

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 2.0, 06 June 2013

ADES Solar and efficient stoves in Madagascar
GS 464
monitoring period 4 (01/01/2012 - 31/12/2012)

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 five cook-stove workshops in Tuléar, Ejeda, Morondava, Morombe and Majunga und two sales points in Fianarantsoa and in Antananarivo. 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. Eight stove types are currently being disseminated: (1) solar box stove, (2) E-solar box stoves, (3) solar parabolic stove, (4) efficient wood stove OLI-b, (5) efficient wood stove OLI-45b, (6) efficient wood stove OLI-60b, (7) efficient charcoal stove OLI-c, and (8) efficient charcoal stove OLI-45c (formerly called OLI-G)¹.

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 2008² – 22 December 2009

Second monitoring period: 23 December 2009 – 31 December 2010

Third monitoring period: 01 January 2011 – 31 December 2011

Project is in continuous operation.

4. Total emission reductions achieved in this monitoring period are **63,069 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

¹ The larger model of the efficient charcoal stove was launched in 2011 as OLI-G stove. Since further stove models have been developed, it was renamed to OLI-45c in order to have consistent stove names.

² 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.

A.3. Location of the project activity:

>> Country: Republic of Madagascar

Regions: entire country of Madagascar

Town/cities, where existing 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
- Majunga: 15°42'55.09"S, 46°19'8.42"E

Additional production and distribution centers will be opened in other parts of Madagascar.

A.4. Technical description of the project

>> The project currently produces and disseminates 8 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. E-solar box stove

In 2011 ADES was celebrating its 10-year anniversary. At the ceremony in Madagascar in July 2011, the prototype of an electric solar cooker was presented, which was developed by ADES in Madagascar. This type of solar box stove includes PV cells and a battery so that people can cook and charge a battery at the same time. Appliances such as radio, lamps or mobile phones can be connected and charged with the solar stove. In 2012 a total number of 13 e-solar stoves were sold.



E-solar box stove, which allows cooking and charging electric devices at the same time.

3. 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

4. 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 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 applying an adjustment factor for emission reduction calculation.



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

5. Efficient wood stove OLI-45b

In 2012 a new efficient wood stove called “Oli-45b” was introduced for application in larger households and street kitchens. Upon request from its customers ADES developed a larger model of the efficient wood stove called Oli-45b for domestic application in larger households and for commercial application in street kitchens. This new model is identical to existing wood model Oli-b designed for household application but larger in size. The Oli-45b stove was especially designed to satisfy the requirements of the customers using the big cooking pots No. 45 (larger households, street kitchens in urban and rural areas).



6. Efficient wood stove OLI-60b

In 2012 a new efficient wood stove called “Oli-60b” was introduced for application mainly in school kitchens. This new model is identical to existing wood models Oli-b and Oli-45b designed for household application but again larger in size. The Oli-60b stove was especially designed to satisfy the requirements of the customers using the big cooking pots No. 60 (school kitchens).

7. 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 Madagascar (see pictures below). For the new charcoal stove the New-Stove Kitchen Test was conducted in 2011. The results of the New-Stove Kitchen Test allow including this new stove model in the existing charcoal cluster applying an adjustment factor for emission reduction calculation.



New stove model: efficient charcoal stove “OLI-c” and its individual parts

8. Efficient charcoal stove OLI-45c (formerly OLI-G)

In May 2011 the new efficient charcoal stove called “OLI-45c” was introduced for application in larger households and street kitchens. Upon request from its customers ADES developed a larger model of the efficient charcoal stove called OLI-45c for domestic application in larger households and for commercial application in street kitchens. This new model is identical to existing charcoal model OLI-c designed for household application but larger in size. The OLI-45c stove was especially designed to satisfy the requirements of the customers using the big cooking pots No. 45 (larger households, street kitchens in urban and rural areas). A New-Stove Kitchen Test was conducted in 2012.



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):

>>

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Hans Peter Frei, ADES
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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

Official opening of workshop in Fianarantsoe: July 2011

Production start for OLI-45c (formerly OLI-G) stoves: May 2011

Opening of workshop in Majunga: November 2011

Opening of ADES sales point in Antananarivo: May 2012

2. Actual operation:

ADES continues stove production and promotion in Madagascar and is continuously expanding its activities with the opening of new production centers and development of new stove models.

Since the project start until 31.12.2012 a total of 22,151 solar and efficient stoves have been produced and disseminated in Madagascar.

