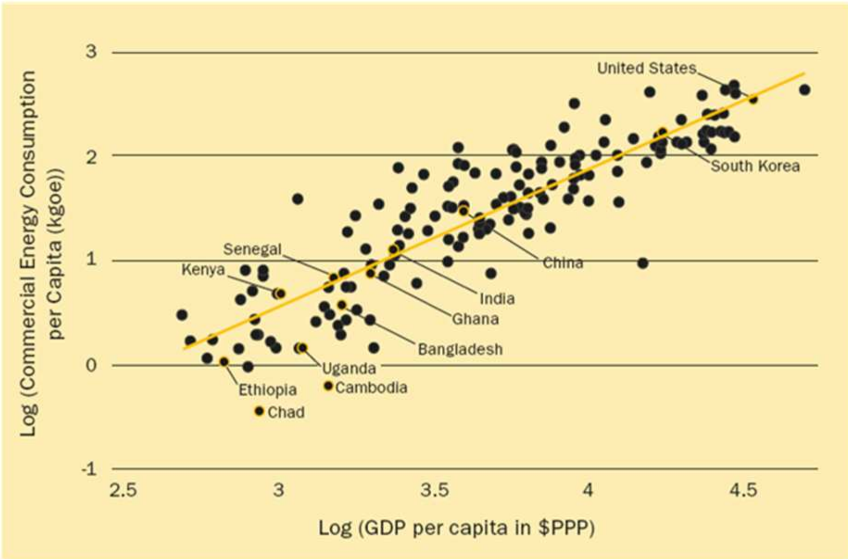


Data source: IEA - World Energy Outlook 2002

[19] A quintile is a portion of a frequency distribution containing one fifth of the total sample.

A more recent study by the Small Enterprise Education and Promotion (SEEP) Network, a global knowledge management network of microenterprise practitioners working since 1985, states: “Most estimates suggest that families in rural areas of developing countries spend on average approximately US$10 per month on poor quality and unreliable energy services. This represents a significant percentage of their income. For example, among the rural poor with incomes of $10–$20 per month, expenditures on inefficient energy can represent 20–25 percent of household incomes-”[20]. Figure 1.12 shows the strict correlation between energy consumption and GDP per capita.

Figure 1.12
The link between Commercial Energy consumption and GDP (2000)
(Log-log plot, the x- and y-axis numbers 0, 1, 2, 3, 4…
… correspond to 1, 10, 100, 1,000, 10,000…)

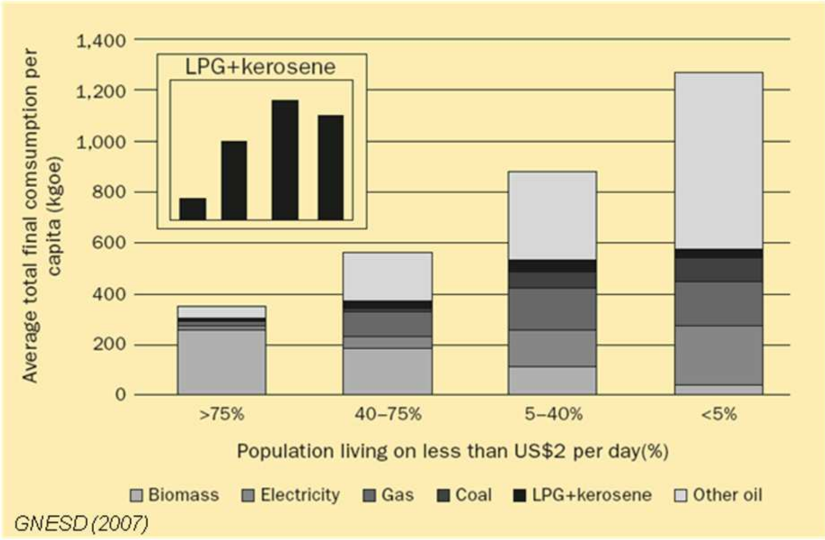


GNESD (2007)

Meanwhile, Figure 1.13 shows the different energy sources used in 100 developing and transition countries, grouped by the share of the population living on less than US$ 2 per day.[21] The latter underscores that the type of fuels vary across countries by income level. For example, in the first group -countries with the largest share of population living on less than US$ 2 per day- biomass remains the most important source of energy.

[20] Chowdhary, S. et al. (2007), *Using Microfinance to expand the access to Energy Services: summary of findings,* USA: The SEEP Network, page 12.
[21] GNESD (2007), *Reaching the Millennium Development Goals and beyond: access to modern form of energy as a prerequisite*, available in www.gnesd.org/, accessed May 15, 2009

Figure 1.13
Share of energy sources in the energy consumption of 100 developing and transition countries, by poverty levels and energy type



Although energy has the potential to drive development, it can also act as one of the greatest barriers for it. Communities which are heavily based on the use of unsustainable energy sources are at higher risk of being exposed to the negative effects of deforestation, desertification and the consequent adverse health impacts. All of these limit their possibilities to escape extreme poverty and hunger. Moreover, according to experts, the impact of controversial climate change will be much more catastrophic in these communities that in the industrialized world. Hence, the possibility to turn to modern energy services equates into a great leap forward. In many cases, a minimum amount of energy can satisfy the basic needs of rural populations, increasing productivity of human capital and resulting in a positive impact on quality of life.

GOAL 2. ACHIEVE UNIVERSAL PRIMARY EDUCATION

Children in households without electricity usually spend a significant portion of their day doing household chores. As mentioned under Goal 1, access to modern forms of energy allows for time which was previously destined to the physical and social burdens of harvesting and gathering fuel wood, fetching water, labor in agricultural activities, etc., to be better invested giving children the education they need for a more promising future. Sustainable energy therefore facilitates the possibility through more free time to attend primary education, study under healthier conditions at school and at home, and for longer hours, even after sunset.

Access to sustainable energy also eases living conditions in previously harsh rural environments, and therefore partially solves the issue of attracting and retaining qualified teachers in these communities. Better lighting and power also increase the quality of teaching, as it makes it possible for educators to access updated resources, refresh their competencies, and develop and acquire better educational materials through the use of computers, internet, TV, etc.

GOAL 3. PROMOTE GENDER EQUALITY AND EMPOWER WOMEN

Gender roles in family and community settings, especially in rural areas of developing countries are in most of the cases disproportionate. Women are more likely to suffer from hunger, disease, environmental degradation and impoverishment. Young girls are more often deprived of studying opportunities than boys are, and throughout their lives they do not normally receive payment for the activities they carry out, as they spend most of their time working to fulfill basic community and family needs which are not granted an economic value.

Poor energy services are not the exception and also affect men and women in different ways. Women are usually more exposed than men to the negative consequences of using inefficient and polluting fuels at home. For example, this refers to the considerable amounts of time spent gathering fuels and using them in everyday household chores, such as cooking over burning fires in reduced kitchens with insufficient ventilation; as well as to women being among the most affected by respiratory and eye disease due to poor indoor air quality.

Access to modern energy frees young girls' and women's time. A study made by the Energy Sector Management Assistance Program *(*ESMAP)[22] in 2002 states that in rural India, the time allotted to wood gathering is about 37 hours per month, day time that would otherwise be available for further productive activities. Another study from 1999 reports that bringing water for household use, mainly done by women simply utilizing buckets, means that they spend around 134 minutes per day fulfilling this task. An electric water pumping system providing direct access to households or even a storage tank closer in the community would considerably change the everyday life of these women, their roles and correct gender imbalances in the community. Furthermore, a study made in China in 2003 reports evidence that using coal for cooking and heating highly exposes people to the risk of lung cancer, making women much more vulnerable to this disease than men.

Women are catalysts for social change. Empowering women, giving girls opportunities to study and women chances to become involved in income-generating activities –enhanced by energy- only brings positive effects to their families and their communities. Their key role in family and community life emphasizes the importance of involving them in decision-making for the success and impact of energy poverty alleviation projects.

GOAL 4. REDUCE CHILD MORTALITY

GOAL 5. IMPROVE MATERNAL HEALTH

GOAL 6. COMBAT HIV/ADIS, MALARIA & OTHER DISEASES

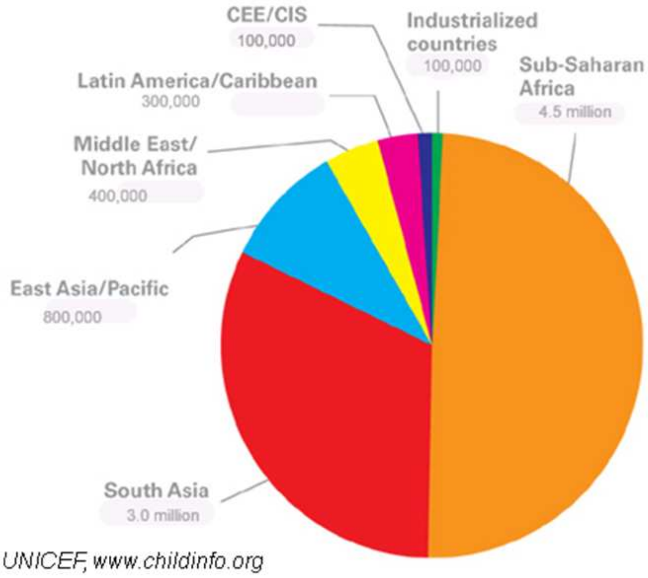
The availability and quality of energy services considerably influences health indicators and health delivery services to community members.

Fortunately, statistics show a declining trend in child mortality. However, it remains an unsolved issue, especially among low-income classes in developing countries.

---

[22] ESMAP was established in 1983 by the World Bank in partnership with UNDP, in response to the global energy crises. ESMAP encourages governments of developing countries and economies in transition to undertake innovative and strategic solutions and contributes to the transfer of technology and knowledge in the energy sector, in the areas of traditional and non-traditional energy use. ESMAP is also active in supporting and facilitating the work of other institutions and the private sector.

Figure 1.14
Number of children who died before reaching their fifth birthday(2007)



Source: UNICEF, www.childinfo.org

Worldwide, 9.2 million children died in 2007 before they reached the age of five. This is mostly due to the lack of access to safe drinking water and adequate sanitation and because of otherwise treatable illnesses like diarrhea, malaria, measles, respiratory disease and pneumonia. Pre-term birth is also a frequent cause of infant mortality. [23]

According to the United Nation's MDGs Program, in 2005 it was estimated that more than 500,000 women die annually and 10 million over the time span of a generation; of preventable or treatable complications during pregnancy. Not surprisingly, 99% of these women are from developing countries. Every year, more than 1 million children are left motherless because of maternal health causes, which make them more vulnerable and up to 10 times more likely to die prematurely than those whose mothers are healthy to take care of them. By preventing the need of manually procuring firewood and water for family needs, the access to modern sources of energy drastically reduce women's labor burdens. It consequently decreases the health risks associated with carrying heavy loads or falling down and hurting the fetus during pregnancy. After birth, the spare time is used to take care of their babies.

Worldwide, an estimated 33 million people were living with HIV/AIDS in 2007. Every day, nearly 5500 people die from AIDS and 7500 new people become infected with the virus. In this same year in Sub-Saharan Africa, the region with the highest incidence rates in the world, 60% of adults living with HIV were women.

There are more than 350 million cases of malaria worldwide each year. The deaths from the disease exceed 1 million people yearly, 80% of whom are children under the age of five in sub-Saharan Africa.

Limiting indoor air pollution helps alleviate chronic respiratory problems among children and women. Young mothers are able to spend more time at home with their babies and younger children in a healthier environment, with fewer negative consequences. It also reduces the

[23] UNICEF (2007), *Progress For Children*: World Fit for Children Statistical Review Number 6, December 2007 *available in* http://www.childinfo.org/mortality.html, accessed May, 20 2009

chances of suffering of respiratory complications that can often result in tuberculosis, the most common HIV/AIDS opportunistic infection.

Often in rural areas, inhabitants, including pregnant women, young children and infected or sick people, have to walk for hours to reach the nearest clinic. Bad road conditions and poor public transportation preclude pregnant women, parents with small children and the population in general from reaching health care facilities in a reasonable time, especially in emergency situations.

Sustainable energy fosters the construction and maintenance of improved health care facilities with modern equipment. In addition, medicines and vaccines can be stored at ideal temperatures, consultations can be offered in healthier conditions and efficient emergency services can be provided after sunset if necessary. Finally, improved living conditions make it easier to attract skilled doctors to those communities with the greatest need.

Energy access creates the possibility to refrigerate food and easily boil water for purification purposes. These are important measures to raise hygiene standards, reduce child mortality and improve maternal health.

Electricity also enables the use of communication systems (e.g. radios, television and internet), which can be efficiently utilized as health education media.[24]

GOAL 7. ENSURE ENVIRONMENTAL SUSTAINABILITY

Energy production and uses are closely linked to environmental degradation because the level and type of contamination and emissions from human activities highly depend on natural resource management and the choice of energy sources.

Inhabitants all over the world are dramatically exposed to the negative consequences of environment degradation: air, soil and water pollution, unsustainable land use, desertification, etc. The carbon footprint of using fossil fuels, its price fluctuation and limited availability, together with the unequal distribution of reserves around the world, have inevitable unsustainable consequences. For example, China and its huge dependency on coal and biomass is an alarming example of a grave environmental crisis, with hundreds of people dying in accidents and entire villages sinking due to illegal mining activities.

In the Caribbean, Haiti evidences the results of unsustainable management of forest resources. The country, one of the poorest in the world, is constantly threatened by an ecological disaster: the extensive use of wood as the main energy source is the major reason for deforestation, causing landslides and floods. The country has lost its natural defense against hurricanes, which for example, just between August and September of 2008, caused the death of hundreds of people and created thousands of environmental refugees.[25]

Although the poorer population in developing countries, particularly those with a limited access to energy and have the lowest consumption rates could be considered the '*least responsible*' for

[24] Interesting examples are two South African TV series: *Soul City,* targeted at adults, and *Soul Buddyz,* targeted at 8 – 12 year olds. These series developed since 1994 by Garth Japhet and Shesren Usdin, members of the Soul City Institute - Heath & Development Communication, www.soulcity.org.za, represent a classical example of what is called *edutainment*. The series take advantage of the typical elements of a soap opera to transmit simple messages (not moralistic) examining many health and development issues, imparting information and impacting on social norms, attitudes and practices. The series are now followed by 70% of the South African TV audience and have been broadcasted in many parts of Africa as well as Latin America, the Caribbean and South East Asia.

[25] Heldmore E (2009), *Un albero per Haiti*, Internazionale no.784, anno 16: 46 - 48

the current climate situation, due to geographical reasons, global warming is expected to affect them the worst.

Renewable energy technologies offer a suitable alternative for poor communities to overcome the barriers that thwart their sustainable development, while reducing the threat posed to and by climate instability.

GOAL 8. GLOBAL PARTNERSHIP FOR DEVELOPMENT

The link between energy services and the need to develop a global partnership for development is two-fold. Electricity enables access to media and communication technologies. The absence of it makes networking harder; knowledge management for actors and among potential partners for development much more tedious; and identifying commonalities, complementary characteristics, as well as building and making partnerships work substantially more difficult.

On the other hand, partnerships for development are created to better address local and global development issues. This MDG is an explicit call for different partners to join efforts, expertise, and resources to achieve sustainable development through international cooperation (traditional north-south, south-south and multilateral cooperation), as well as through multi-stakeholder partnerships involving actors from diverse and relevant sectors and levels, e.g. private sector: local suppliers, national and multinational corporations, consultants, etc.; civil society: communities, community-based organizations -CBOs-, '*Northern*' and '*Southern*' NGOs, etc.; public institutions: utilities, local, regional, national and supranational governments; intergovernmental organizations; media, trade unions, academia, etc.

As analyzed at the beginning of this chapter, the challenges to achieve 100% worldwide energy access and therefore create advancement towards the achievement of the MDGs are very overwhelming. It is a task that low-income countries cannot successfully manage on their own. Strengthening global partnerships can help develop the necessary technology and technical resources, as well as adequate financing and business models to improve access to sustainable energy.

1.4 Breaching the gaps

This chapter has thus far referred in depth to the vast energy access and financing gaps the world faces today. There are approximately 2.5 billion people without access to modern energy services for cooking and heating and 1.6 billion people without access to electricity. An approximate total investment of US$5.665 trillion is required to breach these gaps in developing countries in the period of 2001-2030. The importance of energy as a pre-requisite for the achievement of the MDGs has also been thoroughly explained.

One of the objectives of this paper is to examine small-scale modern energy access projects implemented through innovative business models and financing schemes and analyze their potential in helping breach the energy access and financing gaps. For the purposes of this study, financing schemes of energy access projects are assessed at two different levels:

1. *Project funding*- or the system of provision of capital funds to cover project implementation and administration costs, i.e., the project's budget; and

2. *Product/Service financing*- to make the modern energy products/services available through the energy projects, affordable to poor customers.

The following chapter encompasses a comprehensive analysis of the partnerships, settings, features, opportunities, barriers and impacts associated with energy poverty alleviation projects through Clean Development Mechanism (CDM), Corporate Social Responsibility (CSR) and Microfinance.

Case studies have been chosen according to qualitative criteria (i.e., creativity of their business models; application of non-traditional financing schemes; resourcefulness; and significant lessons learned, promising practices and ideas for replication that they can contribute), rather than the geographical distribution or variety of actors.

2 Innovative financing models for small-scale energy access projects

2.1 Location of Case-Studies

Figure 2.1
Location of case-studies featured, by type of financing

2.2 SUMMARY OF CASE-STUDIES

	Purpose	Main Stakeholders	Technology	Financing Scheme	Impact	Most Interesting Features	Directly Targeted MDGs
Global Rural Electrification Program, Morocco	To provide electricity through renewable energy to 9% of rural communities that could not be connected to the electricity grid.	Office National de l'Electricité (ONE), BP Solar, Temasol, Sunlight, The Board of Rural Communities, Executive board of UNFCCC	Individual PV Solar Home systems	Programmatic CDM	29,809 kits installed (only 30% of the 91,500 kits expected to be on site at the end of 2007), 5,800 tons of CO_2 reductions in 2007	PERG descentralised model makes Morocco one of the most advanced countries in the world in this field	1,7,8
Kuyasa Urban Housing Energy Upgrade Project, South Africa	To improve the living conditions of the inhabitants of Kuyasa while reducing fossil based energy consumption and CO_2 emissions, by improving the thermal performance, providing energy efficient lighting in households, and improving water heating efficiency through solar water heaters.	NGO SouthSouthNorth, Local Government of The City of Cape Town, the community of Kuyasa, Executive board of UNFCCC	Solar water heaters, compact fluorescent light bulbs, house insulation systems	Programmatic CDM	2,309 households equipped, 46,060 CERs/ 7 years	First Gold Standard-certified project in the world	1,6,7,8,
Nepal Biogas Support Program	To improve energy access for rural poor and to reduce rural poverty by providing high quality biogas plants to poor households at an affordable price.	Alternative Energy Promotion Centre (AEPC), Biogas Sector Partnership (BSP-Nepal), German Development Bank (KfW), Netherlands Development Agency (SNV), Community Development Carbon Fund (CDCF), Microfinance institutions (MFI), Executive board of UNFCCC, rural communities of Nepal	Household biogas digester plants	Programmatic CDM	9,688 domestic plants installed by this project at the end of 2005. Added to other projects, a total of 124,000 plants are installed in Nepal. Biogas serves about 4% of the population.	Project aims to develop a commercial activity with the integration of carbon revenues to serve a large rural population Good demonstration that a program of small-scale activities can have a big impact	1,3,6,7,8
e7 Micro Hydropower Project, Bhutan	To provide electricity to the Chendebji village by means of a hydro power station installed on site.	Royal Government of Bhutan, Japanese Government, e7 Fund for Sustainable Energy Development represented by the Kansai Electric Power Co., Executive board of UNFCCC, Chendebji village	Micro-Hydro Electric power station	Small-scale CDM	50 households connected, 593 tons CO_2/year estimated	First CDM-registered project for the e7 group, the first CDM project for Bhutan, and the sixth to be registered in the world	1,6,7,8

Unión Fenosa Energía Social in Colombia	Management of 'subnormal' markets in order to decrease fraud, create a solution to avoid grid losses and increase human safety. To provide 18 communities in the city of Santa Marta with regular access to electricity, thereby improving the infrastructure in the area for local small businesses and schools and safe wiring systems.	Energía Social, local government, local community, consumers	Connection to an existing electricity grid	CSR: approx. US$1.5 million by Energía Social, approx. US$6 million by the Colombian government	18 communities with 12,000 families have been 'normalised', meaning they have an official connection to the electric grid.	Energía Social is the only Latin American utility company specifically created for and serving poor communities.	1,7,8
Osram's Off Grid Pilot Project Umeme Kwa Wote – Energy for All	Pilot project to create an alternative energy source to kerosene for the fishing community in Mbita, on the shores of Lake Victoria. The project was to provide fishermen with energy-efficient lamps, which are less expensive in the long term and could replace ca. 20 million liters of kerosene per year, (about 50,000 tonnes of CO_2). The lamps are rechargeable with solar power at a central facility, named the "O-Hub".	Siemens, Solarworld AG, Nokia, Osienala, Global Nature Fund, Deutsche Investitions- und Entwicklungsgesellschaft (German Investment and Development Organization)	Energy-efficient lamps, LEDs, photovoltaic technology, UVC lamps	CSR (to finance the project) and Micro-credit (to finance the lamps and deposit)	1,500 users (mainly fishermen) switched to the solar powered, efficient lamps. Social benefits, including decrease in health issues. Economic benefits for the local community. Important environmental impact: less pollution, reduction of emissions, more sustainable product life cycle.	High potential of replication. CSR combined with micro-credit. In essence, a 'triple win situation' has been created, by: 1) the local population profits from a higher income and the benefits from the reduction in health problems associated with the kerosene lamps, 2)the economy and the local economy are supported and 3) emissions are reduced. Moreover, long term beneficial market opportunity for Osram.	1,7,8
ABB's "Access to Electricity" Pilot Project Tanzania	ABB aims to create new solutions through technical and commercial expertise, aiming towards improving the situation of the community, focusing on the productive use of affordable electricity and promotion of local economic growth. The village of Ngarambe received a locally adapted solution to receive access to electricity in mid-2004. ABB supplied the generator, installed underground cables and low-voltage equipment, and trained local people to run the power supply. WWF provided guidance on issues ranging from reducing deforestation to health care and environmental education.	ABB, The WWF Tanzania, the local community and the District Council	"UEC Eco-Engine", an "environment ally friendly" diesel engine developed by Mitsubishi Heavy Industries, Ltd.	CSR, Public-Private Partnership	15 businesses created, 25 new homes and more homes connected to the mini-grid and a new water pump, increased number of students (from 250 to 350) attending school now with possibility to study after dark.	Strong stakeholder engagement, which allowed a holistic approach for the village.	1,2,7,8

GreenVillage Credit China	To encourage the use of sustainable energy through an innovative approach to financing; which promotes economic development, improves health conditions, and environmental protection.	E+Co, UNEP, TNC China, Rural Credit Cooperatives (RCCs), local government agencies, Clean Energy Enterprises, new small-medium enterprises created, customers.	Domestic Biogas Plants, Solar Water Heaters, Micro-hydro Power Generators, Improved Cooking Stoves.	Micro-credit	500-600 households	Enterprises-centered commercialization model (local clean energy entrepreneurs), strategic partnerships, risk fund.	1,4,7,8
SEEDS Sri Lanka	To provide affordable financial packages to enable users to pay for their off-grid electricity systems.	Sarvodaya Economic Enterprise Development Services (SEEDS), accredited energy installers, customers.	PV Solar Home Systems, Village Micro-hydro Power Generators, Grid Connection	Micro-credit	52,000 Solar Home Systems, 14 micro-hydro schemes, 3,692 grid connections	Partnership with several energy companies, assurance fund.	4,7,8
Grameen Bank Bangladesh	To empower people living in rural areas with access to Green Energy and income.	Grameen Shatki; PV, Stove and Biogas Technicians; Infrastructure Development Company Limited (Government of Bangladesh); World Bank, GEF, UNDP, USAID, GTZ, KfW, (donors); customers.	PV Solar Home Systems, Biogas Plants, Improved Cooking Stoves	Micro-credit	150,000 SHSs, 3,000 biogas plants, 15,000 improved stoves	Proximity business model, strong gender approach, micro-utility scheme, cattle-biogas package.	1,3,4,7,8
Faulu Kenya Kenya	To increase the consumer-loans portfolio (according to customer-identified needs) in order to enhance its core product: enterprise development loans.	Faulu Kenya, Kenol Kobil, Total, BP, Shell, Caltex, Chloride Exide, customers.	LPG, PV Solar Home Systems, Biogas	Micro-credit	4,000 clients, overwhelmingly for LPG	Energy portfolio financed by its own resources, fully developed system of engagement and responsiveness with clients.	1,7,8

2.3 Corporate Social Responsibility

2.3.1 Corporate Social Responsibility for Energy Poverty Alleviation

"If the leaders of business continue to conceive of social responsibility as a mere euphemism for charity, a surrogate for the corporate image, a concern only for the public relations department, or simply a passing fad, they will fail to meet what may be one of mankind's greatest challenges."

-Don Votaw on Corporate Social Responsibility, 1973

The immense power of economic interests, yet the relative political and economic fragility of many countries and the growing tension between moral values and commercial goals, have sparked a debate on ethics in the past few years where society has begun to question the costs and excesses of 'big business', particularly since the corporate governance crises have recently begun to multiply. In addition, the downsides and the extent of the impact on socio-economic, environmental, educational, and health consequences are becoming apparent.[26] Media revelations of business misconduct and the new phenomenal speed in communications have changed global public awareness:

> *"If left to its own, the capitalist system is efficient but ruthless. It creates enormous wealth but can leave poverty and inequality in its wake. It increases productivity but discards employees. Capitalism powers the stock market but closes factories and abandons whole communities. It reduces consumer prices but lowers the wage of workers. It balances budgets but deprives governments of resources needed for investment. It offers access to the wonders of the World Wide Web but leaves millions behind in a new digital divide. It generates marvelous inventions but leaves environmental pollution in its wake. It democratizes information but marginalizes people. It speeds up the flow of goods, services and money but creates increased volatility, vulnerability, and insecurity. Globalization creates unprecedented riches but widens the gap between those who have and get ahead and those who don't and are left farther and farther behind."*[27]

The general assumption is that society and companies have opposing interests. Yet, there is a growing recognition that, "companies and societies are not in different camps; they are in the same boat. Companies cannot thrive in corrupt, enervated, impoverished societies; and the train of social progress will move much faster with locomotives at its head. [Assuming] that business and society are interdependent, CSR becomes an opportunity, not a duty."[28] Thus, due to the importance and interlinkage of social issues with business success, Ian Davis, worldwide managing director of the consultancy firm McKinsey & Company, has recast the long-running debate and presents "the relationship between big business and society as an implicit social contract – Rousseau adapted to the corporate world [where] this contract has obligations, opportunities, and advantages for both sides."[29] A healthy business requires a healthy society and vice versa.[30]

The need to link corporate social responsibility to the business' competitive advantage has also been expounded upon by Michael Porter and Mark Kramer of Harvard Business School, who advocate intersecting and integrating CSR approaches into core business, in order to achieve social and economic benefits which simultaneously create a benefit for greater society and the

---

[26] Jody Jensen, "Governing Global Markets In A New Age Of Globalization," *Economy & Society*, Forthcoming (2008): 7.
[27] Ira A. Jackson, and Jane Nelson, *Profit With Principles: Seven Strategies for Delivering Value With Values* (New York: Currency Doubleday, 2004), 17.
[28] Thomas A. Stewart, "Corporate Social Responsibility: Getting the Logic Right," *Harvard Business Review* 84, no. 12 (2006): 14.
[29] Ian Davis, "What is the business of business?" *The McKinsey Quarterly* no.3 (2005): 106.
[30] Ibid.,106-113.

firm, moving from "mitigating harm to finding ways to reinforce corporate strategy by advancing social conditions."[31] Ideally, CSR would consist of three layers: 1) corporate philanthropy; 2) risk management, where companies respond to environmental, social and governance issues posing risks to the business;[32] and 3) strategically embedding CSR into the core business to create value and become a part of the firm's competitive advantage.[33] Therefore, the 'triple bottom line' was created to define profitability in social and environmental terms as well as in economic terms.[34]

As mentioned previously, energy in general and electricity in particular are key factors in meeting global goals for economic and social development, as well as creating solutions for poverty alleviation, since they both allow small enterprises to emerge and innovate. This enables improved living conditions for those involved by increasing incomes, allowing more opportunities for education and improving livelihoods; thus ultimately breaking the poverty cycle. The development of small businesses producing services and goods is a key component in job generation and income growth in rural communities.[35] Since rural electrification is a dilemma for many governments, due to the complex process dealing with energy policy, as well as economical, technological and institutional aspects, consequently MNCs are exploring low-income markets in search of legitimacy and growth opportunities to fill this "electricity gap". MNCs are also creating innovative solutions for greater electrification access due to increasing societal pressures and the intensifying motivation to protect corporate reputations.

Again, for the purposes of this paper, CSR is understood as those practices that are part of the corporate strategy which complement and support core business activities, seek to avoid damage and promote the well-being of stakeholders by complying with the law and *voluntarily* going further. More specifically, this paper concentrates on the business opportunities that arise through CSR and create benefits for the company and its stakeholders. It is important to underline that businesses often willingly takes advantage of these opportunities, which simultaneously also create benefits for society, despite numerous contextual challenges, such as adapting to cultural characteristics of different regions and countries.[36] Businesses not only do "good" by investing in energy development, but can also carve out lucrative competitive advantages for themselves in the future, for example creating market niches or securing positions in new markets by anchoring their brand and corporate reputation with the first mover advantage.

However, correct project identification and implementation have been recognized as key obstacles for expanding healthy and profitable private sector involvement in energy development, particularly towards alleviating energy poverty. For these reasons, the following case studies have been selected, utilizing criteria which include: context, project scope and benefits; as well as lessons to be learned from each, with the understanding that pinpointing potential weaknesses and learning from them for the future is equally valuable to identifying strengths to replicate. The following section presents the case studies of Osram in Kenya, ABB in Tanzania and Unión Fenosa in Columbia.

---

[31] Michael E. Porter and Mark R. Kramer, "Strategy & Society: The Link Between Competitive Advantage and Corporate Social Responsibility," *Harvard Business Review* 84, no. 12 (2006): 85.
[32] Daniel Franklin, "Just Good Business: A Special Report on Corporate Social Responsibility," *The Economist* (January 19, 2008): 4.
[33] Ibid.
[34] Jody Jensen, "Governing Global Markets In A New Age Of Globalization," *Economy & Society*,Forthcoming (2008): 10.
[35] ABB (2005), "Access to Electricity- White Paper on ABB's initiative for Access to Electricity", 2-3.
[36] Peinado-Vara, Estrella (Spring 2006), "Corporate Social Responsibility in Latin America", *The Journal of Corporate Citizenship*, available in http://www.allbusiness.com/finance/4071875-1.html accessed June 6, 2009.

Osram's Off Grid Project:
Umeme Kwa Wote – Energy For All

Type of financing: Corporate Social Responsibility
Location: Mbita, Lake Victoria, Kenya
Technology: Energy-efficient lamps, LEDs, photovoltaic technology, UVC lamps
Power generation/Scale: 10 kW (Energy Hub peak capacity)
Main stakeholders: Siemens, Solarworld AG, Nokia, Osienala, Deutsche Investitions- und Entwicklungsgesellschaft (German Investment and Development Organization), Global Nature Fund
Total Cost: 2 Million Euros initial investment (for 4 hubs and pilot project)
Timing: Project initiation in 2005-2006; hub opening in April 2008; after circa one year of planning and 4 months for hub construction time

COUNTRY PROFILE

Total population (2005): 35.6 million
GDP per capita (2005): 1,240 PPP USD
Life Expectancy: 52.1 years
HDI value & ranking (2005): 0.521; 148 of 177 countries
Population living under US$2/day: 58.3% (1990-2005)
Population with access to electricity: 14%
Avg. annual electricity consumption per capita (2004): 169 kWh
Total CO_2 emissions (2004): 10.6 million tCO_2
Annual CO_2 emissions per capita (2004): 0.3 tCO_2

ABOUT THE COMPANY: OSRAM

Osram is a subsidiary within the Siemens Corporation and a high-tech company in the lighting industry as well as one of the two leading lighting manufacturers in the world. Approximately 60% of sales come from energy-efficient products. Sales for the Osram Group worldwide for the fiscal year ending September 30, 2007 totaled 4.7 billion Euros, 88% of which came from outside Germany. Osram employs over 41,000 people worldwide, supplies customers in about 150 countries and has 48 production facilities in 17 countries.

PROJECT DESCRIPTION

Background

Around Lake Victoria in Africa, approximately 30 million people have no access to a permanent power supply. Instead, they produce light by burning kerosene, which is a huge environmental burden: burning kerosene emits around 67 million tonnes of CO_2 every year in Africa. Besides being a very inefficient light source, kerosene lighting is expensive, dangerous and poses a hazard for the health of its users. However, for decades, the fishermen on Lake Victoria have been dependent on portable, kerosene-burning lanterns for light, which they use for night fishing. In total, these lamps use 20 million liters of kerosene every year, producing about 50,000 tonnes of CO_2.

An average fisherman in that community spends about 70% of his income just on the kerosene for the lamps. Kerosene is widely spread throughout most parts of the world and can be purchased in small quantities, which is the main advantage to those people who have a small and irregular income.

The community of Mbita, situated on Lake Victoria in Kenya, does not have a permanent power supply, but does have a thriving economy based on fishing. Around 175,000 fishermen use kerosene lamps every night to entice the fish. Osram has implemented a pilot project to improve the environment and lives of these Kenyan fishermen who live 'off-the-grid', meaning in a remote area of the world with no access to electricity. Osram sees this project as the first step in achieving a global solution to help diminish the dependence on kerosene by providing an alternative solution. The decision to implement the pilot project in Mbita, Kenya was due to the high dependence local fishermen have in using kerosene for their fishing activities, and consequently, the assumed high interest in an alternative energy source, since kerosene purchases consume a substantial part of the fishermen's income. In 2008, Osram implemented the project under the Swahili name of 'Umeme Kwa Wote' or Energy for All.

Stakeholders involved

The main stakeholders for the project were Osram´s parent company Siemens, which as the parent company was involved in the large scale financing model; Solarworld AG which supplied the appropriate solar panels for charging batteries; the Deutsche Investitions- und Entwicklungsgesellschaft (German Investment and Development Organization), which had a financial stake; as well as Osienala, which was responsible for the microcredit financing to enable the fishermen to pay the deposit of 10 Euros (30 Euros market value) for the lanterns; were also involved. Nokia also became a stakeholder with a financial stake. This was due to the lack of landline telephones in the area. Hence, many people have mobile phones, using them extensively and therefore a solution to recharge these batteries is also important. The Hub allows customers to recharge phones more easily (while promoting the communications business for Nokia). The Global Nature Fund was brought on board to implement an environmental impact assessment to ensure that replacing the lanterns would not have a negative environmental impact (particularly for the fish and air quality).

Technology

Osram provides alternative light products for its Off Grid project that are watertight, particularly robust and cost-effective in comparison to the kerosene lamps currently in use: compact fluorescent lamps. The products vary, but all depend on batteries which can be recharged with solar power at a central facility or energy hub, named the 'O-Hub' (for Osram Hub, or alternatively, Energy Hub). The product portfolio being offered is the following:

O-Box
This rechargeable external battery box, complete with electrical components to control charging, comes housed in a sturdy case that includes a handle for easy transport. It can power a basic 11-watt O-Lamp for more than eight hours and also can be used to power a portable radio or recharge a compatible mobile phone. The O-Box can be taken back to the nearest Energy Hub as soon as it is discharged and exchanged for a fully charged battery.

O-Lamp Basic
This is the luminaire fishermen use to illuminate their nightly fishing. Powered by an O-Box battery, it is water tight, dust resistant and comes with a screw-on cover. It uses a solar 11-watt bulb that provides about 600 lumen: sufficient light to illuminate an entire room. It operates in combination with the O-Box.

O-Lamp 2 in 1
This lantern-type luminaire comprises an energy-saving lamp and LED. Powered by an integrated rechargeable battery, it offers two lighting levels. It is comprised of a seven-watt compact fluorescent lamp that produces approximately 400 lumens for about eight hours. On its second setting, the O-Lamp activates LEDs, which provide a longer-lasting light that's bright enough to illuminate book reading. It can be recharged or exchanged at the O-Hub as a separate unit.

LED Solar I
The 'all-in-one solution', this luminaire offers light for up to seven hours in its normal mode and up to 30 hours when power is reduced by 25%. The package includes a small solar panel and adapters for charging several types of mobile phones.

Financing

The initial investment for Osram totals approximately 2 million Euros (for four hubs and the pilot project). On top are internal costs incurred by Osram, including, but not limited to costs for a four employee team, technology, research and development and all costs for the pilot phase.

A deposit of 10 Euros is to be paid by the fishermen (market value of the lamp is 30 Euros), so a micro-financing system organized by the local NGO Osienala was established to finance the lamps and deposit.

Osram claims that the switch over to the solar powered models 'O-LAMP BASIC' or 'O-LAMP 2 in 1' energy saving lamps pays for itself in approximately four weeks, when compared to the accumulated cost of kerosene.

Implementation

In April 2008, Osram's pilot project to create an alternative energy source to kerosene for the fishing community in Mbita, Kenya, was initiated, under the Swahili name of 'Umeme Kwa Wote' or Energy for All. This took place after approximately a year of planning and four months construction time for the specially constructed solar energy station called the 'O-Hub', located on the banks of Lake Victoria. The O-Hub is a small cabin-like building. It was constructed in cooperation with Siemens, and Osram's two partners Solarworld AG and Nokia. Here, users can recharge batteries for energy-saving lamps and batteries. Initial acceptance barriers were overcome through the gradual acceptance by key community leaders.

Key concepts of the project are:

- Efficient, energy saving lamps, luminaires and LEDs are operated with rechargeable batteries.
- Users can take their battery ('O-Box') and/or lamps to the Energy Hub as soon as it is discharged and exchange it for a fully charged battery or exchange the product as a separate unit. The Energy Hub has photovoltaic panels installed on the roof, so that the batteries are then recharged using solar power.
- The deposit the users pay for the batteries and/or lamps is covered by a micro-financing system which is organized by a local NGO.

The ultimate aim here is that the advantage of kerosene (being able to buy it in small quantities) becomes negligible, by making the cost of recharging the solar powered batteries even smaller than the cost of kerosene. In addition, the lighting is brighter, safer and has no health hazards, as kerosene does.

The 'heart' of the project is the 'O-Hub', which has a central role due to the vital function of recharging the lamps and batteries. Similar concepts of recharging stations in off-grid areas do exist, however the model Osram has created is unique due to the fact that via photovoltaic panels installed on the roof of the hub, all power generated is solar and therefore creates no CO_2 emissions for the community nor for the environment.

In addition, the solution Osram has created includes the aspect that the batteries and lamps are constantly being exchanged, so that regular product checks can be implemented in order to guarantee high quality standards. This ensures a long product life as well as the implementation of recycling programs at the end of the life cycle, which are additional mechanisms to mitigate environmental pollution.

Initially, the 'O-Hub' was intended only as a recharging station for its lighting products. However, during the implementation phase, Osram realized that the community of Mbita would also benefit from additional services which the O-Hub could provide. For example, other electrical appliances, such as mobile phones, can be recharged at a low cost and without damaging consequences for the environment. Other services were subsequently added, including the filtering of drinking water. The goal is to cooperate with Siemens to provide water treatment systems after the pilot trial period. With the implementation of Siemens' water-treatment units and Osram Puritec UVC lamps, bacteria and viruses are eliminated from water, enabling the 'O-Hub' to produce up to 3,000 liters of purified water every day.

THE CSR CASE FOR OSRAM

"OSRAM is a pioneer in the field of Off Grid solutions. We are proud to be the first lighting manufacturer in the world to offer a sustainable lighting solution for regions without power supply networks", said Dr. Kurt Gerl, CSO of OSRAM GmbH at a press conference in Nairobi.

