

MONITORING REPORT FORM (CDM-MR) *
Version 01 - in effect as of: 28/09/2010

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* as contained within the document entitled "Guidelines for completing the monitoring report form (CDM-MR)" (EB 54 meeting report, annex 34).

MONITORING REPORT
version 3.1, 22 September 2011

ADES Solar and efficient stoves in Southwest Madagascar
GS 464
monitoring period 2 (23/12/2009 - 31/12/2010)

SECTION A. General description of the project activity

A.1. Brief description of the project activity:

>> 1. The objective of this project is to locally produce and distribute solar and efficient cook stoves to people in Southwest Madagascar. The Swiss-Madagascan non-governmental organization ADES (Association pour le Développement de l'Energie Solaire) has increased its capacities since the project start in 2007 and today operates four cook-stove workshops in Tuléar, Ejeda, Morondava and Morombe. In order to create awareness for new stove technologies and to convince people to buy a new stove, cooking demonstrations in villages and schools as well as training programs for solar cooking are conducted.

2. Installed technologies are locally produced solar and efficient cook stoves. Four stove types are currently being disseminated: (1) solar box stove, (2) solar parabolic stove, (3) efficient wood stove Oli-B, and (4) efficient charcoal stoves Oli-C.

3. Relevant dates:

Start date of the project: 27 August 2007

Start date of crediting period: 01 January 2008

Date of first stove sale: 04 January 2008

First monitoring period: 04 January 2008¹ – 22 December 2009

Project is in continuous operation.

4. Total emission reductions achieved in this monitoring period are **8,343 tCO₂e**

A.2. Project Participants

>>

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Madagascar (Host)	Private Entity - ADES – Association pour le Développement de l'Energie Solaire	No
Switzerland (Annex 1)	Private Entity - Foundation myclimate - the Climate Protection Partnership	No

A.3. Location of the project activity:

>> Country: Republic of Madagascar

¹ Upon request by the Gold Standard during first issuance the start of the first monitoring period was set to be the date of first stove construction and not the start date of the crediting period as defined in the PDD.

Regions: Menabe, Atsimo-Andrefana, Androy, Anosy, Melaky and Boeny.

Town/cities, where production and distribution centres are located:

- Toliara (Tuléar): 23°21'S, 43°40'E
- Ejeda: 24°21'S, 44°31'E
- Morondava: 20°17'5"S, 44°19'3"E
- Morombe: 21°44'56"S, 43°21'47"E

A.4. Technical description of the project

>> The project currently produces and disseminates four types of stoves.

1. Solar box stove

The box type solar stove is an easily built, insulated box. Due to incident solar radiation temperatures up to 150° C can be generated in the box which is sufficient to cook almost all meals: rice, manioc, mais, potatoes, vegetables, meat and fish. Also, bread and cakes can be baked and medical tools or water can be sterilised. The box solar stove is produced in the ADES workshops in Madagascar.



Solar box stove

2. Solar parabolic stove

The parabolic solar stove is using a parabolic mirror. In the focus point of the mirror there is a device where the cooking pot can be put. The parabolic mirror gathers the sun rays and this process leads to high temperatures at the focal point. These temperatures are high enough to cook, bake, grill and even fry. The cooker can also be used to sterilize medical tools. The parabolic mirror is made of weather-proof shining aluminium and the base frame is made of zinc-coated steel (galvanised). The material for the mirror of parabolic solar cooker comes from Europe. The mirror parts and the frame of the stove are fabricated in Madagascar. ADES then assembles the parabolic solar stove in its workshops. The temperatures in the focus point of a parabolic-solar cooker are higher than the temperatures in the interior of the solar cooking box, which leads to a faster cooking process. The parabolic-solar cooker and the solar cooker box can be used in a complimentary manner.



Solar parabolic stove

3. Efficient wood stove Oli-B

In May 2010 a new model of an efficient wood stove called „Oli-B“ was launched. ADES locally produces this efficient rocket stove in its workshop in Southwest Madagascar (see pictures below). A New-Stove Kitchen Test for the “Oli-B”-stoves was conducted in July/August/September 2010 in order to determine fuel savings for this new stove model. The results of the New-Stove Kitchen Test allow including this new stove model in the existing wood cluster.



New stove model: efficient wood stove “Oli-B” and its individual parts

4. Efficient charcoal stove Oli-C

In December 2010 also a new charcoal stove called “Oli-C” was introduced. ADES locally produces this efficient rocket stove in its workshop in Southwest Madagascar (see pictures below). For the new charcoal stove the New-Stove Kitchen Test will be conducted in 2011. Emission reductions from this stove type are therefore not yet counted for this monitoring period.



New stove model: efficient charcoal stove “Oli-C” and its individual parts

A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:

>> The approved monitoring methodology applied to the project activity is included in the Gold Standard methodology for Improved Cook-stoves and Kitchen Regimes V.01.
http://www.cdmgoldstandard.org/fileadmin/editors/files/6_GS_technical_docs/manuals_and_methodologies/GS_Methodology_Cookstove.pdf

A.6. Registration date of the project activity:

>> 23 December 2009

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

>> The start of the crediting period was on 01 January 2008.

A crediting period of 7 years with the option of renewal is chosen for the project activity

A.8. Name of responsible person(s)/entity(ies):

>>
 Tobias Hoeck, myclimate
tobias.hoeck@myclimate.org

Hans Peter Frei, ADES
hanspeter.frei@bluemail.ch

SECTION B. Implementation of the project activity

B.1. Implementation status of the project activity

>>

1. Starting date of operation

Start date of project activity (workshops in Tuléar and Ejeda in operation): 27 August 2007

Opening of workshop in Morondava: May 2008

Opening of workshop in Morombe: October 2010

Production start of Oli-B stoves: May 2010

Production start of Oli-C stoves: December 2010

2. Actual operation:

The last years were difficult times for Madagascar. Three events hit Madagascar and its population very hard: the global economic crisis starting in 2008; the political crisis starting in early 2009; and severe droughts in 2009 in the already arid South of Madagascar. In addition to the political crisis, also the global economic crisis and droughts and cyclones showed their impact on the economy and the population. The country and its population have not yet recovered from these events. Under such economic and political conditions it is very challenging to convince people to invest in new stove technologies. However, also during these difficult times ADES continued stove production and promotion in Madagascar and continuously expanded its activities.

Total stove sales since project start:

Year	Stove type:					not counted	wood cluster	charcoal cluster
	Stove type: solar box	Stove type: solar parabolic	Stove type: Oli-B	Stove type: Oli-C	Stove type: Yoyo			
2008	1459	67	0	0	117	225	1008	635
2009	621	14	1	0	0	59	205	431
2010	1464	26	615	168	0	438	991	1282
Total	3544	107	616	168	117	722	2204	2348

Comment: Please note that the above table includes also stoves that are not counted for emission reduction calculations. Moreover, secondary stoves are listed under the year the first stove was purchased. Emissions reductions are not claimed for secondary stoves.

In the year 2010 there are especially the following activities to be highlighted:

1. After a two-years development phase new stove models for the efficient stove could be officially launched in 2010: the new efficient wood stove is called “Oli-B” and was launched in May 2010 and the new efficient charcoal stove is called “Oli-C” and was launched in December 2010. ADES thus now promotes four different types of stoves (solar box, solar parabolic, Oli-B, and Oli-C).

Both efficient rocket stove models consist of a clay core and a metal liner. In the region of Tuléar no adequate source of clay could be found. Therefore, a craftsman in Fianarantsoa in the central highlands was assigned with the production of the clay core. In order to increase production capacities to about 500 pieces per month a new workshop was established, which was officially opened in July 2011. The aluminum top of the Oli-B stove is also produced in a small family workshop located in Ambatolampy in the highland area. In this way, ADES promotes many new jobs. In Tuléar a metal workshop was established to manufacture the other metal parts of the efficient stove models.

2. Besides the existing production and distribution centers in Tuléar, Ejeda and Morondava a fourth ADES center was opened in Morombe located north of Tuléar in October 2010.

