



**Monitoring report form for CDM programme of activities  
(Version 02.0)**

*Complete this form in accordance with the instructions attached at the end of this form.*

**MONITORING REPORT**

<b>Title of the PoA</b>	PoA: Improved Cooking Stoves for Nigeria Programme of Activities  CPA1: CPA # 1 Improved Cooking Stoves for Nigeria CPA2: CPA # 2 Improved Cooking Stoves for Nigeria CPA3: CPA # 3 Improved Cooking Stoves for Nigeria CPA4: CPA # 4 Improved Cooking Stoves for Nigeria	
<b>UNFCCC reference number of the PoA</b>	PoA Ref. 5067 <u>CPA reference numbers:</u> CPA1: 5067-0001 CPA2: 5067-0002 CPA3: 5067-0003 CPA4: 5067-0004	
<b>Version numbers of the PoA-DD applicable to this monitoring report</b>	3.2	
<b>Version number of this monitoring report</b>	03	
<b>Completion date of this monitoring report</b>	05/02/2018	
<b>Monitoring period number</b>	05	
<b>Duration of this monitoring period</b>	01/07/2015 – 30/06/2017 (both days included)	
<b>Monitoring report number for this monitoring period</b>	01	
<b>Coordinating/managing entity</b>	atmosfair gGmbH	
<b>Host Parties</b>	Host Party of the PoA	Is this the host Party of a CPA covered in this monitoring report? (yes/no)
	Nigeria	Yes
<b>Sectoral scopes</b>	3: Energy demand	
<b>Applied methodologies and standardized baselines</b>	AMS II.G., version 3, "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass"	
<b>Amount of GHG emission reductions or net anthropogenic GHG removals achieved by all CPAs covered in this monitoring report in this monitoring</b>	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	0	62,459 t CO <sub>2</sub> e

period		
<b>Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the CPA-DDs for the CPAs covered in this monitoring report</b>	CPA 1: 19,338 t CO <sub>2</sub> e CPA 2: 23,118 t CO <sub>2</sub> e CPA 3: 23,253 t CO <sub>2</sub> e CPA 4: 69,354 t CO <sub>2</sub> e Total: 135,063 t CO <sub>2</sub> e	

## PART I Monitoring of programme of activities (PoA)

### SECTION A. Description of PoA

#### A.1. General description of PoA

##### Policy/measure or stated goal of the PoA

The aim of the PoA is to enhance the penetration of improved cooking stoves (ICS) by offering cost-effective efficient stoves. The ICS disseminated under this PoA save fuel wood and hence reduce greenhouse gas emissions stemming from the use of non-renewable biomass. The carbon revenues are utilised to recover the balance of costs.

##### General Description

The Improved Cooking Stoves (ICS) for Nigeria Programme of Activities 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.

##### Confirmation that the proposed PoA is a voluntary action by the coordinating/managing entity.

atmosfair as the coordinating/managing entity hereby confirms that the PoA is a voluntary action. Participation of all involved stakeholders such as distributors in the program is completely voluntary.

There are no laws or regulations stipulating the use of efficient cook stoves. Existing laws and regulations concerning the protection of forestry areas in Nigeria are not enforced.

##### Contribution to sustainable development

Besides saving greenhouse gases, the programme aims to

- bring wood consumption down so as to allow natural recovery of forests and/or reforestation to take place,
- diminish Indoor Air Pollution from wood smoke and avoid its harmful health consequences,
- diminish the fuel wood bill for households,
- preserve wood resources so as to avoid inter-communal and/or inter-religious conflict over resources.

**A.1.1. Corresponding generic component project activities (CPAs)**

Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Sectoral scopes	Applied methodologies and standardized baselines
CPA # X Improved Cooking Stoves for Nigeria	3.2	3: Energy demand	AMS II.G., version 3, "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass"

**A.1.2. CPAs included in the PoA**

Title and UNFCCC reference number of the CPA	Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Crediting period type and duration	Covered in this monitoring report? (yes/no)
5067-0001	CPA # X Improved Cooking Stoves for Nigeria	3.2	10/11/2011 – 09/11/2021	yes
5067-0002	CPA # X Improved Cooking Stoves for Nigeria	3.2	15/07/2012 – 14/07/2022	yes
5067-0003	CPA # X Improved Cooking Stoves for Nigeria	3.2	15/07/2012 – 14/07/2022	yes
5067-0004	CPA # x Improved Cooking Stoves for Nigeria	3.2	01/06/2013 – 31/05/2023	yes
5067-0005	CPA # X Improved Cooking Stoves for Nigeria	3.2	01/06/2013 – 31/05/2023	no

**A.2. Coordinating/managing entity**

atmosfair gGmbH  
 Zossener Strasse 55 -58  
 10961 Berlin, Germany  
 Contact person CME: Nele Erdmann,  
 Tel: +49 (0) 30 627 3550-16  
 Email: erdmann@atmosfair.de

**SECTION B. Implementation of PoA****B.1. Description of implemented PoA****1. Implementation of the management system of the PoA**

Roles and responsibilities of personnel

***Managing entity***

atmosfair serves as managing entity and sole legal representative of the programme. Therefore, atmosfair is the coordinating entity and sole focal point which communicates with the Board, including on matters relating to the distribution of CERs. atmosfair ensures that all CPAs under its PoA are neither registered as an individual CDM project activity nor included in another registered PoA and in case of new CPAs that they are subscribed to the PoA. atmosfair manages a central database for all CPAs.

Other tasks of the managing entity may include:

- Partnering with and contracting of ICS suppliers and distributors
- Stove procurement, i.e. order and shipment (if applicable) to the distributors
- Development of numbering procedures to avoid double counting, also with regard to other PoAs or CDM projects in Nigeria
- Assignment of DOEs for validation, CPA inclusion and verifications

**Distributors**

Tasks of registered distributors may include:

- stove assembly, if applicable
- Training of stove assemblers, if applicable
- Numbering of stoves, if applicable
- Stove promotion, incl. trainings and demonstrations
- Stove sales
- Customer support
- Monitoring data collection (e.g. contact details from stove users as required for the monitoring), processing and storage

In the monitoring period covered by this monitoring report (MP5) there were no stove sales under this PoA. The project expansion (i.e. further sales of ICS) has been put on hold due to safety reasons. Therefore number of ICS is also lower as estimated in the PoA-DD.

**Record keeping system for each CPA under the PoA**

An electronic record keeping system is operated and maintained by the managing entity for each CPA under the PoA, which contains at least the following information per CPA:

- Name and ID of the CPA
- Technology deployed (Name of the ICS type)
- Name and contact details of the registered distributors for the CPA, date of registration of the distributor
- Serial numbers (Stove-ID) of the ICS belonging to the CPA and corresponding information required for monitoring
- Start of CPA crediting period

The record keeping system will be updated as per the progress of the CPA.

