CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL-SCALE PROJECT ACTIVITIES (SSC-CDM-PDD)
Version 02

(16/05/2006)

SSC CDM Project Design Document (PDD)

CDM COOK STOVE PROJECT Kupang 1

Indonesia

CONTENTS

SECTION A. General description of the small-scale project activity

A.1. Title of the small-scale project activity:

CDM COOK STOVE PROJECT Kupang 1 Indonesia

A.2. Description of the small-scale project activity:

The "CDM COOK STOVE PROJECT Kupang 1" aims for the city of Kupang in NTT/Indonesia to:

- Help people who depend on oil/kerosene/paraffin[1] as an energy source to switch to renewably harvested biomass.
- Provide training in all steps of implementation of these technologies in this region;
- Collect all data needed for the CDM project in this region
- Demonstrate the chances of financing environmentally friendly projects with the help of CDM

with the cooperation of:

Government of NTT
District of Kupang
BPPT,
Local NGOs
Klimaschutz e.V.
German Experts on sustainable household technology and CDM.

The transferred technology uses renewable resources for cooking meals, sterilising water and preserving food. It can also be used as a source of income. The project strives to spread the most advanced improved cook stoves and heat retaining equipment technology.

Monitoring of the project will be combined with an enduring educational program to ensure best use of the stoves and the devices for cooking with retained heat. The educational program will also teach how to build the stoves along with other life skills.

The latest technology of highly efficient cook stoves and heat retaining devices[2] will be transferred from Germany and adopted according to local demands through intensive participation from the local Governmental Agency BPPT and local NGOs and companies.

The project satisfies the major eligibility criteria of CDM-projects - contribution to sustainable technology, environmental additionality and financial additionality – it also provides further beneficial effects to the host country.

Sustainable development

The project is designed to contribute to sustainable development by avoiding the consumption of fossil fuel, and by avoiding the emission of greenhouse gases and toxic emissions which come from cooking with fossil fuel. It also contributes to sustainable development through poverty alleviation due to significant reduction of household expenditures. In this way the project contributes to sustainable development by improving the standard of households, health issues and the environment. It enables the households to generate income by using appropriate greenhouse gas saving technologies.

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[1] In the following "kerosene" is used as a synonym to describe the non renewable liquid source of primary energy. Annex 6 contains a compilation of synonyms used in the present document.

[2] In the following "system" is used as synonym for the implemented equipment consisting of the highly efficient cook stove "Save80-8L" (8-litre-version) and the heat retaining container "Wonderbox".

Environmental additionality

The project causes a switch from the consumption of fossil fuel to renewable energy. It avoids the emission of greenhouse gases by the use of renewably harvested firewood. Details of environmental additionality are described in chapter B5.

Financial additionality

The project is financially additional, because the target group of users does not have the means to purchase highly efficient and durable cook stoves, as the average income in the area of the target group is only 30 Euro per month. Only through the finance of an investor who pre-finances the returns of the CERs it is possible to carry out the project.

Whilst considering the opportunities provided by the new concept of this project, planned project activity has also taken into consideration the results and lessons learnt from former projects[3] for dissemination of advanced cook stoves in Asia [5], [6], [7].

Acceptance by the users

Projects which were not based on the pre-finance of future returns of CERs faced limitations in providing sufficient quality of equipment. The new concept of the present project enables the project to provide durable equipment of high quality. The use of high quality material enables long lifetime, high efficiency, low weight, and complete combustion of the fuelwood with low emission of smoke. Low cost material often leads to incomplete combustion because the material cannot withstand the necessary high temperatures.

The cook stove is easily portable and the efficiency of the cook stove is not affected by wind which makes it possible to use outside in any place.

The long lifespan of the system, the high savings of firewood and the prevention of indoor pollution contribute to high acceptance of the system by the users. In this way the project overcomes experienced problems arising from insufficient adaptation to the needs of the users.

Income generation and cost savings

The project directly generates income during the implementation and operational phase. At least 10 people are employed during the implementation phase and at least 6 people are employed throughout the project duration.

The mayor source of income is created by cost savings for the households and for informal business due to replacement of fossil fuel by the new equipment. New business opportunities are generated by the system which can be used for example for small scale food and beverage sellers, sugar boilers and other food processing industry.

It is intended to improve the livelihood of 30 000 poor families by providing a sustainable source of thermal energy for the users. Regular meetings are intended to improve existing skills and to introduce additional skills, which will enable the people of Kupang to make the system beneficial to use and to generate additional income. This educational element will be offered in cooperation with local NGOs and educational institutions.

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[3] References see Appendix 4

Implementation

The prefabricated cook stove kits are delivered from Germany to Kupang. Assembly will be carried out by local workers supervised by BPPT. Each cook stove takes approximately 30 minutes to assemble. Therefore it is planned to employ about 25 people, who are trained and supervised by BPPT to assemble and disseminate the cook stoves. Although this project will produce direct employment through assembly and monitoring, the greater impact of generating wealth for the user is the application of the new equipment for generating income and for saving expenses.

The system is given out based on a usage agreement. The beneficiary user is not the owner during the project duration, but he obtains a usage right for 10 years based on the following usage conditions:

a) The user must cooperate with the monitoring team; the responsible user especially has to provide required data according to the monitoring procedure;
b) The user has to use the system predominantly;
c) In case the user doesn't use the system, Klimaschutz e.V., BPPT or their designees have the right to hand over the system to another interested user;
d) In case the user doesn't cooperate with the monitoring team the system can be handed over to another interested user.

Conditions for transfer of ownership after project duration:

1. If the user has fulfilled a) and b) of usage conditions towards the end of the project duration for at least 5 years he obtains the ownership of the system;
2. In other cases the decision on ownership at the end of the project duration is transferred to BPPT.

The cook stoves are meant to be used for the entire duration of the project. They are not intended to be replaced by another technology during this time. Spare parts and maintenance are provided throughout the entire project duration. Klimaschutz e.V. supplies spare parts to the users as required and BPPT takes care of correct use.

The project shares the strong support of involved governmental divisions which ensures smooth transition towards this sustainable technology.

A.3. Project participants:

1. BPPT:

Person in Charge: Mrs. Prof. Herliyani Suharta
Core business:
- Development of sustainable technologies
- Research on community development and rural energy supply

Function in the project in cooperation with their local partners:
Monitoring and project administration; assembly, distribution and maintenance of the system.

BPPT is responsible for the annual project review. BPPT coordinates with Klimaschutz e.V. in case one of the following changes is necessary:
a) Providing additional systems
b) Adaptation of training methods
c) Changes concerning of the users of the system.

2. Klimaschutz e.V.

Project Director: Klaus Trifellner
Function in the project: Project initiator, investor and project supervision

Klimaschutz e.V. receives 100% of the CERs resulting from the project activity. The revenues from the CERs are mainly used to cover the cost of systems, their implementation and their improvement and maintenance.

The official contact for project activities is Klimaschutz e.V.
Further details of the project participants can be found in Annex 1.

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

City of Kupang, NTT, Indonesia
Host Country of Investor: Germany

A.4.1.1. Host Party(ies):

Host country Party(ies): INDONESIA

A.4.1.2. Region/State/Province etc.:

Region/State/Province etc.: City of Kupang, NTT, Indonesia

A.4.1.3. City/Town/Community etc:

City/Town/Community etc: Kupang

A.4.1.4. Detail of physical location, including information allowing the unique identification of this small-scale project activity(ies):

Households and small scale industry of City of Kupang/Indonesia

A.4.2. Type and category(ies) and technology of the small-scale project activity:

Renewable Energy Project type I.C. Thermal energy for the user

The project falls into this category as it provides thermal energy through introduction of highly efficient firewood stoves and heat retaining containers to replace the use of fossil fuels. The project avoids the use of kerosene or other fossil fuel for cooking and heating and sterilizing water. The stove uses small pieces of firewood, therefore renewable sources of firewood like small pieces of waste and dead wood (which normally are not used as fuel) can supply the demand for firewood. Without alternative cooking options, fossil fuel would continue to be burnt to satisfy the demand for thermal energy. Thus the transferred technology causes the transition from non renewable sources of energy to renewable resources.

