



**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>	Improved Cook Stoves programme for Rwanda	
<b>UNFCCC reference number of the PoA</b>	6207	
<b>Version numbers of the PoA-DD applicable to this monitoring report</b>	7.0	
<b>Version number of this monitoring report</b>	3	
<b>Completion date of this monitoring report</b>	07/11/2017	
<b>Monitoring period number</b>	4	
<b>Duration of this monitoring period</b>	01/07/2016 – 30/06/2017, both days inclusive	
<b>Monitoring report number for this monitoring period</b>	1	
<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)
	Rwanda Cameroon	Yes 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 period</b>	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	0	107,810 tCO <sub>2</sub> e
<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</b>	239,400 tCO <sub>2</sub> e	

covered in this monitoring report

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

### SECTION A. Description of PoA

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

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##### 1. General operating and implementing framework

The programme replaces traditional stoves with high efficiency biomass fired cook stoves (hereafter referred to as “Improved Cookstoves” or “ICS<sup>1</sup>”) in Rwanda and Cameroon. Rwanda is amongst the Least Developed Countries (LDCs) in the world<sup>2</sup>. The use of woody biomass (wood and charcoal which is derived from wood) leads to deforestation, erosion and environmental problems. The use of charcoal also leads to high cost for households for cooking.

The purpose of the PoA is to use carbon finance for the dissemination of ICS to the people of Rwanda and Cameroon, replacing less efficient charcoal or wood cook stoves currently in use, thereby reducing the use of non-renewable biomass. The PoA reduces CO<sub>2</sub> emissions due to more efficient fuel combustion and thus less biomass consumption in Improved Cookstoves and by directly using wood for cooking and thus avoiding the inefficient conversion of wood into charcoal.

The PoA is implemented by atmosfair gGmbH who is the coordinating/managing entity (hereafter referred to as “CME”) for the PoA. The CPA implementer for CPA 6207-0001 is atmosfair gGmbH in partnership with ENEDOM Domestique s.a.r.l (ENEDOM). Other implementing entities assisting the CPA implementers are SaferRwanda and Rwanda Women Network. The CPA implementer for CPA 6207-0005 and 6207-0006 is atmosfair gGmbH in partnership with SaferRwanda and Rwanda Women Network.

The CPA implementer for CPA 6207-0002, 6207-0003, 6207-0004 and 6207-0007 is atmosfair gGmbH and the implementing entities assisting the CPA implementer are United Nations High Commissioner for Refugees (UNHCR) (6207-0002), Inyenyeri (6207-0003) and Pro Climate International (6207-0004 and 6207-0007).

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

The aim of the PoA is to distribute ICS to reduce carbon emissions, reduce health problems related to smoke, reduce deforestation and erosion due to extensive woody biomass sourcing for firewood utilization and charcoal production and to increase purchase power of rural households.

##### 3. Confirmation that the proposed PoA is a voluntary action by the CME

atmosfair gGmbH as the CME confirms that the PoA is a voluntary action. Participation of all involved stakeholders is completely voluntary.

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

#### Sustainable development:

<sup>1</sup> Other expressions used in this document for an Improved Cookstove are “system”, “appliance”, “installation”.

<sup>2</sup> <http://www.unohrrls.org/en/ldc/25/>

### Environment

The programme helps to preserve the existing forests due to current consumption activities of biomass, particularly wood. Furthermore, it helps preventing adverse changes in the ecosystem as a result of deforestation leading to erosion which could harm the local community. The PoA triggers communities to maintain and preserve the forests so that they can continuously maintain their traditional life and get benefits from the project. The use of ICS reduces the pressure placed on local forests (as firewood resources and for the production of charcoal) through less amount of woody biomass being consumed. Also, it helps preventing woody biomass from being harvested faster than it is being grown.

### Social

The implementation of the PoA creates temporary and permanent employment opportunities through ICS construction, dissemination, and customer support activities. Another opportunity comes from monitoring activities which also involve people from the local community.

### Economic

The PoA yields environmental, social as well as economic benefits. If households are purchasing charcoal or wood, the cost savings from switching to wood or by reducing the wood consumption, results in a substantial reduction of expenditures for the daily fuel consumption for cooking. Less money is spent on charcoal and wood and more money can be available to be spent on food, medical care and education. Thus, people have the opportunity to enjoy a higher standard of living and they acquire knowledge about energy and environmental conservation.

For households cooking with collected wood, the application of more efficient stoves reduces time spent collecting firewood by the households, resulting in more time which can be used to perform income-producing activities (more time can be saved to earn cash or produce other goods and services/boosting family's income).

The programme is developed and implemented as a CDM Gold Standard Programme of Activities.

#### 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 Cook Stoves programme for Rwanda	7.0	3: Energy demand	AMS II.G., version 3, "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass"  <a href="https://cdm.unfccc.int/methodologies/DB/KZ6FQOCEEHD1V02ARW/TW1W2R9G45BX">https://cdm.unfccc.int/methodologies/DB/KZ6FQOCEEHD1V02ARW/TW1W2R9G45BX</a>

#### 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)
Improved Cook Stoves programme for Rwanda: 6207-0001	CPA # x Improved Cook Stoves programme for Rwanda	7.0	01/07/2013-30/06/2023	Yes
CPA 2 Improved Cook Stoves programme for Rwanda: 6207-0002	CPA # x Improved Cook Stoves programme for Rwanda	7.0	01/02/2014 – 31/01/2024	Yes
CPA 3 Improved Cook	CPA # x Improved Cook	7.0	01/02/2015 –	Yes

Stoves programme for Rwanda – Inyenyeri: 6207-0003	Stoves programme for Rwanda		31/01/2025	
Improved Cook Stoves programme for Rwanda #CPA1 Cameroon: 6207-0004	CPA # x Improved Cook Stoves programme for Rwanda	7.0	01/03/2015 – 28/02/2025	Yes
CPA 4 Improved Cook Stoves programme for Rwanda: 6207-0005	CPA # x Improved Cook Stoves programme for Rwanda	7.0	01/08/2015 – 30/07/2025	Yes
CPA 5 Improved Cook Stoves programme for Rwanda: 6207-0006	CPA # x Improved Cook Stoves programme for Rwanda	7.0	01/08/2015 – 30/07/2025	Yes
Improved Cook Stoves programme for Rwanda #CPA2 Cameroon: 6207-0007	CPA # x Improved Cook Stoves programme for Rwanda	7.0	01/01/2017 – 31/12/2026	Yes

## A.2. Coordinating/managing entity

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### Coordinating/Managing entity (CME) and responsible persons

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## SECTION B. Implementation of PoA

### B.1. Description of implemented PoA

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#### Roles and responsibilities of personnel

atmosfair gGmbH is the Coordinating / Managing Entity (CME) for the PoA and is the overall in-charge for operational and management arrangements for the implementation of the PoA. atmosfair undertook the following responsibilities with respect to the implementation of the PoA:

- Created PoA documentation (PoA-DD and CPA-DD forms)
- Checked for compliance of CPAs with inclusion eligibility criteria
- Obtained Letter(s) of Authorization from host country(s)
- Obtained Letter of Approval from the Annex I party involved in PoA
- Coordinates and communicates with the validating/verifying DOE and the EB
- Drafts monitoring reports for all CPAs in accordance with the methodology outlined in the PoA-DD
- Requests the UNFCCC to issue CERs into a registry account of the CER buyer(s)

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

The CME kept electronic files for each CPA under the PoA, which contains the following information per CPA<sup>3</sup>:

- Name and ID of the CPA
- Type of appliance (ICS type) deployed
- Name and contact details of the registered IEs for the CPA
- Serial numbers (Stove-ID) of all systems belonging to the CPA
- Start of CPA crediting period
- CERs issued per verification period

This database is updated as per the progress of the CPA.