ADES has been working together with another organization called Bleu Ventures since 2007 and thus decided in 2008 to establish a branch office in Andavadoaka, where Blue Ventures is located to promote conservation activities for the local coral reefs. Due to several reasons, the location in Andavadoaka did not fulfill the expectations; Andavadoaka is very remote, communication was only possible via satellite and it could thus not be managed in an optimal way. In the fall of 2009, ADES decided to close the branch in Andavadoaka and to open a new and better-equipped centre in Morombe, the district capital located 45 km to the North. The centre in Morombe was officially opened in October 2010.

3. ADES Madagascar school program

ADES already planned for some time to establish a program for environmental education in schools. Support for the team in Tuléar to accomplish this task came from a Swiss teacher. After analyzing the state of environmental education in the school, four lessons were elaborated for a pilot program to be tested in three schools in 2011. The school authority is very happy about such efforts and is fully supporting ADES in this regard. ADES will also try to include the content of these lessons in advanced teacher trainings. Furthermore, ADES would like to invite schools to motivate school children to plant a tree and take care of it, since responsible children today will take care of the environment of tomorrow.

4. Solar stove for schools

The development phase for solar cook stoves for schools could be successfully completed in 2010. During excessive tests the best model out of four prototypes could be selected. In a first step the school solar stove will be further tested in a pilot with 10 stoves in two schools in order to gain practical experiences with this “cantine scolaire”. The school solar stove is larger and more robust than the solar stove for households.

5. New CO2 Manager in Madagascar

The former CO2 Manager in Madagascar Dorissah Ramiandrisoa has taken up a new job end of 2009 due to private reasons. This vacancy was filled with Andriamfidy Razafimanarantsoa („Fidy“) in January 2010. Fidy has extensive experiences in conducting surveys and interviews and thus brings in the necessary skills for the position of the CO2 Manager, which is responsible for monitoring activities. Fidy has been instructed by his predecessor and by Mr. Hans Peter Frei, ADES CO2 Manager in Switzerland.

3. Impact on applicability of methodology

No events occurred during this monitoring period, which impact the applicability of the monitoring methodology.

B.2. Revision of the monitoring plan

>> Upon request of the verifier the monitoring plan will be updated and submitted to the Gold Standard for approval for 3rd verification.

B.3. Request for deviation applied to this monitoring period

>> Upon request of the verifier, minor deviations from the monitoring methodology are discussed here.

Frequency of Kitchen Surveys conducted:

As can be seen in the approved monitoring plan (0910_ADES_monitoring_plan.doc), the number of kitchen surveys was defined as “at least 25 kitchen surveys for each cluster” and the frequency was defined as “Each season (Every 6 months)”. The methodology (p. 22) requests monitoring KS to be conducted each quarter (3 month period) to ensure that data is collected at all times of the year such that seasonal variation is captured. In Madagascar there are just two seasons, the rainy and dry season. Thus, KS are conducted in each season resulting in surveys 6 months. The sample size for a monitoring KS is not less than 25 customers according to the methodology (p. 22). In 2010 for the wood cluster 54 KS were conducted and for the charcoal cluster 113 KS were conducted. This is in line with the approved monitoring plan.

For future monitoring KS, a minimum sample size of 100 per year per cluster will be applied for better representativeness of these surveys. The monitoring plan will be adapted to include “at least 50 kitchen surveys for each cluster shall be conducted each season (every 6 months)” resulting in at least 100 kitchen surveys per cluster per year.

Sampling procedure:

The applied methodology requires a random sampling of households from the sales record. There are many approaches possible for random sampling. This project applies for the monitoring activities a combined approach of geographical cluster sampling with a multi-stage sampling as per CDM guidelines for sampling and surveys.

Clustered sampling refers to a technique where the population is divided into sub-groups (clusters) and the sub-groups are sampled, rather than the individual elements to be studied. In this technique the total population is divided into sub-groups, and a sample of groups is selected. One version of clustered sampling is area sampling or geographical cluster sampling.

In contrast to pure cluster sampling where all of the elements of the sub-units are measured, multi-stage sampling collects data only for a sample of the sub-units. Multi-stage sampling can be extended further to three or more stages.

The chosen sampling approach is applied in practical terms as follows: The project area is divided into several monitoring regions, which again are sub-divided into several monitoring sectors. Thus, each customer belongs to a specific monitoring region and sector. Moreover, each customer belongs to one of

the two clusters defined for this project (wood or charcoal users). For a survey or test for example two monitoring regions are randomly selected and from each monitoring region one or two sectors are again randomly selected (applying in Excel the formula “RAND BETWEEN (x;y). In the selected monitoring sectors a sample of the population is surveyed. For this the Total Sales Record is filtered to display all stove users from the identified monitoring sector. Random sampling of the individual stove users in the selected monitoring sector is done by randomly defining (applying the method of drawing) the starting point for the survey: This means if the survey starts investigating from the North, the East, the South, the West or in the center of the sector. The survey starts from the identified starting point with a list of all households in the respective sector, visiting stove users until the requested number has been surveyed. The ADES team of the corresponding monitoring region assists the monitoring coordinator in finding the households from the list. In case a home is closed (stove user is not at home), the monitoring team proceeds to the closest household nearby from the list. In case a project stove is not in use, this is recorded in the monitoring documents. The survey is conducted until the required sample size has been reached (including households with stoves not in use).

This approach guarantees random sampling and supports geographical representativeness in the project area. For the Usage Survey this sampling approach might not be ideal to define the drop-off rate, since it might lead to underrepresentation of households with stoves not in use. A more appropriate sampling approach for the Usage Survey will be applied in the future.

The sampling procedure for each monitoring activity is in details described in the monitoring manual.

Monitoring set-up and responsibilities:

For practical reasons, the organizational set-up of the monitoring system has been amended (see MR Section C or monitoring manual) compared to the set-up defined in the monitoring plan from 2009 (see monitoring plan). The monitoring plan will be updated to include the revised set-up.

The monitoring set-up as described in the monitoring plan has not been implemented due to practical reasons considering the current project size. The project is still small and monitoring activities are conducted by a single monitoring manager CO2 in Madagascar, and not by monitoring teams at each center. The introduction of several monitoring teams does not make sense at the current project stage. The monitoring manager CO2 personally conducts all monitoring activities. He is accompanied by staff from the different centers to allow for better orientation in the region. This procedure guarantees coherent data generation and interpretation of monitoring results.

Since spring 2011, an additional person (Mr. Joseph) is employed in Tuléar to support the administrative work related to monitoring activities (sales reports). This new position is also seen as a back up to always ensure continuous operation of monitoring activities.

Education / training of monitoring staff:

Due to the amended monitoring set-up, the training of monitoring staff has also been adapted. In the monitoring plan a three-day training program was foreseen as well as annual refreshment courses. The Monitoring Manager CO2 Madagascar was trained during more than three weeks by his predecessor (Mr. Ramiandrisoa) and by the Monitoring Manager CO2 Switzerland (Mr. Frei). The current Monitoring Manager CO2 Madagascar is well qualified to conduct all monitoring activities. Based on generated monitoring data, insights from data analysis by myclimate as well as feedback from verifiers during verification, the monitoring system is continuously improved. This process gives the Monitoring Manager CO2 Madagascar valuable experience and allows him to further improve his skills for monitoring to ensure data quality and coherent results. The Monitoring Manager CO2 Switzerland makes annual visits for the preparation of the external audits. This gives the monitoring managers the possibility to thoroughly discuss, reassess and refresh applied monitoring activities on an annual basis. The education of further monitoring personnel as per monitoring plan depends on whether there is a need for further monitoring staff as the project grows. At the moment an evaluation is being conducted for a general IT solution for this project. One component of this system would also be a database for monitoring data logging and analysis. However, a potential implementation of this system can be expected earliest in 2012.

Calculation of emission reductions:

Emission reductions are calculated following the approach for paired sample kitchen tests as outlined in the applied methodology. However in the PDD the formulae were not documented in details to reflect

this approach, where ER are calculated for a single kitchen. The MR and project database have been updated including further explanation.

Location of production and distribution centres:

In the PDD on page 10 it is stated: “The production and distribution centres for solar and efficient stoves are located in Tuléar (already operating), Ejeda (already operating), Morondava (already operating), and Ambovomb (to be opened in summer 2009)”. The centres in Tuléar, Ejeda, and Morondava are in operation, whereas the centre in Ambovomb has not been established. Instead, the fourth centre was opened in Morombe. This was done for several reasons, such as effectiveness of the project activities and possibilities for implementation considering political and financial aspects.