The highly efficient stove "Save80-8L" (8-liter-pot-version) has a nominal effective thermal power P_{system}

$$P_{\text{system}} = 1.45 \text{ kW} \quad (1).$$

As the total number is 30.000 units the total thermal power of all units used in the project will be 43.5 MW and therefore below the limit of 45 MW (thermal) for small scale CDM projects.

The highly efficient stoves are to be used in households and small scale enterprises. The technology is transferred by providing the knowledge, the stove kits and devices for cooking by retained heat. The stoves are built locally under the supervision of local specialists trained by German experts.

The project has a new concept through using CDM as a means of making cooking equipment of high quality and long durability accessible to the people who most need to overcome the disadvantages of conventional cooking. A further difference of the project's concept is the use of prefabricated kits. This enables production of high quantities with high quality and it assures a transparent processing of the project.

The stove "Save80" is particularly planned for cases unfavourable for solar cooking, utilising the opportunities provided by CDM and by consequent use of prefabrication, which is best suited for implementation of CDM projects. The extraordinary high efficiency of the stove (up to more than 50%), its portability, the easy, self regulating air supply, and the independence of ambient conditions enable further measures, which could not be applied successfully in earlier cases. One of these measures is the use of small pieces of wood, being burnt under favourable conditions to ensure low emission of smoke. This concept also ensures that dry pieces of dead wood or bushes and shrubs are consumed; therefore the highly efficient stoves use a renewable source of energy.

The small amount of wood needed by the stove "Save80" for preparing dishes and boiling water (it can boil 6 litres of water with a consumption of less than 300 g of dry firewood) makes it extremely reasonable to acquire the adequate pieces of firewood. Experiences show that the supply of the small pieces can be managed comfortably.

The supply of renewable biomass for the implemented cook stoves is ensured due to the small amount of firewood consumed and due to particular suitability of dead wood and sticks of shrubs and bushes, which can be planted as renewable source of energy if there is not enough dead wood available.

The use of prefabricated boxes for cooking with retained heat (simmering) in addition to the stove is a highly recommended measure for saving fuel, to separate cooking time from meal time, to conserve water at high temperature, to shorten the time when the pot is in the stove, and to simplify the cooking process. Simmering takes place without the need of surveillance and intervention. The project will turn high attention to this technology. Advanced material and an appropriate form, especially developed to fulfil the high standard of the project equipment, ensures durable quality, very high heat retaining effect and simple application of the heat retaining "Wonderbox".

Using prefabricated kits assures high quality and a transparent process of the project. It can be deduced from experiments, that the cook stove "Save80" and the heat retaining "Wonderbox" have a life span of many years.

A.4.3. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small-scale project activity, taking into account national and/or sectoral policies and circumstances:

Reduction of anthropogenic GHG emission is achieved by using highly efficient cook stoves and heat retaining boxes to avoid the use of kerosene as an energy source.

Assumed mean emission reduction (CO_2-equivalents) by one stove "Save80-8L" in combination with the heat retaining container by avoiding emissions from the consumption of fossil fuel is m_{CO2} = 1.488 CO_2 eq tonnes/year according equation (23c) in chapter B5.1.

A.4.3.1 Estimated amount of emission reductions over the chosen crediting period:

(Please state briefly how anthropogenic greenhouse gas (GHG) emission reductions are to be achieved (detail to be provided in section B.) and provide the estimate of total anticipated reductions in tonnes of CO_2 equivalent as determined in section E. below.)

After implementation of 30 000 systems the total amount of emission reduction by 30 000 systems is assumed to be about 44 625 CO_2 eq tonnes per year (see table in section E.2). As an education program and a maintenance service are incorporated into the project, it is assumed that the emission reduction will be constant during the crediting period (10 years). Therefore the estimated amount of emission reductions over the 10 years crediting period is 446 250 CO_2 eq tonnes.

A.4.4. Public funding of the small-scale project activity:

(Indicate whether public funding from Parties included in Annex I is involved in the proposed project activity. If public funding from one or more Annex I Parties is involved, please provide information on sources of public funding for the project activity in annex 2, including an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of those Parties.)

Public resources (ODA) are not used to finance this project.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a larger project activity:

The project is not a debundled component of a larger project activity. The project activity is a bundling of small systems for households.

SECTION B. Application of a baseline methodology:

B.1. Title and reference of the approved baseline methodology applied to the small-scale project activity:

Title: Renewable Energy Projects; Reference: AMS I.C., Thermal energy for the user

B.2 Project category applicable to the small-scale project activity:

The project category I.C. Thermal energy for the user is applicable.
The thermal capacity[4] of the project is below the limit of 45 $MW_{thermal}$, therefore the simplified methodology for small scale CDM projects applies.

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

Without the project there will be an emission of GHGs from the combustion of kerosene. The project activity has only negligible emissions, particularly from transport of the systems.

Project barriers and risks:

1. Risks and natural disasters: Natural disasters cannot be avoided, but they are part of the risk. According to local statements and official records, disasters that could affect the project, happen in a frequency of approximately once in 100 years.
2. Lack of acceptance by the population: This barrier will be overcome by educational efforts, training, events and random visits.
3. Financial barriers: Without CDM credits the entire project will not be self supporting. This barrier is already overcome by pre-financing the returns of the CERs by an investor.

[4] Nominal thermal capacity of the project is 30000 * 1.45 $kW_{thermal} = 43.5\ MW_{thermal} < 45\ MW_{thermal}$

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the small-scale project activity:

The project boundary is the city of Kupang.
The thermal capacity of the project is 43.5 $MW_{thermal}$, which is below the limit of 45 $MW_{thermal}$.

The only energy alternative that could be proposed in the target area is non renewable biomass or fossil fuel.

B5. Details of the baseline and its development:

B.5.1 *Specify the baseline for the proposed project activity using a methodology specified in the applicable project category for small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities:*

The project encourages the use of high quality stoves and heat retaining containers by people who - without the help of CDM - cannot afford to abandon conventional use of kerosene.

The main conditions for calculating the emission reductions by using the high quality stove and heat retaining container are:

- A certified highly efficient cook stove is used which saves (approved by a field test) approximately all the fossil fuel consumption of the household;

- The stove is repaired when parts are damaged. The whole stove is replaced when reparation is no longer possible. If repairing or replacing is not carried out, the non functional stove will not be counted among the project activity.

Certification of the stove by an acknowledged institution should include the verification of:

a) Nominal power P_{system} = 1,45 kW (equation (1));
b) Overall efficiency is above 40% (approved by Water Boiling Test[5] (WBT) [3],[8]);
c) The stove is suitable for preparing at least 80% of usual dishes;
d) Comfortable handling of the stove (easy access to the pot; stove is portable if necessary; automatic regulation of air)
e) Manual is provided;
f) High lifetime (more than 10 years in appropriate use; metallic parts in contact with the flames made from stainless steel);
g) Low emission of smoke and GHGs. The cooker is portable; it is assumed that at least lighting the fire is performed outside the kitchen.
h) Combined use with effective heat retaining container provided (decrease of temperature less than 20 °C during a period of 2 hours, when the pot is filled with 6 litres of water at boiling point);

According to Environmental Impact Controlling Agency East Nusa Tenggara Province[6], the mean kerosene consumption $V_{kerosene}$ for conventional cook stoves by a household in the project area ranges between 1.6 litres and 4 litres per day and the time for daily cooking is about 4 to 6 hours. The baseline-calculation uses the conservative value for the consumption (volume) $V_{kerosene}$

$$V_{kerosene} = 1.6 \text{ litre/day} \qquad (2).$$

[5] Using VITA Water Boiling Test for testing the power P_{system} and efficiency η_{system} according http://www.hedon.info/goto.php/WaterBoilingTest

[6] see Appendix 1 (official paper is in preparation)

The corresponding annual consumptions is

$V_{kerosene}$ = 1.6 litre/day * 365 day/year = 584 litre/year (2a).