The stove records database contains specific information as outlined in section B.7.2, part two, of the registered PoA-DD.

### **Avoiding 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.

By checking the data from the record keeping system for each CPA under the PoA it is ensured that no CPA which has been registered as a CDM Project Activity or a CPA included into another PoA can be included in this PoA.

To ensure this, the record keeping system covers the following information:

- Name and ID of the CPA
- Type of appliance (ICS type) deployed
- Name and contact details of the registered IEs for the CPA
- Unique serial numbers (Stove-ID) of system belonging to the CPA (see also eligibility criteria Nr. 6)
- Start of CPA crediting period
- CERs issued per verification period

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

The CME signed agreements with Implementing Entities to ensure that all parties involved in implementing the CPAs are aware and agree that the CPAs are subscribed to the PoA.

At the user level, households are informed that their activity is being subscribed to the PoA and that they cede all rights on the CERs to the CME. Thus users are informed that the ICS is deployed to them due to CDM revenues stemming from emission reductions from using the ICS.

### **Arrangements for training and capacity development of personnel**

The CME, the CPA implementing body or an entity assigned by the CME has conducted training and capacity building exercises for its own personnel based on any identified needs to ensure that continuous improvements of the PoA management system are taking place.

### **Measures for continuous improvement**

The CME holds internal meetings with staff to review the performance of the PoA management system, in order to identify issues that need to be addressed for obtaining continuous improvements of the PoA management system.

### **Implementation of single sampling plan(s)**

A single sampling plan was implemented for CPAs 6207-0001, 6207-0005 and 6207-0006 whereas a separate sampling plan was implemented for the specific-case CPA 6207-0002 (see section E.3. for further information).

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<sup>3</sup> The record keeping system collects as much information as necessary to facilitate the Verification of the CERs by the DOE.

**B.2. Post-registration changes to PoA****B.2.1. Corrections**

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

**B.2.2. Inclusion of monitoring plan**

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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.

**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**

&gt;&gt;

No permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools have been approved during this monitoring period or submitted with this monitoring report.

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

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(a) Changes that have been approved by the Board for the periods prior to this monitoring period; Another host party – Cameroon – was added to the PoA. Thus, eligibility criteria for inclusion of specific-case CPAs in the PoA were adapted accordingly. Please refer to the approved PoA-DD, version 7.0.

[http://cdm.unfccc.int/ProgrammeOfActivities/poa\\_db/J8SI1GZNVU6FQ7KC24OA3LE50WDTRH/view](http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/J8SI1GZNVU6FQ7KC24OA3LE50WDTRH/view)

The first CPA in Cameroon (Improved Cook Stoves programme for Rwanda #CPA1 Cameroon, 6207-0004) was included into the PoA on 03/02/2015.

[http://cdm.unfccc.int/ProgrammeOfActivities/poa\\_db/J8SI1GZNVU6FQ7KC24OA3LE50WDTRH/viewCPAs](http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/J8SI1GZNVU6FQ7KC24OA3LE50WDTRH/viewCPAs)

(b) Changes that have been approved by the Board for this monitoring period; No changes to the programme design of the registered PoA-DD have been approved by the Board during this monitoring period.

(c) Changes that are being submitted with this monitoring report as part of the request for issuance (post-registration change - issuance track):

No changes to the programme design of the registered PoA-DD 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 specific case CPAs 6207-0001, 6207-0002, 6207-0003, 6207-0004, 6207-0005, 6207-0006 and 6207-0007.

The CPAs 6207-0003, 6207-0004 and 6207-0007 were not monitored since no ICS have been distributed under CPAs 6207-0003, 6207-0004 and 6207-0007 until the end of the monitoring period. CME therefore decided not to include those CPAs into the monitoring and verification of the PoA. Thus, emission reduction values for CPAs 6207-0003, 6207-0004 and 6207-0007 are set to 0 in the present Monitoring Report. Furthermore, the CME is not claiming any CERs for CPAs 6207-0003, 6207-0004 and 6207-0007 in this respective Monitoring Period.

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.

## SECTION C. Implementation of CPAs

### C.1. Description of implemented CPAs

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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 to use carbon finance for the dissemination of ICS to the people of Rwanda and Cameroon. The project activities will reduce CO<sub>2</sub> emissions due to more efficient fuel combustion and thus less biomass consumption in Improved Cookstoves and by directly using wood for cooking and thus avoiding the inefficient conversion of wood into charcoal. The project activities replace traditional stoves with high efficiency biomass fired cook stoves (hereafter referred to as "Improved Cookstoves" or "ICS "). The use of woody biomass (wood and charcoal which is derived from wood) leads to deforestation, erosion and environmental problems throughout Rwanda and Cameroon. The use of charcoal also leads to high cost for households for cooking. The energy efficient cook stoves disseminated save up to 80% of fuel wood.

- (b) Description of the technology employed and installed equipment and/or infrastructure, including information requested by the eligibility criteria;

The improved cook stove (ICS) disseminated under CPA 6207-0001, 6207-0002, 6207-0005 and 6207-0006 is the "SAVE80", a portable stove made of stainless steel, developed and prefabricated by a German manufacturer and constructed locally to create employment and income.

According to the manufacturer specifications of the SAVE80, the specified efficiency is >20%, which is above the CPA eligibility requirement ("The stove type disseminated under the CPA has a specified efficiency of at least 20%").

The following total stoves were included in each CPA distribution database until the end of this monitoring period (30/06/2017):

CPA	Stoves distributed	Stoves in CPA database (stoves distributed minus confirmed drop-outs from previous MPs)
6207-0001	10,559	10,559
6207-0002	7,313	7,297
6207-0003	0	0
6207-0004	0	0
6207-0005	10,466	10,466
6207-0006	981	981
6207-0007	0	0

- (c) Relevant dates for the specific-case CPA(s) (e.g. construction, commissioning, continued operation periods, etc.);

Date	Milestone
25/08/2011	Start date of distribution of stoves under CPA 6207-0001
13/01/2013	Start date of distribution of stoves under CPA 6207-

	0002
01/07/2013	Starting date of crediting period CPA 6207-0001
01/02/2014	Starting date of crediting period CPA 6207-0002
31/07/2015	Last date of distribution of stoves under CPA 6207-0001
01/08/2015	Starting date of crediting period CPA 6207-0005 and 6207-0006
01/08/2015	Start date of distribution of stoves under CPA 6207-0005
31/01/2017	Last date of distribution of stoves under CPA 6207-0005
01/02/2017	Start date of distribution of stoves under CPA 6207-0006

(d) Total GHG emission reductions or net GHG removals by sinks achieved in this monitoring period for the specific-case CPA(s), including information on how double counting is avoided.

CPA 6207-0001: 47,637 t of CO<sub>2e</sub>  
 CPA 6207-0002: 14,530 t of CO<sub>2e</sub>  
 CPA 6207-0003: 0 t of CO<sub>2e</sub>  
 CPA 6207-0004: 0 t of CO<sub>2e</sub>  
 CPA 6207-0005: 44,531 t of CO<sub>2e</sub>  
 CPA 6207-0006: 1,112 t of CO<sub>2e</sub>  
 CPA 6207-0007: 0 t of CO<sub>2e</sub>

Combined: 107,810 t of CO<sub>2e</sub>

#### *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.

#### *Ensuring avoidance of double counting*

All appliances disseminated under each CPA have a unique serial number, allowing to doubtlessly identifying the appliance and its corresponding CPA. The CME also reviews individual CPA documents and implementation to ensure no ICS distributed under a specific CPA is part of another single CDM project activity or CPA under another PoA.

## **C.2. Location of CPAs**

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(a) Host Parties:

Republic of Rwanda, Republic of Cameroon

(b) Region/ State/ Province:

The ICS deployed under the CPAs are spread all over Rwanda and Cameroon.