Osram offers energy-saving alternatives for all lighting applications – including innovative products such as energy-efficient halogen lamps, also for commercial applications. To further expand production capacities for energy-saving lighting solutions – especially for high-growth markets in Asia-Pacific and Latin America – they are building new manufacturing plants in China, India and Malaysia. Osram will need more consumers in the future.

Osram already had established distribution channels in Africa. It initiated the project after an employee saw the opportunity to improve these distribution channels, as well as to create a more sustainable solution for the wide usage of batteries in Africa, where there was neither proper after sales service for the battery-operated lanterns nor the possibility of correct disposal for the used batteries.

Not only is the first mover advantage excellent for Osram's corporate reputation, but the Mbita pilot project also makes good business sense, since it is simultaneously laying the groundwork for future business opportunities in many developing countries.

LESSONS LEARNED

Strengths

A true 'win-win situation': Osram has created for itself the first mover advantage by being the first lighting manufacturer in the world to offer a sustainable lighting solution for off-grid communities, while the local community of Mbita is benefiting from their technology. Instead of using environmentally harmful kerosene lamps, local fishermen have the possibility to choose and can now also decide to use the solar-powered, energy efficient lamps. Currently there are approximately 1,500 users.

The pilot project in Mbita provides an excellent example for sustainable development in the region as well as successful and creative implementation of renewable energies to meet off-grid community needs In addition, jobs are being created at the Energy Hubs, since local training courses for operating and sales staff has been implemented.

Further social benefits of the project include those of the introduction of a new form of 'energy culture' in the region. Familiarizing the community with solar energy consequently increases energy literacy, the potential to expand the system to other (larger) applications, such as lighting in community centers, schools, or residential areas, etc. as well as a higher acceptance for alternative energy solutions.

Furthermore, the need to cover initial high costs (for lamps and deposits) for local fisherman was recognized and therefore a micro-financing system was organized by a local NGO. However, the microfinance part of the project later became obsolete when Osram recognized that the community was not utilizing the program, since motivation was high to save and pay for the initial cost privately.

The environment benefits from the reduction of CO2 emissions and eliminating contamination associated with kerosene.

In essence, a 'triple win situation' for the community has been created: 1) the local economy profits from a higher income/cost savings, 2) the local population benefits from the reduction in health problems associated with the kerosene lamps, and 3) emissions for the environment are reduced. Moreover, the company profits in the long term from a new market, new customers and improving its reputation (as outlined in the CSR Case).

Weaknesses

Some critics say that the rate of the fishermen in Mbita switching over to solar powered 'O-LAMP BASIC' or 'O-LAMP 2 in 1' energy saving lamps has been lower than expected, saying that initial costs remain too high and have created a barrier to acceptance among the fishing community. On the other hand, Osram says that the lamps are affordable and that the community was not making use of the microfinancing program because they preferred not to use the option, instead using collective means to come up with the money.

Potential for replication

"Osram's solar station, the Osram Energy Hub, is a concept that can be replicated anywhere in the world. We are supporting the local economy in the region, the local population, and reducing CO2 emissions," says Wolfgang Gregor, project leader Off Grid and Chief Sustainability Officer at Osram.

The 'O-Hub' in Mbita was the first of many that Osram intends to build in remote areas. Currently, four hubs and the pilot project exist, three of which are also in the vicinity of Lake Victoria, the fourth in Uganda. In addition, the construction of an energy hub in India is being assessed. Osram intends to replicate this model on a large scale, considering that still to be insufficient to make a significant impact in combating global climate change. Implementation on a large scale is also important for Osram in order to recover costs.

Aside from the company Osram giving access to the needed technology, energy hubs could be built in any community off the grid and easily adapted to meet specific needs and demands.

SOURCES

- Interview with Mr. Christian Merz, Sustainability Manager, OSRAM GmbH
- Osram Corporate Website, www.osram.de
- Siemens Corporate Website, www.siemens.com
- The American Ceramic Society, Ceramic Tech Weekly, http://ceramictechweekly.org/?p=823

ABB's "Access to Electricity": Pilot Project Tanzania

Type of financing: Corporate Social Responsibility
Location: Village of Ngarambe, Southern Tanzania
Technology: Fuel-oil generator/ 'UEC Eco-Engine', developed by Mitsubishi Heavy Industries, Ltd.
Power generation/Scale: 1,800 users, exact figures unavailable
Main stakeholders: ABB, The WWF Tanzania, local community and the District Council
Total Cost: Exact figures unavailable
Timing: Launched in 2002, ongoing

COUNTRY PROFILE

Total population (2004): 38,478 million
GDP per capita (2005): 744 PPP US$
Life Expectancy (2005): 51.0 years
HDI value & ranking: 0.467; 159 out of 177 countries
Population living under US$2/day: 89.9% (1990-2005)
Population without access to electricity: 34.2 million
Avg. annual electricity consumption per capita (2004): 69 kWh
Total CO_2 emissions (2004): 4.3 million tCO_2
CO_2 emissions (of world total, 2004): (.)
Annual CO_2 emissions per capita (2004): 0.1 tCO_2

ABOUT THE COMPANY: ABB

ABB, formerly ASEA BROWN BOVERI, is a Swedish–Swiss multinational headquartered in Zürich, Switzerland. ABB is one of the leading engineering companies as well as one of the largest conglomerate companies in the world. It is also the world's principal builder of electricity grids and a leader in power and automation technologies that enable utility and industry customers to improve performance while lowering environmental impact. The ABB Group of companies operates in approximately 100 countries and with approximately 115,000 employees (2008).

- Total revenues in 2004: $20.7 billion
- Power Technologies: $8.8 billion
- Automation Technologies: $11,0 billion
- Orders received in 2003: $21.7 billion

PROJECT DESCRIPTION

Background

In the early 1960s, Africa's population was about 300 million and 10% of the rural and 50% of the urban African households were connected to the grid. Today, Africa has approximately 891 million people. The total population in Sub-Saharan Africa is 738 million and which has an overall electrification rate of just 25.9%. Furthermore, it has an urban electrification rate of 58.3% and a rural electrification rate of 8.0% (see Chapter 1). Important to take into consideration are the demographic changes, mainly the heavy rural to urban migration patterns which are increasing, particularly in the past few decades.

In Tanzania, electricity generation, transmission and distribution is done through the Tanzania Electric Supply Company, which is 100% government owned and responsible for 98% of the country's electricity supply. Between 2000 and 2001, the rural average for mainland Tanzanian households reporting a grid connection was 2%, the Kilimanjaro region ranking first nationwide with 13%. Biomass energy resources, which comprises fuel-wood and charcoal from both natural forests and plantations, accounts for 93% of total energy consumption. About 80% of the population lives in rural areas where energy requirements are mostly met by fuel-wood, resulting in deforestation.

ABB has activities in thirty-eight of the forty-nine countries currently designated by the United Nations as the least developed countries in the world and has local representation in ten of them. The Access to Electricity (ATE) program is ABB's response to the

United Nations Global Compact launched in 2000, which urged companies and organizations to provide greater assistance to the least developed countries.

ATE focuses on the implementation of local, bottom-up and low cost electrification projects with particular emphasis on:

- The productive use of electricity
- The establishment of sustainable power systems capable of paying their own operating and maintenance costs

Challenges facing rural electrification schemes include:

- Adapting technical standards and technology to low electrical loads
- Adjustment to smaller and intermittent patterns of consumption
- Overcoming low affordability

Therefore, this requires simple and sound technology with the ability to:

- Withstand severe climatic conditions
- Resistant to vandalism and theft
- Simple to operate and maintain

The choice of rural sub-Saharan Africa was related to the low level of electrification in this region. Of the 1.6 billion people lacking access to electricity around the globe, 547 million live in sub-Saharan Africa, making it the second region with the highest need of electricity after South Asia.

In 2002, ABB approached the World Wide Fund for Nature (WWF) to form a partnership for rural electrification. WWF International agreed and assumed the responsibility for identifying a suitable Tanzanian village for a pilot project. It recommended the remote village of Ngarambe, population 1800, located just outside the Selous Game Reserve, because they had worked with Ngarambe since the mid-1990s on a number of other issues, such as wildlife conservation.

After choosing Ngarambe as a pilot project site, ABB launched the ATE project at the 2002 World Summit in Johannesburg. ABB presented ATE as its attempt to build a long-term profitable rural electrification business and the Ngarambe project as its way to gain the necessary experience for this.

Project characteristics, as defined by ABB:

ABB strives for business applications and demonstrative projects characterized by:

- A focus on the development of poor communities in developing regions.
- Synergies with other infrastructure and focus on growth of local business.
- Local involvement and partnership with companies and organizations.
- Alternative business models adaptable to local conditions.
- Opportunities for ABB to contribute technical and commercial expertise.
- Projects are profitable, since otherwise efforts are unsustainable in the long term.
- Projects supporting the UN Global Compact's programs for Growing Sustainable Business in the Least Developed Countries.

Stakeholders involved

ATE emphasizes collaboration with stakeholders from all sectors– governments, companies, non-governmental organizations, aid agencies and the broader civil society – since each partner brings complementary skills to the project. Moreover, to work with local authorities to realize villagers' needs and create affordable solutions. Concretely for the pilot project in the village of Ngarambe, Southern Tanzania, ABB worked together with The WWF, the local community and the District Council.

Technology

The most 'environmentally friendly' diesel engine on the market was used, which was at that time a fuel-oil generator named 'UEC Eco-Engine' and developed by Mitsubishi Heavy Industries, Ltd. in order to address the trend towards the enhancement of low emissions in the marine industry. It is an engine which was the result of a modification of a conventional engine with a fuel injection system, exhaust valve driving system, engine starting system and cylinder lubricating system; and all are controlled electronically. Consequently, the engine structure is simplified by eliminating the conventional large mechanical parts, such as cams, camshaft and driving gears. As a result, fuel oil consumption can be reduced by 1-2% and at equivalent fuel oil consumption levels, Nitrogen Oxide (NOX) emissions are reduced by ca. 10-15%, when compared with conventional engines.

Financing

All financing was done by ABB, however, exact figures were not available.

Implementation

The village of Ngarambe received a locally adapted solution to have access to electricity in mid-2004. ABB supplied the generator, installed underground cables and low-voltage equipment and trained local people to run the power supply. WWF provided guidance on issues ranging from reducing deforestation to health care and environmental education. The following issues arose during the implementation process:

- In deciding upon the power source, for various reasons wind, water and grid extension were ruled out. Only diesel and solar cells were seen as options. While recognizing that diesel was environmentally unsustainable, ABB and WWF decided that it was the only viable alternative given the project's budget. Therefore, the most 'environmentally friendly' diesel engine on the market was used. A feasibility study in the second phase of the project concerning the use of wind power as backup was conducted.
- Ngarambe villagers were skeptical, initially not wanting electricity in their homes, which was apparently related to a lack of awareness of the benefits of electricity and a general mistrust of companies. In addition, some villagers' beliefs strongly opposed electricity, which was particularly evident with the village's traditional medicine man, who did not allow ABB employees to set foot in his house nor install electricity.
- To reduce costs, ABB initially envisioned installing the distribution cables between the generator and the houses above ground. WWF rejected this option on the grounds that elephants, which were often present in the area, might get electrocuted. Therefore, ABB accepted the additional cost of burying cables underground and ABB, WWF and the village government agreed that the villagers would dig the necessary trenches. However, this only became possible when the villagers received payment.
- ABB agreed to provide necessary technical training for two villagers, since the village would be assuming operation of the electrical system. The village government selected two candidates deemed to be the best skilled for the job. However, during training it became clear that those were the two with the best connections to the village government and another four villagers needed to be trained.

Feasibility studies were done to introduce a wind power installation to replace the generator; to electrify a maize mill and sawmill and link more homes to the mini-grid. Most recent information indicates that this remains pending.

THE CSR CASE FOR ABB

ABB agrees that access to modern energy services is key to economic and social development. With many electrification programs in developing countries having failed to reach the rural poor, ABB aims at improving the response to the needs of developing regions and create new solutions through their technical and commercial expertise. These actions would also ensure the creation of a future market niche, strengthen the corporate brand and reputation to gain customers, and achieve ABB's overall goal of long-term business engagement in these regions.

Through Access to Electricity, ABB seeks to contribute to objectives close to its core business of providing technical and commercial expertise, aiming towards improving the situation of communities in developing regions left on the margins of sustainable development, focusing on the productive use of affordable electricity and promotion of local economic growth. While ABB has broad experience in electrification projects all over the world, including in developing countries where ABB faces challenges in its daily operations, involvement in these projects creates valuable knowledge management for ABB in its' normal business operations, particularly in those markets where it currently only has a limited presence. ABB expects that ATE will strengthen its ability to meet the needs of these markets and that this may become a substantial part of ABB's regular business. Moreover, the program is a key driver in brand management and reputation protection.

LESSONS LEARNED

Strengths

ABB's pilot project for ATE in Ngarambe has led to economic, social and environmental gains. One major reason is the strong stakeholder engagement: having the WWF, the local community and the District Council partner the electrification project together allowed a more holistic approach for the village.

Today, power from a diesel-fired generator is lighting up the school, dispensary, local government office, mosque, small businesses on the main road and a number of homes. The electricity – cheaper than the kerosene used previously – is on for four hours every day after dusk. As of the end of 2006, a total of 15 businesses, including a guest house, food stores and clothes shops had been created, compared to three prior to electrification. Other advances were:

- 25 new homes, underscoring economic gains and local immigration
- More homes connected to the mini-grid, based on the diesel generator donated by ABB and a new water pump
- The number of students has increased from 250 to 350. Children who are able to study after dark are passing school exams in increasing numbers
- Training on limiting hunting and sustainable logging

Weaknesses

ABB adopted the business model in Ngarambe similar to that proposed by the Rural Electrification Funds (part of the Rural Electrification and Transmission project funded by the World Bank and Asian Development Bank, and whose objective is to accelerate the rural electrification rate and reduce economic supply costs). Therefore, it was intended that the villagers themselves should finance the long term operation and maintenance of the electrical system. However, financing was a large challenge for the Ngarambe village, since ABB was the only one with financial resources at its'disposal.

Moreover, diesel may have been an attractive power source due to its low initial investment, but operational costs are high. Therefore, ABB and WWF are currently supporting the village financially and technically. The support is to the extent that Ngarambe's electricity supply is indeed secure. However, it would have been more sustainable and more rewarding for the community, had they had the means to sustain themselves independently. Therefore, a microfinancing model may have created beneficial added-value to the project.

Furthermore, due to budget constraints, ABB did not have the funding at the time to implement a renewable energy solution. Given the remote location of the village, as well as being next to a game reserve, it would have been better to have a solution which would have had minimal to no impact on the environmental surroundings. The choice of diesel has since then been questioned by several stakeholders at the international level, some at the Tanzanian level (hardly any at village level). Given that ABB did not have sufficient financial resources; it could have been better to invite an additional partner to cover the financial gap in order to make a renewable solution feasible.

Stakeholder engagement with the community should have been stronger prior to project implementation, as is demonstrated that key community leaders refused to deal with ATE (ie., denying access to private households) and the lack of a community project contribution (ie., digging the needed trenches for free). ATE is a commercial *and* social venture for ABB. With external funding needed for further projects, ATE is not 'classical' CSR.

Potential for replication

ABB and WWF are exploring similar projects in other parts of Tanzania, including nearby villages in the Selous game reserve. ABB is working with other partners on World Bank-financed projects in Senegal and Uganda.

ABB extended ATE at the end of 2005 to Rajasthan in western India, following the successful launch in another remote location in southern Tanzania. The project – based on multi-stakeholder partnership – has brought together ABB, the state government of Rajasthan and an NGO to provide power to desert hamlets. The program started with providing one hamlet with power generated by solar panels and has since been extended to four more hamlets covering 500 households. The hamlets' inhabitants, of which the majority are tailors, can now work longer and earn more. Their children can also study at night. Since, ABB has also become active in Bangladesh, Mozambique and Laos to implement solutions to assist in achieving energy poverty alleviation.

SOURCES

- ABB Corporate Website, http://www.abb.com.
- ABB (2005), "Access to Electricity- White Paper on ABB's initiative for Access to Electricity": 1-10, available in www.abb.com, accessed June 7, 2009.
- African Rural Energy Enterprise Development (AREED), "Energy in Tanzania", http://www.areed.org/country/tanzania/energy.pdf, accessed July 4, 2009.
- CSR Europe, "Access to Energy", http://www.csreurope.org/solutions.php?action=show_solution&solution_id=168, accessed June 7, 2009.
- Egels, Niklas (Summer 2005), "CSR in Electrification of Rural Africa: The Case of ABB in Tanzania", JCC, Issue 18, available at Centre for Business in Society, School of Economics and Commercial Law at Göteborg University, Göteborg, Sweden, www.handels.gu.se, accessed June 7, 2009.
- Ikeno, Jun (March 2007), "The Declining Coffee Economy And Low Population Growth In Mwanga District, Tanzania", African Study Monographs, Graduate School of Asian & African Area Studies (ASAFAS), Kyoto University, Suppl.35: 3-39.
- http://www.africa.kyotou.ac.jp/kiroku/asm_suppl/abstracts/pdf/ASM_s35/1IKENO.pdf, accessed June 17, 2009.
- Mitsubishi Heavy Industries, Ltd., Katsuhiko Sakaguchi (Feb. 2004), "Environmental Friendly Diesel Engine, UEC Eco-Engine", *Technical Review*,

Unión Fenosa: Energía Social in Colombia

Type of financing: Corporate Social Responsibility
Location: Santa Marta, Colombia
Technology: Connection to main electric grid
Power generation/Scale: Exact figures unavailable
Main stakeholders: Energía Social, local government, small local implementing companies, local community and end consumers
Total Cost: Exact figures unavailable
Main purpose: Decrease fraud and achieve a solution to avoid grid losses
Timing: Since 2004

COUNTRY PROFILE

Total population (2005): 44.9 million
GDP per capita (2005): 7,304 PPP US$
Life Expectancy (2005): 72.3 years
HDI value & ranking: 0.791; 75 out of 177 countries
Population living under US$2/day: 17.8% (1990-2005)
Population with access to electricity: 86%
Avg. annual electricity consumption/capita (2004): 1,074 kWh
Total CO_2 emissions (2004): 53.6 million tCO_2
CO_2 emissions (of world total, 2004): 0.2%
Annual CO_2 emissions/capita (2004): 1.2 tCO_2

ABOUT THE COMPANY: UNIÓN FENOSA

Unión Fenosa is a Spanish energy group with diversified operations. It primarily deals with the generation, distribution and commercialization of energy (electricity and gas). It also has interests in the telecommunication infrastructure, mining and real estate markets. Unión Fenosa is headquartered in Madrid, Spain, and has operations in 13 countries. It has a gross installed capacity in Spain of 7,231 megawatts (MW). It has a gross installed capacity of 285 MW under special regime as of December 2006. In the international generation business, the installed capacity of the company reached 2,773 MW, at the end of December 2006.[37]

PROJECT DESCRIPTION

Background

The Spanish electricity company Unión Fenosa has taken a unique approach to provide both energy and a future to a poor community in Santa Marta, Colombia. A quarter of Colombia´s population lives on the Atlantic coast, 70% of which lives below the poverty line. These settlements are usually created by internally displaced people of guerilla conflict zones, with approximately 2 million people living in poor conditions.

This entails no access to public services, reliance on rudimentary power lines often self-made by local people. There are no contracts for power supply. Those that did have a regular service were usually tapping it directly from the network without paying. As a result, regular violence and accidents occur frequently. The electricity distribution companies, Electrocosta and Eletricaribe had suffered severe and persistent losses. This was the situation when the Spanish utility entered the Colombian energy market in 2000. In 2002, Unión Fenosa took control of eight state-run electricity providers. The eight Colombian companies had accounts that were nearly US$345 million in arrears and were losing nearly US$66 million a year through illegal connections. On closer scrutiny of the 1.45 million customers in Colombia, Unión Fenosa found that more than half of them lived below the poverty line.

The company realized that the market was characterized by scarce formal access to electricity in

[37] Please note that this data corresponds with the previous status of Unión Fenosa, prior to the current merger with Gas Natural.

many areas: 269,000 families (or about 2 million people) had illegal access to electricity which caused safety problems. Furthermore, living conditions and income patterns of these users were not the same as in the regular electricity market and it was the socio-economic factors which contributed to fraud, waste and the lack of a reliable billing and payment system. Unión Fenosa's investment in Colombia was approximately US$1,500 million, possibly one of the biggest investments of the Spanish company in any foreign market. However, the company was facing lower revenues and higher energy losses than expected: approximately 19% of potential revenue was lost due to illegal energy usage.

Rather than cut users off completely from the grid, as well as to ensure profitability, Unión Fenosa created Energía Social in 2004 as a subsidiary of the company's Electricaribe division, with the purpose of managing these 'subnormal' markets.

The company realized that they might not be able to turn a profit with customers, but they hoped to reduce the tide of irregular connections, which subsequently led to accidents and other losses. With the creation of Energía Social, Unión Fenosa addressed a basic need: safe and legal electricity access to market segments that had been traditionally excluded and considered not profitable for utilities providers, on a sustainable and cost-effective basis.

Stakeholders involved

As an electricity trading company based on a bottom-up approach, stakeholders became engaged through Energía Social's establishment of an alliance between the company, the administration (town halls, councils etc.) and end consumers (local people). The consumers became the important drivers. Since electricity supply had been a difficult, tension-laden issue for 30 years, the main barrier to overcome was the distrust amongst stakeholders.

Technology

Connections to existing electric grid.

Financing

Unión Fenosa took a leadership role in approaching both central and local governments to contribute to this project both financially and in creating the necessary legal infrastructure to implement it. The Colombian government invested approximately US$6 million (80% of a total US$7.5 million total investment needed to normalize 18 communities) and local governments and Energía Social donated the remaining approximate US$1.5 million or 20% of the total investment, a contribution to 'normalize' 12,000 families living on the Colombian coast, providing them with regular access to electricity to improve the basic infrastructure in the area for local small businesses and schools, and safe wiring systems.

Implementation

Unión Fenosa established Energía Social as a subsidiary of Unión Fenosa's Electricaribe division and as an electricity trading company based on a bottom-up approach to the problem, via the establishment of the stakeholder alliance. The business model is also based on the concept of sustainability, both for the community and the company. Energía Social was conceived by taking into account the different operating context from the very beginning, particularly:

- Existing electricity infrastructure
- Ideological constraints
- The state of the local economy

In its execution phase, Energía Social implemented the following measures:

1. It conducted a census to determine which electrical appliances were in each home. With this information, it calculated an average consumption for each neighborhood and charged the district accordingly. The bill was divided among the inhabitants, who were in turn allowed to pay according to a flexible payment system. In addition, Energía Social helped to reactivate home-based businesses in the communities, as a method to help people find the means in order to pay.
2. Energía Social collaborated with local companies to create the connections, billings, collections and customer services in every community. This in return created direct employment for approximately 130 local people and indirect employment for another 1,200 people.
3. Afterwards, Energía Social set out to change the attitude of non-payment and energy wastefulness. They created a major advertising campaign regarding energy-saving possibilities, which was then followed by widely publicized grid improvements (to reduce illegal connections).

More concretely: the issue of low revenues was tackled by creating a method of collecting the revenues through small enterprises (which were called Mypimes) initiated within the communities to measure energy usage, collect payments and provide customer services, such as repairs and energy literacy. Energía Social outsources opportunities that can be met by local contractors due to their local knowledge of the specific community. It established a collective billing system that allows the community to make a common investment and decide how to split the costs. For these reasons, one can claim that due to Energía Social enforcing institutional conditions, managed to re-establish a type of local governance.

The company worked closely with central and local authorities to develop an appropriate tariff and billing structure and raise awareness of the need for a legal framework reform in the Colombian energy market. The newly implemented regulation allowed more flexible payment periods to adapt to the income patterns in this market. According to the company's 2004 annual report, the fiscal year ended with a 60% increase in revenues from billing (US$2,914 million increase).

In order to deliver energy, the following procedures were implemented:

- A communal meter placed in every district.
- Regular supply and timetables established between the company and communities to regulate the consumption of energy for productive activities.
- Small collection units operated by local people and procedures created by Energía Social's management, for example the 'pay the day', where payments are made on specific days in order to accommodate the family budget.
- Technical training is carried out on weekends for network improvements through a company volunteer program. Additional training is focused on energy efficiency awareness.
- Corporate philanthropy programs target improving living conditions in the slums.

Electricity access has led to the improvement of their standard of living through access to employment, business and better government regulation.

THE CSR CASE FOR UNIÓN FENOSA

Energía Social in Colombia is an example highlighting the significant social value firms can generate while simultaneously improving profitability. Unión Fenosa has been able to successfully operate in a low-income market, improving reputation and gaining a competitive advantage while taking advantage of new business opportunities. These operations are also beneficial towards improving corporate relations with governments and communities that provide licenses to operate.

Energía Social, as Latin America's only electricity utility specifically dedicated towards poor customers, was not initially geared towards making a profit. Instead, the company's main objective was to reduce the number of irregular connections, amount of energy illegally obtained, as well as the number of accidents and other associated losses. This it has achieved.

Since 2004, the number of Unión Fenosa's regular customers in Colombia's low-income communities has risen by more than two-thirds (71%). In market terms, this is equitable to an increase from US$8.3 billion to $14.2 billion per year. Currently, in concrete terms, corporate social responsibility for Unión Fenosa includes the following figures (2007):

Number of new customers in developing countries:	**324.000 (6,3%)**
Total expenditure on social action, patronage and sponsorship:	US$6,89 million[38]
Direct jobs generated by Energía Social:	185
Rate of job placement of people trained in social projects in Spain:	70%

LESSONS LEARNED

Strengths

- Total number of direct jobs generated by Energía Social: 185
- The service delivery side also provides employment for local residents. Energía Social collaborated with small local companies to execute functions such as billing, payment,

[38] 5,3 million Euros at an exchange rate of US$1,30

disconnections, reconnections and customer service. Operating under the Energía Social brand, these local representatives became the interface in the community. This interface has created direct and indirect employment, totaling approximately 1,200 jobs.

- 143 sessions have been carried out for network improvement and 50,000 families have benefited from a normalized electricity supply.
- Revenues have increased by 65%.

By adapting its business model, Unión Fenosa (through Energía Social), has been able to strengthen its relationship with targeted communities. Consequently, a range of competitive services is offered today for a previously unforeseen sector. Meanwhile, local residents benefit from a more reliable and efficient electricity supply and this contributes to their social development, which in turn makes them more lucrative customers. Moreover, ensuring the proper electricity regulation, for example, has persuaded the government to push forward with proper legalization of these communities, which has associated benefits for residents, such as enabling them to obtain ownership titles for homes.

In addition, in these poor communities there are resources available in the form of local knowledge and human capital that a business can tap into. These can be integrated into the company's mainstream business if it is able to identify how to utilize them, in ways that add value or reduce operating costs. This was the case for Energía Social with the 'marañeros': a term used for people that manipulate the grid and illegally connect to the electric service. With very basic skills and receiving a little bit more than one dollar, they were able to provide electricity to a household. Apart from representing lost business to the company and being illegal, this activity was a safety hazard for all. To address this issue, Energía Social designed and implemented a program to include them as beneficiaries, hired them as contractors after a training period to provide them with jobs and a more stable source of income.

Employment creation and the social integration of otherwise marginalized communities are beneficial consequences of business seeking the commercial inclusion of low-income sectors. New local businesses can be created as a result of a multinational company's presence, in order to supply it with raw materials, workforce and other needed resources. This is particularly relevant as micro, small and medium enterprises have an important role in job creation and therefore poverty alleviation. As shown in this case, the poor may be business partners, suppliers, employees or distributors. Energía Social tapped into the entrepreneurial capacity of nearby communities and helped local people benefit from the company's know-how and created new, official job opportunities.

Weaknesses

The case of Energía Social is sound. A possible improvement in the future for similar projects is a stronger reinforcement of a better usage of energy among the consumers and a stronger emphasis on energy efficiency. Energía Social implemented a campaign to create awareness for these issues, but pending the education and literacy levels in this community, the success thereof is questionable. A suggestion for future projects would be to incorporate the service team. Providing further education to the service team could create a multiplier effect within the community due to the frequent contact with customers.

Potential for replication

Based on this experience, Energía Social is currently considering expansion to other communities. It is an interesting case that features a win-win solution for urban energy poverty alleviation and the concept is transferable to similar energy utilities.

SOURCES

- Balch, Oliver (April 3, 2007), "Colombia: social energy – Keeping the lights on" in *Ethical Corporation* http://www.ethicalcorp.com/content.asp?ContentID=4989, accessed June 6, 2009.
- CSR Europe, "Energy supply in low income countries (Energia Social): Improvement and normalisation of electricity supply in Colombia´s slums",
- http://www.csreurope.org/solutions.php?action=show_solution&solution_id=142, accessed June 6, 2009.
- Peinado-Vara, Estrella (Spring 2006), "Corporate Social Responsibility in Latin America", *The Journal of Corporate Citizenship*, available in
- http://www.allbusiness.com/finance/4071875-1.html, accessed June 6, 2009.
- Unión Fenosa Corporate Website,
- http://www.unionfenosa.es.
- "Unión Fenosa involves Colombian communities in providing electricity and jobs", *Ethical Insight*, Issue 64, May 9, 2007, http://hades.maplecroft.com/ethicalinsight/issue64/analysis_23.html, accessed June 6, 2009.

2.3.2 Corporate Social Responsibility Findings

Taking into consideration the vast energy access gap society faces today with 2.5 billion people without modern energy services for cooking and heating, 1.6 billion people without electricity and a significant financial gap to breach, the private sector is called upon to make a contribution to help alleviate these issues. The instrument for this is corporate social responsibility. The previous section presented the case studies of ABB in Tanzania, Osram in Kenya and Unión Fenosa in Colombia. As the various projects and the associated lessons learned have demonstrated, there is a wide scope for application and innovation. Done correctly, CSR is a great opportunity for the private sector and society as a whole.

The reason is that today, multinational companies operate extensively in developed markets, focused on short term profits and a relatively small customer segment. Future markets of over four billion potential customers and consumers are waiting to have their needs addressed by innovative companies. While these new markets, called the *Bottom of the Pyramid*, require a long term approach, particularly regarding investments, strategies and commitment, as well as the adaptation of products and services; they also represent substantial and lucrative business opportunities. This is a fundamental motive for the private sector to begin creating innovative solutions to alleviate energy poverty. Not only are the needs of society being improved, but CSR equates into excellent opportunities for companies, a few which include: tapping into local knowledge and resources, opportunities to improve products and services or establishing a good reputation by "doing good" and acquiring a first mover advantage in these future markets, etc. There is a certain logic and great opportunity to be found. For example, an energy technology company can enter the wide-open market in developing countries, instead of attempting to force their technology prematurely into applications for developed markets, where institutions and tough competition can raise high barriers to success.[39]

At the same time, the private sector needs to remain aware of the exact purposes it is attempting to achieve in order to weigh the benefits and limitations. The three main drivers for CSR are: 1) risk management (ie. changing stakeholder expectations and the business environments); 2) gaining new business opportunities (ie. access to new markets, maintaining markets or access to resources); and 3) seeking recognition of the company's role in society (due to reasons as diverse as the aims of individual leadership or long term brand positioning). For the three case studies we have presented, there was ample rationale involved in moving to the Bottom of the Pyramid, as well as in creating innovative solutions for energy poverty alleviation.

In the case of Osram in Kenya, the company saw a new business opportunity, since adaptation of the product to meet the needs of a local community and recognizing simultaneously the opportunity to do so in a sustainable manner creates maximum stakeholder benefits. In addition, acting in a responsible manner creates recognition for its sustainable practices, thus benefiting the corporate reputation. The project is already in the process of replication, thus demonstrating the high potential for the new business idea. Therefore, Osram's drivers were gaining new business opportunities and reputation.

When Unión Fenosa expanded to Colombia, it discovered that approximately 19% of potential revenue was being lost due to fraud and grid losses, ie. illegal energy usage. By establishing the subsidiary Energía Social, the company managed to resolve the issue in a way that created benefits for all. Since the start of Energía Social, the number of regular customers for Unión Fenosa in Colombia's low-income communities rose by 71%, so that in market terms, this is equitable to an increase of US$8.3 billion to $14.2 billion per year. In turn, the communities have benefited from safe and legal access to energy, as well as economic and social benefits. Therefore, Unión Fenosa's drivers were first risk management, followed by a new business

[39] Prahalad, C.K., Hart, Stuart L., "The Fortune Pyramid Bottom at the Bottom of the Pyramid," *Strategy and Business* 26, vol 1 (2002): 4.

opportunity. Subsequently, Unión Fenosa has also gained recognition for its innovative approach to resolving the energy poverty issue.

In the case of ABB, it is a MNC operating in thirty-eight of the forty-nine countries currently designated by the United Nations as the least developed countries in the world, and thus the Access to Electricity (ATE) program is ABB's response to the United Nations Global Compact which urged companies and organizations to provide greater assistance to the least developed countries. But ATE is also the medium through which ABB aims to improve and respond to the needs of developing regions and to create new solutions through their technical and commercial expertise. For ABB, these actions ensure the creation of a future market niche, establish recognition of the corporate brand and create reputation in order to gain customers and achieve ABB's overall goal of long-term business engagement in these regions. Therefore, the previously mentioned drivers would be all three for ABB. However, the CSR project explained in the case study demonstrates the limitations CSR projects can have and that not all types of projects are suitable or very successful, even if well intentioned. The many weaknesses of the project (as outlined in the case study) show that implementation could have been improved: more environmentally friendly and sustainable technology, stronger stakeholder engagement and a higher alignment with the core business of ABB.

The case studies have attempted to demonstrate that CSR is about creating a win-win situation, where the company and society mutually benefit from CSR programs and initiatives. Identifying benefits and limitations, as well as deciding which project is the most suitable to become successful under a company's CSR strategy (in order to maximize gains) are real challenges for many companies. Essential to keep in mind, is that when businesses define applicable levels of social responsibility and their goals, they should prioritize according to the importance of the various issues at hand. Due to constraints such as resources and capabilities, it is necessary to evaluate whether and where it is worthwhile to invest resources in order to achieve the optimal outcome. The following figure demonstrates the different levels of CSR that are targeted.

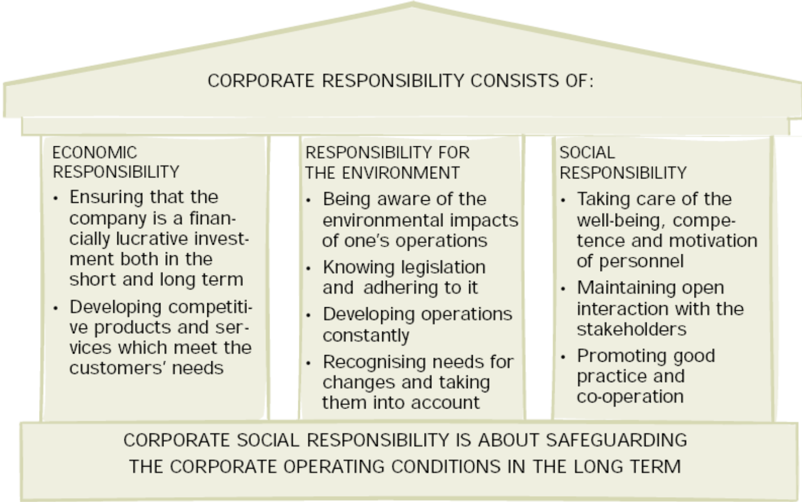
Figure 2.2: Levels of Corporate Social Responsibility[40]

In addition, corporate responsibility consists of the "triple bottom line", meaning that the company should measure performance in terms of economic, environmental and social responsibility and that these responsibilities ideally are in balance.[41] The following figure illustrates the three dimensions.

[40] Finnish Energy Industries Federation FINERGY (2002), "Corporate Social Responsibility of the energy industry:Guide to Business," http://www.energia.fi/en/publications/corporatesocialresponsibilityoftheenergyindustry.pdf", accessed June 20, 2009.

[41] Ibid.

Figure 2.3: The Three Pillars of Corporate Social Responsibility[42]



Furthermore, recently there has been increasing interest in the dimension of governance, which incorporates internal issues, such as corporate codes of conduct, as well as external matters, ie. regulation and international standards.

Above all, corporate social responsibility is about implementing sustainable development in business.[43] Ideally, this incorporates all four dimensions: going past minimum governance requirements, improving society and safeguarding the environment; all while benefiting the company economically, in order to ensure its operation. The case of Osram, for example, has demonstrated that this is feasible: they have succeeded in creating a new product and services which has had beneficial impacts on the lives of the users and the surrounding environment of Lake Victoria, while creating an economic benefit in the long term. There remain many opportunities for companies interested in innovation and dedicated to sustainability. Facing the challenge on deciding how to select the strategically relevant projects is tackled in the following chapter with the proposal of a CSR project selection tool.

---

[42] Finnish Energy Industries Federation FINERGY (2002), "Corporate Social Responsibility of the energy industry:Guide to Business," http://www.energia.fi/en/publications/corporatesocialresponsibilityoftheenergyindustry.pdf", accessed June 20, 2009.

[43] Ibid.

2.4 The Clean Development Mechanism

2.4.1 Clean Development Mechanism for Energy Poverty Alleviation

"Climate challenge offers real opportunities to advance development and place our societies on a more sustainable path. […] International carbon finance flows to developing countries could reach $100 billion per year. The Kyoto Protocol is now fully operational and its Clean Development Mechanism has become a multibillion-dollar source of funding for sustainable development. This mechanism is an outstanding example of a UN-led partnership linking government action to the private sector in the developing world."

-Kofi Annan, former UN Secretary-General

The Kyoto Protocol, drawn up in 1997 by the United Nations Framework Convention on Climate Change (UNFCCC), imposes greenhouse gas (GHG) emission limitations on industrialized countries. To help developed countries to meet their targets, the protocol includes **flexible mechanisms,** enabling them to reduce GHG emissions in other countries. The use of these mechanisms must be supplementary to the domestic reductions and allows cost-effective reductions: it is cheaper to reduce emissions in some countries than in others.

The Clean Development Mechanism (CDM) is one of these flexibility mechanisms. It assists developed countries in reaching their reduction targets by promoting sustainable development in developing countries.[44] In practice, it means that an industrialized country finances a "clean development project" in a developing country, resulting in less GHG emissions than what would have happened without the project. An example is financing a renewable energy system in an area that would otherwise rely on fossil fuels. It is then considered that the reduction generated "offsets" the financing country's emissions. In regards to the host country, it must ensure that this project promotes its sustainable development.

An essential concept ruling the justification of CDM is called **additionality**. This means that the activity undertaken would not have happened without the support of CDM due to economic, technological or other barriers. Project designers have to prove this additionality by demonstrating which barriers would prevent the proposed activity from happening and by conducting a common practice analysis to confirm that the people in surrounding areas are not currently using the proposed technology.

To be considered valid by the UNFCCC Executive Board, a CDM project must follow a precise framework. Activities are classified into different types, depending on the technology used and the scale of implementation (see Annex: Small-Scale CDM Project Activity Categories) and a special methodology defines how to calculate emission reductions for each type of activity. There is also the need to define a **baseline**, i.e. to describe what type of development would have happened without the project and calculate the emissions that would have otherwise occurred. The difference between the baseline and the scenario with the CDM project, over the crediting period, gives the amount of Certified Emission Reductions (CER).[45] One CER is equivalent to one tCO_2.

[44] United Nations Framework Convention on Climate Change (1997), The Kyoto Protocol Article12, *available in* http://unfccc.int/resource/docs/convkp/kpeng.html
[45] Labriet, M. (2008) *Climate Change, Emissions Trading and CDM*, Master Course, EOI Escuela de Negocios, Madrid.

In order to obtain the CERs, a CDM project must go through the following phases:[46]

1. Project formulation: the project participants, often helped by consultants, prepare the Project Description Document (PDD), following the guidelines explained above.
2. National approvals: the host and investor countries approve the project if it respects their laws and policies.
3. Validation: the Designed Operational Entity (third-party consultants) checks whether the project meets all the requirements and submits its validation report to the executive board.
4. Registration: the board accepts the project.
5. Implementation & monitoring: the project activity takes place and the project proponents monitor the actual GHGs reduced.
6. Validation and certification of emission reductions: a periodic independent review is conducted to certify the monitored emission reductions.
7. Issuance of CER: CERs are issued by the UNFCCC board and ready to be traded.