With the density[7] $\rho_{kerosene}$ of kerosene

$\rho_{kerosene}$ = 0.80 kg /litre (3)

the consumption (volume) $V_{kerosene}$ is converted to the consumption (mass) $m_{kerosene}$

$m_{kerosene} = V_{kerosene} * \rho_{kerosene}$ (4)
= 1,6 litre kerosene/day * 0.80 kg kerosene/litre kerosene

= 1.28 kg kerosene/day (4a).

The corresponding annual consumption (mass) is

$m_{kerosene}$ = 1.28 kg kerosene/day * 365 day/year = 467.2 kg kerosene/year (4b).

With the net calorific value $NCV_{kerosene}$ of "Other Kerosene" stated in IPCC Workbook [1], Chapter Energy[8]

$NCV_{kerosene}$ = 44.75 TJ/kt = 44.75 MJ/kg (5)

the used mean primary energy $E_{kerosene}$ of a household using a conventional cooker can be calculated:

$E_{kerosene} = m_{kerosene} * NCV_{kerosene}$ (6)
= 1.28 kg kerosene/day * 44.75 MJ/kg
= 57.28 MJ/day (6a)
= 20907 MJ/year (6b).

This primary energy $E_{kerosene}$ is also the product of the effective power $P_{kerosene}$ and operating time $t_{kerosene}$ divided by the efficiency $\eta_{kerosene}$ of the conventional cooker:

$E_{kerosene} = P_{kerosene} * t_{kerosene} / \eta_{kerosene}$ (7).

Equations (6) and (7) can be used to transform data about operating time $t_{kerosene}$ to consumption $m_{kerosene}$ of kerosene:

$m_{kerosene} = E_{kerosene} / NCV_{kerosene}$
$= P_{kerosene} * t_{kerosene} / (\eta_{kerosene} * NCV_{kerosene})$ (8).

For a the replaced conventional stove with known effective power $P_{kerosene,r}$ and efficiency $\eta_{kerosene,r}$ it is equivalent to know consumption $m_{kerosene,r}$ or operating time $t_{kerosene,r}$. Equation (8) can be written as:

$t_{kerosene,r} = m_{kerosene,r} * \eta_{kerosene,r} * NCV_{kerosene} / P_{kerosene,r}$ (9).

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[7] Specific density 0.87 for petroleum and 0.78-0.82 for kerosene is stated in: Chemical Engineers' Handbook, McGraw-Hill Book Co., 4.th ed., Table 3-137 [9]. A test on a sample of Indonesian kerosene resulted in a density $\rho_{kerosene}$ = 0.80 kg/litre. This value is used in equation (3).

[8] Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook, Chapter "Energy, Table 1-3

With the density of kerosene $\rho_{kerosene}$ = 0.80 kg kerosene/litre kerosene from equation (3) the consumption (volume) $V_{kerosene,r}$ can be calculated from consumption (mass) $m_{kerosene,r}$

$$V_{kerosene,r} = m_{kerosene,r} / \rho_{kerosene} \quad (10).$$

The operating time $t_{kerosene}$ according to equation (9) can be determined from the consumption (volume) $V_{kerosene,r}$ by using equation (10):

$$t_{kerosene,r} = V_{kerosene,r} * \rho_{kerosene} * \eta_{kerosene,r} * NCV_{kerosene} / P_{kerosene,r} \quad (11).$$

Both ways[9] for calculating the amount of primary energy consumption $E_{kerosene}$ are equivalent, if effective power and efficiency of the cooker are known.

The effective power $P_{kerosene}$ of the replaced conventional stove can be multiplied with its operating time $t_{kerosene,r}$ to get the effective energy consumption $E_{eff,kerosene}$

$$E_{eff,kerosene} = P_{kerosene} * t_{kerosene} \quad (12).$$

This effective thermal energy $E_{eff,kerosene}$ can also be calculated from primary energy $E_{kerosene}$ consumed by the conventional cooker by using an efficiency $\eta_{kerosene}$

$$E_{eff,kerosene} = E_{kerosene} * \eta_{kerosene} \quad (12a).$$

The same effective thermal energy $E_{eff,kerosene}$ delivered before by the replaced stove has to be delivered in the operating time t_{system} by using the new system which uses renewably harvested firewood and has an effective power P_{system}:

$$E_{eff} = E_{eff,kerosene} = E_{eff,system} \quad (13)$$

$$E_{eff,system} = P_{system} * t_{system} \quad (14).$$

Therefore the necessary operating time t_{system} of the new system replacing the conventional kerosene stove is calculated by using equations (14), (13), (12a) and (6):

$$\begin{aligned} t_{system} &= E_{eff} / P_{system} \\ &= E_{kerosene} * \eta_{kerosene} / P_{system} && (15) \\ &= m_{kerosene} * NCV_{kerosene} * \eta_{kerosene} / P_{system} && (15a). \end{aligned}$$

Equation (15a) can be used for estimating the annual hours of operation of an average system requested by the "Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories" for category I.C, chapter 9. (c) [10] in cases with emission reduction per system less than 5 tonnes of CO_2 per year. Calculations below show that this condition is fulfilled. Inserting the values stated by equation (1) for effective power P_{system} of the replacing system and equation (5) for $NCV_{kerosene}$, and using a mean efficiency of the replaced conventional stoves $\eta_{kerosene,r}$

$$\eta_{kerosene,r} = 0,45 \quad (16),$$

the operating time t_{system} can be deduced from equation (15a) and (1):

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[9] (a) Calculating consumed primary energy from fuel consumption by equation (6) or from operating time by equation (7)

[10] CDM-Executive Board: I.C/Version 08, 03. March 2006

t_{system} $= m_{kerosene} * NCV_{kerosene} * \eta_{kerosene,r} / P_{system}$ (17)
t_{system} $= m_{kerosene}$ * 44.75 MJ/kg * 0,45 / 1,45 kW
$= m_{kerosene}$ * 44.75 MJ/kg * 0,45 / (1,45 * 3.6 MJ/h)
$= m_{kerosene}$ * 3.858 h/kg kerosene (17a).

With the consumption $m_{kerosene}$ of kerosene per day from equation (4a) the operating time t_{system} for this case is

t_{system} = 1.28 kg kerosene/day * 3.858 h/kg kerosene
= 4.94 h/day (17a)
= 4.94 h/day * 365 day/year
= 1802 h/year (17b).

On the other hand the primary energy $E_{kerosene}$ of saved kerosene can be calculated by equation (15) if operation time t_{system} and effective power P_{system} of the new system and efficiency $\eta_{kerosene,r}$ of the replaced stove are known:

$E_{kerosene} = P_{system} * t_{system} / \eta_{kerosene,r}$ (18).

Carbon Emission Factor ($CEF_{kerosene}$) from IPCC Guidelines Workbook [1] for kerosene[11] enables the conversion of the primary energy $E_{kerosene}$ calculated by equation (16) or (6b) to the correspondent amount m_C of annually emitted carbon of a medium household using a conventional kerosene cooker:

$CEF_{kerosene}$ = 19.6 t C/TJ [= 19.6 kg C/GJ = 0.0196 kg C/MJ] (19),

$m_C = E_{kerosene} * CEF_{kerosene}$ (20).

