



**Monitoring report form for CDM programme of activities
(Version 03.0)**

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

MONITORING REPORT

Title of the PoA	Programme of Activities for Local Improved Cookstoves in West Africa	
UNFCCC reference number of the PoA	UNFCCC Ref. No. 9941	
Version numbers of the PoA-DD applicable to this monitoring report	Version: 7 Dated: 24/03/2014	
Version number of this monitoring report	05	
Completion date of this monitoring report	30/12/2019	
Monitoring period number	Second monitoring period	
Duration of this monitoring period	01/01/2016 to 31/12/2017	
Monitoring report number for this monitoring period	01	
Coordinating/managing entity	GERES	
Host Parties	Host Party of the PoA	Is this the host Party of a CPA covered in this monitoring report? (yes/no)
	Mali	Yes
	Benin	No
Applied methodologies and standardized baselines	AMS-II.G: "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass" , Version 05.0	
Sectoral scopes	03: Energy Demand	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by all CPAs covered in this monitoring report in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	00 tCO ₂ e	14,337 tCO ₂ e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the CPA-DDs for the CPAs covered in this monitoring report	87,382 tCO ₂ e	

PART I Monitoring of programme of activities (PoA)

SECTION A. Description of PoA

A.1. General description of PoA

This Small-Scale Programme of Activities (SSC-PoA) involves the promotion, distribution and sale of the Improved charcoal Cookstoves (ICS) in the West African region, in Mali and Benin. The ICS disseminated through this programme replace the prevailing inefficient traditional or charcoal cookstoves commonly used by the target population in urban, peri-urban and rural areas, which combust wood more efficiently, and improve thermal transfer to pots, hence saving fuel and lowering greenhouse gas emissions.

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
Project Activity for Local Improved Cookstoves in Bamako - Generic CPA-DD (there is only one generic CPA under the PoA) ¹	07	03	AMS-II.G: "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass" (Version 05.0) ²

A.1.2. CPAs included in the PoA

Title and UNFCCC reference number of the CPA	Version of the PoA-DD	Title and reference number of the corresponding generic CPA	Crediting period type and duration	Covered in this monitoring report? (yes/no)
Project Activity for Local Improved Cookstoves in Bamako 9941-P1-0001-CP1	07	Project Activity for Local Improved Cookstoves in Bamako 9941-P1-XXXX-CP1	01/06/2014 to 31/05/2021	Yes

A.2. Coordinating/managing entity

GERES Association (Groupe Energies Renouvelables, Environnement et Solidarités) a French NGO based in Aubagne, France with an office in Bamako, Mali and Cotonou, Benin, is the Coordinating and Managing Entity (CME) of the PoA.

Contact person : Fulgence AKAFFOU
 Title: Monitoring manager
 Department: GERES Mali
 Personal e-mail: f.akaffou@geres.eu

Street/P.O. Box : 2 cours Foch
 City / Country: 13400 Aubagne – France
 Website : www.geres.eu

¹ http://cdm.unfccc.int/ProgrammeOfActivities/cpa_db/K2R165F9QO4EGMJDPW3C7BNY0ALVUX/view

² <http://cdm.unfccc.int/UserManagement/FileStorage/24G3EKN6PT0QJ1BHRICMYDX97OW8UF>

SECTION B. Implementation of PoA

B.1. Description of implemented PoA

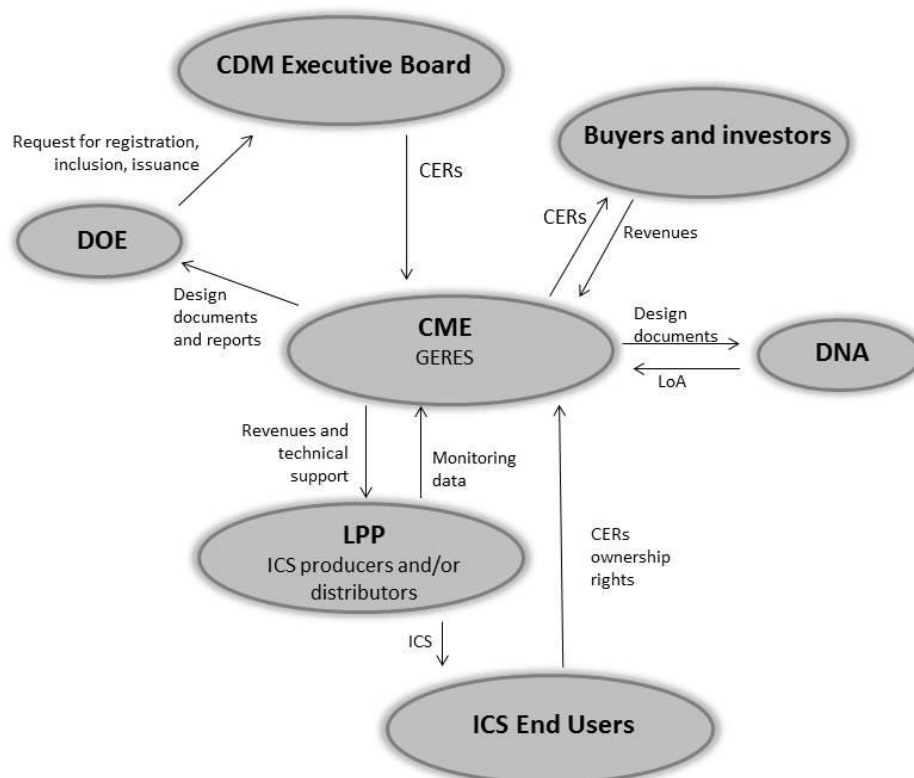
a) Definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies;

This PoA is a joint initiative of international and local organizations. GERES (Groupe Energies Renouvelables, Environnement et Solidarités) a French NGO based in Aubagne, France with an office in Bamako, Mali and Cotonou, Benin, is the Coordinating and Managing Entity (CME) of the PoA.

