



**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)	Côte d'Ivoire and Cameroon Efficient Cookstoves Program	
UNFCCC reference number of the PoA	PoA reference number: 8696	
Version number(s) of the PoA-DD(s) applicable to this monitoring report	1.10	
Coordinating/managing entity (CME)	Envirofit International Ltd.	
Version number of this monitoring report	07	
Completion date of this monitoring report	12/11/2016	
Monitoring period number and dates covered by this monitoring report	Monitoring period 1 Dates covered: 1/07/2013 – 2/03/2016 (both days inclusive)	
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)
	Cameroon	Yes
	Côte d'Ivoire	No
Sectoral scope(s)	Sectoral Scope 3: Energy Demand	
Selected methodology(ies)	AMS-II.G Version 4.0: Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass	
Selected standardized baseline(s)	No standardized baseline was used for this CPA	
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	5,420 tCO ₂

PART I - Programme of activities

SECTION A. Description of PoA

A.1. Brief description of the PoA

Policy/measure or stated goal of the PoA

The PoA aims at significantly reducing wood fuel¹ consumption of Ivorian and Cameroonian users (households, communities, small and medium enterprises) by providing them with affordable improved cook stoves (ICS) in replacement of their low-efficiency three-stone fires and traditional cook stoves.

Throughout Côte d'Ivoire and Cameroon wood fuel represents an overwhelming majority of the cooking energy requirements. For instance in Côte d'Ivoire it is estimated that around 90% of the households use wood fuel for their cooking energy requirements (Djezou, 2009), and that biomass (mainly wood fuel) represents 74% of the total primary energy consumed in the country (IEA, 2008). In Cameroon biomass is also the most utilized form of primary energy (70%) (IEA, 2008) with 73.6% of Cameroonian households using wood fuel as their primary cooking energy. (Njong, 2011)

Under the PoA, improved cook stoves are marketed to Ivorian and Cameroonian users in replacement of their low efficiency three stone fires and traditional cook stoves. The offsets are realized by the reduction of non-renewable wood fuel consumption at users (households/communities/small and medium enterprises) level.

In accordance with version 4.0 of the small-scale CDM methodology AMS-II.G., in the absence of the project activity, the baseline scenario would be the use of fossil fuels for meeting similar thermal energy needs. Therefore, by reducing the amount of fuel required for cooking and thus the use of non-renewable woody biomass, the replacement of less efficient stoves with more efficient ICS reduces the amount of greenhouse gases (GHG) emitted into the atmosphere.

Envirofit International, Ltd. is the coordinating/managing entity (CME) of the PoA. Envirofit International, Ltd. is also the CPA implementer and the technology supplier for the CPAs included under this PoA, so far.

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

The proposed PoA undertaken by Envirofit International, Ltd. is a voluntary action since no laws or regulations in Côte d'Ivoire or Cameroon obligate the distribution and use of improved cook stoves whatsoever.

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)
Côte d'Ivoire and Cameroon Efficient Cookstoves Program CPA [CPA identification number] Version: 1.10 Date: 05/12/2012	Sectoral Scope 3: Energy Demand	AMS-II.G Version 4.0: Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass

¹ Wood fuel encompasses charcoal and/or firewood, depending on neighborhoods

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)
8696-0003 Côte d'Ivoire and Cameroon Efficient Cook stoves Program CPA003 – Cameroon 001 ²	Côte d'Ivoire and Cameroon Efficient Cookstoves Program CPA [<i>CPA identification number</i>] Version: 1.10 Date of the CPA-DD: 05/12/2012	03/03/2014 – 02/03/2021 (start and end date included)	Yes
8696-0002 Côte d'Ivoire and Cameroon Efficient Cookstoves Program CPA002 –Abidjan ³	Côte d'Ivoire and Cameroon Efficient Cookstoves Program CPA [<i>CPA identification number</i>] Version: 1.10 Date of the CPA-DD: 05/12/2012	01/02/2014 – 31/01/2021 (start and end date included)	No
8696-0001 Côte d'Ivoire and Cameroon Efficient Cookstoves Program CPA001 – Abobo 1 ⁴	Côte d'Ivoire and Cameroon Efficient Cookstoves Program CPA [<i>CPA identification number</i>] Version: 1.10 Date of the CPA-DD: 05/12/2012	01/07/2013 – 30/06/2020 (start and end date included)	No

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

Envirofit International Ltd is the PoA Coordinating/Managing Entity (CME)

Envirofit International Ltd.
109 North College Avenue, Suite 200 Fort Collins, Colorado 80524 USA
Telephone: +1-970-372-2874 Fax: +1-970-221-155
Email: info@envirofit.org

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

1. Envirofit International, Ltd. is the program manager, the Coordinating and managing entity, the CPA implementer and the main technology supplier for all CPAs in the PoA, as at date.
2. The operational and management framework is shown below:

² https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/QJMD342IU90AW65LNY78XVBESHGOT1E/viewCPAs

³ https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/QJMD342IU90AW65LNY78XVBESHGOT1E/viewCPAs

⁴ https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/QJMD342IU90AW65LNY78XVBESHGOT1E/viewCPAs