Total stove sales since project start according to stove type:

Year	Solar box	Solar e-box	Solar parabolic	Oli-b	Oli-c	Yoyo	Oli-45b	Oli-45c	Oli-60b
2008	1460	0	67	1	4	117	0	0	0
2009	621	0	14	3	4	0	0	0	0
2010	1463	1	33	619	192	0	0	0	0
2011	1359	0	108	1123	3827	0	0	234	0
2012	1643	12	156	1309	6932	0	79	724	46
Total	6546	13	378	3055	10959	117	79	958	46

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 and stoves not counted.

Total stove sales since project start according cluster:

Year	wood cluster	charcoal cluster	solar+Oli-b	solar+Oli-c
2008	1007	632	1	4
2009	203	425	3	4
2010	665	1261	166	25
2011	1260	3957	88	629
2012	1545	7805	139	636
Total	4680	14080	397	1298

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 and stoves not counted.

In the year 2012 there are especially the following activities to be highlighted:

1. Opening of a new ADES Sales Point in the capital of Madagascar

In May 2012 ADES opened a new Sales Point in Antananarivo, the capital of Madagascar. This is an important step for expanding the dissemination of solar and efficient stove technologies to the entire island.



A new Sales Point was established in Antananarivo, the Capital of Madagascar, to extend the outreach of the project.

2. Opening of the school canteen in Saondrano

In November 2012 ADES could open the first solar school canteen in Saondrano with a big ceremony. Here ADES will train many women in the use of the school solar stoves so that they can prepare every day a healthy meal for the pupils.



Solar kids



Solar school canteen in Saondrano

3. Opening of new metal workshop in Tuléar

In May 2012 ADES opened a new metal workshop in Tuléar for the production of the metal kettles for the efficient stove models and for the production of the metal case for the school solar cook stove and e-solar box stove.



The new metal workshop in Tuléar.



Opening ceremony with speech from Otto Frei, national director of ADES in Madagascar



The metal workshop also contains a small electrical workshop



Metal kettles are now produced in Tuléar.

4. Official start of e-solar box stove sale in December 2012

Since the presentation of the prototype of the e-solar box cook stove at the ADES 10-years jubilee ceremony in 2011, ADES further developed the stove model and prepared the official launch of this electric solar stove that allows cooking and charging of electronic devices at the same time. In December 2012 ADES could finally celebrate the official start of sale of the e-solar stove.



The e-solar box stove attracted also many journalists.



Nuns were amongst the first customers to buy an e-solar stove.

5. New IT system “Sales Force”

ADES has introduced a new system called “Sales Force”, which allows tracking all data during production and sale of the solar and efficient stoves. Every stove tracked by a unique number is linked to customer data. With this new software stove sales reports are issued on a weekly basis.

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 from second verification the monitoring plan was updated and submitted to the Gold Standard for approval. The Gold Standard approved the revised monitoring plan.

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

>> Upon request during second verification the monitoring plan needed to be updated and be approved by the Gold Standard. Revised monitoring plan was approved by the Gold Standard.

B.4. Notification or request of approval of changes

>> A request for design change was submitted to the Gold Standard extending the project area to the entire country of Madagascar and including further stove models in the project. The PDD was checked by a DOE during third verification and thereafter approved by the Gold Standard in 2012.

The Gold Standard raised Forward Action Requests (FARs) during issuance review of third issuance.
FAR 1: Forward Action Request: PP shall carry out the usage survey to confirm drop off rate for cookstoves prior to next issuance request. DOE shall verify the new usage survey.

-> The PP has carried out the usage survey in August 2012 and survey results are applied for ER calculation for this monitoring period. The new usage rates obtained from the usage survey 2012 are higher than the default values applied so far (this means lower drop-off rates than assumed), thus ER calculations in previous monitoring periods were conservative.

FAR 2: The PP is requested to continue with the existing incentive mechanism till next verification and evaluate the performance in the end of this period and suggest if it should be replaced with new mechanism.

-> In 2012 a total 701 baseline charcoal stoves have been returned. This means almost 10% of customers handed in the baseline stove to profit from the discount price. This is a huge increase

compared to the year 2011. A participation of almost 10% for a discount campaign is already an acceptable result. We therefore suggest keeping the current incentive mechanism and striving for higher return rates in the coming years.