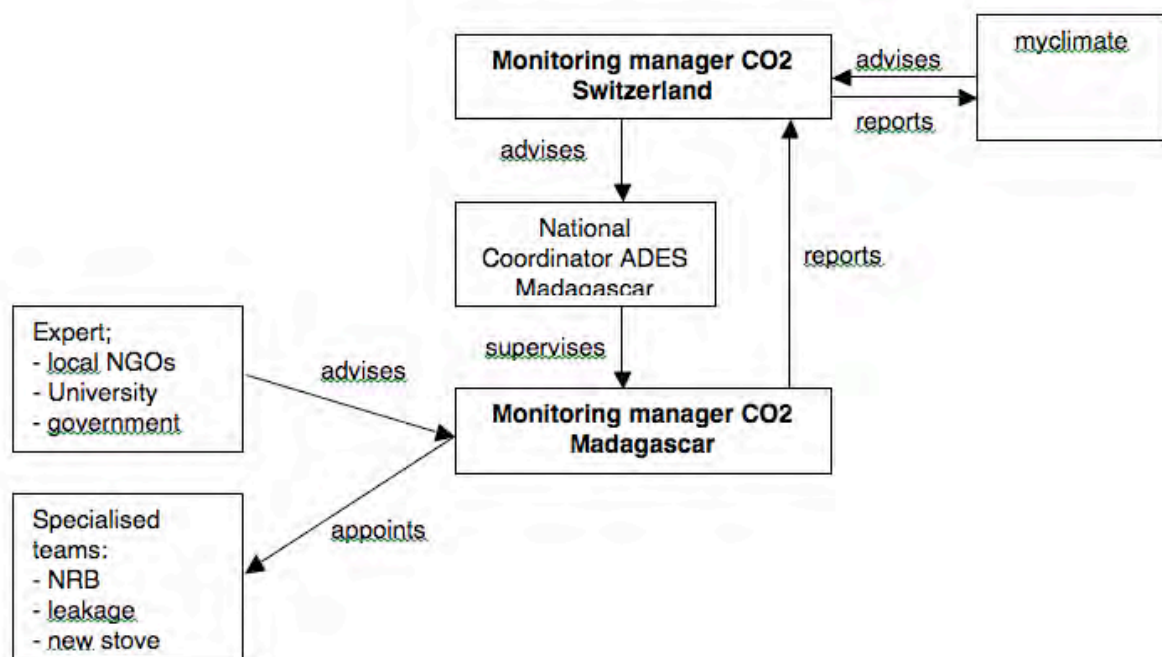
B.4. Notification or request of approval of changes

>> Upon request of the verifier the monitoring plan will be updated and submitted to the Gold Standard for approval for 3rd verification.

SECTION C. Description of the monitoring system

>> A description of the monitoring system (organizational structure, responsibilities of personnel etc.) can be found in the latest monitoring manual V04 provided as a separate document.

Monitoring set-up:



Personnel & Qualifications:

Monitoring Manager CO2 Switzerland:

Mr. Hans Peter Frei, Engineer HTL, Auditor: ISO 9001: 2008 & ISO 14000

Monitoring Manager CO2 Madagascar:

Mr. Andriamfidy Razafimanarantsoa („Fidy“), University degree, long-term professional experience in surveys, interviews, data collection and analysis of results. Received training from predecessor Mr. Dorissah Ramiandrisoa and from Mr. Frei from 5.3. - 30.3.2010.

Responsibilities and quality assurance:

A monitoring manual has been compiled, where all necessary steps and procedures (organization, responsibilities, and tasks) are described in details for all monitoring activities. This manual is applied for all activities conducted from 2010 on and allows for quality assurance at the different levels. The ADES monitoring manager CO2 in Madagascar is responsible for all monitoring activities in the entire project area and is not involved in sales activities to guarantee an independent appraisal. For Kitchen Surveys, Kitchen Tests and other surveys paper records are kept with the ADES monitoring manager CO2 in Tuléar, Madagascar. Surveys are conducted by the monitoring manager CO2 in collaboration with a representative from the corresponding production center. The monitoring manager CO2 conducts household visits, fills in the questionnaires and transforms paper data into electronic data. The electronic data from the monitoring activities is then submitted to the ADES monitoring manager CO2 in Switzerland, where it is checked on its accuracy and consistency. Final check and statistical analysis of the monitoring data is conducted by myclimate.

This organizational separation of data generation and data analysis combined with a two level data check guarantees for accurate and consistent results. The Project Database and the Customer Database are compiled and managed by myclimate.

The monitoring manager CO2 Madagascar conducts plausibility checks during data generation and preparation. Results that cannot be reconstructed are not considered and if required additional surveys or tests are conducted. Moreover, the monitoring manager CO2 Madagascar crosschecks data (especially sales reports) with other data available at the different production and distribution centers during monitoring visits. Delivery and stock lists for materials used also help to verify sales figures.

Monitoring and sales data is transferred to the monitoring manager CO2 Switzerland, who is also the responsible person for logistics. He thus can compare figures of delivered materials with the number of stoves sold. Final plausibility check is conducted during data analysis at myclimate.

All stove sales are carefully documented and recorded in the Total Sales Record, an Excel-file that is managed by the manager CO2 Madagascar at the ADES production center in Tuléar. The manager CO2 Madagascar is responsible for all monitoring activities in Madagascar. ADES has four stove production/distribution centers in Tuléar, Ejeda, Morondava, and Morombe from where also the sale of stoves is promoted. A stove passport (containing information such as stove number, date of sale, name of stove buyer) created for every stove sold is kept as paper record at the corresponding stove production center. Further, sales records are compiled in electronic format at every production center and reported to the manager CO2 Madagascar in Tuléar on a weekly basis. In Tuléar the sales records from the different production centers are checked and compiled in the Total Sales Record of the project activity. During monitoring activities the manager CO2 Madagascar checks stove sales in the production/distribution centers and compares paper records with electronic sales records. The Total Sales Record is submitted to the manager CO2 Switzerland, where data is checked on its accuracy and consistency. For final check and for statistical analysis, the Total Sales Record is submitted to myclimate.

Furthermore, also stoves sold to other organizations or sold outside of the project area are listed in the sales record and marked accordingly with “not counted”. For these stoves no emission reductions are counted (see Project Database). This careful tracking of stove sales is a strict measure to avoid double counting.

Initially, the numbering of stoves was done in every production/distribution center separately starting with the number one. In 2009 the production center in Tuléar was closed for some months and thus stoves produced in Ejeda were transported to Tuléar for sale. In order to allow for traceability in the production process, these stoves received a different stove number starting with an “E” (for Ejeda) followed by the actual stove number. In order to avoid confusion, from 2010 on all stoves are numbered according to the new numbering system always indicating the stoves’ production/distribution center with the Initials such as “T” for Tuléar, “E” for Ejeda, “M” for Morondava and “MB” for Morombe. The new efficient wood and charcoal stoves are manufactured in Tuléar and are numbered starting with the initials of the stove type Oli-B (B for Bois, which means wood in French) followed by a number, and Oli-C (C for Charbon, which means charcoal in French) followed by a number.

From 2010 on a certified independent auditor from Antanarivo, Madagascar, verifies the Sales Record together with the financial audit of ADES Madagascar. This allows for crosschecking stove sales from a financial point of view.

In the future it is also foreseen to replace the Excel-file used for the Sales Record with a database and customer relationship management system (CRM).