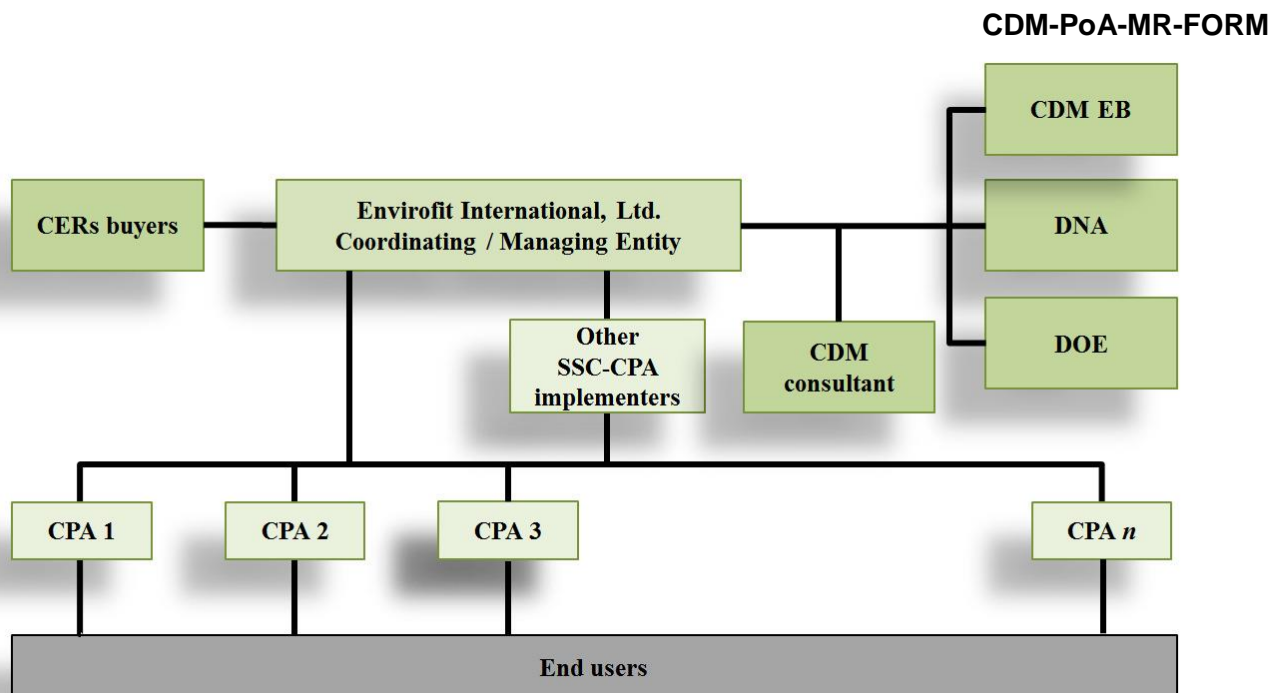


Figure 1: Operational and management diagram.

3. As a CME and CPA Implementer, Envirofit International Ltd is responsible for distributing the ICS to potential users. Envirofit has subcontracted local retailers/distributors (referred as dealers eg CEFEMAC) for dissemination of project stoves.
4. Envirofit maintains a PoA Distribution and Monitoring database. This database is a compilation of CPA distribution records. The database includes CPA wise list of stoves sales, based on following information, received from dealers. For every cook stove sold, records are kept on end user information comprising the following
 - Name of customer and contact details (address & phone number if applicable);
 - Date & location of purchase;
 - Stove model;
 - Serial number of the stove (or GPS coordinates of implantation for built-in stoves); and
 - Name of seller, etc.
 The data collected by dealers is regularly transmitted to the CME.
5. A unique stove id is punched on each stove and the same serial ID is mentioned on the CPA distribution record/carbon form. Therefore, it is possible to identify each stove in the PoA with its unique serial ID number. The unique serial number linked to each stove and its association with a unique CPA bearing a CPA ID number eliminates any risk of double-counting of ICSs between CPAs.
6. Besides it is stated in the CPA distribution records / carbon forms, that the customers agree to voluntarily relinquish the ownership of the CERs generated by their cook stoves to the CME/CPA Implementer.
7. Envirofit coordinated all ex-post monitoring activities in the PoA. In addition, Envirofit;
 - a. Implemented the monitoring plan,
 - b. Determined the sample size as per sampling plan and identified the samples to be monitored
 - c. Ensured the quality of monitoring data (QA/QC) obtained from CEESD
 - d. Used this data for emissions reduction calculations.
8. Envirofit checked and recorded the following key parameters in a CPA Monitoring Record. Key monitored parameters were:
 - a. Efficiency of project stoves

- b. Check if project stoves are operational and in use
- c. End users continuing to use replaced stoves and the consumption accounted for by the old stoves

9. Envirofit calculated emission reductions based on monitoring data collected by CEESD and prepared monitoring report

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

Sampling plan has been carried out per CPA and has been described in section (G.3 of part II) below

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

C.1. Corrections

No corrections

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

Not applicable

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

No permanent changes

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

Not applicable

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

Not applicable

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 purpose of this Component Project Activity (CPA) is the dissemination of improved cooking stoves (ICS) in Cameroon. The CPA will replace cooking stoves using three stone fire using wood as fuel with more efficient stoves using wood fuel.

The physical implementation of the CPA started on 27 September 2012 with the order of first batch of stoves by CEFEMAC who is Retailer 1 under the CPA and who is selling stoves in Cameroon on behalf of Envirofit International Ltd in which both parties have a working agreement.

The CPA is only partly implemented to date with only one stove model namely M5000 having been sold in Cameroon. At the time of writing this monitoring report 3711 stoves were sold with reference to the CPA Distribution Records.

Compared to the previously used three-stone fires or traditional stoves, the efficient stoves that are marketed under this SSC-CPA allow quicker heating-up, shorter cooking time and more heat retention with less wood fuel as well as lower combustion fumes. This results in significant savings of non-renewable biomass and associated expenses, thanks to, inter alia, advanced-material combustion chamber, overconsumption-restricting design, etc.

