



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)	African Improved Cooking Stoves Programme of Activities	
UNFCCC reference number of the PoA	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	2.2	
Completion date of this monitoring report	27/01/2017	
Monitoring period number and dates covered by this monitoring report	Monitoring period: 03 25/10/2014 - 24/10/2015	
Monitoring report number for this monitoring period	2	
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	No
	Nigeria	Yes
	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	20,040

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)
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	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 report? (yes/no)

5342-0001	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	No
5342-0002		01 Nov 2013 - 31 Oct 2023	No
5342-0003		01 Dec 2013 – 30 Nov 2023	No
5342-0004		25 Oct 2014 – 24 Oct 2024	Yes
5342-0005		25 Oct 2014 – 24 Oct 2024	Yes
5342-0006		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:

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Rohit Lohia
 Carbon Projects Development Manager
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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
5342-0004	Envirofit International	Implemented
5342-0005	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 dealers to collect the end user information at the time of sales to make the stove eligible under the PoA. Envirofit made them aware of requirements of end user data collection. Guidance was provided to them 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 CPA wise list of stoves sales, based on following information, received from dealers (collected this information at the time of sale):
 - 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 – wood or charcoal.
3. Envirofit performed cross-checks on the ICS sales information received from the dealers. 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 / stove boxes.
5. Envirofit coordinated all ex-post monitoring activities in the PoA as follows:
 - 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)
 - d. Used this data for emissions reduction calculations.
6. Envirofit checked and recorded the following key parameters in a CPA Monitoring Record. Key monitored parameters were:
 - a. Efficiency of project stoves ($\eta_{new,y}$)
 - 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 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 this monitoring report 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
5342-0005	Small	Charcoal	6,134	25/10/2014 – 24/10/2015
5342-0004	Small	Woodfuel	847	25/10/2014 – 24/10/2015

b) 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	$\eta_{new,y}$	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 CPAs 5342-0004 & 5342-0005, 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 PoA-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. Nigeria	homogeneous
Fuel Type – charcoal / wood fuel	There are two fuel type in the population: Charcoal and woodfuel.	Charcoal stoves have been considered as one sampling frame and wood fuel stove have been considered as other sampling frame.
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	There is only one model under each sampling frame (for charcoal it is CH2300 and for woodfuel it is M5000)	homogeneous

The initial target population were the stoves distributed and recorded under CPA 5342-0004 and 5342-0005. The population was divided into two sampling frames based on fuel type. Simple Random Sampling approach was applied in each sampling frame separately to monitor the three parameters i.e. stove operation (SOF), fraction of traditional stoves still in operation (f_{old}) and amount of woody biomass that continues to be used by the replaced stoves (μ_{old}). Thus, the sample size calculations for parameters SOF, f_{old} , μ_{old} were calculated considering PoA population under two sampling frames.

The following is the number of samples covered during the monitoring activity. The required sample sizes mentioned below have been derived using equation (1) on page 68 and equation (4) on page 70 of the Guideline: Sampling and surveys for CDM project activities and programmes of activities, Version 04.0 for proportion based and mean based parameters respectively as follows:

$$n = \frac{z^2 \cdot N \cdot V}{(N - 1) \cdot c^2 + z^2 \cdot V}$$

$$V = \left(\frac{SD}{Mean}\right)^2 \text{ for mean parameters}$$

$$V = p \cdot (1 - p) / p^2 \text{ for proportion parameters}$$

Where:

n = sample size

N = population size

z = Confidence value constant (1.96 for 95%)

c = Desired precision (10%)

SD = expected standard deviation for mean parameter

$Mean$ = expected mean for mean parameter

p = expected proportion for proportion based parameter

Refer ER calculator worksheet 'Sample Size Calculations' 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 "Standard: Sampling and surveys for CDM project activities and programmes of activities", Version 05.0 available at:

https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20151023110717966/meth_stan05.pdf

Parameter	Total population (N)	Expected results	Reliability	Required Sample Size (n)	Monitored samples
$\eta_{new,y}$ CH2300	6134	31.0% (mean); 3.1% (SD)	95/10	7	9
$\eta_{new,y}$ M5000	847	29.0% (mean); 2.9% (SD)	95/10	7	10
SOF _{CH2300}	6134	90%	95/10	43	60
SOF _{M5000}	847	90%	95/10	41	61
f_{old} CH2300	5521	90%	95/10	43	57
f_{old} M5000	762	90%	95/10	41	58
μ_{old} CH2300	552	450 kg (mean); 45.0 kg (SD)	95/10	7	0 ¹
μ_{old} M5000	76	494 kg (mean); 49.4 kg (SD)	95/10	7	8

