



**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)	PoA Title: African Improved Cooking Stoves Programme of Activities	
UNFCCC reference number of the PoA	PoA reference number: 5342	
Version number(s) of the PoA-DD(s) applicable to this monitoring report	4.3	
Coordinating/managing entity (CME)	Envirofit International Ltd.	
Version number of this monitoring report	1.0	
Completion date of this monitoring report	12/04/2017	
Monitoring period number and dates covered by this monitoring report	Monitoring period: 04 25/10/2015 - 24/10/2016	
Monitoring report number for this monitoring period	1	
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)
	Ghana	Yes
	Nigeria	No
	Liberia	No
Sectoral scope(s)	Sectoral scope: 3: Energy demand	
Selected methodology(ies)	AMS-II.G ver 3.0: Energy efficiency measures in thermal applications of non-renewable biomass	
Selected standardized baseline(s)	Not applicable	
Total amount of GHG emission reductions or net GHG removals by sinks for all specific-case 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	29,662

PART I - Programme of activities

SECTION A. Description of PoA

A.1. Brief description of the PoA

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The purpose of this Programme of Activities (PoA) is the dissemination of improved biomass cooking stoves (ICS) in Ghana, Nigeria and Liberia. The Programme will promote stove categories that replace existing less efficient cooking stoves using woody-biomass (wood-fuel and/or charcoal).

The ICS distributed under the programme are more efficient in transferring heat from the fuel to the pot when compared to the stoves typically being used in the baseline. By replacing inefficient baseline stoves, the PoA saves on consumption of woody biomass (either wood or charcoal made from wood) which is the dominant fuel used for cooking in project households. The ICSs applied in this PoA have been designed to match the traditional utensils and cooking habits of the target consumers in host countries.

In accordance with version 3.0 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 (Envirofit) is the coordinating/managing entity (CME) for this PoA and coordinates the efforts of different Distribution Organizations (DOs) who are involved in distribution of ICS within the boundary of the PoA and comply with the requirements of this PoA. Each DO sells ICSs either directly or through retailers, entrepreneurs or other agents sub-contracted by the DO. The CME provides training and guidance on the correct distribution and monitoring procedures to each DO. Each DO acts individually, implementing the CPA(s) in accordance with local circumstances and the requirements prescribed by CME.

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)
<p>Title: African Improved Cooking Stoves Programme of Activities – Generic CPA Identification: Part II of revised PoA-DD version 4.3 dated 07/06/2014 Reference: http://cdm.unfccc.int/UserManagement/FileStorage/V96Q8RJG3DUWMTMXIYH20Z4LPE5B7OF Version: 1.0</p>	Sectoral Scope 3	AMS-II.G, version 3: Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass

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

Reference number of the specific-case CPA included in the PoA as of the end of this monitoring period	Title, identification/ reference number and version number of the generic CPA to which the specific-case CPA applies	Crediting period dates of the specific-case CPA	Is this specific-case CPA covered in this monitoring
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			report? (yes/no)
5342-00001	Title: African Improved Cooking Stoves Programme of Activities – Generic CPA Identification: Part II of revised PoA-DD version 4.3 dated 07/06/2014 Reference: http://cdm.unfccc.int/UserManagement/FileStorage/V96Q8RJG3DUWTMXIYH20Z4LPE5B7OF Version: 1.0	15 Dec 2012 – 14 Dec 2022	Yes
5342-00002		01 Nov 2013 - 31 Oct 2023	Yes
5342-00003		01 Dec 2013 – 30 Nov 2023	Yes
5342-00004		25 Oct 2014 – 24 Oct 2024	No
5342-00005		25 Oct 2014 – 24 Oct 2024	No
5342-00006		01 Feb 2015 – 31 Jan 2025	No

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

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Envirofit International Limited is the CME for the PoA. The responsible persons for completing the CDM-PoA-MR-Form are as follows:

Rohit Lohia
 Carbon Projects Development Manager
rohit.lohia@envirofit.org

SECTION B. Implementation of PoA

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

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Envirofit International Limited is the Coordinating and Managing Entity (CME) for the PoA. The Distributing Organization(DO) for the CPAs included in the PoA are as follows:

CPA	Name of DO	Status of CPA Implementation
5342-00001	The Centre of Energy, Environment and Sustainable Energy (CEESD)	Implemented
5342-00002	--	Not implemented
5342-00003	Envirofit International	Implemented

The DOs have subcontracted retailers/entrepreneurs (referred as dealers) for dissemination of project stoves. The implemented CPA follow the following management system:

1. Envirofit provided instructions to CEESD to collect the end user information at the time of sales to make the distributed stoves eligible under the PoA. Envirofit advised CEESD on the requirements of end user data collection and provided guidance on the correct procedures to be followed during distribution.
2. Envirofit maintains a PoA Distribution and Monitoring database. This database is a compilation of CPA distribution records. The database includes a CPA-specific list of stoves sales, based on following information received from CEESD (CEESD collected this information at the time of sale, in CPA distribution record form):
 - a. Name of customer
 - b. Address / location of the customer
 - c. Stove unique serial ID number
 - d. Stove Model
 - e. Stove distribution date