SECTION D. Data and parameters

D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors

Data / Parameter:	EF _{bl.bio,co2}
Data unit:	tCO ₂ /t biomass
Description:	CO ₂ emission factor arising from use of wood-fuel in baseline scenario
Source of data used:	Default IPCC values for wood / wood waste are applied Default IPCC values for charcoal are applied 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Tables 1.2/1.4
Value(s) :	1.7472 tCO ₂ /t wood (=112.0 tCO ₂ /TJ * 0.0156 TJ/ t) 3.3040 tCO ₂ /t charcoal (=112.0 tCO ₂ /TJ * 0.0295 TJ/ t)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emissions calculation
Additional comment:	See project database, spreadsheet “ER_per_stove”

Data / Parameter:	EF _{pj.bio,co2}
Data unit:	tCO ₂ /t biomass
Description:	CO ₂ emission factor arising from use of wood-fuel in project scenario
Source of data used:	Default IPCC values for wood / wood waste are applied Default IPCC values for charcoal are applied 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Tables 1.2/1.4
Value(s) :	1.7472 tCO ₂ /t wood (=112.0 tCO ₂ /TJ * 0.0156 TJ/ t) 3.3040 tCO ₂ /t charcoal (=112.0 tCO ₂ /TJ * 0.0295 TJ/ t)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emissions calculations
Additional comment:	See project database, spreadsheet “ER_per_stove”

Data / Parameter:	EF _{af.co2}
Data unit:	tCO ₂ /t _{fuel}
Description:	CO ₂ emission factor arising from use of alternative fuel
Source of data used:	Default IPCC values for Liquefied Petroleum Gases are applied 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Tables 1.2/1.4
Value(s) :	0.8136 tCO ₂ /t LPG (=17.2 tCO ₂ /TJ * 0.0473 TJ/ t), LPG
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emissions calculations
Additional comment:	Currently not applied

Data / Parameter:	EF _{bl.bio.non-co2}
Data unit:	tCO ₂ /t biomass
Description:	Non-CO ₂ emission factor arising from use of wood-fuel in baseline scenario
Source of data used:	Default IPCC values for CH ₄ and N ₂ O emissions for wood / wood waste are applied

	Default IPCC values for CH4 and N2O emissions for charcoal are applied The following GWP100 are applied: 21 for CH4, 310 for N2O 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 2.5
Value(s) :	0.1176 tCO2e/t wood 0.1330 tCO2e/t charcoal
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emissions calculation
Additional comment:	See project database, spreadsheet "ER_per_stove"

Data / Parameter:	EF _{pi.bio.non-co2}
Data unit:	tCO2/t_biomass
Description:	Non-CO2 emission factor arising from use of wood-fuel in project scenario
Source of data used:	Default IPCC values for CH4 and N2O emissions for wood / wood waste are applied Default IPCC values for CH4 and N2O emissions for charcoal are applied The following GWP100 are applied: 21 for CH4, 310 for N2O 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 2.5
Value(s) :	0.1176 tCO2e/t wood 0.1330 tCO2e/t charcoal
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emissions calculation
Additional comment:	See project database, spreadsheet "ER_per_stove"

Data / Parameter:	EF _{af, non-co2}
Data unit:	tCO2/t_fuel
Description:	Non-CO2 emission factor arising from use of alternative fuel
Source of data used:	Default IPCC values for CH4 and N2O emissions for Liquefied Petroleum Gases are applied The following GWP100 are applied: 21 for CH4, 310 for N2O 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 2.5
Value(s) :	0.0064 tCO2e/t LPG
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emissions calculation
Additional comment:	Currently not applied

Data / Parameter:	EF _{bio.prod.co2}
Data unit:	tCO2/t_fuel
Description:	CO2 emission factor arising from production of wood-fuel
Source of data used:	There are no IPCC default values available. Therefore, country-specific values are applied. Girard, P., Rousset, P., Vergnet, A., Rasamindisa, A., 1998. Comparing forestry wood species for the charcoal supply of Antananarivo city, Madagascar, Boiling Point, Issue 40, Household energy and health. (www.hedon.info/ComparingForestryWoodSpeciesForTheCharcoalSupplyOfAntananarivoCityMadagascar) -> Mean of mentioned emission factors

Value(s) :	3.0400 tCO ₂ e/t charcoal 0 tCO ₂ e/t wood
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline and project emissions calculation
Additional comment:	See project database, spreadsheet “ER_per_stove”

Data / Parameter:	EF _{af,prod,co2}
Data unit:	tCO ₂ /t fuel
Description:	Non-CO ₂ emission factor arising from production of alternative fuel
Source of data used:	n.a.
Value(s) :	0
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emissions calculation
Additional comment:	Currently not applied

Data / Parameter:	EF _{bio,prod,non-co2}
Data unit:	tCO ₂ /t biomass
Description:	Non-CO ₂ emission factor arising from production of wood-fuel
Source of data used:	Calculation with factor from “Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Table 1-14 on Page 1.46 of the Reference Manual)”
Value(s) :	0.6195 tCO ₂ e/t charcoal 0 tCO ₂ e/t wood Only methane emissions during charcoal production are reflected (no N ₂ O) Wood is not produced but collected.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline and project emissions calculation
Additional comment:	See project database, spreadsheet “ER_per_stove”

Data / Parameter:	EF _{af,prod,non-co2}
Data unit:	tCO ₂ /t fuel
Description:	Non-CO ₂ emission factor arising from production of alternative fuel
Source of data used:	n.a.
Value(s) :	0
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emissions calculation
Additional comment:	Currently not applied

Data / Parameter:	B _{bl,i,y}
Data unit:	t biomass/stove year
Description:	Mass of woody biomass combusted in the baseline in year y
Source of data used:	Kitchen Test
Value(s) :	Wood cluster: 6.642 t wood/stove year Charcoal cluster: 1.909 t charcoal /stove year
Indicate what the data are	Baseline emissions calculation

used for (Baseline/ Project/ Leakage emission calculations)	
Additional comment:	Fixed baseline applied

Data / Parameter:	$\Delta B_{90\%}$
Data unit:	t biomass/stove year
Description:	Lower bound of the 90% confidence interval of woody biomass savings per stove year
Source of data used:	Kitchen Test 2008
Value(s) :	Wood cluster: 3.1030 t wood/stove year Charcoal cluster: 0.9021 t charcoal /stove year
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline and project emissions calculation
Additional comment:	Fixed baseline applied

References:

- Registered PDD V05: 0912_ADES_GS_VER_PDD_v5.pdf, pp. 51-53
- Project database: 1109_ADES_project_database_08_09_10_V03.xlsx

D.2. Data and parameters monitored

>> Since a fixed baseline is applied only project parameters but no baseline parameters are monitored.

Data / Parameter:	Total Sales Record
Data unit:	Number of stoves sold
Description:	Number of stoves sold per cluster
Measured /Calculated /Default:	Measured
Source of data:	ADES sales record
Value(s) of monitored parameter:	See table below
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Calculation of stove years
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	n.a.
Measuring/ Reading/ Recording frequency:	Continuously
Calculation method (if applicable):	The Total Sales Record is continuously populated with all sales of all stove types since the crediting start date 01.01.2008. The Total Sales Record for this monitoring period contains sales from 04 January 2008 to 31 December 2010.
QA/QC procedures applied:	Third party financial audit of stove sales activities

Stoves counted for emission reductions:

Year	Stove type:					wood cluster	charcoal cluster
	solar box	solar parabolic	Oli-B	Oli-C	Yoyo		
2008	1365	53	0	0	0	803	615
2009	564	12	0	0	0	204	373
2010	1247	16	442	0	0	770	1065
Total	3176	81	442	0	0	1777	2053

Stoves not counted for emission reductions:

In the total sales record a total of 722 solar and efficient stoves are not counted for emission reduction calculations for this monitoring period. There are several reasons, why stoves are not counted:

Reasons why stoves are not counted	Number of stoves
1) The stove is sold to another organization called Blue Ventures: avoidance of double counting	269
2) The stove is sold outside the project area: not eligible sales	128
3) The stove is used in an institution: no domestic use	3
4) The stove model has expired: yoyo stoves are no more counted	18
5) The kitchen test for a new stove model has not yet been completed: for Oli-C stoves	168
6) A household has more than one solar or efficient stove; or the kitchen tests for the combined application of solar and efficient stove (solar+Oli-B or solar+Oli-C) has not yet been completed: only the first stove is counted	136
Total	722

References:

- Project Database: 1109_ADES_project_database_08_09_10_V03.xlsx

Data / Parameter:	1) $X_{nrB,pj,y}$
Data unit:	Fraction
Description:	Non-renewability of woody biomass fuel in the project in year y
Measured /Calculated /Default:	Calculated
Source of data:	Study
Value(s) of monitored parameter:	49.26%
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emissions and project emissions calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	n.a.
Measuring/ Reading/ Recording frequency:	Every two years Assessment of NRB-fraction was done for the PDD and revised and re-assessed during validation and registration in late 2009. This parameter is recorded every two years. Thus, a re-assessment is due in 2011.
Calculation method (if applicable):	$f_{NRB} = (NRB/H)$, whereas $NRB = H - MAI$
QA/QC procedures applied:	

