

CLEAN DEVELOPMENT MECHANISM (CDM) – A POWERFUL INSTRUMENT TO FULFIL THE UN MILLENNIUM GOALS - EXPERIENCES, VISIONS AND SUGGESTIONS

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ABSTRACT

Traditional cooking is associated with a high net emission of greenhouse gases (GHGs) if fossil fuel or non sustainable harvested firewood in the regions of firewood crisis are used. Considering this and the limited amount of environment that support the living, people urgently need a new fuel saving technology such as solar cookers. However, they generally cannot afford it.

There is a way to overcome this obstacle and to provide powerful and durable equipment to poor families in developing countries. The poorest household can save emissions of GHGs by using sustainable technologies. These emission reduction efforts can generate marketable emission reduction certificates in the frame of Clean Development Mechanism (CDM) as defined in the Kyoto-Protocol.



Fig. 1 Maria collecting firewood, Guatemala

This paper is intended to show that CDM is a powerful and very helpful instrument to fulfil the UN Millennium Development Goals concerning poverty, education, gender, health, environment, water and worldwide partnership for sustainable development.

Based on comprehensive experience this article presents chances and challenges that have to be faced to manage the first UNFCCC-registered CDM Solar Cooker Project: Aceh 1 in Indonesia. The immense importance of a fair crediting of saved GHG-emission from avoiding non-renewable biomass consumption is emphasized.



Fig. 2 Traditional cooking, Indonesia

Keywords: 1. solar cooker, 2. cdm, 3. clean development mechanism, 4. millennium development goals, 5. firewood crisis, 6. household energy, 7. poverty eradication.

1. UN MILLENNIUM DEVELOPMENT GOALS AND CLEAN DEVELOPMENT MECHANISM

"The 2005 World Summit was the largest gathering of world leaders in history. From September 14-16, more than 100 Heads of State met at the United Nations to forge an action plan for promoting international security and for achieving the UN Millennium Development Goals by 2015." (1)

On 14 March 2005, TIME Magazine published an excerpt of the book "THE END OF POVERTY" written by Prof. Jeffrey D. Sachs, the Director of the UN Millennium Development Project (2). On page 46 one can read: *"This is a story about ending poverty in our time. It is not a forecast. I am not predicting what will happen, only explaining what can happen. Currently, more than 8 million people around the world die each year because they are too poor to stay alive. Every morning our newspaper could report: More than 20,000 people perished yesterday of extreme poverty ... They die namelessly, without public comment. Sadly, such stories rarely get written.... The sources of poverty are multidimensional. So are the solutions. In my view, clean water, productive soils and a functioning health-care system are just as relevant to development as foreign exchange rates. The task of ending extreme poverty is a collective one - for you as well as for me."* (3)

The eight Millennium Development Goals are listed in Table 1 in the last page. Clean Development Mechanism (CDM) was defined by Article 12 of the Kyoto Protocol (4) to promote worldwide cooperation for climate protection and sustainable development. There are immense chances to utilize CDM for achieving the Millennium Development Goals.

Aims and procedures of CDM project activities are described on the homepage of the United Nations Framework Convention on Climate Change (UNFCCC) (5) and by C. Luce's article (6). Detailed documentation of CDM Solar Cooker Project Aceh 1 can be found on UNFCCC web site (7). The planning of the project started about half a year before the Tsunami catastrophe.

2. PROCEDURES AND CRITERIA OF CDM TO ENSURE HIGH VALUE OF THE CDM PROJECTS

2.1 CDM Procedure and Criteria

The main criteria to be fulfilled by CDM projects are the transfer of sustainable technology, additionality and the use of modalities and procedures with the objective of ensuring transparency, efficiency and accountability through independent auditing and verification of project activities.

Certified Emission Reductions (CERs) can only be achieved if the CDM project passes a stringent process of valuation by an independent Designated Operational Entity (DOE) who checks the fulfilment of all criteria in detail. The validation report by TUEV SUED of CDM Solar Cooker Project Aceh 1 is published on UNFCCC

web site (8). Fulfilling the CDM criteria also ensures that the CDM project activity corresponds to the Millennium Development Goals.



Fig.3 Smokeless Village in India by domestic biogas plants and solar cookers K14

2.2 Transfer of sustainable technology - a prerequisite of CDM projects

Criteria "Transfer of Sustainable Technology" ensures durable solutions and prevents misuse of CDM. Solar cookers in combination with heat retaining containers can contribute to sustainable development by protecting the environment and by improving living conditions. This is achieved not only by saving fossil fuel and/or non sustainable harvested fuel wood but also by avoiding the emission of greenhouse gases and avoiding smoke from traditional cooking that will certainly improve the living standard of households, health and enabling income generation.