- f. Type of old / baseline stove replaced by ICS, i.e. the fuel type used in the old / baseline stove
- 3. Envirofit performed cross-checks on the ICS sales information received from the dealers via CPA distribution records. The CME’s logo is clearly displayed on the CPA Distribution Record, with a copy retained by Envirofit. A unique stove id is punched on each stove and the same serial ID is mentioned on the CPA distribution record. 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.
- 4. Envirofit obtained the customer’s approval during distribution to exclusively assign carbon rights to the CME as per the disclaimer specified on CPA distribution records.
- 5. 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.
- 6. CEESD checked and recorded the following key parameters in a CPA Monitoring Record. Key monitored parameters were:
 - a. Efficiency of project stoves (η_{new})
 - b. Check if project stoves are operational and in use (SOF)
 - c. Check fraction of end users continuing to use replaced stoves (f_{old})
 - d. If replaced stoves are being used, the consumption accounted for by the old stoves (μ_{old})
- 7. Envirofit calculated emission reductions based on monitoring data collected by CEESD and prepared monitoring report

Thus, by carrying out the aforesaid, Envirofit ensured that the PoA Operational and Management plan as given in section A.4.4.1 of registered PoA-DD is duly implemented for concerned CPAs.

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

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a) List of CPAs to which the single sampling was applied

The eligible stoves distributed under the CPAs included in the PoA are as follows:

Table 1: CPA and Stove Installation

CPA	Scale	Type of Project stoves eligible under CPA	Total number of stoves in the CPA	CPA monitoring period covered under this PoA monitoring period
5342-00001	micro	Charcoal	9375 ¹	25/10/2015 – 24/10/2016

¹ Section A.2, page 2 of the registered CPA-DD, clearly mentions, “CPA will have a maximum energy saving of less than or equal to 60/180 GWh_{th}/year, thus staying within the micro/small-scale threshold. Based on the **estimated** energy savings, it is envisaged that 4,500 number of stoves will be distributed under the CPA.” It must be noted that the CPA-DD does not restrict or set a limit on the number of stoves that may be implemented under the CPA and the number of stoves mentioned in respective CPA-DD is only an indicative number. The number of cookstoves under the CPA can change ex-post during the crediting period based on monitored performance.

5342-00002	Small	Woodfuel	0	25/10/2015 – 24/10/2016
5342-00003	Small	Charcoal	5428	25/10/2015 – 24/10/2016

No eligible stoves were distributed in 5342-00002 till the end of monitoring period. Hence, no ERs are being claimed for 5342-00002 for this entire monitoring period. Only 5342-00001 and 5342-00003 have been monitored under the single PoA sampling plan for this monitoring period.

a) Description of implemented single sampling design;

Due to the large number of ICS distributed under the PoA it was not economically feasible to monitor each individual ICS unit distributed. Therefore, representative sampling was undertaken as part of a PoA-wide Sampling Plan. The sampling plan consisted of monitoring the following four parameters mentioned in section D.2.:

Sl.No.	Parameter	Description of parameter
1	η_{new}	The thermal efficiency of the ICS distributed (%)
2	SOF	The Stove Operating Fraction, i.e. the fraction of users using the ICS
3	f_{old}	The fraction of stove users still using baseline (replaced) stoves
4	μ_{old}	The amount of woody biomass that continues to be used in the replaced stoves (kg)

Based on the registered PoA-DD and CPA-DD for 5342-00001 & 5342-00003, 95/10 reliability level was selected for cross-CPA sampling for the parameters mentioned above.

As per page 53 of the PoA-DD, for the parameter η_{new} , the population of each stove model shall be deemed homogeneous across CPAs as the stoves have been designed to meet stringent efficiency specifications and are manufactured in factories to specification. Hence the sample size was calculated for η_{new} considering each stove model as separate population. As per page 53 and page 57 of the PA-DD, for other parameters (SOF, f_{old} , μ_{old}), the homogeneity of the population is demonstrated in compliance with the following conditions;

Homogeneity condition	Characteristic of Population	Status of population
Country	all units have been distributed in the same geographical area, i.e. Ghana	homogeneous
Fuel Type – charcoal / wood fuel	all units that have been distributed are charcoal stoves	homogeneous
End user – domestic / small-medium enterprises / community	all units are for domestic (household) usage as per their design	homogeneous
Stove Type - efficiencies are in a similar range defined as being within +/-10% of each other and they have other common design features	the stove models disseminated have efficiencies within +/-10% of each other (CH2300 considered as the base model which constitutes more than 80% of the stove population)	homogeneous

Thus, the sample size calculations for parameters SOF, f_{old} , μ_{old} were calculated considering CPA population as one sampling frame.

