MONITORING REPORT FORM (F-CDM-MR)
Version 02.0

MONITORING REPORT

Title of the project activity	PoA: Improved Cooking Stoves for Nigeria Programme of Activities CPAs running in this Monitoring Period: CPA # 1 Improved Cooking Stoves for Nigeria
Reference number of the project activity	PoA Ref. 5067 CPA Ref. 5067-0001
Version number of the monitoring report	3
Completion date of the monitoring report	10/10/2013
Registration date of the project activity	10/11/2011
Monitoring period number and duration of this monitoring period	1; 10/11/2011 – 30/06/2012
Project participant(s)	atmosfair gGmbH
Host Party(ies)	Nigeria
Sectoral scope(s) and applied methodology(ies)	3: Energy demand AMS II.G., version 3, "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass"
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	3,705
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	2,376

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

(a) Purpose of the project activity and the measures taken for GHG emission reductions or net anthropogenic GHG removals by sinks

The purpose of the PoA is the dissemination of improved cooking stoves in Nigeria. The CPA # 1 Improved Cooking Stoves for Nigeria is the first registered CPA under the PoA "Improved Cooking Stoves for Nigeria Programme of Activities", which is a joint initiative by the German NGOs atmosfair gGmbH and Lernen-Helfen-Leben e.V. (LHL) and the Nigerian Developmental Association for Renewable Energies (DARE) to promote dissemination of improved cooking stoves to households in the Federal Republic of Nigeria. The efficient stoves disseminated save up to 80% of fuel wood. The CME of the PoA is atmosfair gGmbH.
The ICS disseminated under this CPA save fuel wood and hence reduce greenhouse gas emissions stemming from the use of non-renewable biomass.

(b) Brief description of the installed technology and equipment;

The improved cook stove (ICS) disseminated under this SSC-CPA is the "SAVE80", a portable stove made of stainless steel, developed and prefabricated by a German manufacturer and assembled locally to create employment and income. The initial model has a specified thermal efficiency of 52% and nominal effective thermal power of about 1.5 kW. As per specification of the manufacturer, the SAVE80 needs only about 250 g of small brittle sticks of wood to bring 6 litres of water to the boil, 80% less than traditional fire places. The design ensures preheating of the air and a complete combustion with no visible smoke and only small amounts of ash.
The SAVE80 system also consists of custom-fit pots, pans and a heat retaining box ('Wonderbox'), where food can be transferred after reaching the boiling temperature, and where it will continue to simmer until it is well cooked. The Wonderbox allows important energy savings in addition to the savings by the Save80.

(c) Relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.)

Date	Milestone
29/03/2011	Starting date of the CPA
10/11/2011	PoA registration date and inclusion date of CPA #1
10/11/2011-30/06/2012	First Monitoring Period

(d) Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period.

2,376 t of CO_2e

Conservative approach

The approach followed in monitoring and calculation of emission reductions is conservative as

- as required by the methodology AMS II G, ver. 3, a weighted emission factor (81.6 t CO_2/TJ) is used instead of the emission factor for wood (112 t CO_2/TJ). Therefore, only 73% of the *de facto* emission reductions when using the ICS can be taken into account.

- additional fuel wood savings up to 50% from using the heat retaining device, the Wonderbox, are not considered in calculation of emission reductions.
- the ICS start to generate emission reductions only in the month following the sales of the ICS

A.2. Location of project activity

(a) Host Party: Federal Republic of Nigeria

(b) Region/ State/ Province: The ICS deployed under this CPA are spread all over Nigeria. The location is recorded on the sales receipt and documented in the sales record database.

(c) City/ Town/ Community: The ICS were installed in households in Nigeria.

(d) Physical/ Geographical location:

All appliances disseminated under this CPA have a unique serial number, allowing to doubtlessly identify the appliance. Serial numbers are transferred to the corresponding CPA electronic record keeping system.