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

The technology and know-how being applied by the project activity is environmentally safe and sound. The CPA facilitates the replacement of existing inefficient traditional stoves using wood fuel with Improved Cooking Stoves (ICS) using wood fuel within the national territory of the Republic of Cameroon. Currently, the only stove model distributed under the CPA is M5000 as shown below



Figure 2:M5000

Technical specifications for M5000

Weight	4.2kg
Dimension	28*32 cm
Cooking power output	2.9kW
Efficiency	29.7%
Type of fuel	Wood
Biomass fuel savings	45.2%
Smoke and harmful gases reduction	70.9%
Adoption	Traditional cooking style and posture
Durability	5 years

Information required by Eligibility criteria

Eligibility criteria # 2, 4 and 6 that require information related to project technology / infrastructure are discussed below:

No.	Eligibility criteria		Assessment for CPAs	
	Description	Conditions to be met	Means of proof	Confirmation
#2, #4	The SSC-CPA specifies the level and type of service provided by the	The ICS models marketed in SSC-CPAs shall have certified test results that	Technical specification of ICS provided (either from manufacturer's	Refer D.1 (b) above for the type and specifications of the stove distributed in the CPA. As certified by the manufacturer, the efficiency of M5000 is 29.7%

	technology/measure as well as its performance which are in line with the technology outlined in SSC-PoA-DD A.4.2.1 and in compliance with national and/or international testing/certification requirements	confirm that their efficiency is at least of 20%, by an international testing protocol.	specifications or test results using the Emissions & Performance Test Protocol (EPTP)	
#6	The CPA's annual energy savings do not exceed 180 GWh _{th} ;	In each SSC-CPA-DD, it shall be demonstrated that the number of ICS to be distributed multiplied by the nominal energy savings of each ICS is lower than the applicable limit for Type II small scale CDM project activities i.e. of 180 GWh _{th}	The number of ICS distributed under the CPA and the annual energy savings based on monitoring parameters has been calculated in worksheet, "CPA ER calculations"	The number of stoves included in the CPA is less than the N _{all} limit specified in the CPA-DD. Also, the small scale capacity (= 180GWh _{th}) utilization of CPA is less than 10% during the monitoring period.

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

At the time of writing this monitoring report only two sales orders had been distributed i.e. SO-1472 and SO-1516 with only one stove model - M5000 being distributed as depicted in Table 1 below

Table 1: Implementation status

Stove Batch	Date of first distribution	Total number of eligible stove distributed	CPA in which the Stoves belong	Stove model
SO-1472	22 Dec 2012	2,564	CPA0003	M5000
SO-1516	05 Dec 2013	1,147	CPA0003	M5000
Total		3711		

- 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 avoidance*

The monitoring period covered the period between and including 3rd Mar 2014 to 2nd Mar 2016. During this period two monitoring activities were carried out covering 3 Mar 2014 – 2 Mar 2015 and 3 Mar 2015 – 2 Mar 2016. The emission reductions have been calculated and summed up to achieve the total emission reductions for the CPA under this monitoring period as follows

Table 2: Total Emission Reductions

Monitoring session (MS)	Number of stoves	Net GHG removal achieved under this monitoring period (tCO ₂ /yr)
MS#1: 3 Mar 2014 – 2 Mar 2015	3,711	2727
MS#2: 3 Mar 2015 – 2 Mar 2016	3,658	2,693
Total emission reductions		5,420

Avoidance of double counting

In order to avoid the possibility of double counting the provision of a unique serial number for each stove and the identification in the sales database ensured unique identification of each stove to its batch of origin and the CPA it belonged to and this in turn ensured no double-counting of emission reductions took place.

The project participant confirms that the aforesaid stoves have not claimed any emission reductions under any other carbon standards (including CDM) by being included under any other PoA or as an individual project.

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

Host Party: Cameroon

Region: Entire country

Physical/geographical location:

The CPA has been implemented within the boundary of the Republic of Cameroon as depicted in Figure 5 below

**Figure 3: Location of Cameroon (CIA 2012)****Table 3: Coordinates of Cameroon as defined by the location of four major boundary towns**

Location	Longitude	Latitude
Mokolo(North)	10° 739 E	13° 799 S
Ebolowa (South)	2° 916 E	11° 149 S
Batouri (East):	4° 433 E	14° 366 S
Mamfe (West)	5° 751 E	9° 314 S

SECTION E. Post-registration changes to specific-case CPA(s)**E.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline**

No deviation from the registered monitoring plan

E.2. Corrections

No corrections

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

No changes to start date of the crediting period

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

Not applicable

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

No changes to the monitoring plan

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

Not applicable

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

Not applicable

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

The monitoring system used is described in the Specific CPA-DD and in line with the PoA DD.

Distribution model:

The distribution model is as shown in Figure 4 below where the hierarchy starts with the CME and goes down to the final stove end user.

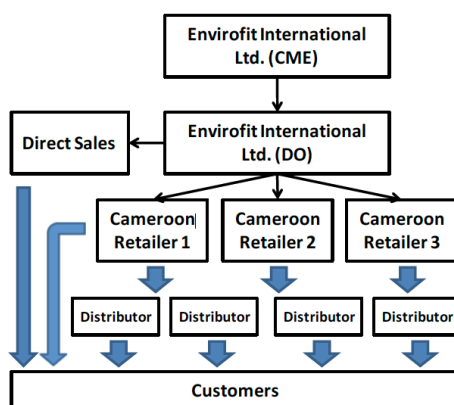


Figure 4: Distribution Hierarchy

The sales of the stoves took place through either Envirofit International Ltd directly, retailers, or sub-retailers; these collectively formed the “Dealers”.

Collection of Data

Sales staff were trained by the dealers, as appropriate, to ensure correct procedures were followed during the distribution of the ICS. The dealers captured the following data during the sales

- Name/Identification of end user;
- Geographical location (fixed address if possible, alternatively other means of locating the stove such as GPS coordinates could be used);
- Serial ID number of ICS (visible on a metal plate riveted to the stove and/or on a sticker on the cardboard box containing the stove);
- Date of distribution;
- The phone number of the end-user (if available);
- Alternate phone number (e.g. close relative)(if available);
- Model of ICS (Envirofit stove) being distributed; and
- Sales Entity details (name, address etc.)

Figure 5 below depicts the various data collection and analysis stages.