The following table gives the number of samples covered during the monitoring activity. Refer ER calculator worksheet 'MP#3 Sample Size Calculation' for more details on calculation of sample size

for each parameter. The expected parameter values (mean, standard deviation and proportion) have been 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=eFN8bzhiZmVpfDA6zJ3bQSs7Q9M1iUqKZBk3

Parameter	Total population (N)	Expected results	Reliability	Required Sample Size (n)	Monitored samples
η_{new} (CH2200)	2,131	32.0	95/10	7	10
η_{new} (CH2300)	12,069	33.0	95/10	7	10
η_{new} (CH5200)	603	35.0	95/10	7	10
SOF	14,803	80%	95/10	96	104
f_{old}	11,842	85%	95/10	68	91
μ_{old}	1,776	2180	95/10	7	17

The stoves were selected by randomly assigning a number to each stove and sorting in increasing order from lower to higher number. 150 random numbers were generated using online random number generator and the numbers obtained were used to identify the samples from the population. A higher number of samples were monitored than that required to ensure that the desired precision / confidence is achieved as well as have sufficient number of samples that use both ICS and baseline stove for determining μ_{old}

a) Collected data (electronic spreadsheets may be attached and referenced);

Data was collected for SOF, f_{old} and μ_{old} following a specially designed survey form. The information collected was introduced into an electronic database, the CPA Monitoring Record. This survey form was design in a way that would allow the surveyor first to check the validity of the records from the CPA Distribution Records, and secondly to collect the necessary information from field visits for the ER calculations. In order to achieve the 95/10 reliability level for cross-CPA sampling, a few additional stoves were sampled from the database (as mentioned in the table above) to cover for non-responses, if any.

As per the PDD, to calculate the thermal efficiency of the stoves, water boiling tests were conducted using the “Emissions and Performance Test Protocol”, or EPTP, (a water boiling test protocol developed by Colorado State University). Refer ER calculator worksheet “Monitoring Survey” and “WBT Data” for details on data collected during monitoring.

b) Analysis of the collected data;

Analysis of the data monitored through sampling revealed the following results:

Parameter	Results
SOF	0.875
f_{old}	0.187
μ_{old}	2204 kg
η_{new} (CH2200)	33.26%
η_{new} (CH2300)	33.56%
η_{new} (CH5200)	35.34%

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

The following tables demonstrate the status of precision/confidence for each of the monitored parameters:

$\eta_{\text{new CH2200}}$	33.26%	%	Calculated
total number of stoves	2131	number	CPA Installation Databases
Sample Size for ($\eta_{\text{newCH2200}}$)	10	number	WBT data
Mean	33.26%	%	Calculated
Standard Deviation	1.85%	%	Calculated
Standard error of mean ($\eta_{\text{newCH2200}}$)	0.0058		Calculated
Precision for $\eta_{\text{newCH2200}}$	3.97%	%	Calculated
Result for $\eta_{\text{newCH2200}}$	ok, acceptable	--	Calculated

$\eta_{\text{new CH2300}}$	33.56%	%	Calculated
total number of stoves	12069	number	CPA Installation Databases
Sample Size for ($\eta_{\text{newCH2300}}$)	10	number	WBT data
Mean	33.56%	%	Calculated
Standard Deviation	1.42%	%	Calculated
Standard error of mean ($\eta_{\text{newCH2300}}$)	0.0045		Calculated
Precision for $\eta_{\text{newCH2300}}$	3.02%	%	Calculated
Result for $\eta_{\text{newCH2300}}$	ok, acceptable	--	Calculated

$\eta_{\text{new CH5200}}$	35.34%	%	Calculated
total number of stoves	603	number	CPA Installation Databases
Sample Size for ($\eta_{\text{newCH5200}}$)	10	number	WBT data
Mean	35.34%	%	Calculated
Standard Deviation	0.88%	%	Calculated
Standard error of mean ($\eta_{\text{newCH5200}}$)	0.0028		Calculated
Precision for $\eta_{\text{newCH5200}}$	1.76%	%	Calculated
Result for $\eta_{\text{newCH5200}}$	ok, acceptable	--	Calculated

SOF	0.875	Fraction	Calculated
Population Size	14803	number	CPA Installation Databases
Sample Size	104	number	Calculated
Proportion for SOF	0.875	Fraction	Calculated
Standard error of proportion for SOF	0.032		Calculated
Precision for SOF	7.24%	%	Calculated
Result for SOF	ok, acceptable	--	Calculated

As per paragraph 11(a) of the Standard - Sampling and surveys for CDM project activities and programmes of activities, $f_{\text{non old}}$ has been determined through sampling and f_{old} has been determined as $f_{\text{old}} = 1 - f_{\text{non old}}$.

f_{old}	0.187	Fraction	Calculated
Population Size	12953	number	CPA Installation Databases
Sample Size	91	number	Calculated
Proportion for $f_{\text{non-old}}$	0.813	Fraction	Calculated
Standard error of proportion for $f_{\text{non-old}}$	0.041		Calculated
Precision for $f_{\text{non-old}}$	9.81%	%	Calculated
Result for $f_{\text{non-old}}$	ok, acceptable	--	Calculated

μ_{old}	2204	Kg/y	Calculated
Population Size	2420	number	CPA Installation Databases
Sample Size	17	number	Calculated
Mean for μ_{old}	2204.4	kg/y	Calculated