The stoves were selected by randomly assigning a number to each stove and sorting in increasing order from lower to higher number. 75 Random numbers were generated using online random number generator for each sampling frame 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}

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

Data was collected for SOF, f_{old} and μ_{old} following a specially design 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 form field visit for the ER calculations. In order to achieve the 95/10 reliability level for cross-CPA sampling few additional stoves were sampled from the database than that required (as mentioned in the table above) to cover for non responses, if any.

¹ μ_{old} CH2300 is used to determine the usage of baseline stove along with ICS, if applicable, for discounting B_{old} in line with para 20(b) of methodology AMS II.G. version 3.0 . This parameter is to be monitored only when the sampled users are found using baseline stoves along with ICS. In case of CH2300 all samples monitored were found using ICS only and no sample was found using baseline stove along with ICS. Hence the parameter μ_{old} CH2300 is not relevant for the concerned monitoring period and need not be monitored. Initially the sample size for μ_{old} CH2300 was calculated based on an initial assumption of f_{old} as 10% (i.e. 10% pf users might be using baeline stove and ICS together). However, as the monitoring revealed that baseline stove users do not exist, the parameter is redundant for the concerned monitoring period.

As for the thermal efficiency of the stoves, water boiling tests were conducted using WBT as given by GACC. Refer ER calculator worksheet “Survey summary” and “WBT Summary” for details on data collected during monitoring. Those involved in field survey monitoring were adequately trained to ensure that the surveys are performed correctly. The WBTs were carried out by in-house experts with prior experience of conducting WBTs.

d) Analysis of the collected data;

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

Parameter	Results	Unit
$\eta_{\text{new,y CH2300}}$	32.35	%
$\eta_{\text{new,y M5000}}$	28.64	%
SOF _{CH2300}	0.950	fraction
SOF _{M5000}	0.951	fraction
$f_{\text{old - CH2300}}$	0.000	fraction
$f_{\text{old - M5000}}$	0.138	fraction
$\mu_{\text{old - CH2300}}$	0.000	kg / year
$\mu_{\text{old - M5000}}$	136.9	kg / year

e) 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:

$\eta_{\text{new,y CH2300}}$	32.35%	percentage	Calculated
total number of stoves	6134	number	CPA Installation Databases
Samples monitored for ($\eta_{\text{new CH2300}}$)	9	number	WBT data
Mean	32.3%	percentage	Calculated
Standard Deviation	1.15%	percentage	Calculated
Standard error of mean ($\eta_{\text{new CH2300}}$)	0.38%	percentage	Calculated
Precision for $\eta_{\text{new CH2300}}$	2.31%	percentage	Calculated
Result for $\eta_{\text{new CH2300}}$	ok, acceptable	--	Calculated

$\eta_{\text{new,y M5000}}$	28.64%	percentage	Calculated
total number of stoves	847	number	CPA Installation Databases
Samples monitored for ($\eta_{\text{new M5000}}$)	10	number	WBT data
Mean	28.6%	percentage	Calculated
Standard Deviation	0.72%	percentage	Calculated
Standard error of mean ($\eta_{\text{new M5000}}$)	0.23%	percentage	Calculated
Precision for $\eta_{\text{new M5000}}$	1.55%	percentage	Calculated
Result for $\eta_{\text{new M5000}}$	ok, acceptable	--	Calculated

SOF _{CH2300}	0.950	fraction	Calculated
Population Size	6134	number	CPA Installation Databases
Samples monitored	60	number	Calculated
Proportion for SOF _{CH2300}	0.950	fraction	Calculated
Standard error of proportion for SOF _{CH2300}	2.80%	percentage	Calculated
Precision for SOF _{CH2300}	5.78%	percentage	Calculated
Result for SOF _{CH2300}	ok, acceptable	--	Calculated

SOF _{M5000}	0.951	fraction	Calculated
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Population Size	847	number	CPA Installation Databases
Samples monitored	61	number	Calculated
Proportion for SOF _{M5000}	0.951	fraction	Calculated
Standard error of proportion for SOF _{M5000}	2.67%	percentage	Calculated
Precision for SOF _{M5000}	5.50%	percentage	Calculated
Result for SOF _{M5000}	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 $f_{\text{old}} = 1 - f_{\text{non old}}$.