The location is recorded on the sales receipt(or user agreement) and documented in the sales record database (or stoves record database).

(c) City/ Town/ Community:

The ICS were installed in households in Rwanda and Cameroon.



**(d)Physical/ Geographical location:**

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

Geographic coordinates of the Republic of Rwanda: 2.0000°S; 30.000°E.

Geographic coordinates of the Republic of Cameroon. 6.0000°N; 12.000°E

**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**

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No temporary deviations from the monitoring plans in the included CPA-DDs, applied methodologies or standardized baselines have been applied during this monitoring period for the specific-case CPAs.

**C.3.2. Corrections**

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No corrections to project information or parameters fixed at validation have been approved during this monitoring period or submitted with this monitoring report for the specific-case CPAs.

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

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No changes to the start date of the crediting period of the specific-case CPA(s) have been approved during this monitoring period or submitted with this monitoring report.

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

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No inclusion of monitoring plan has been approved during this monitoring period or submitted with 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**

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No permanent changes to the included monitoring plans, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools have been approved during this monitoring period or submitted with this monitoring report for the specific-case CPAs.

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

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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.

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

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The monitoring system described in this section is applicable to specific-case CPAs 6207-0001, 6207-0002, 6207-0005 and 6207-0006. The CPAs 6207-0003, 6207-0004 and 6207-0007 were not monitored since no ICS have been distributed under these CPAs until the end of the monitoring period.

*Data collection procedures and organisational structure*

The monitoring system is the same for CPA 6207-0001, 6207-0002, 6207-0005 and CPA-0006. Each CPA has a separate database and only on CME level, roles and responsibilities overlap for the four CPAs.

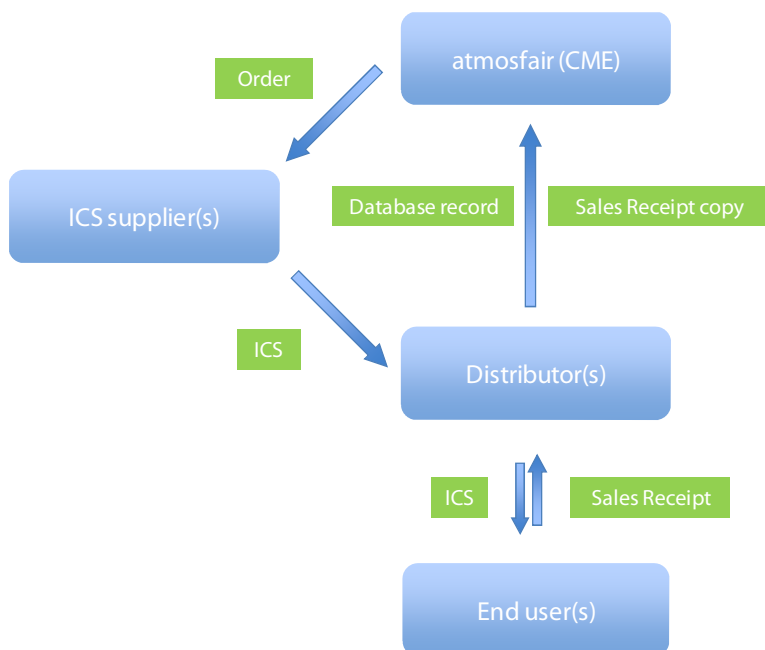
The monitoring consists of three stages for the CPAs:

1. (Continuous) Sales/distribution monitoring to determine  $N_{i,y}$  Adjusted total number of appliances deployed and the "Type of stove predominantly used before purchasing/acquiring the ICS"
2. Sample surveys after the end of the monitoring period and prior to verification to determine:
  - $DO_y$  Statistically adjusted drop out from total population of appliances
  - $N_{eater\_project}$  Average number of eaters for whom meals are prepared on the ICS
  - $\eta_{new}$  Adjusted average efficiency of the system being deployed
3. Data compilation, quality control and drafting of the Monitoring Report

1. Sales/distribution monitoring

Sales/distribution monitoring serves to determine the adjusted total number of appliances deployed until period  $y$  ( $N_y$ ) and to determine the *Type of stove predominantly used before purchasing the ICS*.

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/user agreement. The sales receipt/user agreement provides information on

- Type of appliance (ICS type) deployed
- Serial number (Stove-ID) of system
- Delivery date of appliance (to user)

- User details (Name, Address, etc.)
- Implementing Entity/ Contact Person
- Type of stove predominantly used before acquiring of the ICS

Data recording:

The distributor(s) collect the sales receipts/user agreements 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/user agreement and the electronic datasets from the sales receipts/user agreements to the CME. The CME checks for inconsistencies and instructs distributors to take corrective action where 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 for whom meals are prepared on the ICS ( $N_{eaters\_project}$ )
- adjusted average efficiency of the system being deployed ( $\eta_{new}$ )

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

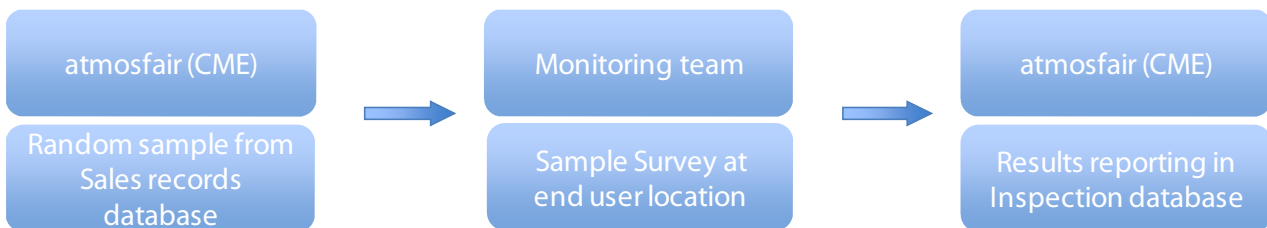


Diagram 2: Sample survey flow chart

Data generation:

The CME draws a random sample from the sales/distribution records database and submits the electronic sample including the 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 where necessary. The CME aggregates and reports the results in an inspection/monitoring database.

For the detailed sampling plan, see Section D.3 of the registered PoA DD.

3. Data compilation

The CME finally transfers the parameter values from the sales/distribution records database and from the inspection/monitoring 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 manager	The database manager is responsible for updating and maintaining all electronic databases.
Monitoring team	The monitoring team per CPA will be assigned by the CME to conduct the user interviews and appliance tests during the periodic sampling and reports the results to the CME database manager.

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 manager checks correctness and consistency between information on the sales receipts/user agreements and the corresponding sales/distribution database record. In case inconsistencies are detected, the CME database manager 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 manager 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**

<b>Data / Parameter:</b>	<b><i>B</i>old, capita., 1,2</b>
Unit	t/year/head
Description	Average charcoal consumption per head per year for Scenario 1)-2)
Source of data	See Step 1 section B.6.3 PoA-DD
Value(s) applied	Rwanda: Scenario 1: 0.11972 t/y/head Scenario 2: 0.17958 t/y/head  Cameroon: Scenario 1: 0.03731 t/y/head Scenario 2: 0 t/y/head
Choice of data or measurement methods and procedures	See section B.6.3 PoA-DD
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	

<b>Data / Parameter:</b>	<b><i>f</i>biomass/charcoal</b>
Unit	Number
Description	conversion factor wood to charcoal
Source of data	See Step 1 section B.6.3 PoA-DD

Value(s) applied	Rwanda: 9 Cameroon: 6
Choice of data or measurement methods and procedures	See section B.6.3 PoA-DD
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	