GERES has a role of supply chain technical assistant and carbon project developer, and is the communication focal point with carbon standards. GERES has managed and coordinated activities of the partners, and also provided all necessary marketing and promotion support. GERES also coordinated the monitoring of the programme activities, and is responsible for the sale of ERs and the sharing of benefits between CPAs.

The ICS production and diffusion activities will be implemented by various local actors individually referred to as a Local Project Partners (LPP). LPPs are responsible for ICS production, diffusion, monitoring and quality control supported by GERES team at the beginning, with a progressive withdrawal. The designation of operational responsibilities shall be clearly defined in between the CME and the LPP previous to the CPA starting date and shall be documented. These responsibilities may change according to the readiness of the LPPs. The issue of the emissions reductions property transfer shall be clarified by a written statement, that clarify that the end-users waive their carbon credit ownership rights to the CME.

Figure: Organisation of the Coordinating and Managing Entity of the PoA



In the specific case of the Project Activity for Local Improved Cookstoves in Bamako, LPPs are GIE PFA (a economic interest group of ICS producers) and resellers of these ICS members of ARFB (Association of stoves resellers in Bamako).

GERES team is composed of a program officer, a monitoring officer and a monitoring assistant, working closely with the GIE PFA staff : a coordinator and some tinsmiths in charge of monitoring and commercial tasks.

More specifically:

- The program officer is coordinating the PoA, including managing the GERES team in Bamako, handling the relationships between all actors involved within the PoA (LPPs, DOE, internal expertise, etc.), and supervising the financial and administrative activities linked with the project activity.
- The monitoring officer is in charge of quality control of the collection and storage of ICS sales data, manages the monitoring assistant and field agents for the field collection and entry in the database, coordinates the design and implementation of periodic field surveys among end-users and is responsible for archive management.
- The monitoring assistant is in charge of awareness raising and data collection from retailers of PFA' ICS, collecting sales records of PFA's ICS, and data entry, as well as contributing to the implementation of marketing and communication activities.
- GIE PFA staff is in charge of managing the production and the distribution of ICS, affixing barcode on ICS, filling and gathering monitoring records, preparing and participating to marketing and communication activities.

b) Record Keeping System

An electronic database is managed at the CME level. This database summarizes all the information regarding the CPAs registered under this PoA as following:

- Name and ID of the CPA
- Name and contact details of the corresponding LPP
- Name and type of ICS distributed by the CPA
- Serial numbers of the ICS distributed under this CPA (and their date of production/sales, as well as the name and contact of the producer/retailer and end-user when available)

This database is updated continuously for each CPA, for their whole crediting period, and for the two years following their crediting period. A monitoring team dedicated to each CPA is responsible for the monthly update of the database, and the CME revises it every 3 months to ensure the validity of the data. In addition to the database, the CME gather and keep available the following documentation:

- Hard copies of the logbooks or invoices used for monitoring
- Raw data and reports of baseline studies
- Raw data and report of performance tests
- Raw data and report of users surveys
- DOE reports and related documentation
- Hard copies of contracts (ERPAs or similar documents) in between the CME, and LPPs of the different CPAs included
- Meeting notes of the CME meetings and internal procedures
- Original version of the PoA Charter signed by the CME and LPPs

The logbooks are filled continuously by the different actors of the ICS production and supply chain for each CPA, and hard copies are collected by a monitoring team every month or less according to stage of maturity of the monitoring system and the level of stove production. The hard copies of the logbooks, and the raw data and reports of monitoring tests will be gathered by the monitoring team at the CPA level, and provided to the CME for validation every three months or larger periods according to the level of maturity and production.

In the case of CPA inclusion, the LPPs will provide technical data on the proposed technology and target group to the CME that will be responsible of the technical review. This technical review will be done to ensure that the potential CPA is eligible under the PoA before submitting its inclusion to the DOE.

Training of the LPPs staff will also be provided at this time to ensure that data monitoring and recording, reporting, internal quality control, and maintenance are followed by the CPA, and so ensure the quality of the data provided to the CME for monitoring.

Finally, to ensure a continuous improvement of the PoA management system, a biennial revision of the management procedures will be done between the CME and the LPPs concerned.

B.2. Post-registration changes to PoA

B.2.1. Corrections

N/A

B.2.2. Inclusion of monitoring plan

N/A

B.2.3. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

N/A

B.2.4. Changes to programme design

N/A

B.2.5. Changes specific to afforestation or reforestation activities

N/A

PART II Monitoring of CPAs

SECTION C. Implementation of CPAs

C.1. Description of implemented CPAs

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

The CPA (9941-P1-0001-CP1) involve the promotion, distribution and sale of the Improved charcoal Cookstoves (ICS) in the district of Bamako, the capital of Mali, produced by the Group of Economic Interest PFA (GIE PFA), the PFA's ICS (also known as Wassa ICS).

The ICS disseminated through this programme replace the prevailing inefficient three-stone fires or traditional pot support with stoves which combust charcoal more efficiently, and improve thermal transfer to pots, hence saving fuel and lowering greenhouse gas emissions.

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

The PFA's ICS is a biomass charcoal stove locally manufactured and was introduced in Mali in 1996 by "Entreprise Works".