Each improved cooking stove will start to generate emission reductions in the month following the sales date (or the date of CPA inclusion, whichever is later), to account for delays between sales and first use.

Data will be kept for the whole crediting period of the CPA and an additional two years.

**Avoid double counting**

In each CPA-DD it is stated that the CPA has not been and will not be registered either as a single CDM project activity or as a CPA under another PoA.

The serial numbers allocated to each ICS under the PoA allow unique identification and tracking of the ICS. Based on the serial numbers, an ICS can only count in one CPA.

**Awareness and agreement of those operating a CPA on PoA subscription**

The provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA are taken.

It is ensured that all parties involved in implementing a CPA are aware and agree that the CPAs are subscribed to the PoA.

**Trainings**

CME ensures that all involved parties in the CPAs (e.g. distributors, CPA operators if different from the CME) are trained adequately to meet the documentation requirements of the PoA.

Regularly, physical or virtual meetings are carried out where the parties involved are exchanging their experiences and will receive updates from the CME which CME considers relevant to properly carry out the PoA.

## 2. Implementation of single sampling plan(s)

A single sampling plan was implemented for CPA1: 5067-0001, CPA2: 5067-0002 and CPA4: 5067-0004, where as a separate sampling plan was implemented for CPA3: 5067-0003 (see details below, section E.3)

### B.2. Post-registration changes to PoA

#### B.2.1. Corrections

There are no corrections to programme information or parameters fixed at registration that

- (a) have been approved by the Board for the periods prior to this monitoring period
- (b) have been approved by the Board for this monitoring period
- (c) are being submitted with this monitoring report as part of the request for issuance (post-registration change – issuance track).

#### B.2.2. Inclusion of monitoring plan

There is no inclusion of a monitoring plan into the PoA-DD, for which the delayed submission of the monitoring plan was chosen by the coordinating/managing entity at the time of the registration of the PoA that

- (a) has been approved by the Board for the periods prior to this monitoring period
- (b) is being submitted with this monitoring report (post-registration change – issuance track).

#### B.2.3. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

There are permanent changes to the registered monitoring plan that

- (a) have been approved by the Board prior to this monitoring period:

A revision of the monitoring plan as Post Registration Change was triggered due to FAR1 raised by the DOE during MP1 following an incomplete notification for the first issuance request by the UNFCCC ([http://cdm.unfccc.int/PoAIssuance/iss\\_db/poaiss571744464/view](http://cdm.unfccc.int/PoAIssuance/iss_db/poaiss571744464/view)).

The PoA-DD and CPA-DDs were revised accordingly and now hold the version number 03.2.  
Completion Date of the revised PoA DD and CPA PDDs: 24/09/2014

According to the FAR, the following changes have been made in the registered monitoring plan:

The PoA-DD and CPA-DDs were revised in a way to now incorporate the requirements of the latest sampling standard and sampling guidelines for monitoring with reference to

- (a) the Desired Precision/Expected Variance and Sample Size;
- (b) the frequency of sampling for each parameter (i.e. annual or biennial);
- (c) the information regarding how the ICS age will be classified (e.g. classification of ICS deployed each 6 months);

The outline of the monitoring report was adapted to the sampling guidelines for monitoring (EB75 Annex 8: Guideline for sampling and surveys for CDM project activities and programmes of

activities). Detailed information on the desired precision, expected variance and sample size for the corresponding sampling frequency was provided in section D.7.2 A.4 of the CPA DDs. Frequency of sampling is provided in section D.7.1 of the CPA DDs. Information on age class classification is provided in section D.7.2 A.3 Sampling method.

Also a detailed description of the simple random sampling approach was included in the PoA-DD and CPA-DDs section D.7.2 A.3 Sampling Method, Approach 1: Simple Random Sampling.

Date of acceptance of the post registration change by the EB: 29.12.2014 (Effective approval date: 25.12.2014).

The Monitoring Report is drafted in line with the revised monitoring plan PoA-DD and CPA DD (versions 03.2)

There are no further changes that

- (b) have been approved by the Board for this monitoring period
- (c) are being submitted with this monitoring report as part of the request for issuance (post-registration change – issuance track).

#### **B.2.4. Changes to programme design**

There are no changes to programme design of the PoA that

- (a) have been approved by the Board for the periods prior to this monitoring period
- (b) have been approved by the Board for this monitoring period
- (c) are being submitted with this monitoring report as part of the request for issuance (post-registration change – issuance track).

## **PART II Monitoring of CPAs**

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The Monitoring Report covers and contains the CPAs 5067-0001, 5067-0002, 5067-0003 and 5067-0004.

Since all CPAs are based on the same generic CPA, information on the CPAs are grouped in the present report wherever appropriate. Monitoring results, information on the sampling process and specific information unique to each CPA are shown individually per CPA, as appropriate.

### **SECTION C. Implementation of CPAs**

#### **C.1. Description of implemented CPAs**

##### **1. Purpose of the CPA(s) and the measures taken for GHG emission reductions**

The purpose of the CPAs is the dissemination of improved cooking stoves to households in Nigeria. The CME of the PoA and CPAs 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.

##### **2. Implementation status of the CPAs**

- (a) Brief description of the installed technology and equipment

The improved cook stove (ICS) disseminated under SSC-CPA 1, SSC-CPA 2 and SSC-CPA 4 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 improved cook stove disseminated under the SSC-CPA 3 is the Envirofit G3300, a wood efficient burning rocket stove.

(b) Information on the implementation and actual operation of the CPAs, including relevant dates

Number of stoves sold under each CPA:

CPA 1: 3,198 stoves

CPA 2: 3,182 stoves

CPA 3: 2,235 stoves

CPA 4: 2,527 stoves

Relevant dates:

Date	Milestone
29/03/2011	Starting Date of the CPA#1
29/03/2011	Starting Date of stove distribution CPA#1
10/11/2011	PoA registration date and inclusion date of CPA #1
10/11/2011	Starting date of crediting period CPA #1
10/11/2011-30/06/2012	First Monitoring Period
05/02/2014	First issuance
01/01/2012	Starting Date of the CPA#2
14/01/2012	Starting Date of stove distribution CPA#2
11/07/2012	Date of CPA#2 inclusion
15/07/2012	Starting date of Crediting period CPA#2
01/01/2012	Starting Date of the CPA#3
07/01/2012	Starting Date of stove distribution CPA#3
11/07/2012	Date of CPA#3 inclusion
15/07/2012	Starting date of the crediting Period CPA #3
01/07/2012-30/06/2013	Second monitoring Period
01/01/2012	Starting Date of the CPA#4
12/07/2013	Starting Date of stove distribution CPA#4
29/05/2013	Date of CPA#4 inclusion
01/06/2013	Starting Date of the crediting Period CPA #4
01/07/2013-30/06/2014	Third monitoring Period
01/07/2014-30/06/2015	Fourth monitoring Period
01/07/2015-30/06/2017	Fifth Monitoring Period

**C.2. Location of CPAs**

(a) Host Party:

Federal Republic of Nigeria

(b) Region/ State/ Province:

The region, where ICS are distributed is the Federal Republic of Nigeria for all CPAs (1-4), since CPAs are not defined by location, but by stove numbers. The exact sales location for each stove is recorded on the sales receipt and documented in the sales record database. Please see below the list of states in which stoves have been distributed in the different CPAs.

