

FUTURE PROSPECT OF CDM SOLAR COOKER PROJECT ACEH 1, INDONESIA

Herliyani Suharta

The Center for Energy Technology (B2TE), BPPT
Kawasan PUSPIPTEK, Serpong, Tangerang, 15314 Indonesia
Email: herli@iptek.net.id

ABSTRACT

Firewood in almost all rural areas uses firewood for cooking. Smoke exposure from firewood seriously affects the children's growth and the health of women, increasing woman burden and poverty. Its greenhouse gas (GHG) emissions contribute to global climate change. This is one of the greatest challenges of humanity. The CDM (Clean Development Mechanism) Solar Cooker Project in Sabang Islands and Badar city in South East Aceh was arranged to lay down a better energy path scenario for the future. Solar concentrator cookers "K14" and heat retaining containers named "Wonder box" will be transferred to the people. This project avoids 3.5 tonnes CO₂ emissions per year per K14 and applies for a renewable crediting CER (carbon emission reduction) for 7 years period. The CER verification is described. Some views as a societal research finding within the CDM Solar Cooker Project Aceh 1 are described briefly.

Key words: Aceh-Indonesia, CDM, Chronical disease, Forest, Solar cooker, Wonder box

ABSTRAK

Kayu bakar digunakan hampir di semua pedesaan untuk memasak. Paparan asap kayu bakar berpengaruh serius pada pertumbuhan anak dan kesehatan perempuan, meningkatkan beban perempuan dan kemiskinan. Polusi gas rumah kaca dari kegiatan memasak ini menyumbang pada perubahan iklim global. Ini merupakan tantangan terbesar umat manusia. Proyek mekanisme pembangunan bersih (CDM) di pulau Sabang dan kota Badar di Aceh Tenggara ditujukan untuk meletakkan skenario penyediaan energi yang lebih baik di masa depan, dan alat memasak bertenaga matahari yang dinamai *solar concentrator cooker tipe K14* dan kotak penyimpan panas yang dinamai "Wonder box" akan dialihkan ke masyarakat. Proyek ini meniadakan emisi CO₂ sebesar 3,5 ton per tahun per unit K14 dan kredit CER (pengurangan emisi karbon) akan didaftarkan selama 7 tahun. Verifikasi CER diuraikan. Beberapa pertimbangan dan saran hasil pengamatan sosial dalam CDM *Solar Cooker Project Aceh 1* diuraikan dengan singkat.

Kata kunci: Aceh-Indonesia, Mekanisme pembangunan bersih (CDM), Penyakit kronis, Hutan, *Solar cooker*, Kotak penyimpan panas (*wonder box*)

1. INTRODUCTION

Firewood is used in almost all rural areas around the world. This leads to consequences such as: loss of forest area, loss of fertile soil caused by erosion, desertification, increase of poverty and conflicts.

The Global Forest Resources Assessment 2005 coordinates a global effort involving 172 national assessment teams to provide data to FAO [1]. Forests now cover nearly 4 billion hectares or 30% of the world's land area. Two-thirds of all forest areas are in Australia,

Brazil, Canada, China, the Democratic Republic of the Congo, India, Indonesia, Peru, the Russian Federation and the United States of America. Primary forests (forests with no visible signs of past or present human activities) account for 36 % of total forest area, but are being lost or modified at a rate of 6 million ha/year through deforestation or selective logging.

Through the 1990s the annual net loss was 8.9 million hectares per year and down to 7.3 million ha/year between 2000 and 2005, equivalent to a net loss of 0.18 % of the world's forests annually. Asia moved from a net loss of around 800,000 ha/year in the 1990s to a net gain of one million ha/year between 2000 and 2005, primarily as a result of large-scale afforestation reported by China. Forest areas in Europe continued to expand but at a slower rate than that in the 1990s. The largest net loss of forests between 2000 and 2005:

- South America lost 4.3 million ha/year
- Africa lost 4 million ha/year. In dry climate replanting is one of the greatest problems
- Oceania had a net loss of 356,000 ha/year
- North and Central America together had a net loss of 333,000 ha/year.