With $E_{kerosene}$ from equation (17) the amount m_C of saved carbon emission is:

$m_C = P_{system} * t_{system} * CEF_{kerosene} / \eta_{kerosene,r}$ (20a).
= 1.45 kW * t_{system} * 0.0196 kg C/MJ / $\eta_{kerosene,r}$
= 1.45 kW* 3.6 MJ/h/kW * t_{system} * 0.0196 kg C/MJ / $\eta_{kerosene,r}$
= 0.1023 kg C/h * t_{system} / $\eta_{kerosene,r}$ (20b).

With data from equation (6b) the amount m_C of saved carbon emission per system is:

m_C = 20907 MJ/year* 0.0196 kg C/MJ
= 409.8 kg C/year (20c).

IPCC-Guidelines [2] recommend as step 5 of the "Approaches for Estimating CO_2 Emissions" accounting for carbon not oxidised during combustion. The default value of the fraction of carbon oxidised stated in Table 1-6 for oil and oil products[12] is 0.99.

Fraction of Carbon Oxidised = 0.99 (21).

According to step 6 of IPCC-Guidelines [2] the emission of carbon is converted to full molecular weight of CO_2 by multiplying the net carbon emission by the molecular weight ratio[13] M_{CO2}/M_C

M_{CO2}/M_C = 44/12 kg CO_2/kg C (22).

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[11] Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook, chapter "Energy", Table 1-2

[12] Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual, p. 1.29

[13] Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual, p. 1.10 and 1.30

Thus the saved annually emission m_{CO2} of carbon dioxide by saving the amount m_C is

$$m_{CO2} = m_C * \textit{Fraction of Carbon Oxidised} * M_{CO2}/M_C \quad (23)$$
$$= m_C * 0.99 * 44/12 \text{ kg } CO_2/\text{kg C}$$
$$= m_C * 3.63 \text{ kg } CO_2/\text{kg C} \quad (23a).$$

With equation (19b) the net value of saved emission is

$$m_{CO2} = 0.1023 \text{ kg C/h} * t_{system} / \eta_{kerosene,r} * 3.63 \text{ kg } CO_2/\text{kg C}$$
$$= 0.3713 \text{ kg } CO_2 * t_{system} / \eta_{kerosene,r} \quad (23b).$$

With equation (20) the saved emission per system replacing a conventional stove is:

$$m_{CO2} = 409.8 \text{ kg C/year} * 0.99 * 44/12 \text{ kg } CO_2/\text{kg C}$$
$$= 1487.5 \text{ kg } CO_2/\text{year (per system)}$$
$$= 1.488 \text{ t } CO_2/\text{year (per system)} \quad (23c).$$

The annually saved CO_2-emission m_{CO2} by a system working with renewable energy, replacing completely an annual consumption of kerosene with primary energy of 20907 MJ/year is 1487.5 kg CO_2/household/year.

This amount m_{CO2} corresponds to replacing a conventional kerosene cooker by a system which uses renewable harvested biomass with an effective power P_{system} = 1.45 kW and a daily operating time t_{system} of about 5 hours.

To check the plausibility of the savings of CO_2 and an assumed daily consumption of 1.6 litres of kerosene per household we can use another way to estimate the saved CO_2-emission, using data about the average energy consumption:

Referring to Annex III §1 of FAO-paper "Wood Fuel Surveys" [3], the energy consumed per capita for cooking in developing countries is about E_1 = 8.0 GJ/capita/year. Data about energy end-use for cooking and for water heating of low income households can be derived from the publication "The Challenge of Rural Energy Poverty in Developing Countries" of World Energy Council. Section 2.3.1 "Cooking" quotes the result of a research project: "… daily cooking energy consumption per capita varied from 11.5 to 49 MJ, based on field measurements. Despite a wide range of locations and conditions the range of consumption is quite small. In all the cases food was cooked predominantly on an open fire. However, the lower figures are those applying to efficient wood or charcoal stoves and modern energy sources." [4]

Thus the lowest value E_{capita} for daily energy consumption per capita

$$E_{capita} = 11.5 \text{ MJ/capita/day} \quad (24)$$

can be used to check if the calculated emission is conservative. The mean number N of the group members of a target household is about

$$N = 5 \text{ capita/household} \quad (25)$$

as most target groups (households) have 4 to 6 members [10]. Therefore the primary energy consumption $E_{calculated}$ per household calculated from E_{capita} = 11.5 MJ/capita/day is

$$E_{calculated} = E_{capita} * N \quad (26)$$
$$= 11.5 \text{ MJ/capita/day} * 5 \text{ capita/household}$$
$$= 57.5 \text{ MJ/household/day}$$

= 20988 MJ/household/year.

$E_{calculated}$ is higher than $E_{kerosene}$ calculated by equation (6b) from an assumed consumption of 1.6 litres of kerosene per day:

$$E_{calculated} = 20988 \text{ MJ/household/year} > E_{kerosene} = 20907 \text{ MJ/household/year} \quad (27).$$

Thus $E_{kerosene}$ = 20907 MJ/household/year and the corresponding emission m_{CO2} = 1487.5 kg CO_2/household/year according to equation (23c) are conservative assumptions.

There are plans by the Indonesian government to replace kerosene by coal briquettes in the project area. If there is a shift from kerosene to coal as commonly observed source of household energy, the baseline would change accordingly, i.e. the respective data of coal briquettes instead of the data of kerosene to obtain the same effective energy will be used.

B.5.2 Date of completing the final draft of this baseline section *(DD/MM/YYYY)*:
16/05/06

B.5.3 Name of person/entity determining the baseline:

Dr.-Ing. Dieter Seifert
Senior Engineer
E-mail: bdiv.seifert@t-online.de
in co-operation with Klimaschutz e.V.
Klimaschutz e.V is listed in annex 1; Dr. Seifert is not separately listed in annex 1 of this document.

SECTION C. Duration of the project activity / Crediting period:

C.1. Duration of the small-scale project activity:

Minimum 11 years

C.1.1. Starting date of the small-scale project activity:

>> 01/09/06

C.1.2. Expected operational lifetime of the small-scale project activity:

>> Minimum 11 years

C.2. Choice of crediting period and related information:

>> Fixed crediting period

C.2.1. Renewable crediting period:

>>

C.2.1.1. Starting date of the first crediting period:

>>

C.2.1.2. Length of the first crediting period:

>>

C.2.2. Fixed crediting period:

>> 10 years

C.2.2.1. Starting date:

>> 01/04/07

C.2.2.2. Length:

>> 10 years

SECTION D. Application of a monitoring methodology and plan:

The emission reduction per system[14] is less than 5 tonnes of CO_2 a year. Thus monitoring according to (c) appendix B / I.C. of simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories is applicable.

Monitoring takes place through random monthly visits of households by local representatives of BPPT. Each stove carries a number and will only be given out upon signing of a user agreement for 10 years, which states, that in case of not using the cook stoves, BPPT or its representatives are allowed to hand over the system to another user.

The coordinates of the responsible household representative and the data of the monitoring will be filed by BPPT or by one of the authorized representatives and evaluated electronically by BPPT.

If conventional cooking is still in use and uses between 25% to 75% of the former consumption of kerosene, then 50% of potential CO_2-reduction will be accounted for (case 2). If conventional means of cooking uses more than 75% of the former consumption, 0% of the potential reduction will be accounted for (case 3).

Assessed data are:

1. Number of households using the systems predominantly, i.e. conventional cooking less than 25% (case 1)
2. Number of households using the systems together with high use of conventional cookers, i.e. conventional cooking between 25% to 75% (case 2)
3. Number of households not using the systems or using it less than 25% in the usage time of a household (case 3)

The numbers referring to case 1 to case 3 are assessed by the random visits and questioning of households by the monitoring agents.