This process is quite long and complicated and implies significant "transaction costs" to pay consultants, travel and administrative expenses.

This study will focus on small-scale CDM, i.e. projects with a generation power lower than 15MW. Indeed, alleviating energy poverty usually requires the use of small-scale technologies like domestic appliances or mini-grids. For such projects, the transaction costs can represent quite a significant amount compared to the total financing. In order to overcome this handicap, a new concept called **Programmatic CDM (pCDM)** is currently being developed.

A Programmatic CDM or Programme of Activities (PoA) is a group of identical small-scale CDM projects, registered together under one single process. The advantage of this framework is to achieve economies of scale by sharing costs and saving time, since there is no need to undertake the validation process for every single project. For example, a PoA could be a national program to promote solar cookers and the individual activity would be the installation of solar cookers in one village. This concept is very recent, so that there is not yet an official pCDM being implemented.[47] However, some CDM projects that had been implemented prior to the definition of pCDM corresponded to this definition. These projects are often called *De Facto* Programmatic CDM and have the same characteristics as a PoA. As a result, the cases analyzed in this study will mainly deal with *De Facto* pCDM.

Finally, the contribution to sustainable development should not be neglected. While the official requirements are less stringent on this aspect than on the emission reductions aspect, the impact a CDM project has on the host country is very important for many investors willing to purchase CERs. Furthermore, the WWF developed a certification label called the Gold Standard[48]so as to award projects providing significant social, economic and environmental benefits. Therefore, the following case studies have been selected to include a variety of contexts, technologies, impacts and lessons learned from the application of small-scale and programmatic CDM in energy poverty alleviation projects. The cases are a housing energy update program in South Africa, a micro hydropower plant in Buthan, a rural electrification program using photovoltaic panels in Morocco, and a biogas program in Nepal.

[46] The Wuppertal Institute www.wupperinst.org/en/home/index.html
[47] UNFCCC, (2009) Programmes of Activities http://cdm.unfccc.int/ProgrammeOfActivities/index.html

[48] www.cdmgoldstandard.org

Kuyasa Urban Housing Energy Upgrade Project

Type of financing: Programmatic Clean Development Mechanism
Location: Kuyasa township, Cape Town, South Africa
Technology: Solar water heaters, compact fluorescent light bulbs, house insulation
Scale: 46,060 CER/7years; 2309 households equipped so far, designed to be replicated in other areas of Cape Town
Main stakeholders: NGO SouthSouthNorth, Local Government of The City of Cape Town, the community of Kuyasa, Executive board of UNFCCC
Total Cost: Unavailable
Timing: Designed from July 2002 to January 2006. Implemented in August 2006. CER revenues until 2012.

COUNTRY PROFILE

Total population (2005): 47.9 millions
GDP per capita (2005): 11,110 PPP US$
HDI value & ranking: 0.674 121 out of 177
Population living under US$2/day: 34.1%
Population with access to electricity: 30%
Av. annual electricity consumption per capita (2005): 4,818 kWh
CO2 emissions (of world total, 2004): 1.5%
Annual CO2 emissions per person (2004): 9.8 tCO2

PROJECT DESCRIPTION

Background

Kuyasa is a township of Khayelitsha, Cape Town, South Africa, which was renovated by the Reconstruction and Development Program (RDP), introduced in 1994 by the first South African government of national unity. This program included the building of one million houses by the year 2000 for all families with a monthly income of less than R3,500 (US$437), who had never owned property before and who resided in squatter camps close to urban areas. With this program, a maximum institutional subsidy of R16,000 (US$ 2,000) per beneficiary was allocated for the building of standard RDP housing units.

The RDP housing units have an area of 30 m^2. They have electricity, but no hot water storage geysers (providing hot water on demand) or ceiling insulation. These households are currently dependent on batch heating for hot water (pots on stoves) and inefficient methods for space heating during the four coldest months of the year.

The goal of the upgrade project is to improve the living conditions of the inhabitants of Kuyasa, while reducing fossil based energy consumption (and CO_2 emissions) by means of 3 interventions aimed to:

1. Improve thermal performance of low-income housing units;
2. Provide energy efficient lighting in these households; and
3. Improve water heating efficiency through solar water heaters.

Stakeholders involved

The project is a City of Cape Town initiative in collaboration with the community of Kuyasa, it is being facilitated by the NGO South*South*North.

The local Government of the City of Cape Town is the coordinating body and the implementing party (via subcontractors). The municipality departments involved in the project are the Environmental and Development Planning and the Urban Renewal Directorate.

South*South*North is a Dutch NGO network specialized in capacity building for community-based adaptation & GHG mitigation. The Dutch government supported the project by covering the costs related to the design of the project activity and its validation.

This funding is a loan to a public project that will have to be repaid.

The Kuyasa community, represented by a steering committee and facilitated by South*South*North, took part in the design and implementation of the project. A subcontractor was hired by the municipality to install and maintain the devices.

The Executive board of the UNFCCC reviewed the design documents and registered the project.

Technology

The interventions constitute three project activities which fall under the following simplified small-scale CDM Project Activity categories:

Type I Renewable Energy Projects:

- Type I.C. Thermal Energy for the user: Installation of Solar Water Heaters to provide hot water.

Type II Energy Efficiency Improvement Projects:

- Type II.C. Demand–side energy efficiency programs for specific technologies: retrofitting with compact fluorescent light bulbs (lighting efficiency).
  2 CFL bulbs are distributed by household, one of 11W, the other of 16W.
- Type II. E. Energy Efficiency and Fuel Switching Measures for Buildings: Introduction of ceilings & ceiling insulation to improve the insulation of the housing units (thermal performance).

Financing

Three options have been considered for the financing of the project. These options are not exclusive, they are complementary:

1. *The CDM Project activity component*

The three interventions in the project activity have an initial cost of US$771 per housing unit. Based on conservative assumptions, the CER revenue should cover 22% of this cost, over an eight year period until 2012. As a result, bridging the financing gap in the first year is still required for this amount.
However, due to the Gold Standard certification, investors show a high interest in the Kuyasa project, although they require a viable financing structure in place to ensure delivery of CERs at least until 2012.
Currently the price of CERs is estimated at about US$15/tCO2e (ton of carbon dioxide equivalent). Predictions are that this price may rise slightly as the market matures.

2. *Replication of the case study to a regular size project activity*

The Kuyasa case study can easily be replicated at a national level. Currently, there are over 1.5 million RDP houses in South Africa which could benefit from this project design (which include technical and financial methodologies). The small-case design can create benefits on a larger implementation scale in various ways:

- A fully transacted Kuyasa project activity will demonstrate the viability of this project design to potential grant fund streams as it contains huge lessons for implementation processes; and
- Establishing a sustainable and replicable financial model at the small-scale will facilitate replication.

Therefore, by replicating this small-scale project activity, the project would benefit from economies of scale and bigger CER income. The City of Cape Town and the local community are discussing ways to overcome institutional barriers, with the acknowledgement of the CDM suppressed demand methodology objective as an initial step. (Suppressed Demand will be explained in the *Implementation* section).

3. *Community involvement*

Kuyasa home-owners are by definition very low income earners. However, some contribution for ownership purposes of the three interventions is considered, both for the sustainability of the project (the interventions have to be present and operating in order to have the credits certified) and potentially as part of the financing package.
According to initial investigations in the region, dwellers currently spend US$5 per month on energy services. This amount could be put into a monthly repayment program towards a loan from micro-lenders to enable the home-owners to borrow US$167 over a 5 year period.
The Net Present Value (NPV) for maintenance costs of these interventions is estimated to be US$65 per household, plus a NPV of CER cost of US$14 per housing unit. These costs have not been included in the initial costs.

Design & Implementation

The design of this project allowed the principle of ***Suppressed Energy Demand***, also called Suppressed Demand Baseline Methodology. This concept refers to a state where current levels of access to energy

services –before CDM intervention– are inadequate because of income and infrastructure constraints. As a result, people are not able to use enough energy to ensure a minimum comfort level. This can be problematic while calculating the baseline, since the energy consumption is likely to increase after the CDM intervention and so will the GHG emissions. For example, Kuyasa inhabitants will save money due to the more efficient houses and could use this money to heat their houses more or buy small electric devices, such as refrigerators, radios, etc.
To increase fairness and accuracy, calculations for the baseline are based on energy consumption needed for a minimum comfort level, not on the actual energy consumption.

Then, the ***additionality*** compared with a baseline scenario had to be proved, ie. proving that this project could not take place without the CDM support. Three main arguments were presented by the project designers:

- Financial barriers: As mentioned above, Kuyasa inhabitants are from a low-income community. They lack information about renewable energy and energy efficiency options and available financing. Moreover, according to South*South*North, "*none of the technologies pay for themselves at the discount rate seen by the households at their current level of consumption.*"
- Lack of National Government support: building regulations do not specify these types of technologies and subsidies are just enough to cover basic shelter and some services.
- Common practice analysis: Ceiling insulation is not part of the current low-cost housing delivery and was not installed in Kuyasa prior to the design of this project. CFLs are currently not installed in any house in Kuyasa (initiatives to install CFLs in the future are reflected in the baseline). For water heating, the common practice is batch heating in pots or kettles using electrical appliances and different fuel sources.

This project was the first small-scale CDM project registered in Africa. It was subsequently recognized as the first de facto Program of Activities. The project had been registered prior to the publication of the detailed guidance and procedural documentation for Program of Activities (PoA) and has been since described as de facto PoA Activities, because it aggregated highly dispersed and small scale emissions reduction activities.

The installation of the technologies is undertaken by a number of small contractors from the local community. These contractors are selected through a tendering process facilitated by the existing Ward Development Forum (WDF) in Khayelitsha. Maintenance is also ensured by the local workforce, especially trained by the City of Cape Town. Most of the people being trained are young and will be able to use these skills to find a job. The manufacturing of the solar heaters, while not done directly in Kuyasa, is done by workshops located in Cape Town.

The program is voluntary, and any installation of the new technologies will be based on individual household decision-making.

Impact:

According to all stakeholders, this project makes a strong potential contribution to sustainable development. It provides environmental, social and economic benefits.

Environmental impact:
This project will result in a significant reduction of CO_2 emissions over a 21 year period: 2.85 CO_2 tonnes/household/year avoided as a result of the project.
Social impact:

- Diffusion of affordable, efficient and clean energy technologies to the poor.
- Establishment of energy security.
- Health cost benefits: increases in the ambient T° and decreases in fire-related dangers and respiratory diseases (SO_x and NO_x emissions due to paraffin and biomass combustion), as well as less dust entering the households due to the installation of ceilings.
- Saving in energy services for the inhabitants: $100 per household per year.
- Development of social awareness and understanding of the link between the environment and energy consumption.

Economic development:

- Building capacity around energy efficiency and renewable energy. The project is providing employment and increasing capacity of local craftsmen involved in the installation and in the maintenance of the program, as a result creating sustainable jobs. Estimation of the employment created: 6,687 person month/1,000CERs.

- Creating new regional jobs for manufacturing the solar water heaters.
- NPV of the income from the emissions reductions will cover approximately 22% of the installation cost of these technologies, based on the current nature of the carbon market.

These multi-dimensional benefits allowed the Kuyasa project to become the first Gold Standard-certified project in the world. The Gold Standard is a label developed by the WWF and given to CDM projects contributing towards sustainable development and are considered to be high-quality emission reduction projects.

LESSONS LEARNED

Strengths

The Kuyasa project was a pioneer project in various methodology aspects:

- Establishing the principle of suppressed demand for energy services.
- The first African CDM project to be registered by the UNFCCC.
- The first CDM project to get the Gold Standard.

This pioneering role makes it an example for similar projects that have the potential to be developed.

It is also a positive example of drawing marginalized people into a global environmental issue, by building human capacity around energy efficiency and renewable energy and by developing social awareness and understanding of the link between the environment and energy consumption. Public participation has been encouraged throughout the project and facilitated by the NGO, which results in empowerment and ownership of the project among the population of Kuyasa.

Weaknesses

This project highlighted the barriers to renewable energy and energy efficiency project implementation, as well as the need for supporting policy, financial and institutional mechanisms. The people cannot pay the entire cost, even in the long-term through loans and with the energy discounts generated by the housing upgrade.

This project will generate a very limited amount of CERs compared to classical CDM projects. Bigger CDM projects generate more important emissions reductions, but tend to make a weaker contribution to sustainable development. As a result, the CER revenue is not sufficient to finance the totality of the project.

Consequently, the funding of this project requires multiplying the sources of income to cover the costs and be sustainable. (This can also be seen as a strength since the project is not dependent on a single source of financial support).

Potential for replication:

Very high potential for replication across all low-income housing projects in South Africa. The South African government mentioned the objective to develop this program in the low cost houses built during the past ten years (more than 1 million).

The successful implementation of this project will demonstrate a viable model for the use of international financing linked to the reduction of greenhouse gas emissions under the Clean Development Mechanism of the Kyoto Protocol, to leverage grant funding for energy upgrades to low income housing throughout South Africa, thereby contributing towards poverty alleviation.

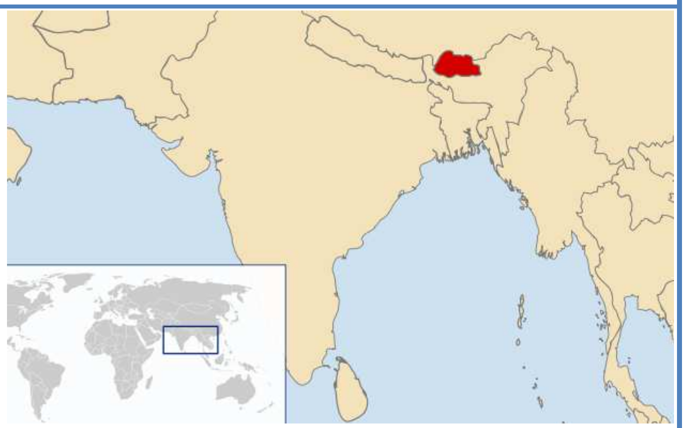
SOURCES

- www.cdm.unfccc.int/Projects/DB/DNV-CUK1121165382.34
- www.capetown.gov.za
- www.cdmgoldstandard.org
- Figueres C. (2004) Programmatic CDM Project Activities: eligibility, methodological requirements, implementation www.figueresonline.com/programmaticcdm.htm www.worldbank.com
- Stutter C. & Parreño J.C. (2007) “Does the current CDM deliver its sustainable development claim? An analysis of officially registered CDM projects”, *Climatic Change* Springer Netherlands
- Mqadi L. & Malgas L. (2004) “Kuyasa Case Study: An effort towards climate justice and energy poverty alleviation”. www.southsouthnorth.org

e7 Bhutan Micro Hydropower Project

Type of financing: Small-scale Clean Development Mechanism
Location: Chendebji village, Kingdom of Bhutan, Asia
Technology: Hydroelectric power station
Power generation/Scale: 70kW - 3,668 CER/7 years
Main stakeholders: Royal Government of Bhutan, Japanese Government, e7 Fund for Sustainable Energy Development represented by the Kansai Electric Power Co., Executive Board of UNFCCC
Total Cost: US$ 280,000 (estimation)
Timing: Built between August 2004 and August 2005, operating since.

COUNTRY PROFILE



Total population (2004): 637,000
Life expectancy: 65.2 years (123/179)
GDP per capita (2006): 4,010 PPP US$
HDI value & ranking: 0.613 (131 out of 177)
Population living under US$2/day: not available
Population with access to electricity:
Unavailable (estimation 35%)
Av. annual electricity consumption per capita (2004): 229 kWh
CO_2 emissions (of world total, 2004): 0%
Annual CO_2 emissions per person (2004): 0.2 tCO_2

PROJECT DESCRIPTION

Background

The Kingdom of Bhutan is a landlocked country between India and China (Tibet) located on the south slope of the east Himalayas. The village of Chendebji is situated on the Lamchela Chu river, 2,500m above sea level in the Trongsa district, about 150km east of the capital Thimphu (an eight-hour-drive by car). The village is faced with a main road leading to Thimphu, but the river running between the village and the road prevents access by vehicle (there is just a walkway to cross the river). Chendebji consists of some 50 households, a dispensary and a school. Despite the ambitious rural electrification plan currently being implemented by the Kingdom of Bhutan, Chendebji and other remote Himalayan villages are still un-electrified and not connected to the power grid because of the high mountains surrounding the village and the high cost of a grid extension. As a result, inhabitants use firewood for cooking and heating, and kerosene for lighting.

Many major towns in the Kingdom of Bhutan have already been electrified and people living there can use lighting appliances, rice cookers, televisions, etc. During the public consultations held in 2003 and 2004, villagers expressed their desire to have access to electricity and explained that they had witnessed the economic development brought by electrification in other villages in Bhutan.

In order to meet the population's needs, this project aims to provide electricity to Chendebji village by means of a hydro power station installed on site.

Stakeholders involved

The project is funded by the e7 Fund for Sustainable Energy Development and implemented by the Department of Energy, Royal Government of Bhutan.

e7 Fund for Sustainable Energy Development:

The e7 (now e8) is a non-profit international organization created at the 1992 Rio Summit, composed of 10 leading electricity companies from the G7 (now G8) countries. Its mission is to play an active role in addressing global electricity issues and to promote sustainable development worldwide.

The e7 Fund for Sustainable Energy Development was created in 1998 to help assemble funding from both the e7 and external donors to finance the implementation of selected e7 projects that promote sustainable energy development and/or reduce greenhouse gas emissions.

The Kansai Electric Power Co. (KEPCO) is a Japanese utility company, member of the e7. It is the representative of the e7 Fund in the Bhutan Project. It serves as the coordination for communication with the CDM Executive Board and the UNFCCC Secretariat, in particular regarding the allocation of CERs. Aside from promoting sustainable development, the purpose of the e7 is to receive CERs from this project.

The project has been carried out in close collaboration with the **Bhutan Department of Energy** from the Ministry of Trade and Industry, the Ministry of Finance and the National Environment Commission. The **National Environment Commission** (NEC) is the Designated National Authority for CDM.

Technology

The interventions constitute one project activity which falls under the following simplified small-scale CDM Project Activity category:

Type I- Renewable Energy Projects

- Type I.A. Electricity Generation by the User: Run-of-river micro hydropower station with cross-flow turbine

Installed capacity: 70 kW (a small-scale CDM project is under 15MW). Generator: voltage of 400V, frequency of 50Hz
Designed annual electricity generation: 582.54MWh
Expected Annual CERs generation: 500 t-CO_2/year, over 21 years

Two transmission/distribution lines will be installed from the power house to Chendebji village and to the farthest Chendebji Chorten Temple. Generated power is directly distributed to the 50 households of Chendebji village at the same voltage as the outlet of the generator through the single circuit of the 230V/400V three-phase four-wire type. In addition, power voltage will be raised from 400V to 11kV by a transformer and sent to Chendebji Chorten via the single circuit of the 11kV three-phase, three-wire type transmission line that goes along the road (*see Figure 2.4 at the end of the case study*). A watt-hour meter will be provided to each facility and household to measure the consumed electricity.

At the request of the community, the project will also provide hot water to the villagers by using the surplus electricity: indeed, the electricity demand is foreseen to be inferior to the production, at least in the early stages of the implementation. Hot water will be made available at the powerhouse to all the village's families. This initiative is expected to reduce dependence on fuel wood for heating water.

Another additional benefit is the setting up of communication equipment for the remote monitoring of generated electricity, education, telemedicine, internet communications and small enterprises development (e-commerce).

Financing

Estimated cost of the project: US$ 280,000
The total reduction in CO_2 emissions by the project is estimated at 593 tons CO_2 per year.

Public funding, such as grants from official development funds, is not involved in this project.

The project, which was registered under the Clean Development Mechanism (CDM) in May 23, 2005, was issued 474 CERs for the period August 2005-November 2006. Bhutan has not received any monetary revenue since (by the end of 2008), as the Emission Reduction Purchase Agreement (ERPA) for the sale of CERs to Kansai Electric is under review and consideration.

Bhutan can earn a revenue of 2,844€/year from the sale of the CERs from the Chendebji project. 50% of the CERs will belong to the funding agency e7, represented by Kansai Electric. The revenue received from small scale projects is nominal, since a substantial amount of money is spent on the consultants who come in for the assessment. The small quantity of CERs issued does not generate a significant income.

Implementation

e7 supervised the construction of the hydro power plant and registered the project as a CDM project activity in accordance with the UNFCCC project activity procedure. The construction was undertaken by a Bhutanese contractor and included an intake, a settling basin, a penstock, a powerhouse and distribution lines. Work began in August 2004 and was completed in August 2005. Construction plans respected the villagers' traditional land uses for farming and animal husbandry and the powerhouse was built in the traditional Bhutanese style. Finally, additional transmission/distribution lines were added to the original project scope to ensure electrification of several remote houses and a local temple

Once the construction was completed, the Department of Energy (DoE) of the Royal Government of Bhutan became owner of the project. Operation, maintenance and monitoring of the data of the power generated have been undertaken by the local community (Trongsa District Administration and Chendebji Village). Monitoring of the project will be done under direct technical guidance of the DoE. e7 will implement necessary training regarding the implementation of monitoring activities.
One villager in the Chendebji Village has been trained by the e7 and employed as a local operator of the power plant, responsible for the operation, monitoring of the electric power generated, patrol and inspections. The Bhutan Power Corporation can offer support in case of possible breakdowns, by sending repair engineers and spare parts.

The **additionality** of this project can be proven by a common practice analysis: the constructions of small-scale hydropower stations in other Bhutan villages have been supported by various kinds of foreign official assistance, since they would have otherwise been very expensive and not profitable. This project activity then would not have occurred, because this project is not financially viable without e7 finance for the purpose of implementing CDM project and acquiring credits. The same conclusion can be drawn from connecting the village to the power grid: it would not have happened.

The **baseline scenario** that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of this project activity, is to electrify the village by diesel power generation. Therefore, it is assumed that the electrification of Chendebji village with hydropower will reduce the greenhouse gas emission from the diesel power generation. The electrification of Chendebji village with hydropower leads to the reduction of greenhouse gases emitted from the burning of fossil fuel (kerosene) and natural wood.
The project also introduced water boilers and rice cookers, which helped in the reduction of fuel wood use.

Impact:
To date, 50 households in the village have been connected to the Chendebji power station, providing the local community a better quality of life.

Environmental impact:
- Decrease of diesel generator pollutants
- Total reduction in CO_2 emissions by the project estimated at 593 tons CO_2/year by replacing kerosene, firewood and diesel
- Reduced deforestation and soil erosion

Social Impact
- Since this is the first hydro power project in Chendebji village which is operated by locals, villagers received benefits from learning and experiencing the operation of environmentally-friendly hydro power technology.
- Health: The use of electricity allowed an improvement in living standards; the access to hot water generated an increase in bathing and washing, which results in an improvement of sanitary conditions. The reduction of firewood use resulted in an improvement of indoor air quality. Electricity and telecommunications also enabled the use of vaccine refrigerators, telemedicine capabilities and other electric medical devices.
- Access to electricity improved educational opportunities by introducing new electricity-driven learning tools (television, computers, etc.); and lighting, which enabled adult education during the evening hours, such as receiving education through satellite broadcasting, etc.

Economic development:
- Estimation of the employment directly created: 1,908 Person month/1,000CERs.
- The creation of electricity generation contributed to the development of small enterprises, including a store, a restaurant, a tourist hotel and a saw mill built near the village. All these helped in the sustainable development of the area although the revenue generated by sale of electricity was low.
- An e-commerce activity was also started thanks to the possibility to use communication devices.
- Reduced kerosene use by 70%.

LESSONS LEARNED

Strengths

The e7 Bhutan Micro Hydro Power Project was the first CDM-project registered for the e7 group, the first CDM project for Bhutan and only the sixth to be registered in the world. Chendebji was initiated as a pilot project to assess the possibilities of promoting CDM in the country. It was utilized as a pilot project, since the Government wanted to learn more and experience CDM in practice, in order to then implement the scheme in larger hydropower projects.

The project's first Certified Emission Reduction credits were validated in January 2007 and 474 CERs were issued in April 2007. These CERs were shared between the Government of Bhutan and the e8 (former e7). Because of its small scale, there will be little revenue from the CERs, but as mentioned before, the purpose of this project was to experiment CDM, not earn a profit.

One of the lessons learned is that any project which helps reduce greenhouse gases is eligible to register for CDM benefits. CDM projects should show real results and have measurable and long-term benefits in terms of climate change mitigation.

Weaknesses

The outlook of this pilot project is that it is very difficult to register companies under CDM and get the benefits. This is because a project only gets the go-ahead if it is able to prove that it is non-profit driven and helps to mitigate greenhouse gases. It is substantially easier to register projects undertaken by local communities or governments.

It turns out that CDM administrative costs are high and modalities complex. A lot of technology is required for this kind of projects to get approved. They imply long project duration from conception to the implementation stage. Consequently, it may be interesting to develop groups of small-scale CDM projects (programmatic CDM) to save costs and time.

Another challenge faced is that Bhutan does not have a baseline scenario to calculate the amount of greenhouse gas reductions. This difficulty can be overcome by using baselines developed in similar regions (for example, in the north-east of India).

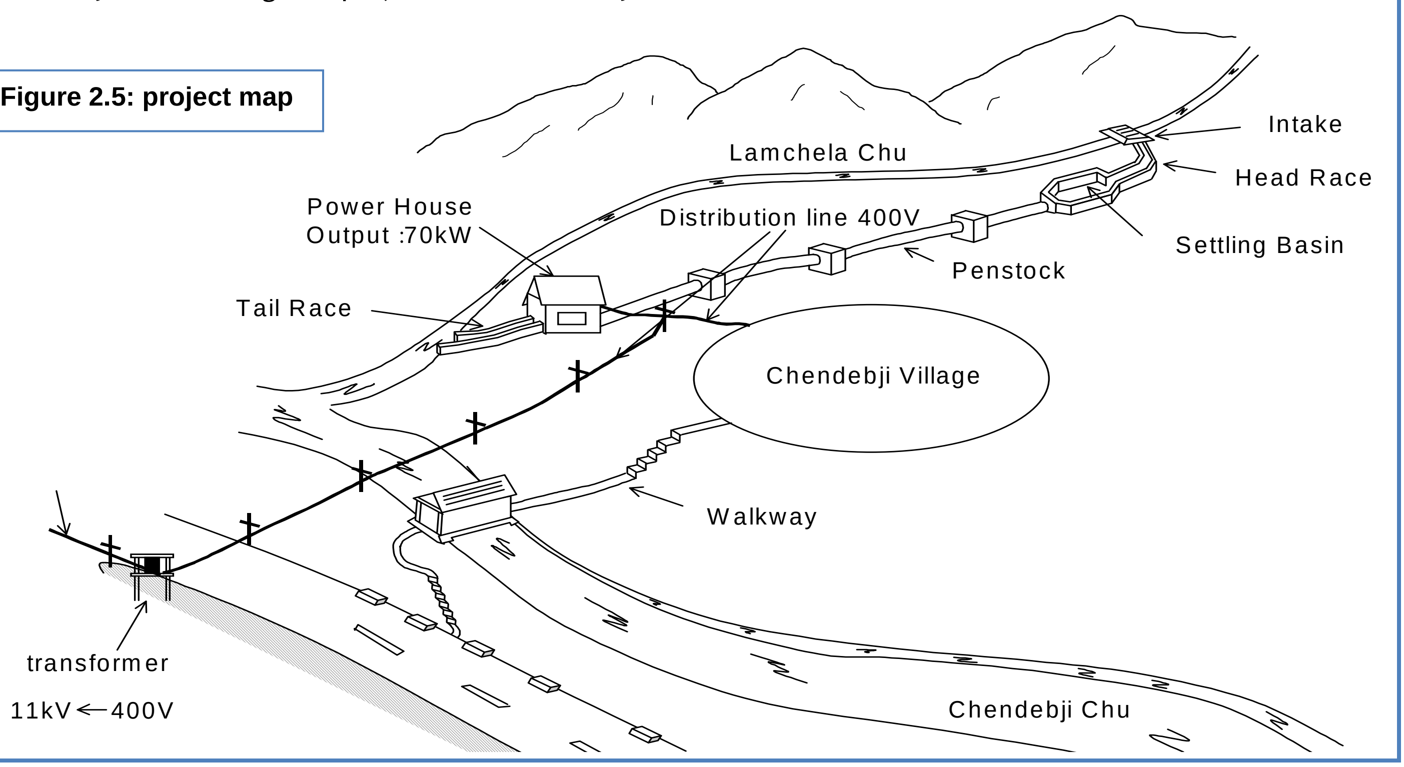
Potential for replication

This project was designed to be replicated after the lessons learned have been fully analyzed. To do so, it is of interest to bundle several CDM projects as a program of activities (PoA), in order to reduce transaction costs. A national strategy for CDM is going to be developed and the NEC will continue as the focal agency in coordination with stakeholders.

SOURCES

- www.e8.org
- http://cdm.unfccc.int/Projects/DB/JACO1113389887.76/view
- Dahal R.D. (2008), *Can Bhutan gain from CDM?* Bhutan Observer – The Independent Voice
- *CDM Implementation Experiences from Bhutan – Pilot projects*, National Environment Commission (NEC)

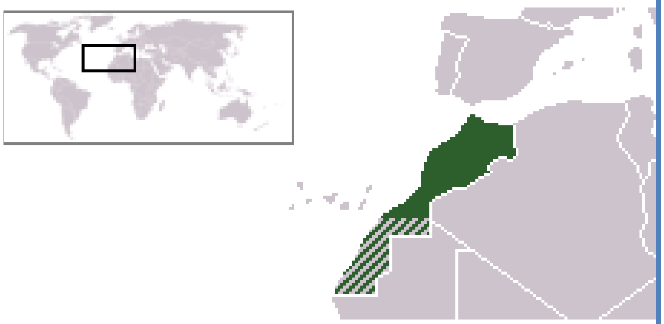
Figure 2.5: project map



Photovoltaic Kits to Light Up Rural Households in Morocco

Type of financing: Programmatic Clean Development Mechanism
Location: All rural communities of Morocco
Technology: Individual PV Solar Home systems
Scale: 101,500 kits, 75.7 Wp per kit, total for the project: 7.7MW
Main stakeholders: Office National de l'Electricité (ONE), BP Solar, Témasol, Sunlight, The Board of Rural Communities, Executive Board of UNFCCC
Total Cost: $280 million
Timing: Implementation period: 2004-2008
CER Crediting period: 2007-2016
Lifetime of project: 2004-2019

COUNTRY PROFILE



Total population (2005): 30.5 million
Life expectancy: 70.4 years
GDP per capita (2005): 4,555 PPP US$
HDI value & ranking: 0.646 (126 out of 177)
Population living under US$2/day: 14.3%
Population with access to electricity: 85%
Av. annual electricity consumption per capita (2004): 652kWh
CO_2 emissions (of world total, 2004): 0.1%
Annual CO_2 emissions per person (2004): 1.4 tCO_2

PROJECT DESCRIPTION

Background

Morocco is an energy poor country, mainly relying on imported sources (accounting for 97.5% of consumption). Its main sources of energy are fossil fuels: oil imported from Saudi Arabia and the Gulf States and coal from USA. 17% of its electricity is also imported from Spain via an interconnector crossing the Strait of Gibraltar.

About 50% of the population lives in rural areas and has access to the electric grid. Among the rural population, 72% had access to electricity in 2004, which still left 18,000 villages to be provided with electricity (representing 6 million inhabitants). With the national grid being centralised around the urban centres and industrial sites along the coast, it is difficult and expensive to connect rural households to the system. Moreover, many villages are located in isolated areas and the houses are liberally dispersed, which confirms that a grid expansion is not the appropriate solution.

As a result, the government decided to resort to renewable energy for electricity generation in isolated rural areas. For instance, photovoltaic technologies are particularly suited to the Moroccan context since these can generate electricity in remote locations, the country benefits from important solar exposure, and the moderate energy needs of rural households can easily be met with individual photovoltaic kits. The government even established a legal framework to define the utilisation of solar panels: whenever it costs more than 27,000 Dirhams (MAD or $3,250 US$) to connect a household to the main grid, the house should be electrified using a photovoltaic kit. Moreover, it is important to know that Morocco signed the Kyoto Protocol in 2002, and has been ranked among the top ten countries hosting Clean Development Mechanism projects.

The Government entrusted the *Office National de l'Électricité* (ONE) to undertake a global rural electrification program (PERG). While 91% of the villages could be connected to the grid, it was decided to provide electricity to the remaining 9% with renewable energies, specifically solar energy. A first pilot project was carried out in 2003 to install 3,500 photovoltaic kits in the rural region of Khouribga. This project was a success and generated important participation from the farming population; therefore it was decided to design a large-scale project to equip an additional 101,500 households.

Stakeholders involved

Office National de l'Electricité (ONE) is the state-run operator in Morocco's electricity supply sector and the government entity that oversees rural electrification projects. It receives technical assistance and advice from the ***Centre pour le Développement des Énergies Renouvelables*** (Centre for Renewable Energy Development), a public entity promoting renewable energies.

Private companies are contracted by ONE to implement the installation: ***Témasol*** (the Moroccan branch of the group Ténésol and owned by Total & EDF), ***Sunlight***, ***BP Solar*** and ***Isofotón***. These companies will then be responsible for the maintenance program.

The Board of Rural Communities represents the population; its members are elected for 5 years. Though ONE engaged in an individual client-supplier relationship with each household, the Board of Rural Communities was still consulted to receive feedback and comments from the population and signed a memorandum of understanding (MoU) with ONE. It is not a legal agreement, just the official statement expressing that the two entities have a convergence of will in this project. Stakeholder consultation meetings have been organized on a regular basis to present the project to the population and explain the concept of CDM.

Technology

The interventions constitute one project activity which falls under the following simplified small-scale CDM Project Activity category:

Type I - Renewable Energy Project

- Type I.A. Renewable electricity generation by the user: individual photovoltaic kits.

The average energy needs of rural Moroccan households have been estimated in 2005 by the French Agency for the Environment and Energy Management (ADEME). Devices used:

- 4 x 10 W bulbs – 3 hrs/day → 120 Wh
- 15 W TV + satellite dish – 3 hrs/day → 45 Wh
- 10 W radio – 4 hrs/day → 40 Wh
- Mobile telephone 5 watt-hours

→Daily total: 210 Wh; and Annual total: 75 kWh

(Urban Moroccan households consume an average of 6,040 Wh per day and 2,200 kWh per year).

The project will allow the households to choose among 3 power capacities: 50Wp, 75Wp (default offer) and 200Wp. The 50Wp kit and the 75Wp are expected to represent respectively 12% and 85% of the installations. 101,500 kits are foreseen to be installed, which represents a total capacity of 7.7MW

For an estimation of 6h (4.7h.s.e) of production per day and the ratio consumption/production of 80%, a 75Wp photovoltaic kit will have an average energy production of 450Wh per day, which represents twice as much as the current daily needs of a household. This estimation, presented as conservative in the project design document, seems in fact quite optimistic knowing that the production of that type of panel is usually between 200Wh and 350Wh per day.

The standard system or "kit" is composed of a photovoltaic module, a regulator, a battery and several light bulbs. A photovoltaic module of 75 Wp is provided with one battery of 150 Ah, one PWM regulator, one LCB (low consumption bulb) of 11 watts, three LCB of 7 W and two plugs of 12 volts (one for the radio and one for a TV set). For the 200 Wp kits, one 12V 150 liters refrigerator is also proposed as an optional choice, all other components being the same.

Financing

The total cost of the project, including initial investment, operation and maintenance costs, is covered by public funding and user payments.

Households pay an initial down payment representing about 10% of the equipment cost (900MAD, US$112); this initial payment secures the household involvement and commitment at the beginning of the project. Once the kit is installed, they pay a monthly contribution of 65 MAD (US$8) for 10 years to take part in the variable costs: battery renewal, maintenance and other services. (For the 200Wp kit, the down-payment is 4,000 MAD (US$500) and 150 MAD (US$19) for the monthly fee. The user contributions cover 52,2% of the total costs.

The CER income is assumed to be used to further reduce the cost share which has to be carried by the farmers. The discount for the users could then be increased to 22% of their fee.

The public funding mainly comes from the ONE, which covers 39% of the total cost. Involved parties (who later plan to buy CERs) also contributed to the financing: Germany donated 5M€ and France issued a long-term loan of 5M€ via the *Agence Française de Développement* (AFD). These two contributions together represent 5% of the total cost. This funding was made available specifically for this project and is not diverted from official development assistance.

To help sustain the subsidy by ONE, Moroccan consumers already connected to the grid pay a tax of 2% of their monthly bill to help promote rural regions' access to solar power.

Design & Implementation

The ***additionality*** of this project is mainly justified by its large scale. ONE successfully implemented a pilot project of 3,500 photovoltaic systems, but argues that a project involving 101,500 kits is beyond its investment capability. Another financial barrier is the very low income of the rural population, which will be able to meet only a portion of the costs. Emphasis is made on the necessity to offer tariffs as low as possible in order to reach the majority of the population.

The ***baseline*** for the electrification of Moroccan rural communities is the building of mini-grids connecting 10-20 households and supplied by diesel generators. The total cost for the network connection is between 3,500 and 5,500 MAD (US$435 and $685) per household. The total cost for a photovoltaic kit is approximately 10,000 MAD (US$1247) per household. This makes it clear that the current project would not occur without additional subsidies and consequently, the baseline situation would prevail, leading to higher CO_2 emissions.

Some technological barriers also prevent the photovoltaic technology from being adopted. As mentioned above, the diesel generator system is the most popular option for power supply since this technology is well known and easily available. On the contrary, the photovoltaic market is still in early stages in Morocco and there is a lack of maintenance capability among local technicians. This program aims at creating incentives to adopt solar systems, raising awareness about this technology and training people to maintain it.

The ***implementation*** is undertaken by private companies contracted by ONE. They are in charge of the implementation of the kits, ensuring their reliability and guaranteeing the service quality delivered. Under a ten-year contract, they are responsible for managing the technical and financial aspects of the program, performing maintenance, replacing equipment and collecting the fees paid by users. The activities of these companies emphasizes African economic development and capacity-building, since the photovoltaic modules are produced in South Africa and job creation concerns local people. For instance, local technicians from rural areas are trained for installing and maintaining the systems, generating a long-term activity which requires good qualifications. These activities are under the responsibility of the private companies, who must respect the total quality principle (for example, maintenance has to be performed within 48 hours of initial client contact).

Impact:

The last progress report completed in December 2007 revealed some disappointing results: 29,809 kits have been installed so far, which only represents 30% of the 91,500 kits expected to be on site at this time.

Several reasons explain the implementation difficulties:

- The private companies in charge of the implementation failed in some of their commitments: insufficient communication and marketing for the implementation program was followed by fewer customers than foreseen; also the global solar market is currently booming and very competitive, so that Sunlight and Témasol experienced difficulties in securing their supply of photovoltaic panels.
- Aside from the global competition to obtain photovoltaic modules, the rising price of essential raw materials like lead (used in batteries) and copper (for cables) resulted in an increase of the kit prices and reduced margins for the intermediary companies.
- The project faced reluctance from some local governments and communities, which refused electrification by photovoltaic kits in the hope to benefit from electrification by an interconnection to the national grid. As explained previously,

connection of these areas to the grid is scarcely feasible, but villagers still hope it happens, in order to benefit from cheaper electricity.

- Another result from the monitoring report is that the largest kits (designed to supply a refrigerator) did not interest the households: 51% of households chose the 50Wp kit, 49% chose the 75Wp kit, and almost none purchased a 200Wp kit.

Economical impact:

- It is estimated that the project created 150 full-time jobs during the 5 years implementation period (2004-2008) and 300-400 full time jobs over the operation period (until at least 2019).
- The project is expected to reduce rural-urban migration and thus reduce several macroeconomic strains on the economy.
- The taxes on the intermediary companies generate revenues for the State (no estimation available).

Environmental impact:

- The use of photovoltaic systems helps to diminish reliance on fossil fuels. The project is designed to avoid the emission of 395,400 tons of CO_2 over the crediting period of 10 years (2007-2016).
- However, according to the monitoring report, the CO_2 emission reduction during 2007 was 5,800 tons of CO_2. At this pace, the total emission reduction in 2016 would be 58,000 tons of CO_2, which is clearly insufficient. As a result, no CERs have been issued so far by the UNFCCC board for this project.