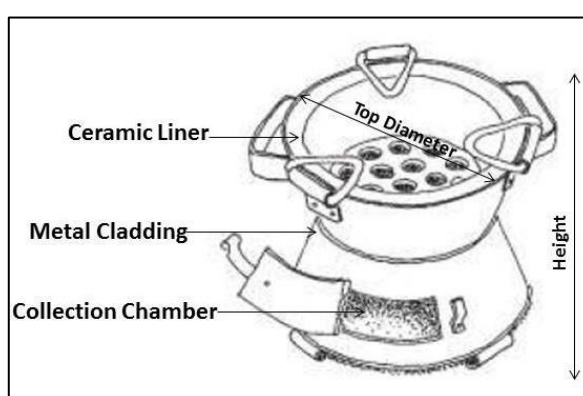
It is the equivalent of the ICS usually referred as "Nansu" in Benin, "Gyapa" in Ghana, "Asuto" in Togo and "Jambar" in Senegal. In Ghana, this technology is well developed as noted by the Ghana Country Action Plan of the GACC (Global Alliance for Clean Cookstoves): "This technology has been successfully adopted by urban and peri-urban Ghanaian consumers because it effectively meets the cooking and cultural needs », and benefit from carbon finance.

The PFA's ICS stove is a portable single-pot ICS made with a metal cladding surrounding a ceramic liner. The ceramic liner provides the combustion chamber insulation and improves the overall efficiency of the stove.

Figure : PFA's ICS producer



Figure : PFA's ICS improved cookstove



Five sizes of PFA's ICS are currently produced in Bamako, nevertheless the "Large" and "Super" sizes (dimensions are presented in the Table below) represent more than 80% of the total sales. Therefore to remain conservative, only these two sizes will be accounted for emissions reductions.

The PFA ICS respect the eligibility criteria of the PoA-DD:

- The PFA's ICS uses charcoal ;
- The PFA's ICS is a single pot portable stove made of metal and clay not equipped of a chimney;
- The PFA's ICS is manufactured locally;
- It is targetting households of Bamako;
- The PFA' ICS dimensions are respecting the PoA-DD criteria;

Size	Top Diameter (mm)		Height (mm)	
	Minimum	Maximum	Minimum	Maximum
Large	318	349	245	262
Super	340	355	260	274

The PFA ICS also respect the eligibility criteria of the AMS-II.G v05.0:

- It's efficiency is higher than 20% with an average efficiency of 26.19% as tested by the « Agence des Energies Renouvelables du MALI » (AER-Mali) in preparation of the CPA-DD ;
- It's annual energy savings are lower than 180 GWh with 0.00276 GWh per PFA ICS.

The thermal energy savings achieved by the CPA during this monitoring period are estimated to be 48.81 GWh³ which is under the limit (180 GWh) of small-scale project.

(c) Relevant dates for the specific-case CPA(s);

Sales and Registration of ICS

CPA	9941-P1-0001-CP1
Date of first ICS sold and registered	01/06/2014
Date of last ICS sold and registered in the database	31/12/2017
Total ICS sold and registered (till 31/12/2017)	17,488

Monitoring Survey

CPA	9941-P1-0001-CP1
Survey date for parameter N_y	02/01/2019 to
Survey date for parameter $\eta_{new,y,i}$	04/02/2019

(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	Emission reductions (t CO2e)
9941-P1-0001-CP1	14,337

The system of unique identification of the ICS, with serial numbering and labelling, and controls among the data collection process avoid the double counting of any ICS.

C.2. Location of CPAs

The CPA boundary corresponds to the district of Bamako, the capital city of the Republic of Mali, where the GIE PFA produces and disseminates PFA's improved cookstoves. The district of Bamako includes 6 communes. The production site of clay liners is located in Kognoumani, Bamako, whereas the tinsmiths workshop is based in Medine market, the Hippodrome neighbourhood (Commune II, north of Bamako); and the retailers are spread over the 6 communes of Bamako.

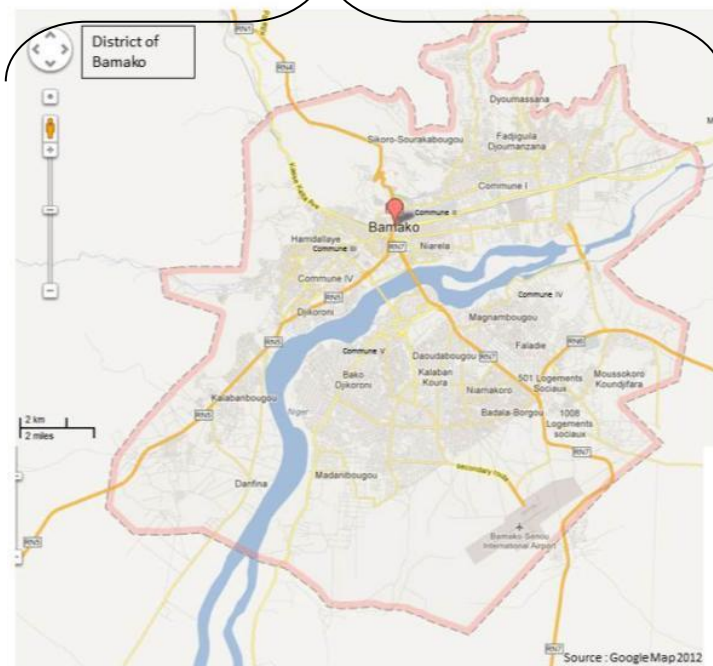
Moreover, as Coordinating and Managing Entity of the PoA, GERES has an office in the Torokorobougou neighbourhood (Commune V – South of Bamako).