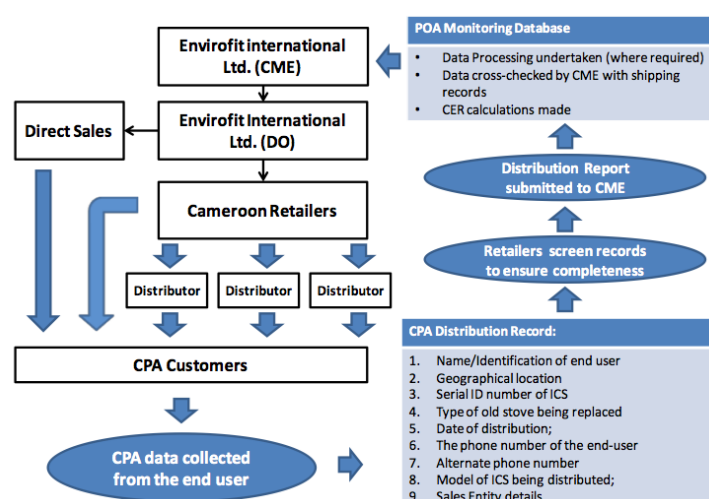


Figure 5: Operational structure and key responsibilities for data collection

Transfer of information to the CME

The data contained in CPA Distribution Records was compiled by the dealers into a CPA Distribution Report and entered directly into the CME’s database via an online server. The data was

entered in an Excel-based spread sheet format at a time following the stove sale that is referred to in the diagram above as a CPA Distribution Report. This approach was designed to integrate data with the CME's master database covering all CPAs under the PoA (this means that the data is always stored securely on the CME's server). The data from each CPA Distribution Record was accessible to the CME in real time as it was entered.

CME responsibilities

The CME kept a record of the serial numbers of the ICS units distributed by the Dealer under this CPA and all other CPAs under the PoA. This enabled crosschecking of the data provided by each of the Dealer to ensure no double counting of stoves across CPAs.

The CME was responsible for crosschecking the data contained in the CPA Distribution Reports provided by the dealer in order to confirm authenticity. Where erroneous CPA Distribution Records were identified (e.g. inconsistency between sales claimed by Sales Entities and stove serial numbers supplied to the dealer) these were not included in the emissions reduction calculations.

The CME is fully in control of the security of the Database and the data contained within it. The stove and customer data used for monitoring and emissions reduction calculations will never be stored on the dealers' computers since it is uploaded in real time to the CME's database, which remains on Envirofit International's secure server. At present, the PoA Distribution and Monitoring Database is located on the CME's "Sharepoint" system.

SECTION G. Data and parameters

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

Data/parameter	M _{woody_biomass,app}
Unit	tonne/year
Description	Estimate of average annual consumption of woody biomass per appliance in baseline
Source of data	Calculated from published data
Value(s) applied	4.1427
Choice of data or measurement methods and procedures	See CER Calculation Sheet and the CPA-DD. This value is already adjusted by a leakage factor
Purpose of data	Calculation of baseline emissions
Additional comments	The value used is adjusted with the different leakages

Data/parameter	N _y
Unit	Number
Description	Maximum number of operating cook stoves in the SSC-CPA
Source of data	
Value(s) applied	15,776
Choice of data or measurement methods and procedures	Calculated in the compliance with the small-scale limit with regard to annual energy saving of the stoves involved in this CPA
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data/parameter	η_{old}
Unit	Fraction
Description	Efficiency of the system being replaced
Source of data	Default value as per the methodology
Value(s) applied	0.1
Choice of data or measurement methods and procedures	As indicated by the methodology <i>AMS-II.G Version 4.0</i> , measured using representative sampling methods or based on referenced literature values; a default value of 0.10 may be optionally used if the replaced system is a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e. without a grit or chimney; for other types of systems a default of 0.1 may be optionally used. Please refer to the PoA-DD Version 1.10 "Côte d'Ivoire and Cameroon Efficient Cook Stoves Program" where the used default value 0.1 has been justified.
Purpose of data	Calculation of baseline emissions
Additional comments	There is no clear literature on the efficiency of stoves used in the market in Cameroon. However what is seen in the market is the predominant use of three stones fires. ⁵ Since there is no clear literature, the project participants opted to use the default value

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.
Source of data	Please refer to PoA-DD Version 1.10 "Côte d'Ivoire and Cameroon Efficient Cook Stoves program"
Value(s) applied	0.70
Choice of data or measurement methods and procedures	Derived from table 1 of the Information Note of the 37th meeting of the SSC WG report Annex 14. Historical data values, including value for Cameroon are provided in Paragraph 4
Purpose of data	Calculations of baseline emissions
Additional comments	

Data/parameter	$NCV_{biomass}$
Unit	TJ/tonne
Description	Net calorific value of the non-renewable woody biomass that is substituted
Source of data	2006 IPCC guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.015
Choice of data or measurement methods and procedures	According to methodology <i>AMS-II.G Version 4.0</i> , paragraph 5 the Net Calorific Value of the non-renewable woody biomass that is substituted has to be taken as IPCC default for wood fuel
Purpose of data	Calculation of baseline emissions

⁵ The DOE also observed this during the site visit validation

Additional comments	
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Data/parameter	EF _{projected fossilfuel}
Unit	tCO ₂ /TJ
Description	Emission factor for the substitution of non-renewable woody biomass by similar consumers
Source of data	2006 IPCC guidelines for national greenhouse gas inventories
Value(s) applied	81.6
Choice of data or measurement methods and procedures	As indicated by the methodology <i>AMS-II.G Version 4.0</i> paragraph 5
Purpose of data	Calculation of baseline emissions
Additional comments	

Data/parameter	Leakage _{adj}
Unit	Fraction
Description	Net gross adjustment factor to account for leakages
Source of data	Methodology <i>AMS-II. G version 4.0</i> paragraph 13
Value(s) applied	0.95
Choice of data or measurement methods and procedures	Default value as per methodology
Purpose of data	Calculation of leakage emissions
Additional comments	

