



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

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

MONITORING REPORT

Title of the programme of activities (PoA)	Programme of Activities for Local Improved Cookstoves in West Africa	
Reference number of the PoA	9941	
Version number(s) of the PoA-DD(s) applicable to this monitoring report	07	
Coordinating/managing entity (CME)	GERES	
Version number of this monitoring report	4	
Completion date of this monitoring report	29/09/2016	
Monitoring period number and dates covered by this monitoring report	First monitoring period 01/06/2014 to 31/12/2015 (inclusive of both dates)	
Monitoring report number for this monitoring period	01	
Host Party(ies)	Host Party(ies) of the PoA	Is this a host Party to a specific-case CPA covered in this monitoring report?(Yes/No)
	Mali	Yes
	Benin	No
Sectoral scope(s)	Sectoral scope 3: Energy demand	
Selected methodology(ies)	AMS-II.G: "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass" (Version 05.0)	
Selected standardized baseline(s)	N/A	
Total amount of GHG emission reductions or net GHG removals by sinks for all specific-case CPAs in the PoA covered in this monitoring report	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	0 tCO ₂ e	2,747 tCO ₂ e

PART I - Programme of activities

SECTION A. Description of PoA

A.1. Brief description of the 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. Generic CPA(s)

Title, identification/reference number and/or version number of the generic CPA(s) of the PoA	Sectoral scope(s)	Applied methodology(ies) or combination of methodologies and/or standardized baseline(s)
Project Activity for Local Improved Cookstoves in Bamako - Generic CPA-DD (there is only one generic CPA under the PoA) ¹	Sectoral scope 3: Energy demand	AMS-II.G: "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass" (Version 05.0) ²

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

Reference number of the specific-case CPA included in the PoA as of the end of this monitoring period	Title, identification/ reference number and version number of the generic CPA to which the specific-case CPA applies	Crediting period dates of the specific-case CPA	Is this specific-case CPA covered in this monitoring report? (yes/no)
9941-0001	Project Activity for Local Improved Cookstoves in Bamako	01/06/2014 to 31/05/2021	Yes

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

Fulgence AKAFFOU
 GERES Association
 2 cours Foch, 13400 Aubagne – France
www.geres.eu

¹ http://cdm.unfccc.int/ProgrammeOfActivities/cpa_db/K2R165F9Q04EGMJDPW3C7BNY0ALVUX/view

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

SECTION B. Implementation of PoA

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

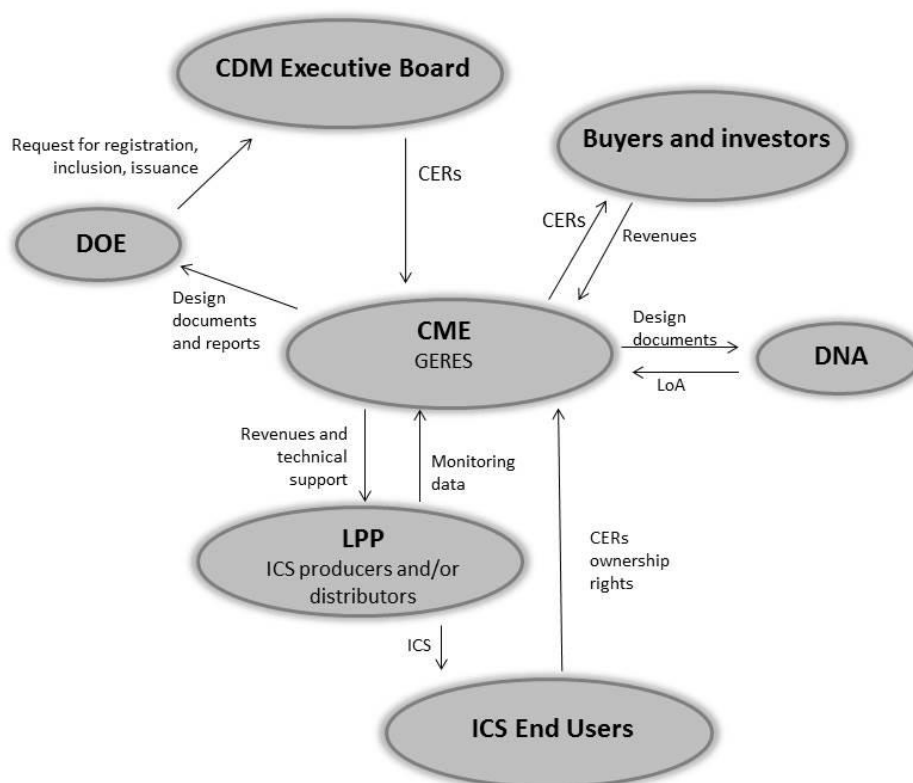
a) Definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies;

This PoA is a joint initiative of international and local organizations. GERES 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.

