



**Monitoring report form for CDM programme of activities  
(version 01.0)**

Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form for CDM programme of activities" at the end of this form.

**MONITORING REPORT**

<b>Title of the programme of activities (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  CPA5: CPA # 5 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 CPA5: 5067-0005	
<b>Version number(s) of the PoA-DD(s) applicable to this monitoring report</b>	3.2	
<b>Coordinating/managing entity (CME)</b>	Atmosfair gGmbH	
<b>Version number of this monitoring report</b>	02	
<b>Completion date of this monitoring report</b>	14.11.2016	
<b>Monitoring period number and dates covered by this monitoring report</b>	MP 03 01/07/2013 – 30/06/2014	
<b>Monitoring report number for this monitoring period</b>	MP3	
<b>Host Party(ies)</b>	Host Party(ies) of the PoA	Is this a host Party to a specific-case CPA covered in this monitoring report?(yes/no)
	Nigeria	
<b>Sectoral scope(s)</b>	3: Energy demand	
<b>Selected methodology(ies)</b>	AMS II.G., version 3, "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass"	

Selected standardized baseline(s)	Not applicable												
Total amount of GHG emission reductions or net GHG removals by sinks for all specific-case-case CPAs in the PoA covered in this monitoring report	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards											
	0	<table border="0"> <tr> <td>PoA:</td> <td>23441</td> </tr> <tr> <td>CPA # 1</td> <td>7713</td> </tr> <tr> <td>CPA # 2</td> <td>7638</td> </tr> <tr> <td>CPA # 3</td> <td>4843</td> </tr> <tr> <td>CPA # 4</td> <td>3247</td> </tr> <tr> <td>CPA # 5</td> <td>0</td> </tr> </table>	PoA:	23441	CPA # 1	7713	CPA # 2	7638	CPA # 3	4843	CPA # 4	3247	CPA # 5
PoA:	23441												
CPA # 1	7713												
CPA # 2	7638												
CPA # 3	4843												
CPA # 4	3247												
CPA # 5	0												

## PART I - Programme of activities

### SECTION A. Description of PoA

#### A.1. Brief description of the PoA

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

The aim of the PoA is to enhance the penetration of efficient cookstoves by offering cost-effective efficient stoves. 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<sup>1</sup> 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. Generic CPA(s)

Title, identification/reference number and/or version number of the generic CPA(s) of the PoA	Sectoral scope(s)	Applied methodology(ies) or combination of methodologies and/or standardized baseline(s)
CPA # 1 Improved Cooking Stoves for Nigeria, 5067-0001	3: Energy demand	AMS II.G., version 3, "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass"
CPA # 2 Improved Cooking Stoves for Nigeria, 5067-0002	3: Energy demand	AMS II.G., version 3, "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass"

Title, identification/reference number and/or version number of the generic CPA(s) of the PoA	Sectoral scope(s)	Applied methodology(ies) or combination of methodologies and/or standardized baseline(s)
CPA # 3 Improved Cooking Stoves for Nigeria, 5067-0003	3: Energy demand	AMS II.G., version 3, "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass"
CPA # 4 Improved Cooking Stoves for Nigeria, 5067-0004	3: Energy demand	AMS II.G., version 3, "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass"
CPA # 5 Improved Cooking Stoves for Nigeria, 5067-0005	3: Energy demand	AMS II.G., version 3, "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass"

#### A.1.2. Specific-case CPA(s) covered in this monitoring report

Reference number of the specific-case CPA included in the PoA as of the end of this monitoring period	Title, identification/reference number and version number of the generic CPA to which the specific-case CPA applies	Crediting period dates of the specific-case CPA	Is this specific-case CPA covered in this monitoring report? (yes/no)
CPA1: 5067-0001	CPA #xxx Improved Cooking Stoves for Nigeria	01/07/2013 – 30/06/2014	yes
CPA2: 5067-0002	CPA #xxx Improved Cooking Stoves for Nigeria	01/07/2013 – 30/06/2014	yes
CPA3: 5067-0003	CPA #xxx Improved Cooking Stoves for Nigeria	01/07/2013 – 30/06/2014	yes
CPA4: 5067-0004	CPA #xxx Improved Cooking Stoves for Nigeria	01/07/2013 – 30/06/2014	yes
CPA5: 5067-0005	CPA #xxx Improved Cooking Stoves for Nigeria	01/07/2013 – 30/06/2014	no