Table : Bamako's GPS coordinates

Coordinates	
Latitude	12° 39'0.00" N
Longitude	8° 0' 0.00" W

³ Total energy savings (in GWh) for entire Monitoring Period = [(ERY/ EF_{projected fossil fuel}) x 277,778] = (14,337 / 81.6) x 277,778/1000000 = 48.81
Total energy savings par year = 24.40 GWh.

Figure : Map of Mali and the district of Bamako



C.3. Post-registration changes to CPAs**C.3.1. Temporary deviations from the monitoring plans in the included CPA-DDs, applied methodologies, standardized baselines or other methodological regulatory documents**

N/A

C.3.2. Corrections

N/A

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

N/A

C.3.4. Inclusion of monitoring plan

N/A

C.3.5. Permanent changes to the included monitoring plans, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

N/A

C.3.6. Changes to project design

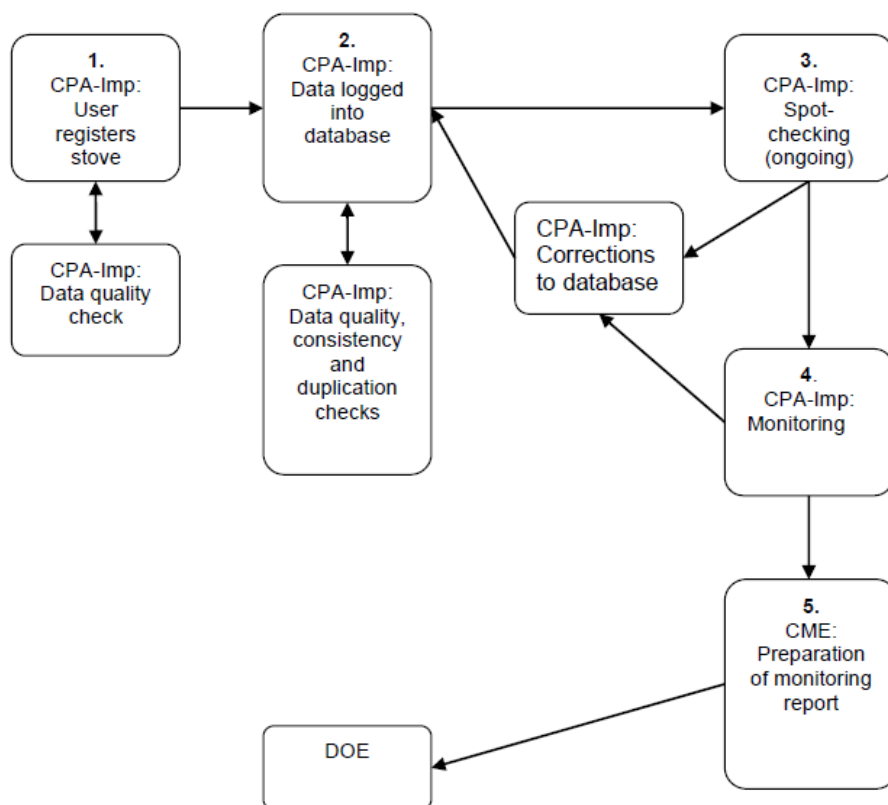
N/A

C.3.7. Changes specific to afforestation or reforestation CPA

N/A

SECTION D. Description of monitoring system of CPAs

The monitoring system applied involves a number of key elements that ensure that the CME and CPA-Implementer have high-quality, unbiased and reliable information regarding the performance of the project in terms of implementation and outcomes, and for the purposes of calculating Certified Emission Reductions (CERs) following AMS II.G version 5.0 on the basis of the amount of non-renewable biomass saved by the ICS in the CPA. The below flow-chart illustrates the roles and responsibilities of the parties during the implementation of the monitoring plan for the SSC-CPA. In the below flowchart, the CPA implementer is abbreviated to "CPA-Imp", and can be the CME or another party authorized by the CME.



Below is the description of the above steps on the flow-chart.

1. **CPA-Imp:** User registers stove: CPA Implementer collects/receives the necessary information requested on the Registration Card from the user. Means of collecting this information is through a physical Registration Card filled by CPA-Imp staff, retailers, end-users or partner organization's staff, or through the use of ICTs or SMS. CPA Implementers' staff spot check the accuracy of information provided, and request for field staff additional clarifications if needed;
2. **CPA-Imp:** Data logged into database: CPA Implementer trained staff input the data in the database either manually (if data collected from physical Registration Card) or automatically if data was collected using ICTs or SMS. CPA Implementer staff double check the information included on the database and check for duplications. Any duplicate information is investigated and errors corrected or excluded from the database if it is a true duplicate entry.
3. **CPA-Imp:** Spot-checking (ongoing): CPA Implementer field staff randomly select households included in the database and visit them to cross-check the information on the database with the factual evidence in the field. Any inconsistencies found (e.g. change in the address of a user) will be updated on the database, and in the case ICS are found to be no longer in use, they will be clearly marked as such and excluded from emission reductions calculations.
4. **CPA-Imp:** Monitoring: CPA Implementer follows the requirements as per SSC-POA-DD to collect the necessary information for a monitoring report.
5. **CME:** Preparation of monitoring report: the CPA Implementers prepare the final monitoring report to be provided to the verifier DOE for verification of emission reductions. A copy of the monitoring report will remain with the CME.

The CME coordinates and manages each CPA Implementer and assists them in implementing each element of the monitoring plan.