GERES Association 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 CEnAO 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 groupement 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. Implementation of single sampling plan(s)

Only one CPA is covered in this monitoring report. The sampling plan was implemented for this CPA only and is detailed in the section G.3.

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

C.1. Corrections

N/A

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

N/A

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

N/A

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

N/A

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

N/A

PART II - Specific-case component project activity(ies)**SECTION D. Description of specific-case CPA(s)****D.1. Brief description of implemented specific-case CPA(s)**

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

The CPA (9941-0001) 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;

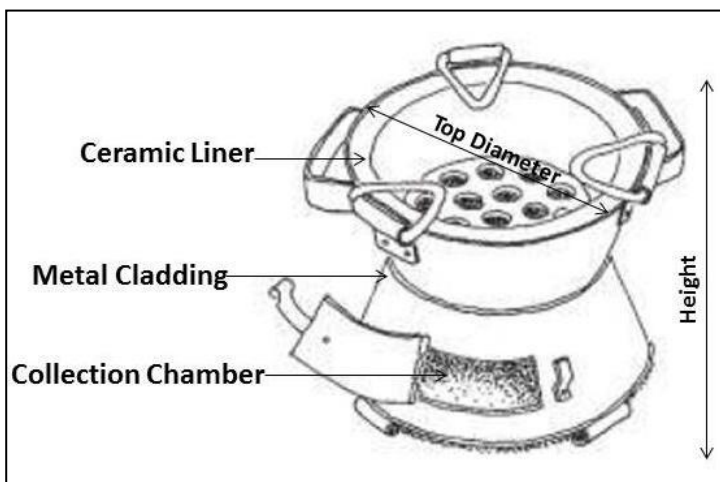
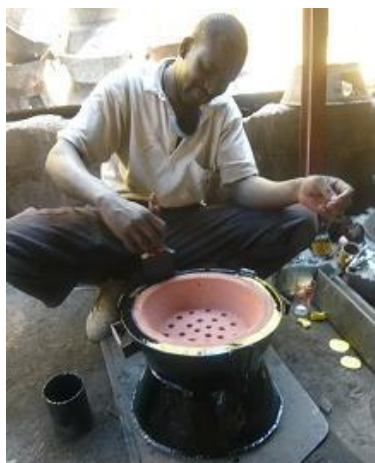
The PFA's ICS is a biomass charcoal stove locally manufactured and was introduced in Mali in 1996 by "Entreprise Works".

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 : A 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 « Centre National de l’Energie Solaire et des Energies Renouvelables » (CNESOLER, now named 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.

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

Sales and Registration of ICS

CPA	9941-0001
Date of first ICS sold and registered	01/06/2014
Date of last ICS sold and registered in the database	31/12/2015
Total ICS sold and registered (till 31/12/2015)	6521

Monitoring Survey

CPA	9941-0001
Survey date for parameter Ny	Montly

Survey date for parameter $\eta_{new,y,i}$	15/03/2016 to 11/04/2016
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(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.