Standard Deviation μ old	225.40	kg/y	Calculated
Standard error of mean μ old	54.48		Calculated
Precision for μ old	4.84%	%	Calculated
Result for μ old	ok, acceptable	--	Calculated

For detailed calculations refer ER calculator, worksheet 'Monitoring Survey'

a) *Demonstration of whether the samples were randomly selected and are representative of the population.*

Stoves were selected randomly after arranging them in chronological order by date of sale and assigning a number to each stove. Random numbers were generated using a range from 1 to 14804 using online random number generator available at <http://stattrek.com/statistics/random-number-generator.aspx> and the random numbers received were selected from 5342-00001 and 5342-00003 distribution databases combined to identify the samples to be monitored. The approach ensured that the samples picked are random and represent the population.

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

C.1. Corrections

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Not Applicable

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

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Not Applicable

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

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Not Applicable

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

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Not Applicable

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

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Not Applicable

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

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

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This Monitoring Report covers all the three CPAs included in the concerned monitoring period. These CPAs have the same project boundary and follow a common generic CPA as identified in section A.1.1, Part I of this monitoring report. The following sections therefore represent all these three CPAs.

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

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

The purpose of the CDM Programme Activities (CPAs) is dissemination of improved cooking stoves (ICS) in the Republic of Ghana. The CPAs replace cooking stoves using charcoal / woodfuel with more efficient stoves using charcoal / woodfuel.

The project ICS are more efficient in transferring heat from the fuel to the pot, thus saving fuel compared to the baseline stoves which would have been used in the absence of the project activity. Furthermore, the ICSs applied in these CPAs have been designed not only to increase heat transfer, but also to match traditional utensils and cooking habits of people in Ghana.

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

The Envirofit stoves have been designed with the specific intention of maximizing thermal efficiency while simultaneously minimizing the production of toxic emissions. While many interrelated factors need to be considered in order to achieve these goals, primary aspects of stove performance were explored during the development of the stoves: 1) fuel and air mixing 2) heat transfer to the pot. In order to maximize temperature, the combustion chamber shape, fuel amount, and air flow through the stove all need to be considered and correctly coordinated. In order to use the available thermal energy in the most efficient manner possible, specific stove geometry and configuration choices were made; including reducing stove thermal mass and minimizing heat flux through the sides and bottom of the stove. In order to minimize emissions, the combustion chamber shape, fuel amount, and air flow rate through the stove all need to be considered and correctly coordinated in order to maintain a proper air to fuel mixture.

The following table details the implementation status of the CPAs along with technology involved:

CPA	Type of Project stoves eligible	Stove models installed ²	Total number of stoves installed
5342-00001	Charcoal	CH2200, CH2300	9,375
5342-00002	Wood fuel	--	0
5342-00003	Charcoal	CH2300, CH5200	4,899

CPA 5342-00002 has not been implemented, hence all ICS under the CPAs covered in the monitoring report are charcoal stoves that replace traditional charcoal stoves in the baseline.

The stove models referred above are shown below:



CH2200



CH2300



CH5200

² At the end of monitoring period.

Information required by Eligibility criteria

Eligibility criteria # 3, 4 and 11 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
#3	Applicability of Methodology AMS-II. G - Technology type	The ICS uses one of the following fuel types: <ul style="list-style-type: none"> • Wood fuel • Charcoal 	Technical specification of ICS provided	Refer D.1 (b) above for the type and number of stoves distributed in the CPAs till the end of the monitoring period. All these models are charcoal stoves
#4	Applicability of Methodology AMS-II. G – Minimum ICS efficiency/ specifications of technology including the level and type of service	The ICS has a minimum efficiency of 20% (AMS-II.G, V.3, para 1)	Technical specification of ICS provided (either from manufacturer's specifications or test results using the Emissions & Performance Test Protocol (EPTP))	Already specified in the registered CPA-DD for CH2200 and CH2300. Manufacturer's specifications for CH5200 substantiate that the design efficiency of CH5200 is 37%
#11	SSC Limit for CPAs	The annual energy savings of each CPA shall not go beyond the limits of 180 GWh _{th} /year over the entire crediting period. In the case of using option 1 to prove additionality under Eligibility Criteria 7, the limit shall be 60 GWh _{th} /year over the entire crediting period.	The maximum number of ICS will be determined in each CPA-DD depending on the technology used (excel sheet will be provided to show calculated energy savings). If a CPA exceeds the applicable limit in any year, the claimable emission reduction shall be capped based on the estimated GHG reductions in the CPA-DD).	Refer ER calculator, worksheet 'MP#2 ER Calculations' which calculates the annual energy savings in 5342-00001 and 5342-00003. While 5342-00001 exceeds micro-scale threshold, 5342-00003 remains within the small-scale threshold. The ERs from 5342-00001 have accordingly been capped to the estimated GHG emissions in the CPA-DDs

For detailed information on complete list of eligibility criteria refer the CPA-DDs available on UNFCCC website as mentioned in Section A.1.2, Part I of this monitoring report.