Fig. 4 Solar cooker workshop, ICNEER, India

The CDM Solar Cooker Project Aceh 1 uses CDM as a means of making devices of high quality and long durability accessible to the people who most need to overcome the disadvantages of conventional cooking. The use of prefabricated kits enables production of a high number of solar cookers with high quality and assures a transparent process of the project.

2.3 CDM additionality-criterion to focus on poverty alleviation

The additionality-criterion, which has to be satisfied by CDM projects, gives priority to projects that aim towards poverty alleviation by providing high quality sustainable technologies. These technologies are highly necessary, but unaffordable by the people that need them. If saving GHG-emission is counted through CDM, this saving of GHG-emission by poor households using high quality equipment can produce CERs. These CERs can be used to finance the equipment and the CDM-procedure.

The Aceh 1 project is additional, because the target groups of users do not have the means to purchase the fuelwood saving devices. The average income in this area of the target group is only about 30 Euro per month (7). Through the support of investors, who would actually pre-finance the returns of the CERs, it is possible to realize the project.

It is obvious that the additionality-criterion provides a strong incentive for poverty alleviation projects required to fulfill the first UN Millennium Development Goal.

2.4 Use of CDM modalities and procedures ensures the high value of CERs

The laborious official procedure, the necessary local assessments and approvals and the preparation of an extensive documentation may discourage project developers. However, the stringent CDM procedure has the important advantage to assure that the project is supported by the national and local authorities and to get high acceptance by the users. CDM procedure also assures the high value of the CERs.

The procedure comprises the steps and the responsibilities of every participant involved, making it transparent and traceable. Transparency of the procedure (including the presentation of the project documents on the web site of UNFCCC), validation by a Designated Operational Entity (TUEV SUED, Munich for the CDM Solar Cooker Project Aceh 1) and the official certification improve the chance of obtaining finance from private investors.

3. ROLE OF THE CDM SOLAR COOKER PILOT PROJECT ACEH 1

3.1 Aims of Project Aceh 1 (7), p.2

The CDM solar cooker pilot project Aceh 1 intends to

- Help people depending on traditional fuel by introducing high quality solar cookers and heat

retention containers for cooking, heating and sterilizing water and for preserving food;

- Provide training throughout all steps of implementation of these technologies;
- Collect all data needed for the CDM project;
- Demonstrate a chance of financing environmental projects with the help of CDM.

The pilot project comprises 1000 parabolic solar cookers K14 and heat retaining devices.

3.2 Environmental impacts (7), p. 20

The environmental impacts of solar cooker projects may be summarised by the following keywords

- Prevention of resource depletion by unsustainable logging
- Avoidance of indoor air pollution from smoke of traditional fireplaces
- Reduction of GHGs emission
- Protection of soil fertility
- Protection of biodiversity
- Protection of coastal areas
- Prevention of desertification
- Diminishing risks of fires caused by open fireplaces.

One of the main positive environmental impacts of the project will be the leverage of public awareness of environmental challenges that can be implemented through the transferred sustainable technology and by the accompanying educational program.



Fig. 5 Boiling up to 48 liters of water per day by solar cooker K14

3.3 Social impacts

The solar cooker is a powerful instrument in the fight against poverty, directly by alleviating the burden in providing fuel costs that increase continuously. Solar cookers also provide experiences in using a sustainable technology which does not produce smoke and enables people to cook large quantities of water at no cost. The income generated through these CDM projects ranges from job opportunities for assembly in workshops and

monitoring, the use of the cookers to preserve fruits, vegetables and to produce juice. Small scale solar bakeries will also generate further income.

The spreading of the solar cooking is a decentralized action. It contributes to the prevention of environmental destruction / desertification, enables reforestation, improves living standards in rural areas and indirectly might prevent migration.

Its appropriateness builds trust. It is an instructive instrument for environmental education through self learning and experience. It encourages private initiative. Women and children are relieved from the laborious, time consuming and often dangerous process of collecting biomass for cooking. They are not exposed to smoke which is a major cause for lung and eye diseases in developing countries.