Forests are important to the global balance as havens of biological diversity, recreational resources and sources of wood products. Eleven percent (11%) of the world's forests is used principally for the conservation of biological diversity. Such areas have increased by an estimated 96 million hectares since 1990. Around 348 million hectares of forests are used to conserve soil and water, control avalanches and desertification, stabilize sand dunes and protect coastal areas. Forests also act as carbon sinks absorbing excessive carbon dioxide in the atmosphere. The amount of carbon stored in forest biomass alone is about 283 giga tonnes of carbon. It decreased globally by 1.1 giga tonnes annually between 1990 and 2005.

Smoke and Health

Of the estimated 57 million global deaths last year, 33 million were attributed to chronic diseases such as cardiovascular diseases, cancers, diabetes and chronic respiratory diseases. *"Chronic diseases are a major global health problem and a key barrier to development, to alleviating poverty and to making progress towards the Millennium Development Goals. Cost-effective preventive and clinical interventions need to be implemented globally"* said Lee Jong Wook, WHO Director General. Smoking-related diseases are a major global health issue with serious financial and social implications for all countries, therefore the Framework Convention on Tobacco Control was endorsed last year and expected to be in legal force by 2005 [2].

Worldwide, more than 1.6 million children die because of interior cooking every year, while smoke exposure throughout their life seriously effects the development of more than 100 million children. These are the obstacles to successful socioeconomic development.

Other diseases in developing countries are water-borne that can be avoided by boiling of water. The actions to overcome these problems are urgently needed and to bring it to the governments around the world. Need to move the resources to action. A strong leadership is needed to coordinate national action.

2. CDM (Clean Development Mechanism), A CHANCE FOR TECHNOLOGY TRANSFER OF SOLAR COOKING

Most low income rural houses use firewood for cooking. They are gathered from surroundings rather than being purchased. Wealthier households use kerosene. In Aceh, 66% of households use firewood, 27% use kerosene and 7% use gas and electricity, see Fig. 1. The poverty line in Aceh is Rp70,000 and 17% of Aceh's population lives below this poverty line, which means their incomes are below Rp70,000 [3]. When the kerosene price rises, the kerosene consumers tend to switch to firewood to save cash. Three essential elements in human development are education, health and freedom from fear.

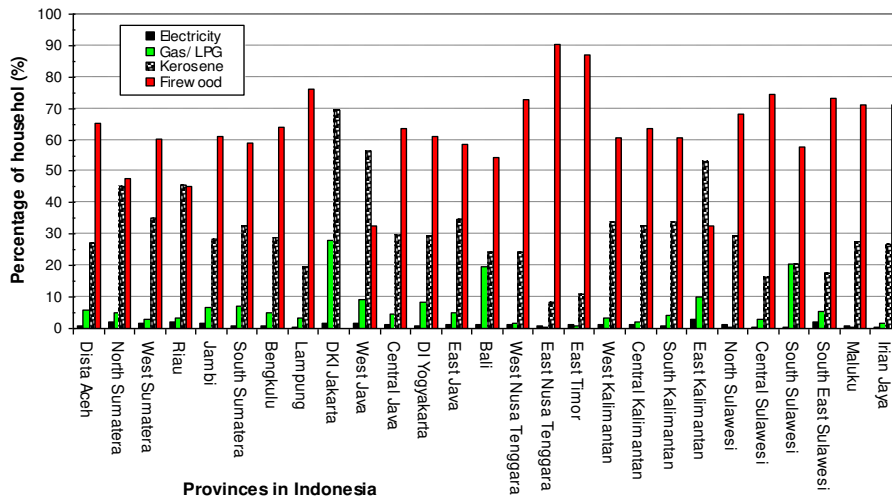


Fig. 1. Percentage of household by province and types of cooking fuel (electricity /LPG / kerosene and firewood). More than 90% of total houses in East Nusa Tenggara Province use firewood to fulfill their primary energy need
Sources: Statistic Indonesia 1999, BPS 2000, p127

Indonesia, the biggest archipelago country in the world, is a country with a huge population while many islands lack of infrastructure and services. Human capital is seen as the basic resource in the socio-economic development, but low quality of human resources, low income per capita, high dependency on the government, low public participation and limited funding are the challenges.

The education is not limited to formal education; but is geared to the achievement of a well-informed society. This means informal education is counted important to improve the welfare of firewood consumers. Introducing solar cooking is also seen as an alternative to reduce smoke exposure and give a chance to improve the health of firewood consumers. However the major targets these peoples are poor and cannot afford the solar cooker. This means, the main barrier is financial.