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Nigeria (host)	Atmosfair gGmbH (private entity)	No

A.4. Reference of applied methodology

AMS II.G., version 3 (EB 60), "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass"

A.5. Crediting period of project activity

Fixed crediting period (10 years)
Start of crediting period: 10/11/2011
End of crediting period: 09/11/2021

SECTION B. Implementation of project activity
B.1. Description of implemented registered project activity

(a) Description of the installed technology, technical processes and equipment

The ICS deployed under this SSC-CPA is the "SAVE80", a portable stove made of stainless steel, developed and prefabricated by a German manufacturer and assembled locally to create employment and income. The initial model has a specified thermal efficiency of 52% and nominal effective thermal power of about 1.5 kW. As per specification of the manufacturer, the SAVE80 needs only about 250 g of small brittle sticks of wood to bring 6 litres of water to the boil, 80% less than traditional fire places. The design ensures preheating of the air and a complete combustion with no visible smoke and only small amounts of ash. The SAVE80 system also consists of custom-fit pots, pans and a heat retaining box ('Wonderbox'), where food can be transferred after reaching the boiling temperature, and where it will continue to simmer until it is well cooked. The Wonderbox allows important energy savings in addition to the savings by the Save80. However, these energy savings will not be taken into account for calculating emission reductions which is increasing the overall conservativeness of the Emission Reduction calculations.

(b) Information on the implementation and actual operation of the project activity, including relevant dates (e.g. construction, commissioning, continued operation periods, etc.).

The following table lists the number of ICS deployed under this CPA since the starting date of the project activity on 29/03/2011 (date of first sales under the PoA) and as recorded in the sales record database at the end of the monitoring period. Please note: Not all ICS that were sold until the end of the Monitoring Period were already recorded in the database. Hence deployment figures in the next monitoring reports may slightly vary.

Month	Year	ICS deployed
March	2011	5
April	2011	18
May	2011	13
June	2011	11
July	2011	28
August	2011	289
September	2011	43
October	2011	47
November	2011	112
December	2011	143
January	2012	96
February	2012	216
March	2012	866
April	2012	276
May	2012	351
TOTAL		**2,514**

(c) Description of:

(i) The events or situations that occurred during the monitoring period that may impact the applicability of the applied methodology;

No special events which may impact the applicability of the methodology occurred.

(ii) How the issues resulting from these events or situations have been addressed.

Not applicable.

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

No temporary deviations from registered monitoring plan or applied methodology have been applied during this monitoring period.

B.2.2. Corrections

No corrections to project information or parameters fixed at validation have been approved during this monitoring period or submitted with this monitoring report.

B.2.3. Permanent changes from registered monitoring plan or applied methodology

No permanent changes from the registered monitoring plan or applied methodologies have been approved during this monitoring period or submitted with this monitoring report.

B.2.4. Changes to project design of registered project activity

No changes to the project design of the project activity have been approved during this monitoring period or submitted with this monitoring report.

B.2.5. Changes to start date of crediting period

No changes to the start date of the crediting period have been approved during this monitoring period or submitted with this monitoring report.

B.2.6. Types of changes specific to afforestation or reforestation project activity

Not applicable.

SECTION C. Description of monitoring system

Data collection procedures and organisational structure

The monitoring consists of three stages:

1. (Continuous) Sales monitoring
2. Sample surveys after the end of the monitoring period and prior to verification
3. Data compilation, quality control and drafting of the Monitoring Report

1. Sales monitoring

Sales monitoring serves to determine the adjusted total number of appliances deployed until period y (N_y)

The ICS deployment and sales monitoring data flow process incl. organisational structure is illustrated in the following diagram:

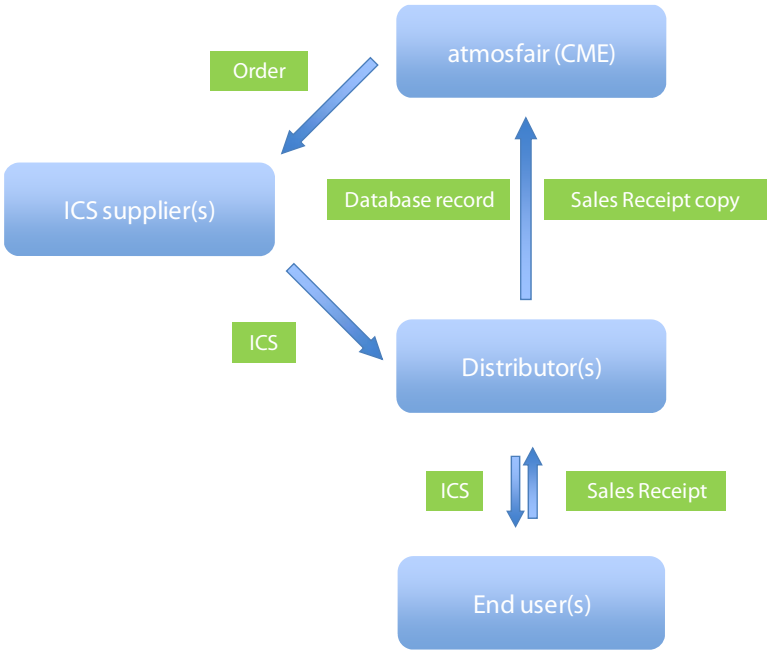

Diagram 1: Sales monitoring flow chart

Data generation:
Every end user acknowledges receipt of an ICS on a sales receipt. The sales receipt provides information on

- Name and contact details of the user
- Serial number of the ICS deployed
- Sales date

Data recording:
The distributor(s) are collecting the sales receipts from the end users and enter the information from the sales receipts into an electronic database (the "sales records database").

Data aggregation and reporting:
The distributors submit both the sales receipt copies and the electronic datasets of the sales receipts to the CME. CME checks for inconsistencies and instructs distributors to take corrective action if necessary.

2. Sample surveys

After the end of the monitoring period and prior to the verification, sample surveys are conducted that serve to determine the

- statistically adjusted drop out from total population of appliances in period y (DO_y)
- average number of eaters per appliance ($N_{eaters,\ appliance}$)
- adjusted average efficiency of the system being deployed (η_{new})

The sample survey data flow incl. organisational structure is illustrated in the following line diagram:

Diagram 2: Sample survey flow chart

Data generation:
The CME draws a random sample from the sales records database and submits the electronic sample incl. user details to the monitoring team. The monitoring team conducts the surveys (user interviews and efficiency tests) at the end user locations.

Data recording:
The monitoring team records the information from the user interviews on questionnaires and from the efficiency tests on data entry forms.

Data aggregation and reporting:
The monitoring team submits the questionnaires and the data entry forms to the CME. CME checks for inconsistencies and instructs the monitoring team to take corrective action if necessary. The CME aggregates and reports the results in an inspection database.

For the detailed sampling plan, see Section D.3

3. Data compilation

The CME finally transfers the parameter values from the sales records database and from the inspection database to an Excel spreadsheet containing the equations to calculate the emission reductions of the monitoring period. The so achieved values are reported in the monitoring report.

Roles and responsibilities of personnel

Person	**Role**
Managing Entity database administrator	The database administrator is responsible for updating and maintaining all electronic databases.
Monitoring team	The monitoring team will be assigned by the CME to conduct the user interviews and appliance tests during the periodic sampling and reports the results to the database administrator.

Emergency procedures for the monitoring system

The CME has implemented a system of cross-checks to ensure data quality. There is a separation of roles for every step of the data generation, aggregation & recording, calculation and reporting between those who are responsible and those who are controlling the respective step.

In particular, the CME database administrator checks correctness and consistency between information on the sales receipts and the corresponding sales database record. In case inconsistencies are detected, the CME database administrator instructs the distributors to search for the error source. If the error source can be found, the information is corrected accordingly, if not, the database record is removed from the database.

Furthermore, the CME database administrator checks the correctness and consistency of all sampling data collected and processed in in this Monitoring Period.

SECTION D. Data and parameters
D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data/Parameter	$B_{old,capita}$
Unit	t/year
Description	Average baseline fuelwood consumption per capita per year
Source of data	UN Statistics Database, Value for 2006; Nigeria Census Data 2006
Value(s) applied	0.692
Purpose of data	Baseline emission calculation
Additional comment	

Data/Parameter	η_{old}
Unit	-
Description	Efficiency of the baseline system being replaced
Source of data	AMS II.G. (Ver. 3)
Value(s) applied	0.10
Purpose of data	Baseline emission calculation
Additional comment	

Data/Parameter	L_{NRB}
Unit	-
Description	Net-to-gross adjustment factor for NRB Leakage
Source of data	AMS II.G. (Ver. 03)
Value(s) applied	0.95
Purpose of data	Baseline emission calculation
Additional comment	

Data/Parameter	L_{PoA}
Unit	-
Description	Net-to-gross adjustment factor for PoA Leakage
Source of data	AMS II.G. (Ver. 03)
Value(s) applied	0.95
Purpose of data	Baseline emission calculation
Additional comment	