G.2. Data and parameters monitored

Data/parameter	N _{op_stoves,y}		
Unit	Number		
Description	Number of distributed cook stoves still operating		
Measured/calculated/ default	Calculated		
Source of data	Monitoring Survey results		
Value(s) of monitored parameter	From the total number of stoves distributed and surveyed during the two year monitoring activities the number of stoves that were found to be in operation were as follows:		
	Monitoring period 1	Percentage of stoves still in operation	Number of stoves in operation
	Monitoring session 1	87.76%	3,257
	Monitoring session 2	79.52%	2,909
Monitoring equipment	Survey questionnaires		
Measuring/reading/ recording frequency	Annually		

Calculation method (if applicable)	<p>The CPA implementer kept a database of all stoves sold to account for the distributed cook stoves. During each of the monitoring sessions in this monitoring period, a representative sample of the households where the stoves had been distributed was selected. Once this was done the monitoring entity visited the households to establish whether the project stoves were still in operation or not through visual inspections and interviews.</p> <p>Based on this information the proportion of stoves still in operation was derived for each monitoring session by dividing the number of valid surveys by the number of operational stoves. To arrive at the number of stoves in operation the proportion was multiplied by the total number of stoves distributed.</p>
QA/QC procedures	<p>The database was periodically checked by the CME to ensure that the entries were correct. Each stove was traced from manufacturer to user using its unique identification number. Any invalid or incomplete entries related to cook stove sales was not taken into consideration in CERs calculation.</p> <p>The sample was selected based on a 90% level of confidence and 10% precision required for inspecting individual CPAs in line with the sampling plan in the registered CPA-DD. The proportion of stoves that were still operational was tested to determine if the desired precision was met.</p> <p>The survey result in the first monitoring session attained a precision of 6.12% and thus the calculated value of 87.76% based on the survey results was used as the proper representation of the proportion of stoves still in operation.</p> <p>In the second monitoring session the proportion calculated was 80.33%. This proportion achieved a precision of 10.34% which meant that the desired precision of 10% was missed by 0.34% and therefore for conservativeness, the monitored proportion of 80.33% in the second monitoring session was discounted by three times (x3) the percentage precision points missed in line with paragraph 17 of the Standard: <i>Sampling and surveys for CDM project activities and programme of activities version 05.0</i> to arrive at the value of 79.52%</p>
Purpose of data	Calculation of baseline emissions
Additional comments	

Data/parameter	$\eta_{new,y}$				
Unit	Fraction				
Description	Efficiency of the device being deployed as part of the project activity in year y				
Measured/calculated/ default	Measured.				
Source of data	Determined through water boiling tests of the selected sample per age class during each monitoring session				
Value(s) of monitored parameter	Stove model	Age Class	Number of stoves in the vintage	Monitored Efficiency (session#1)	Monitored Efficiency (session #2)
	M5000	2012	33	20.10%	-
	M5000	2013	2,408	21.10%	20.37%
	M5000	2014	1,250	20.22%	20.56%
	M5000	2015	20	22.96%	-
Monitoring equipment	Equipment				
	Omegatte HH308 Mini Thermometer for measuring temperature of water during test				
	Bracknell Scale Balance for measuring weight of fuel consumed during test (max 12 lb = 6kg, d= 0.0005 lb = 0.0002kg)				

	<p>Equipment calibration</p> <p><i>Prior to undertaking the efficiency tests for the two monitoring sessions the equipment were certified by a national institution of higher learning, Bamenda University of Science and Technology that they were in proper calibration and that they did not require extra calibration.</i></p> <p><i>Details of the calibration of the equipment are as provided below for the two monitoring sessions</i></p> <p><i>Monitoring session 1</i> Calibration date: 13th May 2015 Equipment: Brecknell counting scale Model: B140 Serial no: 0514000008 Capacity: 6kg*0.0002kg/12lb*0.0005 lb Accuracy : +/- 0.0002 kg / +/- 0.0005 lb</p> <p>Equipment: Mini thermometer Model: Omegatte HH308 Serial no. 140400157 Capacity range : 200°C ~ 1370°C / 328°F~249°F Accuracy: +/- 0.3% reading +1°C / +/- 0.3% reading +2°F</p> <p><i>Calibration carried out by The University of Bamenda</i></p> <p><i>Monitoring session 2</i> Calibration date: 2th May 2016 Equipment: Brecknell counting scale Model: B140 Serial no: 0514000008 Capacity: 6kg*0.0002kg / 12lb*0.0005 lb Accuracy : +/- 0.0002 kg / +/- 0.0005 lb</p> <p>Equipment: Mini thermometer Model: Omegatte HH308 Serial no. 140400157 Capacity range : 200°C ~ 1370°C / 328°F~249°F Accuracy: +/- 0.3% reading +1°C / +/- 0.3% reading +2°F <i>Calibration carried out by The University of Bamenda</i></p> <p><i>Certification of the same have been provided from the university</i></p>
Measuring/reading/recording frequency	<p>For the first monitoring session, a sample of stoves from the four vintages (2012, 2013, 2014 and 2015) based on the years of distribution was taken and subjected to water boiling tests to determine the thermal efficiency of the stoves. The results from the stove tests were averaged and used as the efficiencies of the vintages.</p> <p>For the second monitoring session, two vintages (2013 and 2014 only) were taken into account after it was found that the number of stoves in other age class (i.e. 33 in 2012 and 20 in 2015) made less than 1% of the total stove population and was not economical to monitor and claim emission reductions for the stoves distributed in these age classes. For this reason the CME shall therefore not be claiming emissions from stoves distributed in the year 2012 and the year 2015 in the second monitoring session.</p> <p>The WBTs were carried out for a sample of installed ICSs in operation in line with the monitoring plan on an annual basis.</p>

Calculation method (if applicable)	WBTs were carried out following the WBT protocol version 4.2.3 for stoves selected through simple random sampling for the different vintages. An average efficiency from all the tests was determined for each vintage and the average tested to establish if the desired precision was met.
QA/QC procedures	WBTs were carried out for a sample of installed ICSs in operation in line with the PoA Sampling Plan on an annual basis. The test protocol used can be found here (http://cleancookstoves.org/binary-data/DOCUMENT/file/000/000/399-1.pdf)
Purpose of data	Calculation of baseline emissions
Additional comments	Emission reductions have been calculated for each monitoring session per age class of the stoves then summed up.