#### A.2. Contact information of the coordinating/managing entity (CME) and/or responsible persons(s)/entity(ies)

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Katrin Wolf

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Email: wolf@atmosfair.de

Atmosfair gGmbH

Zossener Strasse 55 -58

10961 Berlin, Germany

## SECTION B. Implementation of PoA

### B.1. Implementation of the management system of the PoA

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#### Roles and responsibilities of personnel

##### ***Managing entity***

Though the programme is a joint initiative by atmosfair, LHL and DARE, for legal matters, atmosfair shall serve as managing entity and sole legal representative of the programme. Therefore, atmosfair shall be the coordinating entity and sole focal point which communicates with the Board, including on matters relating to the distribution of CERs. atmosfair will ensure that all CPAs under its PoA are neither registered as an individual CDM project activity nor included in another registered PoA and that the CPA is subscribed to the PoA. atmosfair will manage 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

##### ***Role of DARE and LHL***

Developmental Association for Renewable Energies (DARE) is a Nigerian non-profit organisation aiming at promoting the sustainable management of natural resources in Nigeria.

DARE will have the role of representing the PoA in Nigeria. DARE will also be a distributor of Improved Cookstoves. However, in this PoA, DARE will not be a project participant, and the role of DARE as representing the PoA is not an official function in relation to any PoA rules or PoA definitions of entities. The same applies for Lernen-Helfen-Leben e.V. (LHL), a German non-profit organisation founded in 1988 by former development workers to support private development projects in the field of education and environment. LHL will support atmosfair in managing the PoA and is the liaising organisation between atmosfair and DARE as well as other potential distributors.

##### ***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

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

An electronic record keeping system will be 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 (please refer to Section B.7.2 of the PoA DD part II for details)
- 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 will be 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 will be taken.

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

### **Trainings**

CME will ensure 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 will be 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.

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

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A single sampling plan was implemented for CPA1: 5067-0001, CPA2: 5067-0002, CPA4: 5067-0004 and CPA5: 5067-0005 where as a separate sampling plan was implemented for the specific-case CPA3: 5067-0003 (see section G.3. of part II for further information).

## **SECTION C. Post-registration changes to the PoA (including the generic CPA(s))**

### **C.1. Corrections**

>>

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

### **C.2. Inclusion of a monitoring plan to the registered PoA-DD (including its generic CPA-DD(s)), if a monitoring plan was not included at the time of registration**

>>

No inclusion of a monitoring plan to the registered PoA-DD (including its generic CPA-DD(s)), has been approved during this monitoring period or submitted with this monitoring report.

### **C.3. Permanent changes to the monitoring plan as described in the registered PoA-DD, applied methodology, or applied standardized baseline**

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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: 25.12.2014.

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

### **C.4. Changes to the programme design of the registered PoA-DD (including corresponding changes to project design of the generic CPA-DD(s)) and updates to the eligibility criteria for inclusion of specific-case CPAs in the PoA**

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No changes to the programme design of the registered PoA-DD (including corresponding changes to project design of the generic CPA-DD(s)) and updates to the eligibility criteria for inclusion of specific-case CPAs in the PoA

### **C.5. Types of changes specific to afforestation and reforestation activities**

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Not applicable.

## **PART II - Specific-case component project activity(ies)**

### **SECTION D. Description of specific-case CPA(s)**

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The Monitoring Report covers and contains the specific case 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 specific-case CPA are shown individually per CPA, as appropriate.

**D.1. Brief description of implemented specific-case CPA(s)**

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- (a) Purpose of the specific-case CPA(s) and the measures taken for GHG emission reductions or net GHG removals by sinks;

The purpose of the CPAs is the dissemination of improved cooking stoves in Nigeria. The CPAs under the PoA “Improved Cooking Stoves 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. 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.