Social impact:

This project is still very recent, no social study has been conducted yet to assess the impact on the population.

LESSONS LEARNED

As mentioned previously, this program is experiencing several challenges and has not progressed as quickly as expected. However, it is still a valuable project by the scale of its implementation and the lessons it contributes.

Strengths

The project confirmed that the option to use PV modules in rural remote areas is an attractive and viable one in this area, due to the high daily solar radiation. Morocco's decentralized rural electrification program, which represents 10% of its entire rural electrification scheme, makes it one of the most advanced countries in the world in this field.

The previous studies and pilot project operated by ONE generated knowledge of the situation (climatic, technical, social and economic data) which was extremely useful during the project. It assisted the Moroccan government in opting for the fee-for-service model instead of the sale of equipment model that has been adopted in other countries. This fee-for-service business model helps make the project viable and sustainable. The data collected was also used by the companies to design their marketing campaigns.

The training and hiring of local technicians by the private companies enables them to provide prompt and reliable services to its customers, at affordable rates. This saved costs for the companies and also helped them to improve their reputation among the local populations. Various other initiatives were developed to further improve this proximity, such as a local representation at the weekly souks. This presence enables the sharing of sales information, contracts to be signed with new customers, monthly fees to be collected and any repair requests to be logged. This attention to customer support has resulted in a low payment default rate.

Weaknesses

The relation between the private companies and the users is a challenge, since they are in fact customers of ONE and not of the private operator.

This is also an issue in terms of cash-flow: the implementing operators have to advance the money for the equipment before being reimbursed through the subsidy of ONE. Payment delays can lead to cash-flow problems, especially for the local offices which have to be supported by their companies while waiting for the payment of subsidies.

Such a large-scale project is highly dependent on the supply of devices, which can significantly slow the implementation process down.

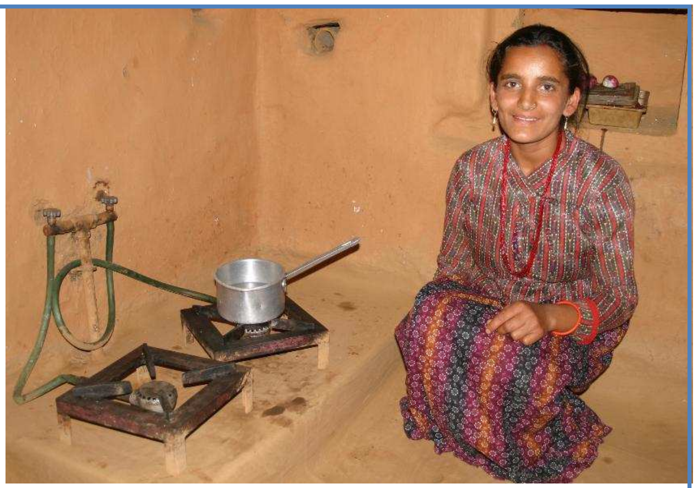
Acceptance of the population can be an issue: they often hope to be connected to the grid to receive cheaper electricity, even when a grid extension is not a realistic solution. This low acceptance perhaps means that the rural population's needs have been overestimated or misunderstood: while many households welcome the electrification, some do not see the benefit thereof, while others are convinced that other solutions are better. The towns' unrealistic expectations can also provide evidence of a lack of effective and straightforward communication concerning basic information from the central Government and the implementing companies.

The low amount of carbon emission reductions is preventing CERs to be issued. Consequently, the project is not likely to get CER revenues in the medium-term.

SOURCES

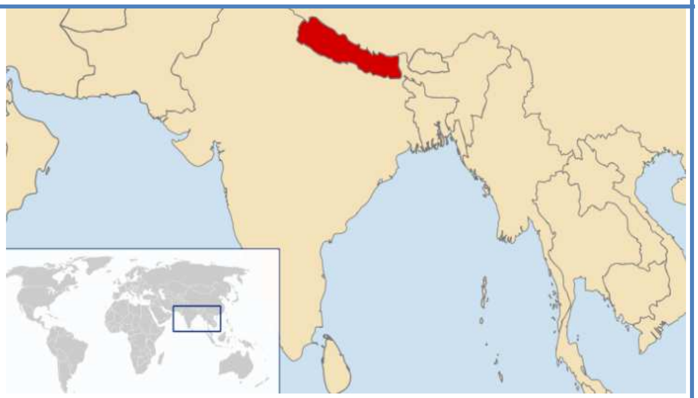
- www.one.org.ma
- www.ademe.fr
- Project design webpage, UNFCCC, http://cdm.unfccc.int/Projects/DB/TUEV-SUED1134746545.91/view
- UNDP (2005), *Morocco Case Study - Solar Power,* www.ncppp.org/undp/morocco.html
- The French Global Environment Facility & Temasol (2005), *Decentralised rural electrification in Morocco*

Nepal Biogas Support Program (BSP-Nepal activity 2)



Type of financing: Programmatic Clean Development Mechanism
Location: 55 out of 75 districts, in rural Nepal
Technology: Household biogas digester plants
Power generation: Total power installed: 14.66 MWt
Main stakeholders: Nepal Alternative Energy Promotion Center (AEPC), Biogas Sector Partnership (BSP-Nepal), Netherland Development Agency (SNV), The German Development Bank (KfW), the World Bank, Microfinance institutions, rural households, Executive Board of UNFCCC
Total Cost: US$ 25.36 million
Implementation period: June 2004 to April 2005
Crediting period: 2005 to 2012

COUNTRY PROFILE



Total population (2004): 27 millions
Life expectancy: 63 years (132/179)
GDP per capita (2006): 999 PPP US$
HDI value & ranking: 0.530 (145 out of 177)
Population living under US$2/day: 68.7%
Population with access to electricity: 33%
Av. annual electricity consumption per capita (2004): 86kWh
CO_2 emissions (of world total, 2004): 0%
Annual CO_2 emissions per person (2004): 0.1 tCO_2

PROJECT DESCRIPTION

Background

The Federal Democratic Republic of Nepal is an inland country located between India and China, in the Himalaya region.

Nepal is currently facing a major deforestation issue. Only 20% of the country is arable and the population's needs in heating and rice are growing considerably. Only one third of the population has access to electricity and 80% of the 4.2 million Nepali households use fuel wood, cattle-dung cakes and agricultural residues for cooking and kerosene for lighting. With consumption of wood exceeding the rate of re-growth, the forest size is decreasing, land is harmed and watersheds are damaged.

Furthermore, the use of wood and kerosene for indoor fires increases dangerous exposure to air pollutants and a risk of fire. Like in many countries, the wood is usually collected by women and girls, taking up to three hours of their day.

To face this situation, in 1992 the Government of Nepal launched the Biogas Sector Partnership (BSP) program in order to improve energy access for rural poor and reduce rural poverty by providing high quality biogas plants to poor households at an affordable price. The project is overseen by the Alternative Energy Promotion Center (AEPC) with help from German and Dutch development assistance. They aim to install a total of 200,000 small biogas digesters all over Nepal, particularly for farming households in villages in remote areas. Thanks to this initiative, 124,000 domestic plants were installed between 1992 and 2005.

The project activity analyzed in this case is a sub-project of the BSP-Nepal umbrella biogas program. Thus far, the investment in biogas has been a donor-supported non-commercial activity, but with the phasing out of international public support for the sector, additional sources of revenues are needed. Consequently, BSP has chosen to register this project as a Clean Development Mechanism (CDM) and seeks to develop a commercial activity with the integration of carbon revenues to serve a large number of rural inhabitants.

Stakeholders involved

The project sponsor is the Nepal **Alternative Energy Promotion Centre (AEPC)**, a government body under the Ministry of Environment, Science and Technology; and is responsible for ensuring the overall implementation of the proposed project activity. It oversees the policy design and promotion of the renewable energy sector, of which biogas is a part of. AEPC also provides a fund to microfinance institutions in order for them to provide credits to farmers for biogas installation.

The **Biogas Sector Partnership (BSP or BSP-Nepal)** is a non-governmental-organization (NGO) established in 1992 to manage the biogas program in Nepal. Its main roles are to provide training to users and biogas companies, ensure quality and long-term reliability of plants and manage the program of subsidies to assist users with the purchase of plants. BSP has an independent executive board and employs 14 professional staff. Under the supervision of AEPC, BSP-Nepal acts as an intermediary agency to ensure the management and operation of the proposed project activity.

The Government of The Netherlands and the German government are financially supporting the program via the **Netherlands Development Agency (SNV) and** the **German Development Bank (KfW).**

The **biogas households** are families who decide to take part in the project and to invest in a biogas plant. They own emission reductions generated, but most of households have agreed by contract to transfer these CERs to the AEPC, who will carry on their transaction.

The **Community Development Carbon Fund (CDCF)** is a trust fund maintained and operated by the **World Bank**. It applied to purchase the CERs generated by the project.

Microfinance institutions (MFIs) provide microloans to farmers to pay the upfront costs for the building of a biogas plant.

Technology

The interventions constitute a program of activities which falls under the following simplified small-scale CDM Project Activity category:

Type I - Renewable Energy Projects

- Category I.C. Thermal Energy for the User: household biogas digester plants

The plants use cattle manure to provide biogas for cooking and lighting. A minimum of 2 heads of cattle (cows or buffalo) are required to provide daily energy supply for a household. The user has to mix the dung with water to form slurry, which is digested inside the biodigester to produce biogas. The gas produced in the digester is then collected in a brick underground dome, linked to the house by a pipeline. Biogas is a mixture primarily of methane with some carbon dioxide and it burns easily, producing CO_2 and water.

This system also brings additional conveniences, for instance, the use of the remaining material as organic compost. Moreover, about 75% of the plants incorporate toilets, allowing for human waste as an additional input for biogas production.

To be part of the project, the biogas plants have to be based on a uniform technical design, manufactured and installed following established technical standards in Nepal. These standards define four sizes of digesters, with total volumes from 4 to 10 m^3, generating power ranging from 1.16 kWt to 2.32 kWt.

This system reduces GHG emissions mainly by replacing wood and kerosene for cooking and lightning. It also reduces the emissions of CH_4 and N_2O from chemical fertilizers, since farmers can use bio-slurry to fertilize their land. However, these additional emission reductions are not accounted for in the credits. The methodology applied gives 4.99 tCO_2 per plant per year.

Financing

The total cost of the program is estimated at US$ 25.36 million. The initial investment represents US$ 20.5 million, and the operations and maintenance cost is US$ 4.8 million.

CERs are being issued after project implementation; the BSP-Nepal biogas program requires ***public funding*** to cover the initial investment. The cash position of BSP-Nepal indicates a financing gap in the first 10 years of operation. For the 2003-2009 period, the German Development Bank (KfW) committed to provide US$ 9.15 million, the Netherlands Development Agency (SNV) US$ 4.92 million and the government of Nepal US$ 5.61 million through the AEPC. This public funding has not resulted in the diversion of official development assistance and does not entitle the involved parties to receive CERs. The purchase of emission reductions generated by BSP-Nepal is a separate transaction even for AEPC, which will have to trade directly with the households.

Public funding totals US$19.7 million, which means that the Nepali government still requires an additional US$5.6 million to finance the project. Therefore, the ***CDM revenue*** is needed to fill this financing gap. An Emission Reduction Purchase Agreement (ERPA) has been signed with the World Bank, which is willing to buy emission reductions at US$4.5 per ton. A negotiation is being held with the World Bank to sell one million tCO2 through which BSP-Nepal would generate about US$4.5 million.

The households have to pay a part of the biogas plant cost. Because of the "CDM on delivery" rule, the farmers will be entitled for their annual CDM revenue amount after the particular verification year. As a result, it will not support the upfront investment. To allow the households to purchase their biodigesters, financial support is brought through subsidies, MFIs and Cooperatives:
A $6m^3$ plant costs between US$251 and $393 in Nepal, depending on its location (more or less isolated). BSP manages a subsidy program ensuring that all owners of $6m^3$ plants pay only US$200, wherever they live. One third of this is paid in-kind, through the family providing labor and materials for the installation of the plant. The remaining US$130 is paid through a microloan provided by over 80 banks and micro-finance organizations. The financing of biogas plants is seen as a safe investment in Nepal since the savings generated by the use of biogas (eliminating the purchase of firewood and fertilizers) allow households to repay rather promptly: most families pay back their loan within approximately eighteen months. The subsidies are greater for $4m^3$ and $6m^3$ plants than for $8m^3$ and $10m^3$ plants. This is to encourage poorer farmers who have fewer cattle and are less likely to pay for firewood to purchase plants.

Implementation

As seen previously, the main obstacle proving the ***additionality*** of this activity is the investment barrier at the national level. Even with public funding, a financial gap needs to be filled. Since donor support is gradually decreasing, the aim of this project is to make the biogas sector a commercially sustainable sector with the support of CDM. It is estimated that for the application of the CDM to make the biogas sector economically viable, installation of at least 200,000 biogas plants is necessary. This would spread the use of biodigesters across the country, maximizing their socio-economic and carbon value and allow the trade of large amounts of CERs, therefore creating an economic basis for future biogas sector investments.
Another issue is the investment barrier at a household level: an improved wood stove costs from US$3 - 6 and a kerosene stove costs from US$6 - 8, much less than a biodigester. Farmers understand the long-term benefits of a biogas plant and are willing to pay the subsidized price of US$130 which represents a large amount of money for them, but they would not be able to support the total cost without financial aid.
Finally, the last obstacle is the technologic barrier: BSP performs quality controls to ensure that the plants built are efficient and of high quality. These controls, essential to convince the population of the effectiveness of biogas technology, require funding from CDM.

BSP does not itself install biogas plants, but trains and accredits private installation companies, an approach which has enabled the private biogas sector to thrive. ***Implementation*** is undertaken by about 60 accredited private construction companies, using appliances that are produced locally. In the previous phases of the biogas program, a long-term technical assistance program of the SNV facilitated technology transfer and capacity building, resulting now in good quality plants.
This quality is ensured by a "carrot and stick" approach by BSP. As mentioned previously, BSP executes an extensive quality control to ensure the interests of households. The companies performing well are paid a subsidy; the companies not meeting the regulation requirements get a penalty and can even lose their accreditation. However, BSP tries to avoid this last option and focuses on constructive actions: if a company performs poorly, BSP-Nepal will first provide additional training to aid the company to improve its service quality and strengthen its business operations.
Another incentive for the companies to install high-quality plants is the compulsory after-sales services: the cost of a biogas plant includes a 3-year guarantee period when free maintenance has to be provided by the installing company.

In the long term, BSP ***monitors*** the performance of the biogas plants, the user satisfaction and actual emission reductions. Simultaneously, the AEPC supports continuous research and development efforts to optimize plant operation and to tailor the biogas plants to the needs of the end-users. Therefore, to maximize the benefits of bio-slurry, a fertilizer extension program has been implemented.

Impact

The project activity had installed 9,688 small biogas digesters in 2005. According to a survey conducted by BSP, around 95% of the sampled biogas households are satisfied with the performance of their plants. The remaining 5% are primarily unsatisfied due to the size of the biodigester: it is either too big or too small for their needs.

Environmental impact:

- This project allows the replacement of unsustainable fuels with biogas: it suppresses the use of 400,000 tons of firewood and 800,000 liters of kerosene per year.
- Each biogas digester under the proposed project claims emission reductions of 4.99 tCO_2/plant/year (the real emission reduction is higher). Total emission reductions are 46,893 tCO_2/year.
- The project supports forest conservation by substituting firewood with biogas fuel. This is a crucial issue in Nepal, where the forest is damaged.

Economic impact:

- BSP has met its goal to develop a real private biogas business sector with this program. Over 55 construction companies, 15 biogas appliance manufacturers and 80 finance institutions are involved in the Nepali biogas sector, providing over 11,000 long-term jobs.
- This project also provides economic benefits to the households: it saves them the cost of firewood, kerosene and fertilizers.
- Besides improving soil quality, the organic compost can also generate additional income for the farmers who sell it.

CERs have not been issued so far, but the project is already running very well.

Social impact:

- By linking toilets to the biogas plants, this project provides better sanitation to rural households and has a significant health impact. BSP also provides some basic hygiene education during the training for the use of the biogas plant.
- Another health benefit is the withdrawal of indoor smoke.
- The project brings important social benefits for women and children by reducing the time spent to collect wood and by easing the cooking task.
- In 20% of houses, biogas provides safer lighting as well.

LESSONS LEARNED

This project is an example of good management by BSP-Nepal and is remarkable because of its scale. While the use of cattle dung to generate biogas is well known in the Indian subcontinent, in no other place has it been used with such success as in Nepal. Biogas already serves about 1 million people (4% of the population of Nepal). It is an excellent demonstration that a program of small-scale projects can have a big impact, which is also one of the goals of the Programmatic CDM approach. While Nepal large-scale projects like “mega dams” are blocked, this micro activity is making a significant contribution for sustainable development.

Strengths

- Outstanding results mainly come from an excellent cooperation between the different groups involved: BSP, Nepal government, construction companies, donors, and the MFI.
- The second key success factor is the thorough quality checking and capacity building undertaken by BSP-Nepal to ensure that private companies are performing well.
- This project uses a basic technology, easy to build with local raw materials: cement, sand, gravel, bricks, stones and water. This lowers the costs and enables possible replication across the country.
- The combination of public subsidies and potential CDM revenues makes the investment more attractive for the households. The support of microfinance institutions enables them to cover the initial investment.
- Total GHG reductions of biogas can be significant, so potential CDM revenues can also be substantial. The expected revenues from CDM should fill the financial gap for the current project and the project

designers are planning to use surplus revenues for extension of the program.

Weaknesses

- The size of the plant has to be selected on basis of the available dung, not on the family size. This means that daily biogas production depends on the number of cattle, not on the family's needs. As seen before, miscalculations in plant sizes are the main reason for dissatisfaction among users.
- This technology has some limits: families with less than two cattle cannot use a biogas plant, it requires a reliable water supply and does not work properly in very cold climate, e.g. around Mount Everest. However, BSP's constant R&D efforts are aiming to tackle these limitations.
- This project, while being exemplary, had not received CERs by mid-2008, since the monitoring system was not being fully implemented. This demonstrates that the CDM system creates additional requirements, like a very stringent quality assurance and monitoring, which may delay income generation. The monitoring plan has to be carried out very methodically; otherwise the Executive Board of UNFCCC can refuse to issue the CERs. Fortunately, this project is solid and able to sustain itself. However, this also demonstrates that a project budget should not be based mainly on the CDM income. As seen in this case, the CDM can be used as an additional income source to make the project commercially viable.
- The recent political instability in Nepal could be a threat to the project, but so far no change of regime has affected the project.

Potential for replication

There is a huge potential for expansion of the use of domestic biogas in Nepal and also in many other countries. This is a very fitting technology for the Indian sub-continent, in addition to other technologies using the same, very efficient framework.

SOURCES

- http://cdm.unfccc.int/Projects/DB/DNV-CUK1132671435.09/view
- www.bspnepal.org.np
- SNV Netherlands Development Organization (2005) *Domestic Biogas and CDM financing: perfect match or white elephant?* http://unapcaem.org/
- www.ashdenawards.org/winners/bsp
- Dixit, K. (2005) *Small is bountiful in Nepal's energy sector*, The Nepali Times with Science and Development Network (SciDev.Net)

2.4.2 Clean Development Mechanism Findings

In December 2009, the United Nations Climate Change Conference (COP15) will take place in Copenhagen to define a post Kyoto agreement for the years 2013-2017. Many NGOs are now criticizing the CDM in general: either requesting improvements or for its suppression[49], arguing that most of the projects lack the prerequisite of additionality and only benefit large industrial actors instead of small local populations. However, these critics mainly target large-scale projects (concerning big energy plants, factories improvement, etc.), and they recognize that small-scale and programmatic CDM can make a positive contribution to sustainable development. There are currently 2,027 small-scale CDM projects operating or being implemented[50] and even if they are quite recent, most of them have already had a positive impact on many people's lives in developing countries.

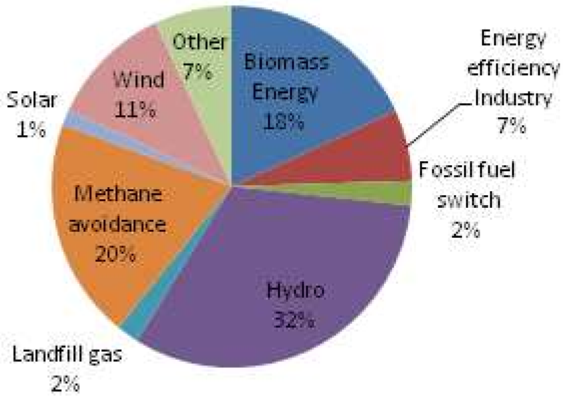


Figure 2.6 Small-Scale CDM Projects by type of activity (*Data from www.cdmpipeline.org*)

The cases studies clearly show that CDM alone cannot be used to fully fund energy poverty alleviation projects since these projects do not generate a sufficient amount of CERs to obtain enough financing. This is actually one of the debated issues about flexibility mechanisms: large-scale activities generate significant emission reductions and get a consequent income, but do not contribute much to sustainable development, or can even create a negative impact (ie. mega dams); while small-scale projects which have a positive impact get a low income because of their relatively low emission reductions.

A second key element is the transaction costs compared to the scale: most energy projects in remote areas could be qualified as "micro-scale" (less than 100kW) compared to what the UNFCCC considers as "small-scale" (less than 15MW). For these projects, the CDM validation process is too long and too expensive to be directly used. The best option is to group similar activities in a program of activities. In other terms, the electrification of one single village is not likely to make an appropriate CDM project; it is much more efficient to register a rural electrification program concerning several villages under a Programmatic CDM.

The following are additional lessons learned from case studies, readings, meetings and conferences. They are clustered in key areas in the use of CDM to tackle energy poverty:

Project Definition:

- The proposed activity must answer to a clear demand from users and employ the most appropriate technology. The technology used has to be reliable, easy to maintain, and

---

[49]Friends of Earth (2009) Trading in Fake Carbon Credits: Problems with the Clean Development Mechanism, *available in* http://www.foe.org/pdf/FOE_IR_CDM_FS.pdf

[50] www.cdmpipeline.org

accessible to prevent any possible supply issue (in order to ensure a regular CER income, the project must run smoothly).

- While any project using "clean technologies" can be registered, the more a project reduces GHG emissions, the better, as it will generate more CER income. Biogas is a very efficient technology for this.
- Additionality is a blurry concept and some projects are validated although their additionality is not obvious. Nevertheless, a project with a strong additionality will make a significant difference with the baseline and is therefore likely to get more CERs. It is also easier to register.
- A precise baseline is required in order to be able to calculate emission reductions. The baseline has to be as precise as possible and the reduction calculation must be done in the most objective way: an optimistic estimation could lead to an overestimation of the potential CERs generated, which becomes an issue when the real amount proves to be less.

Financing plan:

- Project funding should include several sources to ensure its solidity. Ideally, the CDM revenue should not be part of the upfront funding. If it cannot be avoided, a loan has to be taken, since this income is generated after implementation.
- On the contrary, the best use of the CDM income is to subsidize the product/service financing so as to reduce the cost for end-users. The economic contribution of users, even if minimal and complemented by subsidies, is essential to ensure project ownership.
- In order to guarantee the economic sustainability of the project, it is necessary not to rely much on CDM in the long-term. Indeed, when the crediting period ends, the CER income will stop. Consequently, Willingness-To-Pay (WTP) from the users is essential to cover the maintenance costs, aside from potential public subsidies.

Project Management:

- Implementation success depends mainly on good coordination and clear responsibilities among the stakeholders. It is particularly important that one actor is visibly in charge of the CDM validation process. Quality assurance can be put in place to guarantee a certain level of performance for the users.
- Project implementation cannot only consist of delivering a device to the local community. Community contribution should be encouraged in the installation and maintenance phases, via capacity-building policies.
- Follow-up mechanisms are always important in an energy development project, but they are even more essential for CDM. Indeed, the UNFCCC framework requires strict monitoring of energy production/consumption during the operation period in order to calculate the actual GHG emissions. This monitoring is a *sine qua non* condition in order to obtain CERs. Maintenance is also essential for users to get a continuous service and for the UNFCCC Executive Board to be sure that the activity does not come to a halt during the accreditation period.

Contribution to sustainable development:

One CDM objective is to contribute to sustainable development in the host country. While this aspect is less controlled by the UNFCCC than the GHG emissions (in a more subjective way), it should not be neglected. Countries or companies purchasing CERs to offset their emissions often communicate their actions, however, the potential benefit for their image increases if the project financed by their contribution has significant economic, social and environmental impacts. As a result, the credits coming from a project labeled with the Gold Standard (which ensures a good project contribution towards sustainable development), have greater value and can subsequently be sold for a higher price.[51]

---

[51] The World Bank Carbon Finance Unit wbcarbonfinance.org ; www.carbonpositive.net

2.5 Microfinance

2.5.1 Microfinance & energy lending

"People cannot be developed; they can only develop themselves."

- Julius Nyerere

First President of Tanzania, freedom and development activist.

Sustainable Development (SD) has been traditionally defined as "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*"[52] A more grassroots and people-centered approach to the concept of development defines it as a process whereby people have the possibility to make the most of their strengths and capacities to address their needs and improve their own lives, or a growth that ensures opportunities for people to build up on their own *capabilities*. This is understood as a set of basic freedoms that allow people to choose and lead the lifestyle they want for themselves.
"*People living in poverty, like everyone else, need a diverse range of financial services to run their businesses, build assets, allow for necessary consumption and manage risks. Microfinance offers poor people access to basic financial services such as loans, savings, money transfer services and microinsurance.*"[53] These services usually involve small transactions, thus the term *microfinance* differentiates them from those services which traditional banks provide.[54]

Microfinance is a pioneering tool for social and economic development, as well as an innovation to the traditional financing system. It is designed to encourage entrepreneurship among the poorest of the poor, as a way out of the vicious cycle of poverty. It is generally considered to have originated in the late 1970's in Bangladesh, with Professor Muhammad Yunus and his experiences with the Grameen (Rural) Bank.[55]
Microcredits, in its most well-known form, are a small loan delivery system based on the belief that credit should be regarded as a human right. Therefore it addresses poor people who would otherwise not be eligible for credit through the traditional banking system.[56] It follows the idea, that those who possess the least should get the highest priority.

Following this philosophy in service delivery, most microfinance institutions particularly target poor women, who are traditionally neglected by the conventional banking system. However, it is women and children, who are usually the ones most affected by poverty. Although this policy does not go without its criticisms, evidence shows that the benefits of increased household income are more rapidly and easily translated into improved living conditions for the whole family through women than men. Moreover, they are less likely to default on their loans.[57]

The microcredit methodology is not based on people's material possessions, but on their unlimited intrinsic potential. Unlike in traditional banks, microcredit borrowers are not normally required to provide any collaterals or guarantees, return is based on the expectation of their higher future incomes. Hence, risk is more evenly allocated between lender and borrower.

Repayment, however, is usually promoted by a system of *solidarity* or *group lending*: customers have to be members of a small group in order to receive loans. Although there is generally no joint liability (repayment responsibility rests solely on each individual borrower), group

[52] Brundtland Commission. (1987), Our common future, *available in* www.worldinbalance.net/agreements/1987-brundtland.php, June 7, 2009.
[53] www.cgap.org
[54] www.kiva.org
[55] Yunus, M. (2003), *Banker to the Poor: Micro-lending and the battle against world poverty*, NP: Public Affairs.
[56] Yunus, M. (2007), *Creating a World Without Poverty: Social Business and the Future of Capitalism*, USA: Public Affairs.
[57] www.grameen-info.org

members oversee that the others behave responsibly towards the microfinance institution (MFI). In other words, group members are not obliged to pay on behalf of the defaulting member. Yet, since members know each other and are possibly related, or at least living within the same small community, commitment levels to one another are significant and thus, they exert (positive) peer pressure on each other.

In practice, it is common for group members to contribute any defaulted amount(s) with the intention of collecting the money later from the person who failed to pay. They do this, in order to not lose access to future credits. This way, more focus is put on the benefits of paying back (good community relations and "*keeping the bank's door open*"), rather than the more conventional penalties to discourage defaults.

Voluntary or compulsory *emergency* or *insurance funds* are now common to serve as an assurance against contingencies.[58] Loan repayment rates vary throughout MFIs, of course, but against traditional bankers' forecasts, they are usually outstandingly high. This, along with the truly pressing needs that microfinance tackles, explains why the sector has grown on an average of 12% annually in coverage (number of borrowers) since 1996; and now reaches over 500 million people all over the world.[59]

Loans are also sometimes accompanied by capacity-building on basic financial management and/or small-business practices.
Striving for sustainability and therefore long-term survival, the microfinance sector includes financial considerations such as effectively reaching target customers, availability of funds for loan disbursement, being able to afford administrative costs, managing risk, securing repayment, etc. However, taking social, cultural, political, and environmental matters into consideration has proven to be just as essential. Microfinance has evolved from working capital loans to other financial products and services that poor households and entrepreneurs require to improve their livelihoods. These include saving accounts, money transfer services, insurance, pensions, and consumer loans, among others.

According to the SEEP Network study referenced in Chapter 1, it is estimated that the average monthly energy fee for rural households in low and middle income countries is about US$10, which represents a significant share of their total income (up to 20-25% for the poorest families). This stresses the concern that if energy is a basic need, and taking into consideration that people spend significant amounts on unsustainable, poor quality energy products and services, this could be *and should be* more wisely invested in modern energy services. Especially, if these were available and accessible to them. As stated in the research paper, "*access to modern energy services can be greatly enhanced if people also have access to microfinance loans to pay for these services.*"[60]

Partnering between MFIs and the energy sector has proven successful. It results in attracting new clients for financial services, existing microfinance customers to energy services, all while helping alleviate poverty through livelihood upgrading and improving quality or life. For these reasons, four energy lending projects in four different countries are presented in this study: GreenVillage Credit in China, Grameen Shakti in Bangladesh, Sarvodaya Economic Enterprise Development Services (SEEDS) in Sri Lanka and Faulu Kenya. These demonstrate a variety of drivers, engagement approaches, product and service portfolios, business models and promising practices in energy lending. Three out of these four case studies are from countries in Asia, since this the continent where the largest number of electricity-deprived people live (due to its high population count, approximately 930 million). It is also unquestionably the region where

---

[58] www.grameen-info.org, www.GrameenFoundation.org, http://es.youtube.com/watch?v=8_edy2K_Nlw
[59] Helms, B. (2006), Access for All: Building Inclusive Financial Systems. USA: The Consultative Group to Assist the Poor, The World Bank.
[60] Chowdhary, S. et al. (2007), *Using Microfinance to expand the access to Energy Services: summary of findings,* USA: The SEEP Network,14.

the microfinance sector is most developed in terms of the number of people served, depth (relative poverty of borrowers), outreach (clients in truly remote locations) and innovative product diversification, which includes energy lending.[61] It must be mentioned, however, that energy lending is still in an emerging phase and therefore it represents an extremely low proportion of MFIs' disbursements.

Little information was found on successful energy lending cases in Latin America and the Caribbean. This is possibly due to the region's relatively high electrification rates (compared to Africa or Asia), but most likely contributed to the fact that the 45 million people who live without access to electricity and the approximate 83 million who depend on unsustainable biomass for cooking live in financially under and/or un-served communities. Microfinance in the region tends to be more focused on urban settings and "*economically-active*" microenterprises, rather than the poorest population without considerable income flows in the most remote areas. These "economically-active" microenterprises are already carrying out some kind of income-generating activity, but need additional capital to grow. According to researchers, energy loans in the region are commonly managed jointly with other consumer loans, which therefore makes it challenging to find specific and reliable information, particularly statistics.

The fourth case study is from Africa, the continent with some of the highest levels of poverty and the lowest urban and rural electrification rates: only 38% of the continent's population has access to electricity.[62] Microfinance in Eastern, Central and Western African countries has a strong tendency towards focusing on traditional products, such as loans for small-scale income-generating activities and the promotion of savings. Regardless of the region's enormous potential market for modern energy services through microfinance, microcredit for energy services and products remains very limited.

[61] Chowdhary, S. et al. (2007), *Using Microfinance to expand the access to Energy Services: summary of findings,* USA: The SEEP Network, 14.
[62] Kabutha, J. Et at. (2007), *The Emerging Experiences in East Africa of Faulu Kenya and Kenya Union of Savings and Credit Cooperatives (KUSCCO),* USA: The SEEP Network.

Green Village Credit Project

China Rural Energy Enterprise Development Initiative

Type of financing: Microfinance
Location: Northwest of the Yunnan province, China
Technology: Domestic biogas digesters, solar water heaters, micro hydro-power generators, improved cooking stoves.
Power generation/ Scale: 500-600 households of diverse ethnic groups in 6 towns of the area.
Main Stakeholders: E+Co, UNEP, TNC China, Rural Credit Cooperatives (RCCs), local government agencies, Clean Energy Enterprises, new small-medium enterprises created, consumer credit customers.
Total Cost: US$786,550
Timing: 1st phase: February 2004-June, 2007

COUNTRY PROFILE

Total population (2004): >1.31billion
GDP per capita (2005): PPP US$6757
Life expectancy (2000-05): 72.5 years
HDI value & ranking: 0.777, 81 of 177
Population living under US$2/day: 34.9%
Population with access to electricity: 99%
Av. annual electricity consumption per capita (2004)63: 1684kWh
CO_2 emissions (of world total, 2004): 17.3%
Annual CO_2 emissions per person (2004): 3.8tCO_2

PROJECT DESCRIPTION

Background

The North West region of the Yunnan province in China is one of remarkable ethnic diversity. Tibetan, Naxi, Yi, Bai, Lisu, Nu, Dulong, Pumi, Achang and Muoso people mostly live in the higher areas and tend to maintain traditional living conventions, among them the use of coal briquettes and firewood as fuel for cooking and heating. The heavy physical and social burden of harvesting and gathering wood falls primarily on women and children, who are also among the most affected by respiratory and eye disease from poor indoor air quality.

It is calculated that a single household in the area consumes between 6m^3 and 10m^3 of fuel wood yearly and, according to the Yunnan Provincial Government, 130,000 hectares of forest are cut down each year for this purpose. This practice not only hinders the ecological functions provided by the forest -such as protection of the water sources and soil quality- and endangers biodiversity in one of the richest regions of the world in terms of flora, but also increases greenhouse gas emissions and thus, contributes to climate change.

Poor accessibility and lack of affordability of sustainable energy technologies is an issue in the area.

Stakeholders involved

The Nature Conservancy: Since 1951, TNC is a world leading conservation NGO which seeks *"to protect ecologically important lands and waters for nature and people."*

E+Co (Energy through Enterprise): A not for profit clean energy investment company created in 1994, with the help of the Rockefeller Foundation, to finance *"local entrepreneurs to create a cleaner, healthier and more prosperous planet while generating financial returns."*

United Nations' Environment Programme (UNEP): UN programme established in 1972 with the mission *"to provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations."*

63 Global average is 2,490 kWh., (www.ashdenawards.org)

Rural Credit Cooperatives (RCCs): Local microfinance institutions (MFIs) which manage their own loan capital as well as the project's revolving fund. Also serve as platform for all financial operations.

Clean Energy Enterprises: Local sustainable energy entrepreneurs serving rural costumers financed and technically assisted through the project.

Consumer credit customers/ small-medium entrepreneurs (who use sustainable energy services in their businesses): Invest in sustainable energy services to improve their living conditions and livelihoods, e.g. more efficient production of subsistence crops, cash-crops, animal husbandry and tourism services. Create wealth through income and employment generation, provide goods and services to the community and activate the economy. Also receive both financing and technical assistance through the project.

Local authorities/ leaders: Supporting local government agencies (e.g. local environmental protection, rural energy and poverty alleviation offices) and community associations.

Technologies

Domestic biogas digesters, solar water heaters, micro hydro-power generators, improved cooking stoves, advanced fireplaces for heating, house retrofitting for improved energy-efficiency and hybrid fuels that incorporate biomass waste as a component of coal briquettes, thereby reducing the unhealthy effects of coal burning.

Financing & Implementation

The project aims to encourage the use of sustainable energy through an innovative approach to financing which promotes economic development, improved health conditions and environmental protection (the reduction in the demand for unsustainably harvested fuel wood, GHG emissions reduction and decreased stress on Yunnan's threatened biodiversity). Specifically, the project seeks to reduce consumption of fuel wood by 15,000-20,000 m^3 in the 15-20 year lifespan of the installed systems (some households reported a 30-60% reduction in their consumption). Yet another project objective is to persuade local RCCs to offer renewable energy finance as part of their regular product portfolio (not just with the project's loan capital).

With an average annual income of less than US$125, most households in the area cannot afford to pay for renewable energy or energy efficient technologies upfront, e.g.: the average cost for a domestic biogas digester is US$150-230; a solar water heater is US$250-400; an improved cooking stove: US$40-80.

The strategy developed by E+Co consists of promoting an enterprise-centred approach to commercialization of sustainable energy through complementing access to seed capital with capacity building at several levels. This in turn, supports the creation of local clean energy ventures (Clean Energy Enterprises) for the delivery of this type of services/ technologies to the local population (components 1+2 below). Additionally, as part of its efforts to preserve biodiversity in the region, TNC China Program supports a dual microcredit programme. Traditional microcredit to develop small scale income-generating activities which make use of the new energy services available is matched up with household financing to purchase clean, high quality energy systems (component 3 below).

The project's 4 main components are the following:

1. *Capacity Building:* Technical training to local staff, RCCs, and government on design and management of microcredit and small-business development, including Clean Energy Enterprises. Executed by E+Co.
2. *Clean Energy Services Initiative (CESI):* Seed capital and technical assistance to support an enterprise-centered commercialization model for clean energies: local clean energy entrepreneurs.
3. *Consumer Credit and Income Generation:* To strengthen the link between modern sustainable energy supply and economic opportunity creation. Implemented by TNC China through Rural Credit Cooperatives already existing platforms and with the support of community associations.
4. *Communication, Dissemination and Outreach:* Directed by TNC China in close collaboration with local government agencies, to document and share outputs and outcomes and enhance the project's replicability in other parts of China and abroad.

Community Associations facilitate loan disbursements (from RCCs) and collections. Because some households directly harvest and gather their fuel wood, acquiring clean energy installations does not necessarily guarantee cash savings or an increase in household income. Therefore, GreenVillage Credit only makes loans available to households where consumer and income generation credit can be reimbursed from increasing income.

All borrowers are members of local community associations and are endorsed by smaller *solidarity groups* within them: 5-8 households which come together and reciprocally accept responsibility for each individual member's loan repayment.

Lending conditions (amounts approved, interest rates, repayment and collection periods, ratio of loans for household credit or income generation, etc.) are determined by agreements between TNC, RCCs and community associations.

- Disbursed amounts vary according to the energy installation and economic activity proposed, but usually do not exceed US$1250.
- Annual interest rates are approx. 5%
- Consumer credit loans usually represent 15-40% of total loan.
- Repayment period is usually 18 months with 6 month installments.
- Approx. 5% of loan amount remains in an RCC bank account as *risk fund* to compensate for any member of a *solidarity group* who fails to pay.

Impact

500-600 households of diverse ethnic groups in 6 towns in the area now have access to green energy.

Environmental benefits: Reduced consumption of fuel wood and therefore decrease in deforestation and GHG emissions; increased protection of water sources, soil quality, biodiversity, environmental functions of the forest, etc.; while promoting the use of green energy technologies.
Health benefits: Indoor air quality improvement, clinics improve their services by having better lighting during evening consultations and being able to refrigerate vaccines, healthier studying conditions for youth and entertainment.
Economic benefits: Affordable installments, long-term savings, extended work hours, improved business opportunities (e.g., checking orders or market prices of farm goods by phone, etc.) and provision of phone services.