4. The total number of installed systems is assessed yearly. In the implementation phase the number of installed systems is assessed monthly.

During the implementation phase the number of installed systems (4.) is assessed monthly by counting the number of signed user agreements. Each agreement carries the name and address of the representative of the household and an identity number of the system. After implementation of all systems is complete, monitoring will take place according to point 4.

The total number of systems supplied can be counterchecked with the bill of lading from the shipment of the kits. During the implementation phase the evaluations are forwarded by e-mail to Klimaschutz e.V. for recording on a monthly basis. After implementing all systems, the evaluations are forwarded to Klimaschutz e.V. on a quarterly basis.

For the present project more detailed monitoring is additionally planned. This monitoring will be incorporated into an educational program. BPPT is responsible for the monitoring in all phases.

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[14] system = an advanced cook stove "Save 80" (8-litre version) and a heat retaining container "Wonderbox"

A detailed agreement between BPPT and Klimaschutz e.V. is drafted, outlining the responsibilities of each party. BPPT has the right to contract local partners for fulfilling parts of the monitoring activity.

BPPT cooperates with local NGOs, governmental institutions, religious institutions and village leaders.

If there are reports from one of the monitoring assistants that one or more users don't use the cook stove, BPPT will instruct (within a grace period of one month) the users to hand over the system to an interested user.

Verification of the credibility of the data takes place through the following:

Regular visits to the users and regular meetings in the communities help to obtain additional feedback about the actual usage, cooperativeness and correct recording. The visits to the users and the discussions within the communities show especially, if a stove is not used appropriately and the respective reasons for this. In the meetings these problems are confronted by solving them or possibly handing over the system to another family.

The visits to the user are intended to give the utmost assistance to the users in changing their cooking habits towards a sustainable manner. Additionally local assistance is provided to enable them to use the system for income generation. The visits to the user communities obtain filing of the following data:

1. Registered number of system and area:
2. Name of representative of household:
3. Address of household:
4. Name of monitoring agent:
5. Date/Control period:
6. System in use for more than 75% of usage (case 1)? (yes/no).
7. System in use for less than 75% but more than 25% of usage (case 2)? (yes/no):
8. System in use for less than 25% of usage (case 3)? (yes/no):
9. How much kerosene is still used per month?
10. Is the system also used to generate income and how?
11. Comments:

Comments may include reasons of non-usage, experiences, suggestions, and specific problems encountered whilst using the system. In case of times of non-use, reasons are expected to be provided.

Point 9 assists in counterchecking the percentage of use.

Regular meetings of the user community are organised, where upon users discuss their experiences.

Every year meetings/seminars or workshops are organized by the local representative of BPPT.
The following issues are included in the meetings:

- Discussion about experiences acquired whilst using the system;
- Educational sessions to demonstrate ways of saving expenses and generating income;
- Educational sessions to show new recipes for cooking;
- Individual questionnaires to further check use of the system; Questionnaires will also verify how many household representatives are present;
- Information about health consequences of interior cooking, indoor pollution and solutions.

In the implementation phase meetings take place quarterly. After the implementation phase meetings are replaced by seminars and workshops in schools or other public institutions. The frequency is adapted according to the experience acquired. As the meetings take place on a local basis, monitoring may be done in connection with these meetings.

A report of the meeting/seminar/workshop is filed, containing especially:

1. Which household representatives were present at the meeting, seminar or workshop?
1. How many participants use the system actively?
2. Identifying reasons for potential ongoing use of conventional cookers;
3. Identifying ways to switch users from using conventional cookers to the new equipment.

Coordination and responsibility of the monitoring lies within BPPT, Director Prof. Herliyani Suharta and their designee.

This governmental agency and their designees are experienced in community development, energy supply, income generation for households and general education.

BPPT or their designee transfers the data into a database. The file memos of the controlling agents are kept by BPPT. The database and following reports is submitted quarterly to Klimaschutz e.V. for data back-up and verification.

BPPT or their designee prepares an annual report. The control cards are prepared in the Indonesian language to enable the user to report correctly. The reports are in the English language.

The reports cover the following issues:

a. List of events, seminars and workshops;
b. List of monitoring assistants;
c. List of training activities;
d. Summaries of results of random checks:
   n_1: Monitored number systems according to case 1
   n_2: Monitored number systems according to case 2
   n_3: Monitored number systems according to case 3
e. n_{total}: Number of installed systems;
f. Estimated average usage hours $t_{average}$
g. Reported problems;
h. Proposed and implemented solutions.

Based on the monitoring results BPPT prepares an annual report. BPPT is also responsible for calculating the emission reduction according to the given formulae and the collected data. The final report together with the calculated emission reduced is submitted to the responsible DOE for verification.

Prompt reporting should avoid the occurrence of systematic errors.

The summary of all monitoring teams is expected to provide information for the following aspects in the monitoring report:

a) Social impacts;
b) Environmental impacts;
c) Obtained income generation for families and small scale industries;
d) Health related improvements due to switching from interior cooking with kerosene through use of the system;
e) Impact on household expenditure and usage of saved funds towards education.

Regular control by the monitoring entities verifies if the user applies the new technology. If the family does not use the system for more than one month the monitoring entity has the right to transfer the system to another family. This is formulated in the contract between the responsible user and the monitoring entity when the system is handed over.

The project intends to include religious leaders, community chiefs, governmental institutions (especially BAPPELDA the provincial environmental agency NTT) and local NGOs, who are already present at the project location. The local entities are meant to report continuously with regards to the usage of the systems and eventual problems with their usage. In case of problems BPPT in cooperation with the local entity decides which steps are to be taken to solve possible problems with regards to the acceptance of the highly efficient stoves. These local entities are continuously supported through regular demonstrations by representatives of BPPT.