- (b) 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 will be the Envirofit G3300, a wood efficient burning rocket stove.

- (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#1
10/11/2011	PoA registration date and inclusion date of CPA #1
10/11/2011	Starting date of crediting period
10/11/2011-30/06/2012	First Monitoring Period
05/02/2014	First issuance
01/01/2012	Starting Date of the CPA#2
11/07/2012	Date of CPA#2 inclusion
15/07/2012	Starting date of Crediting period
01/01/2012	Starting Date of the CPA#3
11/07/2012	Date of CPA#3 inclusion
15/07/2012	Starting date of the crediting Period of CPA #3
01/07/2012-30/06/2013	Second monitoring Period
01/01/2012	Starting Date of the CPA#4
01/06/2013	Starting Date of the crediting Period of CPA #4
01/07/2013-30/06/2014	Third monitoring Period

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



CPA 1: 7,713 t CO<sub>2</sub>e  
CPA 2: 7,638 t CO<sub>2</sub>e  
CPA 3: 4,843 t CO<sub>2</sub>e  
CPA 4: 3,247 t CO<sub>2</sub>e  
CPA 5: 0 t CO<sub>2</sub>e

Combine: 23,441 t CO<sub>2</sub>e

#### *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

#### **D.2. Geographical references or other means of identification of the location of the specific-case CPA(s)**

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(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 (1-5), 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.



The physical boundary of the PoA- the Federal Republic of Nigeria.

Source: [http://upload.wikimedia.org/wikipedia/commons/d/d2/Nigeria\\_political.png](http://upload.wikimedia.org/wikipedia/commons/d/d2/Nigeria_political.png), last accessed 15.02.2010

States				
CPA 1	CPA 2	CPA 3	CPA 4	CPA 5
Abia State	Abia State	Federal Capital/ Abuja	Abia	no distribution so far
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 and map provided above. Implementation of CPA 5 are yet to be started.

(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 and map provided above.

## **SECTION E. Post-registration changes to specific-case CPA(s)**

### **E.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline**

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According to request for clarification on monitoring and verification in conflict zones (INQ-Q4074-EB) we applied for contingency measures for monitoring and verification. The exception is valid until the 27<sup>th</sup> of November 2018. See for more details section C.

### **E.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.

### **E.3. Changes to the start date of the crediting period of the specific-case CPA(s)**

>>

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

### **E.4. Inclusion of a monitoring plan into the specific-case CPA(s) that was not included at registration**

>>

No inclusion of a monitoring plan into the specific-case CPA(s) that was not included at registration has been approved during this monitoring period or submitted with this monitoring report for the specific-case CPAs.

### **E.5. Permanent changes to the monitoring plan as described in the registered specific-case CPA-DD(s), applied methodology or standardized baseline**

>>

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: 25.12.2014.

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

**E.6. Changes to project design of the specific-case CPA(s)**

>>

No changes to project design of the specific-case CPA(s) have been approved during this monitoring period or submitted with this monitoring report for the specific-case CPAs.

**E.7. Types of changes specific to afforestation and reforestation specific-case CPA(s)**

>>

Not applicable

**SECTION F. Description of the monitoring system of specific-case CPA(s)**

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According to request for clarification on monitoring and verification in conflict zones (INQ-Q4074-EB) we applied for contingency measures for monitoring and verification. In agreement with the DoE the monitoring consists of:

Parameter	Data Source(s)
Number of systems in use ( $N_{y,i}$ )	1. Purchase Contracts 2. Project Database Records 3. Spot Checks to User Households
Operation time of the systems ( $t_{y,i}$ )	Project Database Records
Efficiency of the systems ( $\eta_{new,i}$ )	Water Boiling Test

Based on the political situation in Nigeria the UN approved an exception that the verification was performed together with the monitoring and that the amount of on-site visits of the households was reduced from 25 to 8. The exception is valid until the 27<sup>th</sup> of November 2018.