2.1. Financial Mechanism through CDM

The burning of one billion cubic meters of firewood causes an emission of about 820 million tonnes of CO₂ per year. This emission is equivalent to the annual CO₂ emission of Germany in the year 2000 that is about 867 million tonnes. More than 200 million K14 solar cookers are necessary to help solve these problems [4]. Knowing these situations, a global solution named Kyoto Protocol was derived. Its Article 12 says:

- To assist Non-Annex I countries (developing countries) in achieving sustainable development.
- To assist Annex I countries in achieving their emission reduction commitments.

The Clean Development Mechanism is derived for executing the actions. The governments and private sectors in Annex I countries can develop or invest in greenhouse gas mitigation projects in developing countries. Proved emission reductions will be certified then credited to the investing country that provides the solar cookers and this Certified Emission Reduction (CER) will be counted against the national CO₂ emission reduction targets. The developing country gains the cooking technology for sustainable development. The firewood consumers that used solar cooker have made an effort to save GHG-emission. Free energy will give extra profit for food sellers who use solar cookers for cooking.

2.2. Solar Concentrator Cooker K14 and Heat Retaining Box ("Wonderbox")

The cooking technologies that will be transferred in the CDMSCP Aceh 1 are the Solar Concentrator Cooker K14 plus the heat retaining box named "Wonder box" for simmering, see **Fig. 2**. The K14 evolved within twenty years of development and experiences. It has a reflector diameter of 140 cm. A good prefabrication gives a high quality product in a short time even high quantities of solar cookers can be fast produced. Constructing of solar concentrator cookers K14 from the prefabricated kits can be done through community education training. Its life span is about 20 years. Annual operation time is assumed 1500 hours/year.

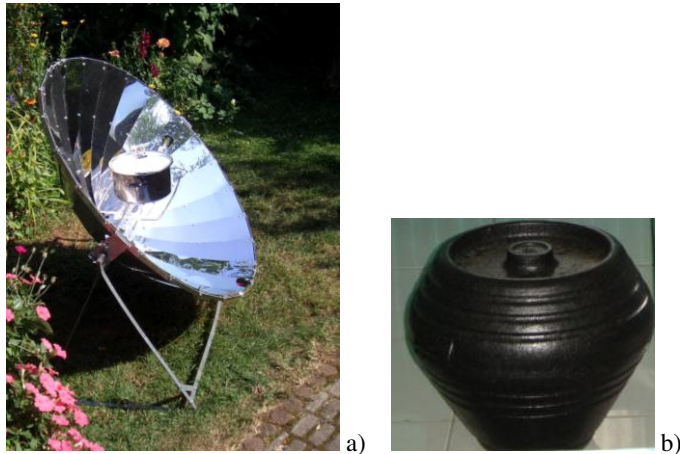


Fig. 2. a) Concentrator Cooker K14
b) The "Wonder box" to place the hot pan inside for simmering

The cooking pot of 12 liters volume and 28 cm in diameter was made of steel with black enamel on the other surface. The lid of cooking pot (for the first term of handing over within CDM in Aceh) was made of black enamel; for the second and third terms was made of glass. The K14 can bring 6 liters water from 20°C to boiling within 55 minutes, see **Fig. 3**. It can be used for frying, steaming, baking, etc.

Simmering inside the Wonder box takes place without energy and without intervention. The field test in Kupang, East Nusa Tenggara on 26 September 2005 proved that the Wonderbox is very useful to keep food / water hot till mealtime. The pot filled with 6 liters of boiling water was stored in the Wonder box at 23:15 local time. The next morning at 6:15, after 7 hours, the water temperature was still 70 °C [6].

3. CDM SOLAR COOKER PROJECT ACEH 1 [7]

The CDM Solar Cooker Project Aceh 1 (CDMSCP Aceh 1) is a *non-renewable biomass of Small Scale Category (SSC) I.C.* Methodology used: CDM Project AMS – 1C ver.6, Thermal Energy for the Users. It will avoid non-sustainable harvested firewood.

It had been initiated before the Tsunami disaster while Indonesia had not healed yet from the monetary crisis. This severe natural disaster caused everybody is panic, hoarding and shocked. The energy infrastructures were washed away to the sea. It resulted in unrivaled suffering. This situation drove all proponents to make the project succeed and to lay down a better energy path scenario for the future. The German proponent considered the existing expertise with experiences in sun cooking dissemination in Indonesia [3].