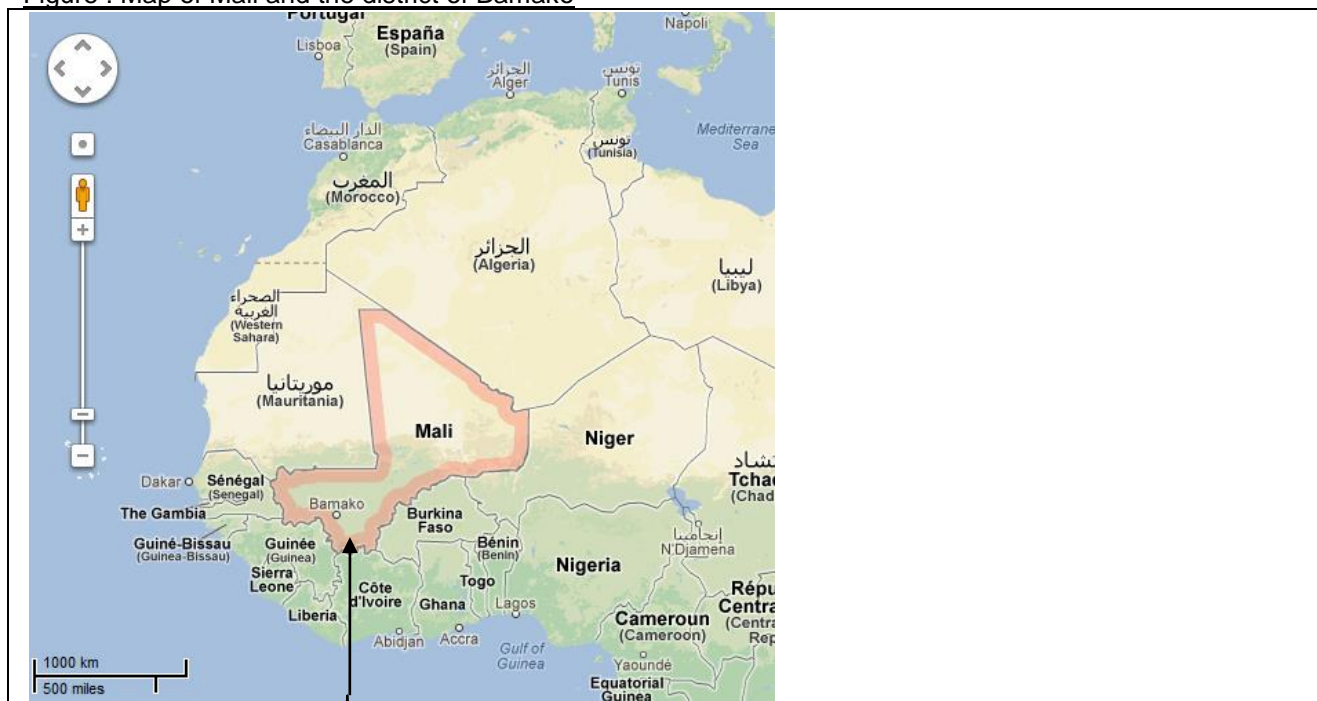
CPA	Emission reductions (t CO2e)
9941-0001	2,747
Total	2,747

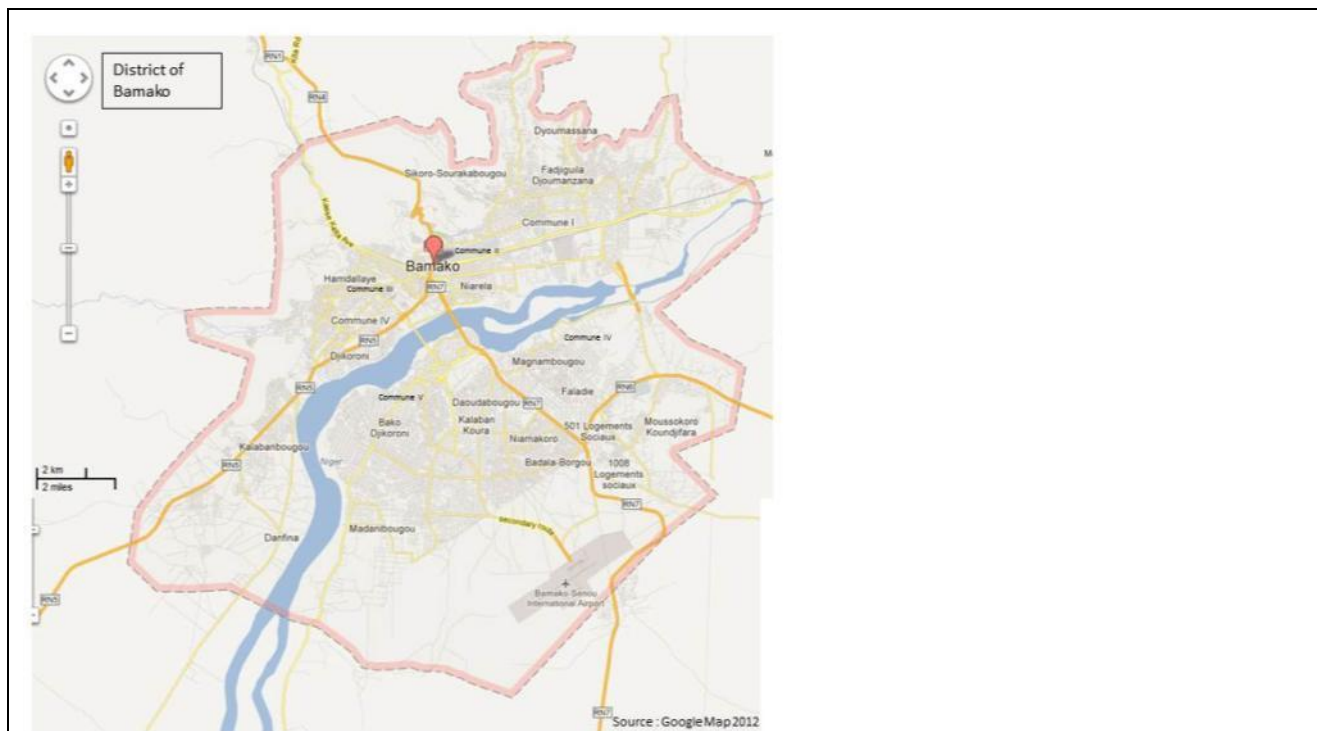
The system of unique identification of the ICS, with serial numbering and labelling, and controls among the data collection process avoid the double counting of any ICS.