The monitoring system is the same for all CPAs.

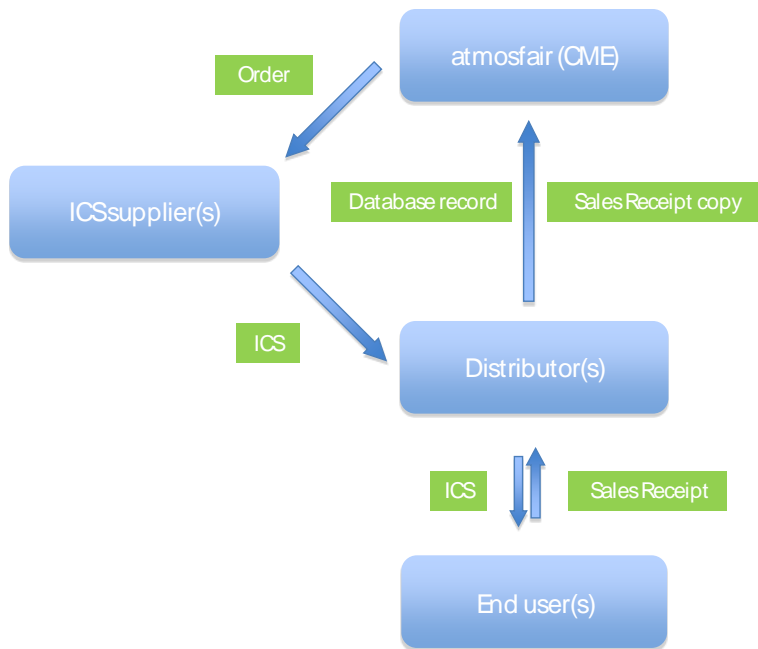
The monitoring consists of three stages:

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 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.

**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 ( $\eta_{new}$ )

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

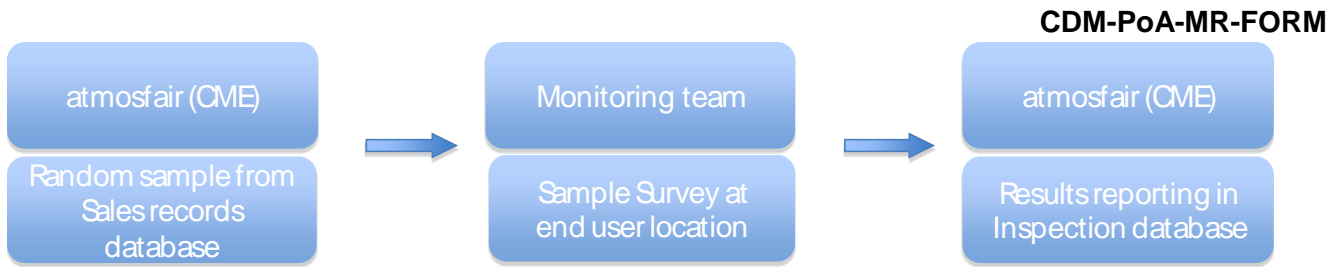


Diagram 2: Sample survey flow chart

**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 G. Data and parameters****G.1. Data and parameters fixed ex ante, at registration, inclusion or renewal of crediting period**

(Copy this table for each piece of data and parameter)

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	
Purpose of data	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	
Purpose of data	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	
Purpose of data	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	
Purpose of data	Baseline emission calculation
Additional comments	

<b>Data/parameter</b>	<b><math>f_{NR,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	
Purpose of data	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	
Purpose of data	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	
Purpose of data	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	
Purpose of data	Not used for emission reduction calculation. Only as cap for monitored parameter $N_{\text{eaters, appliance}}$
Additional comments	

<b>Data/parameter</b>	<i><math>\eta_{\text{specified}}</math></i>
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	
Purpose of data	Not used for emission reduction calculation. Only for demonstration of fulfillment of eligibility criterion 2 (for CPA inclusion).
Additional comments	

## G.2. Data and parameters monitored

(Copy this table for each piece of data and parameter)