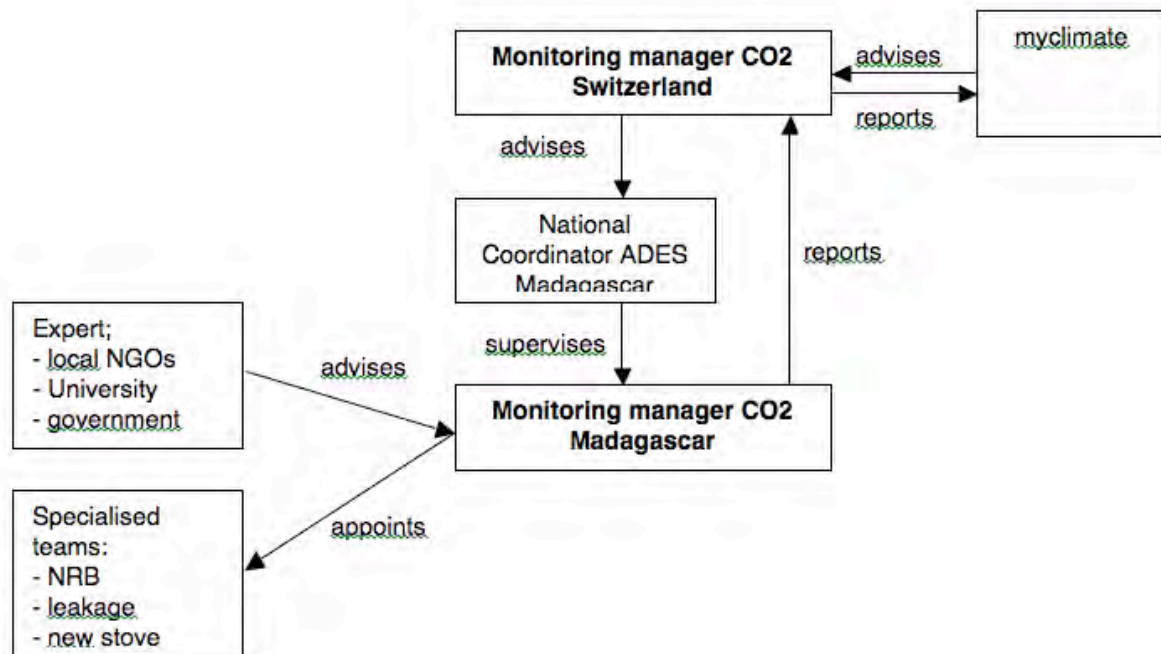
FAR 3: The FAR has been raised to carry out the Oli-45C performance test as per the monitoring methodology. However, if PP would like to follow the same approach i.e., the conservative estimation of emission reduction based on performance of Oli-C kitchen test in future, which is indeed allowed as per the new methodology, PP shall submit the separate deviation memo on this approach for GS approval prior to next verification, otherwise Oli-45C specific kitchen test shall be carried out to meet the monitoring requirement.

-> We have conducted KS and KT for Oli-45c stoves in 2012. Results confirm our assumption that the use of Oli-45c stoves leads to higher fuel savings and thus higher ER. It is therefore conservative to include Oli-45c stoves in the existing charcoal cluster and count them as the smaller model Oli-c. A corresponding deviation memo was submitted to the Gold Standard in February 2013. The Gold Standard replied on 03 April 2013 via email: "Your request for inclusion of the larger version of the efficient wood (Oli-45b) and charcoal (Oli-45c) stove in the existing clusters is accepted. However, you will be required to carry out the separate Aging test in line with the methodology applied at the time of registration". Thus, Oli-45c and Oli-45b stoves are included in the existing cluster and counted as stove Oli-c and Oli-b respectively.

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 V07 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.

Monitoring Assistant CO2 Madagascar:

Ms. Alphène Noëline Etienne

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 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 five stove production/distribution centers in Tuléar, Ejeda, Morondava, Morombe and Majunga from where also the sale of stoves is promoted. 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 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, “MB” for Morombe, and “MG” for Majunga (see Monitoring Manual for details).

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.

The larger models for the efficient wood and charcoal stove are named as follows: OLI-45b followed by a number, OLI-45c followed by a number (formerly OLI-G followed by a number), OLI-60b followed by a number.

From 2010 on a certified independent auditor from Antananarivo, 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 2012 ADES has introduced a new system called “Sales Force”, which allows tracking all data during production and sale of the solar and efficient stoves. Every stove tracked by a unique number is linked to customer data. Stove sales reports are now issued on a weekly basis.