SECTION E. Data and parameters**E.1. Data and parameters fixed ex ante***(Copy this table for each data or parameter.)*

Data/Parameter	B_{old}
Unit	Tonnes per year per device
Description	Average annual consumption of woody biomass per appliance in absence of the project activity
Source of data	Calculated based on Survey report.
Value(s) applied	0.37
Choice of data or measurement methods and procedures	This value was calculated based on KPT performed using PCIA guidelines and has been fixed ex-ante.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	η_{old}
Unit	Fraction
Description	Efficiency of the baseline stoves mix
Source of data	UNFCCC, AMS-II.G v05.0 default value
Value(s) applied	19.21
Choice of data or measurement methods and procedures	This value was calculated by taking weighted average values of the baselines stoves as per the applied methodology and has been fixed ex-ante.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	$EF_{projected_fossilfuel}$
Unit	tCO ₂ /TJ
Description	Emission factor for the substitution of non-renewable wood biomass by similar consumers.
Source of data	IPCC default value as provided in Version 5 of AMS IIG.
Value(s) applied	81.6
Choice of data or measurement methods and procedures	It is assumed that the mix of present and future fuel used would consist of a solid fossil fuel (lowest in the ladder of fuel choices), a liquid fossil fuel (represents a progression in the ladder of fuel use choices) and a gaseous fuel (represents a progression over liquid fuel in the ladder of fuel use choices).
Purpose of data/parameter	Thus a 50% weight is assigned to coal as the alternative solid fossil fuel (96 tCO ₂ /TJ) and a 25% weight is assigned to both liquid and gaseous fuels (71.5 tCO ₂ /TJ for Kerosene and 63.0 tCO ₂ /TJ for Liquefied Petroleum Gas (LPG)).
Additional comments	Calculation of baseline and project emissions

Data/Parameter	NCV biomass
Unit	TJ / tonne
Description	Net calorific value of the non-renewable woody biomass that is substituted
Source of data	IPCC Guidelines 2006, Chapter 1, Table 1.2
Value(s) applied	0.015
Choice of data or measurement methods and procedures	Default IPCC value, also suggested by the AMS-II.G v05.0 methodology on page 4.
Purpose of data/parameter	Calculation of baseline and project emissions
Additional comments	As a default value is applied, monitoring is not required.

Data/Parameter	CF ch-fw
Unit	-
Description	Conversion factor from charcoal to wood according to the charcoal production techniques in Mali
Source of data	Schéma directeur d'approvisionnement en bois énergie de Bamako, 2006 – Malian Agency for the Development of Energy and Rural Electrification (AMADER)
Value(s) applied	7
Choice of data or measurement methods and procedures	Value specific to the charcoal production chain chosen to maximise the accuracy of the emission reduction calculations
Purpose of data/parameter	Calculation of leakage
Additional comments	As a default value is applied, monitoring is not required.

Data/Parameter	Leakage (L)
Unit	Fraction
Description	Leakages related to the use/diversion of non-renewable biomass saved under the project activity by non-project households/users that previously used renewable energy sources ; the use of non-renewable woody biomass saved under the project of activity to justify the baseline of other CDM project activity; or to the increase in the use of non-renewable woody biomass outside the project boundary to create non-renewable woody biomass baselines.
Source of data	AMS-II.G v05.0 default value
Value(s) applied	0.95
Choice of data or measurement methods and procedures	A net to gross adjustment factor (0.95 default) is applied in order to adjust Bold to account for leakages as per paragraph 20 of the AMS II.G, version 5 methodology.
Purpose of data/parameter	Calculation of leakage
Additional comments	As a default value is applied, no monitoring is required

E.2. Data and parameters monitored

Data/Parameter	Ny,j			
Unit	Number of stoves sold			
Description	Total number of stoves installed since the beginning of the project per vintage			
Measured/calculated/default	Measured			
Source of data	Monitoring database			
Value(s) of monitored parameter	CPA	large	Super	Total
	9941-P1-0001-CP1	9,122	8,366	17,488
Monitoring equipment	Sampling surveys and project database			
Measuring/reading/recording frequency	At least once every two years			
Calculation method (if applicable)				
QA/QC procedures	As each stove has a unique serial number, and the monitoring database is checked at the CPA level, and at the coordinating entity; therefore double counting is avoided			
Purpose of data/parameter	Calculation of baseline and project emissions (Ny calculation)			
Additional comments	-			

Data/Parameter	fNRB,y			
Unit	Fraction			
Description	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass			
Measured/calculated/default	Default			
Source of data	UNFCCC Default Values of fNRB for LDCs and SIDs in 35th meeting Report Annex 20, page 1. Update from UNFCCC website: http://cdm.unfccc.int/DNA/fNRB/index.html			
Value(s) of monitored parameter	Mali: 0.73			
Monitoring equipment	N/A			
Measuring/reading/recording frequency	Annually			
Calculation method (if applicable)	N/A			
QA/QC procedures	As a default value is applied, monitoring consists on the desk review to check if changes had occurred.			
Purpose of data/parameter	Calculation of baseline and project emissions			
Additional comments	-			

Data/Parameter	$\eta_{new,y,i}$			
Unit	Fraction			
Description	Efficiency of the stove implemented at year y			
Measured/calculated/default	Measured			
Source of data	Water Boiling Test (WBT)			