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

Description	5342-00001	5342-00002	5342-00003	Reference
Start Date	03/01/2012	11/08/2013	06/06/2012	Respective CPA-DD
Date of first stove distribution	23/02/2012	--	20/06/2012	PoA / CPA distribution database

(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 tCO ₂ e
5342-00001	15,477
5342-00002	0
5342-00003	14,185
Total	29,662

Each stove bears a unique serial ID punched on the stove. The same is recorded to trace the stove later and avoid double counting. Further, for each stove included under each CPA, information on the location of the stove has been collected by collecting address of the user at the time of sale in CPA Distribution Record. Thus, location of each stove in CPA distribution database can be traced. Please refer the ER calculator, worksheet 'CPA Distribution data' in which the sales information i.e. Stove unit details and the end user information for each stove is mentioned. The system of recording the unique serial on each stove along with its location serves toward avoiding double counting of stoves amongst various CPAs.

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

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Host Parties: Ghana, Nigeria and Liberia

Region/State/Province: All across Ghana, Nigeria and Liberia

City/Town/Community: All across Ghana, Nigeria and Liberia

Physical Geographical location: The geographical locations of Ghana, Nigeria and Liberia are depicted by the map below.

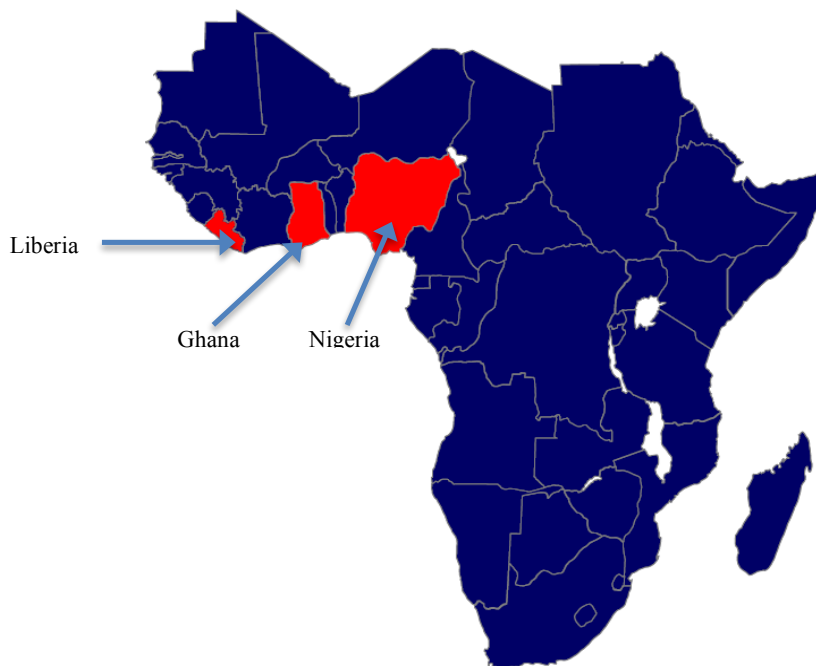


Figure 1: Countries included in PoA boundary

For the three CPAs included at the end of this first monitoring period, only Ghana is the host party.

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

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

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Not Applicable

E.2. Corrections

>>
Not Applicable

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

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Not Applicable

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

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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

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Not Applicable

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)

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Not Applicable

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

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Stoves were either distributed to end-users by CEESD directly or via dealers sub-contracted. Any such third parties were trained by CEESD for ensuring correct procedures according to the PoA are fulfilled.

At the CPA level, CEESD ensured that necessary data was correctly obtained from the customer and recorded in the CPA Distribution Record, firstly to avoid double counting and secondly to enable tracking of the ICS for monitoring purposes. This data captured included:

- a. Name of customer
- b. Address / location of the customer
- c. Stove unique serial ID number
- d. Stove Model
- e. Stove distribution date
- f. Type of old stove which the ICS replaced, i.e. the fuel type used in the old / baseline stove (in this case charcoal)

All other monitoring activities have been carried out at the PoA level, single stage sampling plan. The monitoring surveys and efficiency tests were conducted during the period Feb - April 2017

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

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

Data/parameter	Q_{biomass}
Unit	Tonnes/year
Description	Annual average biomass consumption per appliance
Source of data	Historical data from literature, as allowed by the methodology
Value(s) applied	4.36
Choice of data or measurement methods and procedures	As per registered CPA-DD
Purpose of data	Calculation of baseline emissions
Additional comments	Used for calculation of B_{old}

Data/parameter	$f_{\text{NRB},y}$
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	FAO and IPCC
Value(s) applied	0.99
Choice of data or measurement methods and procedures	As per registered CPA-DD
Purpose of data	Calculation of baseline emissions
Additional comments	