It is hoped that CDMSCP Aceh 1 becomes a successful example to be applied worldwide.

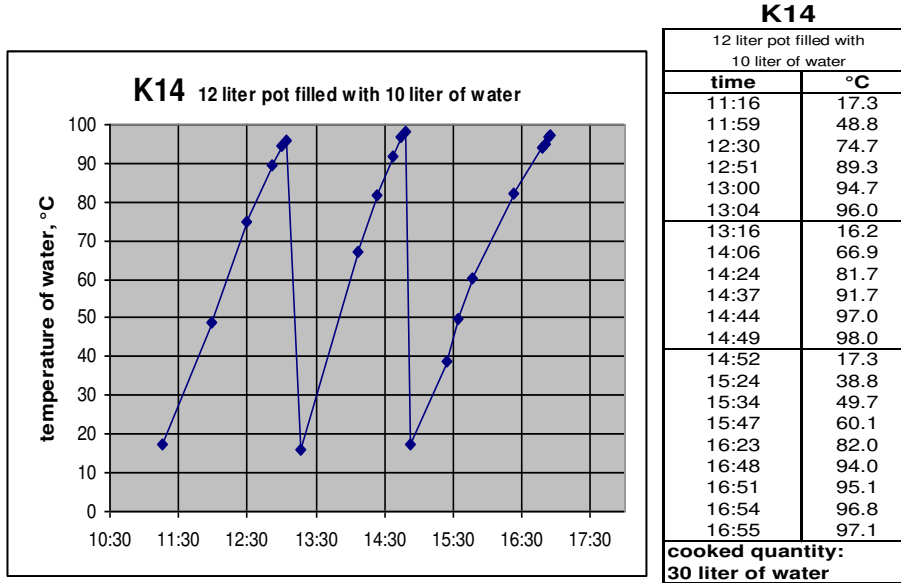


Fig. 3. The test of K14 on 1 October 2002, at Neuoetting, Germany (48.2° north latitude 12.7° east longitude) from 11:00 in the morning. Condition: clear sky and no wind [5]. Temperature measurement used a digital thermometer having a range of -10°C to 200 °C



Fig. 4. The selected locations are Sabang Islands and Badar city in South East Aceh. Target users are fisherman, households, small-scale industries, and community kitchens

3.1. Previous Commitments Lead to CDMSCP Aceh 1

- Herliyani Suharta met Dr Dieter Seifert at his Solar Kitchen Exhibition at Umbutu Village, a side event of World Summit on Sustainable Development in Johannesburg, July 2002. She gave a suggestion to Dr. Seifert to expand solar cooker dissemination to Indonesia.
- Funding uncertainty, and in order to help the suggested matter to come true, has drove Herliyani Suharta to write a proposal “GLOBAL SOLAR COOKER PROGRAM” to ALCAN (Aluminium Canada) London in August 2002. It covers Dr. Seifert name, the patent holder of solar cooker K14. She describes the advantages of this global project to ALCAN to make the proposal attractive to ALCAN.
- This proposal was presented in the World Renewable Energy Network (WREN) Meeting in Brighton, UK in October 2002.

3.2. Chronology of CDMSCP Aceh 1

- In the year 2004, Dr.Seifert was exerted effort to write Project Design Document (PDD) of CDM Solar Cooker Project Aceh 1. Formatted: Bullets and Numbering
- PT Petromat Agrotech works and helps Dr. Seifert’s partner (Klaus Trifellner) to arrange the project in Aceh. Formatted: Bullets and Numbering
 - August 2004: Discussion with Regional Parliament of Aceh about the potential of CDM Solar Cooker Project in Aceh.
 - 16 December 2004: Presentation of solar cooking in front of Government of Aceh by Klaus Trifellner, project initiator and administrator, Klimaschutz e.V.
 - Acceptance of Government of Aceh for CDM Solar Cooker Project Aceh 1. The letters of Approval from Government of Aceh, from Walikota of Sabang, from Bupati of Aceh Tenggara and from Bapedalda of Sabang Island are given.
 - 20 December 2004: Submission of first proposal to Mr. Sudariyono, CDM Focal Point at the Ministry of Environment Office, Jakarta.
- 26 December 2004: Tsunami destroyed Aceh.
- February 2005: Instruction of TÜV SÜD for Validation.
- April 2005: Submission of PDD of CDMSCP Aceh 1 to TÜV SÜD, Munich, Germany.
- June 2005: Completion of Verification of PDD.
- July 2005: Publication of CDMSCP Aceh 1 through web pages of UNFCCC for global stakeholder process. The number is 0218. No comments on project activity. Formatted: Bullets and Numbering
- August 2005: Visit of Validator from TUEV SÜED - Manila to Jakarta, to meet Regional Parliament of Aceh and to meet the staffs of the Ministry of Energy and Mining Office in Jakarta. Formatted: Bullets and Numbering
- Meeting of project developer Klimaschutz e.V. with Mrs. Nelly Hilman, the head of Indonesian DNA and delegates of Regional Parliament of Aceh in Jakarta.
- September 2005: Submission of CDMSCP Aceh 1 to Indonesian DNA for process of approval.