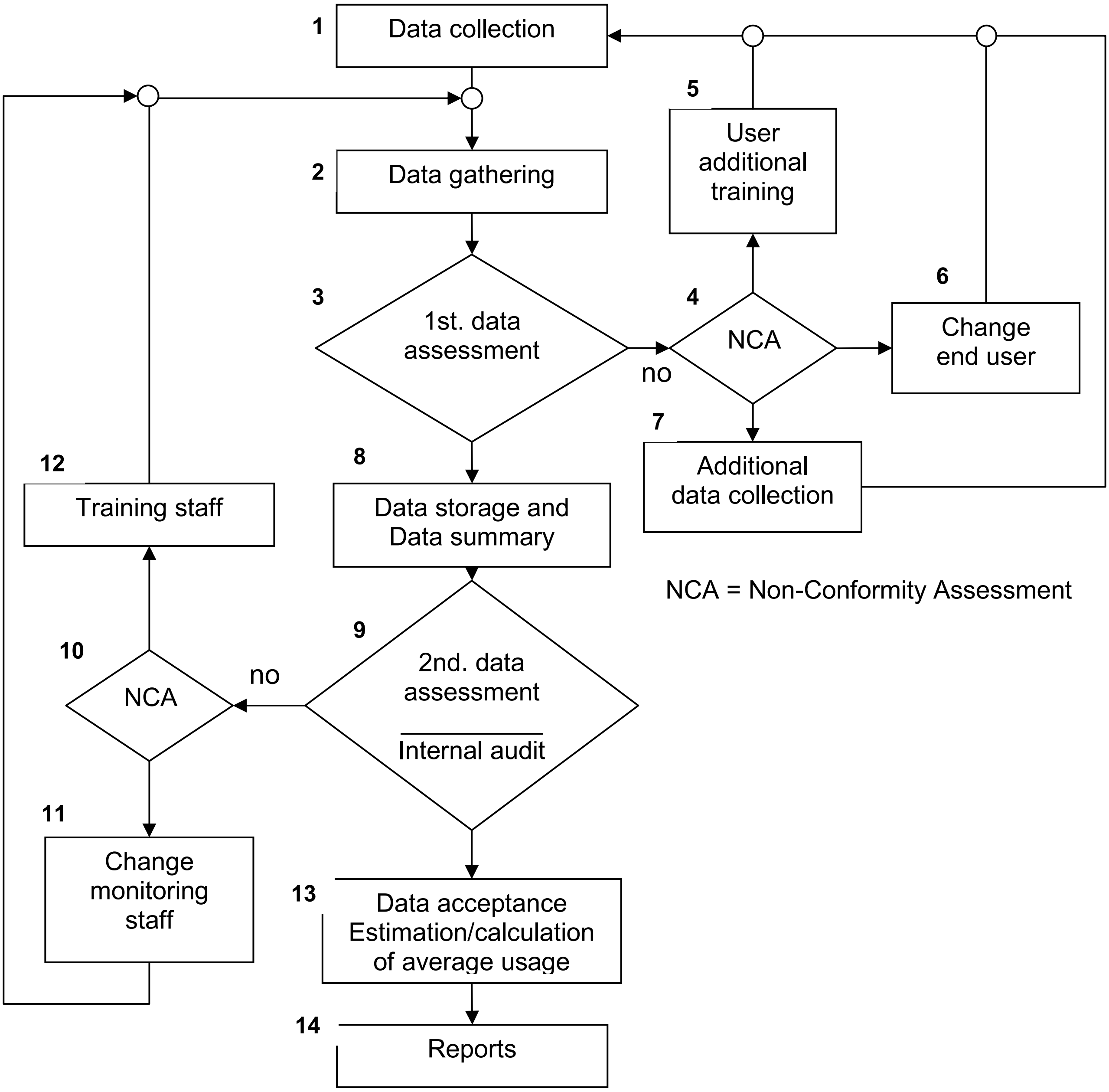
Planned measurements in case monitoring is not conducted in planned manner:

1) BPPT has full responsibility over the monitoring activity. In case one or more representative do not monitor according to the agreement, BPPT has the right to nominate a new representative.
2) Data is inconsistent: In case that verification of data proves that monitoring has not been performed according to agreement, BPPT is obliged to verify the data obtained by employees. BPPT would undertake its own representative survey.

Monitoring responsibilities:

1. Data is collected by BPPT and their designee
2. Data is gathered by BPPT and their designee
3. Data is assessed by BPPT and their designee
4. Monitoring personnel is trained by Klimaschutz e.V. or their designee
5. Change of end user is decided by BPPT or their designee
6. Data are stored by BPPT or their designee
7. Data 2nd assessment is performed by BPPT and an internal audit is done by Klimaschutz e.V. or their designee
8. Audits are done by Klimaschutz e.V. or their designee
9. Change of monitoring personal is done by Klaus Trifellner or his designee.
10. Monitoring reports are prepared by BPPT or by their designee.

Scheme of Monitoring Procedure:
(Next page)



Scope of monitoring procedure: The procedure aims to monitor and register if the system is fully, partially or not used.

There are two stages of implementation of the monitoring procedure. The first stage is an experimental stage, which will last for approximately 6 months. In the first 6 months the monitoring procedure will be implemented and involved parties will be taught all stages of monitoring. The first stage will allow for training and all necessary corrective actions to enable correct application of the monitoring procedure in the second stage.

The procedure of monitoring involves the following steps which are going to be implemented with the monitoring scheme. During the second stage of implementation of the monitoring procedure the steps will be followed.

Step **1**: (Data Collection):
To obtain viable and statistically firm data, about 10% of the systems are controlled by BPPT per year. The controlling agents transfer the monitoring data which shows if the system is used, partly used or not used. The data will then be collected and placed in a monitoring database.
The monitoring is done by unannounced visits to 10% of the users. Monitoring is intended to take place on different cook stoves each following year to ensure the monitoring of all cook stoves during 10 years. Once a year every user is visited for counting the installed systems. The quantity of cook stoves will be checked by the bill of lading of the shipping line and by the signed user agreements.

Step **2**: (Data Gathering):
After completion of data collection, the data will be transferred to a data base, which is maintained by the monitoring assistants. Each monitoring assistant has an area to monitor with a registered number of given out systems. The data will then be transferred to a book where the following data are collated and analysed:

- Name of monitoring assistant
- Area name and monitoring area number
- Number of systems implemented
- Number of systems monitored
- Number of systems used fully (more than 75%; case 1)
- Number of systems partly used (25% to 75%; case 2)
- Number of systems not used (less than 25%; case 3).

Step **3**: (First Data Assessment):
The data will be assessed. It will be controlled if the data has been transferred correctly. It will be particularly noted if the number of given out systems correlate to the initial quantities. It will be checked if monitoring is in line with the intention to monitor all the systems at least once in 10 years.

Non-Conformity Assessment (**4**):
Case 1 (**5**): The user does not use the system; then he gets additional training
Case 2 (**6**): The user does not cooperate with monitoring and he does not use the system; then the system is handed over to another user.
Case 3 (**7**): If the number of newly monitored systems is too small, additional system have to be monitored.

In case of the data being correct, the data will be forwarded to BPPT for storage.

Step **8**: After assessing the gathered data by BPPT or their designee the data will be centrally stored and summarized on a data base. After completing the data collection the data will be summarised. The results will contain the following figures:

n_1: Monitored number systems according to case 1
n_2: Monitored number systems according to case 2
n_3: Monitored number systems according to case 3
n_{total}: Number of installed systems
$t_{average:}$: Estimated/calculated average usage hours per system per year.

Step **9**: BPPT or their designee will check gathered data to see, if it is consistent. If data is consistent the data will be handed over to Klaus Trifellner or his designee for auditing purposes.

When results are satisfactory, in terms of correct reporting, data completeness and correct analysis, data will be accepted for the monitoring report.

In case

- Monitoring has not been performed satisfactorily,
- Faulty data has been stored,

- Monitoring data has been lost or
- The data summary by the monitoring entity does not reflect the results of the monitoring cards,

then Step **10** applies and Klaus Trifellner or his designee can decide to perform additional training for the monitoring personal (Step **12**) or change monitoring personal (Step **11**).

In either case data will have to be collected again. In case of major data loss or data fault, a random analysis can be undertaken by the monitoring staff and missing data can be estimated by comparing results of nearby users.

In the case that data has been accepted (Step **13**) by Klaus Trifellner and by BPPT, a monitoring report will be prepared based on collected data once a year (Step **14**).

Monitoring uncertainties:

Sources of uncertainties and corrective actions are:

a) Faulty completion of monitoring cards by monitoring staff or non cooperation of user:
   Corrective action according to the procedure
b) Faulty management of data by the monitoring personal:
   Corrective action according to the procedure
c) Data loss by loss of monitoring cards:
   Corrective action by estimating and random checks according to the procedure
d) Data loss by computer breakdown or loss of memos:
   Corrective action by estimating and random checks according to the procedure.
   Preventive action will be undertaken by monthly back up and regular forwarding of data to Klimaschutz e.V. by email.

Training of monitoring personal:

During implementation of the project the monitoring process will be implemented by Klaus Trifellner or his designee to enable the monitoring staff to perform the monitoring according to the procedure. The training of the monitoring staff will involve the following:

1. Overall understanding of the main objectives of the project
   a) Transferring cooking habits with fossil fuels to sustainable ways of cooking
   b) Health care standards
   c) Income generation
   d) Environmental education
   e) Reduction of CO_2 emissions by avoiding the use of fossil fuels in households.

