



**Monitoring report form
(Version 04.0)**

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

MONITORING REPORT

Title of the project activity	PoA: Clean Cook Stoves in Sub-Saharan Africa by ClimateCare Limited
Reference number of the project activity	PoA: 8438 CPA: 8438-0001
Version number of the monitoring report	7.0
Completion date of the monitoring report	16/12/2014
Registration date of the project activity	30/11/2012
Monitoring period number and duration of this monitoring period	01 01/01/2013 to 31/03/2014
Project participant(s)	CookClean Ghana Limited (Project Developer) ClimateCare Limited (CME).
Host Party(ies)	Ghana
Sectoral scope and selected methodology(ies), and where applicable, applied standardized baseline(s)	3 : Energy demand AMS-II.G. ver. 4 - Energy efficiency measures in thermal applications of non-renewable biomass
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	CPA01: 84,020 tCO ₂ e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	CPA01: 20,689 tCO ₂ e Total PoA: 20,689 tCO ₂ e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period up to 31 December 2012(if applicable)	CPA01: 0 tCO ₂ e Total PoA: 0 tCO ₂ e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period from 1 January 2013 onwards (if applicable).	CPA01: 20,689 tCO ₂ e Total PoA: 20,689 tCO ₂ e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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a) Description of the CPA

The CookClean Ghana Limited --CPA01 is a component of the Programme of Activities (PoA); "Clean Cook Stoves in Sub-Saharan Africa by ClimateCare Limited". The purpose of this CPA is to promote the use of efficient charcoal stoves (ECS) which provide the same service with significantly less fuel use than the charcoal stoves in common use (Baseline stoves) in Ghana, the project host. The CPA aims to establish regular use of efficient charcoal stoves (ECS) by distributing ECS in Ghana. The adoption and usage of the improved cook-stoves therefore constitutes the project scenario.

Under this CPA, CookClean Ghana Limited, acting as the Programme Activity Implementer (PAI), has adapted an appropriate ECS design, the CookMate, which it manufactures, creates market awareness of it, distributes and sells on a commercial basis through appropriate agents developed by the company in Ghana. The company also collects and stores stoves sales data and maintains the Sales Database (as described in the registered PoA-DD and CPA-DD) while providing the after sales service to the users. The PAI acts individually, running the project in accordance with the demand of the local market.

CookClean Ghana Limited has set up and applies procedures, appropriate records and documentation control process to assert legal rights of the carbon credits generated and to avoid double counting. Through a Warranty Card system, CookClean Ghana Limited transfers the information of each ECS sold to the Sales Database, and this ensures that no ECS is counted more than once under the CPA as per the registered PoA-ADD. The Sales Database also serves as the basis for the calculation of CERs.

Accordingly, the PAI will use the CER proceeds to reduce costs of ECS to users, provide maintenance and recoup associated costs for the dissemination of the stoves, such as the development of the supply chain personnel and systems, marketing activities and building new manufacturing units.

There are no laws, policies or mandatory requirements in Ghana, stipulating the adoption of efficient charcoal cook-stoves. This CPA is a voluntary action by CookClean Ghana Limited.

b) Technical description of the CPA

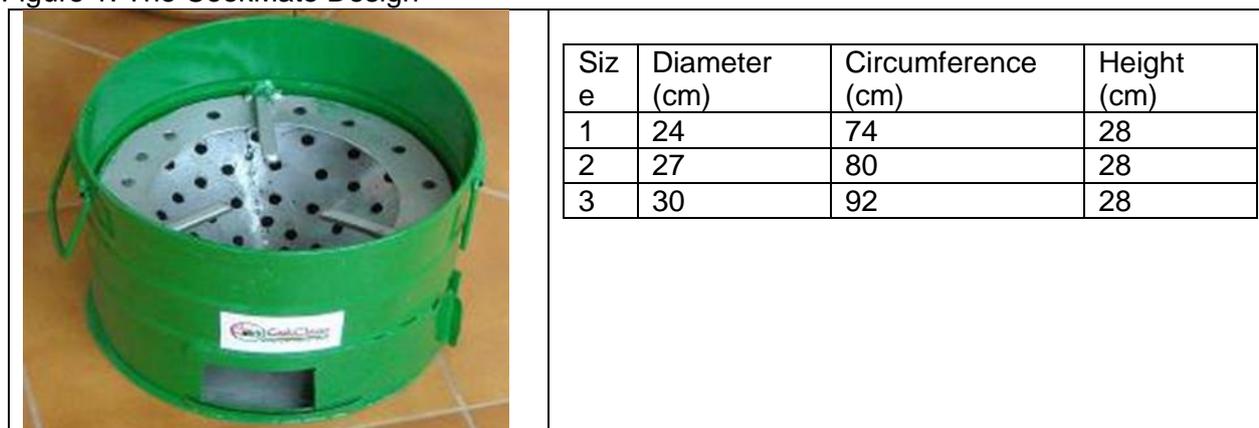
The principal design of the CookMate stove features a pot-skirt and a conical grate, or some other technologically equivalent design feature that improves charcoal stoves efficiency and their demand.