CPA 1	CPA 2	CPA 3	CPA 4
Abia State	Abia State	Federal Capital/ Abuja	Abia
Federal Capital/Abuja	Federal Capital/Abuja	Adamawa State	Adamawa State
Adamawa State	Adamawa State	Anambra	Anambra State
Akwa Ibom State	Akwa Ibom State	Bauchi State	Bauchi State

Anambra State	Anambra State	Benue State	Benue State
Bauchi State	Bauchi State	Borno State	Borno State
Bayelsa State	Benin State	Edo State	Edo State
Benue State	Benue State	Gombe State	Enugu State
Borno State	Borno State	Jigawa State	Gombe
Cross Rivers State	Delta State	Kaduna State	Gombe State
Delta State	Edo State	Kano State	Imo State
Ebonyi State	Ekiti State	Katsina State	Jigawa State
Edo State	Enugu State	Kebbi	Kaduna State
Ekiti state	FCT	Kogi State	Kano State
Enugu State	Gombe State	Lagos State	Katsina State
FCT	Ibadan	Plateau State	Kwara State
Funtuna	Imo State	Taraba State	Lagos State
Gombe State	Jigawa State	Yobe	Nasarawa
Imo State	Kaduna State	Zamfara State	Nassarawa
Jigawa State	Kano State		Niger State
Kaduna State	Katsina State		Ondo State
Kano State	Kebbi State		Plateau State
Katsina State	Kogi state		Sokoto
Kebbi State	Kwara State		Yobe
Kogi State	Lagos State		Zamfara State
Kwara State	Nassarawa State		
Lagos State	Niger State		
Nassarawa State	Ogun State		
Niger State	Ondo State		
Ogun State	Osun State		
Ondo State	Oyo State		
Osun State	Plateau State		
Oyo State	Rivers State		
Plateau State	Sokoto State		
Rivers State	Taraba State		
Sokoto State	Yobe State		
Taraba State	Zamfara State		
Yobe State			
Zamfara State			

## (c) City/ Town/ Community:

The ICS of all CPAs 1- CPA 4 were installed in households all over the Federal Republic of Nigeria. For distribution of stove in the single CPAs please see the table provided above.

## (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. For distribution of stove in the single CPAs please see the table provided above.



### **C.3. Post-registration changes to CPAs**

#### **C.3.1. Temporary deviations from the monitoring plans in the included CPA-DDs, applied methodologies or standardized baselines**

There are no temporary deviations from the monitoring plans in the included CPA-DDs for any of the CPAs covered in this monitoring report.

#### **C.3.2. Corrections**

There are no corrections to project information or parameters fixed at the inclusion of any of the CPAs covered in this monitoring report.

#### **C.3.3. Changes to the start date of the crediting period**

There are no changes to the start date of the crediting period fixed at the inclusion of any of the CPAs covered in this monitoring report.

#### **C.3.4. Inclusion of monitoring plan**

There are no post-registration changes to include a monitoring plan into the CPA-DDs, for which the delayed submission of the monitoring plan was chosen by the coordinating/managing entity at the time of the inclusion of the CPAs, for any of the CPAs covered in this monitoring report.

#### **C.3.5. Permanent changes to the included monitoring plans, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools**

There are permanent changes to the monitoring plans included in the CPA-DDs for all of the CPA-DDs covered in this monitoring report. These changes have been

(a) notified to the secretariat as applicable from the period prior to this monitoring period:

A revision of the monitoring plan as Post Registration Change was triggered due to FAR1 raised by the DOE during MP1 following an incomplete notification for the first issuance request by the UNFCCC ([http://cdm.unfccc.int/PoAIssuance/iss\\_db/poaiss571744464/view](http://cdm.unfccc.int/PoAIssuance/iss_db/poaiss571744464/view))

The PoA-DD and CPA-DDs were revised accordingly and now hold the version number 03.2.

Completion Date of the revised PoA DD and CPA PDDs: 24/09/2014

According to the FAR, the following changes have been made in the registered monitoring plan:

The PoA-DD and CPA-DDs were revised in a way to now incorporate the requirements of the latest sampling standard and sampling guidelines for monitoring with reference to

- the Desired Precision/Expected Variance and Sample Size;
- the frequency of sampling for each parameter (i.e. annual or biennial);
- the information regarding how the ICS age will be classified (e.g. classification of ICS deployed each 6 months);

The outline of the monitoring report was adapted to the sampling guidelines for monitoring (*EB75 Annex 8: Guideline for sampling and surveys for CDM project activities and programmes of activities*). Detailed information on the desired precision, expected variance and sample size for

the corresponding sampling frequency was provided in section D.7.2 A.4 of the CPA DDs. Frequency of sampling is provided in section D.7.1 of the CPA DDS. Information on age class classification is provided in section D.7.2 A.3 Sampling method.

Also a detailed description of the simple random sampling approach was included in the PoA-DD and CPA-DDs section D.7.2 A.3 Sampling Method, Approach 1: Simple Random Sampling. Date of acceptance of the post registration change by the EB: 29.12.2014 (Effective approval date: 25.12.2014).

The Monitoring Report is drafted in line with the revised monitoring plan PoA-DD and CPA DD (versions 03.2).

There are no further changes that have been

(b) notified to the secretariat as applicable from this monitoring period.

### **C.3.6. Changes to project design**

There are no changes to the project design of any of the CPAs covered in this monitoring report.

## **SECTION D. Description of monitoring system of CPAs**

The monitoring system is the same for all CPAs.