Data/Parameter	$f_{NRB,y}$
Unit	-
Description	Fraction of woody biomass saved by the project activity in period y that can be established as non-renewable biomass
Source of data	FAO (2010): Global Forest Resource Assessment 2010, Country Report Nigeria, http://www.fao.org/forestry/20262-1-1.pdf
Value(s) applied	0.77
Purpose of data	Baseline emission calculation
Additional comment	

Data/Parameter	$NCV_{biomass}$
Unit	TJ/t
Description	Net calorific value of the non-renewable woody biomass that is substituted
Source of data	AMS II.G (Ver. 3)
Value(s) applied	0.015
Purpose of data	Baseline emission calculation
Additional comment	

Data/Parameter	$EF_{projected\_fossilfuel}$
Unit	tCO_2/TJ
Description	Emission factor for the substitution of non-renewable biomass by similar consumers
Source of data	AMS II.G (Ver. 3)
Value(s) applied	81.6
Purpose of data	Baseline emission calculation
Additional comment	

Data/Parameter	***HH_CAP***
Unit	Number
Description	Maximum number of eaters possible per specific ICS as applied in the specific CPA
Source of data	Manufactures specifications
Value(s) applied	8
Purpose of data	Not used for emission reduction calculation. Only as cap for monitored parameter $N_{eaters,\ appliance}$
Additional comment	

Data/Parameter	$\eta_{specified}$
Unit	%
Description	Efficiency of the system being deployed as per manufacturer specification
Source of data	Manufactures specifications
Value(s) applied	52
Purpose of data	Not used for emission reduction calculation. Only for demonstration of fulfillment of eligibility criterion 2 (for CPA inclusion).
Additional comment	

D.2. Data and parameters monitored

Data/Parameter	$N_{eaters\ ,appliance}$
Unit	-
Description	Average number of eaters per appliance (capped at value for parameter HH_Cap, see above)
Measured/Calculated /Default	Calculated from sample survey
Source of data	Sample survey
Value(s) of monitored parameter	7.28
Monitoring equipment	Questionnaire
Measuring/Reading/ Recording frequency	Once for this monitoring period (i.e. annual inspection at 90/10 confidence/precision since monitoring period < 1 year)

Calculation method (if applicable)	Monitoring of the statistically adjusted average number of eaters involves two steps: Step 1: Sample survey amongst appliances deployed Step 2: Calculation of the average number of eaters at confidence level and precision as required by the methodology (AMS II.G. ver. 3) for the inspection frequency chosen, following the statistical standard approach for a homograde test of independent units that have a standard normal distribution. The average number of eaters are determined through interviews performed by a dedicated monitoring team. Interviews are reported in a questionnaire. Interviews are conducted until the required precision for this parameter is achieved. All questionnaires and information gathered during the sampling by the monitoring team are handed over to the managing entity that takes care of entering the information to an electronic database and updating databases where appropriate. Interviews are conducted until the required precision for this parameter is achieved. All questionnaires and information gathered during the sampling by the monitoring team are handed over to the managing entity that takes care of entering the information to an electronic database and updating databases where appropriate. During the interviews users where asked: “For how many people do you normally cook on the stove?” (See questionnaire_user_interviews_PoA Question 3 which was provided to the DOE), thus it is made sure that the answers only refer to the eaters that solely used the ICS. All questions where only asked referring to the new stove. Therefore, household members possibly served by baseline stoves are not included. Additionally it should be noted that the number of eaters per ICS is capped at 8 people per household maximum (Maximum numbers of eaters parameter HH_CAP). It was found during the field visit that the Save 80 is suitable for serving considerably higher numbers of eaters than 8 since the average number of eaters without applying the HH_CAP would be 10.01 instead of 7.28 with the HH_CAP; See: PoA Inspection database MP1). The Emission Reductions achieved during this monitoring period without the CAP on the average numbers of eaters would be 3,265 t/CO2 instead of 2,376 t/CO2 with cap. This means capping the number of eaters per appliance at 8 eaters per ICS decreases the ER by 37% which shows that method of defining the average eaters per ICS is very conservative.