2. Information about impacts of the project

3. Explanation of the importance of the monitoring of this project

4. Responsibilities within the project activity

5. Data to be monitored regularly
   n_1: Monitored number of systems according to case 1
   n_2: Monitored number of systems according to case 2
   n_3: Monitored number of systems according to case 3
   n_{total}: Number of installed systems.

6. Data to be checked by random visits
   a) Social impacts

b) Impacts on household expenditures
c) Health effects and further improvements on quality of life
d) Income generation due to project activity

7. Method of estimating/calculating average usage hours

8. Training to educate users about possibilities for income generation

9. Monitoring procedure

10. Global impact of Green House Gases

11. General understanding of CDM and the aims of CDM.

D.1. Name and reference of approved monitoring methodology applied to the small-scale project activity:

(Please refer to the UNFCCC CDM web site for the most recent version of the indicative list of small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities.)
(If a national or international monitoring standard has to be applied to monitor certain aspects of the project activity, please identify this standard and provide a reference to the source where a detailed description of the standard can be found.)

Thermal energy for the user, AMS I.C. Monitoring 9.(c)

The emission reduction per system (one highly efficient cook stove and one heat retention container) is less than 5 tonnes of CO_2 a year. The monitoring according to 9.(c) is applicable, consisting of:

i) Recording annually the number of systems operating,
ii) Estimating the annual hours of operation of an average system.

D.2. Justification of the choice of the methodology and why it is applicable to the small-scale project activity:

(Justify the choice of the monitoring methodology applicable to the project category as provided for in appendix B.)

For the purpose of transition from conventional cooking methods towards a sustainable, new technology it is essential to implement ample education. This ensures high rate of acceptance and provides detailed feedback as a verification of the monitoring.

The random monitoring counterchecked by the educational events optimises the quality of the monitoring data. Monitoring of the mentioned data ensures transparency and sufficient precision in determining the saved emissions despite the comparatively high number of involved households. The planned monitoring method will be easily carried out over a long time by local assistance and will result in precise determination of the required figures.

To obtain viable and statistically firm data, about 10% of the installed systems are monitored annually.

D.3 Data to be monitored:

ID Number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic / paper)	For how long is archived data to be kept?	Comment
1	Number of households using the system predominantly	n_1	-	m	yearly	about 10 %	paper and electronic	until 05/2019	
2	Number of households using the system together with high use of conventional cookers	n_2	-	m	yearly	about 10 %	paper and electronic	until 05/2019	
3	Number of households not using the system	n_3	-	m	yearly	about 10 %	paper and electronic	until 05/2019	
4	Total number of installed systems	n_{total}	-	m	yearly resp. monthly during installation phase	100%	paper and electronic	until 05/2019	Data measured yearly
5	estimated annual hours of operation of an average system	$t_{avarage}$	h/year	e	actualized monthly	100%	paper and electronic	until 05/2019	

D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

(Please provide contact information and indicate if the person/entity is also a project participant listed in annex 1 of this document.)

QC and QA procedures are undertaken by BPPT. It has been taken due account of comments received from local stakeholders.

D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:

BPPT has the authority over the project and they supply members of NGOs and Universities with guidelines for the monitoring activities. Klimaschutz e.V. will undertake the training of the trainees in cooperation with BPPT and will control project activities and monitoring. Klimaschutz e.V. as the project owner has final decision right and authority over BPPT in all steps of implementation and monitoring.

D.6. Name of person/entity determining the monitoring methodology:

Dr.-Ing. Dieter Seifert
Senior Engineer
E-mail: bdiv.seifert@t-online.de
in co-operation with Klimaschutz e.V.
Klimaschutz e.V is listed in annex 1; Dr. Seifert is not separately listed in annex 1 of this document.

E. Calculation of GHG emission reductions by sources

E.1. Formulae used:

E.1.1 Selected formulae as provided in appendix B:

The saved CO_2-emission m_{CO2} by a medium household through full replacement of a conventional kerosene cooker by a system working with renewable energy is 1487.5 kg CO_2/year according to equation (23c) in B.5.1.

$$m_{CO2,saved} = 1488 \text{ kg } CO_2/\text{system/year} \quad (28).$$

This CO_2-emission is saved by the system using renewable biomass instead of kerosene and by avoiding energy consumption for simmering by the heat retaining technique, if a consumption of 1.6 litres of kerosene per day is replaced.

The CO_2-emission $m_{CO2,saved}$ saved per system can be determined with equation (23b) by estimating the annual hours t_{system} of operation of system and by accounting for the efficiency $\eta_{kerosene,r}$ of an average replaced kerosene stove:

$$m_{CO2,saved} = 0.3713 \text{ kg } CO_2/\text{h}^* \, t_{system} / \eta_{kerosene,r} \quad (29).$$

From equation (29) the annual hours t_{system} are

$$t_{system} = m_{CO2,saved} * \eta_{kerosene,r} / 0.3713 \text{ kg } CO_2/\text{h} \quad (30).$$

With equation (28) and the efficiency $\eta_{kerosene,r}$ of the replaced kerosene stove from equation (16) the hours of operation corresponding to the mean consumption of 1.6 litres of kerosene per day are:

$$t_{system} = 1487.5 \text{ kg } CO_2/\text{system/year} * 0.45 / 0.3713 \text{ kg } CO_2/\text{h} = 1803 \text{ h/system/year.} \quad (30a).$$

For determining GHG emission reductions the saving of CO_2-emission by the system, consisting of a highly efficient wood stove combined with a heat retaining container, in addition following figures are distinguished for a considered month i:

- n_1 Number of monitored systems in case 1 (replacing more than 75% of the former consumption of kerosene). The calculated emission reduction by a system in case 1 is $m_{CO2,e}$
- n_2 Number of monitored systems in case 2 (replacing between 25% to 75% of the former consumption). The calculated emission reduction by a system in case 2 is 0.5 * $m_{CO2,e}$
- n_3 Number of monitored systems in case 3 (replacing less than 25% of former consumption). The calculated emission reduction by a system of case 3 is zero.
- n_{total} Total number of installed systems (systems existing in the project area in period i).

$t_{average}$ Estimated annual hours of operation of an average system

The number of monitored systems in the considered period i is

$$n_{monitored} = n_1 + n_2 + n_3 \quad (31).$$

The saved CO_2-emission $m_{CO2,saved}$(period i) by n_{total} systems in the considered period i is

$$m_{CO2,saved}(\text{period } i) = n_{total} / n_{monitored} * m_{CO2,saved} * (n_1 + 0.5 * n_2) \quad (32).$$

With data from equation (28):

$$m_{CO2,saved}(\text{year } i) = n_{total} / n_{monitored} * 1487.5 \text{ kg } CO_2\text{/hh/year} * (n_1 + 0.5 * n_2) \quad (33).$$

Method of estimation of $t_{average}$:

$$t_{average} = (n_1 + 0.5 * n_2) / n_{monitored} * t_{system} \quad (34).$$

With data from equations (29) and efficiency $\eta_{kerosene,rr}$ of the replaced kerosene stove from equation (16):

$$m_{CO2}(\text{year } i) = n_{total} * 0.3713 \text{ kg } CO_2\text{/h} / 0.45 * t_{average}$$
$$= n_{total} * 0.825\text{kg } CO_2\text{/h} * t_{average} \quad (35).$$

E.1.2 Description of formulae when not provided in appendix B:

Time is needed to install all systems. The number n_{total} will increase in this time up to the maximum of 30000. Therefore n_{total} reflects the actual number of systems in the considered period *i*.