<b>Data / Parameter:</b>	<b><i>B<sub>old, capita,3</sub></i></b>
Unit	t/year/head
Description	Average woody biomass consumption per head per year for Scenario 3)
Source of data	See Step 1 section B.6.3 PoA-DD
Value(s) applied	Rwanda: 0.6353 Cameroon: 0.6305
Choice of data or measurement methods and procedures	See section B.6.3 PoA-DD
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	

<b>Data / Parameter:</b>	<b><i><math>\eta_{charcoal\_stove,1,2}</math></i></b>
Unit	%
Description	Efficiency of the baseline system being replaced
Source of data	See section B.6.3 PoA-DD
Value(s) applied	Scenario 1= 30% (efficient charcoal stove with clay) Scenario 2= 20% (inefficient charcoal stove without clay)
Choice of data or measurement methods and procedures	Scenario 1= literature value (see Part II - Section B.3 PoA DD) Scenario 2= literature value (see Part II - Section B.3 PoA DD)
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	

<b>Data / Parameter:</b>	<b><i><math>\eta_{old,3}</math></i></b>
Unit	%
Description	Efficiency of the baseline system being replaced
Source of data	AMS-II.G. default value
Value(s) applied	10% (default value for wood stove see below)
Choice of data or measurement methods and procedures	According to AMS-II.G., 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 or a chimney". See Section B.6.3, Step 4 PoA-DD
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	

<b>Data / Parameter:</b>	<b><i>NCV<sub>biomass</sub></i></b>
Unit	TJ/t
Description	Net calorific value of the non-renewable woody biomass that is substituted

Source of data	IPCC
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, par. 6
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	NCV for wood fuel

<b>Data / Parameter:</b>	<b><i>NCV<sub>charcoal</sub></i></b>
Unit	TJ/t
Description	Net calorific value of the non-renewable woody biomass that is substituted
Source of data	IPCC
Value(s) applied	0.0295
Choice of data or measurement methods and procedures	This is the IPCC default value for charcoal fuel
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	

<b>Data / Parameter:</b>	<b><i>EF<sub>projected_fossilfuel</sub></i></b>
Unit	tCO <sub>2</sub> /TJ
Description	Emission factor for the substitution of non-renewable woody biomass by similar consumers
Source of data	AMS-II.G. default value
Value(s) applied	81.6
Choice of data or measurement methods and procedures	According to AMS-II.G., the emission factor for the substitution fuel likely to be used instead of non-renewable woody biomass a value of 81.6 t CO <sub>2</sub> /TJ is to be taken.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	

<b>Data / Parameter:</b>	<b><i>L<sub>y</sub></i></b>
Unit	Fraction
Description	Leakage adjustment factor period y
Source of data	default value
Value(s) applied	0.95
Choice of data or measurement methods and procedures	According to AMS-II.G.: Para 13 and Para 23, B <sub>old</sub> can be multiplied by a net to gross adjustment factor of 0.95 to account for leakage in which case surveys are not required.
Purpose of data/parameter	Calculation of baseline emissions by adjusting for leakage emissions
Additional comments	

<b>Data / Parameter:</b>	$f_{NRB,y}$
Unit	
Description	Fraction of woody biomass saved by the project activity in period y that can be established as non-renewable biomass
Source of data	See Section B.6.3 PoA-DD
Value(s) applied	Rwanda: 0.98 or 98% Cameroon: 0.70 or 70%
Choice of data or measurement methods and procedures	See section B.6.3 PoA-DD
Purpose of data/parameter	Calculation of baseline emissions
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 CPAs
Source of data	Manufacturer's specifications
Value(s) applied	8
Choice of data or measurement methods and procedures	According to manufacturer's specifications
Purpose of data/parameter	Not used for emission reduction calculation. Only as a cap for monitored parameter $N_{eaters, appliance}$
Additional comments	

## E.2. Data and parameters monitored

<b>Data/Parameter</b>	$N_{eaters\_project}$
Unit	Number
Description	Average number of eaters for whom meals are prepared on the ICS
Measured/calculated/default	Calculated from sample survey
Source of data	Sample survey
Value(s) of monitored parameter	CPA 6207-0001,6207-0005 and 6207-0006: 5.56 CPA 6207-0002: 4.40
Monitoring equipment	Questionnaire
Measuring/reading/recording frequency	Once for this monitoring period (i.e. annual inspection at 90/10 confidence/precision applied for CPA 6207-0002 (single CPA sampling) and 95/10 confidence/precision applied for CPAs 6207-0001,6207-0005 and 6207-0006 (across CPA sampling))

Calculation method (if applicable)	<p>Monitoring of the statistically adjusted average number of eaters for whom meals are prepared on the ICS has been performed by monitoring a sample of all appliances deployed and involved two steps:</p> <p>Step 1: Sample survey amongst ICS deployed under the CPA 6207-0002 (single CPA sampling is applied) and ICS deployed under CPAs 6207-0001, 6207-0005 and 6207-0006 (across CPA sampling applied)</p> <p>Step 2: Calculation of the average number of eaters at 90/10 confidence/precision for CPA 6207-0002 and 95/10 confidence/precision applied for CPAs 6207-0001, 6207-0005 and 6207-0006</p> <p>The average number of eaters has been determined through interviews performed by a dedicated monitoring team according to the sampling procedure described below. Interviews were conducted using a questionnaire.</p> <p>Interviews were conducted with the aim to achieve the required precision of 10% for this parameter.</p> <p>By determining the average number of eaters for whom meals are prepared on the ICS, the continuous use of the baseline appliance is considered as only the baseline consumption which is reduced by the ICS.</p> <p>All questionnaires and information gathered during the sampling by the monitoring team have been handed over to the CME that takes care of entering the information into an electronic database and updating databases where appropriate.</p>
QA/QC procedures	<p>All formulae applied to determine the statistical precision used have been standard formulae.</p> <p>Furthermore, according to AMS-II.G., par.22 the sampling error has to be deducted (“...the lower bound of a 90% or 95% confidence interval of the parameter value may be chosen...”) in the event that 90/10 or 95/5 precision could not be achieved because of a small sample size. Deductions were made, where 90/10 or 95/10 precision was not achieved by sampling an appropriate number of appliances. Data has been 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_{i,y}</math></b>
Unit	-
Description	Adjusted total number of appliances deployed until period y per CPA
Measured/calculated/default	Calculated
Source of data	Sales Records
Value(s) of monitored parameter	CPA 6207-0001: 10,559 CPA 6207-0002: 7,297 CPA 6207-0005: 9,761 CPA 6207-0006: 202
Monitoring equipment	Sales receipts/user agreements and sales/distribution records database for each CPA
Measuring/reading/recording frequency	Continuous monitoring and recording of $n_i$



Calculation method (if applicable)	<p>The total number of appliances deployed until the end of the monitoring period has been calculated based on information monitored through the stove records database separately per CPA.</p> $N_{i,y} = \sum_{j=1}^y n_{i,j} \cdot OT_{adjusted,i,j,y}$	
	Parameter	Description
	$n_{ij}$	Number of ICS deployed in period j per baseline scenario i as reported in the stove records database
	$OT_{adjusted,i,j,y} = \begin{cases} 1 & , j < y \\ \frac{d_{average,i,y}}{mp_{length}} & , j = y \end{cases}$	Adjustment factor for reduced operational time of appliances deployed in period y per baseline scenario i
	$d_{average,i,y}$	Average number of days that appliances deployed in period y have been operational in period y as determined by respective deployment dates of appliances counted for $n_y$ . Delivery dates are determined mutatis mutandis as in the context of $n_j$ above.
	$mp_{length}$	Length of monitoring period y
QA/QC procedures	Data was 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/parameter	Baseline emission calculation	
Additional comments	y= current monitoring period, j= term for monitoring period, i= comprises the four options according to the scenario 1) - 4).	