<b>Data/parameter</b>	<i><math>N_{\text{eaters, appliance}}</math></i>
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 : 7.37 For CPA 3 : 7.73
Monitoring equipment	Questionnaire
Measuring/reading/recording frequency	Once for this monitoring period  Survey Period CPA 1, 2 and 4: 21. - 30.08.04.2014; 17.06.2016 – 14.08.2016 Survey Period CPA 3: 20.06.2016 – 30.07.2016  (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: annual inspection at 95/10 confidence/precision since monitoring period = 1 year and sampling covered more than one CPA, and for CPA 3: annual inspection at 90/10 confidence/precision since monitoring period = 1 year 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                  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 homogeneity 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 (“...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	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: 3,195.58 CPA 2: 3,164.62 CPA 3: 1,849.50 CPA 4: 1,345.17
Monitoring equipment	Sales receipts and sales records database
Measuring/reading/recording frequency	Continuous monitoring and recording of $n_i$

Calculation method (if applicable)	<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"> <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														
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 comments																

<b>Data/parameter</b>	<b>DO<sub>y</sub></b>
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	For CPA 1, 2 and 4: 23.68% (monitored drop-out rate) For CPA 3: 11,43%

Monitoring equipment	Questionnaire
Measuring/reading/recording frequency	Once for this monitoring period (i.e. annual monitoring) Survey Period CPA 1, 2 and 4: 21. - 30.08.04.2014; 17.06.2016 – 14.08.2016 Survey Period CPA 3: 20.06.2016 – 30.07.2016
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. 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 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: 0.37																						
	<b>Prefix</b>	<b>Stove ID:</b>	<b>Thermal efficiency:</b>																				
	ATM 01	435	34.07%																				
	ATM 01	650	36.54%																				
	ATM 01	1334	39.02%																				
	ATM 01	2954	42.41%																				
	ATM 01	3910	34.19%																				
	ATM 01	6038	36.82%																				
	ATM 01	7558	35.96%																				
	<b>Average</b>		<b>37.00%</b>																				
Survey Period: 17.06.2016 – 28.06.2016 Number of stoves tested: 7																							
	For CPA 3: 0.3258																						
	<b>Prefix</b>	<b>Stove ID:</b>	<b>Thermal efficiency:</b>																				
	EG1J	114958	30.15%																				
	EG1J	115140	28.13%																				
	EG1J	115999	35.13%																				
	EG1J	116075	30.65%																				
	EG1J	191665	29.49%																				
	EG1J	194494	23.28%																				
	EG1J	194757	22.53%																				
	EG1J	172401	29.18%																				
EG1J	171646	27.91%																					
EG1J	189964	28.83%																					
EG1J	194376	28.73%																					
<b>Average</b>		<b>28.55%</b>																					
Survey Period: 20.06.2016 – 25.07.2016 Number of stoves tested: 11																							
Monitoring equipment	<table border="1"> <tr> <td colspan="2"><u>Precision Balance</u></td> </tr> <tr> <td>Type/Name</td> <td>KD 8000</td> </tr> <tr> <td>Accuracy class</td> <td>+/- 1 g</td> </tr> <tr> <td>Serial number</td> <td>ESN5678224992T</td> </tr> <tr> <td>Calibration status</td> <td>Factory calibrated, according to manufacturer does not need to be recalibrated during its lifetime.</td> </tr> <tr> <td colspan="2"><u>Thermometer</u></td> </tr> <tr> <td>Type/Name</td> <td>Greisinger Präzisionsthermometer GMH 3710</td> </tr> <tr> <td>Accuracy class</td> <td>Temperature range -199.99° C - +199.99° C</td> </tr> <tr> <td>Serial number</td> <td>32402476</td> </tr> <tr> <td>Calibration status</td> <td>Calibrated on 20/05/2016</td> </tr> </table>			<u>Precision Balance</u>		Type/Name	KD 8000	Accuracy class	+/- 1 g	Serial number	ESN5678224992T	Calibration status	Factory calibrated, according to manufacturer does not need to be recalibrated during its lifetime.	<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 20/05/2016
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Accuracy class	Temperature range -199.99° C - +199.99° C																						
Serial number	32402476																						
Calibration status	Calibrated on 20/05/2016																						