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 _{pl.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 CH ₄ and N ₂ O emissions for charcoal are

	applied The following GWP100 are applied: 21 for CH ₄ , 310 for N ₂ O 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 2.5
Value(s) :	0.1176 tCO ₂ e/t wood 0.1330 tCO ₂ e/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 _{pl.bio.non-co2}
Data unit:	tCO ₂ /t biomass
Description:	Non-CO ₂ emission factor arising from use of wood-fuel in project 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 CH ₄ and N ₂ O emissions for charcoal are applied The following GWP100 are applied: 21 for CH ₄ , 310 for N ₂ O 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 2.5
Value(s) :	0.1176 tCO ₂ e/t wood 0.1330 tCO ₂ e/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:	tCO ₂ /t fuel
Description:	Non-CO ₂ emission factor arising from use of alternative fuel
Source of data used:	Default IPCC values for CH ₄ and N ₂ O emissions for Liquefied Petroleum Gases are applied The following GWP100 are applied: 21 for CH ₄ , 310 for N ₂ O 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 2.5
Value(s) :	0.0064 tCO ₂ e/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:	tCO ₂ /t fuel
Description:	CO ₂ 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: 5.001 t wood/stove year Charcoal cluster: 1.909 t charcoal /stove year
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emissions calculation

Leakage emission calculations)	
Additional comment:	Fixed baseline applied. Repetition of KT for the wood cluster revealed that the original values for baseline consumption are no more representative/conservative for the project area. Therefore, a lower value obtained from paired KT for baseline and project fuel consumption conducted in January 2012 is 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 for charcoal cluster Kitchen Test 2012 for wood cluster
Value(s) :	Wood cluster: 2.365 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. Repetition of KT for the wood cluster revealed that the original values for baseline consumption are no more representative/conservative for the project area. Therefore, a lower value obtained from paired KT for baseline and project fuel consumption conducted in January 2012 is applied.

References:

- Revised PDD V06.1: 1206_ADES_GS_VER_PDD_V6_1.pdf, pp. 51-53
- Project Database: 130606_ADES_Project_Database_2012_V02.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 2012.
QA/QC procedures applied:	Third party financial audit of stove sales activities

Stoves counted for emission reductions according to stove type:

Year	Solar box	Solar e-box	Solar parabolic	Oli-b	Oli-c	Yoyo	Oli-45b	Oli-45c
2008	1387	0	54	1	4	0	0	54
2009	621	0	14	3	4	0	0	14
2010	1409	1	25	578	192	0	0	25
2011	1358	0	108	1118	3825	0	0	108
2012	1607	12	148	1307	6926	0	79	148
Total	6382	13	349	3007	10951	0	79	349

Households counted for emission reductions according to cluster:

Year	wood cluster	charcoal cluster	solar+Oli-B	solar+Oli-C
2008	804	632	1	4
2009	203	425	3	4
2010	659	1240	90	25
2011	1255	3954	88	629
2012	1498	7754	137	632
Total	4419	14005	319	1294

For this monitoring period a total of 21,733 solar and efficient stoves are counted.

Stoves not counted for emission reductions:

In the total sales record a total of 418 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	267
2) The stove is sold outside the project area: not eligible sales	31
3) The stove is used in an institution: no domestic use	43
4) The stove model has expired: yoyo stoves are no more counted.	18
5) A household has more than one stove of the same type (e.g. two solar stoves or two efficient stoves)	13
6) The stove is a new model. Kitchen Test have not yet been conducted	46
Total	418

References:

– Project Database: 130606_ADES_Project_Database_2012_V02.xlsx

Data / Parameter:	1) $X_{nrp,pi,y}$
Data unit:	Fraction
Description:	Non-renewability of woody biomass fuel in the project in year y
Measured /Calculated	Default

/Default:	
Source of data:	Information note: default values of fraction of non-renewable biomass for least developed countries and small island developing states (Version 01.0), EB 67 Report, Annex 22, page 5, value for Madagascar.
Value(s) of monitored parameter:	72.0%
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 was due in 2011. In May 2012 the CDM published default values for NRB for Madagascar. The default value of 72% is applied.
Calculation method (if applicable):	$f_{NRB} = (NRB/H)$, whereas $NRB = H - MAI$
QA/QC procedures applied:	

References:

- Information note: default values of fraction of non-renewable biomass for least developed countries and small island developing states (Version 01.0), EB 67 Report, Annex 22, page 5. http://cdm.unfccc.int/filestorage/H/2/9/H29X6EKQMJU7RY85DIT4ZPFAL3O1GW/eb67_repan22.pdf?t=RHN8bTV1eHBhfDCZ-FAcnx9mRokcNma3dPSZ

Data / Parameter:	2) $B_{pi,y}$
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: 2.499 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. Repetition of KT for the wood cluster revealed that the original values for baseline and project consumption are no more representative/conservative for the project area. Therefore, a lower value obtained from paired KT project fuel consumption conducted in January 2012 is applied.
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 2012 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/	Baseline and project emissions

Leakage emission calculations)	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	n.a.
Measuring/ Reading/ Recording frequency:	Every two years (last survey conducted in 2012)
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 2012 and revealed the following results (for details please see the Usage Survey Report 2012). The drop-off rate for solar stoves that are already 3.8 years in operation is 16.7%. This results in an annual drop-off rate of 4.4%. The drop-off rate for Oli-b stoves that are already 1.8 years in operation is 9.5%. This results in an annual drop-off rate of 5.1%.