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

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).

Figure : Map of Mali and the district of Bamako





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

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

N/A

E.2. Corrections

N/A

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

N/A

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

N/A

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

N/A

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

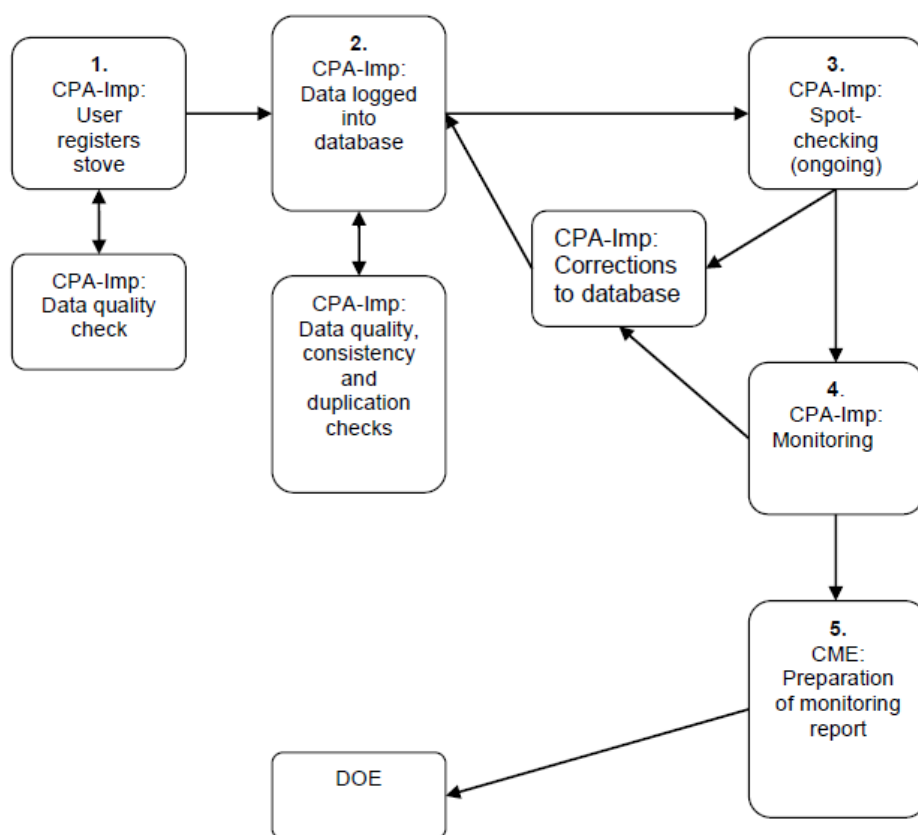
N/A

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

N/A

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

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 G. Data and parameters

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

Data/parameter	<i>B_{old}</i>
Unit	Tonnes per year per device
Description	Average annual consumption of woody biomass per appliance in absence of the project activity
Source of data	Kitchen Performance Tests performed by GERES in 2012-2013; Baseline user survey conducted by GERES in 2012.
Value(s) applied	0.37
Choice of data or measurement methods and procedures	Baseline consumption per household is estimated using KPT performed following PCIA published guidelines and then divided by the cooking stoves equipment ratio obtained by the baseline user survey to get the baseline woody biomass consumption per device.
Purpose of data	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	Households survey has been undertaken to estimate the distribution of the traditional stoves in the baseline (GERES, 2012). This value has been calculated considering a default factor of 10% for the 3 stones stoves and 20% for the others in accordance with the AMS.II-G version 5.0 methodology. Therefore, the result is a weighted value of 19.21%.
Purpose of data	Calculation of baseline emissions
Additional comments	-