In line with PoA-DD and CPA-DDs, 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

In response to the political situation in Nigeria the UN approved following exception which is valid until the 27<sup>th</sup> of November 2018:

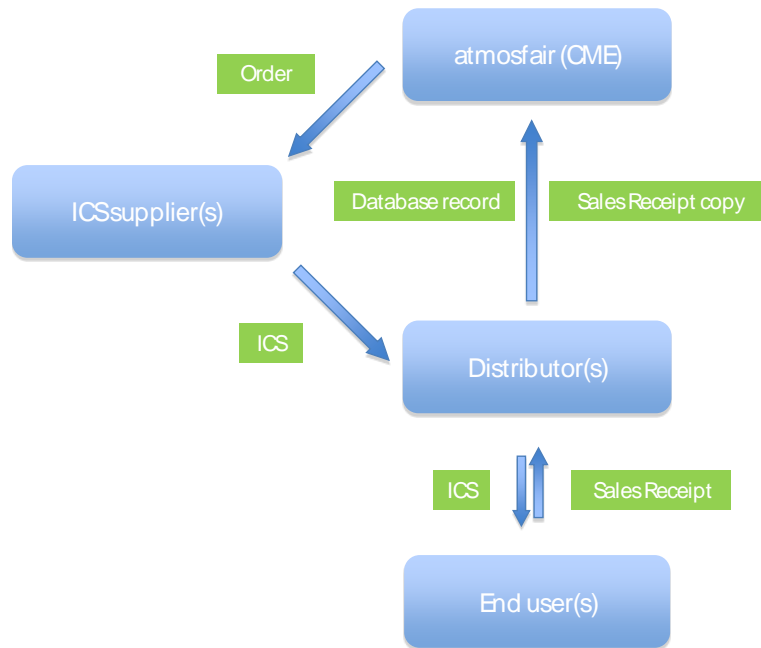
- a)The CME and DOE may apply a combination of survey and data collection methods as per section 9 of the "Guidelines for sampling and surveys for CDM project activities and programme of activities" (version 4.0, CDM-EB86-A04), for example using telephone interviews and household visits for the data collection;
- b)Joint site visits by the monitoring and verification personnel to collect data and evidence may be undertaken.

This exception was granted to CME following our request for clarification on monitoring and verification in conflict zones (INQ-04074-EB), where we applied for contingency measures for monitoring and verification.

### **1.Sales monitoring**

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

The process of ICS deployment and sales monitoring data flow 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) collect 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, copies of the sales receipt and the electronic datasets from the sales receipts to the CME. CME checks for inconsistencies and instructs distributors to take corrective action if necessary.

In this monitoring period there were no new sales of ICS under the CPAs covered in the monitoring report.

## 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 ( $N_{\text{eaters,appliance}}$ )
- adjusted average efficiency of the system being deployed ( $\eta_{\text{new}}$ )

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 E.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 is 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 this Monitoring Period.

## SECTION E. Data and parameters

### E.1. Data and parameters fixed ex ante

Data and parameters values valid for CPA 1, CPA 2, CPA 3 and CPA 4.

<b>Data/Parameter</b>	<b><math>B_{old, capita}</math></b>
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
Choice of data or measurement methods and procedures	The United Nations Statistics Division has published fuelwood consumption figures for households in Nigeria. To arrive at the per capita consumption, this figure is divided by the total population in Nigeria. The population data is taken from official census. Both data are taken from the same, most recent year for consistency reason.
Purpose of data/parameter	Baseline emission calculation
Additional comments	

<b>Data/Parameter</b>	<b><math>\eta_{old}</math></b>
Unit	%
Description	Efficiency of the baseline system being replaced
Source of data	AMS II.G. (Ver. 3)
Value(s) applied	0.10
Choice of data or measurement methods and procedures	According to AMS II.G. ver. 3, a default value of 0.10 can be used "if the replaced system is the three stone fire or a conventional system lacking improved combustion air supply mechanism and flue gas ventilation system i.e., without a grate as well as a chimney".
Purpose of data/parameter	Baseline emission calculation
Additional comments	

<b>Data/Parameter</b>	<b><math>L_{NRB}</math></b>
Unit	-
Description	Net-to-gross adjustment factor for NRB Leakage
Source of data	AMS II.G. (Ver. 03)
Value(s) applied	0.95
Choice of data or measurement methods and procedures	As per the methodology AMS II.G. ver. 3, a default value as provided under par. 13 can be optionally used to account for leakages, in which case surveys are not required.
Purpose of data/parameter	Baseline emission calculation
Additional comments	

<b>Data/Parameter</b>	<b><math>L_{PoA}</math></b>
Unit	-
Description	Net-to-gross adjustment factor for PoA Leakage
Source of data	AMS II.G. (Ver. 03)

Value(s) applied	0.95
Choice of data or measurement methods and procedures	As per the methodology AMS II.G, ver. 3, a default value as provided under par. 23 can be optionally used to account for potential PoA leakages, in which case estimates of the leakage is not required.
Purpose of data/parameter	Baseline emission calculation
Additional comments	

<b>Data/Parameter</b>	<b><math>f_{NRB,y}</math></b>
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, <a href="http://www.fao.org/forestry/20262-1-1.pdf">http://www.fao.org/forestry/20262-1-1.pdf</a>
Value(s) applied	0.77
Choice of data or measurement methods and procedures	Though the NRB assessment comes to the conclusion that 100% of the woody biomass available to the end users is none-renewable, since none of the three conditions outlined in the methodology AMS II.G., ver. 3, par. 9 are fulfilled and hence it cannot be shown that demonstrably renewable woody biomass exists, a lower factor is used to be conservative.
Purpose of data/parameter	Baseline emission calculation
Additional comments	

<b>Data/Parameter</b>	<b><math>NCV_{biomass}</math></b>
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
Choice of data or measurement methods and procedures	This is the IPCC default value for wood fuel as provided by AMS II.G ver. 3, par. 5.
Purpose of data/parameter	Baseline emission calculation
Additional comments	

<b>Data/Parameter</b>	<b><math>EF_{projected\_fossilfuel}</math></b>
Unit	tCO <sub>2</sub> /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
Choice of data or measurement methods and procedures	This is the IPCC default value as provided by AMS II.G. ver. 3, par. 5.
Purpose of data/parameter	Baseline emission calculation
Additional comments	

<b>Data/Parameter</b>	<b><math>HH\_CAP</math></b>
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
Choice of data or measurement methods and procedures	According to manufactures specifications.
Purpose of data/parameter	Not used for emission reduction calculation. Only as cap for monitored parameter $N_{\text{eaters, appliance}}$
Additional comments	

<b>Data/Parameter</b>	<b><math>\eta_{\text{specified}}</math></b>
Unit	%
Description	Efficiency of the system being deployed as per manufacturer specification
Source of data	Manufactures specifications
Value(s) applied	For CPA 1, 2 and 4: 52 For CPA 3: 32.6
Choice of data or measurement methods and procedures	According to manufactures specifications.
Purpose of data/parameter	Not used for emission reduction calculation. Only for demonstration of fulfillment of eligibility criterion 2 (for CPA inclusion).
Additional comments	

## E.2. Data and parameters monitored

<b>Data/Parameter</b>	<b><math>N_{\text{eaters, appliance}}</math></b>
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	For CPA 1, 2 and 4 : 7.70 For CPA 3 : 7.31
Monitoring equipment	Questionnaire
Measuring/reading/recording frequency	Once for this monitoring period (i.e. biennial monitoring)  According to AMS-II.G. ver. 3, par. 22, and Standard for Sampling and surveys (CDM-EB50-A30_STAN vers.4.1 par 20, confidence/precision criteria to be met is determined as follows: for CPA 1, 2 and 4: biennial inspection at 95/5 confidence/precision since monitoring period = 2 years and sampling covered more than one CPA, and for CPA 3: biennial inspection at 95/5 confidence/precision since monitoring period = 2 years and sampling covered one CPA