- November 2005: CDMSCP Aceh 1 was validated.
- | -○ On 26 November 2005, Executive Board of UNFCCC has deleted the methodology of *non-renewable biomass of SSC I.C.*, however any project seeks credit from switching non-renewable biomass that had been validated was given a chance to submit a National Approval before 26 December 2005, the deadline [8].
- | -○ 20 December 2005: Discussion with Indonesian DNA at the Ministry of Environment Office, Jakarta. Klaus Trifelner asked Herliyani Suharta to present in the meeting when Klaus Trifelner should give a presentation to get national letter from DNA of Indonesia.
- | -○ 23 December 2005: Indonesian DNA released the approval letter for CDMSCP Aceh 1.
- | -○ The Letters of Approval of German and Indonesian Government that were necessary for registration were submitted to UNFCCC by Klimaschutz e.V. on 23 December 2005, just 3 days before the deadline.
- | -○ 6 February 2006: CDMSCP Aceh 1 was registered formally in UNFCCC, as Project UNFCCC0218 CDM Solar Cooker Project Aceh 1.

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

It is the first CDM of Indonesia and of Germany.

Before 6 February 2006, it was not able to rise the funding for this project due to the deletion of non-renewable biomass from the methodology for crediting emission reductions on 26 November 2005. That made most of the potential partners who were willing to give funding to the project withdrew their participation. An effort described in section 3.1 give an impact. ALCAN come as an investor for CDM Solar Cooker Project Aceh 1. Funding for this CDM is managed solely by German side.

3.3. Planning for Implementation of CDM Solar Cooker Project Aceh 1 [9]

After 6 February 2006, Klimaschutz e.V. is preparing the project implementation phase. Discussion with the new strategic investors started again after 6 February 2006 and ALCAN was preparing a budget for the project. The budgeting process was scheduled to be completed by the end of April 2006. As soon as the funding was available, Klimaschutz e.V. ordered the production of solar cooker kits and the heat retaining containers for the CDMSCP Aceh 1. The schedule was:

- Production of the kits needs 6 weeks.
- Delivery to Indonesia by ship needs 6 weeks.
- Announcement and local training in the project area was done within the production and delivery period.
- Delivery all solar cookers K14 and the Wonder Boxes to the project areas in Sabang and South East Aceh needs 10 days.
- Assembly of all solar cookers and distribution to the households needs 60 days.
- The start of monitoring is expected 5 months after the funding for the project is confirmed, but timing described above made the users started to use their solar cooker K14 for cooking on 10 October 2006.

Provision of the spare parts and maintenance for the entire project duration is the responsibility of Klimaschutz e. V. The local governments have provided a place to assemble the equipment. Two local NGOs and one private company assembled the solar cookers in a community education. They have been trained for this job. As the project covers the households in coastal villages therefore the fisherman families were taught to use the solar cooker for boiling the fish for preserving. They can sell the cooked fish to generate income. In this way, they can save household fuel-expenses. The local authority included this program in national programs named as Life-Skill Programs.

4. SAVED AMOUNT OF CARBON DIOXIDE GENERATED BY THE USE OF SOLAR COOKER K14 [7]

This project avoids 3.5 tonnes of CO₂ emissions per year per K14 solar cooker and applies for a renewable crediting CER in the period of 7 years. The following is a brief calculation.