The main stove design is an adaptation of the Pulamusa stove developed by ProBEC in Zambia after extensive research into the manufacturing of energy efficient stoves and other thermal technologies. The stoves are constructed by local trained technicians working mostly in centralised manufacturing workshops operated and managed by CookClean Ghana Limited. For durability (up to 4 years average lifetime), the stoves are made of Galvanised/Mild Steel Plate and are produced in three sizes.

The ECSs are more efficient than traditional charcoal stoves as they reduce the heat loss. Water boiling tests carried out on CookMate in September 2014 have shown that it has an average thermal efficiency of about 36%, however, for ER calculations, each stove size has applied its average efficiency after subjecting them to statistical analysis.

During the life of the project, research and development work may result in more efficient ECS designs, subject to the appropriate tests proving real and measurable quantity of charcoal saved.

Figure 1: The CookMate Design



During this monitoring period, this CPA has sold 11,334 ECSs and the annual energy saving per stove is estimated at 0.34Wh_{th}, therefore this CPA has contributed to a total energy saving of about 20.35 GWh_{th} during the monitoring period. The total energy saved by the small scale project is therefore below the 180 GWh_{th} energy small scale energy saving threshold.

The baseline scenario is the same as the existing scenario where the same amount of household energy needs is met through the traditional coal pot, used in most urban areas of Ghana.

c) Relevant dates for the project activity

The following are the key relevant milestones of the project activity.

1. Programme of activity (PoA) registered: 30/11/2012
2. Installation of stove manufacturing equipment: October 2012
3. Stove production; November 2012
4. Factory relocation and equipment upgrade: December 2013
5. Cutting and punching machine breakdown: January 2014

(d) Total GHG emission reductions achieved in this monitoring period.

During this monitoring period, the project activity achieved 20, 689 tCO_{2e}.

A.2. Location of project activity

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- a) Host Party(ies): Ghana
- b) Region/ State/ Province: Geographical boundary of the country of Ghana
- c) City/ Town/ Community: Geographical boundary of the country of Ghana
- d) Physical/ Geographical location: 8° 00' N, 2° 00' W

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Ghana (host)	CookClean Ghana Limited (private) ClimateCare Limited (CME) (private)	No

A.4. Reference of applied methodology and standardized baseline

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The project applies the methodology AMS-II.G. ver. 4 - Energy efficiency measures in thermal applications of non-renewable biomass.

A.5. Crediting period of project activity

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The project applies a renewable crediting period.

Start of crediting: 01/01/2013.

End of crediting: 31/12/2019.

Length: 7 years and 0 months

A.6. Contact information of responsible persons/ entities

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Telephone	+44 (0) 1534 888 777
Fax	N/A
E-mail	mail@climatecare.org
Website	www.climatecare.org
Contact person	Tom Morton
Title	Director
Salutation	Mr.
Last name	Morton
Middle name	S.D.
First name	Tom
Department	Management
Mobile	+254 (0) 728 218 183
Direct fax	N/A
Direct tel.	+254 (0) 20 213 3604
Personal e-mail	tom.morton@climatecare.org

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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(a) Information on the implementation status of the project activity during this monitoring period

During this monitoring period, only one CPA (CookClean Ghana Limited-CPA01) has been included in this PoA and only one monitoring report has been prepared for the monitoring period. The CPA is in operation and continues to manufacture and sell stoves to users. The CPA implementer is responsible for managing the supply chain for the sale and for offering after-sales service to the stove users.