Data/Parameter	DO <sub>y</sub>
Unit	%
Description	Statistically adjusted drop out from total population of appliances under scenario 1) to 3) in this monitoring period
Measured/calculated/default	Calculated from sample survey
Source of data	Sample survey
Value(s) of monitored parameter	CPA6207-0001, 6207-0005 and 0006: 0.00% CPA6207-0002: 13.40%
Monitoring equipment	Questionnaire
Measuring/reading/recording frequency	Once for this monitoring period (i.e. annual monitoring)

<p>Calculation method (if applicable)</p>	<p>Monitoring of the statistically adjusted drop out are performed by monitoring a sample of all appliances and involves two steps:</p> <p>Step 1: Sample survey amongst ICS deployed under the CPA 6207-0002 (single CPA sampling is applied) and ICS deployed under CPAs 6207-0001, 6207-0005 and 6207-0006 (across CPA sampling applied) Step 2: Calculation of the statistically adjusted dropout at 90/10 confidence/precision for CPA 6207-0002 and 95/10 confidence/precision applied for CPAs 6207-0001, 6207-0005 and 6207-0006</p> <p>The Drop outs have been determined through interviews where it has been checked if the appliances are still operational, performed by a dedicated monitoring team according to the sampling procedure described below.</p> <p>Interviews were reported in a questionnaire.</p> <p>Checks were conducted with the aim to reach the required precision (10%) for this parameter. All questionnaires and information gathered during the sampling by the monitoring team have been handed over to the CME that takes care of entering the information to an electronic database and updating sample databases where appropriate.</p>
<p>QA/QC procedures</p>	<p>All formulae applied to determine the statistical precision used are standard formula. Furthermore, according to AMS-II.G., par.22 the sampling error has to be deducted (“...the lower bound of a 90% or 95% confidence interval of the parameter value may be chosen...”) in the event that 90/10 or 95/5 precision could not be achieved because of a small sample size. No deductions had to be made, since 90/10 (6207-0002) and 95/10 (6207-0001, 6207-0005 and 6207-0006) precision have been achieved by sampling an appropriate number of appliances.</p> <p>Data has been 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>A traceable “identity check” of the appliances visited during sampling has been performed and recorded (e.g. a picture of the appliance clearly showing its serial no., etc.).</p>
<p>Purpose of data/parameter</p>	<p>Baseline emission calculation</p>
<p>Additional comments</p>	

<p><b>Data/Parameter</b></p>	<p><math>\eta_{new}</math></p>
<p>Unit</p>	<p>% (efficiency value of ICS using biomass)</p>
<p>Description</p>	<p>Adjusted average efficiency of the system being deployed as part of the CPAs</p>
<p>Measured/calculated/ default</p>	<p>Calculated from sample survey</p>
<p>Source of data</p>	<p>WBTs</p>

Value(s) of monitored parameter	CPA 6207-0001, 6207-0005 and 6207-0006:	
	<b>Stove ID:</b>	<b>Thermal efficiency:</b>
	6207-28500	45.95%
	6207-21008	44.12%
	6207-26492	43.07%
	6207-16861	44.17%
	6207-15815	43.88%
	6207-20138	46.90%
	6207-20080	46.85%
	6207-31838	45.34%
	00344	43.85%
	<b>Average</b>	<b>44.90%</b>
	Survey Period: 19/07/2017 - 08/08/2017 Number of stoves tested: 9	
	CPA 6207-0002:	
<b>Stove ID:</b>	<b>Thermal efficiency:</b>	
6207-4130	34.05%	
6207-101141	34.83%	
UN6207-101561	41.45%	
UN6207-101727	28.28%	
UN6207-105057	31.13%	
6207-105814	32.14%	
6207-106336	34.65%	
UN6207-106815	35.09%	
<b>Average</b>	<b>33.95%</b>	
Survey Period: 26/07/2017 – 02/08/2017 Number of stoves tested: 8		
Monitoring equipment	CPA 6207-0001, 6207-0002, 6207-0005 and 6207-0006	
		<u>Weighing Scale</u>
	Type	KD 7000
	Accuracy class	+/- 1 g
	Serial number	ESN56784224992T
	Date of last calibration	19/06/2017
	Calibration frequency	Once per 12 months
	Validity.	Valid
		<u>Thermocouple</u>
	Type	Greisinger Präzisionsthermometer GMH 3710
	Accuracy class	+/- 0.03°C
	Serial number	32402671
	Date of last calibration	22/06/2017
	Calibration frequency	Once per 12 months
Validity.	Valid	

Measuring/reading/recording frequency	Once for this monitoring period (i.e. annual monitoring)
Calculation method (if applicable)	<p>Monitoring of the statistically adjusted average efficiency involved two steps:</p> <p>Step 1: Sample survey and efficiency testing amongst appliances deployed under the CPA as specified in section B.7.2 of the PoA-DD</p> <p>Step 2: Calculation of the adjusted average efficiency at 90/10 confidence/precision for CPA 6207-0002 (single CPA sampling applied) and 95/10 confidence/precision applied for CPAs 6207-0001, 6207-0005 and 6207-0006 (across CPA sampling applied)</p> <p><math>\eta_{new}</math> was determined following the Water Boiling Test (WBT) protocol, performed by a dedicated monitoring team according to the sampling procedure described in section B.7.2. of the PoA-DD and following the WBT protocol. Tests were reported in spreadsheet templates.</p> <p>Checks were conducted with the aim to achieve the required precision (10%) for this parameter. The CME established a dedicated monitoring team itself.</p>
QA/QC procedures	<p>All formulae applied to determine the statistical precision are standard formula. Furthermore, according to AMS-II.G., par.22 the sampling error has to be deducted (“...the lower bound of a 90% or 95% confidence interval of the parameter value may be chosen...”) in the event that 90/10 or 95/5 precision could not be achieved because of a small sample size. No deductions had to be made, since 90/10 (6207-0002) and 95/10 (6207-0001, 6207-0005 and 6207-0006) precision have been achieved by sampling an appropriate number of appliances.</p> <p>Data was collected using the standard procedures and will be stored for the CPA crediting period and an additional two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later.</p> <p>A traceable “identity check” of the appliances visited during sampling was performed and recorded (e.g. a picture of the appliance clearly showing its serial no. was taken).</p> <p>Cross-checks: The monitoring team cross-checked results with literature values, or specifications from manufacturer, where available.</p>
Purpose of data/parameter	Baseline emission calculation
Additional comments	

According to eligibility criteria number 5 of the PoA-DD, it needs to be shown that every CPA remains under the thermal threshold of 180GWh thermal energy savings. During verifications the DOE needs to assess, that the small scale limit (180 GWh per CPAs) was not exceeded at any time for any CPA.

Aggregated energy savings of all ICS included in CPA 6207-0001, 6207-0002, 6207-0005 and 6207-0006 during this monitoring period are:

CPA 6207-0001: 174.19 GWh<sub>th</sub>  
 CPA 6207-0002: 61.36 GWh<sub>th</sub>  
 CPA 6207-0005: 162.83 GWh<sub>th</sub>  
 CPA 6207-0006: 4.07 GWh<sub>th</sub>

### E.3. Implementation of sampling plan

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

- 6207-0001: Improved Cook Stoves programme for Rwanda
- 6207-0002: CPA 2 Improved Cook Stoves programme for Rwanda
- 6207-0005: CPA 4 Improved Cook Stoves programme for Rwanda
- 6207-0006: CPA 5 Improved Cook Stoves programme for Rwanda

The CPAs 6207-0003, 6207-0004 and 6207-0007 were not monitored since no ICS have been distributed under these CPAs until the end of the monitoring period.

**b)Description of implemented sampling design;**

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.

$N_y$  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 sample (the “sample database”) was drawn from the stove records database by the CME via a computerized randomizer based on which all of the parameters determined via sampling were monitored.