Calculation method (if applicable)	<p>Monitoring of the statistically adjusted average number of eaters involves two steps:</p> <p>Step 1: Sample survey amongst appliances deployed</p> <p>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.</p> <p>The average number of eaters is determined through interviews performed by a dedicated monitoring team. Interviews are reported in a questionnaire.</p> <p>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.</p>
QA/QC procedures	<p>All formulae applied to determine the statistical precision used, are standard formulae as of CDM EB67 A06 GUID version 3.0 (Guideline for sampling and surveys for CDM activities and programme of activities). Furthermore, according to AMS II.G (ver. 3), par.22 the sampling error has to be deducted (<i>"...the lower bound of a [...] confidence interval of the parameter value may be chosen"</i>) 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.</p> <p>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.</p>
Purpose of data/parameter	Baseline emission calculation
Additional comments	

<b>Data/Parameter</b>	<b><math>N_y</math></b>
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	CPA 1: 3,198 CPA 2: 3,182 CPA 3: 2,235 CPA 4: 2,527
Monitoring equipment	Sales receipts and sales records database
Measuring/reading/recording frequency	Continuous monitoring and recording of $n_i$



<p>Calculation method (if applicable)</p>	<p>The total number of appliances deployed until period y is calculated based on information monitored through the sales records database.</p> $N_y = \sum_{i=1}^y n_i \cdot OT_{adjusted,i,y}$ <table border="1" data-bbox="584 378 1414 1541"> <thead> <tr> <th>Parameter</th> <th>Unit</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td><math>n_i</math></td> <td>-</td> <td>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.</td> </tr> <tr> <td><math>OT_{adjusted,i,y} = \begin{cases} 1 &amp; , i &lt; y \\ \frac{d_{average,y}}{mp_{length}} &amp; , i = y \end{cases}</math></td> <td>-</td> <td>Adjustment factor for reduced operational time of appliances deployed in monitoring period y, whereas <math>i = 1, \dots, y</math>. For all appliances deployed in the periods i prior to Monitoring period y, the adjustment factor is 1.</td> </tr> <tr> <td><math>d_{average,y}</math></td> <td>days</td> <td>Average number of days appliances deployed in period y have been operational in period y as determined by respective deployment dates of appliances counted for ny. Deployment dates are determined mutatis mutandis as in the context of <math>n_i</math> above.</td> </tr> <tr> <td><math>mp_{length}</math></td> <td>days</td> <td>Length of monitoring period y</td> </tr> </tbody> </table>	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.	$OT_{adjusted,i,y} = \begin{cases} 1 & , i < y \\ \frac{d_{average,y}}{mp_{length}} & , i = y \end{cases}$	-	Adjustment factor for reduced operational time of appliances deployed in monitoring period y, whereas $i = 1, \dots, y$ . 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 appliances deployed in period y have been operational in period y as determined by respective deployment dates of appliances counted for ny. Deployment dates are determined mutatis mutandis as in the context of $n_i$ above.	$mp_{length}$	days	Length of monitoring period 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.														
$OT_{adjusted,i,y} = \begin{cases} 1 & , i < y \\ \frac{d_{average,y}}{mp_{length}} & , i = y \end{cases}$	-	Adjustment factor for reduced operational time of appliances deployed in monitoring period y, whereas $i = 1, \dots, y$ . 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 appliances deployed in period y have been operational in period y as determined by respective deployment dates of appliances counted for ny. Deployment dates are determined mutatis mutandis as in the context of $n_i$ above.														
$mp_{length}$	days	Length of monitoring period y														
<p>QA/QC procedures</p>	<p>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.</p>															
<p>Purpose of data/parameter</p>	<p>Baseline emission calculation</p>															
<p>Additional comments</p>	<p>Since there were no new appliances deployed during the monitoring period and under the CPAs covered in this monitoring period, the adjustment factor <math>OT_{adjusted,i,y}</math> is 1.</p>															

<p><b>Data/Parameter</b></p>	<p><b>DO<sub>y</sub></b></p>
<p>Unit</p>	<p>%</p>
<p>Description</p>	<p>Statistically adjusted drop out from total population of appliances in period y</p>
<p>Measured/calculated/default</p>	<p>Calculated from sample survey</p>
<p>Source of data</p>	<p>Sample survey</p>

Value(s) of monitored parameter	For CPA 1, 2 and 4: 15.57% For CPA 3: 8.22%
Monitoring equipment	Questionnaire
Measuring/reading/recording frequency	Once for this monitoring period (i.e. biennial monitoring)
Calculation method (if applicable)	<p>Monitoring of the statistically adjusted drop out involves two steps:</p> <p>Step 1: Sample survey amongst appliances deployed</p> <p>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.</p> <p>The Drop outs are determined through interviews where it is checked if the appliances are still operational, performed by a dedicated monitoring team.</p> <p>Interviews are reported in a questionnaire.</p> <p>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.</p>
QA/QC procedures	<p>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.</p> <p>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.</p>
Purpose of data/parameter	Baseline emission calculation
Additional comments	

<b>Data/Parameter</b>	$\eta_{new}$
Unit	%
Description	Adjusted average efficiency of the system being deployed
Measured/calculated/default	Calculated from sample survey
Source of data	Sample survey
Value(s) of monitored parameter	for CPA 1,2 and 4: 0.4009 for CPA 3: 0.2746

Monitoring equipment		<u>Precision Balance</u>
	Type/Name	KD 8000
	Accuracy class	+/- 1 g
	Serial number	ESN5678224992T
	Calibration status	Calibrated on 06/07/2017
		<u>Thermometer</u>
	Type/Name	Greisinger Präzisionsthermometer GMH 3710
	Accuracy class	Temperature range -199.99° C - +199.99° C
	Serial number	32402476
	Calibration status	Calibrated on 06/07/2017
Measuring/reading/recording frequency	Once for this monitoring period (i.e. biennial monitoring)	
Calculation method (if applicable)	<p>Monitoring of the statistically adjusted drop out involves two steps:</p> <p>Step 1: Sample survey amongst appliances deployed</p> <p>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.</p> <p><math>\eta_{\text{new}}</math> is determined following the Water Boiling Test (WBT), performed by a dedicated monitoring team.</p> <p>Checks are conducted until the required precision for this parameter is achieved.</p>	
QA/QC procedures	<p>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.</p> <p>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.</p> <p>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.</p>	
Purpose of data/parameter	Baseline emission calculation	
Additional comments		

### E.3. Implementation of sampling plan

#### a) List of CPAs to which the sampling plan was applied

The sampling plan was applied to all CPAs covered under this monitoring report, i.e.