Value(s) of monitored parameter	Stove size		%						
	Large	25.18							
	Super	25.72							
Monitoring equipment	Stove testing equipment from AER-Mali								
Measuring/reading/recording frequency	Biennially ⁴								
Calculation method (if applicable)	According to the methodology AMS-II.G v05.0, efficiency of the device being deployed as part of the project activity is determined biennially using the water boiling test (WBT) protocol carried out in accordance with national standards or international standards or guidelines.								
QA/QC procedures	<p>The WBT had been conducted in accordance with international protocol.</p> <p>According to paragraph 28 of the AMS-II.G v 05.0 methodology, when biennial inspection is chosen a 95% confidence interval and 10% margin of error shall be achieved for the sampling parameter.</p> <p>Standard error of mean is calculated using the formulae</p> $\sqrt{(1-n/N) \times (SD/\sqrt{n})}$ <p>Where: n = sample size N = population size SD = standard deviation</p> <p>The precision achieved is calculated to be as follows:</p> <table border="1"> <tr> <td></td> <td>Large</td> <td>Super</td> </tr> <tr> <td>Precision for 95% confidence interval</td> <td>0.33%</td> <td>0.88%</td> </tr> </table> <p>The calculated precision is below the required precision of 10% for all the model sizes and is hence deemed to be acceptable.</p>				Large	Super	Precision for 95% confidence interval	0.33%	0.88%
	Large	Super							
Precision for 95% confidence interval	0.33%	0.88%							
Purpose of data/parameter	Calculation of project emissions								
Additional comments	<p>The tests were conducted by AER-MALI (Agence des Energies Renouvelables), which is the national entity dedicated for stove testing.</p> <p>The tests and undertaken following the version 4.2.3 of WBT protocol.</p>								

⁴ Biennial monitoring of this parameter has been chosen, as results of WBT comparing performance of new ICS and 3-year-old ICS show that the PFA's ICS efficiency does not decrease over a period of 4 years, which makes the PFA's ICS population homogenous. This option is enabled thanks to the paragraph 23 of AMS-II. G version 05.0 methodology (footnote number 12).

Data/Parameter	U_i													
Unit	Fraction													
Description	Usage rate per vintage (% of stoves operating by age group)													
Measured/calculated/default	Calculated													
Source of data	Monitoring surveys, users feedback													
Value(s) of monitored parameter	<table border="1"> <thead> <tr> <th>Vintage</th> <th>Value %</th> </tr> </thead> <tbody> <tr> <td>2014</td> <td>93.14</td> </tr> <tr> <td>2015</td> <td>95.00</td> </tr> <tr> <td>2016</td> <td>97.16</td> </tr> <tr> <td>2017</td> <td>98.10</td> </tr> </tbody> </table>				Vintage	Value %	2014	93.14	2015	95.00	2016	97.16	2017	98.10
Vintage	Value %													
2014	93.14													
2015	95.00													
2016	97.16													
2017	98.10													
Monitoring equipment	N/A													
Measuring/reading/recording frequency	Biennially													
Calculation method (if applicable)	Surveys is conducted on a representative sample of end-users picked up from the monitoring sales database													
QA/QC procedures	<p>The survey is carried out with a statistically valid sample as per the relevant requirements for sampling in the “Standard for sampling and surveys for CDM project activities and programme of activities”</p> <p>For this monitoring period of the PoA, as the monitoring will be conducted on a biennial basis the confidence/precision applicable is 95/10.</p> <p>Standard error of mean is calculated using the formulae $\sqrt{(1-n/N) \times (SD/\sqrt{n})}$</p> <p>Where: n = sample size N = population size SD = standard deviation</p> <p>The precision achieved is calculated to be as follows:</p> <table border="1"> <thead> <tr> <th></th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> </tr> </thead> <tbody> <tr> <td>Precision for 95% confidence interval</td> <td>4.8 %</td> <td>3.1 %</td> <td>1.6 %</td> <td>0.9 %</td> </tr> </tbody> </table> <p>The calculated precision is below the required precision of 10% for all the model sizes and is hence deemed to be acceptable.</p>					2014	2015	2016	2017	Precision for 95% confidence interval	4.8 %	3.1 %	1.6 %	0.9 %
	2014	2015	2016	2017										
Precision for 95% confidence interval	4.8 %	3.1 %	1.6 %	0.9 %										
Purpose of data/parameter	Calculation of baseline and project emissions (N_y calculation)													
Additional comments	-													

E.3. Implementation of sampling plan

The following section details the implementation of the sampling plan in the specific case of the CPA “Project Activity for Local Improved Cookstoves in Bamako”, in accordance with the sampling plan described in the PoA-DD.

a) Description of the implemented sampling design

(i) Objective and Reliability Requirements

The objective of sampling is to obtain an unbiased and reliable estimate of the $\eta_{new,y,i}$ and U_i parameters over the course of the crediting period.

(ii) Target Populations

The primary target population of the sampling are the users of the improved cookstoves disseminated by the CPA under this PoA. The target population corresponds to ICS users identified in the monitoring database and located in the CPAs boundaries.

(iii) Sampling frame

The sampling frame will be the list of the households extracted from the monitoring database.

(iv) Sampling Method

A random sampling approach has been used to select the targeted households for each vintage in the monitoring database. A single random number has been generated for each household of the users database for the monitoring period, using a function RANDOM to generate the household sample that will be surveyed.

(v) Sample Size

The following monitoring parameters are required to be monitored under the sampling plan:

- a. The thermal efficiency of the ICS distributed (%) ($\eta_{new,y,i}$)
- b. Usage rate per vintage (% of stoves operating by age group) (U_i)

The sample size has been calculated for the following parameters according to the confidence/precision level to be achieved.