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 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 ”*

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 registered CPAs, a single sample was drawn for CPAs 6207-0001, 6207-0005 and 6207-0006. Therefore, 95/10 confidence/precision for the sampling applies for CPAs 6207-0001, 6207-0005 and 6207-0006. A separate sample was drawn for CPA 6207-0002, therefore 90/10 confidence/precision for the sampling applies this CPA.

As per the registered CPA-DDs, the sampling procedure has to be a simple random sampling process which randomly samples households across the CPA. Though the monitoring team undertook the monitoring of the parameters simultaneously and on the same sample, different sample sizes applied since the confidence/precision of the parameters depend on the variation of the obtained values. The required sample sizes were calculated prior to conducting the sample survey using the equations for simple random sampling as per EB 67 Annex 6, para 16 to 26 for the proportional parameter of interest ( $DO_y$ ) and para 51 to 57 for the mean value parameters of interest ( $N_{eaters\_project}$ ;  $\eta_{new}$ )

Since the resulting sample is a random sample, stoves from all age classes and geographical representation were present as to their real percentage in the sample databases.

Sampling for CPAs 6207-0001, 6207-0005 and 6207-0006:

In accordance with the Monitoring Plan of the registered PoA-DD and to reduce monitoring efforts a single sample was drawn from the sales records databases of CPAs 6207-0001, 6207-0005 and 6207-0006 based on which all of the parameters were monitored and the 95/10 confidence/precision was applied. This does not imply that for each of the parameters the same number of ICS had to be monitored during sampling.

The users in the sample were selected via a computerized randomizer from the combined sales records database of CPAs 6207-0001, 6207-0005 and 6207-0006 (across CPA sampling). A sample size of 63 users was calculated for  $DO_y$  and considering an 80% response, the computerized randomizer produced an unsorted sample list of 79 ICS users. The sample of 79 stove users was drawn on 06/07/2017 based on a total population size of 22,006 Save80 stoves.

Out of the 79 sampled ICS users, 66 users could be contacted and an interview was performed to determine  $DO_y$  and  $N_{eaters\_project}$ . For  $N_{eaters\_project}$ , the calculated sample size was 48 (considering an 80% response rate the calculated sample size was 60). As the calculated sample size for  $DO_y$  was larger than the calculated sample size for  $N_{eaters\_project}$ , the former was also chosen for the survey efforts of the parameter  $N_{eaters\_project}$ , as it was one common survey. Therefore, for  $N_{eaters\_project}$ , all the 66 Save80 users who were interviewed to determine  $DO_y$ , were considered also for determining  $N_{eaters\_project}$ .

In order to determine  $\eta_{new}$ , 9 Water Boiling Tests were conducted. For this the first 10 users from the unsorted sample list (79 users) were selected as a sub-sample for the performance of the Water Boiling Tests (WBTs). A total of 9 tests could be performed, which fulfills the required calculated minimum sample size for  $\eta_{new}$  ( $n=8$ ), since an 80% response rate was assumed.

Sampling for CPA6207-0002:

In accordance with the Monitoring Plan of the registered PoA-DD and to reduce monitoring efforts a single sample was drawn from the distribution records database of CPA 6207-0002 based on which all of the parameters were monitored and the 90/10 confidence/precision was applied. This does not imply that for each of the parameters the same number of ICS had to be monitored during sampling.

The users in the sample were selected via a computerized randomizer from the distribution records database of CPA 6207-0002. For  $DO_y$  a sample size of 81 was calculated, for  $N_{eaters\_project}$  the calculated sample size was 97. As the latter one was the higher value, the calculated sample size for  $N_{eaters\_project}$  was also chosen for the survey efforts of the parameter  $DO_y$  since it was one common survey. Considering an 80% response, 122 users were randomly selected from the overall database. Therefore, the computerized randomizer produced an unsorted sample list. The sample was drawn on 06/07/2017 based on a total population size of 7,297 Save80 stoves.

During the initial phase of the monitoring, it became apparent that the actual response rate was less than the assumed response rate of 80%. This was due to shifts that took place within the refugee camps where all the stove users from CPA6207-0002 are based. Therefore, the sampling effort was extended beyond the calculated sample size of 122, until reaching the sample size ( $n$ ) of 97. Interviews were performed to determine  $DO_y$  and  $N_{eaters\_project}$ .

In order to determine  $\eta_{new}$ , 8 WBTs were conducted. The first 10 stoves were selected as a sub-sample for conducting Water Boiling Tests (WBTs) from the unsorted sample set of 122 stoves. During the monitoring survey, only 3 of the initially selected 10 stoves could be availed for conducting the Water Boiling Tests. Therefore in order to achieve the assumed response of 80% (at least 8 stoves out of 10 stoves), 5 additional stoves that could be availed by the users, were tested in ascending order starting from the 11th stove from the unsorted sample list of 122 sampled stoves. Finally, 8 tests were performed in total, which is equal to the minimum sample size for  $\eta_{new}$  (n=8).

**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 same and the demonstration on whether the confidence/precision has been met.

CPAs 6207-0001, 6207-0005 and 6207-0006:

Parameter	n	Response rate	Assumed response rate for oversampling	Result	Standard deviation	Confidence	Precision	Lower bound applicable?
$\eta_{new}$	9	90%	80%	44.90%	1.40	95%	3.05%	No
$DO_y$	66	83.5%	80%	0.00 %	N/A	95%	0.00%	No
$N_{eaters\_project}$	66	83.5%	80%	5.56	1.59	95%	5.86%	No

CPA 6207-0002:

Parameter	n	Response rate	Assumed response rate for oversampling	Result	Standard deviation	Confidence	Precision	Lower bound applicable?
$\eta_{new}$	8	80%	80%	33.95%	3.82	90%	7.53%	No
$DO_y$	97	56.7%	80%	13.40%	N/A	90%	6.53%	No
$N_{eaters\_project}$	97	56.7%	80%	4.40	2.31	90%	8.79%	No

The adjusted values are used for the emission reductions calculations.

The sampling of the stove users included in the Inspection/monitoring Database took place in the month after the end of the Monitoring Period (30/06/2017), 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.

**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 6207-0001, 6207-0005 and 6207-0006 (single sampling plan) and 6207-0002 (separate sample) for this Monitoring Period and as described in G.3. a) and e). Simple random sampling was applied for all CPAs (6207-0001, 6207-0002, 6207-0005 and 6207-0006).

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 6207-0001, 6207-0005 and 6207-0006 (across CPA sampling applied) and CPA 6207-0002 (single CPA sample) for this Monitoring Period. Simple random sampling was applied. Further, sample sizes were calculated based on EB 67 Annex 6, para 16 to 26 for the proportional parameter of interest ( $DO_y$ ) and para 51 to 57 for the mean value parameters of interest ( $N_{eaters\_project}$ ;  $\eta_{new}$ ). In case where calculated sample sizes were lower than the defined minimum sample sizes in the CPA-DD, the minimum sample sizes were applied. This is valid for CPAs 6207-0001, 6207-0002, 6207-0005 and 6207-0006.

## **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 have been operated and maintained by the CME's database manager.

### Stove record database

The stove record database keeps information on all ICS deployed per CPA and included in this monitoring period. At least the following information will be recorded:

- Type of appliance (ICS type) deployed
- Serial number (Stove-ID) of system
- Delivery date of appliance (to user)
- User details (Name, Address, etc.)
- Implementing Entity/ Contact Person
- Type of stove predominantly used before purchasing of the ICS

### Sample Database

From the stove record database the monitoring samples for CPA 6207-0001, CPA 6207-0005 and 6207-0006 (single sampling plan) and 6207-0002 (separate sample) were drawn.