CPA1: 5067-0001  
 CPA2: 5067-0002  
 CPA3: 5067-0003  
 CPA4: 5067-0004

## b) Description of implemented sampling design

A single sample (the “Inspection database”) for CPA 1, CPA 2 and CPA 4 was drawn from the sample database (corresponds to sales records database) by the CME via a computerized randomizer based on which all of the parameters determined via sampling were monitored. A separate sample was drawn for CPA 3 from the corresponding database via a computerized randomizer based on which all of the parameters of CPA 3 determined via sampling were monitored. According to the Monitoring plan of the registered PoA sampling was carried out across CPAs for CPA 1, 2 and 4, because they deploy the same stove type. Sampling of CPA 3 was carried out separately, since CPA 3 deploys a different stove type than CPA 1, 2 and 4. Total number of ICS deployed in CPA 1, 2, 4 is 8,907 and total number of ICS deployed in CPA 3 is 2,235. Therefore total number of ICS deployed by all CPAs covered in this monitoring report is 11,142.

According to AMS II.G. ver. 3, par. 15 and 16, *“Monitoring shall consist of checking the efficiency of all appliances or a representative sample thereof, at least once every two years (biennial) to ensure that they are still operating at the specified efficiency ( $\eta_{new}$ ) or replaced by an equivalent in service appliance. Where replacements are made, monitoring shall also ensure that the efficiency of the new appliances is similar to the appliances being replaced.*

*Monitoring shall also consist of checking of all appliances or a representative sample thereof, at least once every two years (biennial) to determine if they are still operating or are replaced by an equivalent in service appliance”*

Furthermore, according to par. 20, monitoring shall ensure that:

*“Either the replaced low efficiency appliances are disposed of and not used within the boundary or within the region; or*

*If baseline stoves continue to be used, monitoring shall ensure that the fuel-wood consumption of those stoves is excluded from  $B_{old}$ .”*

For this reason, parameters as stated in Section E.2. of this Monitoring Report are monitored. Due to the high number of appliances deployed an annual check of operation and efficiency of all appliances is economically not feasible. Therefore a representative sample was monitored to ensure that all the appliances deployed are still operating or not, or if appliances have been replaced. Additionally the efficiency of the appliances deployed and number of eaters per household was monitored within the representative sample to account for possible continuous use of baseline stoves<sup>1</sup>.

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<sup>1</sup> As per PoA-DD and respective CPA-DDs for all CPAs, the continuous use of the baseline appliance is considered in monitoring parameter  $N_{eaters,appliance}$ , since only the baseline consumption which is reduced by the project appliance is considered. Practically, this is monitored through the following question on the questionnaire for cookstove users: For how many people do you normally cook on the efficient stove?  $B_{old}$  is determined by multiplying  $B_{old, capita}$  (a fixed parametric value) with the monitored value for  $N_{eaters,appliance}$ . As  $N_{eaters,appliance}$  only considers the persons for which meals are prepared on the efficient cookstove, this ensures that only the baseline consumption that is replaced by the efficient cook stove is considered when calculating  $B_{old}$ .

$N_y$  is monitored through sales/distribution records for all appliances deployed till the end of the Monitoring period, whereas the other parameters were determined through a sample survey.

Precision requirements:

As per applicable methodology AMS-II.G. ver. 3, par. 22: *“When biennial inspection is chosen a 95% confidence interval and a 5% margin of error requirement shall be achieved for the sampling parameter. On the other hand when the project proponent chooses to inspect annually, a 90% confidence interval and a 10% margin of error requirement shall be achieved for the sampled parameters. In cases where survey results indicate that 90/10 precision or 95/5 precision is not achieved, the lower bound of a 90% or 95% confidence interval of the parameter value may be chosen as an alternative to repeating the survey efforts to achieve the 90/10 or 95/5 precision.”*

Therefore, since biennial inspection is chosen, 95/5 confidence/precision requirements do apply except for cases where survey results indicate that the 95/5 confidence/precision is not achieved. In this case lower bound<sup>2</sup> can also be used.

Additional requirement for PoAs:

Parameter values shall be estimated by sampling in accordance with the requirements in the applied methodology separately and independently for each of the CPAs included in a PoA except when a single sampling plan covering a group of CPAs is undertaken. In this case, stricter confidence/Precision requirements do apply (95/10 instead of 90/10). But since biennial monitoring is undertaken, confidence/precision requirements are 95/5 in any case, regardless of whether CPAs are monitored under a single sampling plan or separately.

According to the Monitoring plan of the latest PoA DD sampling was carried out across CPA 1, 2 and 4, because they deploy the same stove type. Therefore as per methodology 95/5 confidence/precision for the sampling applied. For the monitoring of the single CPA 3, which deploys a different stove type, same 95/5 confidence/precision for the sampling applied because of biennial monitoring.

Two separate monitoring samples were drawn, one for CPA 1, 2 and 4 and one for CPA 3, in order to obtain two separate inspection databases for the across CPA sample CPA1, 2 and 4 and one for the separate CPA3. Both samples were drawn using the same approach described below.

In accordance with the monitoring plan of the latest PoA DD the CME can choose between three different sampling approaches.

The sampling approach chosen for this monitoring period was Approach 1: Simple random sampling<sup>3</sup>, as the sales record databases equals the sample database in terms of numbers of stoves. In order to obtain a final representative sample (Inspection database), we drew a simple random sample from the Sample database by means of a computerized randomizer<sup>4</sup>. The sample

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<sup>2</sup> Though in this report we speak of “lower bound” as this is the language from the methodology, what is meant is always the most conservative value (i.e. lower or upper bound depending on the parameter).

<sup>3</sup> Besides simple random sampling, PoA-DD and CPA-DDs optionally allow for multistage sampling with either sample database having the same size or sample database being smaller than the sales record database. Both approaches were included in the PoA-DD and CPA-DD to allow CME flexibility in monitoring. All three approaches ensure statistically sound results, but there is broad experience in CDM projects for simple random sampling only, and given the fact that same was already applied in the former monitoring periods, CME opted to choose this approach also for this monitoring period.

<sup>4</sup> The randomizer macro was programmed by atmosfair based on the excel tool of “RAND()” (<https://support.office.com/en-in/article/RAND-function-e98f1011-127d-4815-96f5-a26850ca1866>). The random select tool was provided to the DOE.

database equals the sales record database (in terms of number of cases). Since the resulting Inspection database is a random sample, stoves from all age classes and geographical representation are selected as per their share in the sample database.

In accordance with the Monitoring Plan of the latest PoA DD and to reduce monitoring efforts a common sample is drawn from the sales records database based on which all of the parameters shall be monitored. This does not imply that for each of the parameters the same number of users/ ICS has to be monitored during sampling. The required sample sizes were calculated prior to conducting the sample survey using the equations for simple random sampling as per CDM requirements.