Parameter	Mean or proportion	Confidence/precision level required (frequency of sampling)
U_i	Proportion	95/10 (biennial monitoring)
$\eta_{new,y,i}$	Mean	95/10 (biennial monitoring)

$\eta_{new,y,i}$

As no significant decrease in energy efficiency was observed between new and 3 years old PFA's ICS, the sample size was calculated for each type of ICS using the following formula:

$$n \geq \frac{t^2 NV}{(N - 1) \times 0.1^2 + t^2 \times V}$$

The parameters used for the calculation and the results are presented in the following table:

Parameter	Value	Source
N (Total number of stoves)	Grand: 9,122__Super: 8,366	Sales database
V ((Expected Standard Deviation / Expected mean) ²)	Grand = $\left(\frac{0.21\%}{25.18\%}\right)^2 = 0.01\%$ Super = $\left(\frac{0.54\%}{25.72\%}\right)^2 = 0.04\%$	WBT, 2019 (WBT on a sample of PFA's ICS new and 3 years old)
t value for a 95% precision level	Grand = 2.09 Super = 2.09	Student table
n_{min} (Minimum sample size)	Grand: 1 Super: 1	Sample size

Considering the low amount of PFA's ICS to be tested according to the sample size formula, a sample size of 20 PFA's ICS to be tested for "Grand" and "Super" size have been selected.

U_i

The sample size for the *U_i* parameter has been defined using the following formula:

$$n \geq \frac{1.96^2 N \times p(1 - p)}{(N - 1) \times 0.1^2 \times p^2 + 1.96^2 p(1 - p)}$$

The parameters used for the calculation and the results are presented in the following table:

Parameter	Value	Source
N (Total number of stoves)	2014: 2,160 2015: 4,022 2016: 5,303 2017: 6,003	User database
P (Expected proportion)	2014: 90% 2015: 70% 2016: 50% 2017: 30%	CPA-DD
n_{min} (Minimum sample size)	2014: 42 2015: 159 2016: 359 2017: 781	Sample size (Survey 2019)

The usage rate chosen for ex-ante calculations is based on the values used in a carbon project supporting a similar technology in the same area. The data have been used as the project is located in the district of Bamako and aims at diffusing "Wassa"® type ICS, a portable charcoal stove composed of a metal cladding surrounding a ceramic liner. As the project has a similar target population (households of the district of Bamako) and disseminate a similar technology within the same boundaries, the usage rates of this project have been judged applicable to the PFA's ICS.

The number of samples for each of the parameters covered during the monitoring activity is as given below:

Parameter	Sample Size (n) required	Samples covered during monitoring
η _{new,y} for 'large' sized stoves	1	20
η _{new,y} for 'super' sized stoves	1	20
U _i for 2014	42	102
U _i for 2015	159	180
U _i for 2016	359	387
U _i for 2017	781	789

b) Collected data

The data for the parameters monitored through sampling is collected either through the User survey either through WBT.

User survey

The household survey was led in successive steps :

- A survey questionnaire was elaborated to provide guidance for the surveyors who led the next steps.
- Phone calls were given to the households, in ascending order of the random numbers generated for each household in the sample list.
- Site-visit surveys were then implemented for the households still using their stoves to confirm and complete the information given during the precedent phone calls step. A team of 6 surveyors were recruited and trained to lead properly the survey.

Data collected during phone calls and site-visit survey was entered by trained staff in an Excel file to extract the main results of the household survey.

The mean value and confidence/precision for the data of the usage rate per vintage and equipment ratio per household parameters were calculated from this household survey.

WBT

During the precedent site-visit survey, 40 stoves (5 stoves of each size / year) were randomly selected among the surveyed household.

These 40 stoves have been replaced and given for testing to AER – the Malian Agency of Renewable Energy, which run the national laboratory in charge of stove testing.

AER led the tests accordingly to the international protocol WBT 4.2.3, which results are presented in a report.

c) Analysis of the collected dataUsage rate

Based on the data collected during the user survey the usage rate per vintage of the PFA's ICS has been calculated. The results are presented in the following table.

	2014	2015	2016	2017
N (<i>Total number of stoves</i>)	2,160	4,022	5,303	6,003
n	102	180	387	789
Mean usage rate	93.14 %	95.00 %	97.16 %	98.10 %
Precision for 95% confidence interval	4.8 %	3.1 %	1.6 %	0.9 %

With a precision strictly lower than 10%, the usage rate meets the confidence/precision requirements for a biennial monitoring.

Equipment ratio

In accordance with the CPA-DD and to meet the paragraph 26) b) of the AMS.II-G methodology, continued baseline usage was checked as part of usage rate survey and no households were found to use the baseline stoves.

WBT

The results of the WBT undertaken by the AER – the Malian Agency of Renewable Energy - are presented in the following table.

Parameter	Grand	Super
N (Total number of ICS)	9,122	8,366
n	20	20
Efficiency	25.18%	25.72%
Standard deviation	0.21%	0.54%
Standard error	0.01%	0.04%
Precision for 95% confidence interval	0.33%	0.88%

Super and Grand ICS tested meet the confidence/precision requirements for a biennial monitoring (95/10).

d) Demonstration that the required confidence/precision level has been met

As demonstrated in the section c) the required confidence/precision level of 95/10 for biennial has been met for the parameter U_i

The parameter $\eta_{new,y,i}$ - which is monitored every 2 year - meet the required confidence/precision level of 95/10.

e) Demonstration that the samples were randomly selected and are representative of the population

As demonstrated in the section a), the samples are randomly selected for each vintage, they are therefore representative of the population.