Data/parameter	NCV_{biomass}
Unit	TJ/tonne
Description	Net calorific value of the non-renewable biomass that is substituted
Source of data	AMS-II.G version 03
Value(s) applied	0.015
Choice of data or measurement methods and procedures	As per registered CPA-DD
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data/parameter	EF_{projected_fossilfuel}
Unit	tCO ₂ /TJ
Description	Emission factor for the substitution of non-renewable biomass by similar consumers
Source of data	AMS-II.G version 03
Value(s) applied	81.6
Choice of data or measurement methods and procedures	As per registered CPA-DD
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data/parameter	η_{old}
Unit	Efficiency
Description	Efficiency of the system being replaced
Source of data	AMS-II.G version 03
Value(s) applied	0.101
Choice of data or measurement methods and procedures	As per registered CPA-DD
Purpose of data	Calculation of baseline emissions
Additional comments	

Data/parameter	LAF
Unit	Fraction
Description	Net to gross adjustment factor to account for leakages
Source of data	AMS-II.G version 03
Value(s) applied	0.95
Choice of data or measurement methods and procedures	As per registered CPA-DD
Purpose of data	Calculation of baseline emissions
Additional comments	-

G.2. Data and parameters monitored

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

Data/parameter	η_{new}																												
Unit	Efficiency																												
Description	Efficiency of the system being deployed as part of the project activity																												
Measured/calculated/default	Measured																												
Source of data	As determined through sample testing of stoves by performing WBTs																												
Value(s) of monitored parameter	<table border="1"> <thead> <tr> <th>Stove model</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>CH2200</td> <td>33.26%</td> </tr> <tr> <td>CH2300</td> <td>33.56%</td> </tr> <tr> <td>CH5200</td> <td>35.34%</td> </tr> <tr> <td>Weighted Average 5342-00001</td> <td>33.49%</td> </tr> <tr> <td>Weighted Average 5342-00003</td> <td>33.75%</td> </tr> </tbody> </table>	Stove model	%	CH2200	33.26%	CH2300	33.56%	CH5200	35.34%	Weighted Average 5342-00001	33.49%	Weighted Average 5342-00003	33.75%																
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CH2300	33.56%																												
CH5200	35.34%																												
Weighted Average 5342-00001	33.49%																												
Weighted Average 5342-00003	33.75%																												
Monitoring equipment	<table border="1"> <thead> <tr> <th>Name of equipment</th> <td>Thermocouple Thermo-meter</td> <td>Weighing Scale</td> <td>Moisture meter</td> </tr> </thead> <tbody> <tr> <th>Name of manufacturer</th> <td>Omegaette</td> <td>TREE</td> <td>Lignomat</td> </tr> <tr> <th>Name of model</th> <td>HH308 mini thermometer</td> <td>LCT-33</td> <td>Min-LIGNO (MD)</td> </tr> <tr> <th>Measurement accuracy</th> <td>0.1 °C</td> <td>0.001lb</td> <td>1%</td> </tr> <tr> <th>Number of units used for testing</th> <td>1</td> <td>1</td> <td>1</td> </tr> <tr> <th>Serial number of each unit</th> <td>130707120</td> <td>LC1305074</td> <td>N/A</td> </tr> <tr> <th>Date of purchase</th> <td>28-Febrary, 2017</td> <td>9-March, 2017</td> <td>07-July, 2016</td> </tr> </tbody> </table> <p>These items were newly bought so no calibration was needed. Besides, these are self-calibrating equipment so measurements were done with the necessary guarantees.</p>	Name of equipment	Thermocouple Thermo-meter	Weighing Scale	Moisture meter	Name of manufacturer	Omegaette	TREE	Lignomat	Name of model	HH308 mini thermometer	LCT-33	Min-LIGNO (MD)	Measurement accuracy	0.1 °C	0.001lb	1%	Number of units used for testing	1	1	1	Serial number of each unit	130707120	LC1305074	N/A	Date of purchase	28-Febrary, 2017	9-March, 2017	07-July, 2016
Name of equipment	Thermocouple Thermo-meter	Weighing Scale	Moisture meter																										
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Measurement accuracy	0.1 °C	0.001lb	1%																										
Number of units used for testing	1	1	1																										
Serial number of each unit	130707120	LC1305074	N/A																										
Date of purchase	28-Febrary, 2017	9-March, 2017	07-July, 2016																										
Measuring/reading/recording frequency	WBTs were carried out for a sample of installed ICSs in operation in line with the PoA Sampling Plan on an annual basis.																												
Calculation method (if applicable)	n/a																												
QA/QC procedures	WBTs were conducted in line with the guidance provided by the CME and according to a methodology supported by PCIA. Documentation can be found on PCIA website http://www.pciaonline.org/testing																												
Purpose of data	Calculation of baseline emissions																												
Additional comments																													

Data/parameter	N_{all}
Unit	Number
Description	Total number of stoves installed
Measured/calculated/default	Calculated
Source of data	CPA Distribution Records and logbooks
Value(s) of monitored parameter	5342-00001: 9161 5342-00003: 5245
Monitoring equipment	n/a
Measuring/reading/recording frequency	<p>The DO maintained CPA Distribution Records which provided the data used to calculate this parameter. This data was uploaded to the PoA Distribution and Monitoring Database maintained by the CME.</p> <p>The recording of the sales was done in a regular basis during the crediting period and the monitoring in a yearly basis.</p>

Calculation method (if applicable)	Sum of all stove records in the CPA Distribution Records.
QA/QC procedures	The CME supervised the activities of the DO, and provided training, guidelines and distribution templates to facilitate accurate record keeping during the ICS distribution. The CME also maintained a record of the stove serial numbers supplied to the DO, and was able to cross-check these against the CPA Distribution Reports it receives back from the DO.
Purpose of data	Calculation of baseline emissions
Additional comments	Based on the monitoring survey results, the stove number in each CPA has been discounted by the fraction of samples that have reported using more than one EF stove.