The nominal power P of cooker K14 is written as:

$$P = \{(T_2 - T_1) * c_p * m\} / t \quad (1)$$

Boiling 6 liters of water from 20 C will gives

$$P = \{(100 - 20) K * 4.18 \text{ kJ/kg.K} * 6 \text{ kg}\} / (55 * 60 \text{ second}) = 600 \text{ watt.}$$

UNDP [10] survey found: *“The most common method of cooking throughout rural areas in the developing world is the open hearth or three stone fire-place, which typically transfers only 5-15 percent of the fuel’s energy into the cooking pot”*.

The following calculation uses $\eta = 10\%$ as value for overall efficiency.

In comparison with the open fire, saved primary energy SPE of K14 is written as:

$$\text{SPE} = P / \eta \quad (2)$$

Annual operation time fo solar cooker is assumed 1500 hours/year.

The annual saved primary energy is:

$$\text{SPE}_{\text{annually}} = (P / \eta) * t \quad (3)$$

IPCC [11] states that Carbon Emission Factor CEF of solid biomass is 29.9 kg C/GJ or 0.0299 kg C/MJ.

Saved Carbon Emission m_C is written as:

$$m_C = (P / \eta) * t * \text{CEF} \quad (4)$$

Conversion Ratio of saved amount of carbon m_C to saved amount of carbon dioxide m_{CO_2} is equal to molecule weight ratio of CO₂ to C, which is equal to: 44 kg CO₂ / 12 kg C, thus

$$m_{\text{CO}_2} = m_C * 44 \text{ kg CO}_2 / 12 \text{ kg C} \quad (5)$$

$$\begin{aligned} &= (P / \eta) * t * 0.0299 \text{ kg C/MJ} * 44 \text{ kg CO}_2 / 12 \text{ kg C} \\ &= (600 \text{ watt}/0.10) * (1500*3600 \text{ second}) * 0.0299 \text{ kg C/MJ} * 44 \text{ kg CO}_2 / 12 \text{ kg C} \\ &= 3.5 \text{ tonnes CO}_2/\text{year per device.} \end{aligned}$$

This means CO₂ abatement for 1000 solar cookers K14 will be 3,500 tonnes per year and CO₂ abatement cumulative after 7 years becomes 24,500 tonnes maximum.

5. FUTURE PROSPECT OF THIS CDM PROJECT

There are many people on earth who excessively exploit their natural fuel resources and sold to the industrial countries who burn them to run the industries. Overuse of natural fuel resources around the world causes global warming that change the global climate leads to many natural disasters, famine, epidemics and wars. The sustainable development capabilities in some countries declined due to huge funding losses because of both natural and human created disasters. The international crude petroleum price has raised make many governments have to work within highly acute political risks to derive right decisions to secure national energy provision.

In such a situation CDM could bring hope to the poor.

5.1. Consequences of The Deletion of Non-sustainable Biomass, Small Scale Category I.C

“When I came back from Indonesia, I was informed about the decision of the Executive Board that temporarily stops the possibility to submit CDM projects based on non-renewable biomass SSC I.C. start in 26 December 2005. World Bank and the government of Nepal did complain. This prevents a possibility to submit a new CDM Solar Cooker Project.” [8]. Other countries did not complain. This obviously means that the spirit of Kyoto Protocol and clean development mechanism are not well understood. This shows a lack of awareness of the urgency of survival actions to overcome Climate Change worldwide. Logically, the Non-Annex 1 countries representatives should stand up and make a complaint to the Executive Board.

If industries or people who have the ability to help are not well informed about this mechanism, the funding difficulties will not be solved. The CDM Solar Cooker Project such as in Aceh can not be multiplied worldwide. A chance to improve living conditions for hundreds of millions of poor people in the world dismisses made UN Millennium Goals are difficult to be achieved. CO₂ emissions will increase continuously and green areas will continue to disappear.

The good thing happened in December 2007, the Executive Board withdraws their decision.

5.2. The Impacts of CDMSCP Aceh

One of the main intentions of this pilot CDMSCP Aceh is to demonstrate that solar cooker projects can be purely financed by the revenues generated by the sale of CER.

CDMSCP Aceh gives:

- a chance to apply solar cookers to reduce firewood consumption in many areas of the world to a sustainable level to heal the environment and to reduce CO₂ emissions,
- a chance to avoid interior cooking, to reduce the risk of lung and eye diseases that affect millions of people world wide,
- a chance of community education along the project, since transferring technology and monitoring of project are combined with an enduring educational program to ensure best use of the cooking devices,
- a chance to investigate a sustainable path to follow as an approach that gives a better sustainable development in the future.