Data/parameter	B _{residual,y}	
Unit	Tonne	
Description	Quantity of woody biomass that is still consumed by the customers using their baseline cook stoves	
Measured/calculated/ default	Measured	
Source of data	Through interviews of selected sample households in which the ICS are implemented and functioning.	
Value(s) of monitored parameter	Monitoring session	Value
	Monitoring session #1	1.96
	Monitoring session #2	1.91
Monitoring equipment	Survey questionnaire	
Measuring/reading/ recording frequency	Annually	
Calculation method (if applicable)	<p>During the annual monitoring visit, CME-mandated monitoring agents established if the baseline stove that was supposed to be replaced by the ICS was still being used together with the ICS. In the case that the baseline stove was still in use, the usage rate of the baseline stove was estimated and the quantity of woody biomass that would have been consumed using the baseline stove computed.</p> <p>The parameter B_{residual,y} was then calculated by taking the ratio of meals cooked using the traditional stove after the receipt of the ICS against the meals cooked using the traditional stove before the receipt of the ICS, and then multiplied by M_{woody_biomass,app} (kg/year) which was established ex-ante.</p>	
QA/QC procedures	The CME provided training, guidelines and monitoring templates to ensure that the Monitoring Organization responsible for monitoring followed appropriate procedures of carrying out the survey for collecting the data.	
Purpose of data	Calculation of baseline emissions	
Additional comments	-	

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

a) Description of implemented sampling design;

The sampling exercise for the collection of data required by methodology *AMS-II.G. version 4.0* was carried out as described in the CPA-DD. The sampling procedure and calculation of achieved emission reductions was carried out separately for each of the two monitoring sessions covered in this monitoring period.

Objectives of the sampling plan

The sampling effort was aimed at achieving the CDM monitoring requirements (unbiased and reliable estimates of the mean and proportion values of parameters used in the calculations of greenhouse gas emission reductions) through a feasible but representative (statistically valid)

sample of the locations where the systems are deployed, as compared to the large population involved in the project which could hardly be systematically fully monitored.

Data to be collected and sampling approach

As per the monitoring plan, the concerned monitoring parameters were N_{op_stoves} , $n_{new/age}$ and $B_{residual}$. An annual monitoring criteria was followed and separate sampling and monitoring exercises were carried out for the first and second year of the monitoring period.

For the first monitoring session the sample size was calculated based on the considerations mentioned in Table 4 below.

Table 4: Monitoring Session 1 sample size calculation parameters

Parameter	Description	Method used to collect data	Precision target	Age-Class consideration
N_{op_stoves}	Number of distributed cook stoves actually operating	Visual inspection	10%	Samples were drawn from the entire population regardless of the age-class
$B_{residual}$	Quantity of woody biomass that is still consumed by the customers using their baseline cook stove	Users interview	10%	Samples were drawn in regardless of the age class
$n_{new/age}$	Efficiency of stoves by age class / Specific fuel consumption or fuel consumption rate of the system deployed as a part of a specific age class	Water Boiling Test	10%	Stoves were grouped in terms of vintages and sampling done

For the second monitoring session the sample size was calculated based on the considerations in Table 5 below.

Table 5: Monitoring Session 2 sample size calculation parameters

Parameter	Description	Method used to collect data	Precision target	Age-Class consideration
N_{op_stoves}	Number of distributed cook stoves actually operating	Visual inspection	10%	Samples were drawn from the entire population regardless of the age-class
$B_{residual}$	Quantity of woody biomass that is still consumed by the customers using their baseline cook stove	Users interview	10%	Samples were drawn in regardless of the age class
$n_{new/age}$	Efficiency of stoves by age class / Specific fuel consumption or fuel consumption rate of the system deployed as a part of a specific age class	Water Boiling Test	10%	Stoves were grouped in terms of vintages and sampling done

The population was considered homogenous for N_{op_stoves} , and $B_{residual}$ and random sampling was applied based on the following:

- The end-users of the CPA were all households;
- The stoves distributed use the same technology;
- The geographical coverage of the stoves was within the same country;
- The stove model distributed was the same

For $n_{new/age}$ the population included only one stove model in the CPA and was deemed homogenous in terms of:

- Power output;
- Certified thermal efficiency; and

- Fuel used

However as per the CPA-DD the population was deemed heterogeneous based on age class. Thus, the M5000 stove population was categorized into various age class (based on year of sale) and random sampling was applied in each age class.

Target population and Sample frames

The target population for this CPA were end-users who had received the stoves and who could be identified through the following:

- Project stove's serial number;
- Customer's name; and
- Contact details / User's address

A total stove population of 3,711 stoves distributed between 2012 and 2015 were considered in the first monitoring session. For the second monitoring session, stoves considered were only those distributed in the years 2013 and 2014 i.e. only total of 3658 stoves were considered for this second monitoring session. This was due to the fact that the stoves distributed in 2012 and 2015 made less than 1% of the total stove population and was not economical to monitor and claim emission reductions for the stoves distributed in 2012 and 2015. For this reason, the CME shall therefore not be claiming emissions from stoves distributed in the year 2012 and the year 2015 in the second monitoring session. The sample frame for various parameters is as shown in Table 7A and 6B below.