Data / Parameter:	2) $B_{pi,i,y}$
Data unit:	t biomass/stove year
Description:	Mass of woody biomass combusted in the project in year y
Measured /Calculated /Default:	Measured
Source of data:	Kitchen Test
Value(s) of monitored parameter:	Wood cluster: 3.188 t wood/stove year Charcoal cluster: 0.929 t charcoal /stove year
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emissions calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Calibrated balance
Measuring/ Reading/ Recording frequency:	If needed, every two years Repetition of the Kitchen Test in order to control fuel savings is conducted in case Kitchen Surveys reveal that parameters of the type measured by the Kitchen Test may have changed significantly. This parameter is not updated, but adjustment factors are applied for stove aging and stove usage.
Calculation method (if applicable):	n.a.
QA/QC procedures applied:	Calibrated measuring equipment and random sampling of cluster population

Data / Parameter:	3) $AF_{pi,i,y}$
Data unit:	t fuel /stove year
Description:	Mass of alternative fuel i combusted in the project in year y
Measured /Calculated /Default:	Measured
Source of data:	Kitchen Test
Value(s) of monitored parameter:	n.a.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emissions calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Calibrated balance
Measuring/ Reading/ Recording frequency:	If needed, every two years This parameter is assessed with the help of a Kitchen Test in case Kitchen Surveys reveal the use of alternative fuels. Kitchen Surveys conducted in 2010 did not provide any indication for the use of alternative fuels, thus there is no need to conduct a Kitchen Test to measure this parameter.

Calculation method (if applicable):	n.a.
QA/QC procedures applied:	Calibrated measuring equipment and random sampling of cluster population

Data / Parameter:	4) Usage_{z,y}
Data unit:	Fraction
Description:	Percentage of stoves of age z remaining in use in year y
Measured /Calculated /Default:	Calculated
Source of data:	Usage survey
Value(s) of monitored parameter:	See below
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline and project emissions
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	n.a.
Measuring/ Reading/ Recording frequency:	Every two years
Calculation method (if applicable):	Survey of stoves sold in the first year in order to establish the drop-off rate in stove usage over time.
QA/QC procedures applied:	Random sampling of cluster population

This parameter is monitored every two years with Usage Surveys of stoves sold in the year 2008 in order to establish the drop-off rate in stove usage over time. A Stove Usage Kitchen Survey was conducted in 2010 and revealed the following results (for details please see the Usage Survey Report 2010). The drop-off rate for stoves that are already 2 years in operation is 4.2%. This results in an annual drop-off rate of 2.1%. In the PDD a very conservative estimate of 10% annual drop-off rate was assumed. In order to follow a conservative approach for the calculation of emission reductions the drop-off rate from the PDD is applied.

The Stove Usage Survey also revealed that not all households use the stove every day. The results show that after one year in operation 2.6% of stoves are only used every second day and that 0.45% of stoves are only used once per week. This calls for an adjustment of the number of stove years for stoves being operational for more than one year. This will be considered the following way when calculating the number of stove years for every stove:

Stove application	Every 2 nd day	Once per week	Adjustment factor
First year of operation	0%	0%	1.0000
Second year of operation	2.6%	0.45%	0.9831
Third year of operation	5.2%	0.9%	0.9663
Fourth year of operation	7.8%	1.35%	0.9494

Adjustment factor to reflect frequency of stove application

For calculation of stove years a combined adjustment factor reflecting drop-off rate and frequency of stove application is used (see below).

Stove application	Drop-off rate	Frequency	Combined adjustment factor
First year of operation	1	1	1.000
Second year of operation	0.9	0.9831	0.885
Third year of operation	0.81	0.9663	0.783
Fourth year of operation	0.729	0.9494	0.692

Combined adjustment factor to reflect stove usage

References:

- Usage Survey Report 2010: 1102_ADES_usage_survey_report_2010.pdf

Data / Parameter:	5) Age_x
Data unit:	Fraction
Description:	Adjustment to values of $B_{pi,y}$ and $AF_{pi,i,y}$ for stoves of age x
Measured /Calculated /Default:	Measured
Source of data:	Aging-Stove Kitchen Test
Value(s) of monitored parameter:	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Calibrated balance
Measuring/ Reading/ Recording frequency:	Every two years
Calculation method (if applicable):	Aging-Stove Kitchen Test is undertaken for sales made in the first year to measure fuel reduction performance in successive years of stoves of Age x, Age y,...
QA/QC procedures applied:	Calibrated measuring equipment and random sampling of cluster population

The Aging-Stove Kitchen Test is conducted every two years using a questionnaire to interview households that purchased a project stove in the year 2008 (first project year) and measure fuel consumption. The results from the Aging-Stove Kitchen Test are used to determine the fuel saving performance of the stoves over successive years. This is to find out, if stoves after being in use for several years still provide the same fuel savings as in the first year (2008). The first Aging-Stove Kitchen Test was conducted in 2010.

No stove aging effect in the form of poorer stove performance leading to lower fuel savings could be determined. The Aging-Stove Kitchen Test revealed that the application of the project stove even results in higher fuel savings than determined in the previous Kitchen Tests. In order to follow a conservative approach, the fuel consumptions as stated in the PDD are used to calculate emission reductions.

References:

- Aging-Stove Kitchen Test Report 2010: 1103_ADES_Aging_KT_report_2010.pdf

Data / Parameter:	6) New Stove $B_{pi,i,y}$ and $AF_{pi,i,y}$
Data unit:	Fraction
Description:	Adjustment to values of $B_{pj,i,y}$ and $AF_{pj,i,y}$ for new stove models

Measured /Calculated /Default:	Measured
Source of data:	New-Stove Kitchen Test
Value(s) of monitored parameter:	See below
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emissions calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Calibrated balance
Measuring/ Reading/ Recording frequency:	When new stove model is introduced
Calculation method (if applicable):	A New-Stove Kitchen Test is to measure fuel consumption of new stove models and designs introduced by the project
QA/QC procedures applied:	Calibrated measuring equipment and random sampling of cluster population

A New-Stove Kitchen Test was conducted for the new efficient wood stove “Oli-B”. The Kitchen Test revealed the following figures for fuel consumption and fuel savings. Please see the New-Stove Kitchen Test Report 2010 for details.

OLI-B (Efficient wood stove)	2010 New Stove KT (Oli-B)		
	t/(year*stove)		
Mean before	6.75		
Mean after	3.25		
Mean change	3.51	paired sampling	
Standard deviation change	1.00	paired sampling	
Sample size	40		
Upper confidence limit of change 90%	3.77	107.5%	of mean
Lower confidence limit of change 90%	3.24	92.5%	of mean

Average fuel consumption and fuel savings per household for new stove type “Oli-B”.

Fuel savings from the Oli-B stove are slightly higher than the savings from the current wood cluster. Thus, Oli-B stoves are included in the existing wood cluster. It is conservative not to define any adjustment factor for B_{pj,i,y}, but to use the wood cluster’s fuel savings also for efficient Oli-B stoves

References:

- New-Stove Kitchen Test Report 2010: 1107_ADES_Oli_B_KT_report_2010_V02.pdf

Data / Parameter:	7) Similar new project activity in the project area
Data unit:	Number of new project activities
Description:	Similar new project activity in the project area
Measured /Calculated /Default:	Reported
Source of data:	Different sources
Value(s) of monitored parameter:	3 (details see below)

Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Avoid double counting
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	n.a.
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	ADES will report and monitor any similar new project activity in the project area in order to avoid double counting
QA/QC procedures applied:	n.a.

Activities by Blue Ventures:

As already reported in the first monitoring report, Blue Ventures (www.blueventures.org) is a British non-governmental marine conservation organisation that operates since 2001 an information and education centre in Andavadoaka, a fishermen settlement about 120 km north of Tuléar, in Madagascar. The main goal of this organization is conserving the coral reef in southwest Madagascar. Deforestation in the inland also poses a threat to the reef and thus needs to be combated. For this reason, Blue Ventures buys solar and efficient cook stoves from ADES and distributes them to the local population. In the year 2010 ADES has sold 42 solar box and 42 efficient stoves Oli-B to BV. Emissions reductions of these stoves are not counted for this project.