Data/parameter	SOF
Unit	Fraction
Description	Stove Operation Fraction – used to determine the share of distributed stoves that are still operating, measured ex-post through sampling
Measured/calculated/default	Measured
Source of data	Survey of end user behaviour as part of the PoA Sampling Plan
Value(s) of monitored parameter	0.875
Monitoring equipment	No specific monitoring equipment has been used for the surveys.
Measuring/reading/recording frequency	The actual value applied for emissions reduction calculations and request for issuance of CERs was measured ex-post by investigation of the number of ICS installations within the sampled ICS which are operational. This was done on an annual basis as per the PoA monitoring requirements
Calculation method (if applicable)	Since 91 out of 104 stoves have been found to be in operation, SOF has been calculated as 91 divided by 104.
QA/QC procedures	The CME provided training, guidelines and monitoring templates to ensure that the Monitoring Organization responsible for monitoring followed appropriate procedures.
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data/parameter	f_{old}
Unit	Fraction
Description	The fraction of end users that are still using baseline (replaced) stoves
Measured/calculated/default	Measured
Source of data	Survey data of end user behaviour as part of the PoA Sampling Plan
Value(s) of monitored parameter	0.187
Monitoring equipment	No specific monitoring equipment has been used for the surveys.
Measuring/reading/recording frequency	The actual value applied for emissions reduction calculations and request for issuance of CERs was measured ex-post by estimation of a representative sample of end users using the deployed ICS, as conducted in line with the PoA Sampling Plan. Sampling estimated the value of this parameter through monitoring the fraction of end users not using baseline stoves ($f_{non,old}$), This was done on an annual basis as per the PoA monitoring requirements

Calculation method (if applicable)	Based on the registered CPA-DD, the fraction of users not using the baseline stoves ($f_{non,old}$) has been monitored. Then f_{old} has been calculated as $1 - f_{non,old}$
QA/QC procedures	The CME provided training, guidelines and monitoring templates to ensure that the Monitoring Organization responsible for monitoring followed appropriate procedures.
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data/parameter	μ_{old}
Unit	kg/year
Description	The amount of woody biomass consumption that is consumed through the continued use of old stoves
Measured/calculated/default	Measured
Source of data	Data from survey of end user behaviour as part of PoA Sampling Plan combined with the same source of data as for $Q_{biomass}$
Value(s) of monitored parameter	2,204 kg/year
Monitoring equipment	No specific monitoring equipment has been used for the surveys.
Measuring/reading/recording frequency	<p>The actual value applied for emissions reduction calculations and request for issuance of CERs was measured ex-post by estimation of a representative sample of end users using the deployed ICS, as conducted in line with the PoA Sampling Plan.</p> <p>During the survey, the interviewer conducted an interview with the end user to identify how much the baseline (replaced) stove as being used. The value of μ_{old} will be estimated by comparing the number of meals per month before and after ICS distribution.</p> <p>This was done on an annual basis as per the PoA monitoring requirements</p>
Calculation method (if applicable)	Based on the registered CPA-DD, this parameter has been calculated by multiplying the Total Annual Fuel Consumption, 4,360 kg/year, by the ratio of meals cooked by the traditional stove in operation before and after purchasing the Envirofit Stove.
QA/QC procedures	The CME provided training, guidelines and monitoring templates to ensure that the Monitoring Organization responsible for monitoring followed appropriate procedures
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data/parameter	Stove_{year}
Unit	Year
Description	Calculated average stove operation years in the monitoring period.
Measured/calculated/default	Calculated
Source of data	PoA Distribution and Monitoring Database
Value(s) of monitored parameter	5342-00001: 1.00 5342-00003: 0.97
Monitoring equipment	No specific monitoring equipment has been used for the surveys.
Measuring/reading/recording frequency	<p>Each ICS entered into the PoA Distribution and Monitoring Database was linked to a distribution date (recorded during distribution). Thus for any monitoring period it is possible to calculate the period of time that the stoves included in the emissions reduction calculations for that period have been operating..</p> <p>The recording of the sales date was done in a regular basis during the crediting period and the monitoring on an annual basis.</p>

Calculation method (if applicable)	Average of all stove records in the CPA Distribution Records.
QA/QC procedures	The CME was responsible for overseeing the collection of data by DOs during distribution, training the DOs in correct data recording practices, maintaining a secure Database, and back up of files contained in the Database.
Purpose of data	Calculation of baseline emissions
Additional comments	-

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

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A single sampling plan covering all specific-case CPAs covered in this monitoring report has been undertaken to estimate parameter values, therefore, this section is not applicable. Refer Section B.2 and the ER calculation spreadsheet.