SECTION F. Calculation of emission reductions or net anthropogenic removals

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

This SSC-PoA calculated emission reductions through application of the following equations:

$$ER_y = B_{y,savings} * f_{NRB,y} * NCV_{biomass} * EF_{projected_fossilfuel} * N_y * CF_{ch-fw}$$

Where:

- **ER_y** = Emissions reductions during the year y in tCO₂e per year
- **B_{y,savings}** = Quantity of woody biomass that is saved in tonnes per year.
- **f_{NRB,y}** = Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass. UNFCCC default value of 0.73 is used.
- **NCV_{biomass}** = Net Calorific Value of the non-renewable woody biomass that is substituted. IPCC default value for wood fuel of 0.015TJ/t is used.
- **EF_{projected_fossilfuel}** = Emission factor for the substitution of non-renewable woody biomass by similar consumers. Default value suggested by the methodology of 81.6 tCO₂e/TJ is used.

- **CF_{ch-fw}** = Conversion factor from charcoal to wood according to the charcoal production techniques in Mali. National value proposed is 7.
- **N_y**, = Number of project devices operating in year y

Where :

$$N_y = \sum N_{y,i} * U_i$$

- **N_{y,i}** = Total number of stoves deployed in year y.

The number of stove deployed is calculated on a monthly basis using correction factors for the PFA's ICS being disseminated after the first of each month. In order to keep conservative the PFA's ICS are not considered operational on the day of their purchase by the end-user.

- **U_i** = Usage rate, measured ex post using surveys and users feedback (% of stoves operating by age group)

Calculating B_{y,savings}

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

$$B_{old-adj} = B_{old} * L$$

Where:

- **B_{old}** = Quantity of woody biomass used in the absence of the project activity in tonnes per device. The value has been assessed through KPT carried out by GERES according to PCIA guidelines in 2012-2013 and baseline user survey. This value has been updated to account for the difference in equipment ratio during the project monitoring period. The value used during this monitoring period is 0.37 t/year per device equivalent to 0.031 t/month per device.
- **η_{old}** = Efficiency of the device being replaced using weighted UNFCCC default value according to the baseline survey undertaken by GERES in 2012. The value is 19.21%.
- **η_{new,y}** = Efficiency of the device being deployed as part of the project activity (fraction), as determined annually using the water boiling test (WBT) protocol carried out in accordance with international standards or guidelines. The value **η_{new,y}** Wassa "G" is 25.18%, and **η_{new,y}** Wassa "S" is 25.72%.
- **L** = Leakages related to the use/diversion of non-renewable biomass saved under the project activity. The value used is 0.95 as proposed in the AMS-II.G v05.0 methodology.
- **B_{old-adj}** = Quantity of woody biomass used in the absence of the project activity in tonnes per device adjusted by the leakage factor. The value **B_{old-adj}** obtained is 0.36 t/year per device equivalent to 0.030 t/month per device.

The full calculation of each ICS is available in an Excel spreadsheet shared with the DOE

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

The AMS-II.G v05.0 doesn't account for project emissions.

F.3. Calculation of leakage emissions

As per the AMS-II.G v05.0, a leakage factor of 0.95 has been applied in the calculation of to the B_{old} parameter in section F.1

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

CPA UNFCCC reference number	Baseline GHG emissions or baseline net GHG removals (t CO ₂ e)	Project GHG emissions or actual net GHG removals (t CO ₂ e)	Leakage GHG emissions (t CO ₂ e)	GHG emission reductions or net anthropogenic GHG removals (t CO ₂ e)		
				Before 01/01/2013	From 01/01/2013	Total amount
9941-P1-0001-CP1	14,337	0	0	0	14,337	14,337
Total	14,337	0	0	0	14,337	14,337

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 ₂ e)	Amount estimated ex ante for this monitoring period in the CPA-DD (t CO ₂ e)
9941-P1-0001-CP1	14,337	87,382
Total	14,337	87,382

F.5.1. Explanation of calculation of “amount estimated ex ante for this monitoring period in the CPA-DD”

Comparison of the actual GHG emission reductions with the estimates in the included specific CPAs is given in the below table. Actual emission reduction is lower than the estimate of the registered (included)/ approved CPA-DD for the current monitoring period.

F.6. Remarks on increase in achieved emission reductions

The increase is not applicable in this case as ERs have decreased from ex ante estimates.

F.7. Remarks on scale of small-scale CPAs

The PFA ICS also respect the eligibility criteria of the AMS-II. G v05.0 because the annual energy savings are lower than 180 GWh with 0.00276 GWh per PFA ICS.

The thermal energy savings achieved by the CPA during this monitoring period are estimated to be 48.81 GWhth which is under the limit (180 GWhth) of small-scale project.

Total energy savings (in GWh) for entire Monitoring Period = $[(ER_y / EF_{\text{projected fossil fuel}}) \times 277.778] = (14,337 / 81.6) \times 277.778 / 1000000 = 48.81$

Total energy savings per year = 24.40 GWh.

Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
03.0	31 May 2019	Revision to: <ul style="list-style-type: none"> • Ensure consistency with version 02.0 of the “CDM project standard for programmes of activities” (CDM-EB93-A07-STAN); • Add a section on remarks on the observance of the scale limit of small-scale CPAs during the crediting periods; • Add "changes specific to afforestation or reforestation activities/CPA" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R PoAs between two commitment periods; • Make structural and editorial improvements.
02.0	7 June 2017	Revision to: <ul style="list-style-type: none"> • Ensure consistency with version 01.0 of the “CDM project standard for programmes of activities (CDM-EB93-A07-STAN); • Make editorial improvements.
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