Indeed, we need to encourage future projects and to multiply CDM Solar Cooker Projects.

5.3. Monitoring and CER Verifications [12]

The sharing of works described in the project design document (PDD):

- Finance of project, supply of solar cookers and supervision of monitoring are the share of Klimaschutz e.V., Bonn, Germany.
- Distribution of the solar cookers and monitoring of project activity are done by PT. Petromat Agrotech based in Jakarta in corporate with two local NGOs in Aceh.
- Monitoring report will be done together between the parties.

The monitoring is very important, as this process will determine the hours of usage of the solar cookers.

The requirements as a part of the monitoring procedure are:

- The user will sign an agreement that obliges him/her to use the equipment and to participate in the monitoring activity.
- Monitoring will be done by filling a simple monitoring card, which will be provided to every user.
- The user has to draw a line indicating the number of hours of his daily usage.
- The sum of the usage hours of Solar Cooker K14 in every household will be counted and converted into emission reduction by using a formula published in the PDD [7].

The amount of emission reductions gained will be used to pay back the costs of the project.

This means will be submitted to ALCAN.

Monitoring constraints

1. The process until CER issuing is a though process in this CDM that involve a huge number of users having various education levels that might lead to various uncertainty.

2. Limited ability of targets in filling the monitoring form might leads to a partial missing of monitored-data and dictated the CER issuing.
3. Each proponents involved in the project such as:
 - a. Project developers
 - b. Targets who receive technology to save CO₂ emission.
 - c. Monitoring team.
 - d. Related institutes that involves in the project arrangement, has different knowledge about CDM.
4. Klaus Trifellner solely holds the funding for this CDM Project. Funding flow mechanism not transparent. This causes difficulties for PT. Petromat Agrotech the local project developer to involve in the monitoring.

Monitoring report of the CDM Solar Cooker Project Aceh 1, dated 12 December 2007 [12] informed the monitoring result in the period of 6 February 2006 - 31 October 2007.

It consists of:

Part 1: Feb. 2006- May 2007,

Part 2: June – July 2007,

Part 3: August – October 2007, while

Part 4 shows Tables of monitoring results. The summary is given in **Table 1**.

No information about the real number of solar cooker K14 that are disseminated.

Table 1. Monitoring report of the CDM Solar Cooker Project Aceh 1

Month	Sum of Save Emission ton CO ₂
March-Dec 2006	none
Jan-07	none
Feb-07	none
Mar-07	29.3
Apr-07	60.5
May-07	200.5
Jun-07	269.8
Jul-07	307
Aug-07	73.9
Sep-07	86.8
Oct-07	61.4
Total	1089.2

5.4. CER Price [13]

In this section, the CER price in Europe is described.

Last July 2008, there is a dramatic fall in the price of carbon [13]. The December 2008 price of secondary CERs – credits produced by Clean Development Mechanism (CDM) – fell by almost 20% over the same period. The price of European Union Allowances (EUAs) fell by 25% from a high price of €29.33 on July 1 to a low price of €21.21 on August 4.

IDEAcarbon's forecast an average CER price in phase II (2008-2012) is €24, compared with a current market price of €21.3. The estimate does not account a risk issued CERs. IDEAcarbon's calculations suggest an average price for EUAs for phase II is of €29. The December 2008 price of EUAs is €26.5, while a current market value of about €23.3.

It is expected that CDM produce 1.6 billion credits by the end of 2012 and Joint Implementation will add a further 90 million tonnes. On the buy side, government demand has remained steady at about 1.1 – 1.4 billion tonnes. Under political pressure to meet their Kyoto commitments, governments are fairly price inelastic. *However, Green Investment Schemes (GIS) are a ready alternative if CER/ERU prices should rise too much.*

The January 2008 climate change package by the European Commission included an aggregate CDM/JI quota of 1.4 billion tonnes for 2008—2020, without constraints on timing. The financial merits will depend on the cost of internal abatement.

For example, a compliance buyer purchasing 100 CERs for use in phase III (after 2012) would today pay about $(100 \times 20 =)$ €2,000. Swapping the credits would yield some 80 EUAs. Storing them until 2020 would incur a cost of carry of about €1,400. This is only attractive if the cost of internal abatement in 2020 is more than $\{(2,000 + 1,400) / 80 =\}$ €40.50

Mitigation cost data suggests that there are many options to reduce emissions at less than this price.