Across CPA Sample CPA 1, 2 and 4:

Table E.3.1 shows the estimated sample size and the applied sample size for the parameters of interest for CPAs 1, 2 and 4, calculated to reach the targeted confidence/precision and based on values from the previous monitoring period.

We applied oversampling as good practice as per "Standard Sampling and Surveys for CDM projects and programme of activities", footnote 10 to compensate for, outliers or non-response associated with the sample. We assumed 60% response rate, based on the experience from last monitoring period.

The monitoring team undertook the monitoring of the parameters determined via sampling simultaneously and on the same sample, but with different required sample sizes since the confidence/precision of the parameter depend on the variation of the obtained values.

Table E.3.1: Applied sample size for CPA 1 and same for CPA 2 and for CPA 4.

Parameter	Timeframe	Targeted Confidence / Precision	Estimated value*	Expected Standard Deviation *	Estimated Sample Size	Applied sample size**
DO <sub>y</sub>	biennial	95/5	0.0917	No variance	153	255
N <sub>eaters,appliance</sub>	biennial	95/5	6.45	1.46	79	255
η <sub>new</sub>	biennial	95/5	0.3661	0.03	13	255

\*results from monitoring of PoA MP4

\*\*oversampling was employed at design stage as good practice.

Single CPA Sample CPA 3:

Table E 3.2 shows the estimated sample size for the parameters of interest for CPA 3, calculated to reach the targeted confidence/precision and based on values from the previous monitoring period.

We applied oversampling as good practice as per "Standard Sampling and Surveys for CDM projects and programme of activities", footnote 10 to compensate for outliers or non-response associated with the sample. We assumed 32% response rate, based on the experience from last monitoring period.

The monitoring team undertook the monitoring of the parameters determined via sampling simultaneously and on the same sample, but with different required sample sizes since the confidence/precision of the parameter depend on the variation of the obtained values.

Table E.3.2: Applied sample size for CPA 3

Parameter	Timeframe	Targeted Confidence / Precision	Estimated value*	Expected Standard Deviation *	Estimated Sample Size	Applied sample size**
DO <sub>y</sub>	biennial	95/5	0.091	No variance	144	450

$N_{\text{eaters,appliance}}$	biennial	95/5	7.65	0.66	14	450
$\eta_{\text{new}}$	biennial	95/5	0.2851	0.04	30	450

\*results from monitoring of PoA MP4

\*\*oversampling was employed at design stage as good practice.

Monitoring of the parameters  $DO_y$  and  $N_{\text{eaters\_project}}$  was done through interviews of stove users using a common questionnaire. Monitoring of the parameter  $\eta_{\text{new}}$ , was done by applying the Water Boiling Test (WBT) protocol.

### c,d,e) Collected data, analysis of the collected data and demonstration of whether the required confidence/precision level has been met

The following tables summarise the collected data, give the analysis of the samples and the demonstration on whether the confidence/precision has been met.

CPAs 1,2 and 4:

Parameter	n*	Response rate	Result	Standard deviation	Confidence	Precision	Lower bound applicable?
$\eta_{\text{new}}$	12	N/A	40.09%	0.026	95%	4%	No
$DO_y$	150	59%	10.67%	N/A	95%	5%**	Yes
$N_{\text{eaters\_appliance}}$	133	52%	7.70	0.67	95%	1%	No

\*valid responses

\*\*achieved precision 5.48%, therefore exceeding the 5% threshold. The value used for emission reduction calculation is thus 15.57% (lower bound)

CPA 3:

Parameter	n*	Response rate	Result	Standard deviation	Confidence	Precision	Lower bound applicable?
$\eta_{\text{new}}$	13*	N/A	30.25%	0.051	95%	9%**	Yes
$DO_y$	146	32%	8.22%	N/A	95%	5%	No
$N_{\text{eaters\_appliance}}$	134	29%	7.31	0.72	95%	2%	No

\*valid responses

\*\*achieved precision exceeds the 5% threshold. The value used for emission reduction calculation is thus 27.46% (lower bound).

Due to safety issues, only limited number of WBTs could be performed. Since precision requirement was not met, lower bound of  $\eta_{\text{new}}$  is used in emission reduction calculation, This is in line with the requirements since AMS II. G ver. 3 allows to use the lower bound instead of repeating survey efforts.

The adjusted values are used for the emission reductions calculations.

### f) Demonstration of whether the selected samples are representative of the population

The selected samples are representative of the population since they were randomly drawn from the sales/distribution record databases containing the full ICS population considered under CPA 1, 2, 3 and 4 for this Monitoring Period.

For the monitoring parameters  $DO_y$ , and  $\eta_{\text{new}}$ , the target population consists in all ICSs which are included until the end of the monitoring period (30/06/2017). Total number of applied stoves in CPA

1, 2 and 4 is 8,907. The total number of applied stoves for CPA 3 is 2,235 stoves. There were no new ICS deployed in this monitoring period in any of the CPAs covered under this monitoring report.

For the monitoring parameter  $N_{eaters,appliance}$ , the target population consists in all Save80 stoves (CPA 1, 2 and 4) or Envirofit stoves (CPA 3) respectively which are included until the end of the monitoring period; however households, where stoves are found to be not operational will not be considered to determine  $N_{eaters,appliance}$ .

#### **f) Demonstration of whether the samples were randomly selected and are representative of the population**

The users were randomly selected via a computerized randomizer from the sales record databases containing the full ICS population considered under CPA 1, 2 and 4 (single sampling plan) and CPA 3 (separate sample) for this Monitoring Period and as described above.

#### **Quality assurance / Quality control**

Procedures for conducting the data collection and/or field measurements:

Data collection and administration of data:

To ensure completeness and accuracy of monitoring information, electronic databases per CPA are operated and maintained by the CME's database manager.

#### **Sample database**

There are two separate sample databases existing, one for CPA 1, 2 and 4 and one for CPA 3. The sample databases are equal to their respective sales record data base (in terms of size) since all user details of all Save80 users or Envirofit G3300 users respectively are included in the sampling. The sample database keeps information on all appliances deployed. At least the following information will be recorded:

- Serial number of appliance sold
- Sales date
- CPA-ID (CPA to which the appliance belongs to)
- User details (Name, State, Local Government Area (LGA), Address if available, etc.)

#### **Inspection Database**

The Inspection databases keep monitoring results and information from the randomly sampled appliances of the respective CPAs. There is one Inspection database existing for CPA 1, 2 and 4 and one separate Inspection database for CPA 3. The following information was recorded:

- Serial number of appliance checked
- CPA-ID (CPA to which the appliance belongs to)

Information as determined during monitoring:

- Continuous operation of appliance (yes/no) (to determine parameter  $DO_{y,}$ )
- Average number of eaters per appliance (to determine parameter  $N_{eaters,appliance}$ )
- Date of the check
- Efficiency tested (to determine parameter  $\eta_{new}$ )



After the sample was drawn, a monitoring List containing stove numbers and contact details of the users was sent to the Monitoring teams. Data collected and processed by the field staff during monitoring was checked by the CMEs' database manager and the QA/QC Manager.