After monitoring the results were also included in an additional inspection/monitoring database. The following information were recorded:

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

After the sample was drawn, a monitoring List containing stove serial numbers and contact details of the users was sent to the Monitoring teams. Data that was collected and processed by the field staff during monitoring was checked by the CME's 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 F. Calculation of emission reductions or net anthropogenic removals

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

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Please note that the methodology AMS II.G., ver. 3 does not provide specific equations for calculation of baseline emissions, project emissions or leakage, only for Emission reductions.

Equations applied for calculations:

$$ER_y = B_{y,savings} \cdot f_{NRBy} \cdot NCV_{biomass} \cdot EF_{projected\ fossilfuel} \cdot N_{y,i}$$

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

$$B_{old,i} = B_{old,appliance,i} \cdot \left(1 - DO_y\right) \cdot \frac{mp_{length}}{365} \cdot L_y$$

$$B_{old,appliance,1,2} = B_{old,capita,1,2} \cdot f_{biomass / charcoal} \cdot N_{eaters\_project}$$

$$B_{old,appliance,3} = B_{old,capita,3} \cdot N_{eaters\_project}$$

$$\eta_{old,1,2} = \frac{\eta_{charcoal\_stove1,2} \cdot NCV_{charcoal}}{f_{biomass/charcoal} \cdot NCV_{biomass}}$$

Sample calculations:

Scenario 1			Scenario 2			Scenario 3		
Year	Unit	1.07.2016-30.06.2017	Year	Unit	1.07.2016-30.06.2017	Year	Unit	1.07.2016-30.06.2017
B <sub>y,savings</sub>	tCO <sub>2</sub> e	0.12	B <sub>y,savings</sub>	tCO <sub>2</sub> e	0.15	B <sub>y,savings</sub>	tCO <sub>2</sub> e	0.32
f <sub>NRBy</sub>	%	9	f <sub>NRBy</sub>	%	9	f <sub>NRBy</sub>	%	9
NCV <sub>biomass</sub>	tCO <sub>2</sub> e/t	5.58	NCV <sub>biomass</sub>	tCO <sub>2</sub> e/t	5.58	NCV <sub>biomass</sub>	tCO <sub>2</sub> e/t	5.58
EF <sub>projected fossilfuel</sub>	tCO <sub>2</sub> e/t	8.99	EF <sub>projected fossilfuel</sub>	tCO <sub>2</sub> e/t	8.99	EF <sub>projected fossilfuel</sub>	tCO <sub>2</sub> e/t	3.53
N <sub>y,i</sub>		2.864	N <sub>y,i</sub>		1.122	N <sub>y,i</sub>		6.573
η <sub>old,i</sub>	%	0.95	η <sub>old,i</sub>	%	0.95	η <sub>old,i</sub>	%	0.95
DO <sub>y</sub>	%	0.00%	DO <sub>y</sub>	%	0.00%	DO <sub>y</sub>	%	0.00%
mp <sub>length</sub>	days	365	mp <sub>length</sub>	days	365	mp <sub>length</sub>	days	365
L <sub>y</sub>		8.38	L <sub>y</sub>		8.38	L <sub>y</sub>		3.33
f <sub>biomass / charcoal</sub>	%	30%	f <sub>biomass / charcoal</sub>	%	30%	f <sub>biomass / charcoal</sub>	%	30%
f <sub>biomass / charcoal</sub>	%	20%	f <sub>biomass / charcoal</sub>	%	20%	f <sub>biomass / charcoal</sub>	%	20%
NCV <sub>charcoal</sub>	tCO <sub>2</sub> e/t	0.0265	NCV <sub>charcoal</sub>	tCO <sub>2</sub> e/t	0.0265	NCV <sub>charcoal</sub>	tCO <sub>2</sub> e/t	0.0265
f <sub>biomass / charcoal</sub>	%	44.90%	f <sub>biomass / charcoal</sub>	%	44.90%	f <sub>biomass / charcoal</sub>	%	44.90%
N <sub>eaters_project</sub>		4.58	N <sub>eaters_project</sub>		7.7	N <sub>eaters_project</sub>		2.67
B <sub>old,capita,1,2</sub>	tCO <sub>2</sub> e	0.96	B <sub>old,capita,1,2</sub>	tCO <sub>2</sub> e	0.96	B <sub>old,capita,1,2</sub>	tCO <sub>2</sub> e	0.96
B <sub>old,capita,3</sub>	tCO <sub>2</sub> e	0.015	B <sub>old,capita,3</sub>	tCO <sub>2</sub> e	0.015	B <sub>old,capita,3</sub>	tCO <sub>2</sub> e	0.015
B <sub>old,capita,3</sub>	tCO <sub>2</sub> e	51.4	B <sub>old,capita,3</sub>	tCO <sub>2</sub> e	51.4	B <sub>old,capita,3</sub>	tCO <sub>2</sub> e	51.4
ER <sub>y</sub>	tCO <sub>2</sub> e	18.699	ER <sub>y</sub>	tCO <sub>2</sub> e	10.372	ER <sub>y</sub>	tCO <sub>2</sub> e	20.587

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

&gt;&gt;

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

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

&gt;&gt;

As per AMS-II.G. leakage has to be considered to adjust  $B_{old}$ . Therefore, leakage emissions are considered in the baseline emissions calculation and do not need to be considered during monitoring.

**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
6207-0001	47,637	N/A	N/A	0	47,637	47,637
6207-0002	14,530	N/A	N/A	0	14,530	14,530
6207-0003	0	N/A	N/A	0	0	0
6207-0004	0	N/A	N/A	0	0	0
6207-0005	44,531	N/A	N/A	0	44,531	44,531
6207-0006	1,112	N/A	N/A	0	1,112	1,112
6207-0007	0	N/A	N/A	0	0	0
<b>Total</b>	<b>107,810</b>	<b>Not applicable</b>	<b>Not applicable</b>	<b>0</b>	<b>107,810</b>	<b>107,810</b>

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:

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

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. $B_{y,savings}$ comprises three options defined according to the scenario 1) to 3) illustrated in section B.4 of the registered PoA-DD, part two.
$f_{NRB,y}$	%	Fixed	Fraction of woody biomass saved by the project activity in period y that can be established as non-renewable biomass

$NCV_{biomass}$	TJ/t	Fixed	Net calorific value of the non-renewable woody biomass that is substituted (IPCC: 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
$N_{y,i}$	-	Measured	Number of project devices of type i operating in year y, determined

$B_{y,savings}$  shall be calculated according to Option 2 of Para 6 of AMS II G:

$$B_{y,savings} = \sum_{i=1}^3 B_{old,i} \cdot \left( 1 - \frac{\eta_{old,i}}{\eta_{new}} \right)$$

Index i comprises four options according to the scenario 1)-3) illustrated in section E.4 of the registered PoA-DD. Please note: if instead of index i specific scenarios are selected the scenario number is stated as subscript as follows:  $X_1$  = parameter X refers to scenario 1 only,  $X_{1,2}$  = parameter X refers to both scenarios 1) and 2)

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
$\eta_{new}$	%	Monitored	Efficiency of the system being deployed as part of the project activity

The efficiency of the charcoal stoves under scenario 1) and 2) still need to be converted to the efficiency of a fuel wood stove to derive the efficiency  $\eta_{old,1,2}$ <sup>4</sup>:

$$\eta_{old,1,2} = \frac{\eta_{charcoal\_stove,1,2} \cdot NCV_{charcoal}}{f_{biomass/charcoal} \cdot NCV_{biomass}}$$

Parameter	Unit	Type	Description
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<sup>4</sup>Charcoal is already a transformed product, which in Rwanda needs 9 kg of wood to produce 1 kg of charcoal.

Even though the NCV of the charcoal is more than twice that of the fuel wood, the losses during charcoal production mean that less than 23% of the energy contained in the fuel wood is transformed into charcoal.

A thermal efficiency of 30% like for the efficient charcoal stoves means that 30% of the energy content of the charcoal is going into the food, but taking into account the losses during charcoal production, only around 6.8 % of the energy content of the fuel wood which was used to produce the charcoal is going into the food.