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Data/parameter	<i>EF_{projected_fossilfuel}</i>
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). 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)).
Purpose of data	Calculation of baseline and project emissions
Additional comments	As a default value is applied, monitoring is not required

Data/parameter	<i>NCV_{biomass}</i>
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	Calculation of baseline and project emissions
Additional comments	As a default value is applied, monitoring is not required.

Data/parameter	<i>CF_{ch-fw}</i>
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	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 B_{old} to account for leakages as per paragraph 20 of the AMS II.G, version 5 methodology.
Purpose of data	Calculation of leakage
Additional comments	As a default value is applied, no monitoring is required

G.2. Data and parameters monitored

Data/parameter	$N_{y,j}$								
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	<table border="1"> <tr> <td>CPA</td> <td>large</td> <td>Super</td> <td>Total</td> </tr> <tr> <td>9941-0001</td> <td>3476</td> <td>3045</td> <td>6521</td> </tr> </table>	CPA	large	Super	Total	9941-0001	3476	3045	6521
CPA	large	Super	Total						
9941-0001	3476	3045	6521						
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	Calculation of baseline and project emissions (N_y calculation)								
Additional comments	-								

Data/parameter	$f_{NRB,y}$
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 f_{NRB} 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	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	Large : 27.16% Super: 25.60%
Monitoring equipment	Stove testing equipment from AER-Mali
Measuring/reading/recording frequency	Biennially ³
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. Weighted average values are used to consider the share of Large and Super PFA's ICS disseminated in use.
QA/QC procedures	The WBT had been conducted in accordance with international or national adapted protocols.
Purpose of data	Calculation of project emissions
Additional comments	The tests were conducted by AER-MALI (Agence des Energies Renouvelables), which is the national entity dedicated for stove testing. The tests and undertaken following the version 4.2.3 of WBT protocol.

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

³ Biennial monitoring of this parameter has been chosen, as results of WBT comparing performance of new ICS and 2 year-old ICS show that the PFA's ICS efficiency does not decrease over a period of 2 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).

Value(s) of monitored parameter	Vintage	Value	
	2014	88.48%	
	2015	94.56%	
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	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”		
Purpose of data	Calculation of baseline and project emissions (N_y calculation)		
Additional comments			

G.3. Implementation of specific-case CPA level 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.

In addition, the equipment ratio have to be assessed, to determine the evolution of the baseline cookstoves use after the introduction of the PFA’ ICS.

(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 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)

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 households)	2014: 924 2015: 2708	User database
P (Expected proportion)	2014: 70% 2015: 90%	CPA-DD
n_{min} (Minimum sample size)	2014: 140 2015: 43	

$\eta_{new,y,i}$

As no significant decrease in energy efficiency was observed between new and 2 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 households)	Grand: 1936 Super: 1696	Sales database
V ((Expected Standard Deviation / Expected mean) ²)	Grand = $\left(\frac{1.36\%}{27.15\%}\right)^2 =$ 0.25% Super = $\left(\frac{1.02\%}{26.38\%}\right)^2 =$ 0.15%	WBT, 2015 (WBT on a sample of PFA's ICS new and 2 years old)
t value for a 95% precision level	Grand = 2.31 Super = 2.26	Student table
n_{min} (Minimum sample size)	Grand: 2 Super: 1	

Considering the low amount of PFA’s ICS to be tested according to the sample size formula, a sample size of 5 PFA’s ICS to be tested for “Grand” and “Super” size have been selected.

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, 10 stoves (5 stoves of each size) were randomly selected among the surveyed household.