Table 6A: Sampling frame for monitoring session 1 and monitoring session 2 for N_{op_stoves} , and $B_{residual}$

Sample frame	Target population	
	Monitoring session 1	Monitoring session 2
N_{op_stoves}	3711	3658
$B_{residual}$	3711	3658

Table 7B: Sampling frame for monitoring session 1 and monitoring session 2 for $n_{new/age}$

Sample frame (Vintage)	Target population	
	Monitoring session 1	Monitoring session 2
2012	33	-
2013	2,408	2,408
2014	1,250	1,250
2015	20	-
TOTAL	3,711	3,658

Sample sizes calculated for the different parameters in the two monitoring sessions are as shown in the table below. Refer ER calculator for more details on calculation of sample size for each parameter. The expected parameter values (mean, standard deviation and proportion) were determined based on project developer's knowledge and experience as per para 12(b) and 12(c) of the Sampling and surveys for CDM project activities and programmes of activities, Version 05.0 available at:

https://cdm.unfccc.int/filestorage/e/x/t/extfile-20151023110718130-meth_stan05.pdf/meth_stan05.pdf?t=eFN8bzhjZmVpfDA6zJ3bQSs7Q9M1iUqKZBk3

In case the sample size calculations returned a value of less than 30 for a mean value parameter, based on the Standard: *Sampling and surveys for CDM project activities and programme of activities version 05.0 paragraph 13* which states that 'If the parameter of interest is a numeric mean value (i.e. not a proportion or percentage) the Student's t-distribution shall be used if the resulting sample size is less than 30.' Therefore, student t-distribution was applied to determine the final sample size for the two monitoring sessions.

Table 8: Sample sizes calculated for monitoring session 1 and monitoring session 2

Parameter	Sample size		
	Monitoring session 1		Monitoring session 2
N _{op_stoves}	81 (oversampled by 20% to cover for non-respondents) number of samples actually monitored = 98		58 (oversampled by 20% and an additional buffer to cover for non-respondents and to meet the required precision) number of samples actually monitored = 61
B _{residual}	13 number of samples actually monitored = 76		13 number of samples actually monitored = 42
n _{new/age}	Vintage	Calculated Sample size	Samples monitored
	2012	5	5
	2013	5	5
	2014	5	5
	2015	5	5

Based on the project's developer past experience in monitoring of similar projects, additional samples were covered during surveys (more than the calculated sample size). This was supposed to cover the reliability of 90/10 as required for annual monitoring.

b) Collected data

The data collected during the two monitoring exercises were N_{op_stoves}, n_{new/age} and B_{residual}. For B_{residual} and N_{op_stoves} the data was collected through interviews and physical inspection of the stoves. Additional survey samples were covered as mentioned above to meet the desired precision / confidence levels. Testing for n_{new/age} was done in a laboratory by carrying out water boiling tests on the stoves that were part of the selected samples in the respective monitoring sessions.

c) Analysis of the collected data;

Following the survey and water boiling tests carried out on the sampled stoves in the two monitoring sessions, the results are discussed below:

Parameter B_{residual}

For the parameter B_{residual} data was collected from the households that were found to be using both the Envirofit stove and the traditional stove. From these households the proportion of meals cooked using the traditional stove prior to obtaining the envirofit stove vs. meals cooked using traditional stove after obtaining the envirofit stove was determined and multiplied by the value of M_{woody_biomass} already determined ex-ante to account for the amount of woody biomass still being consumed by the old stove. This value of B_{residual} was subtracted from M_{woody-biomass} in the final emission reduction calculations for the respective monitoring sessions.

For the first monitoring session, the amount of woody biomass that was found to still being used by the traditional stoves was found to be 1.96 tonnes.

In the second monitoring session, the amount of woody biomass that was found to still being used by traditional stoves was found to be 1.91 tonnes.

Parameter N_{op_stoves}

The number of stoves still operating was captured from the surveys where home visits and visual inspection was conducted and stove owners were interviewed on the operation of the Envirofit stove.

In the first monitoring session, 87.76% of the Envirofit stoves surveyed were still in operation while in the second monitoring session 79.32% of the sampled stoves were found to be in operation.

Parameter $n_{\text{new/age}}$

For the parameter $n_{\text{new/age}}$ the stoves samples were collected on the basis of four stove vintages. The 2012 and 2015 vintages were not included in the monitoring during the second monitoring session. The stoves samples thermal efficiency results were averaged per vintage and emission reductions calculated per vintage.

The summary of results is presented Table 9 and Table 10 below. The comprehensive results are found in the emission reduction spreadsheet.

Table 9: Summary of Results for monitoring session 1

Parameter		Valid responses	Survey/Test results	Precision attained	Final results	Comments
B _{residual}		76	1.96 tonnes	5.14%	1.96	Precision attained so value taken as it is
N _{op_stoves}		98	87.76%	6.12%	87.76%	Precision attained so value taken as it is
n _{new/age}						
Stove Vintage	2012	5	20.10%	4.49%	20.10%	Precision attained so value taken as it is
	2013	5	21.10%	7.76%	21.10%	Precision attained so value taken as it is
	2014	5	20.22%	9.80%	20.22%	Precision attained so value taken as it is
	2015	5	22.96%	8.61%	22.96%	Precision attained so value taken as it is

Table 10: Summary of results from monitoring session 2

Parameter		Valid responses	Survey/Test results	Precision attained	Final results	Comments
B _{residual}		42	1.91 tonnes	5.39%	1.91	Precision attained so value taken as it is
N _{op_stoves}		61	80.33%	10.34%	79.52%	Precision not attained so emission reductions have been discounted by three times the missed precision points
n _{new/age}						
Stove Vintage	2013	9	20.37%	4.04%	20.37%	Precision attained so value taken as it is
	2014	9	20.56%	6.70%	20.56%	Precision attained so value taken as it is

d) Demonstration of whether the required confidence/precision level has been met;

For the different parameters, the precision achieved varied. The tables below show the precision achieved by the various parameters in the monitoring sessions. In the event that the precision target was not met, based on the Standard: *Sampling and surveys for CDM project activities and programme of activities version 05.0 paragraph 17 (b) (i) b.*, the parameter values were discounted three times the missed precision points. The calculation of the precision can be found in the emission reduction calculation spreadsheet.