Stove application	Drop-off rate	Adjustment factor
First year of operation	0%	1
Second year of operation (after 1 year in use)	4.4%	0.956
Third year of operation (after 2 years in use)	8.7%	0.913
Fourth year of operation (after 3 years in use)	13.1%	0.869
Fifth year of operation (after 4 years in use)	17.4%	0.826

Adjustment factor to reflect stove usage of solar stoves

Stove application	Drop-off rate	Adjustment factor
First year of operation	0%	1
Second year of operation (after 1 year in use)	5.1%	0.949
Third year of operation (after 2 years in use)	10.3%	0.897
Fourth year of operation (after 3 years in use)	15.4%	0.849
Fifth year of operation (after 4 years in use)	20.6%	0.794

Adjustment factor to reflect stove usage of Oli-b stoves

Note: For ER calculation in the project database the most conservative adjustment factors for drop-off rate and aging-effect is used for all stove types and clusters, since consideration of separate adjustment factors for every single stove model is too complicated. This is a conservative approach.

References:

- Usage Survey Report 2012: 120827_ADES_usage_survey_report_2012_V01.pdf
- Project Database: 130606_ADES_Project_Database_2012_V02.xlsx

Data / Parameter:	5) Age_z
Data unit:	Fraction
Description:	Adjustment to values of $B_{pl,y}$ and $AF_{pl,i,y}$ for stoves of age x
Measured /Calculated /Default:	Measured
Source of data:	Aging-Stove Kitchen Test
Value(s) of monitored parameter:	See below
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 (last test conducted in 2012)
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 solar stove in the year 2008 (first project year) or a efficient charcoal stove in 2010 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 or 2010). The Aging-Stove Kitchen Test conducted in 2012 with solar stoves for the wood and charcoal cluster and with oli-c stoves revealed aging effects for all investigated stove types.

Stove age	Stove performance: charcoal cluster
First year of operation	100.0%
Second year of operation (after 1 year in use)	98.0%
Third year of operation (after 2 years in use)	96.0%
Fourth year of operation (after 3 years in use)	94.1%
Fifth year of operation (after 4 years in use)	92.1%
Adjustment factors for aging in charcoal cluster	

Stove age	Stove performance: wood cluster
First year of operation	100.0%
Second year of operation (after 1 year in use)	99.7%
Third year of operation (after 2 years in use)	99.4%
Fourth year of operation (after 3 years in use)	99.1%
Fifth year of operation (after 4 years in use)	98.8%
Adjustment factors for aging in wood cluster	

The Aging-Stove Kitchen Test with Oli-b stoves revealed no aging effects with regard to stove performance. It can be concluded that stove performance of Oli-b does not decrease in the first two years of stove operation.

Note: For ER calculation in the project database the most conservative adjustment factors for drop-off rate and aging-effect is used for all stove types and clusters, since consideration of separate adjustment factors for every single stove model is too complicated. This is a conservative approach.

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 charcoal stove “Oli-45c”. The Kitchen Test revealed the following figures for fuel consumption and fuel savings. Please see the New-Stove Kitchen Rest Report 2012 for details.

OLI-45c (Larger efficient charcoal stove)	2012 New Stove KT (Oli-45c)		
	t/(year*stove)		
Mean before	2.648		
Mean after	1.229		
Mean change	1.419	paired sampling	
Standard deviation change	0.206	paired sampling	
Sample size	40		
Upper confidence limit of change 90%	1.474	103.9%	of mean
Lower confidence limit of change 90%	1.364	96.1%	of mean

Average fuel consumption and fuel savings per household for new stove type “Oli-45c”.

The New Stove Kitchen Test for the Oli-45c stoves showed annual fuel savings of around 1.4 tons (51.5%), which is higher compared to fuel savings from the smaller Oli-c stoves or from solar stoves in the charcoal cluster amounting to 0.9 tons (45.2%-47.3%). The use of an Oli-45c stove thus leads to

higher emission reductions per year. It is therefore conservative to include the Oli-45c stove users in the existing charcoal cluster. This leads to an underestimation of overall emission reductions.