QA/QC procedures	All formulas applied to determine the statistical precision used are standard formula. Furthermore, according to AMS II.G (ver. 3), par.22 the sampling error has to be deducted (*"...the lower bound of a […] confidence interval of the parameter value may be chosen"*) in the event that the required precision could not be achieved because of a small sample size. No deductions have to be made if the precision is achieved by sampling a proper number of appliances. Data will be collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.
Purpose of data	Baseline emission calculation
Additional comment	

Data/Parameter	N_y
Unit	-
Description	Adjusted total number of appliances deployed until period y
Measured/Calculated /Default	Calculated
Source of data	Sales Records
Value(s) of monitored parameter	1,295
Monitoring equipment	Sales receipts and sales records database
Measuring/Reading/ Recording frequency	Continuous monitoring and recording of n_i
Calculation method (if applicable)	The total number of appliances deployed until period y is calculated based on information monitored through the sales records database. $N_y = \sum_{i=1}^{y} n_i \cdot OT_{adjusted,i,y}$

Parameter	Unit	Description
n_i	-	Number of appliances deployed in period i as reported in the sales records database and adjusted to account for delays between sales date and first use. Every appliance starts to operate (deployment date) in the month following the month in which the appliance was sold.
$OT_{adjust,i,y} = \begin{cases} 1 & ,i < y \\ \frac{d_{average,y}}{mp_{length}} & ,i = y \end{cases}$	-	Adjustment factor for reduced operational time of appliances deployed in monitoring period y, whereas i = 1, …, y. For all appliances deployed in the periods *i* prior to Monitoring period *y*, the adjustment factor is 1.
$d_{average,y}$	days	Average number of days that appliances deployed in period y have been operational in period y as determined by respective deployment dates of appliances counted for n_y . Deployment dates are determined mutatis mutandis as in the context of n_i above.
mp_{length}	days	Length of monitoring period y

QA/QC procedures	Data will be collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.
Purpose of data	Baseline emission calculation
Additional comment	

Data/Parameter	DO_y
Unit	%
Description	Statistically adjusted drop out from total population of appliances in period y
Measured/Calculated /Default	Calculated from sample survey
Source of data	Sample survey
Value(s) of monitored parameter	11.32
Monitoring equipment	Questionnaire
Measuring/Reading/ Recording frequency	Once for this monitoring period (i.e. annual inspection at 90/10 confidence/precision since monitoring period < 1 year)
Calculation method (if applicable)	Monitoring of the statistically adjusted drop out involves two steps: Step 1: Sample survey amongst appliances deployed Step 2: Calculation of the adjusted drop out rate at confidence level and precision as required by the methodology (AMS II.G. ver. 3) for the inspection frequency chosen, following the statistical standard approach for a homograde test of independent units that have a standard normal distribution. The Drop outs are determined through interviews where it is checked if the appliances are still operational, performed by a dedicated monitoring team. Interviews are reported in a questionnaire. Checks are conducted until the required precision for this parameter is achieved. All questionnaires and information gathered during the sampling by the monitoring team are handed over to the managing entity that takes care of entering the information to an electronic database and updating databases where appropriate.
QA/QC procedures	All formulas applied to determine the statistical precision used are standard formula. Furthermore, according to AMS II.G (ver. 3), par.22 the sampling error has to be deducted (*"...the lower bound of a […] confidence interval of the parameter value may be chosen"*) in the event that the required precision could not be achieved because of a small sample size. No deductions have to be made if the precision is achieved by sampling a proper number of appliances. Data will be collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.
Purpose of data	Baseline emission calculation
Additional comment	

<table>
<tr><td>Data/Parameter</td><td>η_{new}</td></tr>
<tr><td>Unit</td><td>%</td></tr>
<tr><td>Description</td><td>Adjusted average efficiency of the system being deployed</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Calculated from sample survey</td></tr>
<tr><td>Source of data</td><td>Sample survey</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>40.47</td></tr>
<tr><td>Monitoring equipment</td><td>
<table>
<tr><td></td><td><u>Weighing Scale</u></td></tr>
<tr><td>Type</td><td>KD 8000</td></tr>
<tr><td>Accuracy class</td><td>+/- 1 g</td></tr>
</table>
<table>
<tr><td></td><td><u>Thermocouple</u></td></tr>
<tr><td>Type</td><td>Voltcraft Thermometer with Timer</td></tr>
<tr><td>Accuracy class</td><td>Temperature range 0° C - 200° C</td></tr>
</table>
</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Once for this monitoring period (i.e. annual inspection at 90/10 confidence/precision since monitoring period < 1 year)</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Monitoring of the statistically adjusted average efficiency involves two steps:

Step 1: Sample survey amongst appliances deployed
Step 2: Calculation of the average efficiency at confidence level and precision as required by the methodology (AMS II.G. ver. 3) for the inspection frequency chosen, following the statistical standard approach for a heterograde test of independent units that have a standard normal distribution.