Estimates of Emissions Trading System (ETS) - internal compliance costs in 2020, €45 per tonne in current value seems reasonable, which implies an average phase II price of €29 for EUAs and €24 for CERs. If this is correct, the market may have undershot its trend level.

5.5. Remarks and Suggestion

It is true that the local government willing to improve the local energy infrastructure, to improve their poor people condition and to keep their environment green. On the other side, there are business persons from industrial countries looking another way to get profit, still producing CO₂, but hoping the CDM project clean the environment simultaneously. Flying far distance and staying in fancy hotel and put all expenses in CDM budget counting. These two different standards of living meet in the CO₂ trading. In case of Aceh, the wealthy side worries to lose in getting CER and therefore they keep all funding for their own mobility.

Investor might expect CER, this the reason why German side is keeping the funding for this CDM as they think it is a tool to reach the monitoring target. However, this management could humble the local parties to do the task share written in the PDD, they bear a risk to be

blamed as not to do their share, not cooperate well in the CDM project that aim to reduce CO₂ emission.

German side wrote the monitoring report alone contrary to what is described in section 5.3. If this can be accepted then need to question a meaning of technology/knowledge transfer.

The CDM project should be seen as learning tool that has a great potential for social research in delivering a massive amount of new cooking technology for the poor, research of social change is very useful for the world future. However, this needs transparency. It is suggested to clarify the funding breakdown and flow mechanism for a future CDM project to make the local partner learning.

-Article 12 of Kyoto Protocol says: "To assist Annex I countries in achieving their emission reduction commitments". The firewood consumers that used solar cooker have made an effort to save GHG-emission, while the developed country still produce CO₂ in the technology production. Is their target in CO₂ emission reduction achieved?

Formatted: Bullets and Numbering

REFERENCES

- [1] FAO, "Destruction of World Forest's Continues, but Slows", the Food and Agriculture Organization of the United Nations, 14 November 2005, Rome, Italy, 2005.
- [2] WHO news release, "The Fourth World Health Organization (WHO) Global Forum on Chronic Disease Prevention and Control", 3 November 2004, Ottawa, Canada, 2005.
- [3] Herliyani Suharta and Ali Sayigh, "Cooking With The Sun", in RENEWABLE ENERGY 2005, an Official publication of WREN affiliate with UNESCO (2005), Renewable Energy 2005, David Flin (editor), Sovereign Publications Ltd, London, UK, 2005.
- [4] Deepak Gadhia, Birgit and Dieter Seifert, "Solar Cooking Against Poverty". Presentation, Youth Energy Summit (YES2004), Bonn, Germany, 29 May, 2004.
- [5] Dieter Seifert, "Test of Solar Concentrator Cooker", D-84524 Neuoetting, Germany, 1st October, 2002. Email: bdiv.seifert@t-online.de
- [6] Herliyani Suharta, CDM Solar Cooker and Cook Stove Save80, photographic report of field test and promotion in Kupang, BPPT-B2TE, Serpong, Indonesia, 2005.
- [7] Project Design Document, "CDM SOLAR COOKER PROJECT Aceh 1Indonesia. Small Scale Project Category I.C., final PDD Version", 10 October 2005. <http://cdm.unfccc.int/Projects/TUEV-SUED1135345789.43/view.html>
- [8] Klaus Trifellner, "Private Communication through Email", November, 2005.
- [9] Klaus Trifellner, "Private Communication through Email", discussed in 15 April, 2006.
- [10] UNDP-ESDP, "Clean Energy for Development and Economic Growth: Biomass and Other Renewable Energy Options to Meet Energy and Development Needs in Poor Nations", published by UNDP, Kingdom of Morocco and GEF, 2002. http://www.undp.org/energy/publications/2002/Clean_Energy_Biomass.pdf

- [11] IPCC, Workbook of Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, Vol. 2, Energy, IPCC, 1996.
<http://www.ipcc-nggip.iges.or.jp/public/gl/guidelin/ch1wb1.pdf>
- [12] Klaus Trifellner, "CDM Monitoring report of the Project UNFCCC0218 CDM Solar Cooker Project Aceh 1", dated 12 December 2007, monitoring period: 6 Feb. 2006 - 31 Oct., 2007.
- [13] IDEACarbon, "Carbon credits undervalued for Phase II", 2008.