Activities by GIZ (Gesellschaft für internationale Zusammenarbeit, Deutschland):

GIZ together with local producers develops efficient stoves for charcoal consumers in the region of Tuléar. These stoves are installed in the households and thus are not portable. The stoves are also promoted for school kitchens within the activities of the UN World Food Program. As to ADES's knowledge, around 10 local producers have been trained. However, some of the producers have ceased production again. This project is so far only little known to the public and does not compete against ADES's activities. ADES is in frequent contact with the GIZ office in Tuléar. Furthermore, due to political reasons GIZ has drastically reduced its activities in Madagascar.

Activities by WWF Madagascar:

WWF Madagascar has presented the idea for a solar cook stove "plus" project in November 2010. This project aims at installing a total of 110,000 parabolic solar stoves in the next years. These solar stoves besides used for cooking will also produce electricity to charge batteries. The project's target area will be the South and West of Madagascar and thus is almost identical with the project area of the ADES project. As to ADES's view, this solar "plus" project is not yet technically developed and in the proposed way hardly feasible to be implemented. The company Homeo-Pharma was assigned to be responsible for project coordination of this solar "plus" project, which as to ADES's knowledge does not yet have experiences with solar cookers. The participation or involvement of ADES in this solar "plus" project is not yet clear.

References:

- Project Database: 1109_ADES_project_database_08_09_10_V03.xlsx
- Registered PDD V05: 0912_ADES_GS_VER_PDD_v5.pdf

Data / Parameter:	8) Incentive scheme to surrender charcoal baseline stove
Data unit:	Number of stoves sold at discount
Description:	Number of efficient charcoal stoves sold at discount
Measured /Calculated /Default:	Calculated
Source of data:	ADES financial records

Value(s) of monitored parameter:	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Leakage emissions calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	n.a.
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Number of efficient charcoal stoves (Oli-C) sold at a discount of 20% granted to households that hand in the baseline charcoal stove.
QA/QC procedures applied:	n.a.

During registration in December 2009 upon request by the Gold Standard an incentive scheme was added to the PDD on page 9, where a discount of 20% is granted to households that hand in their charcoal baseline stove in exchange for the efficient stove. As can be seen in the Total Sales Record efficient yoyo stoves have been sold only in 2008. No efficient stoves were sold after this issue was raised by the Gold Standard. A new design of the efficient charcoal stove Oli-C was launched in December 2010. These stoves are not yet counted for this monitoring period since respective New-Stove Kitchen Test has not yet been conducted. Upon request by the Gold Standard during issuance review in June/July 2011, the impact of this incentive scheme was added to the monitoring plan and will be monitored for future sales. This monitoring parameter is therefore not applicable to this monitoring period.

Data / Parameter:	9) F_{var}
Data unit:	Fraction
Description:	Adjustment factor for seasonal and weekly variation of biomass fuel consumption
Measured /Calculated /Default:	Calculated
Source of data:	Kitchen Survey
Value(s) of monitored parameter:	1. Wood cluster: 97.9% 2. Charcoal cluster: 98.9%
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline and project emission calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	n.a.
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	n.a.
QA/QC procedures applied:	n.a.

Data / Parameter:	LE_v (wood)
Data unit:	Fraction

Description:	Percentage of saved wood used for another purpose
Measured /Calculated /Default:	Calculated
Source of data:	Kitchen Survey/Leakage Survey
Value(s) of monitored parameter:	0% The Kitchen Surveys showed that 0% of households use saved wood for other purposes. The leakage survey showed that the project activity has no influence on the price or on the supply of wood fuel.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Leakage emissions calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	n.a.
Measuring/ Reading/ Recording frequency:	Every two years
Calculation method (if applicable):	Retailers on the market are asked if the supply of wood has risen in the last months or years as consequence of stove appliance
QA/QC procedures applied:	n.a.

References

- Project Database: 1109_ADES_project_database_08_09_10_V03.xlsx
- Leakage Survey Report 2010: 1102_ADES_Leakage_survey_report_2010

Data / Parameter:	LE_v (charcoal)
Data unit:	Fraction
Description:	Percentage of saved charcoal used for another purpose
Measured /Calculated /Default:	Calculated
Source of data:	Kitchen Survey/Leakage Survey
Value(s) of monitored parameter:	0% The Kitchen Surveys showed that 0% of households use saved charcoal for other purposes. The leakage survey showed that the project activity has no influence on the price or on the supply of charcoal.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Leakage emissions calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	n.a.
Measuring/ Reading/ Recording frequency:	Every two years
Calculation method (if applicable):	Retailers on the market are asked if the supply of charcoal has risen in the last months or years as consequence of stove appliance
QA/QC procedures applied:	n.a.

References

- Project Database: 1109_ADES_project_database_08_09_10_V03.xlsx
- Leakage Survey Report 2010: 1102_ADES_Leakage_survey_report_2010

Comments on leakage:

The assessment of possible leakage effects as done in the PDD (pp.24-25) is still valid. There is no indication for leakage effects.

Higher consumption outside the project boundary: As the leakage surveys revealed, the project so far has no impact on the fuel market (price or supply). The economic situation has not improved due to the difficult political situation. Neither have transport and road conditions improved. Prices for petrol have slightly increased (around 10%) and thus also the costs for transport, which again influence the prices for fuel wood.

Substitution of low-emission by high-emission stoves: The project disseminates solar (zero-emission) and efficient stove (low-emission) technologies for charcoal and wood users. There are no other more efficient cooking stoves available that are replaced by the project technologies. The economic situation has not improved and costs for fossil fuels have slightly increased. The use of cooking resources other than wood and charcoal is for normal household not affordable. There are no new appliances in the market, which would allow normal households to switch to cleaner solutions.

Reuse of traditional stoves: Since solar stoves cannot be used all the time (not at night or during bad weather) the traditional stoves remain in the households. In 2010 the project launched new stove models for efficient wood and charcoal stoves. These stoves perfectly complement the solar stoves. Thus for households having both a solar and an efficient stove, there will be no reasons for continued use of traditional stoves.

Emissions from transportation or construction of the stoves: Solar stoves production has been developed to include component groups that allow assembly of solar stoves at the point of sale in the different centers. This considerably reduces transport volume, costs and emissions. Therefore, establishing further production and distribution centers also helps to keep transportation of stoves at a minimum. The production of the clay cores for the efficient stoves is done in Fianarantsoa, from where the entire project area can be served in an optimal way. Efficient stoves are transported in reusable cardboard boxes, which allow for efficient packing and optimizing transportation.

In addition to stove production and sales, ADES discuss issues related to deforestation and excessive use of wood fuel sources with different local stakeholders. ADES is in regular contact with local authorities and organizations working within the region in order to be up to date about the energy situation and its related problems. These discussions help to detect potential leakage effects and define possible measures. Moreover, ADES tries to avoid leakage through education activities, cooperation with local administrations, and through the development of economic alternatives. ADES is further active in the development of solar stoves for schools, efficient stoves for street kitchens, and testing of biomass briquettes to substitute for charcoal. ADES is in contact with a biologist, who develops briquettes out of biomass waste such as rice husks, grass, and charcoal dust and is currently testing this product for its applicability in the efficient charcoal stoves. First results are expected by the end of the year 2011.

Although still small in scale the project is very well known and has a very good reputation in Madagascar. The demand for project's solar and efficient stove technologies also comes from outside the project area.

Sustainable Development Indicators:

Data / Parameter:	SD 1) Jobs created by ADES
Data unit:	Number of jobs
Description:	Number of jobs created by ADES in Madagascar
Measured /Calculated /Default:	Measured
Source of data:	ADES records (contracts with employees)
Value(s) of monitored parameter:	See below

Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	n.a.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	n.a.
Measuring/ Reading/ Recording frequency:	Every two years
Calculation method (if applicable):	n.a.
QA/QC procedures applied:	n.a.

Since the project start in 2007, ADES has continuously increased its activities and also the number of employees from 22 in 2007 to 53 by the end of 2010 (see Table below). ADES offers positions for a variety of qualifications: director, management, secretary, education & training, carpenter, sales animator, CO₂-monitoring, gardener, driver, guard. All positions listed below are offered to local employees. In addition to the jobs listed below, two positions at the ADES national coordination centre in Tuléar are offered to international employees.