References:

- New Stove Kitchen Test Report 2012: 130110_ADES_Oli-45c_KT_report_2012_V01.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 previous monitoring reports, Blue Ventures (www.blueventures.org) is a British non-governmental marine conservation organization 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 bought solar and efficient cook stoves from ADES and distributed them to the local population from 2008 to 2010. In the year 2012 Blue Ventures did not buy solar and efficient stoves from ADES. Emissions reductions from stoves sold to Blue Ventures are not counted for this project.

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

As already mentioned in previous monitoring reports, 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. With financial support from the local foundation Tany Meva and with a lot of promotion activities a project called "Pipe" was launched in the region of Tuléar. The aim of this project is to replace charcoal with other fuels gained from biomass residues such as from maize. As ADES heard from different sources, this project is not very successful up to now. The exact reasons are not known, but high costs for this new fuel and smoke emissions during burning may be challenges the project faces. GIZ is also active in the area of Majunga and disseminates efficient cook stoves there. As to ADES's knowledge clay quality for stove construction is poor in that region and supply is often not secured. There is no update on these activities.

Activities by WWF Madagascar:

As already mentioned in the previous monitoring reports, 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. There are no news on the progress of this project idea and apparently it did not further evolve. WWF Madagascar has approached ADES to support the dissemination of efficient stove models. WWF Madagascar will buy around 1,000 efficient stoves for distribution in Tuléar.

References:

- Project Database: 130606_ADES_Project_Database_2012_V02.xlsx
- PDD V6.1: 1206_ADES_GS_VER_PDD_V6_1.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:	702
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.

In 2011 only 10 customers took the advantage of the 20%-discount granted for handing in the baseline stove. Since 2011 was the first year this new stove model was promoted, customers were still skeptical towards the effectiveness of this efficient stove and thus they were reluctant to hand in their baseline stove at the time of sale. They first wanted to be sure that the new stove is better than the old one before they give up the known technology. After one year of promotion stove acceptance has increased and in 2012 the figure could be increased to 702 customers that handed in the baseline stove for profiting from the 20%-discount. Thus, almost 10% of customers purchasing an efficient charcoal stove handed in the baseline stove. This is already an acceptable result for such a scheme granting price discount. ADES will try to promote the discount model even more intensively and expects to further increase the return rate in the coming years.

Data / Parameter:	9) F_{var}
Data unit:	Fraction
Description:	Adjustment factor for seasonal and weekly variation of biomass fuel consumption
Measured /Calculated	Calculated

/Default:	
Source of data:	Kitchen Survey Report 2012
Value(s) of monitored parameter:	1. Wood cluster: 99.3% 2. Charcoal cluster: 99.5%
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 2012/Leakage Survey 2012
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 (updated in 2012)
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: 130606_ADES_Project_Database_2012_V02.xlsx

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 2012/Leakage Survey 2012
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 (updated in 2012)
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: 130606_ADES_Project_Database_2012_V02.xlsx

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 86 by the end of 2012 (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, four 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	31.12.2011	31.12.2012
Coordination	-	5	8	11	25	34
Tuléar	15	16	15	20	12	11
Ejeda	7	8	8	9	11	13
Morondava	-	8	9	9	11	10
Andavadoaka	-	6	5	-	-	-
Morombe	-	-	-	4	5	6
Majunga	-	-	-	-	5	12
Total	22	43	45	53	69	86

Number of local persons employed by ADES in Madagascar

References:

– Jobs created by ADES: ADES_employees_2012.xlsx

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, 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.

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 2012 a total of 87 schools were visited and 15'557 pupils and teachers were reached.

Location	Number of schools visited	Number of attendees
Ejeda	4	556

Morondava	12	3,920
Tuléar	33	6,494
Mahajanga	25	2,968
Morombe	13	1,619
Total	87	15,557

Number of schools visited and number of people reached by these activities in 2012

A visit card is signed for every school visit, which mentions the number of attendees.

References:

- Schools visited by ADES: 1301_list_schools_visited_2012.xlsx

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 2012 we know that all households purchase charcoal and that on average they spend now using the project stove between 9,095 and 9,457 Ariary per month (approximately EUR 3.20 – 3.40). Conservatively estimated a household spends around 109,140 Ariary per year (EUR 38.30) on charcoal. From the Kitchen Tests we know that a household using a project stove reduces its charcoal consumption by 47.3%. Therefore, the expenses for charcoal prior to the project can be estimated to be 207,096 Ariary per year (EUR 72.70; =109,140/(100%-47.3%)*100%). A household thus annually saves around 97,956 Ariary (EUR 34.40; =207,096-109,140) due to the fuel savings from the project stove.