These 10 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 data

User survey

Usage 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
N (<i>Total number of households</i>)	924	2708
n	165	349
Mean usage rate	88.48%	94.56%
Precision for 95% confidence interval	4.4%	2.2 %

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

Equipment ratio

Based on the data collected the average equipment ratio has been calculated for each household. The survey results give a mean of 2.53 ICS per household, this figure is then compared to the average equipment ratio prior to the PFA’s ICS dissemination. A two-tailed student’s t-test has been done to assess if the equipment ratio was different than the baseline equipment ratio of 2.4.

These results are presented in the following table:

Two-tailed student’s t-test	
Null hypothesis: the mean is equal to 2.4	
Mean	2.53
95% confidence interval	2.36 – 2.68
t-value observed	1.498
p-value (α= 0.05)	0.135

According to the results of the two-tailed student’s t-test, the mean equipment ratio of the household using PFA’s ICS is not statistically different than the 2.4 equipment ratio previous to the PFA’s ICS dissemination assessed during the baseline survey. It can be concluded that the baseline stoves were fully replaced by PFA’s ICS.

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)	1936	1696
n	5	5
Efficiency	27.16%	25.60%
Standard deviation	2.55%	1.49%
Standard error	1.14%	0.67%
Precision for 95% confidence interval	11.65%	7.22%

While the Super ICS tested meet the confidence/precision requirements for a biennial monitoring (95/10), WBT for Grand ICS does not reach the precision required (uncertainty of 11.65%). Therefore, the emission reductions estimated for this stove size have been corrected⁴. So, emission reductions for Grand ICS have been multiplied by a correction factor of 95.05% (three times the percentage precision points missed).

⁴ As allowed by the Standard “Sampling and surveys for CDM project activities and programmes of activities - Version 05.0” (paragraph 17.(b)(i)b.)

d) Demonstration of whether 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 years - meet the required confidence/precision level of 95/10.

e) Demonstration of whether the required 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 H. Calculation of GHG emission reductions or net GHG removals by sinks**H.1. Calculation of baseline emissions or baseline net GHG removals by sinks**

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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 tCO₂ 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_fossil fuel} = 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. 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%.

$\eta_{new,y}$ = Efficiency of the device being deployed as part of the project activity (fraction), as determined biennially using the water boiling test (WBT) protocol carried out in accordance with national standards (if available) or international standards or guidelines.

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.

Bold-adj= Quantity of woody biomass used in the absence of the project activity in tonnes per device adjusted by the leakage factor. The value 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

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

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

H.3. Calculation of leakage

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 H.1.

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

Specific-case CPA reference number	Baseline emissions or baseline net GHG removals by sinks (tCO ₂ e)	Project emissions or actual net GHG removals by sinks (tCO ₂ e)	Leakage (tCO ₂ e)	GHG emission reductions or net GHG removals by sinks (tCO ₂ e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
9941-0001	2,747	0	0	0	2,747	2,747

Total	2,747	0	0	0	2,747	2,747
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H.5. Comparison of GHG emission reductions or net GHG removals by sinks with estimates in the included CPA-DD(s)

Specific-case CPA reference number	Value estimated in ex ante calculation in the included CPA-DD(s)	Actual values achieved by the specific-case CPA(s) during this monitoring period
9941-0001	46,821	2,747
Total	46,821	2,747

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

There is a high difference between the estimated value in the included CPA-DD and the actual values achieved by the specific-case CPA during this monitoring period. This could be explained with the following information :

- The monitoring period only includes half of the year 2014, as the project was registered in June 2014.
- The contractualisation between all the partners of the PoA takes more time than expected. As the contract was finally signed in December 2014, the monitoring activity has only be fully operating since beginning of 2015, even ICS were still being sold.
- Even with the operationalisation of the monitoring activities, the CPA partners encountered big challenges to monitor every selling information among the value chain. Especially, some resellers are illiterate and cannot write the information corresponding to the final users, even ICS were being bought and used by households.
- Moreover, the ICS production was rather less than expected during this monitoring period.

These information raised the fact that the actual GHG emission reductions calculated are very under-estimated, as there were more ICS sold during the corresponding period than ICS monitored. Estimated ER are therefore highly conservative.

In order to solve some monitoring issues, project participants have initiated a trial to facilitate the monitoring process for illiterate resellers, enabling them to monitor the ICS with the only barcode.

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

Coordinating/managing entity and/or responsible person/entity	<input checked="" type="checkbox"/> Coordinating/managing entity <input type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
Organization name	GERES
Street/P.O. Box	2 cours Foch
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