Measuring/reading/recording frequency	Once for this monitoring period (i.e. annual monitoring)  CPA 1,2,4: Survey Period: 17.06.2016 – 28.06.2016 CPA 3: Survey Period: 20.06.2016 – 25.07.2016
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 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.  $\eta_{new}$ 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.
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.
Purpose of data	Baseline emission calculation
Additional comments	

### G.3. Implementation of specific-case CPA level sampling plan

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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 G.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.

$N_y$  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.

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 and 2, 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 applied stoves in CPA 1, 2, 3 and 4 were  $8,907 + 2,235 = 11,142$ .

Precision requirements:

As per applicable methodology AMS-II.G. ver. 3, par. 22: “... 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 is not achieved, the lower bound of a 90% confidence interval of the parameter value may be chosen as an alternative to repeating the survey efforts to achieve the 90/10 precision.”

Additional requirement for PoAs:

In case a single sampling plan for more than one CPA is used, “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 applying 95/10 confidence/precision for the sample size calculation”, as per Par. 20 of the Sampling Standard, EB 50, Annex 30 ver. 4.1.

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 95/10 confidence/precision for the sampling applied. For the monitoring of the single CPA 3, which deploys a different stove type, 90/10 confidence/precision for the sampling applied.

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

The sampling approach chosen for this monitoring period was Approach 1: Simple random sampling. 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>1</sup>. The sample 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 will be present as to their real percentage 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

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<sup>1</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.



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-EB67-A06-GUID Appendix 1, para 12 to 22 for the proportional parameter of interest (DO<sub>y</sub>) and para 50 to 56 for the mean value parameters of interest ( $N_{eaters,appliance}$ ,  $\eta_{new}$ ).

Across CPA Sample CPA 1 and 2:

Table D 3.3: shows the estimated sample size for the parameters of interest for CPAs 1, 2 and 4.

For CPA 1, 2 and 4 we calculated a necessary sample size of 120 stoves for the parameter DO<sub>y</sub>, assuming a 60% response rate the common sample size is 200. The calculated necessary sample size for  $N_{eaters,appliance}$  was 16 and for  $\eta_{new}$  it was 6 (after applying student T distribution).

We applied oversampling since as per CDM-EB50-A30-STAN, footnote 10 to compensate for, outliers or non-response associated with the sample. We assumed 60% response rate, based on the experiences from former Monitoring campaigns in Nigeria.

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

Table D 3.3: Applied sample size for CPA 1 and same for CPA 2 and for CPA 4.

Parameter	Timeframe	Confidence / Precision	Estimated value*	Expected Variance*	Estimated Sample Size	Applied sample size
DO <sub>y</sub>	annual	95/10	0.239	No variance	120	290
$N_{eaters,appliance}$	annual	95/10	7.11	1.37	15	290
$\eta_{new}$	annual	95/10	0.42	0.03	6	6

\*Result from monitoring of PoA MP2

We contacted all of the 200 Save 80 users of the sample. Not enough users could be interviewed to determine DO<sub>y</sub> and  $N_{eaters,appliance}$ , such we draw another sample and continued the monitoring till reaching the necessary 95/10 precision. In total we contacted 290 Safe 80 users of the samples.

For  $N_{eaters,appliance}$  290 Save 80 users were interviewed. 93 valid answers is more than the required minimum sample size for  $N_{eaters,appliance}$ .

In order to determine  $\eta_{new}$  WBTs were conducted on 7 stoves. This is more than the required minimum sample size for  $\eta_{new}$ .

Single CPA Sample CPA3:

Table D 3.4: shows the estimated sample size for the parameters of interest for CPA 3.

For CPA 3 we calculated a necessary sample size of 19 stove IDs for the parameter DO<sub>y</sub>, but according to CDM-EB50-A30-STAN the applied sample size has to be minimum 30. The calculated necessary sample size for  $N_{eaters,appliance}$  was 18 and for  $\eta_{new}$  it was 11 (after applying students T distribution).