η_{new} is determined following the Water Boiling Test (WBT), performed by a dedicated monitoring team.

Checks are conducted until the required precision for this parameter is achieved.</td></tr>
</table>

QA/QC procedures	All formulas applied to determine the statistical precision are standard formula. Furthermore, according to AMS II.G (ver. 3), par.22 the sampling error has to be deducted (*"...the lower bound of a […] confidence interval of the parameter value may be chosen"*) in the event that the required precision could not be achieved because of a small sample size. No deductions have to be made if the precision is achieved by sampling a proper number of appliances. Data will be collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later. Cross-checks: The monitoring team will cross-check results with the efficiency as determined at CPA inclusion stage. Additionally, literature values may also be used to compare the results. Calibration of measuring equipment: Weigh Scale: According to the user manual of the scale it was professionally factory calibrated before shipment and does not need to be recalibrated (See calibration scale WBT kd8000). Thermocouple: The user manual of the thermometer was provided to the DOE. There is a 3 years Manufacturers Guarantee and the precision is also warrantied for 3 years. Weigh scale and Thermocouple were purchased in 21.03.2012 and 23.03.2012 respectively (See Invoice Thermocouple and Invoice Weigh Scale). According to EB 65 Annex 4 par 242 and EB 65 Annex 5 par 56 f, no re-calibration was necessary, since calibration frequency of both instruments is within manufacturers' specification.
Purpose of data	Baseline emission calculation
Additional comment	

D.3. Implementation of sampling plan

Please note:
The registered PoA-DD (Section E.7.2) (reproduced in Section B.6.1. of the registered CPA-DD) contains a description of the sampling methodology envisaged by the CME at time of requesting registration. The section also mentions that "Other sampling methods which may be more practical and cost effective may alternatively be used, while considering the most recent General Guidelines for sampling and surveys for small-scale CDM project activities (http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid20.pdf). If this is the case, the DOE will have to verify at verification stage that the sampling method was statistically sound and as robust as the approaches presented in this PoA-DD."
Given the adoption of both the "Standard for sampling and surveys for CDM project activities and programme of activities" (EB 65 Annex 2) and the "Best practices examples focusing on sample size and reliability calculations" (EB 67 Annex 6) which happened between the registration of the PoA and the end of the first monitoring period, the CME decided to apply

simple random sampling instead of multistage sampling in line with both the registered PoA-DD/CPA-DD ("Other sampling methods which may be more practical and cost effective may alternatively be used") and the requirements of EB 65 Annex 2.

We decided to apply simple random sampling because it has the advantages that it is the most conceptually straight forward way of sampling, especially if there is not enough information on the population, or if the population is rather homogenous.
We originally planned to use multistage sampling to be able to concentrate sampling in fewer administrative regions (possible primary units) and thus would save time and money for traveling. However it turned out that the sample sizes using the multi stage approach were unreasonably higher compared to the single random sampling, and thus theoretical savings due to reduced traveling would not have occurred in reality. Furthermore according to EB 50 Annex 30, para 16 *"Using random sampling methods is recommended when potentially more efficient sampling techniques are infeasible or impractical."* Therefore we decided to use the option opened in the PDD and to apply simple random sampling.

Since simple random sampling was applied during the monitoring the sample is drawn directly from the entire database which includes stoves of all ages. Therefore the sample based on the simple random sampling reflects the actual age distribution of the entire stove database. The age classification is thus not necessary if simple random sampling is applied.

(a) Description of implemented sampling design;

The sample size was determined on the basis of the given precision for annual sampling and the variances of parameters expected ex-ante. Since the monitoring campaign was carried out after monitoring period of less than one year (10.11.2011-31.06.2012), according to EB 50 Annex 30, para 8, a Confidence and Precision of 90/10 is required. The ex-ante variance values for the different parameters needed for the sample size calculation are based on own experience from internal checks. The documentation of the internal checks and the sample size calculator were provided to the DOE. The internal checks resulted in the following values for the parameters:

Parameter	Value	Standard deviation
$N_{eaters\ ,appliance}$	7	2
η_{new}	0.42	0.04
Parameter	Expected proportion	Drop out rate
DO_y	0.8	0.2