#### Training of field personnel

All personnel involved in the monitoring were trained to ensure that each of them undertakes an appropriate monitoring assignment according to the Monitoring Plan.

#### Documentation of out-of-population cases, refusals, other sources of non-responses

Refusals and non-respondents (i.e. households where the contact could not be established) were recorded by the monitoring team. The results were reported in the Reporting Form for user interviews.

#### Outliers

No outliers were recorded during the monitoring period.

## **SECTION F. Calculation of emission reductions or net anthropogenic removals**

### **F.1. Calculation of baseline emissions or baseline net removals**

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.

### **F.2. Calculation of project emissions or actual net removals**

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

### **F.3. Calculation of leakage emissions**

Net-to-gross adjustment factors for NRB leakage ( $L_{NRB}$ ) and for PoA leakage ( $L_{PoA}$ ) (fixed default values of 0.95 as per AMS II.G. ver.3) were applied to the project activity to calculate Emission Reductions of this Monitoring Period.

### **F.4. Calculation of emission reductions or net anthropogenic removals**

CPA UNFCCC reference number	Baseline GHG emissions or baseline net GHG removals (t CO <sub>2</sub> e)	Project GHG emissions or actual net GHG removals (t CO <sub>2</sub> e)	Leakage GHG emissions (t CO <sub>2</sub> e)	GHG emission reductions or net anthropogenic GHG removals (t CO <sub>2</sub> e)		
				Before 01/01/2013	From 01/01/2013	Total amount
5067-0001	18,389	Not applicable	Not applicable	0	18,389	18,389
5067-0002	18,297	Not applicable	Not applicable	0	18,297	18,297
5067-0003	11,242	Not applicable	Not applicable	0	11,242	11,242
5067-0004	14,531	Not applicable	Not applicable	0	14,531	14,531
<b>Total</b>	62,459				62,459	62,459

Equations used for calculation of emission reductions:

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

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

Parameter	Unit	Type	Description
$ER_y$	tCO <sub>2e</sub>	Calculated	Emission reductions of the project activity in period y
$B_{y,savings}$	t	Calculated	Quantity of woody biomass that is saved by the CPA in period y.
$f_{NRB,y}$		Fixed	Fraction of woody biomass saved by the project activity in period y that can be established as non-renewable biomass: 0.77
$NCV_{biomass}$	TJ/t	Fixed	Net calorific value of the non-renewable woody biomass that is substituted: 0.015TJ/t
$EF_{projected\_fossilfuel}$	tCO <sub>2</sub> /TJ	Fixed	Emission factor for the substitution of non-renewable woody biomass by similar consumers: 81.6tCO <sub>2</sub> /TJ

$B_{y,savings}$  is calculated according to the following formula, according to AMS II.G. ver. 3, par. 6, Option 2:

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

Parameter	Unit	Type	Description
$B_{y,savings}$	t	Calculated	Quantity of woody biomass that is saved
$B_{old,i}$	t	Calculated	Quantity of woody biomass used in the absence of the project activity
$\eta_{old,i}$	%	Fixed	Efficiency of the baseline system being replaced 0.1
$\eta_{new}$	%	Monitored	Efficiency of the system being deployed as part of the project activity

$B_{old,i}$  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	Type	Description
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$B_{old}$	t	Calculated	Quantity of woody biomass used in the absence of the project activity
$B_{old,appliance}$	t/year	Monitored	Quantity of woody biomass used in the absence of the project activity in tons, per appliance
$N_y$	-	Monitored	Adjusted total number of appliances deployed in period y
$DO_y$	%	Monitored	Statistically adjusted drop out from total population of appliances in period y
$mp_{length}$	days	Monitored (implicitly, no extra parameter)	Length of monitoring period y
$L_{NRB}$	-	Fixed	Net-to-gross adjustment factor for NRB Leakage (0.95 default value)
$L_{PoA}$	-	Fixed	Net-to-gross adjustment factor for PoA Leakage (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 tons, 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 ( <b>monitored</b> parametric value, capped as per parameter HH_CAP)

### Conservative approach

The approach followed in monitoring and calculation of emission reductions is conservative as required by the methodology AMS II G, v3, for the following reasons:

- A weighted emission factor (81.6 t CO<sub>2</sub>/TJ) is used instead of the emission factor for wood (112 t CO<sub>2</sub>/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

### F.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the included CPA-DDs

CPA UNFCCC reference number	Amount achieved during this monitoring period (t CO <sub>2</sub> e)	Amount estimated ex ante (t CO <sub>2</sub> e)
5067-0001	18,389	19,338
5067-0002	18,297	23,118
5067-0003	11,242	23,253
5067-0004	14,531	69,354
<b>Total</b>	<b>62,459</b>	<b>135,063</b>

Ex ante amounts were calculated as per CER calculation in registered DDs, annual values for 2015 and 2017 were divided by 2.

#### F.6. Remarks on increase in achieved emission reductions

The total actual GHG emission reductions achieved is not greater than the total amount based on the ex ante estimations in the included CPA-DDs.

Regarding CPA 1, 2 and 4:

Total amount of emission reductions as per the registered CPA-DDs are 111,810 t CO<sub>2</sub>eq whereas actual values achieved during this monitoring period are lower (51,217 t CO<sub>2</sub>eq) than estimated in the CPA-DD. The reasons for this are:

- the lower than expected number of stoves deployed till the end of the monitoring period 5 (8,907 stoves for CPA 1, CPA 2 and CPA 4 instead of the expected 16,000<sup>5</sup> for CPA 1, CPA 2 and CPA 4 according to the respective CPAs). Additionally other parameter values achieved during this monitoring period are lower than estimated in the CPA-DD:
- the average number of eaters ( $N_{\text{eater,appliance}}$ ) is lower (7.70 instead of 8)
- the drop-out rate ( $DO_y$ ) among the appliances deployed is higher (0.16 instead of 0.05)
- the efficiency is lower (40% instead of 52%)

Regarding CPA 3:

In the registered CPA-DD, expected emission reductions are 23,253 t CO<sub>2</sub> for this monitoring Period.

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

- the number of appliances deployed is lower (2,235 instead of 3,750 stoves)
- the average number of eaters is lower (7.31 instead of 8)
- the drop-out rate among the appliances deployed is higher than estimated (0.08 instead of 0.05)
- the efficiency is lower (27% instead of 33%)

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<sup>5</sup> According to the CPA DD we expected to deploy in the CPA 1 3,200 stoves, in the CPA 2 3,200 stoves and in the CPA 4 9,600 stoves.