LESSONS LEARNED

Strengths

Strategic partnerships with complementary organizations that share goals: As E+Co was relatively unknown in the targeted communities and the project´s timeframe is somewhat short, its linkages with local authorities and leaders, RCCs (which were already doing business in the area) and TNC China (which already had good standing with local stakeholders) enhanced the project´s ***credibility***, ***transparency*** and ***continuing sustainability*** in terms of follow-up. The alliances of the project also guaranteed optimal levels of ***energy and microfinance expertise***.
Most appropriate technology: The project does not promote a single technology, but instead the use of several accessible renewable technologies, whichever is most suitable to each particular client.
Lending approach promotes empowerment and ownership: People pay for the full cost of the system, no subsidies are utilized.
Energy literacy: The project includes the use of adequate means for the local population to access information and knowledge about potential uses and implications of modern energy technologies. For instance, **demonstration models** are installed in strategic parts of targeted villages to show people the functions and benefits of the technologies.
Integration with other aspects of rural development: The project enhances the income-generating and livelihood improvement potential of modern energy services.
Capacity building: At several levels (individuals, service providers, entrepreneurs, etc.), in order to complement financing and increase the likelihood of success of sustainable energy ventures and small businesses which utilize clean technologies.
Enterprises-centered commercialization model: Promotes local ownership, management and maintenance of the energy systems and services, thereby an economic incentive for the project's long-term sustainability.
Securing loan repayment mechanisms: Peer pressure exerted by the *solidarity of the group, risk fund* as an insurance mechanism in case any member of a solidarity group defaults and through linking consumer credit to buy sustainable energy systems with loans for income-generating activities.
Decentralized presence: Convenient delivery and efficient transactions of credit and energy products

and services, no unnecessary time or transportation costs for customers/borrowers.

Weaknesses

Project scope does not currently extend to all 500,000 households that need assistance.

Although linking consumer credit with income-generation loans as a measure to secure loan repayment is considered a sensible financial practice, this could *limit market insertion of energy loans* and *impede eligibility* of the people who need it the most: those without significant income flow or productive activities.

Repayment period seems ***relatively short*** given the limited solvency of clients and therefore could increase loan default rates. However, community members participate in decision-making regarding loan terms, therefore, if this does not pose any issues, it could actually enhance the project's potential and progress. There was ***no data available*** on the success rate with loan repayments or on energy systems' warranty service.

Potential for replication

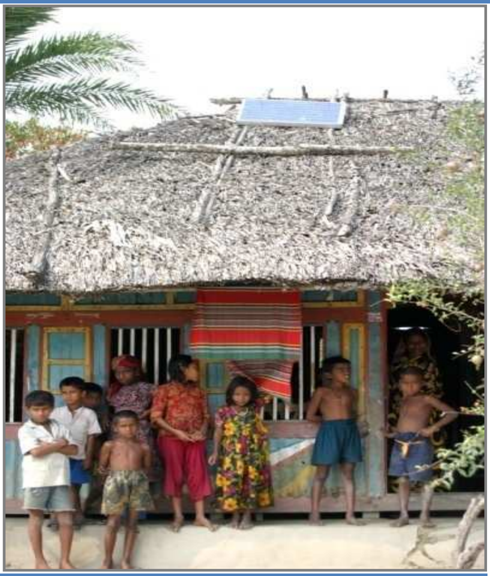
GreenVillage Credit's revolving fund is relatively simple and easy to replicate. Neighboring communities of the project villages have expressed interest in the extension of the project to their towns. The Rural Energy Enterprise Development (REED) approach is also being successfully implemented in Africa (AREED) –Tanzania, Zambia, Senegal, Ghana, and Mali- and Brazil (BREED) with the support of the United Nations Foundation (UNF).

SOURCES

- Chowdhary, S. et al. (2007), *Using Microfinance to expand the access to Energy Services: summary of findings,* USA: The SEEP Network, www.seepnetwork.org, May 2nd, 2009.
- NA. (ND), Green Village Credit: A China Rural Enterprises Development (CREED) Initiative, www.c-reed.org, May 2nd, 2009.
- Wallbaum, H. Et al. (2006), Microfinance and Renewable Energy Investing in a Sustainable Future, *Wisions of Sustainability I. Issue 2006:* 8-9, May 2nd, 2009.
- Yunnan Provincial Government. (2000), Conservation and Development Action Plan, www.c-reed.org
- www.eandco.net
- www.tnc.org
- www.undp.org

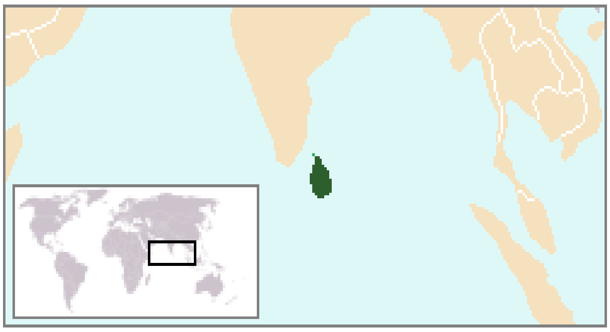
Power to the People
SEEDS Sri Lanka

Type of financing: Microfinance
Location: Rural Sri Lanka
Technology: Photovoltaic Solar Home Systems, Micro-Hydro Schemes, connections to main electrical grid.
Power generation/Scale: 52,000 Solar Home Systems, 14 micro-hydro schemes, 3,692 grid connections.
Main stakeholders: Sarvodaya Economic Enterprise Development Services (SEEDS), accredited energy installers, customers/borrowers.
Total Amount Disbursed: US$8.56 million (August 2006)
Timing: Since 1998.



COUNTRY PROFILE

Total population (2004): >19.1 million
GDP per capita (2005): PPP US$4,595
Life expectancy (2000-05): 71.6 years
HDI value & ranking: 0.743, 99 of 177
Population living under US$2/day: 41.6%
Population with access to electricity: 66%
Av. annual electricity consumption per capita (2004): 420 kWh
Annual CO2 emissions per person (2004): 0.6 tCO2



PROJECT DESCRIPTION

Background

According to the UNDP, the electrification level in Sri Lanka is 66%. However, the local NGO Sarvodaya Economic Enterprise Development Services (SEEDS) states that the percentage of the population with access to electricity in the island is much lower, about 55%, and approximately 40% in rural areas.

An independent survey ordered by SEEDS in 1998 estimated that the average household used 25-30 liters of kerosene per month for lighting purposes. This entails the high risk of respiratory and eye disease from poor indoor air quality, as well as burns.

This suggests that total kerosene savings through the project are estimated to fall between 16-19 million liters of kerosene per year and the deterrence of approx. 40-47 thousand tons of CO2 emissions.

Although the electrical grid is being extended in Sri Lanka, electricity generation has not increased at the same rate as electricity demand has, causing power to be scarce and unreliable, and making independent renewable energy systems an attractive option, even for people living and working in places with access to the grid.

Stakeholders involved

SEEDS is a not for profit company which serves as the economic branch of the Sardovaya Group, the largest and oldest development NGO originally from Sri Lanka. The SEEDS mission is "*to alleviate poverty by promoting economic empowerment of rural people for a sustainable livelihood*".[64]

SEEDS' work focuses on 3 core areas: capacity-building, business development, and **microfinance**. Within the microfinance field, SEEDS seeks to target rural poor prospective micro-entrepreneurs through both individual and group lending opportunities. The organization's total client base is 887,430 with 161,461 active borrowers.

Accredited solar installers: 11 solar companies, ranging from small local ventures to multinationals.

Central Electricity Board (CEB): Public utility Company in Sri Lanka.

Micro-hydro Equipment Suppliers.

[64] www.seeds.lk

Electrical Cooperative Societies (ECS): Community-based energy committees which manage micro-hydro schemes.

Customers/ Borrowers

Technology

Photovoltaic Solar Home Systems (SHSs): Average system can power 4-6 compact fluorescent lamps (CFLs), a television and a mobile phone charger; micro-hydro schemes; and grid connection (funding to enable borrowers to connect to the national electric grid).

Financing & Implementation

It is estimated that the average family in rural Sri Lanka spends approximately 19% of their income on energy expenses. Although poor families cannot afford to pay for the cost of clean modern energy technologies up front, a well-thought-out credit system is making this viable.

Through this project, SEEDS seeks *"to provide affordable financial packages to enable users to pay for their off-grid electricity systems."*[65] Energy lending represents approximately 30% of the organization's credit portfolio, a much higher share than that of other MFIs in Asia, such as the SEWA Bank, NUBL and Amret, where the proportion of credit to promote access to energy represents less than 1% of their disbursements. SHS loans constitute 94.3% of SEEDS' total energy portfolio.

The project started as a pilot of Sarvodaya: SHSs were sold to clients utilizing credit funded through government, multilateral (e.g. World Bank) and privately financed support schemes for energy lending.

General Energy Loan Characteristics

	SHS	Micro-Hydro	Grid Connection
Average Price (US$)	360-900	9,000-18,000	160-360
Loan Amount (US$)	225-900	30-50%	135
Average Interest Rate	10%	16%	8%
Repayment Period	2-6 years	Not available	Not available

[65] www.ashdenawards.org

As part of the project's model for ***SHSs***, SEEDS signs Memorandums of Understanding (MOUs) with solar energy installers in which minimum product and service standards are established.

While marketing their own services, solar companies identify potential energy loan customers and assist them in the completion of SEEDS' application form. Their representatives are trained to perform preliminary loan assessments, ie. a pre-screening process (taking into account applicant's income, expenditures and housing), before submitting the application to SEEDS.

If it is decided to target a particular village, SEEDS field officers along with partner installer-company representatives may visit the town to demonstrate operations and benefits of SHSs and address doubts. In these cases, SEEDS local field officers carry out the preliminary loan assessments themselves. Analysis is thorough and may include informal reference checks with local contacts. Also, applicants need 2 guarantors and may not be over 50 years of age.

Installment amounts are designed to be affordable, varying from the same to double the amount previously spent on kerosene and battery re-charging.

Once approved by SEEDS and upon equipment installation and training of clients on operations and maintenance issues, the solar company collects 15% of the cost as a down payment from the client, and SEEDS disburses the remaining 85% as a loan to the client, who is then responsible for paying directly to the solar company. The solar company, in turn, provides mandatory maintenance within 5 months of installing the equipment and every six months thereafter for 3 years. After this, the users pay a small fee for service.

All system components have warranties, e.g., 1-3 years for batteries and 15-20 years for the PV modules.

For ***grid connection loans***, CEB markets SEEDS loans, which cover up to 80% of the connection cost. Once approved by SEEDS, borrowers sign an official authorization for the MFI that authorizes CEB to disconnect power in case of default in payments. The loan is disbursed directly to CEB. Clients pay their installments to SEEDS.

Micro-hydro loans are offered and managed independently by an arm of SEEDS which oversees the constitution, training (management, operations, and maintenance) and functioning of Electrical Cooperative Societies (ECS), or community-based energy committees. Most of the loan is disbursed directly to the supplier of the micro-hydro equipment, and the balance to the ECS. An ECS representative collects monthly payments from the users of the scheme to cover operation and maintenance costs and loan repayment, which is remitted to SEEDS every month.

There is conflicting information regarding the cumulative repayment rate of loans, ranging from 86% (with high default rates on SHS loans, which is the main energy microfinance product) to 98% (with most default issues arising being solved through re-scheduling of loans).[66]

If a loan is voluntarily evaded and efforts to persuade guarantors to put pressure on the debtor to pay are unsuccessful, SEEDS can recover the SHS and resell it. Moreover, if a borrower becomes permanently disabled or passes away, the family is relieved of further payments and keeps the SHS. The amount due is taken from an assurance fund set up by SEEDS.

Access to clean, modern energy services through SEEDS is mainly being used for lighting, cooking, setting up electric fences around plantations to prevent elephants from entering and damaging the crops, corridor lamps (also as a deterrent to elephants), communication via mobile phones (which people can now recharge), extending work and study hours and entertainment.

SEEDS has documented cases of customers in areas, where there is a grid connection, but who still utilize solar as their main source of energy. They do this in order to save on electricity bills, have a more consistent supply, and subsequently use the grid only as a back-up.

Impact

52,000 Solar Home Systems, 14 micro-hydro schemes, and 3,692 grid connections established.

Environmental benefits: Reduced use of kerosene lamps cuts down GHG emissions; promotion of the use of clean energy technologies.

Health benefits: Indoor air quality improvement and prevention of burns as a result of the reduced use of kerosene lamps, clinics improve their services by having better lighting during evening consultations and being able to refrigerate vaccines, healthier studying conditions for youth and entertainment.

Safety benefits: Reduced risk of fire, elephant deterrent.

Economic benefits: Affordable installments, long-term savings, extended work hours, improved business opportunities (e.g., taking better care of crops, checking orders or market prices of farm goods by phone, etc.), providing phone services, etc.

Improved communications: Through television, radio, mobile phones, e.g., to keep in touch with family members, stay abreast of current events, etc.

LESSONS LEARNED

Strengths

Strategic partnerships with complementary organizations that share goals: As a trusted development actor among local stakeholders, SEEDS' role as the implementing agency enhances the project´s ***credibility*** and ***transparency,*** and secures ***microfinance expertise,*** which allows it to easily mobilize funds from a number of lenders. This is essential to the project's success. Its partnership with accredited energy installers guarantees similar critical levels of ***proficiency in energy know-how*** and ***continuing sustainability*** in terms of technical support (refer to *weaknesses* for the counter-argument).

Having numerous energy partners partially mitigates technical risk, i.e., if one fails, another can substitute (refer to *weaknesses* for the counter-argument).

Enterprises-centered commercialization model: Through its partnership with numerous accredited energy installers and ECSs, SEEDS promotes local ownership, management and maintenance of the energy systems and/or long-term sustainability of the project.

Lending approach promotes empowerment and ownership: People pay for the full cost of the system, no subsidies are involved.

[66] The 86% repayment rate was found on a document by S. Chowdhary (The SEEP Network- refer to *Sources*), posted on the SEEDS website.

Most appropriate technology: Although the project's main focus is on SHSs, it also promotes micro-hydro schemes and credits to enable people to connect to the main electrical grid, when these are considered to be the better options for the borrower(s).

Energy literacy: The project includes the use of adequate means for the local population to access information and knowledge about potential uses and implications of modern energy technologies. For instance, ***public demonstrations*** are carried out in targeted villages to show people the functions and benefits of the technologies.

Decentralised presence/ door-step services: CEB offices around the country, accredited solar installers and 20 SEEDS offices around Sri Lanka offer convenient delivery and the transaction of credit and energy products and services. The project reach is almost country-wide.

Sardovaya, SEEDS' parent organization, took advantage of existing government, multilateral and private ***support schemes for energy-lending*** when first establishing the program, which strengthened its overall performance.

Assurance fund set up by SEEDS in case of permanent disability or death of a debtor.

Clear after-sales servicing policy.

Weaknesses

According to a document posted on the SEEDS official website, the ***loan default rate*** is fairly ***high***: 14%. Not having a highly effective loan repayment mechanism in place threatens the financial sustainability of the project. Additionally, poor financial performance may raise the challenge of moving from a grant-driven scheme to a competitive business model for SEEDS.

Lack of integration with other aspects of rural development: Project efforts to directly and effectively impact income generation and livelihood improvements through modern energy services are not evident. For example, SEEDS has not tapped into the potential to promote energy entrepreneurs.

Set ***age limit*** for applicants (50) leaves a vulnerable sector of the population excluded from the project.

Having numerous energy partners may cause ***disparities in*** the ***quality*** and/or ***efficiency*** of the service provided to customers (refer to *strengths* for counter-arguments).

Lack of reliability of some energy partners has increased technical risk and compelled SEEDS to take on technology stock, training and installation functions which are not within its core competencies. Performance failures while carrying out these activities might damage the project's reputation and even the technologies' credibility. A case study by the Ashden Awards organization states that SEEDS field officers carry out system checks and minor repairs while collecting monthly repayments. Although they have been trained for this, an ***overlap in functions or a lack of clear division in labor among partners*** is a potential source of conflict that is better to avoid.

Moreover, maintaining inventory or ***having to pay for equipment up-front*** (e.g. micro-hydro schemes) means that SEEDS has to bear the ***financial risk*** of the technology being damaged, stolen or possibly replaced by a more suitable technology. An example of this (and which has happened in the past) is an unplanned grid extension done by the government.

No after sales service applies to Micro-Hydro schemes. The ECS is expected to settle a direct agreement with the equipment supplier.

External factors such as armed conflict, ethnic clashes, forced migrations, economic crisis, natural disasters or the aforementioned unplanned grid extension may prevent SEEDS from reaching economies of scale.

Potential for replication

SEEDS energy financing model is simple and easy to replicate. Two commercial companies in Sri Lanka now use the SEEDS model to run their own solar energy financing business.

SOURCES

- www.seeds.lk
- NA. (2007), Microfinance provides solar lighting to homes in rural Sri Lanka, Case Studies, *available in* www.ashdenawards.org, May 5th, 2009.
- Morris, E. and Wurster, E. (2005), Global Village Energy Partnership mobilizes public and private sectors: aims to increasing microfinance for energy services, *Microfinance Matters,* issue 17, *available in* www.uncdf.org/mfmatters, May 10th, 2009.
- Chowdhary, S. et al. (2007), *Using Microfinance to expand the access to Energy Services: summary of findings,* USA: The SEEP Network, *available in* www.seepnetwork.org, May 2nd, 2009.
- Hilman, H. et al. (2007), The Emerging Experiences in Asia of SEWA, SEEDS, NUBL, and AMRET, USA: The SEEP Network, *available in* www.seepnetwork.org, May 2nd, 2009.

Grameen Shakti (Rural Energy)

Type of financing: Microfinance
Location: Bangladesh
Technology: Photovoltaic solar home systems, biogas plants and improved cooking stoves.
Power generation/ Scale (April 2008): 150,000 SHSs (6.75 MWp of PV capacity), 3000 biogas plants, 15,000 improved stoves.
Main stakeholders: Grameen Shatki; PV, Stove and Biogas Technicians; Infrastructure Development Company Limited (Government of Bangladesh); donors; customers.
Total Project Cost: Turnover of US$24 million in 2006.
Timing: Since 1996

COUNTRY PROFILE

Total population (2005): 153.3 million
GDP per capita (2005): PPP US 2,053
Life expectancy (2000-05): 63.1 years
HDI value & ranking: 0.547, 140 of 177
Population living under US$2/day: 84%
Population with access to electricity: 32%
Av. annual electricity consumption per capita (2004): 154kWh
CO_2 emissions (of world total, 2004): 0.1%
Annual CO_2 emissions per person (2004): 0.3 tCO_2

PROJECT DESCRIPTION

Background

Almost 70% of the inhabitants of one of the most populated (and *densely* populated, with more than 104 million people) countries in the world, currently have no access to electricity. These people depend on kerosene for lighting and fuel wood for cooking over open fires, at high risk of respiratory and eye disease from poor indoor air quality and burns.

Official plans to extend the grid exist, but there is little hope that substantial changes will occur in the near future.

Stakeholders involved

Grameen Shatki (GS): Created in 1996 by the founders of The Grameen Bank, this non profit company seeks "*to empower the rural people with access to Green Energy and Income*". It employs over 2,000 workers and it is one of the largest market based suppliers of SHS in the world.

Donors:

- ***Grameen Trust & Grameen Fund Infrastructure Development Company Limited (IDCOL, Government of Bangladesh):*** Financial institution established in 1997 to bridge the financing gap for developing medium-large scale infrastructure and renewable energy projects in Bangladesh.
- ***World Bank, Global Environment Facility (GEF), United Nations Development Programme (UNDP), United States Agency for International Development (US-AID), German International Cooperation Enterprise for Sustainable Development (GTZ), German Promotional Bank for Worldwide Sustainable Development (KfW).***

PV Technicians: Approximately 1,037 *female technicians have been trained at* Grameen Technology Centres (GTCs, 20 throughout the country) to install and maintain SHSs and assemble accessories. More than 300 technicians work at GTCs or independently.

Stove Technicians: Although it was intended for stove technicians to also be female, due to cultural issues, most of the 700 trained stove technicians are male.

Biogas Technicians: All biogas technicians are male and trained by engineers.

Energy loan customers

Technology

Photovoltaic solar home systems: Initially of 40-120Wp. A 40WP can power 4 low power LED lamps for 4 hours per day, a radio, a television and possibly a phone charger. Now there are also smaller 20Wp systems available -which can power 2 lamps and a radio or phone charger- to make the technology more accessible to poorer households.

Biogas plants: Produce biogas from cattle manure and organic waste which can be used for cooking and organic compost as a by-product. Extra gas can be used to produce electricity and/or sold. Domestic sizes range from 1.2m^3 (the dung of 2 cattle) to 4.8 m^3 (10-12 cattle). Larger plants, from 6 m^3 to 20 m^3 have also been built to produce electricity.

Improved cooking stoves: Cuts the consumption of fuel wood in half and eliminates fumes from the kitchen.

Financing & Implementation

It is estimated that the average annual income of a rural household in Bangladesh is approximately US$810. Although poor families cannot afford to pay for the cost of clean modern energy technologies up front, a customized credit system is allowing them to enjoy the benefits of sustainable energy and improve their quality of life.

Initial funding for GS came from the Grameen Trust and Grameen Fund. Additional funding came from the World Bank and GEF (through IDCOL), as well as from the UNDP, USAID, GTZ, and KfW which has helped to finance GS's SHS program through initial subsidies and low-interest loans. Subsidies have been phased out completely as GS increasingly relies on income from sales and loan repayments.

By 2015, Grameen Shatki plans to have an institutional capacity of 1,000 unit offices, 500 GTCs, and 100,000 independent entrepreneurs; supply 1 million SHSs, 500,000 biogas plants, and 10 million improved stoves; and have diffused the benefits of green energy to more than 15 million people.

SHSs				
Average price: US$215-405				
	Option 1	*Option 2*	*Cash*	*M-US*
Down Payment	*15%*	*25%*	*100%*	*10%*
Loan Size	*85%*	*75%*	*0*	*90%*
Interest Rate	*6%*	*4%*	*4% disc.*	*NA*
Repayment	*3 yrs.*[☼]	*2 yrs.*	*NA*	*> 3yrs.*[§]

[☼]*Monthly installments approximately amount to monthly savings on kerosene.*

[§]A micro-utility scheme (M-US) encourages small businesses which could normally not afford to install a PV SHS, to actually invest in a system with additional capacity to reap benefits and generate extra income from spare energy retailing to neighbors and/or lantern recharging.

Even though GHGs reductions per system are moderate, the number of installations is so high that aggregate savings are important: currently approximately 68,000 tonnes CO_2/ year.

SHSs main parts are covered by warranties. Once these expire, GS offers a service contract for approximately US$7 per year, which includes system revisions during monthly fee collections.

Domestic Biogas Plants	
*Average Price: US$116-407**	
Down Payment	15%
GS Loan	75%
IDCOL Loan	68%
Interest Rate	Not available
Repayment	Not available

*A US$102 subsidy provided by IDCOL has been deducted from the prices stated above.

Since people who did not own cattle were unable to benefit from this technology, GS designed a product which allows poor families to buy cattle and biogas plants simultaneously. They can pay back in cash, compost or manure at a later time.

Improved Cooking Stoves[♣]		
Average Price: US$10-12		
	Option 1	*Option 2*
Down Payment	*100%*	*15%*
Loan Size	*0%*	*75%*
Interest Rate	*NA*	*4%*
Repayment	*NA*	*6 months*

[♣]*GS has a reforestation program to enhance its work with improved cooking stoves.*

Under the assumption that each improved stove uses 50% less wood (20kg/month) and each biogas user reduces wood consumption by 100% (40kg/month), total wood savings are approximately 5,000 tonnes/year and rising.

Loan repayment rates are amazingly high: 98%. However, this excludes families who have been affected by natural disasters.

GS' rapid and successful expansion is partly a result of its *'proximity'* business model, and/or community engagement approach. This entails retaining value chain activities, from procurement to collection of payments and maintenance, local. As many raw materials as possible are bought from local or national suppliers and all of the company´s primary activities (marketing, sales, installation, collection of payments, etc.) are either carried out by native staff employed at one of the 387 local *unit offices* all around the country or outsourced from local businesses/ skilled labour.

The training of Stove and Biogas technicians and female PV technicians at GTCs is another good example of this. Around 50 of the most talented PV technicians have been helped through management training and promotion support to establish their own start-ups.

Aside from seeking to reinforce women's role in society and empower women through sometimes unprecedented training and work opportunities, when possible, loan contracts are also signed with women. It must be mentioned, that there is also a practical reasoning behind this: women are at home more often and usually become the main users of the systems. Moreover, female technicians can pay service-visits at homes at anytime, even when the men of the house are away.

Impact

150,000 SHSs (6.75 MWp of PV capacity), 3000 biogas plants, 15,000 improved stoves.

Environmental benefits: Reduced use of firewood and kerosene lamps cuts down GHG emissions, promotion of the use of clean energy technologies.

Health benefits: Indoor air quality improvement and prevention of burns as a result of reduced use of kerosene lamps, clinics improve their services by having better lighting during evening consultations and being able to refrigerate vaccines, healthier studying conditions for youth, entertainment.

Safety benefits: Reduced risk of fire.

Economic benefits: Affordable installments, long-term savings, extended work hours (e.g. women have started small-scale businesses in their spare time), improved business opportunities (e.g. checking orders or market prices of farm goods by phone, providing phone services, community television stations and *micro-utility schemes* (retailing spare PV power or biogas-, selling compost generated as a by-product of bio-digesters). Moreover employment benefits are created: trained technicians working independently and more than 2000 workers directly employed by GS.

Improved communications: Through TV, radio, and mobile phones: to keep in touch with family members, keep abreast of current events, which is particularly important for example, for natural disaster preparedness and mitigation.

LESSONS LEARNED

Strengths

Expertise in energy and microfinance services: Unlike other energy lending programs which rely on partnerships between MFIs and energy companies, GS is highly competent in these 2 main areas of its core business. Having the endorsement of the Grameen Bank -possibly the most successful and reputable Microfinance institution in the world- and the Grameen Family of Companies, enhances the project´s ***credibility*** and ***standing*** and secures ***microfinance expertise,*** which allows it to easily mobilize funds and is essential to the project's success. This is complemented by the organization's ***proficiency in energy know-how,*** which makes the project sustainable. Although partnerships are generally perceived positively as relationships which promote and enable sustainable change and innovation, these are oftentimes challenging and strenuous as well. Therefore, not having to deal with this specific kind of arrangement and yet mastering the business, possibly saves the organization valuable time and energy.

'Proximity' business model/ Community engagement: Active participation of the community is promoted in all GS value chain activities. The company also has a strong local training and employment policy. Institutions at the local level are strengthened.

Gender approach: The project recognises women as catalysts for social change and seeks to empower and directly impact them through unprecedented training and work opportunities.

Most appropriate technology: The project focuses mainly on SHSs, but more recently also on biogas plants and improved cooking stoves. Although the cooking stoves are not a green technology, these are inexpensive, cleaner and healthier than traditional stoves; and are therefore recommended when considered to be the best option for the customer.

Energy literacy: Sales and marketing by local field staff allow the target population to access information and knowledge about potential uses and implications of modern energy technologies.

Capacity building: Training of technicians, mostly female, at Grameen Technology Centres.

Enabling policy environment: Implementing energy-lending activities is facilitated by the government's interest and willingness to promote renewable energy projects in Bangladesh.

Decentralized presence: Convenient delivery and efficient transactions of credit and energy products and services through a network of local *unit offices* and technology centres. No unnecessary time or transportation costs for customers/borrowers.

Lending approach promotes empowerment and ownership: Through customers having to pay full, yet affordable, prices for the technologies they acquire. Subsidized prices apply for specific products.

Clear after-sales/ warranty servicing policy.

Weaknesses

Financial self-sufficiency of the social business model is yet to be accomplished.

External factors such as macro-economic struggles and natural disasters, which unfortunately are not rare in Bangladesh, hinder the achievement of GS's social goals and its aspiration to attain financial self-sufficiency.

Potential for growth and replication

The Grameen Shatki approach is considered to still have high growth capacity in Bangladesh and high launch potential in other countries. Staff members are constantly invited to give presentations and share the organizations' business model at international forums, e.g.: India, Thailand, Sweden, USA, Germany, etc. Donor and implementing organizations seek out Grameen Shatki's expertise and collaboration when planning their own sustainable energy projects, particularly in Africa.

In 2008, two World Bank projects were approved for GS and IDCOL to install 1.3 million SHSs in Bangladesh. According to the Renewables' Global Status Report 2009, published by REN21 –a renewable energy network based in Paris– these are among the first projects worldwide to incorporate off-grid PV carbon finance.

SOURCES

- www.gshatki.org
- www.grameen-info.org
- NA. (2007), Rapidly growing solar installer provides clean cooking as well, Case Studies, *available in* www.ashdenawards.org, May 5th, 2009.
- Yunus, M. (2007), *Creating a World Without Poverty: Social Business and the Future of Capitalism*, USA: Public Affairs.
- REN21. (2009), *Renewables Global Status Report: 2009 Update*, Paris: GTZ, *available in*: www.ren21.net

Faulu (*Success*) Kenya

Type of financing: Microfinance
Location: Kenya
Technology: LPG package, PV Solar Home Systems, biogas plants.
Power generation/ Scale: Over 4,000 clients (Dec. 2006)
Main stakeholders: Faulu Kenya; Kenol Kobil, Total, BP, Shell, Caltex (LPG suppliers); Chloride Exide (SHS supplier); energy loan customers.
Total Project Cost: US$71,860 (to December 2006)
Timing: Since 2003

COUNTRY PROFILE

Total population (2005): 35.59million
GDP per capita (2005): PPP US1,240
Life expectancy (2000-05): 52.1 years
HDI value & ranking: 0.521, 148 of 177
Population living under US$2/day: 58.3%
Population with access to electricity: 14%
Av. annual electricity consumption per capita (2004): 169kWh
CO_2 emissions (of world total, 2004): (.)
Annual CO_2 emissions per person (2004): 0.3 tCO_2

PROJECT DESCRIPTION

Background

With one of the highest poverty levels and lowest reported electrification rates in the world, Kenya (similar to other East African countries) is a good example of how -despite the recognized role of modern clean energy in addressing many dimensions of sustainable development- it is not viable to promote the use of electrification without a feasible plan to make it affordable to the poor population.

Traditional biomass (fuel wood, animal dung, and agricultural waste) currently makes up more than 95% of rural Kenya's energy mix. Lighting and cooking needs in low-income households in urban Kenya are mainly met with paraffin and charcoal respectively. These energy sources are attractive mainly because they come in inexpensive, small packages, sometimes a size sufficient to just cover a day's needs.

Stakeholders involved

Faulu Kenya is a financially sustainable microfinance institution, a subsidiary of Food for the Hungry International (FHI), a Christian relief and development organization based in Arizona, USA. It started operations in Nairobi in 1992, with the mission of "*listening and empowering Kenyans by providing relevant financial solutions*". The organization is registered as a limited liability company. It has its headquarters in Nairobi and 20 branches operating in 30 offices throughout the country. It is also part of a regional network of MFIs, which extend to Uganda and Tanzania. In 2006, Faulu Kenya disbursed US$30 million in loans among its client-base.

LPG suppliers: Kenol Kobil, Total, BP, Shell, Caltex
SHS supplier: Chloride Exide
Biogas supplier: Currently under negotiation.
Energy loan customers

Technology

Liquified Petroleum Gas (LPG): An ozone-friendly, low-carbon emitting hydro-carbon usually used for cooking purposes, but also for lighting, refrigeration and fuel for electric generators and small engines. The package offered includes an LPG cylinder and regulator, a burner and an optional lantern.

Photovoltaic solar home systems (*Mwangaza –Ray of Light-* loan): Includes panel, batteries, wiring, regulator and an optional inverter (changes direct current (DC) into alternating current (AC), which allows for additional devices to be used and thereby opens a wider range of applications). Usually used for lighting, charging mobile phones and small batteries, and powering small appliances, such as radios and televisions.

Biogas plants: Produce biogas from cattle manure, chicken droppings and organic waste which can be used for cooking and organic compost as a by-product.

Extra gas can be used to produce electricity and/or sold.

Financing & Implementation

Like for most MFIs, small-business development loans (*Mkopo Biashara*) are FK's core product and hence, micro-entrepreneurs its core clientele. Most of FK clients are from low-income economically active segments.

The organization prides itself on its effective and new product development process, which is carried out alongside credit management and operations, and is therefore the result of the on-going weekly dialogue and the close relationship FK's field staff develop with clients.

Energy loans are categorized and managed as *consumer loans.* Although the design and introduction of these to the market responds to consumer requests, energy-lending still represents just a small percentage of the organization's loan capital (1,53% in 2004, 1.56% in 2005 and just over 0.32% in June 2006).

100% of the organization's **energy product portfolio has been funded through the MFI's own means.** In 2005, for instance, FK set a precedent as Africa's **first MFI to list a bond** worth US$7 million **through the Nairobi Stock Exchange.**

FK has established partnerships with several energy companies of varying scales for efficient energy product and service delivery.

Faulu field staff meet weekly with already existing *borrowing-groups* to provide loan management training, disburse loans, collect (also weekly) installments (applies for all loan products) and receive feedback regarding current and potential new products.

During these meetings, FK staff also promote the different energy products being offered. Once applications are submitted, headquarters in Nairobi assess each client's capacity to take on the energy loan (according to the criteria listed below), process their application and, if approved, issue a cheque to the energy provider, which is delivered to the client at a weekly meeting.

Loan approval and disbursement is done through a *group lending* methodology, under the following terms:

- Waiting period to determine eligibility of group members (1st time): ~4 weeks.
- At least 1 group member has attended a loan orientation seminar.
- Saving of required *loan security fund* (assurance fund) to secure the solicited loan.
- Group members and Faulu officers' business appraisal.
- Group members guarantee for the customer's credit: they are jointly liable for each member's loan.

Energy providers establish the extent of their own energy services market. Once they obtain the cheque from the client for an energy product, they proceed to supply or install it and train the client on basic operations and maintenance. They provide after-sales and buy-back services, given cases where clients want to re-sell their energy package or system.

The LPG package for cooking purposes is FK's main energy loan.

LPG	
Average Price: From US$65	
Loan Ceiling	NA
Interest Rate	10% Flat
Repayment	Usually 3-6 months, up to 1 yr.

Customers can work with the approved energy supplier of their choice: Kenol Kobil, Total, BP, Shell, or Caltex.

SHSs	
Average Price: US$143-386	
Loan Ceiling	$1,430
Interest Rate	20% flat
Repayment	Up to 1 yr., weekly payments

SHSs are not as popular as the LPG package. According to a study of the program, this could possibly be due to unsuitable and/or insufficient promotion efforts: people perceive these as a technology for "*rich people*". Furthermore, "*solar systems are more complex, they lack support from the energy companies, there are weaknesses in the supply*

chain, the cost is higher, and clients can only access the technology as an addition to a business loan."[67]
SHS loan processing and installation can take between 3 weeks and 2 months from the moment the full application is submitted to FK field staff member.

The biogas product is still in a development stage. The foreseen base price is ~US$430, for a system that would require the client to have at least two cows. The possibility of financing both the biogas plant and the purchase of cows in a single package is being appraised.

FK internal data from June to December 2006 shows interesting trends in terms of gender issues related to energy lending in Kenya. More women obtain LPG loans than males, who seem more interested in SHSs than the opposite sex. FK staff state that this is because of the fact that cooking is women's primary energy need, followed by lighting. In the case of men, their priority use is lighting, followed by communications and powering small appliances.

Type	Sex of client	Number of Products	Amount US$
LPG	Female	475	$41,899
	Male	297	$26,956
Solar	Female	2	$380
	Male	13	$2,634
Total		787	71,860

Source: FK, Internal data, 2006.[68]

In terms of the rural and urban distribution of clients, just 3 of FK's 20 branches are located in Nairobi and periurban areas. It is calculated that 75% of energy loans are disbursed to rural customers.

Impact

Over 4,000 clients (to December 2004).

Environmental benefits: Reduction in GHG emissions and land degradation.
Health benefits: Indoor air quality improvement reduces respiratory health risks.
Economic benefits: Affordable installments, long-term savings, extended work hours (especially for women).

[67] Kabutha, J. Et at. (2007), Page 28.
[68] Kabutha, J. Et at. (2007), Page 27.

LESSONS LEARNED

Strengths

Reputation: FK's rapid expansion and extended presence throughout Kenya and its subsidiary relationship with FHI give it credibility with potential external funders, partners and clients. Its partners in this project are well known for their expertise in the energy sector.
MFI's bold self-financing strategy: FK is Africa's first MFI to list a bond through the Nairobi Stock Exchange to finance its operations through its own resources. 100% of the energy product portfolio has been funded through the MFI's own means.
Effective new product development process: A result of the on-going dialogue and close relationships FK's field staff develop with clients.
Effective risk management: The MFI's low at-risk portfolio (4%) is evidence of this. ***Loan repayment mechanisms*** include peer pressure exerted by the ***joint liability*** feature of their ***group lending methodology***. ***A loan security fund*** is also required as an insurance mechanism in case group members default. ***Weekly installments*** have been identified as the most convenient and effective repayment method for both clients and MFI. Finally, consumer credit to buy the energy systems is linked with business loans (see counter-argument in *Weaknesses* below).
Lending approach promotes empowerment and ownership: Through customers having to pay full, yet affordable, prices for the technologies they acquire.

Weaknesses

LPG is considered a cleaner and healthier option to traditional biomass and paraffin. However, it is derived from oil, so that long-term availability and energy independence issues still remain.
Low demand for SHSs: Although the systems offered are relatively small and inexpensive, demand for them is low possibly due to ***inadequate promotion and poor energy literacy*** *efforts*.
FK staff, who are in charge of marketing the products, communicating their benefits and helping clients make the best choices, receive ***little training on technical issues.***
Although ***partnerships*** in this project appear to be practical, there are said to be ***weaknesses in the supply chain***, i.e. failure to fill roles or meet expectations, specifically with the provider of SHSs. This may be explained by the fact that Chloride Exide's core

business is actually batteries. Solar systems are just a complementary product they introduced for battery charging in electricity-deprived areas.

Centralised process: Although FK field staff meets with borrowers at convenient locations close to their homes on a weekly basis, all energy loan applications have to be sent to Nairobi to be processed at headquarters, which delays transactions of energy credits.

Poor integration of the project with other aspects of socio-economic development: Although energy products are sold among MFI clients complementary to other business development products, their own income-generating and livelihood improvement potential is not fully utilized by Faulu or its clients under their current business model.

Limited accessibility*:* The clients are only able to buy the technology as an addition to a business loan and the ***joint liability*** trait in FK's ***group lending methodology****. This* may limit accessibility to energy loans of those most in need (see counter-arguments in *Strengths* above).

The ***limited presence and distribution capacity of energy service providers*** (mostly concentrated in urban areas), also limits the project's reach and makes costs rise considerably in rural areas.

Although FK is said to have sophisticated monitoring and evaluation processes, at the beginning of 2007 they were ***not monitoring energy-specific data****.* Their website still does not have precise accurate information of FK's energy products. This restricts MFI's ability to identify and address limitations in its energy lending service delivery process.

In general terms, the ***MFI does not seem motivated to make energy lending one of its core business*** lines.

After-sales servicing is the energy providers' responsibility. No information was found on pricing policies for these services.

No information available regarding products/ services' warranties.

Potential for growth and replication

The project's most outstanding and interesting characteristic is its self-financing loan capital strategy. This is important for other organizations to take into account, in order to ensure their project's financial independence and long-term sustainability.

FK has learned from its own experiences and shared its key lessons learned with other FHI subsidiary MFIs in Uganda and Tanzania.