$f_{\text{old CH2300}}$	0.000	fraction	Calculated
Population Size	5827	number	CPA Installation Databases
Samples monitored	57	number	Calculated
Proportion for $f_{\text{non old CH2300}}$	1.000	fraction	Calculated
Standard error of proportion for $f_{\text{non old CH2300}}$	0.00%	percentage	Calculated
Precision for $f_{\text{non old CH2300}}$	0.00%	percentage	Calculated
Result for $f_{\text{non old CH2300}}$	ok, acceptable	--	Calculated

$f_{\text{old M5000}}$	0.138	fraction	Calculated
Population Size	805	number	CPA Installation Databases
Samples monitored	58	number	Calculated
Proportion for $f_{\text{non old M5000}}$	0.862	fraction	Calculated
Standard error of proportion for $f_{\text{non old M5000}}$	4.36%	percentage	Calculated
Precision for $f_{\text{non old M5000}}$	9.92%	percentage	Calculated
Result for $f_{\text{non old M5000}}$	ok, acceptable	--	Calculated

$\mu_{\text{old CH2300}}$	0.000	tonnes/year	Calculated
Population Size	0	number	CPA Installation Databases
Samples monitored	0	number	Calculated
Mean for $\mu_{\text{old CH2300}}$	not applicable	tonnes/y	Calculated
Standard Deviation $\mu_{\text{old CH2300}}$	not applicable	tonnes/y	Calculated
Standard error of mean $\mu_{\text{old CH2300}}$	not applicable	percentage	Calculated
Precision for $\mu_{\text{old CH2300}}$	not applicable	percentage	Calculated
Result for $\mu_{\text{old CH2300}}$	not applicable	--	Calculated

$\mu_{\text{old M5000}}$	0.1369	tonnes/year	Calculated
Population Size	111	number	CPA Installation Databases
Samples monitored	8	number	Calculated
Mean for $\mu_{\text{old M5000}}$	0.14	tonnes/y	Calculated
Standard Deviation $\mu_{\text{old M5000}}$	0.02	tonnes/y	Calculated
Standard error of mean $\mu_{\text{old M5000}}$	0.57%	percentage	Calculated
Precision for $\mu_{\text{old M5000}}$	8.25%	percentage	Calculated
Result for $\mu_{\text{old M5000}}$	ok, acceptable	--	Calculated

For detailed calculations refer ER calculator, worksheet 'Survey Summary' and 'WBT Summary'.

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

Stoves were selected by randomly after arranging them in chronological order of date of sale and assigning a number to each stove. 75 Random numbers were generated using online random number generator available at <http://stattrek.com/statistics/random-number-generator.aspx> for each sampling frame and the random numbers received were selected from sampling frames to identify the samples to the 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 two CPAs i.e. 5342-0004 and 5342-0005 included in Nigeria. 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 both the 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 Nigeria. 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 Nigeria.

(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	Total number of stoves installed
5342-0004	Wood Fuel	M5000	847
5342-0005	Charcoal	CH2300	6134

The stove model referred above are shown below:



Figure 1: M5000 - Woodfuel stove



Figure 2: CH2300 - Charcoal stove

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. M5000 is a woodfuel stove and CH2300 is a charcoal stove.

#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-DDs for CH2300 and M5000.
#11	SSC Limit for CPAs	<p>The annual energy savings of each CPA shall not go beyond the limits of 180 GWh_{th}/year over the entire crediting period.</p> <p>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.</p>	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 'ER Calculations' which calculates the annual energy savings in CPAs 5342-0004 and 5342-0005. Both, CPAs remain within the small-scale threshold during the monitoring period.