The required sample sizes were calculated prior to conducting the sample survey by inserting these ex-ante values into the equations for simple random sampling as per EB 67 Annex 6, para 16 to 26 for the proportional parameter of interest (DO_y) and para 51 to 57 for the mean value parameters of interest ($N_{eaters,\ appliance}$; η_{new}). Determined sample sizes for the different parameters are shown in the table below and the according ex-ante sampling size calculation has been submitted to the DOE. Actual sample sizes for some parameters were higher than the required sample size, either due to practical reasons (the question to determine N_{eaters} was on the questionnaire for DO_y), or because the required sample size was quite small. Since oversampling is in line with EB 50 Annex 30 para. 6 and leads to more reliable results. It may thus be considered as good practice.

Parameter	n required after EB 67 Annex 6	n incl. estimated non-response of 70%	n sampled from database
$N_{eaters\ ,appliance}$	22	31	96
DO_y	67	96	96
η_{new}	3	4	31

A single sample (the "Inspection database") of 96 households was drawn from the sales records database by the CME via a computerized randomizer. Based on this Inspection database all of the parameters to be determined via sampling were monitored. The parameters DO_y and N_{eaters} were monitored in all interviewed households since the question to monitor N_{eaters} is part of the questionnaire used for the determination of DO_y. The sample size for parameter η_{new} was 31 due to oversampling

(b) Collected data, analysis of the same and demonstration on whether the confidence/precision has been met

During the monitoring of DO_y we contacted all households (96) from the Inspection database. In total 53 users could be interviewed. A list of non-responses, including the reasons for non-responses has been submitted to the DOE.
In order to decide if we had to draw an additional sample (which would be feasible according to EB 69 Annex 4, par 16), we calculated the precision which was achieved by analyzing the results of the 53 user interviews which could be performed out of the 96. The ex-post sample size calculation sheet was provided to the DOE. Since the actual value for drop-out rate (DO_y) of cookstoves was lower than the estimated ex-ante value ex-post calculation resulted in a precision of 8% and therefore the required 90/10 confidence/precision could already be achieved with the smaller sample size of 53. The sample size of 53 was therefore statistically large enough to assure the envisaged precision and an additional sampling was not necessary. This approach is in line with the monitoring plan, PoA DD, which states on page 57:

"Therefore, although the monitoring team will undertake monitoring of various parameters simultaneously and on the same sample, the managing entity may decide to stop monitoring of a particular parameter during the campaign once the required precision for this parameter is achieved. The monitoring team will continue to monitor appliances in the sample with respect to the remaining parameter(s) until again the required precision for these parameters is achieved."

For the determination of the parameter $N_{eaters,\ appliance}$, the initially calculated sample size was 31 (see table above). But since it was a common sample for DO_y and $N_{eaters,\ appliance}$, 96 was chosen for both. In total 46 answers where achieved to determine $N_{eaters,appliance}$. This number corresponds to the 53 interviewed households, less the households which did not use the stove (drop-out) and less the interviewees who did not want to give any information on the number of eaters/household size.
The parameter η_{new} sample size was determined as 4 with 70% response rate (seet able above). But in actual efficiency tests were conducted at 19 households, which is appropriate. The valid answers of 19 correspond to originally targeted households (31), less 10 households that where part of the non-response list submitted to the DOE, and less the households which did not use the stove (drop-out). A summary of the number of valid responses and the results for monitored parameters can be found in the table below.

Parameter	N*	Value	Standard deviation	Confidence	Precision	Lower bound applicable?
$N_{eaters\ ,appliance}$	46	7.28	1.17	90%	4%	No
DO_y	53	11.32 %	N/A	90%	8%	No
η_{new}	19	40.47%	2.5%	90%	2%	No

*valid responses

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

Please note that the methodology ASM II.G., ver. 3 does not provide specific equations for calculation of Baseline emissions, project emissions or leakage, only for Emission reductions. As Leakage was considered ex-ante, B_{old} was adjusted to account for the quantified leakage.

E.2. Calculation of project emissions or actual net GHG removals by sinks

Not applicable, as methodology ASM II.G., ver. 3 does not consider project emissions.