3.4 Pilot function of CDM Solar Cooker Project Aceh 1 to determine savings of greenhouse gas emission through solar cooking

The pilot function of this CDM project is to determine savings of greenhouse gas emission from solar cooking. It is intended to show and prove a realistic method of calculation and approving savings of GHG-emissions through the use of sustainable technology for households and small fishery industry. Details are given by the project design document (PDD) (7).

For calculation of saved CO₂-emission pilot project Aceh 1 has used the statement in Appendix B of the simplified modalities and procedures for small-scale CDM project activities, I.C (Thermal energy for the user) in §19: *"For renewable energy technologies that displace non-renewable sources of biomass, the simplified baseline is the non-renewable sources of biomass consumption of the technologies times an emission coefficient for the non-renewable sources biomass displaced. IPCC default values for emission coefficient may be used."*

This paragraph was cancelled by the end of the year 2005 by the CDM Executive Board and a new methodology is currently in preparation. The cited paragraph accounted the saved emission by avoiding non-sustainable harvested firewood. There is a continuing need for fully accounting the saving of Greenhouse Gas emissions by saving non renewable biomass. Without fully accounting further solar cooker projects which implement high quality equipment and provide durable help for the poor will be inhibited.

The accepted method to obtain the amount of saved CO₂-emission by the project activity in Aceh, a region with non-renewably harvested fuelwood, is characterized by the following steps:

Method A

- A1) Determine the effective energy delivered by the solar cooking device
- A2) Calculate the corresponding saved primary energy consumption using an appropriate overall efficiency (?);
- A3) Convert the saved primary energy consumption to saved CO₂-emission using IPCC default emission factor for biomass. ((7), B5 and D3)

Method B, recommended by CDM experts, e.g. (9), to replace the former modality, is described below:

Method B

- B1) Determine the saved consumption of non-renewable biomass;
- B2) Calculate the corresponding saved primary energy consumption, using e.g. the default Net Calorific Value (NCV) for biomass stated by IPCC;
- B3) Convert the saved primary energy consumption to saved CO₂-emission using IPCC default emission factor for biomass.

Methods A and B produce the same result, if overall efficiency ? is correctly defined. In section 4 the consequences of deletion of the cited modality are discussed.

4. POOR HOUSEHOLDS NEED FULL APPRECIATION OF SAVED CO₂-EMISSION

4.1 Deletion of methodology for saving non renewable biomass makes finance of solar cooker projects impossible

There is a draft for another method, which assumes that fossil fuels are replaced by the new technology, instead of the really replaced unsustainably harvested firewood. It is named Method C:

Method C

- C1) Determine the saved consumption of non-renewable biomass;
- C2) Calculate the corresponding saved primary energy consumption of biomass;
- C3) Calculate the corresponding saved primary energy consumption if fossil fuel (kerosene; LPG) would be used
- C4) Convert the saved primary energy consumption of fossil fuel to saved CO₂-emission using IPCC default emission factor for fossil fuel.

In Method C the saving of GHGs by poor households is discounted to a low level - to about 25% of the value calculated by method A or B. This results from the assumption of a switch to fossil fuel (kerosene or LPG). This involves the switch to higher efficient cook stoves

(efficiency default value is 50% instead of 20 % for biomass) and to lower emission factors *EF* (*EF* is 71.5 tCO₂/TJ for kerosene and 63.0 tCO₂/TJ for LPG instead of 109.6 tCO₂/TJ for biomass).

With this low credit, poor households are "expropriated" and CDM projects in support of alleviating poverty and of all the other UN Millennium Development Goals are discouraged. It should be reconsidered, that it is not realistic to assume a switch to fossil fuels for calculating the baseline in cases with costs for fossil fuels beyond the reach of poor households.

4.2 Chances if saving of GHGs-emissions from non-sustainable use of biomass is fully accounted

The high potential for reducing CO₂-emission by sustainable cooking technologies (solar cooking, cooking by retained heat, biogas, highly efficient cook stoves) for poor households makes CDM projects financed by partners in industrialized countries possible. With the help of CDM poor households in developing countries gain access to high quality equipment for cooking which avoids the disadvantages of traditional cooking and supports directly or indirectly each of the eight UN Millennium Development Goals.