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	CPA 5342-0004	CPA 5342-0005	Reference
Start Date	28/12/2012	28/12/2012	Respective CPA-DD
Date of first stove sale in database	06/02/2013	09/01/2013	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
CPA00004	2,423
CPA00005	17,617
Total	20,040

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 '5342-0004 Distribution data' and '5342-0005 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: Nigeria

Region/State/Province: All across Nigeria

City/Town/Community: All across Nigeria

Physical Geographical location: End user households across Nigeria

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

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Not Applicable

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

>>

Not Applicable

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

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Not Applicable

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

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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 Envirofit directly or via dealers sub-contracted. Any such third parties were trained by Envirofit for ensuring correct procedures according to the PoA are fulfilled.

At the CPA level, Envirofit 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:

- Name of customer
- Address / location of the customer
- Stove unique serial ID number
- Stove Model
- Stove distribution date
- Type of old stove which the ICS replaced, i.e. the fuel type – wood or charcoal.

All other monitoring activities have been carried out at the PoA level, single stage sampling plan.

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	4.50 for CPA 0005 which includes CH2300 4.94 for CPA 0004 which includes M5000
Choice of data or measurement methods and procedures	As per registered CPA-DD for 5342-0004 and 5342-0005
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 using national or local statistics, survey results, studies, maps or other sources of information, such as remote-sensing data.
Source of data	As per registered CPA-DD for 5342-0004 and 5342-0005
Value(s) applied	0.93
Choice of data or measurement methods and procedures	As per registered CPA-DD for 5342-0004 and 5342-0005
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	2006 IPCC guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.015
Choice of data or measurement methods and procedures	As per registered CPA-DD for 5342-0004 and 5342-0005

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	2006 IPCC guidelines for National Greenhouse Gas Inventories
Value(s) applied	81.6
Choice of data or measurement methods and procedures	As per registered CPA-DD for 5342-0004 and 5342-0005
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	0.106
Choice of data or measurement methods and procedures	As per registered CPA-DD for 5342-0004 and 5342-0005
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 for 5342-0004 and 5342-0005
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	$\eta_{new,y}$
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	Stove model	Value (%)	Comment
	CH2300	32.35%	Applicable to CPA0005
	M5000	28.64%	Applicable to CPA0004
Monitoring equipment	<p>Mini-thermometer: Brand: Omega Model: Omegaette HH308 Type K Accuracy: +/- 0.3% reading +1°C Number of units: 1 S/N:141203660</p> <p>Mass balance Brand: LW Measurements Model: MCT-33 Plus Accuracy: +/- 2 division, +/- 0.002 lbs Number of units: 1 S/N: MCP1408033</p> <p>Moisture Meter Brand: Delmhorst Model: J2000 Accuracy: +/- 0.2% Number of units: 1 S/N: 38784</p> <p>These equipment were either newly purchased thereby not requiring calibration or were auto calibrated at the time of use so measurements were done with the necessary guarantees.</p>		
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	Stove model	Value (number)	Comment
	CH2300	6134	Applicable to CPA0005
	M5000	847	Applicable to CPA0004
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	Stove model	Value (fraction)	Comment
	CH2300	0.950	Applicable to CPA0005
	M5000	0.951	Applicable to CPA0004
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)	57 out of 60 samples for CH2300 were found to be in operation 58 out of 61 samples for M5000 were found to be in operation		
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	Stove model	Value (fraction)	Comment
	CH2300	0.000	Applicable to CPA0005
	M5000	0.138	Applicable to CPA0004
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>Sampling estimated the value of this parameter through monitoring the fraction of end users not using baseline stoves ($f_{\text{non,old}}$),</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, the fraction of users not using the baseline stoves ($f_{\text{non,old}}$) has been monitored. Then f_{old} has been calculated as $1 - f_{\text{non,old}}$
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	<p>0 out of 57 samples were found using CH2300 and baseline stove together</p> <p>8 out of 58 samples were found using M5000 and baseline stove together</p>