E.3. Calculation of leakage

Net-to-gross adjustment factors for NRB Leakage ($\boldsymbol{L_{NRB}}$) and for PoA Leakage ($\boldsymbol{L_{PoA}}$) (fixed default values of 0.95 as per AMS II.G.) were applied to the project activity to calculate Emission Reductions of this Monitoring Period.

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Time Period	Baseline emissions or baseline net GHG removals by sinks (tCO_2e)	Project emissions or actual net GHG removals by sinks (tCO_{2e})	Leakage (tCO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO_2e)
Total	2,376	Not applicable	Not applicable	2,376

Equations used for calculation of emission reductions:

In line with the AMS II. G., ver. 3, emission reductions are calculated using the following equation:

$$ER_y = B_{y,savings} \cdot f_{NRB,y} \cdot NCV_{biomass} \cdot EF_{projected\ \_\ fossilfuel}$$

Parameter	Unit	Description

ER_y	tCO_2	Emission reductions of the project activity in period *y*
$B_{y,savings}$	t	Quantity of woody biomass that is saved by the CPA in period y
$f_{NRB,y}$	-	Fraction of woody biomass saved by the project activity in period y that can be established as non-renewable biomass (fixed parametric value of 0.77)
$NCV_{biomass}$	TJ/t	Net calorific value of the non-renewable woody biomass that is substituted (fixed parametric value of 0.015 TJ/tonne)
$EF_{projected\_fossilfuel}$	tCO_2/TJ	Emission factor for the substitution of non-renewable woody biomass by similar consumers (fixed parametric value of 81.6 tCO_2/TJ)

$B_{y,savings}$ is calculated according to the following formula, according to AMS II.G., par. 6, Option 2:

$$B_{y,savings} = B_{old} \cdot (1 - \frac{\eta_{old}}{\eta_{new}})$$

Parameter	Unit	Description
$B_{y,savings}$	t	Quantity of woody biomass that is saved
B_{old}	t	Quantity of woody biomass used in the absence of the project activity
η_{old}	%	Efficiency of the baseline system being replaced (fixed parametric value of 0.1)
η_{new}	%	Efficiency of the system being deployed as part of the project activity (**monitored** parametric value)

B_{old} is calculated according to the following formula:

$$B_{old} = B_{old,appliance} \cdot N_y \cdot (1 - DO_y) \cdot \frac{mp_{length}}{365} \cdot L_{NRB} \cdot L_{PoA}$$

Parameter	Unit	Description
B_{old}	t	Quantity of woody biomass used in the absence of the project activity

$B_{old,appliance}$	t/year	Quantity of woody biomass used in the absence of the project activity in tonnes, per appliance
N_y	-	Adjusted total number of appliances deployed in period y (**monitored** parametric value)
DO_y	%	Statistically adjusted drop out from total population of appliances in period y (**monitored** parametric value)
mp_{length}	days	Length of monitoring period y
L_{NRB}	-	Net-to-gross adjustment factor for NRB Leakage (fixed parametric value of 0.95)
L_{PoA}	-	Net-to-gross adjustment factor for PoA Leakage (fixed parametric value of 0.95)

$B_{old,,appliance}$ is calculated according to the following formula:

$$B_{old,appliance} = B_{old,capita} \cdot N_{eaters,appliance}$$

Parameter	Unit	Description
$B_{old,,appliance}$	t/year	Quantity of woody biomass used in the absence of the project activity in tonnes, per appliance
$B_{old,capita}$	t/year	Average baseline fuelwood consumption per capita per year (fixed parametric value of 0.692 t/year)
$N_{eaters,appliance}$	-	Average number of eaters per project appliance (**monitored** parametric value, capped as per parameter HH_CAP)

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO_2e)	3,705	2,376

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

In the registered CPA-DD, expected annual emission reductions are 5,780 t CO_2 for 2012 (see Section A.4.4). This monitoring period covers 234 days (10/11/2011 – 30/06/2012, both days

included) and hence expected emission reductions as applied in ex-ante calculation of the registered CPA-DD are 5,780 t CO_2 / 365 days (of a year) * 234 days = 3,705 t CO_2 .

The actual values achieved during this monitoring period are lower than estimated in the registered CPA-DD. The reason is that compared to the estimates in the DD,

- the number of appliances deployed is lower
- the average number of eaters is lower
- the drop out rate among the appliances deployed is higher

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History of the document

Version	Date	Nature of revision
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	EB 54, Annex 34 28 May 2010	Initial adoption.
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