In the article "THE END OF POVERTY" in TIME Magazine (3) Jeffrey D. Sachs reports: "*A few years back, Sauri's residents cooked with locally collected wood, but the decline in the number of trees has left the area bereft of sufficient fuel. Villagers said that they now buy pieces of fuel wood in Yala or Muhanda, a bundle of seven sticks costing around 30¢. Not only are seven sticks barely enough to cook one meal, but for a lack of 30¢, many villagers had in fact reverted to cooking with cow dung or to eating uncooked meals.*"

5. CONCLUSION AND SUGGESTIONS: CDM TO FULFILL THE UN MILLENNIUM DEVELOPMENT GOALS

If firewood crisis spreads, the mission of Millennium Development Goals surely will have no meaning. CDM can be a powerful tool to pave the way out of this misery and to a sustainable future for all. Table 1 shows how CDM can contribute to fulfill the eight UN Millennium Development Goals on the basis of CDM solar cooker projects.

A summary of the Goals is given by the UN Millennium Project (2): "*The Millennium Development Goals (MDGs) are the world's time-bound and quantified targets for addressing extreme poverty in its many dimensions - income poverty, hunger, disease, lack of adequate shelter, and exclusion - while promoting gender*

equality, education, and environmental sustainability. They are also basic human rights - the rights of each person on the planet to health, education, shelter, and security."

Related to this definition, the CDM solar cooker projects are seen as a breakthrough to a new way to achieve the UN Millennium Development Goals.

CDM Solar Cooker Project Aceh 1 is the first CDM solar cooker project registered by UNFCCC and was launched as a pilot project to show the challenges and the opportunities. The pilot project is based on a methodology which has been suspended by UNFCCC in the meantime. For further CDM solar cooker projects an equivalent methodology is necessary which accounts for the whole saving of greenhouse gas emissions from non renewably harvested biomass by sustainable technologies to overcome firewood crisis.

6. REFERENCES

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TABLE 1: HOW SOLAR COOKER PROJECTS SUPPORT UN MILLENNIUM DEVELOPMENT GOALS

Arguments marked by * are referring to Table 2: "ENERGY-RELATED OPTIONS TO ADDRESS SOCIAL ISSUES". Overview of "World Energy Assessment" (10)

	Millennium Dev. Goals	Supported by CDM solar cooker projects through:
Goal 1	Eradicate extreme poverty and hunger	<ul style="list-style-type: none"> • <i>Avoiding expenses for fuel.</i> • <i>Making energy available to increase income-generating opportunities.*</i> • <i>Improving health and increasing productivity by providing universal access to adequate energy services – particularly for cooking, lighting, and transport – through affordable, high-quality, safe, and environmentally acceptable energy carriers and end-use devices.*</i>
Goal 2	Achieve universal primary education	<ul style="list-style-type: none"> • <i>Attending school instead of collecting firewood.</i> • <i>Making school fees affordable due to 1.</i>
Goal 3	Promote gender equality and empower women	<ul style="list-style-type: none"> • <i>Alleviating food preparation and food preservation by transfer of equipment and know-how.</i> • <i>Supporting the use of affordable energy to minimise arduous and time-consuming physical labour at home and at work.*</i> • <i>Using women's managerial and entrepreneurial skills to develop, run, and profit from decentralised energy systems.*</i>
Goal 4	Reduce child mortality	<ul style="list-style-type: none"> • <i>Avoiding smoke in the kitchen and avoiding accidents due to traditional cooking.</i> • <i>Introducing cleaner fuels and cooking devices and providing safe, potable water.*</i> • <i>Using energy initiatives to shift the relative benefits and costs of fertility – for example, adequate energy services can reduce the need for children's physical labour for household chores.*</i>
Goal 5	Improve maternal health	<ul style="list-style-type: none"> • <i>Improving life conditions.</i> • <i>Sterilising large amounts of water.</i> • <i>Encouraging the use of solar cookers to reduce indoor air pollution and improve women's health.</i>
Goal 6	Combat HIV/AIDS, malaria, and other diseases	<ul style="list-style-type: none"> • <i>Having awareness campaigns incorporated in projects.</i> • <i>Sterilising large amounts of water.</i>
Goal 7	Ensure environmental sustainability	<ul style="list-style-type: none"> • <i>Avoiding unsustainable logging, erosion and desertification</i> • <i>Avoiding GHG-emissions.</i> • <i>Reducing the 'push' factor in rural-urban migration by improving the energy services in rural areas.*</i> • <i>Taking advantage of new technologies to avoid energy-intensive, environmentally unsound development paths.*</i>
Goal 8	Develop a global partnership for development	<ul style="list-style-type: none"> • <i>Cooperating for climate protection and supporting Millennium Development Goals 1-7.</i>