Location	31.12.2007	31.12.2008	31.12.2009	31.12.2010
Coordination	-	5	8	11
Tuléar	15	16	15	20
Ejeda	7	8	8	9
Morondava	-	8	9	9
Andavadoaka	-	6	5	-
Morombe	-	-	-	4
Total	22	43	45	53

Number of local persons employed by ADES in Madagascar

References:

- Jobs created by ADES: ADES_employees_2010.xlsx
- ADES Monitoring Report 2008-2009: 1107_ADES_monitoring_report_0809_V5_1.pdf

Data / Parameter:	SD 2) Schools visited by ADES
Data unit:	Number of schools
Description:	Number of schools visited by ADES in Madagascar
Measured /Calculated /Default:	Measured
Source of data:	ADES records
Value(s) of monitored parameter:	See below
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	n.a.
Monitoring equipment (type,	n.a.

accuracy class, serial number, calibration frequency, date of last calibration, validity)	
Measuring/ Reading/ Recording frequency:	Every two years
Calculation method (if applicable):	n.a.
QA/QC procedures applied:	n.a.

In order to create awareness for the problem of deforestation and for new, clean and more efficient stove technologies cooking demonstrations and animations in schools are performed. In the year 2010 a total of 66 schools were visited and 3,585 pupils and teachers were reached.

Location	Number of schools visited	Number of attendees
Tuléar	43	1,168
Ejeda	n.a.	n.a.
Morondava	20	1,457
Morombe	3	960
Total	66	3,585

Number of schools visited and number of people reached by these activities in 2010

References:

– - Schools visited by ADES: 1104_list_schools_visited_2010.xls.x

Data / Parameter:	SD 3) Expenses for wood and charcoal
Data unit:	Hours or Ariary (local currency)/month
Description:	Time or money households spend on fuel acquisition
Measured /Calculated /Default:	Measured
Source of data:	Kitchen surveys
Value(s) of monitored parameter:	See below
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	n.a.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	n.a.
Measuring/ Reading/ Recording frequency:	Every two years
Calculation method (if applicable):	n.a.
QA/QC procedures applied:	n.a.

Charcoal cluster

From the Kitchen Surveys conducted in 2010 we know that all households purchase charcoal and that on average they spend now using the project stove between 9,827 and 19,544 Ariary per month (approximately EUR 3.50 - 7.00). Conservatively estimated a household spends around 117,924 Ariary

per year (EUR 42) on charcoal. From the Kitchen Tests we know that a household using a project stove reduces its charcoal consumption by 47.2%. Therefore, the expenses for charcoal prior to the project can be estimated to be 223,340 Ariary per year (EUR 80; $117,924/(100\%-47.2\%)*100\%$). A household thus annually saves around 105,417 Ariary (EUR 37) due to the fuel savings from the project stove.

Wood cluster

The Kitchen Surveys showed that the majority of households collect fuelwood. Only 11.5% of households interviewed in the rainy season stated to purchase wood. On average households spend between 14.3 and 15.1 hours per months on wood collection. Households that purchase fuel wood spend on average around 18,667 Ariary per months (around EUR 6.80).

References:

- Kitchen Survey Report 2010: 1103_ADES_Kitchen_survey_report_2010.pdf

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

>> The general formula for calculating baseline emissions is

$$\begin{aligned} BE_y = & X_{nr,b,y} * B_{bl,y} * EF_{bl,bio,CO_2} + \sum (AF_{bl,i,y} * EF_{af,CO_2,i}) \\ & + \sum (B_{bl,y} * EF_{bl,bio,non-co_2,i}) + \sum (AF_{bl,i,y} * EF_{af,i,non-co_2 \text{ gas } i}) \\ & + X_{nr,b} * B_{bl,y} * EF_{bio,prod,co_2} + \sum (AF_{bl,i,y} * EF_{af,prod,co_2,i}) + \sum (B_{bl,y} * \\ & EF_{bio,prod,non-co_2 \text{ gas } i}) + \sum (AF_{bl,i,y} * EF_{af,i,prod,non-co_2 \text{ gas } i}) \end{aligned}$$

Since Kitchen Tests were performed with paired samples (that is baseline and project fuel consumption in the same households) it is “legitimate to derive a value for emission reduction for each individual kitchen in the sample tested. That is, the values of BE and PE are not found for each cluster, but instead are found for each kitchen, giving an emission reduction value for each kitchen” (see applied methodology, p 19).

Therefore, baseline emissions are not calculated separately. See E.4 for formula of emission reduction calculation applied.

E.2. Project emissions calculation

>> The general formula for calculating project emissions is

$$\begin{aligned} PE_y = & X_{nr,pj,y} * B_{pj,y} * EF_{pj,bio,CO_2} + \sum (AF_{pj,i,y} * EF_{af,CO_2,i}) \\ & + \sum (B_{pj,y} * EF_{pj,bio,non-co_2,i}) + \sum (AF_{pj,i,y} * EF_{af,i,non-co_2 \text{ gas } i}) \\ & + X_{nr,b} * B_{pj,y} * EF_{bio,prod,co_2} + \sum (AF_{pj,i,y} * EF_{af,prod,co_2,i}) + \sum (B_{pj,y} * \\ & EF_{bio,prod,non-co_2 \text{ gas } i}) + \sum (AF_{pj,i,y} * EF_{af,i,prod,non-co_2 \text{ gas } i}) \end{aligned}$$

Since Kitchen Tests were performed with paired samples (that is baseline and project fuel consumption in the same households) it is “legitimate to derive a value for emission reduction for each individual kitchen in the sample tested. That is, the values of BE and PE are not found for each cluster, but instead are found for each kitchen, giving an emission reduction value for each kitchen” (see applied methodology, p 19).

Therefore, project emissions are not calculated separately. See E.4 for formula of emission reduction calculation applied.

E.3. Leakage calculation

>> The formula for calculating leakage is

$$\sum LE_{i,y} = LE_y (\text{charcoal}) + LE_y (\text{wood})$$

Based on the monitoring conducted no leakage effect for charcoal and wood clusters was identified. Leakage therefore is:

$$\sum LE_{2010} = LE_{2010} (\text{charcoal}) + LE_{2010} (\text{wood}) = 0 + 0 = 0$$

E.4. Emission reductions calculation / table

>> The general formula for calculating emission reductions is

$$ER_y = \sum BE_{i,y} - \sum PE_{i,y} - \sum LE_{i,y}$$

Since Kitchen Tests were performed with paired samples (that is baseline and project fuel consumption in the same households) it is “legitimate to derive a value for emission reduction for each individual kitchen in the sample tested. That is, the values of BE and PE are not found for each cluster, but instead are found for each kitchen, giving an emission reduction value for each kitchen.” Moreover, “it is legitimate to derive emission reduction values on a per Unit basis directly from the KT tests, and modify the mode of calculation of project emission reductions [...] accordingly, in cases where this results in the most transparent and clear mode of calculation [...]” (see applied methodology, p 19).