SOURCES

- www.faulukenya.com
- Chowdhary, S. et al. (2007), *Using Microfinance to expand the access to Energy Services: summary of findings*, USA: The SEEP Network, *available in* www.seepnetwork.org, May 2nd, 2009.
- Kabutha, J. Et at. (2007), *The Emerging Experiences in East Africa of Faulu Kenya and Kenya Union of Savings and Credit Cooperatives (KUSCCO)*, USA: The SEEP Network, *available in* www.seepnetwork.org, May 2nd, 2009.
- www.auto.howstuffworks.com/fuel-efficiency/alternative-fuels/lpg.htm

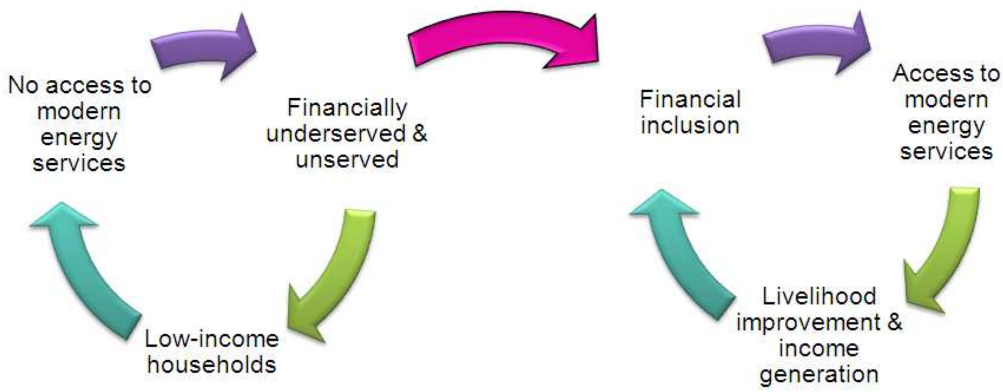
2.5.2 Energy lending findings

Too often, institutions and policies in developed and developing countries regard the poor as a social liability and seldom recognize their capacity to improve their own lives and play a part in the progress of society.[69]

When it comes to energy access, some argue that charging the poorest of the poor for electricity access is out of the question and therefore the only solution is for the service to be subsidized by governments or the international community as a socio-economic investment.[70] This, however, is a paternalistic and patronizing standpoint to the issue. Studies by some of these same organizations and governments show that the world's poor already spend much more on regularly polluting and hazardous traditional fuels than they would on electricity, were they connected to the grid. The real challenge then is making initial installation costs affordable, helping generate adequate incomes for people to meet long-term operations and maintenance expenses of the systems and, in cases where a grid-connection is an option that the kWh is paid for.

The case-studies highlighted in this chapter attest to the fact that local communities can help themselves and microfinance can be a catalyst for it. According to Sonali Chowdhary, "potential markets for energy products can be transformed into effective demand if individuals can access appropriately designed loans for the purchase of modern energy services."[71] (Figure 2.7).

Figure 2.7
Energy lending can help make the shift to a virtuous cycle towards sustainable development



The following are some key findings from the energy lending experiences analyzed:

- Energy lending projects must be set in response to a clearly identified market demand for energy products. As seen in the cases, the scheme may be suited to finance low-income user

[69] Yunus, M. (2003), *Banker to the Poor: Micro-lending and the battle against world poverty*, NP: Public Affairs.

[70] See IEA's World Energy Investment Outlook 2003 and EUEI's *Development Capital for Energy Access: opportunities to reach the energy poor*, 2003.

[71] Chowdhary, S. et al. (2007), *Using Microfinance to expand the access to Energy Services: summary of findings,* USA: The SEEP Network, page 19.

connections to the main electric grid, as well as community mini-grids and individual systems.

- The model offers civic incentives for civil society and private sector involvement, including economic incentives for the latter, e.g. energy companies, small-scale sustainable energy ventures, all while promoting empowerment of local communities.

- On the other hand, the energy lending component of a project on its own does not address the overall project funding issue (availability of funds for loan disbursement). Therefore it has to be complemented with some kind of financing scheme at this level, e.g. international cooperation, CSR, CDM, lending institutions' own means, etc. Furthermore, a project is not financially viable in the long-term unless it includes funding plans that promote the transition from a grant-driven scheme to a more competitive business model.

- Another potential challenge of the concept in terms of project management has to do with loan default risk management mechanisms. Although these are essential for the project's financial feasibility, they must be designed in a way that does not limit market insertion of energy loans or project depth and outreach.

- The success of projects encompassing energy lending heavily relies on appropriate project design in terms of community engagement, acceptance and appropriation (e.g. through a 'proximity' business model); energy literacy and capacity building (e.g. through enterprises-centered commercialization models). In addition, it relies on strong links to other development initiatives, such as income-generation enhancement, livelihood improvements and poverty alleviation programs.

- Moreover, the potential of energy lending projects is enhanced through the recognition of women as catalysts for social change. This necessitates their active involvement and direct creation of benefits for them through training and work opportunities.

- In order to ensure optimal levels of energy and microfinance expertise, the most common business model for energy lending has until now been through alliances between MFIs and energy companies. Successful partnerships require serious commitment from strong parties. In working together, parties inevitably loose autonomy. If not managed carefully, partnerships can become demanding, wearisome and risky. Possible implementation challenges can be avoided through clear division of labor according to each partner's field of expertise. Mutual agreement on efficient and standardized processes as well as proficient communication and decision-making systems is critical.

- In terms of products and service delivery: **s**ustainable development, environmental impact minimization and proportionality principles must be taken into account when choosing the most appropriate technologies. Prices should be cost rather than market-based and adapted to client purchasing power. Loan terms must also be well suited to target client needs, ie. affordable down payments; low, cost-based interest rates; and repayments which meet previous energy expenditure patterns in terms of amount and the frequency of collection periods. Finally, transparent warranty and after-warranty servicing policies are fundamental.

"If we are looking for one single action which will enable the poor to overcome their poverty, I would focus on credit."

-Muhammad Yunus,
Founder of the Grameen Bank, Nobel Peace Prize 2006

2.6 Innovative Financing Schemes: Main Overall Findings

In this chapter, we have presented practical and recent case studies in three areas: corporate social responsibility, clean development mechanism and microfinancing. Each case study has been designed to give background information, an overview of the project strengths and weaknesses and the lessons learned. The following is a table summarizing the main findings of these case studies and have been categorized into the following sections in order to emphasize relevant and significant aspects:

- Project scope and level of application
- Sustainability
- Strengths
- Limitations and Challenges

PROJECT SCOPE / LEVEL OF APPLICATION		
CSR	**CDM**	**MICRO-FINANCE**
Financing/Subsidizing products & services Connections to main grid Community mini-grid projects Individual systems projects Large-scale projects Innovative/New sustainable solutions	The mechanism is designed for energy projects taking place in a developing country and generating a reduction in greenhouse gases emissions compared to the development baseline. Financing of products/ services Connections to main grid Community mini-grid projects Individual systems projects Large-scale projects Innovative/New sustainable solutions	Financing of products / services Connections to main grid Community mini-grid projects Individual systems projects Innovative/New sustainable solutions
SUSTAINABILITY		
Reinforce company commitment to society Through CSR companies fund and allocate resources to providing energy services for poor communities, often filling energy services gaps and can target the Bottom of Pyramid. A healthy business needs a healthy society to operate in.	The main focus of CDM is to reduce greenhouse gases emissions in order to fight climate change. Creates a new solidarity channel between developed and developing countries The Gold Standard promotes CDM project with a strong contribution to Sustainable Development.	Lending approach promotes empowerment and ownership in local communities While it helps to provide energy services, it is designed to encourage entrepreneurship among the poor.

STRENGTHS		
There are multiple drivers for companies to commit to energy services projects Corporate commitment stronger if reputation is linked to project success Encouragement of more than philanthropy Corporations have financial resources and know-how usually out of reach for other organizations Potential strategic first mover advantage for companies expanding to new markets/market niches/gain competitive advantage/lays groundwork for new business opportunities Company aim to improve operations / ability to operate in new markets/creating official/legal customers Business perspective beneficial due to abilities of resource allocation Potential to tap into local knowledge/ human capital / creates knowledge management, which can create added value or reduce future operating costs for the company Allows communities to access innovative and efficient, reliable and more sustainable solutions, higher social and economic integration Company often supports job creation; income generation and economic development in the community are key to business survival Strategies are not only focused on the economic side of development, but also improving living standards, increasing energy literacy and improving education in the community. Innovative energy solutions can incorporate the benefits of minimizing environmental harm and reduction of CO_2 emissions. Multi-stakeholder pressure to do energy poverty reduction projects. Company accountability to key stakeholders and shareholders is high and often positively influences project success. Companies need the license to operate within the community and CSR can enable them to positively distinguish themselves from competitors.	Provides an additional income into the community when the project operates. Encourages the use of "clean" energy by populations that could not afford it otherwise. Promotes monitoring and maintaining of the project and by doing so, gives an incentive to involve local communities on the long term. Promote entrepreneur initiatives in the local community Promotes partnership between developed and developing countries. A large database documenting previous CDM projects is available online. This is a good knowledge management system that allows project designers to learn from similar projects. CDM involves stakeholders at every level: public and private sectors, governments, local communities, NGOs and intergovernmental organizations.	Makes energy products/services available through projects actually affordable for most vulnerable populations Offers civic incentives to get civil society and private sector involved Offers economic incentives to get private sector involved, e.g. energy companies, small-scale sustainable energy ventures Usually linked to other development initiatives Previous experiences have demonstrated high repayment rates Gender issues are often taken into consideration while designing the loan program Promotes partnership within developing countries and between developed and developing countries.

LIMITATIONS / CHALLENGES		
Short term company focus -often due to shareholder pressure or management changes- can be a driver for the implementation of unsustainable solutions appropriate corporate motives Governmental/institutional frameworks can negatively influence project outcomes by influencing corporate abilities to act, such as the lack of an appropriate energy and electricity regulation Company reputation and community perception influence ability to engage the community, critical to project success Due to company specialization, they may lack key knowledge, such as local know-how Partnerships are often created to manage these projects, however the challenge lies in utilizing know how and creating synergies, due to very different perspectives, mind sets, needs, etc. Clear responsibilities and tasks need to be set to minimize potential conflict during the project Often project target communities have a certain level of development. Minimizing company risks may cut off extremely poor communities from receiving benefits	Other sources of financing are needed. The CDM income can prevent a project from showing a deficit and can even make it profitable, but it cannot support the complete costs. The credits of emission reduction are issued once the project operates and that the reductions are proved: the income is generated after the implementation so it cannot cover the upfront financing. The registration process is long, complicated and costly This financing scheme can only be applied to '*additional*' projects, i.e. projects which would not take place otherwise. Moreover, additionality is sometimes difficult to prove.	Does not address project funding issue, therefore has to be complemented by a financing scheme at this level Not financially viable in the long-term unless a funding plan exists that promotes the transition from a grant-driven scheme to a competitive business model for the project (i.e. financial self-sufficiency) Risk management mechanisms may limit market insertion of energy loans Success is heavily reliant on community engagement, acceptance and appropriation; energy literacy strategies; capacity building; and strong links to other development initiatives Must be combined with strategies to help generate adequate incomes for people to meet long-term operation and maintenance expenses of the systems and/or ensure that the kWh is paid for Most common business model for energy lending is through partnerships. By working together, parties inevitably lose autonomy, and if not managed cautiously, partnerships can be challenging, wearisome and risky.

3 Tools for strategic approaches

As we have seen in the previous chapter, there are several possibilities for institutions, organizations and companies to finance projects to alleviate energy poverty. Whether through corporate social responsibility projects or clean development mechanism schemes, these companies and organizations have innovative means to address the needs of society while simultaneously finding sustainable models for projects and business opportunities. Moreover, through microcredit financing, communities have the possibility to help themselves. Ideally, and whenever possible, this should be made available in conjunction with corporate solutions.

However, as also mentioned in the previous chapter, one of the key challenges facing many institutions, organizations and companies when strategically selecting relevant projects and the best way for correct implementation is the issue of financing. Among the many financing options that can be used for energy poverty alleviation projects, the three addressed in this document provide new and interesting formulae when wide groups of individuals are targeted. To help project managers in properly evaluating the suitability of the financing mechanism mentioned above, as well as the way it is being carried out, three tools have been developed: 1) The Corporate Social Responsibility Project Assessment Tool; 2) The Clean Development Mechanism Self-Assessment Tool; and 3) The Energy Lending Self-Assessment Tool for microfinancing.

For corporate social responsibility, the tool follows the triple bottom line approach with the addition of a fourth pillar, governance, which is a concept that has recently been gaining importance. The Clean Development Mechanism tool is based on key criteria considered essential for success in the different stages of a CDM project. These are grouped into four main phases of the project cycle: project definition, financing plan, project management and the contribution to sustainable development. Finally, the energy lending self-assessment is a qualitative tool addressed to key players in energy poverty alleviation projects which include an energy lending component. It is based on critical factors which are clustered into focus areas.

These three proposals are intended to serve as practical tools that key practitioners, decision makers and other stakeholders can apply. They have been standardized to enable a wide application for the different actors within the energy sector, whether as consultants, utility companies, etc. The three tools share common elements: all have been designed for self assessment, are based on good practices from previous practical experiences and are aimed towards serving as a guide. They are not to be understood as a final and precise reference, but instead should be adapted to the needs of each organization and subsequently allowed to evolve to become truly effective and beneficial to the user. The underlying assumption that each tool needs to be adapted to the specific needs of each organization has been allowed through the allocation of variable indicators and flexible application procedures in each tool. Finally, at the end of each tool, visual aids have been included to assist in making decisions apparent.

First, we turn to the tool for corporate social responsibility.

3.1 The Corporate Social Responsibility Project Assessment Tool (CSR PAT)

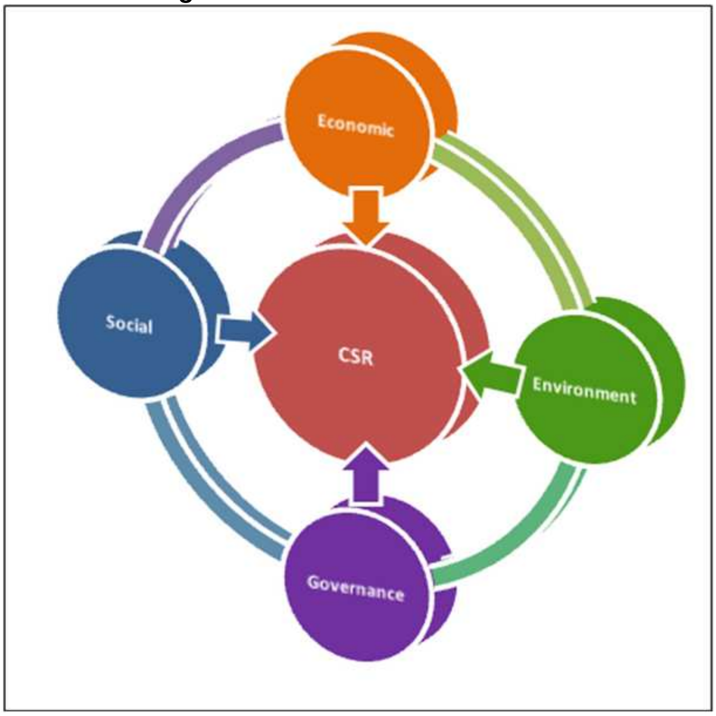
3.1.1 About CSR PAT

CSR PAT is a qualitative tool addressed to key players in energy poverty alleviation projects, i.e. providing access to make modern energy products and services available to the poor. The tool was developed to assist mainly companies, but also institutions and organizations, to assess and decide upon which programs and projects to implement in accordance with the objectives of the enterprise.

Furthermore, it aids in creating awareness for important issues (or "drivers") that need to be accounted for. The tool is based on the assessment of these drivers, necessary for the CSR strategy and therefore, also for programs and projects.

The proposed list of potential drivers was identified through the analysis of real cases featuring companies' CSR strategies for energy poverty alleviation. These have been clustered into four main dimensions, which correspond with the three pillars of the ***'triple bottom line'***, the ***social***, ***economic*** and ***environmental*** dimension, adding ***governance*** as a fourth pillar, since it is an area that is recently gaining interest.

Figure 3.1 Structure of CSR PAT



According to corporate social responsibility theory, there are three main reasons to implement CSR strategies: ***risk management***, ***gaining new business opportunities*** and ***seeking recognition*** of the company's role in society. Therefore, in order to understand the strategic value of a CSR program, it is essential to identify the key drivers for CSR and their importance for the enterprise before selecting projects.

Quantitative indicators reflect the qualitative self-assessment results for each of the dimensions mentioned above, and are then presented in graphs to facilitate the analysis of performance.

The tool does not automatically provide exact answers or scientific measures of performance. Each project's uniqueness should encourage users to adapt the tool to their specific objectives and context.

3.1.2 Who can use CSR PAT?

CSR PAT is addressed to institutions, organizations and companies and their managers in decision making and implementation of a corporate social responsibility project; and ensuring that it is in line with the CSR strategy. While CSR PAT has been created to address the sectors and businesses involved with energy poverty alleviation, it is easily adaptable to other sectors and purposes.

3.1.3 How to use CSR PAT?

The tool is divided into three phases, which involve eight Excel worksheets. The user can easily move between worksheets using the colored tabs at the bottom of the Excel sheet: *'Instructions'*, '*1.1 Driver Categorization*', *'1.2 Social'*, *'1.3 Economic'*, *'1.4 Environmental'*, *'1.5 Governance*', '*1.6 Final Score'*, *'2. Benefit -Cost Analysis'* and *'3. Strategic Planning'*.

The sections which require individual input are: *'1.2 Social'*, *'1.3 Economic'*, *'1.4 Environmental*', *'1.5 Governance'*,' *2. Benefit -Cost Analysis'* and *'3. Strategic Planning'*. The rest of the worksheets have formulas incorporated, in order to automatically generate information.

<u>Phase 1</u>

Step 1.1 Driver Categorization

It is highly recommended that the user begins with the worksheet *'1.1 Driver Categorization'* to identify key drivers and rationale incorporated in the individual CSR strategy. **The user is highly encouraged to adapt this listing and this categorization as relevant to the enterprise or institution.**

Steps 1.2 -1.5 Self -Assessment Worksheets

Users are asked to respond Yes, No or Not Applicable (N/A) to each of the statements listed in each Self-Assessment Worksheet, according to the current conditions within the company.

Each of the dimensions has a Self-Assessment Worksheet and performance is calculated using the following formula:

Total YES / (10 - Total NA)*100

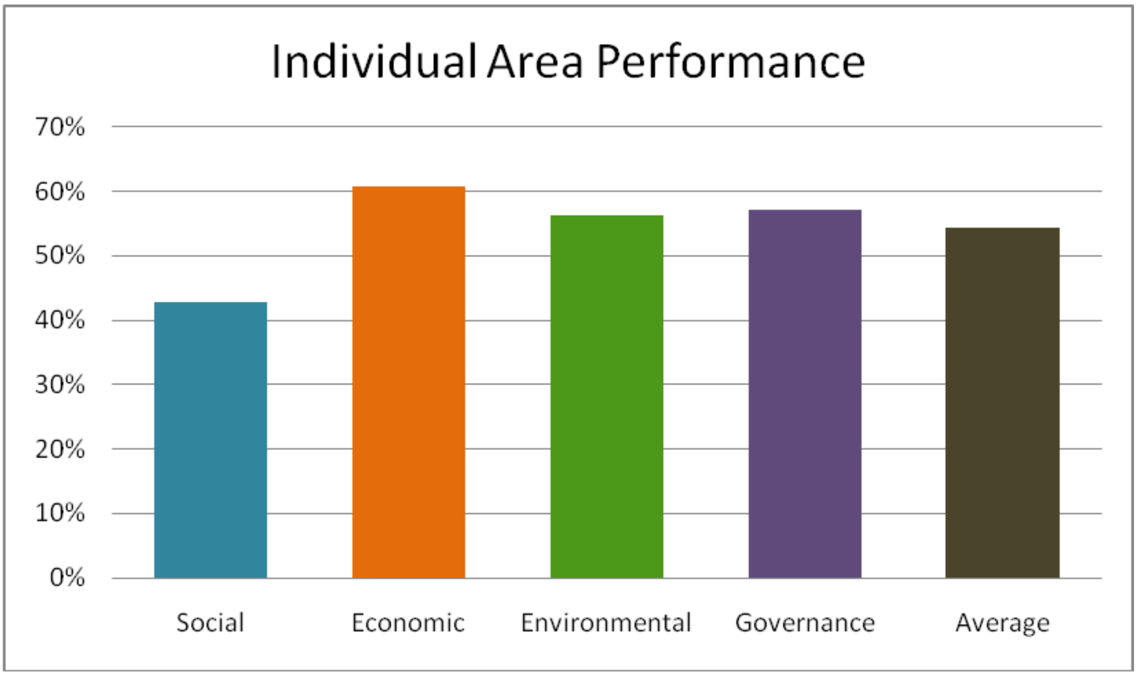
The resulting score is associated with traffic light colors, to better visualize project or program potential to fulfill the requirements and needs of this dimension.

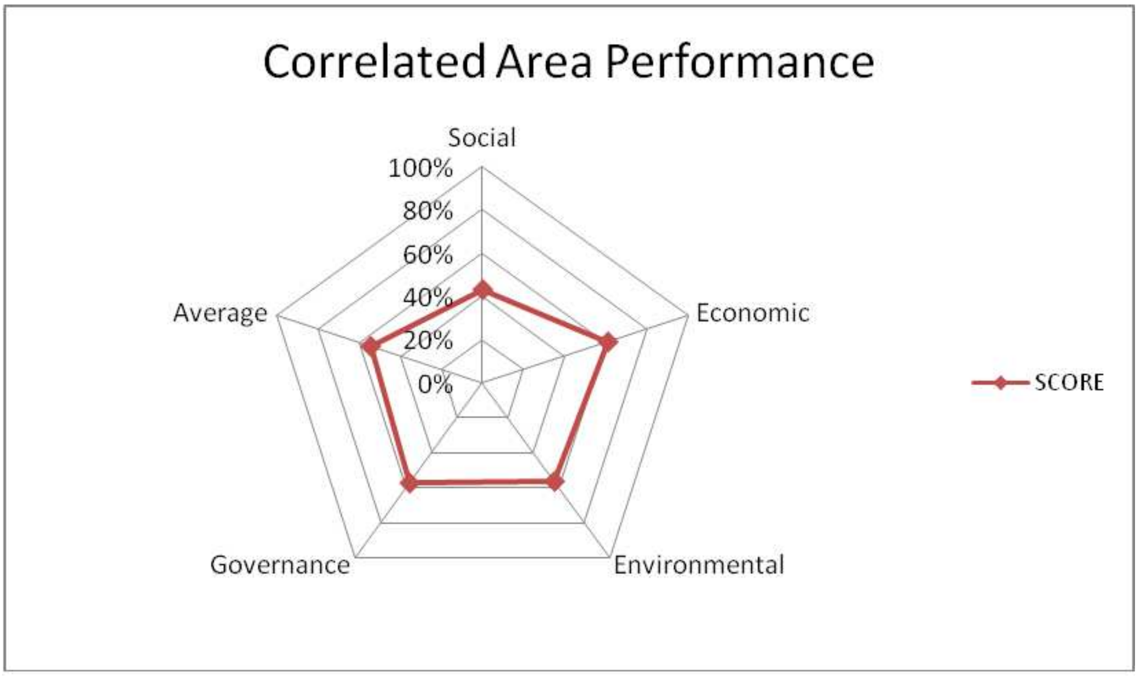
Sample of self assessment worksheet in CSR PAT

GOVERNANCE				
	STATEMENTS	Y	N	N/A
1	The project is in line with the vision and mission of corporate governance policies			
2	We have a corporate code of conduct policy, supported by senior management, that links the triple bottom line performance			
3	The project is in line with the corporate code of conduct policies			
4	We have a corporate code of conduct policy for the supply chain			
5	The project complies with the code of conduct established for the supply chain/ The project is part of an ethical sourcing program which seeks to promote effective and efficient compliance of business partners to the company's code of conduct			
6	The project meets company requirements to comply with national and international standards			
7	The project complies with all (local and national) social and environmental regulation requirements in the targeted community			
	TOTALS	0	0	0

Step 1.6 Final Score

In this worksheet users will find an automatically-generated table and two graphs that visualize: 1. 'Individual Area Performance' and 2. 'Correlated Areas Performance'. The following are sample graphs.





It is suggested to carry out this self-assessment during the project decision-making processes, in order to evaluate potential, fit and rationale of the program or project.

<u>Phase 2 Benefit-Cost Analysis</u>

To be individually evaluated, in accordance with key drivers relevant to the enterprise. Once performance is evaluated and possible future actions to be undertaken have been identified, these may be documented in the '*Benefit-Cost Analysis'* worksheet. The steps are the following:

1. Identify the key driver(s) and related goal(s).
2. Select potential actions and correlated benefits and costs.
3. Rate each benefit received and cost incurred in: high, medium, low, and not applicable (N/A).

Formulas are set to calculate the Benefit-Cost ratio. The possible results are: > 1 when benefits are greater than costs, = 1 when benefits are equal to costs; and < 1 when costs are greater than benefits. Colors appear according to a 'traffic light system' for better visualization. Ratios and the automatically generated ranking clarify whether there is a benefit-cost balance and serve to identify which actions should be prioritized according to the capabilities and objectives of the company.

<u>Phase 3 Strategic Planning: Program and Project Relevance to CSR Strategies</u>

When businesses define their CSR goals, it is important to evaluate where and how it is worthwhile to invest resources in order to achieve the optimal outcome. These are prioritized according to the importance of the key drivers for an enterprise. Therefore, the final score of the project or program evaluation falls into different categories of "fit", meaning how well it is in line with the CSR strategy. The categories of fit are the following:

- Low Fit: Adherence to legislation and good practices
- Medium Fit: Meeting the expectations of stakeholders
- High Fit: Proactive responsibility

- Strategic Fit: Competitive edge

Space has been provided to list internal and external drivers, which act as further rationale for the basis of the decision. These are to be added individually, according to relevance. To act as a stepping stone, an additional legend of possible drivers has been provided.

ⓘ The tool is intended to assist in offering insight, clarifying rationale, raising questions and prompting awareness of the relevance of issues regarding drivers, projects, CSR programs and the "fit" with CSR strategies.

3.2 The Clean Development Mechanism Self-Assessment Tool (CDM_SAT)

3.2.1 About CDM_SAT

CDM_SAT is a qualitative tool addressed to key players in energy poverty alleviation projects who want to assess the potential of their project as a Clean Development Mechanism (CDM). It aims to help project designers to decide whether they want to register their project under the CDM Framework and if so, what are the strengths and weaknesses.

a) The tool is based on reviewing whether key ***criteria*** considered essential for success in the required ***steps*** of a CDM process have been taken into account.

b) For each criteria, the user can assess the level of fulfilment of the project: issue not tackled, low, medium or high performance. The steps are grouped in 4 ***phases*** of the project cycle. (see Figure 3.2)

The objective of this tool is neither to provide exact answers nor to replace the official tools and guidelines defined in the CDM framework. The official tools and methodologies need to be used to design a CDM project and get it validated by the UNFCCC Executive Board[72].

CDM_SAT is meant to raise awareness concerning key issues, stimulate the reflexion and debate about a project, and warn about possible obstacles or weaknesses. Besides the official UNFCCC guidelines, this tool benefits from lessons learned in CDM case studies, conferences and readings, and it identifies critical issues that frequently arise.

This tool is in its first version and is meant to be improved and adapted to different contexts. Consequently, it should be considered as a basis for further development by its users.

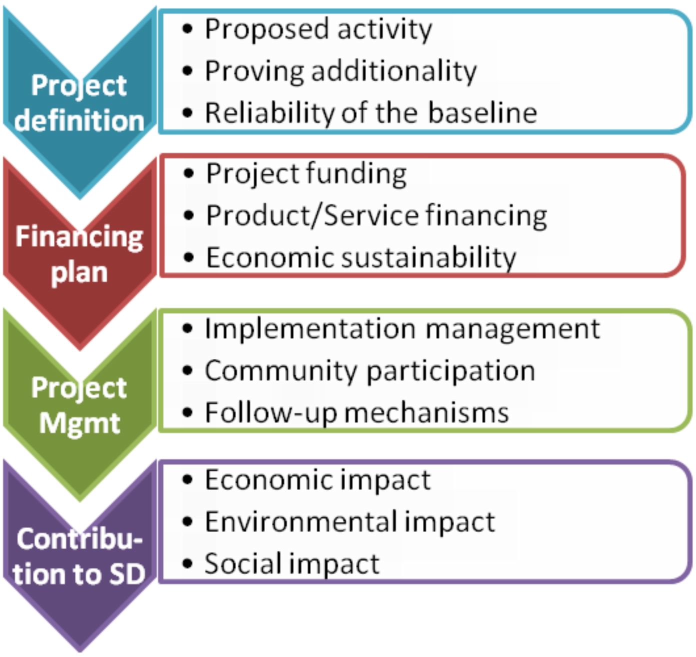


Figure 3.2 Structure of CDM_SAT

[72]Official guidelines, methodologies and tools can be found on the UNFCCC CDM website: http://cdm.unfccc.int/Projects/pac/index.html

The following figure shows the list of criteria used to assess a project with CDM_SAT. When necessary, good practices or recommendations about precise criteria are mentioned.

1. PROJECT DEFINITION	
STEPS	***CRITERIA***
Proposed Activity	Scale of emission reductions
	Use of the Most Appropriate Technology
	Availability of devices and raw materials
	Reliability of technology
	CDM Project Activity Category
Proving Additionality	Economic barriers
	Political barriers
	Technological barriers
	Common practice analysis
Reliability of the Baseline	Based on extensive study
	Official methodology
	Quantified emissions

2. FINANCING PLAN	
STEPS	***CRITERIA***
Project Funding	Local government
	External donors
	Private sector
	CER income
Product/ Service Financing	Local government
	Private sector
	Users
	CER revenues
Economic Sustainability	Profitability
	Willingness To Pay
	Independence of CER income
	Payback period

3. PROJECT MANAGEMENT	
STEPS	***CRITERIA***
Implementation Management	Clear project coordinator
	Clear responsibilities among stakeholders
	Technical knowledge required
	Quality assurance mechanisms
Community Participation	Engagement
	Contribution in the installation
	Contribution in operations & maintenance
Follow-up Mechanisms	Maintenance systems
	Transparent communication channels to receive feedback from users
	Monitoring

4. CONTRIBUTION TO SUSTAINABLE DEVELOPMENT	
STEPS	***CRITERIA***
Economic Impact	Local employment
	Opportunities for local entrepreneurs
	Savings for the users
Environmental Impact	Climate change mitigation
	Air quality
	Other environmental impacts
	Reduction in unsustainable resource usage
Social Impact	Education
	Gender equality
	Health
	Energy literacy
	Ownership
	Targets vulnerable populations

Figure 3.3 List of criteria used in CDM_SAT

3.2.2 How to use CDM_SAT?

The Tool is an Excel document divided in four sections or worksheets: '*Instructions', 'SELF-ASSESSMENT', 'Score Card', 'Graphs by Phase'* 'and *'Formulas'*.

The section '*Self-Assessment'* is the only one where the user needs to input information. Formulas are set for the rest of the worksheets to be automatically updated according to the information entered into the worksheet.

<u>'SELF-ASSESSMENT' Worksheet:</u>

This table lists the key **criteria** considered essential for success in the required **steps** of a CDM (see Figure 3.3). For each criteria, the user fills the 'Self-Assessment' cell to describe the project's situation regarding this measure.

Then the user grades its project performance in the 'Mark' cell. The grades rank from 0 to 3 (0=issue not tackled; 1=low performance; 2=medium; 3=high).

This list of criteria is also a checklist to help project designers include all key items of a successful project in their own. Ideally, the assessment of an excellent project should not have a "0" grade for any of the criteria.

<u>'Score Card' Worksheet:</u>

In this worksheet an automatically-generated table and two graphs show the ***performance*** for the individual steps and the ***overall performance*** for each phase. The higher the percentage obtained, the better. The graphs' backgrounds have been color coded according to a "traffic light system" to reveal at which steps of the project difficulties could emerge.

SCORECARD	
Steps	**%**
1. Project Definition	58%
Proposed Activity	47%
Proving the Additionality	100%
Reliability of the Baseline	22%
2. Financing plan	67%
Project Funding	50%
Product/Service Financing	67%
Economic Sustainability	83%
3. Project Management	74%
Implementation Management	83%
Community Participation	67%
Follow-up Mechanisms	67%
4. Contribution to Sustainable Development	64%
Economic Impact	56%
Environmental Impact	50%
Social Impact	78%

Figure 3.4 Sample Scorecard

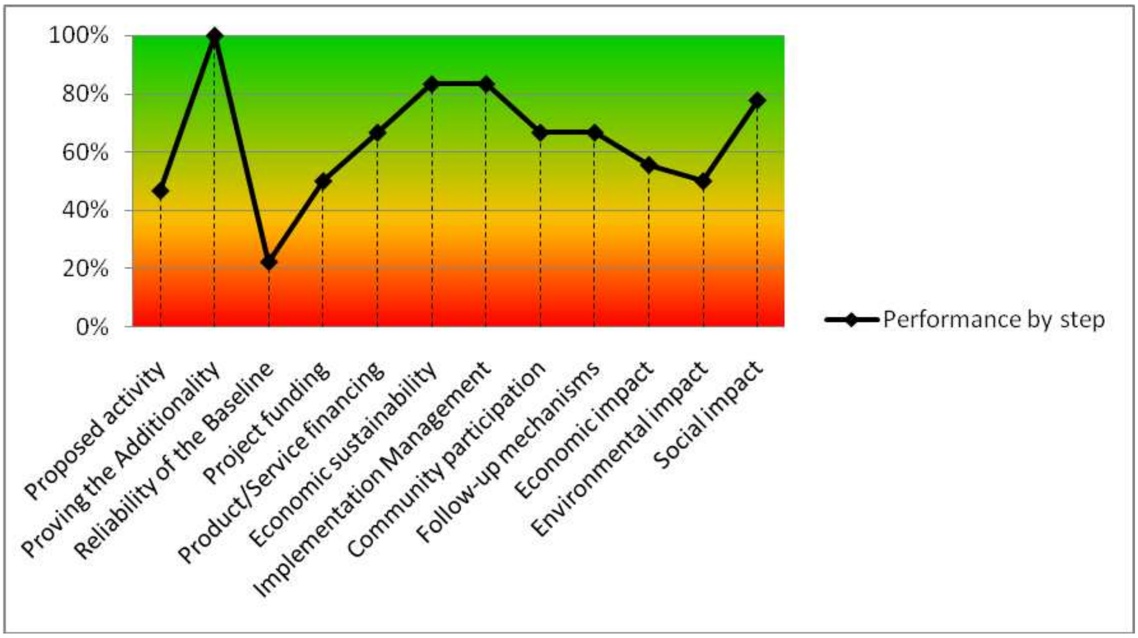


Figure 3.5 Sample Step Performance Graph

'Graphs by Phase' Worksheet

Similarly, radar graphs show ***performance*** by ***step*** for each of the 4 ***project phases***. See the example below.

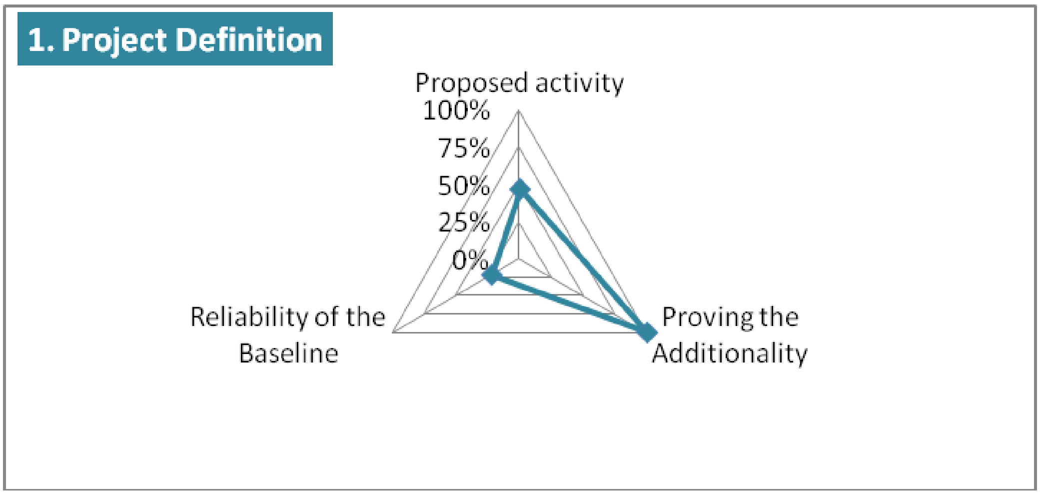


Figure 3.6 Sample Phase Performance Radar Graph

'Formulas' Worksheet

Automatically-generated input information for this tool to function correctly, including input data for the figures in the '*Graphs by Phase'* section, can be found in this tab.

As CDM SAT is a design tool, it is suggested to perform the self-assessment regularly during the project design process to ensure that key success criteria are included. It can also be used throughout project implementation; however, many criteria may not be modifiable at this later stage, which makes it less useful.

3.3 The Energy Lending Self-Assessment Tool (ELSAT)

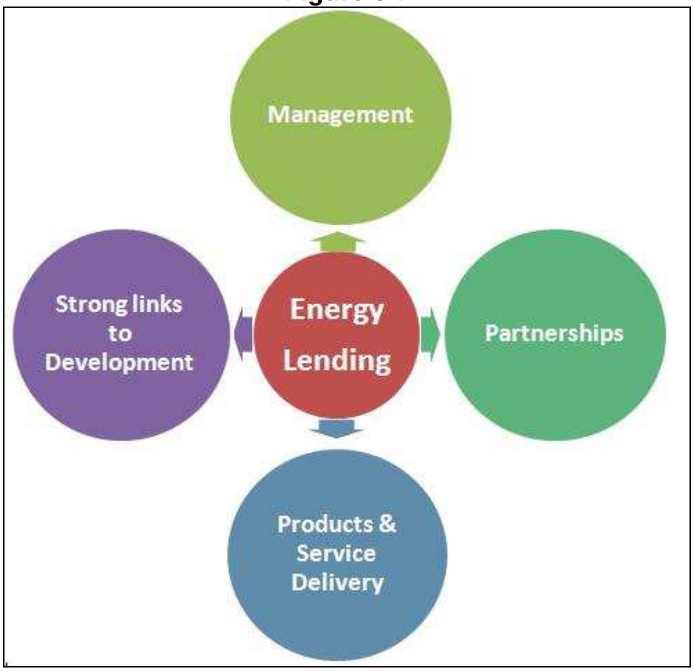
3.3.1 About ELSAT

ELSAT is a qualitative tool addressed to key players in energy poverty alleviation projects with an **energy lending component**, ie. providing access to microcredit to make modern energy products and services affordable to the poor. It is an aid for stakeholders to assess whether critical issues are being taken into account in their project design, management and implementation process; and to encourage on-going monitoring and evaluation.

The tool is based on ***factors*** deemed ***essential*** for the success of a project encompassing energy lending. These factors were identified through the analysis of real cases featuring innovative business and financing models for energy poverty alleviation, and grouped into sets of ***criteria*** (19). These were in turn clustered in 4 main ***focus areas***. The ***focus areas*** correspond to the most sensitive issues of the matter under discussion, allowing user organizations to contemplate whether the elements listed have been considered in the formulation of their project, reflect on the degree to which these have been incorporated, and/or decide how convenient it is to develop new ones. (See Figures 3.7 and 3.8).

Ideas for this tool also came from experts' opinions extracted from sources referenced under Figure 3.7.

Figure 3.7



Self-assessment results are reflected as quantitative indicators for each of the sets of criteria and focus areas mentioned above, and presented in graphs to facilitate analysis and follow-up of performance evolution.