Wood cluster

The Kitchen Surveys showed that the majority of households purchase fuelwood. In the rainy season 100% of households stated to purchase firewood, whereas in the dry season 67% of households stated to collect fuel wood. This is in line with the results from Kitchen Surveys in 2011. Considering results from previous Surveys there may be a tendency that more and more households start purchasing fuel wood. On average households spend between around 5 hours per months on wood collection. This is less than stated in previous Kitchen Surveys 2011, where people stated to collect between 11.4 and 15.1

hours per month on fuel collection. The reduction in time spent on fuel collection may also be due to the fact that more households stated to purchase firewood.

Households that purchase fuel wood spend on average around 11,530 Ariary per month (around EUR 4). This is in line with results stated in the Kitchen Survey 2011.

References:

- Kitchen Survey Report 2012: 130108_ADES_Kitchen_survey_report_2012_V01.pdf

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

>> The general formula for calculating baseline emissions is

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

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

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

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.

$$ER_{\text{stove year}} = X_{\text{nrb,y}} * (B_{\text{bl,y}} * EF_{\text{bl,bio,CO2}} - B_{\text{pj,y}} * EF_{\text{pj,bio,CO2}}) + (AF_{\text{bl,i,y}} * EF_{\text{af,CO2,i}} - AF_{\text{pj,i,y}} * EF_{\text{af,CO2,i}}) + (B_{\text{bl,y}} * EF_{\text{bl,bio,non-co2,i}} - B_{\text{pj,y}} * EF_{\text{pj,bio,non-co2,i}}) + X_{\text{nrb,y}} * (B_{\text{bl,y}} * EF_{\text{bio,prod,co2}} - B_{\text{pj,y}} * EF_{\text{bio,prod,co2}}) + (AF_{\text{bl,i,y}} * EF_{\text{af,prod,co2,i}} - AF_{\text{pj,i,y}} * EF_{\text{af,prod,co2,i}}) + (B_{\text{bl,y}} * EF_{\text{bio,prod,non-co2 gas,i}} - B_{\text{pj,y}} * EF_{\text{bio,prod,non-co2 gas,i}}) + (AF_{\text{bl,i,y}} * EF_{\text{af,i,prod,non-co2 gas,i}} - AF_{\text{pj,i,y}} * EF_{\text{af,i,prod,non-co2 gas,i}}) - LE_{\text{i,y}}$$

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:

$$ER_{\text{stove year}} = X_{\text{nrb,y}} * (B_{\text{bl,y}} - B_{\text{pj,y}}) * EF_{\text{bio,CO2}} + 0 + (B_{\text{bl,y}} - B_{\text{pj,y}}) * EF_{\text{bio,non-co2,i}} + X_{\text{nrb,y}} * (B_{\text{bl,y}} - B_{\text{pj,y}}) * EF_{\text{bio,prod,co2}} + 0 + (B_{\text{bl,y}} - B_{\text{pj,y}}) * EF_{\text{bio,prod,non-co2 gas,i}} + 0 - LE_{\text{i,y}}$$

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:

$$ER_{\text{stove year}} = X_{\text{nrb,y}} * (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio,CO2}} + 0 + (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio,non-co2,i}} + X_{\text{nrb,y}} * (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio,prod,co2}} + 0 + (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio,prod,non-co2 gas,i}} + 0 - LE_{\text{i,y}}$$

For the charcoal cluster the formula applied is:

$$ER_{\text{stove year}} (\text{charcoal}) = X_{\text{nrb,y}} * (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio,CO2}} + 0 + (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio,non-co2,i}} + X_{\text{nrb,y}} * (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio,prod,co2}} + 0 + (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio,prod,non-co2 gas,i}} + 0 - LE_{\text{i,y}}$$

$$ER_{\text{stove year2012}} (\text{charcoal}) = 72.00\% * (0.9021*0.994) * 3.3040 + 0 + (0.9021*0.994) * 0.1330 + 72.00\% * (0.9021*0.994) * 3.0400 + (0.9021*0.994) * 0.6195 + 0 - 0$$