$\eta_{charcoal\_stove\ 1,2}$	fraction	fixed	Efficiency of the charcoal system/s being replaced
$NCV_{charcoal}$	TJ/t	fixed	Net calorific value of charcoal
$f_{biomass/charcoal}$	number	fixed	Conversion factor for wood to charcoal
$NCV_{biomass}$	TJ/t	fixed	Net calorific value of the non-renewable woody biomass that is substituted

For calculating  $B_{y,savings}$  a CPA shall calculate efficiency gains of the ICS compared to the baseline efficiency.

In order to be able to calculate the Emission Reductions the following additional steps are required to determine:  $B_{old,i}$ ,  $f_{NRB,y}$ ,  $\eta_{old,i}$

AMS-II.G., par.7 provides two principal approaches how to determine  $B_{old}$ . We choose to apply approach (a):

*“Calculated as the product of the number of systems multiplied by the estimated average annual consumption of woody biomass per appliance (tonnes/year). This can be derived from historical data or a survey of local usage,”*

Further assessment of the above paragraph shows that the average annual consumption of woody biomass in the baseline can be determined based on either Historical Data, or a Survey of Local Usage

As historical data on charcoal and fuel wood consumption is available for Rwanda, we chose option a) “historical data”, and therefore establish the average annual consumption of woody biomass per system ( $B_{old}$ ) ex ante in the PoA for scenario 1), 2) and 3).

$B_{old,i}$  shall be calculated according to the following formula:

$$B_{old,i} = B_{old,appliance,i} \cdot N_{i,y} \cdot (1 - DO_y) \cdot \frac{mp_{length}}{365} \cdot L_y$$

Index i comprises four options according to the scenario 1)-3) illustrated in section E.4 of the registered PoA-DD.

Parameter	Unit	Type	Description
$B_{old,i}$	t/year	Calculated	Quantity of woody biomass used in the absence of the project activity
$B_{old,appliance,i}$	t/year	Monitored	Average annual consumption of woody biomass per appliance $B_{old,appliance,i}$ comprises four options according to the scenario 1) to 4) illustrated in section B.4 of the PoA-DD, part two.
$N_{i,y}$	-	Monitored	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 $y$
$L_y$	-	Fixed	0.95 default value

Applying the procedures outlined in section section E.6.2 of the of the registered PoA-DD the value  $B_{old, appliance, i}$  is derived from per capita woody biomass consumption ( $B_{old, capita, i}$ ), (Step 1), multiplied with the average number of eaters per ICS as determined during monitoring ( $N_{eaters\_project}$ ) (Step1), multiplied by total number of appliances deployed ( $N_{i,y}$ ) times an adjustment factor for drop out ( $DO_y$ ) as found during sampling (Step 2).

Since  $B_{i,y, appliance}$  is an annual value the term is also adjusted according to the length of the monitoring period, in case it doesn't equal one calendar year. Finally, the term is adjusted for leakage ( $L_y$ ) using the default leakage factor (Step 3).

Furthermore in order to determine Quantity of woody biomass that is saved ( $B_{y,savings}$ ) the efficiency of the replaced and deployed appliances needs to be determined (Step 4).

At last the share of Non-Renewable biomass ( $f_{NRB,y}$ ) needs to be determined in order to calculate the emission reductions (Step 5).

Please see the attached emission reduction spreadsheets for CPA 6207-0001, CPA 6207-0002, 6207-0005 and 6207-0006 which include the calculations for each stove included in the monitoring period. The emission reduction calculations are done separately for each baseline scenario 1) to 3) per CPA.

#### 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)
6207-0001	47,637	44,180 *
6207-0002	14,530	35,517**
6207-0003	0	41,739***
6207-0004	0	19,384****
6207-0005	44,531	44,095*****
6207-0006	1,112	44,095*****
6207-0007	0	10,390*****
<b>Total</b>	<b>107,810</b>	<b>239,400</b>

\* Ex ante estimate based on CPA-DD values, as indicated for the period from 01/10/2015 to 30/09/2016 (366 days = 44,211 CERs) and 01/10/2016 to 30/09/2017 (365 days = 44,211 CERs). The ex ante estimates for both periods have been calculated on a daily basis and multiplied with the specific days of the monitoring period as follow:  $(44,211 / 366 * 92 \text{ days}) + (44,211 / 365 * 273 \text{ days}) = 44,180 \text{ CERs}$ .

\*\* Ex ante estimate based on CPA-DD values, as indicated for the year 2016 (366 days = 35,566 CERs) and 2017 (365 days = 35,566 CERs). The ex ante estimates for both periods have been calculated on a daily basis and multiplied with the specific days of the monitoring period as follow:  $(35,566 / 366 * 184 \text{ days}) + (35,566 / 365 * 181 \text{ days}) = 35,517 \text{ CERs}$ .

\*\*\* Ex ante estimate based on CPA-DD values, as indicated for the year 2 (366 days = 41,806 CERs) and year 3 (365 days = 41,806 CERs). The ex ante estimates for both periods have been calculated on a daily basis and multiplied with the specific days of the monitoring period as follow:  $(41,806 / 366 * 215 \text{ days}) + (41,806 / 365 * 150 \text{ days}) = 41,739 \text{ CERs}$ .

\*\*\*\* Ex ante estimate based on CPA-DD values, as indicated for the year 2 (365 days = 19,384 CERs) and year 3 (365 days = 19,384 CERs). The ex ante estimates for both periods have been calculated on a daily basis and multiplied with the specific days of the monitoring period as follow:  $(19,384 / 365 * 243 \text{ days}) + (19,384 / 365 * 122 \text{ days}) = 19,384 \text{ CERs}$ .

\*\*\*\*\* Ex ante estimate based on CPA-DD values, as indicated for the period of year 2 (365 days = 44,095 CERs).

\*\*\*\*\* Ex ante estimate based on CPA-DD values, as indicated for the period of year 2 (365 days = 44,095 CERs).

\*\*\*\*\* Ex ante estimate based on CPA-DD values, as indicated for the year 1 (365 days = 20,952 CERs). As year 1 only started on 01.01.2017, the ex ante estimate for the monitoring period has been calculated on a daily basis and multiplied with the specific days of the monitoring period as follow:  $(20,952 / 365 * 181 \text{ days}) = 10,390 \text{ CERs}$ .

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

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For CPA 6207-0001 and CPA 0005 the monitoring results are slightly higher than the estimates because the total number of stoves distributed was higher than the total number of stoves assumed in the CPA-DDs. Furthermore there was a higher actual efficiency of the cookstoves being used and lower dropout rate as compared to the values estimated in the registered CPA-DDs .

For CPA 6207-0002 it was estimated that 11,000 stoves would be operational but during the ICS deployment monitoring, only 7,297 stoves could be included in the distribution database hence the ex ante estimated emission reductions are higher than the achieved emission reductions.

For CPA 6207-0006, it was estimated that 9,500 stoves would be operational but only 981 were deployed until the end of MP4. The stoves deployed under the CPA were only deployed from 1<sup>st</sup> February 2017 hence the ex ante estimated emission reductions are higher than the achieved emission reductions.

CPAs 6207-0003, 6207-0004 and 6207-0007 were not monitored since no ICS have been distributed under these CPAs until the end of the monitoring period, therefore no emission reductions have been achieved.

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**Document information**

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<i>Version</i>	<i>Date</i>	<i>Description</i>
02.0	7 June 2017	Revision to: <ul style="list-style-type: none"><li>• Ensure consistency with version 01.0 of the “CDM project standard for programmes of activities (CDM-EB93-A07-STAN);</li><li>• Make editorial improvements.</li></ul>
01.0	1 April 2015	Initial publication.

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