Table 11: Precision attained for the different parameters in monitoring session 1

Parameter	Precision attained	Precision achieved	Result	Is the discounting of parameter value / lower bound applied?
$N_{\text{op_stoves}}$	6.12%	Yes	87.76%	No

B _{residual}	5.14%	Yes	1.96 tonnes	No
η _{new/age}				
2012	4.49%	Yes	20.10%	No
2013	7.76%	Yes	21.10%	No
2014	9.80%	Yes	20.22%	No
2015	8.61%	Yes	22.96%	No

Table 12: Precision attained for the different parameters in monitoring session 2

Parameter	Precision attained	Precision achieved	Result	Is the discounting of parameter value / lower bound applied?
N _{op_stoves}	10.34%	No	80.33%	Yes. Discounted value 79.52%
B _{residual}	5.39%	Yes	1.91 tonnes	No
η _{new/age}				
2013	4.04%	Yes	20.37%	No
2014	6.70%	Yes	20.56%	No

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

Emission reductions were calculated for each monitoring session using Equation 1 from the CPA-DD below.

$$ER_y = B_{y,savings} \cdot f_{NRB,y} \cdot NCV_{biomass} \cdot EF_{projected_fossilfuel} \quad \text{Equation 1}$$

Where for the first monitoring session for the first monitoring period

Parameter	Description	Unit	Value	Source
B _{y,savings}	Quantity of woody biomass that is saved in tonnes	Tonnes	3,183	Calculated in the ex-post ER sheet
f _{NRB,y}	Fraction of woody biomass saved by the project in year y that can be established as non-renewable biomass.	%	70%	Ex-ante determined
NCV _{biomass}	Net calorific value of the non-renewable woody biomass that is substituted	TJ/tonne	0.015	Methodological Default
EF _{projected_fossilfuel}	Emission factor for the substitution of non-renewable woody biomass by similar consumers	tCO ₂ /TJ	81.6	Methodological Default
ER _y	Emission reductions during the year y	tCO ₂	2727	Calculated

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

Where:

Where:

Parameter	Value	Sources										
B _{y,savings}	3,183 tonnes	Calculated in the ex-post ER sheet										
B _{old}	6,759.46 tonnes	Calculated in the ex-post ER sheet										
η _{old}	10%	Ex ante										
η _{new}	<table><tr><th>Vintage year</th><th>Efficiency</th></tr><tr><td>2012</td><td>20.10%</td></tr><tr><td>2013</td><td>21.10%</td></tr><tr><td>2014</td><td>20.22%</td></tr><tr><td>2015</td><td>22.96%</td></tr></table>	Vintage year	Efficiency	2012	20.10%	2013	21.10%	2014	20.22%	2015	22.96%	Measured ex-ante through water boiling tests of a representative sample.
Vintage year	Efficiency											
2012	20.10%											
2013	21.10%											
2014	20.22%											
2015	22.96%											

$$B_{old} = N_{op_stoves,y} * (M_{woody,biomass,app} - B_{residual,y})$$

Parameter	Unit	Value	Source
B _{old}	tons	6,759.46	Calculated in the ex-post ER sheet
N _{op_stoves,y}	fraction	87.76%	Calculated in the ex-post ER sheet
M _{woody,biomass}	tonnes/yr	4.142	Literature as established ex-ante
B _{residual,y}	tonnes/yr	1.96	Calculated in the ex-post ER sheet
N _{op_stoves,y}	Number	3,257	Sales records
Leakage _{adj}	-	0.95	Default

For the second monitoring session in the first monitoring period

Parameter	Description	Unit	Value	Source
B _{y,savings}	Quantity of woody biomass that is saved in tonnes	Tonnes	3,143	Calculated in the ex-post ER sheet
fNRB _y	Fraction of woody biomass saved by the project in year y that can be established as non-renewable biomass.	%	70 %	Ex-ante determined
NCV _{biomass}	Net calorific value of the non-renewable woody biomass that is substituted	TJ/tonne	0.015	Methodological Default
EF _{projected_fossilfuel}	Emission factor for the substitution of non-renewable woody biomass by similar consumers	tCO ₂ /TJ	81.6	Methodological Default
ER _y	Emission reductions during the year y	tCO ₂	2693	Calculated

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

Where:

Parameter	Value	Sources
B _{y,savings}	3,143 tonnes	Calculated in the ex-post ER sheet
B _{old}	6,156.65 tonnes	Calculated in the ex-post ER sheet
η _{old}	10%	Ex ante
η _{new}	Vintage year	Measured ex-ante through water boiling tests of a representative sample.
	2013	
	2014	

$$B_{old} = N_{op_stoves,y} * (M_{woody,biomass,app} - B_{residual,y})$$

Parameter	Unit	Value	Source
B _{old}	tonnes	6,156.65	Calculated in the ex-post ER sheet
N _{op_stoves,y}	fraction	79.52%	Calculated in the ex-post ER sheet
M _{woody,biomass}	tonnes/yr	4.142	Literature as established ex-ante
B _{residual,y}	tonnes/yr	1.91	Calculated in the ex-post ER sheet
N _{op_stoves,y}	Number	2909	Sales records
Leakage _{adj}	-	0.95	Default

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

No project emissions were accounted for under this CPA. And thus the projects emissions are deemed zero.

H.3. Calculation of leakage

Leakage was factored in by multiplying B_y by a net to gross adjustment factor of 0.95 and therefore no surveys was required for this.

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
8696-0003	5,420	0	0	0	5,420	5,420
Total	5,420	0	0	0	5,420	5,420

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
8696-0003	56,260	5,420
Total	56,260	5,420

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

The achieved emission reductions by the CPA did not surpass those indicated in the CPA-DD

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	Envirofit International Ltd.
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