We applied oversampling since as per CDM-EB50-A30-STAN, footnote 10 to compensate for, outliers or non-response associated with the sample. We assumed 60% response rate, based on the experiences from former Monitoring campaigns in Nigeria. Applying this oversampling approach, a common sample size of 50 resulted.

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

Table D 3.4: Applied sample size for CPA 3

Parameter	Timeframe	Confidence / Precision	Estimated value*	Expected Variance*	Estimated Sample Size	Applied sample size
DO <sub>y</sub>	annual	90/10	0.06	No variance	30	50
N <sub>eaters,appliance</sub>	annual	90/10	6.67	1.62	18	50
η <sub>new</sub>	annual	90/10	0.33	0.06	11	11

\*Result from monitoring of PoA MP2

We contacted all of the 50 Envirofit stove users of the sample. As the response rate was less than the required 30 stove users we draw a second sample. In total we contacted 91 Envirofit stove users of the samples. 35 out of the 91 Envirofit users could be interviewed to determine DO<sub>y</sub> and N<sub>eaters,appliance</sub>. This is more than the required minimum sample size for DO<sub>y</sub> and for N<sub>eaters,appliance</sub>. In order to determine η<sub>new</sub> WBTs were conducted on 11 stoves, which is the required minimum sample size for η<sub>new</sub>.

### **b,c,d) 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	Assumed response rate for oversampling	Result	Standard deviation	Confidence	Precision	Lower bound applicable?
η <sub>new</sub>	7	100%	60%	37%	2.92	90%	<b>5.9%</b>	No
DO <sub>y</sub>	120	41%	60%	23,68%	N/A	90%	<b>9.9%</b>	No
N <sub>eaters_project</sub>	93	32%	60%	7.37	0.93	90%	<b>2.6%</b>	No

\*valid responses

#### CPA 3:

Parameter	n*	Response rate	Assumed response rate for oversampling	Result	Standard deviation	Confidence	Precision	Lower bound applicable?
η <sub>new</sub>	11	100%	60%	28.55%	3.4	90%	<b>5.9%</b>	No
DO <sub>y</sub>	35	38%	60%	11.43%	N/A	90%	<b>9.91%</b>	No
N <sub>eaters_project</sub>	30	33%	60%	7.73	4.5	90%	<b>1.7%</b>	No

\*valid responses

The adjusted values are used for the emission reductions calculations.

The sampling of the stove IDs included in the Inspection/monitoring Database took place in the month after the end of the Monitoring Period (31/07/2014), when the sales/distribution record database was fully established.

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

#### **e) 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  $\eta_{new}$ , the target population consists in all ICSs which are included until the end of the third monitoring period (30/06/2014). Total number of applied stoves in CPA 1, 2 and 4 were 8,907. The total number of applied stoves for CPA 3 is 2,235 stoves.

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 third 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 in G.3. a) and e).

### **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 and 2 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 and 2 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  $DO_{y_i}$ )
- 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 as well as the reason for the refusal. The results were reported in the Reporting Form for user interviews.

#### Outliers

No outliers were recorded during the monitoring period.

## **SECTION H. Calculation of GHG emission reductions or net GHG removals by sinks**

### **H.1. Calculation of baseline emissions or baseline net GHG removals by sinks**

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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, Bold was adjusted to account for the quantified leakage.

### **H.2. Calculation of project emissions or actual net GHG removals by sinks**

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

### **H.3. Calculation of leakage**

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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.