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	<table><tr><th>Stove model</th><th>Value (kg/year)</th><th>Comment</th></tr><tr><td>CH2300</td><td>0.000</td><td>Applicable to CPA0005</td></tr><tr><td>M5000</td><td>136.9</td><td>Applicable to CPA0004</td></tr></table>	Stove model	Value (kg/year)	Comment	CH2300	0.000	Applicable to CPA0005	M5000	136.9	Applicable to CPA0004
Stove model	Value (kg/year)	Comment								
CH2300	0.000	Applicable to CPA0005								
M5000	136.9	Applicable to CPA0004								
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 before and after buying ICS.</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-DDs, this parameter has been calculated by multiplying the Total Annual Fuel Consumption, $Q_{biomass}$, 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	The parameter value for CH2300 is deemed as zero as during monitoring, none of the CH2300 sampled user were found using baseline stoves i.e. $f_{old\ CH2300} = 0$
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Data/parameter	Stove _{year}									
Unit	Year									
Description	Calculated average stove operation years in the monitoring period. If stoves have been operating for 365 days then Stove _{year} = 1.0. If less than 365 days, then Stove _{year} is represented as a fraction of 365 (eg. 180 days= 0.5).									
Measured/calculated/default	Calculated									
Source of data	PoA Distribution and Monitoring Database									
Value(s) of monitored parameter	<table><tr><th>Stove model</th><th>Value (fraction)</th><th>Comment</th></tr><tr><td>CH2300</td><td>0.92</td><td>Applicable to CPA0005</td></tr><tr><td>M5000</td><td>0.90</td><td>Applicable to CPA0004</td></tr></table>	Stove model	Value (fraction)	Comment	CH2300	0.92	Applicable to CPA0005	M5000	0.90	Applicable to CPA0004
Stove model	Value (fraction)	Comment								
CH2300	0.92	Applicable to CPA0005								
M5000	0.90	Applicable to CPA0004								
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

>>

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

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

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

Data Ex Ante	Value	Unit	Source	
$Q_{\text{biomass (CH2300)}}$	4.50	tonne/year	Ex-ante, PoA-DD / CPA-DDs	
$Q_{\text{biomass (M5000)}}$	4.94	tonne/year	Ex-ante, PoA-DD / CPA-DDs	
f_{NRB}	0.93	fraction	Ex-ante, PoA-DD / CPA-DDs	
NCV_{biomass}	0.015	TJ/tonne	Ex-ante, PoA-DD / CPA-DDs	
$EF_{\text{fossil_fuel}}$	81.6	tCO2/TJ	Ex-ante, PoA-DD / CPA-DDs	
$\eta_{\text{old CH2300}}$	0.106	fraction	Ex-ante, PoA-DD / CPA-DDs	
$\eta_{\text{old M5000}}$	0.106	fraction	Ex-ante, PoA-DD / CPA-DDs	
LAF	0.95	fraction	Ex-ante, PoA-DD / CPA-DDs	
Data Ex Post	Value	Unit	Source	
Monitored				
$\eta_{\text{new CH2300}}$	32.35%	percentage	WBT Summary	
$\eta_{\text{new M5000}}$	28.64%	percentage	WBT Summary	
SOF_{CH2300}	0.950	fraction	Survey Summary	
SOF_{M5000}	0.951	fraction	Survey Summary	
$f_{\text{old CH2300}}$	0.000	fraction	Survey Summary	
$f_{\text{old M5000}}$	0.138	fraction	Survey Summary	
$\mu_{\text{old CH2300}}$	0.000	kg/year	Survey Summary	
$\mu_{\text{old M5000}}$	136.90	kg/year	Survey Summary	
Data Ex Post	CPA0004	CPA0005	Unit	Source
N_{all}	847	6134	stoves	Calculated
$STOVE_{\text{year}}$	0.90	0.92	fraction	Calculated
η_{new}	28.64%	32.35%	percentage	Calculated
B_{old}	3379.34	23019.77	t biomass	Calculated
$B_{\text{y,savings}}$	2,128.7	15,476.9	t biomass	Calculated
Total Annual Energy savings	8.87	64.49	GWh	Calculated
Scale?	Small	Small	-scale	Calculated
Capacity Utilization	5%	36%		Calculated
ER_{v}	2,423	17,617	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 by application of Gross to Net Leakage adjustment factor of 0.95 to baseline emissions. 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
5342-0004	2,423	0	0	0	2,423	2,423
5342-0005	17,617	0	0	0	17,617	17,617
Total	20,040	0	0	0	20,040	20,040

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
5342-0004	44,159	2,423
5342-0005	44,159	17,617
Total	88,318	20,040

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
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Postcode	CO 80524
Country	United States of America
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Contact person	Rohit Lohia
Title	Carbon Project Development Manager

Salutation	Mr
Last name	Lohia
Middle name	-
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01.0	1 April 2015	Initial publication.
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