Note: $n_1 + n_2 + n_3$ will be less than n_{total} because under normal circumstances not systems are monitored, but only a representative number $n_{monitored} = n_1 + n_2 + n_3$. Quotient $n_{total} / n_{monitored}$ in equation (32) is the factor to calculate the saving of n_{total} systems (number of all installed system at this time) from the saving of the monitored ($n_1 + n_2 + n_3$) systems.

According to equation (28) one system which substitutes a kerosene-stove saves a CO_2-emission of 1487.5 kg CO_2/system/year:

$$m_{CO2}(case1) = 1487.5 \text{ kg } CO_2\text{/system/year} \quad (36).$$

Only half of the amount will be accounted in case 2 in which the system is combined with considerable use of conventional cookers:

$$m_{CO2}(case2) = 0.5 * m_{CO2}(case1) = 743.7 \text{ kg } CO_2\text{/system/year} \quad (37).$$

The calculated emission reduction by systems of case 3 is zero.

$$m_{CO2}(case3) = 0 \quad (38).$$

Therefore the number n_1 of systems of case 1 and half of the number n_2 of systems of case 2 are added in the term of equations (32), (33) and (34).

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

>> Not applicable. GHG emissions by sources are zero.

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities

>> The energy generating equipment is not transferred from another activity and the existing equipment will not be transferred to another activity. Therefore leakage is not to be considered.

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the small-scale project activity emissions:

>> Emissions are negligible.

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities:

>> The description is given in B.5.1 and E.1.2. From table in E.2 the estimated savings add up to 446 250 eq tonnes CO_2 in 10 years.

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

>> 446 250 eq tonnes CO_2 in 10 years.

E.2 Table providing values obtained when applying formulae above:

>>

CDM COOK STOVE PROJECT Kupang 1

year	CO_2 eq. tonnes abated	Cumulative (tonnes)
2006	0	0
2007	33469	33469
2008	44625	78094
2009	44625	122719
2010	44625	167344
2011	44625	211969
2012	44625	256594
2013	44625	301219
2014	44625	345844
2015	44625	390469
2016	44625	435094
2017	11156	446250
sum	446250	

SECTION F.: Environmental impacts:

F.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

>> According to the Indonesian environmental regulations projects with a capacity exceeding 10 MW require an environmental impact assessment. Although the project has no negative environmental impact, the required impact assessment will be conducted by the respective authorities and submitted before the application of registration.

The transferred technology has a high potential for reducing GHG-emission and smoke.

One of the main positive environmental impacts of the project will be the rising awareness about environmental challenges, enabled by the transferred sustainable technology and by the accompanying educational program.

SECTION G. Stakeholders' comments:

G.1. Brief description of how comments by local stakeholders have been invited and compiled:

>> Lokal stakeholder and local institutions have been questioned about acceptance of the new technology during public demonstrations. The local government (Bupati and Governor) and the Provincial Environmental Impact Assessment Agency of NTT (BAPPELDA) are supporting the project activity. Minutes of a meeting held on 27 of September 2005 with 28 representatives of the Provincial Government of NTT and of different Governmental Departments of NTT have been signed and are available for the DOE.

G.2. Summary of the comments received:

>> Stakeholders responded without exception positive. Comments received at the meeting cited in G.1. referred to monitoring, equipment and income generation and have been considered in the project planning. Members of the Planning Department of the Province of Kupang suggested that prayer groups should be included in the monitoring activity. Additionally it was mentioned that the technology should be adapted for preparing palm sugar. Summary of questions relating to acceptance, monitoring participation and affordability resulted in: 28 from 28 questioned representatives believe that the project will be accepted by the target groups, 28 from 28 think that people will participate in monitoring and only 3 believe that the technology can be used for income generation, 1 said no and 24 doubted. Nobody thought that people would be able to buy the equipment.

G.3. Report on how due account was taken of any comments received:

>> It is planned that each prayer group nominates a representative to assist the monitoring team of BPPT.
The equipment can be adapted for preparing palm sugar.

Annex 1
CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Annex 2
INFORMATION REGARDING PUBLIC FUNDING

- - - - -

Annex 1: CONTACT INFORMATION FOR PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	BPPT
Street/P.O.Box:	Jl. MH. Thamrin, No. 8
Building:	BPPT Building
City:	Jakarta
State/Region:	Jakarta
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Public resources (ODA) are not used to finance this project.

Annex 3

List dimension units, abbreviations, synonyms and mathematical symbols (*cursive*) used in the formulae

C	carbon
case 1	system which replaces more than 75% of the former consumption of kerosene
case 2	system which partially replaces between 25% to 75% of the former consumption of kerosene
case 3	system which replaces less than 25% of former consumption of kerosene
CO_2	carbon dioxide
CO_2 eq. tonnes/system/year	weight of carbon dioxide equivalent saved per system per year
GJ	10^9 J
h	hour = 3600 s
hh	household; group using one system, e.g. family
J	Joule = W*s
K	degree Kelvin; degrees Celsius scale differences
kg	kilogram
kJ	10^3 J
kW	10^3 W = kJ/s
kt	10^6 kg
minute	60 s
MJ	10^6 J
kerosene	actually used primary liquid primary energy source (= oil/kerosene/paraffin)
period	unit of reporting time interval, normally one year
primary energy (kerosene)	energy of kerosene; mass of kerosene multiplied by $NCV_{kerosene}$
s	second
system	a highly efficient cook stove Save80® (8-litre-version Save80-8L) and heat retaining container Wonderbox®
t	metric ton = 1000 kg
Tt	10^{12} t
TJ	10^{12} J
year	calculated with 365 days
W	Watt = J/s

$CEF_{kerosene}$	Carbon Emission Factor of kerosene	t C/TJ
$E_{calculated}$	calculated primary energy consumed per household	MJ/hh/day
$E_{kerosene}$	primary energy consumed per household with conventional cooker	MJ/hh/day
E_{capita}	primary energy consumed per person with conventional cooker	MJ/capita/day
E_{eff}	effective energy delivered per conventional cooker	MJ/day
$E_{eff,kerosene}$	effective energy delivered per conventional cooker	MJ/day
m	mass	kg
m_C	C-mass emitted annually by a conventional cooker	kg C/year
m_{CO2}	CO_2-mass emitted annually by a conventional cooker	kg CO_2/year
$m_{CO2,saved}$	equivalent CO_2-mass-emission saved annually by one system replacing a conventional cooker in a medium household	kg CO_2/year
$m_{CO2}(year\ i)$	CO_2-emission saved by the project in year i	kg CO_2/year
$m_{CO2}(case1)$	CO_2-emission saved by one system in case 1	kg CO_2/period
$m_{CO2}(case2)$	CO_2-emission saved by one system in case 2	kg CO_2/period
$m_{CO2}(case3)$	CO_2-emission saved by one system in case 3	kg CO_2/period
$m_{CO2}(period)$	CO_2-mass-emission saved by the project in the period	kg CO_2/period

$m_{kerosene}$	mean consumption of oil/kerosene/paraffin by a household	kg /year
M_{CO2}/M_C	Molecular weight ratio CO_2/C	kg CO_2/kg C
$n_{monitored}$	number of monitored systems	
n_1	monitored number of systems according to case 1	
n_2	monitored number of systems according to case 2	
n_3	monitored number of systems according to case 3	
n_{total}	total number of systems	
$NCV_{kerosene}$	Net Calorific Value of kerosene	MJ/kg
P_{system}	nominal effective power of the system	kW
$P_{kerosene}$	nominal effective power of conventional cooker	kW
t_{system}	operating time of system for delivering E_{eff}	h/day
$t_{kerosene}$	mean operating time of conventional cooker	h/day
$V_{kerosene}$	consumption (Volume) of kerosene per household with conventional cooker	litre/day
$\rho_{kerosene}$	density of kerosene	kg/litre

Annex 4

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