1) Thus, in a first step emission reductions are calculated for a SINGLE KITCHEN resulting in a value for emission reductions per STOVE YEAR for each cluster (see Project Database in the spreadsheet “ER per stove”). Baseline and project emissions are not separately calculated, but the formulae are modified to deliver directly the emission reductions per stove year.

$$ER_{\text{stove year}} = X_{\text{nrb},y} * (B_{\text{bl},y} * EF_{\text{bl,bio},\text{CO}_2} - B_{\text{pj},y} * EF_{\text{pj,bio},\text{CO}_2}) + (AF_{\text{bl},i,y} * EF_{\text{af},\text{CO}_2,i} - AF_{\text{pj},i,y} * EF_{\text{af},\text{CO}_2,i}) + (B_{\text{bl},y} * EF_{\text{bl,bio},\text{non-co}_2,i} - B_{\text{pj},y} * EF_{\text{pj,bio},\text{non-co}_2,i}) + X_{\text{nrb},y} * (B_{\text{bl},y} * EF_{\text{bio,prod},\text{co}_2} - B_{\text{pj},y} * EF_{\text{bio,prod},\text{co}_2}) + (AF_{\text{bl},i,y} * EF_{\text{af,prod},\text{co}_2,i} - AF_{\text{pj},i,y} * EF_{\text{af,prod},\text{co}_2,i}) + (B_{\text{bl},y} * EF_{\text{bio,prod},\text{non-co}_2 \text{ gas},i} - B_{\text{pj},y} * EF_{\text{bio,prod},\text{non-co}_2 \text{ gas},i}) + (AF_{\text{bl},i,y} * EF_{\text{af,i,prod},\text{non-co}_2 \text{ gas},i} - AF_{\text{pj},i,y} * EF_{\text{af,i,prod},\text{non-co}_2 \text{ gas},i}) - LE_{i,y}$$

This formula can further be simplified since no alternative fuels are used and since identical emission factors for biomass combustion are used in the baseline and in the project case:

$$ER_{\text{stove year}} = X_{\text{nrb},y} * (B_{\text{bl},y} - B_{\text{pj},y}) * EF_{\text{bio},\text{CO}_2} + 0 + (B_{\text{bl},y} - B_{\text{pj},y}) * EF_{\text{bio},\text{non-co}_2,i} + X_{\text{nrb},y} * (B_{\text{bl},y} - B_{\text{pj},y}) * EF_{\text{bio,prod},\text{co}_2} + 0 + (B_{\text{bl},y} - B_{\text{pj},y}) * EF_{\text{bio,prod},\text{non-co}_2 \text{ gas},i} + 0 - LE_{i,y}$$

Since for fuel savings ($B_{\text{bl},y} - B_{\text{pj},y}$) the lower bound of the 90% confidence interval needs to be applied ($\Delta B_{90\%}$) and an adjustment factor for seasonal and weekly variations (F_{var}) is considered in the calculations, the formula is modified as shown below:

$$ER_{\text{stove year}} = X_{\text{nrb},y} * (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio},\text{CO}_2} + 0 + (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio},\text{non-co}_2,i} + X_{\text{nrb},y} * (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio,prod},\text{co}_2} + 0 + (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio,prod},\text{non-co}_2 \text{ gas},i} + 0 - LE_{i,y}$$

For the charcoal cluster the formula applied is:

$$ER_{\text{stove year}} (\text{charcoal}) = X_{\text{nrb},y} * (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio},\text{CO}_2} + 0 + (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio},\text{non-co}_2,i} + X_{\text{nrb},y} * (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio,prod},\text{co}_2} + 0 + (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio,prod},\text{non-co}_2 \text{ gas},i} + 0 - LE_{i,y}$$

$$ER_{\text{stove year 2010}} (\text{charcoal}) = 49.26\% * (0.9021 * 0.989) * 3.3040 + 0 + (0.9021 * 0.989) * 0.1330 + 49.26\% * (0.9021 * 0.989) * 3.0400 + (0.9021 * 0.989) * 0.6195 + 0 - 0$$

For the wood cluster the formula can be further simplified since there are no emissions during production of the fuel. Thus the formula applied is:

$$ER_{\text{stove year}} (\text{wood}) = X_{\text{nrb},y} * (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio},\text{CO}_2} + 0 + (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio},\text{non-co}_2,i} + 0 + 0 + 0 + 0 - LE_{i,y}$$

$$ER_{\text{stove year 2010}} (\text{wood}) = 49.26\% * (3.1030 * 0.979) * 1.7472 + 0 + (3.1030 * 0.979) * 0.1176 + 0 + 0 + 0 + 0 - 0$$

Cluster	Emissions reductions tCO ₂ e per stove year (lower bound 90% confidence interval and including seasonal/weekly variation)
Wood	2.97 tCO ₂ e
Charcoal	3.46 tCO ₂ e

Emission reduction per stove year for each cluster

Adjustment factors other than for lower bound of 90% confidence level and for seasonal/weekly variations in fuel use are not reflected in the emission factor above. Other adjustment factors for emission reductions such as drop-off rate and frequency of stove application are considered when calculating number of stove years.

2) In a second step, emission reductions are calculated separately for each cluster by multiplying the number of stove years (including the drop-off rate and adjustment factor for frequency of stove application) with the values for emission reductions per stove years (including lower bound of 90% confidence level and seasonal/weekly variations in fuel consumption).

For every stove, the number of stove days is calculated by counting the number of days from the sale date or start of monitoring period until the end of the monitoring period (see Project Database). For this the formula “=DAYS360(x;y)” (or in German “=TAGE360(x;y)”) is applied.

The adjustment factor for the drop-off rate and for frequency of stove application is considered in the following way: For every stove being in operation for the second year or third year, the stove days in the respective operational year is multiplied with an adjustment factor. This provides for every stove the corrected number of stove days in its second year and third year of operation.

Stove years of a specific year are then calculated by adding up all corrected/adjusted stove days of all stoves sold in a specific year divided by 360 (days).

	WOOD Cluster		CHARCOAL Cluster		Leakage	TOTAL	
Year	Stove years	ERs (tCO ₂ e)	Stove years	ERs (tCO ₂ e)		Stove years	ERs (tCO ₂ e)
2009	20.3	60	20.4	71	0.0	40.7	131
2010	1122.9	3337	1409.1	4875	0.0	2532.0	8212
TOTAL	1143.2	3397	1429.5	4945	0.0	2572.7	8343

References

- Project Database: 1109_ADES_project_database_08_09_10_V03.xlsx

E.5. Comparison of actual emission reductions with estimates in the CDM-PDD

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Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO ₂ e)	25,917	8,343

E.6. Remarks on difference from estimated value in the PDD

>> Projected overall emission reductions in the PDD are higher than actual emission reductions achieved by the project in the monitoring period. This is due to the following reasons:

- The project is the continuous dissemination of solar and efficient stoves and stove sales are projected to increase over time. If expected number of stove sales is not achieved in earlier years, then this also has implication of emission reductions in later years.
- Due to the difficult political and economic situation in Madagascar starting from 2009, stove sale was below expectations during the first project years.

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History of the document

Version	Date	Nature of revision
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory Document Type: Guideline, Form Business Function: Issuance		

Annex 1

Appended Files

No.	Reference	Description	File name
1	Detailed Customer Database	Results and sample from baseline Kitchen Surveys and Kitchen Tests	1107_ADES_customer_database_08_09_10.xlsx
2	Project Database	Outcome of baseline Kitchen Surveys and Kitchen Test and clustering, and ER calculations	1109_ADES_project_database_08_09_10_V03.xlsx
3	Total Sales Record	Total Sales Record is integrated in the Project Database	1107_ADES_project_database_08_09_10_V03.xlsx
4	Sales Audit 2010	Financial audit of stove sales 2010	Rapport ADES sur vente_2010.docx
5	Monitoring Manual	Monitoring Manual V04	1101_ADES_monitoring_manual_french_V04.pdf
6	Monitoring Schedule	Monitoring Schedule 2010	1001_ADES_monitoring_schedule 2010.xlsx

Annex 2

References

No.	Ref. to Chapter	Description	File name
1	PDD	Validated and registered PDD, version 5, dated 21.12.2009	0912_ADES_GS_VER_PDD_v5.pdf
2	SD 2: Schools visited by ADES	List of schools visited in 2010	1104_list_schools_visited_2010.xls.x
3	SD 1: Jobs created by ADES	Number of jobs created by ADES in 2010	ADES_employees_2010.xlsx
4	SD 1: Jobs created by ADES	Number of jobs created by ADES from 2007-2009	1107_ADES_monitoring_report_0809_V5_1.pdf
5	Usage Survey Report	Usage Survey Report 2010	1102_ADES_usage_survey_report_2010.pdf
6	Aging-Stove Kitchen Test Report	Aging-Stove Kitchen Test Report 2010	1103_ADES_Aging_KT_report_2010.pdf
7	New-Stove Kitchen Test Report	New-Stove Kitchen Test Report 2010 for Oli-B stoves	1107_ADES_Oli_B_KT_report_2010_V02.pdf
8	Leakage Survey Report	Leakage Survey Report 2010	1102_ADES_Leakage_survey_report_2010
9	Kitchen Survey Report	Kitchen Survey Report 2010	1103_ADES_Kitchen_survey_report_2010.pdf
10	First Monitoring Report	First Monitoring Report covering the period from 04.01.2008-22.12.2009	1107_ADES_monitoring_report_0809_V5_1.pdf