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

>>

$$ER_y = B_{y,savings} \cdot f_{NRB} \cdot NCV_{biomass} \cdot EF_{projected\ fossil\ fuel}$$

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

$$B_{old} = LAF \cdot N_{all} \cdot SOF \cdot \left(Q_{biomass} - \left(\frac{\mu_{old}}{1000} \cdot f_{old}\right)\right) \cdot Stove_{year}$$

Data Ex Ante	Value	Unit	Source	
Q _{biomass} (charcoal)	4.36	tonne/year	Ex-ante, CPA-DD	
Q _{biomass} (Firewood)	-			
f _{NRB}	0.9949	fractio	Ex-ante, CPA-DD	
NCV _{biomass}	0.015	TJ/tonne	Ex-ante, CPA-DD	
EF _{fossil_fuel}	81.6	tCO2/TJ	Ex-ante, CPA-DD	
Efficiency _{old} (charcoal)	0.101	fraction	Ex-ante, CPA-DD	
Efficiency _{old} (firewood)	-			
LAF	0.95	fraction	Ex-ante, CPA-DD	
Data Ex Post	Value	Unit	Source	
Monitored				
Efficiency _{new} CH2200	33.26%	%	Monitored - "WBT data"	
Efficiency _{new} CH2300	33.56%	%	Monitored - "WBT data"	
Efficiency _{new} CH5200	35.34%	%	Monitored - "WBT data"	
SOF	0.875	fraction	Monitored - "Monitoring Survey"	
f _{old}	0.187	fraction	Monitored - "Monitoring Survey"	
μ _{old}	2204	kg/year	Monitored - "Monitoring Survey"	
Data Ex Post	5342-00001	5342-00003	Unit	Source
N _{CH2200}	2131	0	number	Monitored - "CPA Distribution data"
N _{CH2300}	7030	4683	number	Monitored - "CPA Distribution data"
N _{CH5200}	0	562	number	Monitored - "CPA Distribution data"
N _{all}	9161	5245	stoves	Calculated
STOVE _{year}	1.00	0.97	fraction	Calculated
Efficiency _{new}	33.49%	33.75%	%	Calculated
B _{old}	30065.74	16624.40	t biomass	Calculated
B _{y,savings}	20997.71	11649.11	t biomass	Calculated
Annual Energy savings	87.49	50.26	GWh	Calculated
Scale?	Micro	Small	-scale	
Capacity Utilization	1.46	0.28		Calculated
CPA-DD ER cap	15477	47008	tCO2e	calculated
ER _y	15477	14185	tCO2e	Calculated

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

>>

As explained above, the methodology directly provides equation for emission reductions; without separate baseline, project or leakage emission reduction equations. Calculation of Emission Reductions has already been explained above as per the methodology. Thus, this section is not applicable

H.3. Calculation of leakage

>>

As explained above, the methodology directly provides equation for emission reductions; without separate baseline, project or leakage emission reduction equations. Calculation of Emission Reductions has already been explained above as per the methodology. Thus, this section is not applicable.

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
5342-00001	15,477	0	0	0	15,477	15,477
5342-00002	0	0	0	0	0	0
5342-00003	14,185	0	0	0	14,185	14,185
Total	29,662	0	0	0	29,662	29,662

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
5342-00001	15,477	15,477
5342-00002	47,008	0
5342-00003	47,008	14,185
Total	109,493	29,662

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

>>

There is no increase in the GHG emission reductions or net GHG removals by sinks achieved by the specific-case CPA(s) during this monitoring period.

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.
Street/P.O. Box	109 N Colleague Ave Suite 200
Building	-
City	Fort Collins
State/Region	Colorado
Postcode	CO 80524
Country	United States of America
Telephone	-
Fax	+1 970 221-1550
E-mail	-
Website	www.envirofit.org
Contact person	Nathan Lorenz
Title	Vice-president - Engineering
Salutation	-
Last name	Lorenz
Middle name	-
First name	Nathan
Department	-
Mobile	-
Direct fax	+1 970 221-2874
Direct tel.	+1 970 372-2874
Personal e-mail	nathan.lorenz@envirofit.org

Coordinating/managing entity and/or responsible person/entity	<input type="checkbox"/> Coordinating/managing entity <input checked="" type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
Organization name	Envirofit International Ltd.
Street/P.O. Box	109 N Colleague Ave Suite 200
Building	-
City	Fort Collins
State/Region	Colorado
Postcode	CO 80524
Country	United States of America
Telephone	-
Fax	+1 970 221-1550
E-mail	
Website	
Contact person	Rohit Lohia
Title	Carbon Project Development Manager
Salutation	Mr
Last name	Lohia
Middle name	-

First name	Rohit
Department	-
Mobile	-
Direct fax	-
Direct tel.	-
Personal e-mail	rohit.lohia@envirofit.org

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