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:

$$ER_{\text{stove year}} (\text{wood}) = X_{\text{nrb,y}} * (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio,CO2}} + 0 + (\Delta B_{90\%} * F_{\text{var}}) * EF_{\text{bio,non-co2,i}} + 0 + 0 + 0 + 0 - LE_{\text{i,y}}$$

$$ER_{\text{stove year2012}} (\text{wood}) = 72.00\% * (3.1030*0.993) * 1.7472 + 0 + (3.1030*0.993) * 0.1176 + 0 + 0 + 0 + 0 - 0$$

For the combined application solar+OLI-b an adjustment factor is applied to the emission factors of the wood cluster. KT for combined application of solar+OLI-b stove showed that households save more fuel than with only one stove (see KT Report 2011 and Customer Database). Thus, the formula applied is:

$$ER_{\text{stove year2012 (solar+OLI-b)}} = ER_{\text{stove year2012 (wood)}} * 1.18$$

For the combined application solar+OLI-c an adjustment factor is applied to the emission factors of the charcoal cluster. KT for combined application of solar+OLI-c stove showed that households save more fuel than with only one stove (see KT Report 2011 and Customer Database). Thus, the formula applied is:

$$ER_{\text{stove year2012 (solar+OLI-c)}} = ER_{\text{stove year2012 (charcoal)}} * 1.319$$

Cluster	Emissions reductions tCO ₂ e per stove year (lower bound 90% confidence interval and including seasonal/weekly variation)
Wood	3.23 tCO ₂ e
Charcoal	4.78 tCO ₂ e
Solar+OLI-b	3.81 tCO ₂ e
Solar+OLI-c	6.30 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, third, fourth or fifth 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, third or fourth year of operation.

Since OLI-c stoves are included in the charcoal cluster, an adjustment factor of 0.96 is applied to the stove days in order to reflect slightly lower fuel savings. For combined application of OLI-c and solar stoves this adjustment factor for lower fuel savings of OLI-c stoves is not applied, because separate KT have been conducted for the combined application and thus already subsume this effect.

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).

	2012	
Year	Stove years	ERs (tCO ₂ e)
WOOD Cluster	3'372	10'894
CHARCOAL Cluster	9'508	45'406
Solar+OLI-b	249	948
Solar+OLI-c	924	5'822
Leakage	-	-
TOTAL	14'053	63'069

References

- Project Database: 130606_ADES_Project_Database_2012_V02.xlsx

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

>>

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO ₂ e)	57,377	63,069

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

>> Projected overall emission reductions in the PDD are slightly lower 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 higher than planned, then this also has implications on emission reductions.

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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	130319_ADES_customer_database_2012_V01.xlsx
2	Project Database	Outcome of baseline Kitchen Surveys and Kitchen Test and clustering, and ER calculations	130606_ADES_Project_Database_2012_V02.xlsx
3	Total Sales Record	Total Sales Record is integrated in the Project Database	130606_ADES_Project_Database_2012_V02.xlsx
4	Sales Audit 2012	Financial audit of stove sales 2012	Rapport ADES sur vente_2012 Projet.pdf Rapport ADES sur four 2012-Version finale.docx
5	Monitoring Manual	Monitoring Manual V07	130314_ADES_monitoring_manual_french_V07.pdf

Annex 2

References

No.	Ref. to Chapter	Description	File name
1	PDD	PDD, version 6.1, dated 19.06.2012	1206_ADES_GS_VER_PDD_V6_1.pdf
2	SD 2: Schools visited by ADES	List of schools visited in 2012	1301_list_schools_visited_2012.xlsx
3	SD 1: Jobs created by ADES	Number of jobs created by ADES in 2012	ADES_employees_2012.xlsx
4	Kitchen Test Report 2012	Kitchen Test Report for KT conducted in 2012	121205_ADES_Aging_KT_solar_report_2012.pdf 130121_ADES_Aging_KT_Oli-b_report_2012.pdf 130110_ADES_Oli-45c_KT_report_2012_V01.pdf
5	Kitchen Survey Report 2012	Kitchen Survey Reports 2012	121215_ADES_Oli_45c_KS_report_2012_V01.pdf 130108_ADES_Kitchen_survey_report_2012_V01.pdf
6	NRB reassessment	CDM default value for NRB in Madagascar	Information note: default values of fraction of non-renewable biomass for least developed countries and small island developing states (Version 01.0), EB 67 Report, Annex 22, page 5. http://cdm.unfccc.int/filestorage/H/2/9/H29X6EKQMJU7RY85DIT4ZPFAL3O1GW/eb67_repan22.pdf?t=RHN8bTV1eHBhfDCZ-FAcnx9mRokcNma3dPSZ