3.3.2 Who can use ELSAT?

ELSAT is addressed to NGOs, MFIs, potential/current donors or investors, government institutions, community leadership, energy companies, other private companies, social businesses, and other crucial stakeholders planning to engage (or already engaged) in supporting and/or implementing an energy access project with an **energy lending component.**

Figure 3.8- ENERGY LENDING SELF-ASSESSMENT TOOL

Contents at a Glance[73]

FOCUS AREAS *Criticeria* • Factors	1. PROJECT MANAGEMENT	2. PARTNERSHIPS
	1. *Market research & product development* ▪ Context and trends' analysis ▪ Market research/strategy formulation ▪ Target market segment ▪ Depth & Outreach ▪ New product development process	**1. *Testing the waters*** ▪ Enabling environment ▪ Common purpose ▪ Resource mapping & analysis ▪ Drivers' analysis
	2. *Financial Sustainability* ▪ Revenues > Costs ▪ Economies of scale ▪ Funding availability ▪ Financial self-sufficiency	**2. *Complementary roles*** ▪ Partners' role & capacity to deliver ▪ Your own role & capacity to deliver ▪ Alliances guarantee optimal levels of energy and microfinance expertise
	3. *Credit Risk Management* ▪ Loan repayment mechanisms: • Period, methods and amounts • Tracking and monitoring systems • Peer pressure/solidarity lending • Insurance mechanisms • Links to small-business loans ▪ Effect on market insertion	**3. *Risks & Benefits Analysis*** ▪ Proposed R&B criteria
	4. *Monitoring & Evaluation* ▪ Baseline indicators ▪ Targets & performance indicators ▪ Monitoring & Evaluation (M&E) Plan ▪ Flexibility to strategy adaptations	**4. *Effective process*** ▪ Division of labor ▪ Processes and procedures ▪ Communication and decision-making ▪ Partnership-process M&E ▪ Conflict resolution ▪ Public Relations
		5. *MOU* ▪ Basic contents

[73] **References for the tool**

- Casey, G. (2008), *Yunus speaks out against for-profit microfinance from Asia-Pacific Micro-credit Summit*, available at www.microcapital.org
- Chowdhary, S. et al. (2007), *Using Microfinance to expand the access to Energy Services: summary of findings,* USA: The SEEP Network.
- Energías sin Fronteras. (2007), *Acceso a servicios energéticos en zonas rurales aisladas de países en desarrollo. Posicionamiento de EsF.* Madrid: NP.
- Peace Corps. (2003), *An NGO Training Guide for Peace Corps Volunteers*, Washington DC: Information Collection and Exchange.
- Stott, L. (June 1-5, 2009), ***Partnerships for Development Course,*** Madrid: EOI Business School.
- www.seepnetwork.org
- www.copenhagencentre.org/partalch.pdf
- www.bpd-waterandsanitation.org

Figure 3.8- ENERGY LENDING SELF-ASSESSMENT TOOL

Contents at a Glance Continued...

FOCUS AREAS *Criteria* • Factors	3. PRODUCTS & SERVICE DELIVERY	4. STRONG LINKS TO DEVELOPMENT
	1. *Most Appropriate Technology* ▪ Suitability ▪ Grid connections ▪ Mini-grids or individual systems ▪ Renewable energies and efficient biomass use solutions	**1. *MDGs*** ▪ Links to poverty alleviation programs ▪ Energy use for community services ▪ Eligibility of most vulnerable population ▪ Quality of life
	2. *Price* ▪ Cost-based ▪ Clients' purchasing power	**2. *Ownership & Community Engagement*** ▪ Community-driven project development ▪ Community involvement in establishing payment mechanisms ▪ Community leadership buy-in ▪ 'Proximity' business model ▪ Local training policy ▪ Subsidies ▪ Appropriation of project by host community

	3. *Terms of Loans*
	▪ Down payments
	▪ Interest rates
	▪ Installments
	▪ Diversity of energy loan portfolio
		3. *Energy Literacy*
		▪ Means for the local population to access information:
		  • Public demonstrations
		  • Written materials
		  • Illiteracy
		  • Cost-benefit analysis
		▪ Capacity building for management of community systems
		▪ Enterprise-centered commercialization

	4. *Process of Delivery* ▪ Decentralization of loan processing ▪ Sales & distribution strategy	**4. *Business Promotion*** ▪ Livelihood improvement potential ▪ Capacity building for small business development
	5. *After-sales service* ▪ Warranties ▪ After-warranty servicing policy	**5. *Gender Issues*** ▪ Women as catalysts for social change ▪ Women as users of energy ▪ Loan disbursement to women ▪ Training and work opportunities

3.3.3 How to use ELSAT? A simple 3-step process

Users are strongly advised to browse through the tool to acquire a better understanding of how to work with it. Nevertheless, a short description of how to use ELSAT follows.

The tool is an Excel document which is divided into sections or worksheets. Users can easily move between worksheets using the colored tabs at the bottom of the Excel page: *'Instructions', 'SELF-ASSESSMENT', 'Score Card', 'Graphs by Area', 'Progress Report', 'Work Plan'* and *'Formulas'*. Formulas are set for worksheets to be automatically updated according to the information entered on to the *'SELF-ASSESSMENT'* worksheet (simple 3-step process). This is the only section users need to input data onto.

***'Instructions'* Worksheet**: more detailed instructions on how to use ELSAT are provided in this section.

***'SELF-ASSESSMENT'* Worksheet: A simple 3-step process**

- ***Step 1:*** Users write a short description of the *current status* of their project's performance for each *criteria*. It is recommended to refer to all ***essential factors*** provided on the *Sample High Performance Indicators* column. Users may add additional indicators to this column to reflect project-specific targets. Two lines *(Optional 1 & Optional 2)* under each *focus area* have been left blank to encourage the inclusion of additional relevant *criteria*. More lines can be inserted if considered necessary.

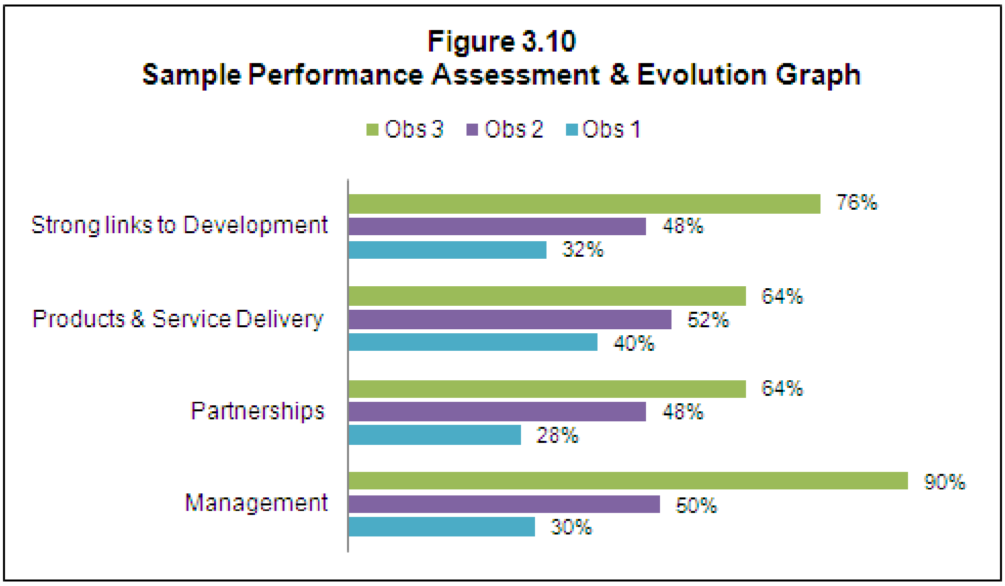
- ***Step 2:*** Users rate the *current status* of their project from 0-5. Quick guidance on values for this scale is provided on the '*Instructions'* worksheet.

- ***Step 3-*** Users fill out a *work plan* for each ***criteria*** detailing further activities and tasks to be carried out in order to move towards the implementation of all ***essential factors*** provided in the *Sample High Performance Indicators* column. A timeframe should be set for these.

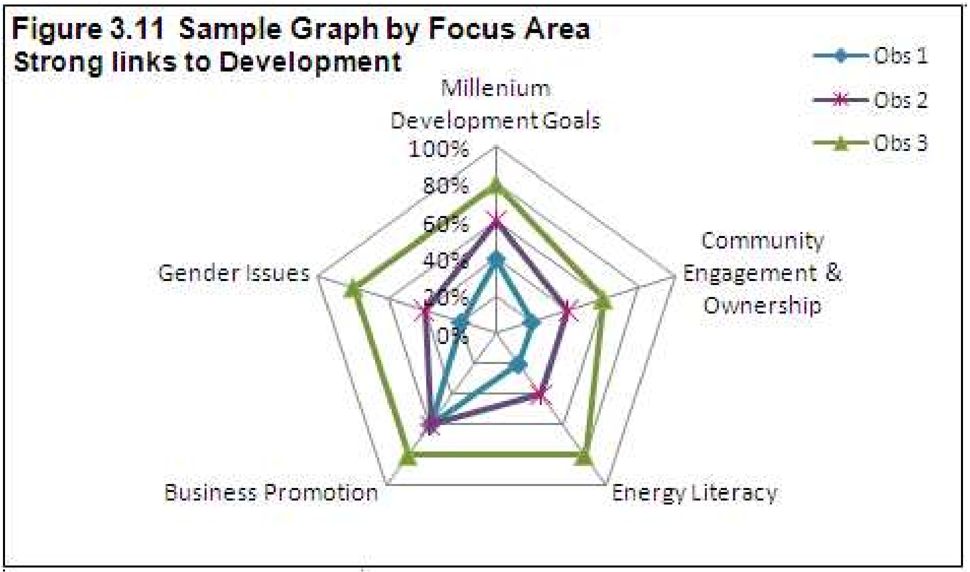
'Score Card'* Worksheet:** In this worksheet users will find an automatically-generated table and two graphs to show ***overall performance for each observation and ***performance evolution*** from one observation period to the next. (Figures 3.9 and 3.10)

Figure 3.9 Sample Scorecard Table

	Area	Obs1	%	Obs 2	%	Obs 3	%
1	Management	6	30%	10	50%	18	90%
2	Partnerships	7	28%	12	48%	16	64%
3	Products & Service Delivery	10	40%	13	52%	16	64%
4	Strong Links to Development	8	32%	12	48%	19	76%
	Total	**31**	**33%**	**47**	**49%**	**69**	**73%**



'Graphs by Area' **Worksheet:** Similarly, radar graphs show ***performance*** and ***performance evolution*** by ***criteria*** for each of the 4 ***focus areas***. (Figure 3.11)



'Progress Report' **and** ***'Work Plan'*** **Worksheets:** An automatically-generated, easily-printable *Progress Report* and *Work Plan* are compiled in the respective worksheets from the information entered in the *'SELF-ASSESSMENT'* worksheet.

'Formulas' **Worksheet:** Automatically-generated input information for the ELSAT tool to function correctly can be found in this tab.

Reminders of all instructions are included towards the top of each worksheet. Specific cells have clarifying comments and definitions attached. It is suggested to carry out this self-assessment periodically, approximately every 6 months or yearly, to gauge performance evolution from one observation to the next.

ⓘ The tool is intended to offer some insight, raise questions, and promote debate about appropriate issues, not to provide exact answers or scientific measures of performance. Each project's uniqueness certainly calls for distinctive ***focus areas, assessment criteria*** and ***essential factors***. Users are highly encouraged to adapt the tool to their specific objectives and context.

3.4 Toolkit: Closing Statements

Unfortunately, very often theory clashes with reality. Strategies and concepts that are amazing on paper can change or become misdirected in “doing business as usual” patterns, good intentions get lost when navigating through the mazes of bureaucracy or institutional frameworks, or just trying to find a route through the fog of the unknown. These situations become increasingly difficult when there is a real need for innovation, for finding new solutions to new concerns, particularly when tackling matters as pressing and complex as energy poverty alleviation. Institutions, organizations and companies most often have good intentions and demonstrate goodwill in doing their part to contributing towards sustainable change. However, due to limited resources, whether it be financial, time, know-how, etc., it is important for each enterprise to strategically decide where they can contribute to achieving the most optimal outcome for the issue(s) at hand, for themselves and for all parties involved. Therefore, in practice, the real challenge lies in the decision-making and correct implementation of potential programs and projects.

For these reasons, it has been attempted with this chapter to create a structured and effective means for doing so, with the tools that have been developed and presented: 1) The Corporate Social Responsibility Project Assessment Tool; 2) The Clean Development Mechanism Self-Assessment Tool; and 3) The Energy Lending Self-Assessment Tool for microfinancing. These three tools share many commonalities: all have been designed for self assessment and are based on good practices from previous practical experiences, they are intended to serve as guides, designed to assist decision makers and project managers in all types of enterprises to properly implement potential projects and programs; taking into consideration aspects such as identifying opportunities and barriers, maximizing resource allocation and utilization, evaluating internal and external strengths and weaknesses, or filling financial gaps.

It is important to emphasize, that the tools are intended to facilitate. They are not to be understood as a final and precise reference. As every situation is different, every project has its particularities and each enterprise its own structural make-up; users must adapt them to specific situations, to corporate or organizational cultures, etc. in order to allow them to be truly effective. Their goal is to act as a means to finding the best options and suitability, whether it is the evaluation of a program to see if it is in line with the corporate social responsibility strategy, or not just complying with minimum requirements of a CDM project, but maximizing benefits for all parties concerned. For microfinancing, users may contemplate whether the critical issues listed have been considered in their project formulation and to which extent they have been incorporated, and/or decide how suitable it is to develop new ones. In addition, it is imperative to provide an analysis for the rationale behind decision making and/or for correct implementation, which all three tools also incorporate.

Above all, these mechanisms are intended to act as a catalyst for improvement, since all three areas of these tools, whether corporate social responsibility, the clean development mechanism or microfinancing, are new and have huge potential to contribute towards energy poverty alleviation if done correctly.

4 CONCLUSIONS & RECOMMENDATIONS

Thomas Kuhn introduced the concept of the paradigm shift in 1962, which is understood as "a change from one way of thinking to another. It's a revolution, a transformation, a sort of metamorphosis. It just does not happen, but rather it is driven by agents of change."[74] He went on to say, that "awareness is prerequisite to all acceptable changes of theory."[75] Today, we can observe the signs of a paradigm shift, as we see our global society slowly "shifting from a mechanistic, manufacturing, industrial society to an organic, service based, information centered society, and increases in technology will continue to impact [us] globally."[76]

It is astonishing, that today in 2009, over a century after the invention of the modern electric light, there are inhabited regions that remain in the dark. In the dark not only in the sense that after the sun sets, there is no electricity in order to continue with daily activities, but also in the sense that these communities and individuals will be left behind as the current catalyst of change towards this technology and information based society is not being fully taken advantage of, widening the gap between those who "have" and those "who have not". The catalyst is named globalization and one of the most fundamental prerequisites to bridging and eliminating this gap is the access to energy.

The intentions of this paper are to create awareness and to assist those agents of change in driving another paradigm shift in our society: the alleviation of energy poverty. In developed countries, energy and electricity are commodities that are usually taken for granted. Indispensable for daily activities, these services are considered so basic that they are considered to be "a given" in life. This is not surprising, since 99% of the world's population without access to electricity lives in developing and emerging countries. Today, 2.5 billion people are without the use of modern energy services for such fundamental basics as cooking and heating, 1.6 billion people live without access to electricity for reasons such as geographical location, economic structure or economic instability; corruption, lack of political will or feeble deregulation and privatization processes of public utilities in developing countries. If no action is taken, approximately 1.4 billion people, equivalent to 22% of the world's population, will still not have access to electricity by 2030. However, in order to enable change, an approximate total investment of US$5.665 trillion in developing countries, in the time span between 2001 and 2030 is essential. The magnitude of this challenge increases with the awareness of the importance of energy as a pre-requisite for the achievement of the Millennium Development Goals. Innovative initiatives are imperative, if we are to eradicate energy poverty.

Mechanisms for change do exist. Alone in the past decade, the concepts of **corporate social responsibility (CSR), the clean development mechanism (CDM) and microfinancing** have gained awareness and are growing in importance. All three create a significant step forward for sustainable development. Hence, the reinforcement of the very idea for this type of development is of the essence. These three instruments can help to correct the imbalances between societies. While there may currently be a limited amount of successful and strategic examples, there lie great opportunities for the future, due to the huge amount of potential available for institutions, organizations, and enterprises to tap into.

---

[74] "What is a paradigm shift?" http://www.taketheleap.com, accessed July 7, 2009.

[75] Ibid.

[76] Ibid.

Analysis of Innovative Financing Mechanisms: CDM, CSR and Microfinancing

A first objective of this paper was to analyze small-scale modern energy access projects implemented through innovative business models and financing schemes, and analyze their potential in helping to breach the energy access and financing gaps. For the purposes of this study, financing schemes of energy access projects were assessed at two different levels:

- ***Project funding*** or the system of provision of capital funds to cover project implementation and administration costs, ie., the budget of the project; and
- ***Product/Service financing*** or how to make modern energy products and services available through these energy projects, actually affordable to poor customers.

The analysis begins with a comprehensive analysis of the partnerships, settings, features, opportunities, barriers, and impacts associated with energy poverty alleviation projects in regards to CSR, CDM and Microfinance. Case studies were chosen according to qualitative criteria (ie. the innovation of their business models; creativity in the application of non-traditional financing schemes and significant lessons learned; promising practices, and ideas for replication that they can contribute), rather than geographical distribution or variety of actors. In the conclusion of the case studies chapter, findings were reorganized into a table with categorizations according to project scope, sustainability, strengths and limitation and challenges. This is viewed as a part of the added value created for practitioners, since these aspects are relevant for strategic implementation, but difficult to access.

The potential and the great opportunities of these three concepts in the future are counterbalanced by the challenges to integrate or to combine these aspects with economic terms. Therefore, the accessibility of case studies, benchmarks and learning from others is of great significance to those institutions, companies and organizations that may have minimal knowledge and experience, but are otherwise well equipped to create a contribution. By highlighting these mechanisms, the case studies and associated lessons learned, by encouraging the replication of strengths and learning from limitations and challenges, it is hoped to assist practitioners gain interest in and adopt innovative business models, and thus facilitate change.

The main findings for each of the three mechanisms analyzed in the following.

CDM

Since CDM is based on climate change, this is an interesting opportunity for sustainable development. Climate change has become a new financing channel for projects, and while the main objective for CDM may be the limitation of greenhouse gases, if the project is done well, CDM can also incorporate social dimensions and benefits. Thus, CDM could be a helping tool to contribute to financing energy poverty alleviation.

There are currently 2,027 small-scale CDM projects operating or being implemented[77] and even if they are quite recent, most of them have already had a positive impact on many lives in developing countries.

As stated above, CDM can be used to finance energy projects for the poor. However three main areas of uncertainty are currently detected which clearly affect its present implementation in a wider and more rapid way:

- As the case studies for CDM demonstrate, CDM currently remains a moving context; the topic is still so fresh that it is highly dependent on future developments, such as

[77] www.cdmpipeline.org

conferences and future agreements, an example of which is the next COP conference in Copenhagen in December 2009. While CDM may have become established, it is still evolving, such as the recent variant of programmatic CDM with currently only three examples to illustrate.

- The cases studies also show that CDM alone cannot be used to fund energy poverty alleviation projects, since these projects do not generate a sufficient amount of CERs to obtain sufficient financing. This initiative, jointly with the complexity and amount of transaction costs of the process to be qualified as CERs, require the involvement of a sound institution to firmly lead the procedure and help the beneficiaries during the period of application, proceeding and validation. Additionally, CERs could not be used to address up-front costs since their payment usually is done well after the implementation and operation of the project. In this case, a financing gap has to be assumed and corresponding solutions have to be looked for.

- In addition, the case studies have identified that small-scale projects do have a positive impact on sustainable development because of their relatively low emission reductions, but due to the drawback of a low income creation because of the limited number of CERs that are generated; they can be overseen and neglected. Therefore, the flexibility mechanism and the contribution towards sustainable development are two of the most delicate issues for CDM.

- The cases studies indicate that CDM alone cannot be used to fund energy poverty alleviation projects, since these projects do not generate a sufficient amount of CERs to obtain sufficient financing. However, that small-scale projects *do* have a positive impact on sustainable development because of their relatively low emission reductions, but due to the drawback of a low income creation because of the limited number of CERs that are generated; they can be overseen and neglected. Therefore, the flexibility mechanism and the contribution towards sustainable development are two of the most delicate issues for CDM.

CSR

Meanwhile, CSR has also become an interesting medium for companies. Particularly two arguments support this statement:

- Since companies already operate where they can get short term profits, new markets represent substantial lucrative opportunities, despite the required long term commitment and investments. Doing business with the so-called bottom of the pyramid represents a long term approach, as well as empowering the people at the bottom of the pyramid to help themselves, to hopefully finally end the vicious cycle of poverty. When they do so, they become customers and consumers and important future markets for those companies that had already established themselves previously: dynamic and profitable markets.

- One of the greatest challenges for organizations and companies lies in the responsible *and* sustainable pursuit of economic growth. Hence, the introduction of the concept of the ‘Triple Bottom Line’. This approach was modified in this paper with the addition of the dimension of governance, since it is a critical factor to the success of projects aimed at alleviating energy poverty. In the long term, if business operations are sustainable and geared toward meeting targets along all dimensions, this can also create new business opportunities and cost savings, as the following figure demonstrates.

Figure 4.1: The Significance and Opportunities Behind the "Triple Bottom Line"[78]

ECONOMIC RESPONSIBILITY:

Competitiveness
- Return on capital, equity ratio, increase of turnover, value added, market value
- Jobs, wages and salaries, investments, taxes, social insurance premiums
- Input in R&D

Products and services
- New products and services
- R&D input in electricity and heat products and services

Development of customer relations, operating conditions of customers
- Customer satisfaction
- Development of clientele
- Trouble-free energy supply

RESPONSIBILITY FOR THE ENVIRONMENT:

Product life cycle
- Specific emissions of products (CO_2/kWh, SO_2/kWh, NO_x/kWh)
- Emissions from fuel procurement
- Volumes of waste
- Environmental protection investments and operating costs

Reduction in emissions
- Total airborne emissions (CO_2, SO_2, NO_x, particles, heavy metals, radioactive emissions)
- Emissions into waterways and soil
- Trend in specific emissions

Natural resources
- Use of natural resources, proportion of renewable energy sources in production
- Energy efficiency, own use energy
- Utilisation of waste fuels in energy generation
- Proportion of combined heat and power production in energy generation
- Utilisation of by-products

Biodiversity
- Measures promoting biodiversity, including management and reconditioning of waterways
- Measures promoting the biodiversity of electricity transmission grid

Health impacts and risks
- Leaks
- Fires
- Uncontrolled emissions
- Disturbance situations at nuclear power plants

SOCIAL RESPONSIBILITY:

Well-being and competence of personnel
- Personnel structure, turnover of personnel
- Input in training and in recreational and leisure activities
- Job satisfaction

Occupational health and safety
- Accidents and absences caused by illness
- Funds used for health care

Relations with local communities and neighbours
- Feedback from local residents
- Events for stakeholders
- Benefits to communities

Business partners and suppliers
- Coverage of supplier evaluation

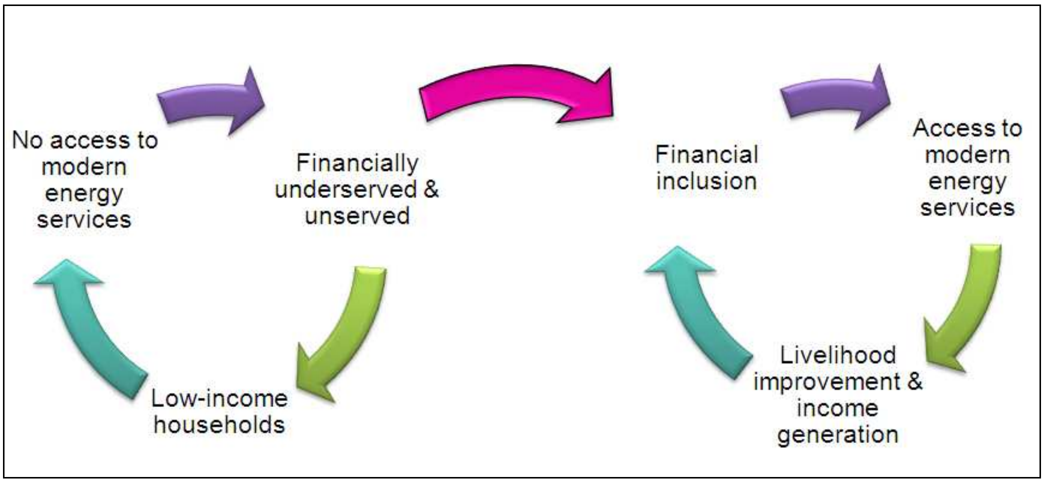
Co-operation with educational establishments
- Co-operation projects
- Number of participating students
- Number of summer jobs

Microfinancing

Empowering people to help themselves is the main intention behind the concept of microfinancing. While the tendency currently is to place the responsibility "to help" on developed countries, microfinancing represents an example of how developing countries can help themselves and not only share responsibility, but through capacity building to ultimately assume ownership. Moreover, the mechanism emphasizes the importance of innovative business models to create new ways of addressing these issues. Experience over the past few decades has demonstrated that it is insufficient to concentrate on official channels, such as aid. These have revealed to be far from as effective as once thought to be, thus creating common consensus in society, that traditional methods are insufficient to address these issues.

[78] Finnish Energy Industries Federation FINERGY (2002), "Corporate Social Responsibility of the energy industry: Guide to Business," http://www.energia.fi/en/publications/corporatesocialresponsibilityoftheenergyindustry.pdf", accessed June 20, 2009.

Figure 4.2: The Contribution of Energy Lending Towards a Cycle of Sustainable Development



The model of microfinancing offers incentives for civil society and private sector involvement. Among the main findings from the case studies conducted, the following are of significant relevance:

- There are profitable economic incentives for the private sector, particularly microfinance institutions and energy companies or other energy related enterprises interested in small-scale sustainable energy ventures.

- A microfinancing scheme can be profitable, while simultaneously promoting the empowerment of local communities to help achieve an end to the cycle of poverty. Improvement of institutional strengths and social integration are also added benefits of any microfinancing project.

- A microfinancing mechanism for energy poverty alleviation enables beneficiaries to develop new activities whose additional income should be also used to issue micro-credits. Thus, a combined effect of energy poverty alleviation and impulse to economic development is more easily achieved (see Figure 4.2 above).

- It is important to be aware that the energy lending component of a project alone does not sufficiently cover the overall project funding (ie. availability of funds for loan disbursement), therefore it needs to be complemented with another type of financing scheme, such as commercialization of bonds through stock exchange markets, CSR, CDM, etc.

- Finally, it is important to note that a project is not financially viable in the long-term unless it includes funding plans that promote the transition from a grant-driven scheme to a competitive business model.

Helping Institutions Make Correct Decisions on Financing Energy Poverty Alleviation

Through the authors' backgrounds, previous experience and research, it was realized that to achieve energy poverty alleviation, the obstacle to overcome is not convincing institutions, organizations or companies that these models are worthwhile, but instead lies in the correct implementation thereof. Proper decision-making and execution is critical. These enterprises have important resources to invest: financial, know-how and technology, all critical drivers for successful projects or programs. However these resources, whether time or financial, are also limited. Simultaneously, the scope of issues that need to be addressed for energy poverty alleviation is vast. Moreover, even within the three different mechanisms there exists huge potential that needs to be developed and optimized as soon as possible, since this is the potential to reduce the energy gap. For these reasons, organizations and companies need guidance for decision-making and implementation, to ensure that they are tackling the correct issues or projects, and/or making certain that they are aligned with the objectives and capabilities of their enterprise; so that in the long term, the investment and implementation of these projects is done to the best of their ability and creates maximum benefits for all parties. Due to these reasons, three tools for corporate self-assessment of each of the chosen financing options, as described in depth in chapter 3, were developed.

The intentions of this toolkit are to be a practical guide for all decision-makers and practitioners in organizations, institutions and companies, who have a key role to play in the development of projects for energy poverty alleviation. However, they can also be adapted to other businesses and/or development purposes, where issues such as resource allocation and filling financial gaps are essential for project success. This is regarded as another added value of this paper for the implementation of each instrument, whether CSR, CDM or Microfinance.

In particular, the tools are to assist in determining best options and suitability. They are to facilitate processes of identifying opportunities, resource allocation and utilization, internal and projects' strengths and weaknesses, as well as areas that can be improved. It is recommended, that a periodical monitoring of the adequate evolution of the adopted strategies and activities be conducted.

The tools are intended to facilitate. Just as there are neither two identical projects nor two identical enterprises, the tools were created with the possibility of being adapted to the criteria, structure and objectives of each enterprise and every project. Once a project has been selected, it needs to be evaluated: how suitable is it? How much potential can be achieved in implementation? These questions apply to the leading organization, but also for each stakeholder involved. These aspects are the intended commonalities between all three tools.

In conclusion, this study was undertaken to promote awareness and to assist those agents of change in driving a paradigm shift in our society: the alleviation of energy poverty. To achieve this, just as Thomas Kuhn envisioned, awareness needs to be created, followed by a transformation in thinking and subsequently driven by agents of change. It is the intention and aspiration of this paper that it can help those change agents, by better equipping them with the necessary tools, which enable them to blaze the way, quickly and sustainably, towards creating a different global energy scenario for 2030.

D. REFERENCES

- ABB Corporate Website, www.abb.com .
- ABB (2005), *Access to Electricity- White Paper on ABB's initiative for Access to Electricity*: 1-10. Available in www.abb.com, accessed June 7, 2009.
- African Rural Energy Enterprise Development (AREED), *Energy in Tanzania*. Available in http://www.areed.org/country/tanzania/energy.pdf, accessed July 4, 2009.
- Agence de l'Environnement et de la Maîtrise de l'Energie (ADEME), French Environment & Energy Agency www.ademe.fr
- Balch, O. (April 3, 2007), *Colombia: social energy – Keeping the lights on*, Ethical Corporation. Available in http://www.ethicalcorp.com/content.asp?ContentID=4989, accessed June 6, 2009.
- Brundtland Commission. (1987), *Our common future*. Available in www.worldinbalance.net/agreements/1987-brundtland.php, accessed June 7th, 2009.
- Buhtan National Environment Commission (NEC), (2005) *CDM Implementation Experiences from Bhutan – Pilot projects,* available in www.cd4cdm.org/Asia/Fifth%20Regional%20Workshop/CDM-Bhutan_Yangley.ppt , accessed may 2009
- Casey, G. (2008), *Yunus speaks out against for-profit microfinance from Asia-Pacific Micro-credit Summit*, available at www.microcapital.org
- Centro Nacional de Energías Renovables (CENER), (2005) *El Mecanismo de Desarrollo Limpio,* www.cener.com
- Chowdhary, S. et al. (2007), *Using Microfinance to expand the access to Energy Services: summary of findings,* USA: The SEEP Network. Available in www.seepnetwork.org , accessed May 2nd, 2009.
- CSR Europe, *Access to Energy*. Available in http://www.csreurope.org/solutions.php?action=show_solution&solution_id=168, accessed June 7, 2009.
- CSR Europe, *Energy supply in low income countries (Energia Social): Improvement and normalisation of electricity supply in Colombia´s slums*. Available in http://www.csreurope.org/solutions.php?action=show_solution&solution_id=142, accessed June 6, 2009.
- Dahal R.D. (2008), *Can Bhutan gain from CDM?* Bhutan Observer – The Independent Voice. Available in http://www.bhutanobserver.bt/2008/featured-stories/09/can-bhutan-gain-from-cdm.html accessed May 2009
- Davis, I. *What is the business of business?* The McKinsey Quarterly no. 3 (2005): 105-113.
- Dutta S., Matinga M., Panjwani A., Cecelski E. (2005), *Empirical Evidence for Linkages: Energy, Gender and the MDGs*, ENERGIA News vol. 8 nr 2, 2005, Available in www.energia.org , accessed May 19, 2009
- Egels, N. (Summer 2005), *CSR in Electrification of Rural Africa: The Case of ABB in Tanzania*, JCC, Issue 18, available at Centre for Business in Society, School of Economics and Commercial Law at Göteborg University, Göteborg, Sweden. Available in www.handels.gu.se, accessed June 7, 2009.
- Elsayed S.'s blog (2009), *Energy Access for Development*. Earth trends – the environmental Information Portal. Available in http://earthtrends.wri.org/updates/node/339, accessed June 1, 2009
- Energías sin Fronteras. (2007), *Acceso a servicios energéticos en zonas rurales aisladas de países en desarrollo. Posicionamiento de EsF*. Madrid: NP.
- Energía sin Fronteras, (2005) *Reformas Eléctricas y electrificación rural. Evaluación y buenas prácticas en los procesos efectuados en el mundo.*
- Figueres, C. (2004), *Programmatic CDM Project Activities: eligibility, methodological requirements, implementation.* Available in www.figueresonline.com/programmaticcdm.htm accessed May 2009
- Figueres, C. (2004) *Programmatic CDM: regulatory hurdles that can be overcome* Available in www.figueresonline.com/programmaticcdm.htm accessed May 2009
- Figueres, C. et al. (2005), *Programmatic CDM Project Activities: Eligibility, Methodological Requirements And Implementation*, Prepared for the Carbon Finance Business Unit of the World Bank.
- Finnish Energy Industries Federation FINERGY (2002), Corporate *Social Responsibility of the energy industry: Guide to Business*. Available in http://www.energia.fi/en/publications/corporatesocialresponsibilityoftheenergyindustry.pdf, (1-20), accessed June 20, 2009.
- Franklin, D. (2008). *Just Good Business: A Special Report on Corporate Social Responsibility*. The Economist (January 19, 2008): 2-22.
  GNESD (2007), *Reaching the Millennium Development Goals and beyond: access to modern form of energy as a prerequisite*, Available in www.gnesd.org, accessed May 15, 2009

- Friends of Earth (2009) *Trading in Fake Carbon Credits: Problems with the Clean Development Mechanism*, available in http://www.foe.org/pdf/FOE_IR_CDM_FS.pdf accessed July 2009.
- GNESD (2007), *Renewable Energy Technologies and Poverty Alleviation: Overcoming Barriers and Unlocking Potentials*, Available in www.gnesd.org accessed May 15, 2009
- Heldmore E. (2009*), Un albero per Haiti*, Internazionale no784, anno 16 : 46 - 48
- Helms, B. (2006), *Access for All: Building Inclusive Financial Systems*. USA: The Consultative Group to Assist the Poor, The World Bank.
- Hilman, H. et al. (2007), *The Emerging Experiences in Asia of SEWA, SEEDS, NUBL, and AMRET*, USA: The SEEP Network, www.seepnetwork.org, May 2nd, 2009.
- IEA. (2003), *World Energy Investment Outlook*, Paris: OECD/IEA, page 39.
- IEA. (2006), *World Energy Outlook*, Paris: OECD/IEA, page 39.
- Ikeno, J. (March 2007), *The Declining Coffee Economy And Low Population Growth In Mwanga District, Tanzania*, African Study Monographs, Graduate School of Asian & African Area Studies (ASAFAS), Kyoto University, Suppl.35: 3-39. Available in http://www.africa.kyoto-u.ac.jp/kiroku/asm_suppl/abstracts/pdf/ASM_s35/1IKENO.pdf, accessed June 17, 2009.
- Industry Canada, *IC - Three Steps to Eco-efficiency*. Available in http://www.ic.gc.ca/eic/site/ee-ee.nsf/eng/ef00012.html, accessed June 20, 2009.
- Industry Canada, *Corporate responsibility Tools.* Available in http://www.ic.gc.ca/eic/site/csr-rse.nsf/eng/h_rs00040.html accessed June 20, 2009.
- Jackson, I. A., and Nelson, J., (2004) *Profit With Principles: Seven Strategies for Delivering Value With Values*. New York: Currency Doubleday,
- Jensen, J. (2008), *Governing Global Markets in a New Age of Globalization. Economy & Society*, Forthcoming 1-21.
- Kabutha, J. et al. (2007), *The Emerging Experiences in East Africa of Faulu Kenya and Kenya Union of Savings and Credit Cooperatives (KUSCCO),* USA: The SEEP Network. Available in www.seepnetwork.org, accessed May 2nd, 2009.
- Kemmler Andreas (2006), *Regional disparities in electrification of India – do geographic factors matter?* CEPE Working Paper No. 51. Available in www.cepe.ethz.ch, accessed June 1, 2009
- Labriet, M. (2008) *Climate Change, Emissions Trading and CDM*, Master Course, EOI Escuela de Negocios, Madrid.
- Mitsubishi Heavy Industries, Ltd., Katsuhiko Sakaguchi, *Environmental Friendly Diesel Engine, UEC Eco-Engine, Technical Review*, Vol.41, No.1 (Feb. 2004): 1-3.
- Modi V., Mc Dade S., Lallement D., Saghir J. (2005), *Energy services for the Millennium Development Goals,* UN Millennium Project. Available in http://www.unmillenniumproject.org/documents/MP_Energy_Low_Res.pdf, accessed May 10, 2009
- Morris, E. and Wurster, E. (2005), *Global Village Energy Partnership mobilizes public and private sectors: aims to increasing microfinance for energy services*, Microfinance Matters, issue 17. Available in www.uncdf.org/mfmatters, accessed May 10th, 2009.
- Mqadi L. & Malgas L. (2004) *Kuyasa Case Study: An effort towards climate justice and energy poverty alleviation*. Available in www.southsouthnorth.org , accessed April 2009.
- NA. (2007), *Microfinance provides solar lighting to homes in rural Sri Lanka*, Ashden Awards Case Studies, Available in www.ashdenawards.org, accessed May 5th, 2009.
- NA. (2007), *Rapidly growing solar installer provides clean cooking as well*, Ashden Awards Case Studies, Available in www.ashdenawards.org, accessed May 5th, 2009.
- NA. (ND), Green Village Credit: A China Rural Enterprises Development (CREED) Initiative, www.c-reed.org, May 2nd, 2009.
- Nelson, J. & Zadek, S. (2000), *Partnership Alchemy*, The Copenhagen Centre, available at www.copenhagencentre.org/partalch.pdf
- Peinado-Vara, Estrella (Spring 2006), *Corporate Social Responsibility in Latin America*, The Journal of Corporate Citizenship. Available in http://www.allbusiness.com/finance/4071875-1.html, accessed June 6th, 2009.
- Porter, M. E., Kramer, M. R. (2006), *Strategy & Society: The Link Between Competitive Advantage and Corporate Social Responsibility*, Harvard Business Review 84, no. 12 : 78-92.
- OECD CSR database, available at www.oecd.org/dac/stats/crs/crsguide
- OECD (2008), *Gender and Sustainable Development - maximizing the economic, social and environmental role of women*, Available in http://www.oecd.org/dataoecd/58/1/40881538.pdf, accessed April 24, 2009
- OECD. (2002), *Reporting Directives for the Creditor Reporting System,* DCD/DAC 2002 21, Paris: OECD.
- OECD/IEA (2006), *World Energy Outloo.,* Available in www.iea.org, accessed May 30 2009

- Osram Corporate Website, www.osram.de.
- Oyarzabal, I. (2006), *El Mecanismo Mdl Y Los Proyectos Micro De Desarrollo: Interes Para EsF*, Energía sin Fronteras (EsF), Area de Estudios
- Parchosky S.(2009), *La soap opera che ti salva la vita*, Internazionale n.791, anno 16 : pag.77
- Peace Corps. (2003), *An NGO Training Guide for Peace Corps Volunteers*, Washington DC: Information Collection and Exchange.
- Prahalad, C.K., Hart, Stuart L., *The Fortune at the Bottom of the Pyramid*, Strategy and Business 26 no.1 (2002):1-14.
- REN21. (2009), *Renewables Global Status Report: 2009 Update*, Paris: GTZ. Available in: www.ren21.net
- Beder, S. (2005), *Critique of the Global Project to Privatize and Marketize Energy*, Available in www.uow.edu.au/arts/sts/sbeder/ accessed May 20, 2009
- Siemens Corporate Website, www.siemens.com
- SNV Netherlands Development Organization (2005) *Domestic Biogas and CDM financing: perfect match or white elephant?* Available in *http://unapcaem.org/*
- Stratos, *Corporate Responsibility Portfolio.* Available in http://www.stratos-sts.com/page.php?page=55&subpage=74 accessed June 20, 2009
- Stott, L. (June 1-5, 2009), *Partnerships for Development Course,* Madrid: EOI Business School.
- Stutter C. & Parreño J.C. (2007) *Does the current CDM deliver its sustainable development claim? An analysis of officially registered CDM projects*, Climatic Change Springer Netherlands
- The American Ceramic Society, Ceramic Tech Weekly, http://ceramictechweekly.org/?p=823
- The French Global Environment Facility & Temasol (2005), *Decentralised rural electrification in Morocco*, Available in http://www.ffem.fr/jahia/webdav/site/ffem/users/administrateur/public/plaquette%20brochure%20effet%20de%20serre/Electrification_rurale_decentralisee_marocang.pdf, accessed June 2009
- The World Bank Carbon Finance Unit wbcarbonfinance.org
- The Wuppertal Institute www.wupperinst.org/en/home/index.html
- Thomas A. Stewart (2006), *Corporate Social Responsibility: Getting the Logic Right*, Harvard Business Review 84, no. 12: 14.
- UNDP (2005), *Morocco Case Study - Solar Power,* www.ncppp.org/undp/morocco.html
- UNFCCC, *Registered CDM Projects* http://cdm.unfccc.int/Projects/registered.html
- UNFCCC, (2009) *Programmes of Activities* http://cdm.unfccc.int/ProgrammeOfActivities/index.html
- UNFCCC, (2002), *Project 0062 : e7 Bhutan Micro Hydro Power CDM Project* http://cdm.unfccc.int/Projects/DB/JACO1113389887.76/view
- UNFCCC, (2002), *Project 0079 : Kuyasa low-cost urban housing energy upgrade project, Khayelitsha (Cape Town; South Africa)* http://cdm.unfccc.int/Projects/DB/DNV-CUK1121165382.34
- UNFCCC (2002*) Project 0139 : Biogas Support Program - Nepal (BSP-Nepal) Activity-2* http://cdm.unfccc.int/Projects/DB/DNV-CUK1132671435.09/view
- UNFCCC (2002) *Project 0182 : Photovoltaic kits to light up rural households in Morocco* http://cdm.unfccc.int/Projects/DB/TUEV-SUED1134746545.91/view
- UNICEF (2007), *Progress For Children*, World Fit for Children Statistical Review Number 6, December 2007. Available in Childinfo, UNICEF http://www.childinfo.org/mortality.html, accessed May, 20 2009
- Unión Fenosa Corporate Website, http://www.unionfenosa.es.
- *Unión Fenosa involves Colombian communities in providing electricity and jobs*, Ethical Insight, Issue 64, May 9, 2007, http://hades.maplecroft.com/ethicalinsight/issue64/analysis_23.html, accessed June 6, 2009.
- United Nations Department of Economic and Social Affairs (2008), *The Millennium Development Goals Report.* Available in www.undp.org/mdg/ accessed May 30, 2009
- United Nations Framework Convention on Climate Change (1997), *The Kyoto Protocol* Article12. Available in http://unfccc.int/resource/docs/convkp/kpeng.html, accesed April 2009.
- Van Aalst, Paul, et al. (2003), *Development Capital for Energy Access: opportunities to reach the energy poor ,* Amsterdam: EUEI (European Union Energy Initiative for poverty eradication and sustainable development), Finance Working Group.
- Wallbaum, H. Et al. (2006), *Microfinance and Renewable Energy Investing in a Sustainable Future,* Visions of Sustainability I. Issue 2006*:* 8-9, May 2nd, 2009.
- *What is a paradigm shift?*http://www.taketheleap.com/define.html, accessed July 7, 2009. From
- WHO, *Multiple links between household energy and the Millennium Development Goals*. Available in http://www.who.int/indoorair/mdg/energymdg/en/, accessed May 19, 2009
- www.ashdenawards.org

- www.auto.howstuffworks.com/fuel-efficiency/alternative-fuels/lpg.htm
- www.bpd-waterandsanitation.org
- www.bspnepal.org.np
- www.capetown.gov.za
- www.carbonpositive.net
- www.cgap.org
- www.cdmgoldstandard.org
- www.cdmpipeline.org
- www.cdmrulebook.org
- www.copenhagencentre.org/partalch.pdf
- www.csrwire.com
- www.eandco.net
- www.e8.org
- www.es.youtube.com/watch?v=8_edy2K_Nlw
- www.faulukenya.com
- www.GrameenFoundation.org
- www.grameen-info.org
- www.gshatki.org
- www.iea.org
- www.kiva.org
- www.oecd.org/dac/stats/crs/crsguide
- www.one.org.ma
- www.seeds.lk
- www.seepnetwork.org
- www.tnc.org
- www.undp.org
- www.worldbank.com
- Yunnan Provincial Government. (2000), *Conservation and Development Action Plan*, www.c-reed.org
- Yunus, M. (2003), *Banker to the Poor: Micro-lending and the battle against world poverty*, NP: Public Affairs.
- Yunus, M. (2007), *Creating a World Without Poverty: Social Business and the Future of Capitalism*, USA: Public Affairs.