## H.4. Summary of calculation of GHG emission reductions or net GHG removals by sinks

Specific-case CPA reference number	Baseline emissions or baseline net GHG removals by sinks (tCO <sub>2</sub> e)	Project emissions or actual net GHG removals by sinks (tCO <sub>2</sub> e)	Leakage (tCO <sub>2</sub> e)	GHG emission reductions or net GHG removals by sinks (tCO <sub>2</sub> e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
CPA 1	7,713	Not applicable	Not applicable		7,713	7,713
CPA 2	7,638	Not applicable	Not applicable		7,638	7,638
CPA 3	4,843	Not applicable	Not applicable		4,843	4,843
CPA 4	3,247	Not applicable	Not applicable		3,247	3,247
<b>Total</b>	23,441				23,441	23,441

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>2</sub> e	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
$B_{old}$	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)

### H.5. Comparison of GHG emission reductions or net GHG removals by sinks with estimates in the included CPA-DD(s)

Specific-case CPA reference number	Value estimated in ex ante calculation in the included CPA-DD(s)	Actual values achieved by the specific-case CPA(s) during this monitoring period
CPA 1	10,988	7,713
CPA 2	11,559	7,638
CPA 3	11,627	4,843
CPA 4	26,051	3,247
CPA 5	27,664	0
<b>Total</b>	<b>87,889</b>	<b>23,441</b>

### H.6. Remarks on difference from the estimated value in the included CPA-DD(s)

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Regarding CPA 1, 2 and 4:

In the registered CPA-DD 1, 2 and 4, expected annual emission reductions are 10,988 tCO<sub>2</sub>, 11,559 tCO<sub>2</sub> and 26,051 tCO<sub>2</sub> respectively for this monitoring Period. The actual values achieved during this monitoring period are lower than estimated in the CPA-DD. The reasons for this are:

- the lower than expected number of stoves sold till the end of the monitoring period 3 (8,908 stoves for CPA 1, CPA 2 and CPA 4 instead of the expected 22,202<sup>2</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 (7.37 instead of 8)
- the drop-out rate ( $DO_y$ ) among the appliances deployed is higher (0.2368 instead of 0.05)

Regarding CPA 3:

In the registered CPA-DD, expected annual emission reductions are 11,627 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)
- the average number of eaters is lower (7.73 instead of 8)
- the drop-out rate among the appliances deployed is higher than estimated (0.1143 instead of 0.05)

<sup>2</sup> According to the CPA DD we expected to sell in the CPA 1 1600 stoves in 2012, 3120 stoves in 2013 and 2,964 stoves in 2014. In the CPA 2 1600 stoves in 2012, 3200 stoves in 2013 and 3,200 stoves in 2014. In the CPA 4 4800 stoves in 2013 and 9,600 stoves in 2014. Thus till the end of monitoring period 3 on 30/06/2014 we expected to sell: 1,600 + 3,120+(2,964/2) + 1,600 + 3,200 + (3,200/2) + 4,800 + (9,600/2)= 22,202 stoves.

**Appendix 1. Contact information of coordinating/managing entity and/or responsible persons/entities**

<b>Coordinating/managing entity and/or responsible person/entity</b>	<input checked="" type="checkbox"/> Coordinating/managing entity <input checked="" type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
<b>Organization name</b>	Atmosfair gGmbH
<b>Street/P.O. Box</b>	Zossener Strasse 55-58
<b>Building</b>	Aufgang D, 6.OG
<b>City</b>	Berlin
<b>State/Region</b>	Berlin
<b>Postcode</b>	10961
<b>Country</b>	Germany
<b>Telephone</b>	+49 (0) 30 627 3550 -16
<b>Fax</b>	+49 (0) 30 627 3550 -29
<b>E-mail</b>	<a href="mailto:info@atmosfair.de">info@atmosfair.de</a>
<b>Website</b>	<a href="http://www.atmosfair.de">www.atmosfair.de</a>
<b>Contact person</b>	Nele Erdmann
<b>Title</b>	-
<b>Salutation</b>	-
<b>Last name</b>	Erdmann
<b>Middle name</b>	-
<b>First name</b>	Nele
<b>Department</b>	CDM Project Development
<b>Mobile</b>	-
<b>Direct fax</b>	+49 (0) 30 627 3550 -29
<b>Direct tel.</b>	+49 (0) 30 627 3550 -16
<b>Personal e-mail</b>	<a href="mailto:erdmann@atmosfair.de">erdmann@atmosfair.de</a>