- *Jornada sobre el Mecanismo de Desarrollo Limpio y su Contribución al Desarrollo Humano*, Ministerio de Medioambiente Español, Intermón Oxfam, Escuela Politécnica de Madrid. (Conference organized by the Spanish Ministry of Environment, about the contribution of CDM to human development), Madrid, June 19th, 2009. http://www.intermonoxfam.org/UnidadesInformacion/anexos/10898/Jornada_MDL_y_desarrollo_humano-19-Junio-2009%5B1%5D.pdf

E. ANNEX

Project types	Small-scale CDM project activity categories	Number
Type I:	A. Electricity generation by the user	30
Renewable	B. Mechanical energy for the user	4
energy projects	C. Thermal energy production with or without electricity	310
<15 MW	D. Renewable electricity generation for a grid	1412
	E. Switch from Non-Renewable Biomass for Thermal Applications by the User	5
Type II:	A. Supply side energy efficiency improvements - transmission and distribution	1
Energy efficiency	B. Supply side energy efficiency improvements - generation	23
improvement	C. Demand-side energy efficiency programmes for specific technologies	24
projects	D. Energy efficiency and fuel switching measures for industrial facilities	144
	E. Energy efficiency and fuel switching measures for buildings	24
<60 GWh savings	F. Energy efficiency and fuel switching measures for agricultural facilities and activities	3
	G. Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass	1
	H. Energy efficiency measures through centralization of utility provisions of an industrial facility Technology	7
	I. Efficient utilization of waste energy in industrial facilities	0
	J. Demand-side activities for efficient lighting technologies (deemed savings)	1
Type III:	A. Urea offset by inoculant application in soybean-corn rotations on acidic soils on existing cropland	0
	B. Switching fossil fuels	62
EB27:	C. Emission reductions by low-greenhouse emission vehicles	7
<60 ktCO2	D. Methane recovery in animal manure managements systems	243
reduction	E. Avoidance of methane production from biomass decay through controlled combustion	61
	F. Avoidance of methane production from biomass decay through composting	67
	G. Landfill methane recovery	24
	H. Methane recovery in wastewater treatment	179
	I. Avoidance of methane production in wastewater treatment through replacement of anaerobic lagoons by aerobic systems	10
	J. Avoidance of fossil fuel combustion for carbon dioxide production to be used as raw material for industrial processes	1
	K. Avoidance of methane release from charcoal production by shifting from pit method to mechanized	2
	L. Avoidance of methane production from biomass decay through controlled pyrolysis	0
	M. Reduction in consumption of electricity by recovering soda from paper manufacturing	3
	N. Avoidance of HFC emissions in rigid Poly Urethane Foam (PUF) manufacturing	3
	O. Hydrogen production using methane extracted from biogas	1
	P. Recovery and utilization of waste gas in refinery facilities	5
	Q. Waste gas based energy systems	69
	R. Methane recovery in agricultural activities at household/small farm level	3
	S. Introduction of low-emission vehicles to commercial vehicle fleets	0
	T. Plant oil production and use for transport applications	1
	U. Cable Cars for Mass Rapid Transit System (MRTS)	1
	V. Decrease of coke consumption in blast furnace by installing dust/sludge recycling system in steel works	1
	W. Methane capture and destruction in non-hydrocarbon mining activities	0
	X. Energy efficiency and HFC-134a recovery in residential refrigerators	0
	Y. Methane avoidance through separation of solids from wastewater or manure treatment systems	0
	Z. Fuel switch, process improvement and energy efficiency in brick manufacture	1
	AA. Transportation Energy Efficiency Activities using Retrofit Technologies	0
	AB. Avoidance of HFC emissions in Standalone Commercial Refrigeration Cabinets	0
	AC. Electricity and/or heat generation using fuel cell	0
	AD. Emission reductions in hydraulic lime production	0
		2733

Table 3:

Project types	Small-scale Afforestation/reforestation CDM project activity categories	Number
AR-AMS1	Afforestation and reforestation project activities under the clean development mechanism implemented on grasslands or croplands	23
AR-AMS2	Afforestation and reforestation project activities under the CDM implemented on settlements	0
AR-AMS3	Afforestation and reforestation project activities implemented on wetlands	0
AR-AMS4	Agroforestry - afforestation and reforestation on crop lands	0
AR-AMS5	Afforestation and reforestation project activities under the clean development mechanism on lands having low inherent potential to support living biomass	0
AR-AMS6	Silvopastoral afforestation and reforestation activities	0
<16 ktCO2 absoption		

Innovative Financing Models for Energy Poverty Alleviation:

Tools for Strategic Approaches

▪ Silvia Araya ▪ Edda Dankmeyer ▪ Pierre Naviaux ▪ Petra Perreca ▪

Executive Summary

July 2009
International Master in Sustainable Development & Corporate Responsibility
EOI - Escuela de Negocios, Madrid, Spain

Introduction

Energy and electricity are highly overlooked commodities in the developed world. In the developing world, on the other hand, 1.6 billion people remain without electricity and 2.5 billion people do not have modern energy services to fulfill basic needs such as cooking and heating. If no extraordinary measures to promote electrification in poor countries are taken and current trends stay as they are, approximately 1.4 billion people, ie. about 22% of today's world population, will still not have access to electricity by 2030. In order to enable change, an approximate total investment of US$5.665 trillion is needed in developing countries between 2001 and 2030, while prospects of alleviating global energy deprivation through traditional public and private schemes are distressingly low.

The urgency of this challenge increases with the recognition of energy as a pre-requisite for the achievement of the Millennium Development Goals. Additionally, providing energy to all world citizens is not only a matter of funding, it is also a question of appropriate implementation in order for improvements to be sustainable in the long-term and have a genuine impact on the lives of billions of people currently living "off-the-grid". Ground-breaking interventions such as innovative and flexible business and financing models are imperative if society is to eradicate world energy poverty.

The overall goal of this project is to create awareness about the main challenges for world energy access and to assist agents of change in driving a paradigm shift in our society: the alleviation of energy poverty. The specific objectives of this study are:

1. To gain a better understanding of the worldwide energy access and financing *status quo* and the relation between sustainable energy and international development.
2. To examine small-scale modern energy access projects implemented through innovative business models and financing schemes, and analyze their potential in helping breach the energy access and financing gaps.
3. To design and propose specific tools that create added value and help determine suitability and best options for the implementation of each mechanism presented: Corporate Social Responsibility (CSR), Clean Development Mechanism (CDM), and Microfinancing.

For the purposes of this study, financing schemes of energy access projects were assessed at two different levels: 1. Project funding and 2. Product/Service financing.

Sustainable Energy and Development

According to the figures published in the World Energy Outlook 2006 by the International Energy Agency (IEA), in 2005 99% of the world's population without access to electricity lived in developing and emerging countries. Africa is the continent with the lowest overall electrification rate (37.8%), and where 35% of the world's electricity-deprived live (554 million people). The breakdown of figures for urban and rural electrification rates in Sub-Saharan Africa is nothing less than alarming: 58.3% and 8% respectively. Although Asia's overall electrification rate is much higher (72.8%), the region's elevated number of inhabitants (3,418 million) makes it the continent with the most people living without electricity (930 million, or 58% of the world's total). Latin America also has higher electrification rates than the Middle East, yet 2 million more people living without electricity. The addition of figures for both of these regions represents approximately 6% of the world's total electricity-poor.

Just as electrification rates vary among regions, and partly as a consequence of it, so do electricity consumption levels. As electricity use is proportionate to the level of socio-economic development of populations, Sub-Saharan Africa shows the lowest per capita kWh consumption levels. Furthermore, almost 85% of the global population that uses unsustainable biomass for cooking purposes lives in rural areas. Over 1,700 million live in Asia, and 575 million in Sub-Saharan Africa.[1]

Several reasons explain why many communities do not have access to electricity and reliable energy services. *Remoteness and/or scattered location* act as a "filter" which influences the process through which one village is selected to be electrified before another. *Economic structure* can also play a significant role on village electrification.[2] Other roots of energy poverty and unequal distribution, at the national and global level, include *corruption* and *lack of political will*, *economic instability* of energy poor countries, and *feeble deregulation* and *privatization processes* of public utilities in developing countries as part of structural adjustment programs promoted by international financial institutions since the late 1970s.

An overall view of the recent international landscape in regards to the energy sector is not promising. According to European Commission data on funding to the energy sector in developing countries, there is a visible declining trend in funding for the sector, from just US$4 billion in 1997 to less than US$3 billion in 2001.[3] In regards to allocation by region, 50% of EU energy assistance flows went to sub-Saharan Africa and Asia got roughly half as much (26%). Of these flows, most were disbursed as loans. In terms of energy sub-sectors, most resources were directed to power generation from non-renewable sources. Although figures are not entirely comparable due to differences in regionalization criteria, private investments follow a different trend. Latin America, which only received 16% of total EU assistance, absorbed the majority of private funds (44%), whilst Sub-Saharan Africa, which received half of EU's financial cooperation, only got 2% of all private investments.

The financing gap to achieve 100% energy access is extremely evident and prospects of alleviating global energy deprivation through traditional public and private business and financing models are disturbingly low. However, investment in energy infrastructure having been recently re-upgraded in the international community's priority ranking shows signs of a general realization that providing energy access to the poor requires a combination of public and private financing, as well as the recognition that energy services are a pre-requisite for the achievement of the Millennium Development Goals. These are powerful drivers to overcome the above-mentioned challenges.

There is a strong correlation between a country's HDI[4] value, and energy consumption. Having energy services readily available results in quality of life benefits (as measured by HDI) for the population. At the local level, energy brings about *environmental benefits* (e.g. reduced use of firewood and fossil fuels cuts down GHG emissions), *health benefits* (e.g. transition to sustainable energy technologies improves indoor air quality, one of the main causes of eye and respiratory disease), *facilitates* the *provision* of *quality basic social services* to the community (e.g. schools can provide healthier studying conditions for youth, clinics have better lighting during evening consultations, can utilize more modern equipment, and are able to refrigerate vaccines), *safety benefits* (e.g. reduced risk of fire), *economic benefits* (e.g. increased productivity, extended work hours, improved business opportunities), *improved communications* (e.g. phones, radio, etc.) and *entertainment*.

---

[1] Chowdhary, S. et al. (2007), *Using Microfinance to expand the access to Energy Services: summary of findings,* USA: The SEEP Network, www.seepnetwork.org, May 2nd, 2009.

[2] Kemmler Andreas (2006), Regional disparities in electrification of India – do geographic factors matter?, CEPE Working Paper No. 51, *available in* www.cepe.ethz.ch, accessed June 1, 2009.

[3] Van Aalst, Paul, et al. (2003), *Development Capital for Energy Access: opportunities to reach the energy poor ,* Amsterdam: EUEI, Finance Working Group.

[4] The Human Development Index (HDI) is the indicator that includes three different spheres: an economic dimension as a means to have a decent standard of living, measured by GDP per capita (in purchasing power parity- PPP, US$); living a long and healthy life at birth, measured through life expectancy (in years); and access to education, measured by adult literacy (%, ages 15+), and enrolment in primary, secondary and tertiary levels (%).

As mentioned before, the access and financing gaps to achieve 100% worldwide energy access, and therefore advance towards the achievement of the MDGs are very overwhelming, and a task that low-income countries cannot successfully manage on their own. Strengthening global partnerships can help develop the necessary technological and technical resources, as well as adequate financing and business models to improve access to sustainable energy.

A comprehensive analysis of the partnerships, settings, characteristics, prospects, challenges, and impacts associated with energy poverty alleviation projects in regards to CSR, CDM and Microfinance; as well as a thorough literature review and interviews with relevant actors in the field were carried out. Case studies were chosen according to qualitative criteria, rather than geographical distribution or variety of actors (Figure 1). Findings were analyzed and organized, subsequently serving as the basis for the design of a set of tools for strategic approaches, all presented in this document. These proposals are intended to offer an insight, raise questions, promote debate concerning pertinent issues, and serve as practical tools for key practitioners, decision makers and other relevant stakeholders. They have been designed for self assessment, and are aimed at serving as a guide, not to provide exact answers or scientific measures of performance, since the uniqueness of each project calls for individual adaptations and the appropriate evolution to meet users' needs and expectations.

Figure 1

Location of case-studies featured, by type of financing

SUMMARY OF CASE-STUDIES							
	Purpose	**Main Stakeholders**	**Technology**	**Financing Scheme**	**Impact**	**Most Interesting Features**	**Directly Targeted MDGs**
Global Rural Electrification Program, Morocco	To provide electricity through renewable energy to 9% of rural communities that could not be connected to the electricity grid.	Office National de l'Electricité (ONE), BP Solar, Temasol, Sunlight, The Board of Rural Communities, Executive board of UNFCCC	Individual PV Solar Home systems	Programmatic CDM	29,809 kits installed (only 30% of the 91,500 kits expected to be on site at the end of 2007), 5,800 tons of CO_2 reductions in 2007	PERG descentralised model makes Morocco one of the most advanced countries in the world in this field	1,7,8
Kuyasa Urban Housing Energy Upgrade Project, South Africa	To improve the living conditions of the inhabitants of Kuyasa while reducing fossil based energy consumption and CO_2 emissions, by improving the thermal performance, providing energy efficient lighting in households, and improving water heating efficiency through solar water heaters.	NGO SouthSouthNorth, Local Government of The City of Cape Town, the community of Kuyasa, Executive board of UNFCCC	Solar water heaters, compact fluorescent light bulbs, house insulation systems	Programmatic CDM	2,309 households equipped, 46,060 CERs/ 7 years	First Gold Standard-certified project in the world	1,6,7,8,
Nepal Biogas Support Program	To improve energy access for rural poor and to reduce rural poverty by providing high quality biogas plants to poor households at an affordable price.	Alternative Energy Promotion Centre (AEPC), Biogas Sector Partnership (BSP-Nepal), German Development Bank (KfW), Netherlands Development Agency (SNV), Community Development Carbon Fund (CDCF), Microfinance institutions (MFI), Executive board of UNFCCC, rural communities of Nepal	Household biogas digester plants	Programmatic CDM	9,688 domestic plants installed by this project at the end of 2005. Added to other projects, a total of 124,000 plants are installed in Nepal. Biogas serves about 4% of the population.	Project aims to develop a commercial activity with the integration of carbon revenues to serve a large rural population Good demonstration that a program of small-scale activities can have a big impact	1,3,6,7,8
e7 Micro Hydropower Project, Bhutan	To provide electricity to the Chendebji village by means of a hydro power station installed on site.	Royal Government of Bhutan, Japanese Government, e7 Fund for Sustainable Energy Development represented by the Kansai Electric Power Co., Executive board of UNFCCC, Chendebji village	Micro-Hydro Electric power station	Small-scale CDM	50 households connected, 593 tons CO_2/year estimated	First CDM-registered project for the e7 group, the first CDM project for Bhutan, and the sixth to be registered in the world	1,6,7,8
Unión Fenosa Energía Social in Colombia	Management of 'subnormal' markets in order to decrease fraud, create a solution to avoid grid losses and increase human safety. To provide 18 communities in the city of Santa Marta with regular access to electricity, thereby improving the infrastructure in the area for local small businesses and schools and safe wiring systems.	Energía Social, local government, local community, consumers	Connection to an existing electricity grid	CSR: approx. US$1.5 million by Energía Social, approx. US$6 million by the Colombian government	18 communities with 12,000 families have been 'normalised', meaning they have an official connection to the electric grid.	Energía Social is the only Latin American utility company specifically created for and serving poor communities.	1,7,8

Osram's Off Grid Pilot Project Umeme Kwa Wote – Energy for All	Pilot project to create an alternative energy source to kerosene for the fishing community in Mbita, on the shores of Lake Victoria. The project was to provide fishermen with energy-efficient lamps, which are less expensive in the long term and could replace ca. 20 million liters of kerosene per year, (about 50,000 tonnes of CO_2). The lamps are rechargeable with solar power at a central facility, named the "O-Hub".	Siemens, Solarworld AG, Nokia, Osienala, Global Nature Fund, Deutsche Investitions- und Entwicklungsgesellschaft (German Investment and Development Organization)	Energy-efficient lamps, LEDs, photovoltaic technology, UVC lamps	CSR (to finance the project) and Micro-credit (to finance the lamps and deposit)	1,500 users (mainly fishermen) switched to the solar powered, efficient lamps. Social benefits, including decrease in health issues. Economic benefits for the local community. Important environmental impact: less pollution, reduction of emissions, more sustainable product life cycle.	High potential of replication. CSR combined with micro-credit. In essence, a 'triple win situation' has been created, by: 1) the local population profits from a higher income and the benefits from the reduction in health problems associated with the kerosene lamps, 2)the economy and the local economy are supported and 3) emissions are reduced. Moreover, long term beneficial market opportunity for Osram.	1,7,8
ABB's "Access to Electricity" Pilot Project Tanzania	ABB aims to create new solutions through technical and commercial expertise, aiming towards improving the situation of the community, focusing on the productive use of affordable electricity and promotion of local economic growth. The village of Ngarambe received a locally adapted solution to receive access to electricity in mid-2004. ABB supplied the generator, installed underground cables and low-voltage equipment, and trained local people to run the power supply. WWF provided guidance on issues ranging from reducing deforestation to health care and environmental education.	ABB, The WWF Tanzania, the local community and the District Council	"UEC Eco-Engine", an "environmentally friendly" diesel engine developed by Mitsubishi Heavy Industries, Ltd.	CSR, Public-Private Partnership	15 businesses created, 25 new homes and more homes connected to the mini-grid and a new water pump, increased number of students (from 250 to 350) attending school now with possibility to study after dark.	Strong stakeholder engagement, which allowed a holistic approach for the village.	1,2,7,8
GreenVillage Credit China	To encourage the use of sustainable energy through an innovative approach to financing; which promotes economic development, improves health conditions, and environmental protection.	E+Co, UNEP, TNC China, Rural Credit Cooperatives (RCCs), local government agencies, Clean Energy Enterprises, new small-medium enterprises created, customers.	Domestic Biogas Plants, Solar Water Heaters, Micro-hydro Power Generators, Improved Cooking Stoves.	Micro-credit	500-600 households	Enterprises-centered commercialization model (local clean energy entrepreneurs), strategic partnerships, risk fund.	1,4,7,8

SEEDS Sri Lanka	To provide affordable financial packages to enable users to pay for their off-grid electricity systems.	Sarvodaya Economic Enterprise Development Services (SEEDS), accredited energy installers, customers.	PV Solar Home Systems, Village Micro-hydro Power Generators, Grid Connection	Micro-credit	52,000 Solar Home Systems, 14 micro-hydro schemes, 3,692 grid connections	Partnership with several energy companies, assurance fund.	4,7,8
Grameen Bank Bangladesh	To empower people living in rural areas with access to Green Energy and income.	Grameen Shatki; PV, Stove and Biogas Technicians; Infrastructure Development Company Limited (Government of Bangladesh); World Bank, GEF, UNDP, USAID, GTZ, KfW, (donors); customers.	PV Solar Home Systems, Biogas Plants, Improved Cooking Stoves	Micro-credit	150,000 SHSs, 3,000 biogas plants, 15,000 improved stoves	Proximity business model, strong gender approach, micro-utility scheme, cattle-biogas package.	1,3,4,7,8
Faulu Kenya Kenya	To increase the consumer-loans portfolio (according to customer-identified needs) in order to enhance its core product: enterprise development loans.	Faulu Kenya, Kenol Kobil, Total, BP, Shell, Caltex, Chloride Exide, customers.	LPG, PV Solar Home Systems, Biogas	Micro-credit	4,000 clients, overwhelmingly for LPG	Energy portfolio financed by its own resources, fully developed system of engagement and responsiveness with clients.	1,7,8

Innovative Financing Schemes: Main Overall Findings

Each case study summarized has been designed to give background information, an overview of the project strengths and weaknesses and the lessons learned. The following is a table summarizing the main findings of these case studies and have been categorized into the following sections in order to emphasize relevant points:

- Project scope and level of application
- Sustainability
- Strengths
- Limitations and Challenges

PROJECT SCOPE / LEVEL OF APPLICATION		
CSR	**CDM**	**MICRO-FINANCE**
Financing/Subsidizing products & services Connections to main grid Community mini-grid projects Individual systems projects Large-scale projects Innovative/New sustainable solutions	The mechanism is designed for energy projects taking place in a developing country and generating a reduction in greenhouse gases emissions compared to the development baseline. Financing of products/ services Connections to main grid Community mini-grid projects Individual systems projects Large-scale projects Innovative/New sustainable solutions	Financing of products / services Connections to main grid Community mini-grid projects Individual systems projects Innovative/New sustainable solutions
SUSTAINABILITY		
Reinforce company commitment to society Through CSR companies fund and allocate resources to providing energy services for poor communities, often filling energy services gaps and can target the Bottom of Pyramid. A healthy business needs a healthy society to operate in.	The main focus of CDM is to reduce greenhouse gases emissions in order to fight climate change. Creates a new solidarity channel between developed and developing countries The Gold Standard promotes CDM project with a strong contribution to Sustainable Development.	Lending approach promotes empowerment and ownership in local communities While it helps to provide energy services, it is designed to encourage entrepreneurship among the poor.
STRENGTHS		
There are multiple drivers for companies to commit to energy services projects Corporate commitment stronger if reputation is linked to project success Encouragement of more than philanthropy Corporations have financial resources and know-how usually out of reach for other organizations Potential strategic first mover advantage for companies expanding to new markets/market niches/gain competitive advantage/lays groundwork for new business opportunities Company aim to improve operations / ability to operate in new markets/creating official/legal customers Business perspective beneficial due to abilities of resource allocation Potential to tap into local knowledge/ human capital / creates knowledge management, which can create added value or reduce future operating costs for the company Allows communities to access innovative and efficient, reliable and more	Provides an additional income into the community when the project operates. Encourages the use of "clean" energy by populations that could not afford it otherwise. Promotes monitoring and maintaining of the project and by doing so, gives an incentive to involve local communities on the long term. Promote entrepreneur initiatives in the local community Promotes partnership between developed and developing countries. A large database documenting previous CDM projects is available online. This is a good knowledge management system that allows project designers to learn from similar projects.	Makes energy products/services available through projects actually affordable for most vulnerable populations Offers civic incentives to get civil society and private sector involved Offers economic incentives to get private sector involved, e.g. energy companies, small-scale sustainable energy ventures Usually linked to other development initiatives Previous experiences have demonstrated high repayment rates Gender issues are often taken into consideration while designing the loan program Promotes partnership within developing countries and between developed and developing countries.

sustainable solutions, higher social and economic integration Company often supports job creation; income generation and economic development in the community are key to business survival Strategies are not only focused on the economic side of development, but also improving living standards, increasing energy literacy and improving education in the community. Innovative energy solutions can incorporate the benefits of minimizing environmental harm and reduction of CO_2 emissions. Multi-stakeholder pressure to do energy poverty reduction projects. Company accountability to key stakeholders and shareholders is high and often positively influences project success. Companies need the license to operate within the community and CSR can enable them to positively distinguish themselves from competitors.	CDM involves stakeholders at every level: public and private sectors, governments, local communities, NGOs and intergovernmental organizations.	
LIMITATIONS / CHALLENGES		
Short term company focus -often due to shareholder pressure or management changes- can be a driver for the implementation of unsustainable solutions appropriate corporate motives Governmental/institutional frameworks can negatively influence project outcomes by influencing corporate abilities to act, such as the lack of an appropriate energy and electricity regulation Company reputation and community perception influence ability to engage the community, critical to project success Due to company specialization, they may lack key knowledge, such as local know-how Partnerships are often created to manage these projects, however the challenge lies in utilizing know how and creating synergies, due to very different perspectives, mind sets, needs, etc. Clear responsibilities and tasks need to be set to minimize potential conflict during the project Often project target communities have a certain level of development. Minimizing company risks may cut off extremely poor communities from receiving benefits	Other sources of financing are needed. The CDM income can prevent a project from showing a deficit and can even make it profitable, but it cannot support the complete costs. The credits of emission reduction are issued once the project operates and that the reductions are proved: the income is generated after the implementation so it cannot cover the upfront financing. The registration process is long, complicated and costly This financing scheme can only be applied to '*additional*' projects, i.e. projects which would not take place otherwise. Moreover, additionality is sometimes difficult to prove.	Does not address project funding issue, therefore has to be complemented by a financing scheme at this level Not financially viable in the long-term unless a funding plan exists that promotes the transition from a grant-driven scheme to a competitive business model for the project (i.e. financial self-sufficiency) Risk management mechanisms may limit market insertion of energy loans Success is heavily reliant on community engagement, acceptance and appropriation; energy literacy strategies; capacity building; and strong links to other development initiatives Must be combined with strategies to help generate adequate incomes for people to meet long-term operation and maintenance expenses of the systems and/or ensure that the kWh is paid for Most common business model for energy lending is through partnerships. By working together, parties inevitably lose autonomy, and if not managed cautiously, partnerships can be challenging, wearisome and risky.

Tools for Strategic Approaches

To help project implementers in properly evaluating the suitability of the financing mechanisms mentioned above, three tools have been developed: 1) The Corporate Social Responsibility Project Assessment Tool; 2) The Clean Development Mechanism Self-Assessment Tool; and 3) The Energy Lending Self-Assessment Tool for microfinancing.

The three proposals are intended to offer some insight, raise questions, promote debate about appropriate issues, and serve as practical tools for key practitioners, decision makers and other relevant stakeholders. They are aimed at serving as a guide, not to provide exact answers or scientific measures of performance. The underlying assumption that each tool needs to be adapted to the specific needs of each organization has been allowed through the allocation of variable indicators and flexible application procedures in each tool.

Users are strongly advised to browse through the tools to acquire a better understanding of how to work with them. Nevertheless, a short description of how to use each one is included in the main document and at the beginning of each tool.

The Corporate Social Responsibility Project Assessment Tool (CSR PAT)

CSR PAT is a qualitative tool addressed to key players in energy poverty alleviation projects, i.e. providing access to make modern energy products/services available to the poor. The tool was developed to assist companies, who want to make use of a CSR approach (as well as interested institutions and organizations) to assess and decide upon which programs and projects to implement in accordance with the objectives of the enterprise. As mentioned, the CSR PAT has been created to address those sectors and business involved with energy poverty alleviation. However, it is important to note, that it can easily be adapted to the needs and purposes of other sectors. Furthermore, it aids in creating awareness for important issues (or "drivers") that need to be accounted for. The tool is based on the assessment of these drivers, necessary for the CSR strategy and therefore, also for the correlated programs and projects.

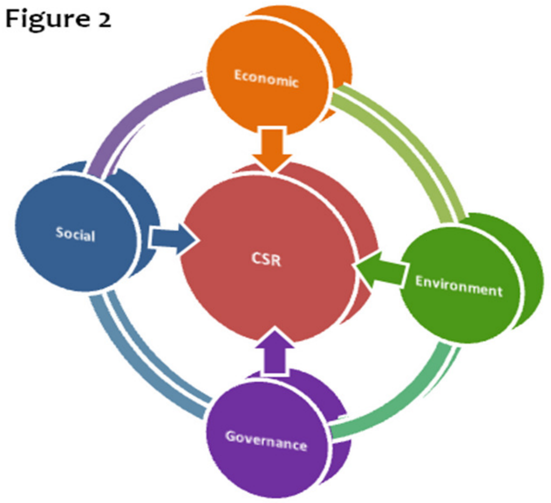
The proposed list of potential drivers was identified through the analysis of real cases featuring companies' CSR strategies for energy poverty alleviation, and clustered in four main dimensions. These dimensions correspond to the three pillars of the '*triple bottom line*', the *social*, *economic* and *environmental* dimensions, adding *governance* as a fourth pillar, since it is an area that is recently increasing in interest (Figure 2).

Some additional advantages of CSR PAT…

- Identification of key drivers behind a CSR strategy
- Assessment of project potential according to the 'triple bottom line' and governance dimensions
- Support critical thinking, for the identification and rationalization of key issues for strategic CSR projects/programs
- Determine projects' strategic value and prioritization according to the CSR strategy
- Visual aids to make decisions apparent

ⓘ The tool is intended to assist in offering insight, clarifying rationale, raising questions, and prompting awareness of the relevance of issues regarding CSR programs, projects, drivers and the "fit" within strategies.

Figure 2

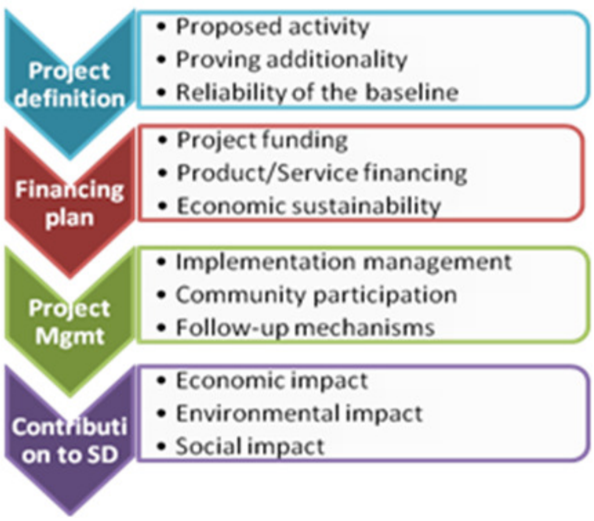


The Clean Development Mechanism Self-Assessment Tool (CDM SAT)

CDM SAT is a qualitative tool addressed to key players in energy poverty alleviation projects who want to assess the potential of their project as a Clean Development Mechanism (CDM). It aims to help project designers to decide whether they want to register their project under the CDM Framework.

The tool is based on *criteria* considered essential for success in the required *steps* of a CDM process. The user can assess the level of fulfilment of the project for each criterion. Steps are grouped in 4 *phases* of the project cycle (Figure 3). Besides the official UNFCCC guidelines, this tool benefits from lessons learned in CDM case studies, conferences and readings, and it identifies critical issues that frequently arise.

Figure 3



Self-assessment results are reflected as quantitative indicators for each of the steps and phases mentioned above, and presented in graphs to facilitate performance analysis. As CDM SAT is a design tool, it is suggested to perform the self-assessment regularly during the project design process to ensure that key success criteria are included. It can also be used throughout project implementation; however, many criteria may not be modifiable at this later stage, which makes it less useful.

Some additional advantages of CDM SAT…

- Identification of project strengths for CDM
- Identification of obstacles and weaknesses of the project for CDM
- Visual aids assist in making process performance apparent

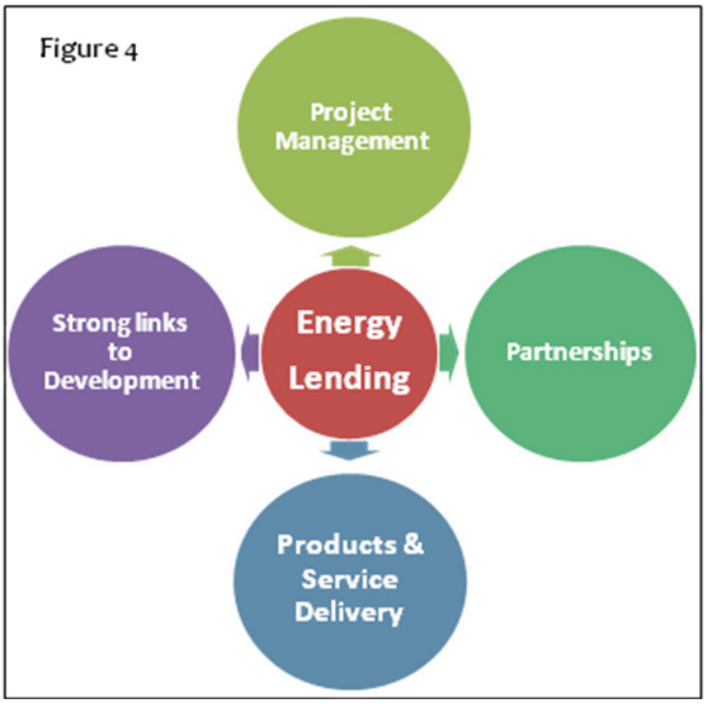
ⓘ The objective of this tool is not to provide exact answers nor replace the official tools and guidelines defined in the CDM framework. CDM SAT is meant to raise awareness about key issues and stimulate reflexion and debate about a project. Additionally, this tool is in its first version and is meant to be improved and adapted to different contexts. Consequently, it should be considered as a basis for further development by its users.

Energy Lending Self-Assessment Tool (ELSAT)

ELSAT is a qualitative tool addressed to key players in energy poverty alleviation projects with an *energy lending component*, i.e. providing access to microcredit to make modern energy products/services affordable to the poor. It is an aid for stakeholders to assess whether critical issues are being taken into account in their project design, management, and implementation process; and to encourage ongoing monitoring and evaluation.

The tool is based on *factors* deemed *essential* for the success of a project encompassing energy lending. These factors were identified through the analysis of real cases featuring innovative business and financing models for energy poverty alleviation, and grouped into sets of *criteria*, which were in turn clustered in 4 main *focus areas* (Figure 4). These *focus areas* correspond to the most sensitive issues of the matter under discussion, allowing user organizations to analyze if the elements listed have been considered in the formulation of their project, reflect on the degree to which these have been incorporated, and/or decide how convenient it is to develop new ones. Ideas for this tool also came from experts' opinions extracted from sources referenced in the main document.

Figure 4



Self-assessment results are reflected as quantitative indicators for each of the sets of *criteria* and *focus areas* mentioned above, and presented in graphs to facilitate analysis and follow-up of performance evolution. It is suggested to carry out this self-assessment periodically, approximately every 6 months or yearly, to gauge performance evolution from an observation to the next.

Some additional advantages of ELSAT…

- Useful for multiple stakeholders in projects with an energy lending component
- Generation of performance and work reports for the follow-up of an energy lending project/program
- Visual aids make the evolution of the overall performance and the individual performance of each area apparent

ⓘ Each project's uniqueness requires distinctive *focus areas, assessment criteria* and *essential factors*. Users are highly encouraged to adapt the tool to their specific objectives and context.

Conclusion

It is astonishing that today in 2009, over a century after the invention of the modern electric light there are inhabited regions that remain in the dark. In the dark not only in the sense that after the sun sets, there is no electricity, but also in the sense that these communities and individuals will be left behind as the current catalyst of change towards this technology and information based society also creates and widens a gap between those who "have" and those "who have not".

The intentions of this paper are to create awareness and to assist agents of change in driving another paradigm shift in our society: the alleviation of energy poverty. The magnitude of this challenge increases with the awareness of the importance of energy as a pre-requisite for the achievement of the Millennium Development Goals. Mechanisms for changes do exist. Alone in the past decade, the concepts of corporate social responsibility, the clean development mechanism and microfinancing have gained awareness and are growing in importance. All three models create a significant step forward for sustainable development. These three schemes can help to correct the imbalances between societies. While there may currently be a limited amount of successful and strategic examples, there lie great opportunities for the future, due to the huge amount of potential available for institutions and enterprises to tap into.

Yet, this potential and the great opportunities of these three mechanisms in the future are counterbalanced by the challenges to integrate or to combine these aspects with economic terms. CDM is based on climate change and creates a great opportunity for sustainable development; CSR has become an interesting medium for companies interested in changing their '*business as usual'* patterns and pursuing profit in a more balanced manner by adhering to the Triple Bottom Line, and thus also contributing to sustainable development. Allowing and empowering people to help themselves is the main intention behind the concept of microfinancing.

Through their backgrounds, previous experiences and research, the team became aware that to achieve energy poverty alleviation, the obstacle to overcome is not convincing institutions, organizations or companies that these models are worthwhile, but instead lies in the correct implementation thereof. Within the three different concepts there exists huge potential that needs to be developed and optimized as soon as possible, since this is the possibility to reduce the energy gap. For these reasons, organizations and companies need a guide for decision making and implementation, in order to ensure that they are tackling the correct issues or projects. Furthermore, to ensure that they are aligned with the objectives and capabilities of the enterprise, so that in the long term the investment and implementation of these projects is done to the best of their ability and creates maximum benefits for all parties.

It is due to these reasons that the three strategic tools described in depth in chapter 3 of the main document were developed. In particular, the tools are to assist in determining best options, suitability and to facilitate the process of identifying opportunities and areas to improve. It is imperative, just as there are neither two identical projects nor two identical enterprises, the strategic tools need to be adapted to the structure and objectives of each particular situation to become effective.

The intention of this paper is to equip those change agents with the necessary tools, to enable them to create a paradigm shift and a different global energy scenario for 2030.