The CPA follows the CME's monitoring plan and procedures for identifying CookClean stoves manufactured and sold during the course of the project and those that are still in use. The stove is engraved with a serial number for identification. The data collected is tabulated and analysed before it's used for the calculation of emission reductions.

Each stove produced has a serial number engraved on it. During sale, the serial number of the stove, the date of sale and the place of sale are captured. The records are then forwarded to the main office for recording and safe keeping.

(b) Project implementation status

The project started implementation (operation) in November 2012 and it has up-scaled the production of stoves. The project has also expanded and recruited retailers in several parts of Greater Accra and Central regions of Ghana.

The project manufactures three stove sizes i.e. Size 9", Size 11" and Size 12". The number of stoves manufactured and sold are show in the table below:

Month	Stoves Manufactured and Sold	Cumulative Stoves
Year 2012	138	138
Jan-13	320	458
Feb-13	246	704
Mar-13	346	1,050
Apr-13	250	1,300
May-13	841	2,141
Jun-13	778	2,919
Jul-13	906	3,825
Aug-13	1306	5,131
Sep-13	926	6,057
Oct-13	1074	7,131
Nov-13	775	7,906
Dec-13	644	8,550
Jan-14	679	9,229
Feb-14	770	9,999
Mar-14	1,335	11,334
Total	11,334	

The CookClean stove is manufactured in Ghana where the project implementer has set up a factory to manufacture the stoves. The stoves are manufactured and sold under the brand name CookMate.

(c) Information regarding PoAs

Only one monitoring report is being submitted for this monitoring period covering CPA0001 only.

No events have had an impact on the applicability of the applied methodology and there has been no requests for prior approval by the Board had been submitted.

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

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No request for deviation has been applied for this monitoring period.

B.2.2. Corrections

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No corrections have been made.

B.2.3. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

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There are no permanent changes from the registered monitoring plan or applied methodology.

B.2.4. Changes to project design of registered project activity

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There are no changes to the project design of the registered project activity.

B.2.5. Changes to start date of crediting period

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There are no changes to the start date of the crediting period.

B.2.6. Types of changes specific to afforestation or reforestation project activity

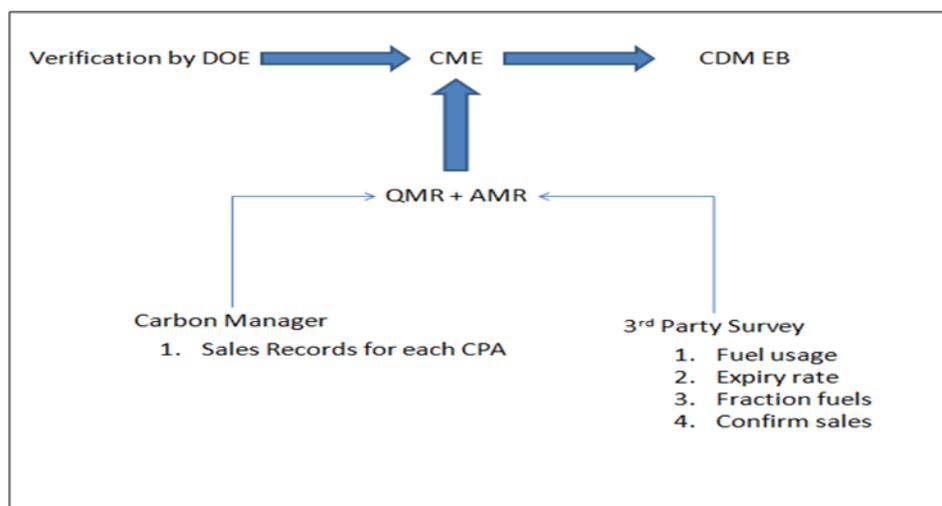
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N/A.

SECTION C. Description of monitoring system

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The monitoring of the operations of the CPA follows guidance outlined in the PoA. The CME is the overall coordinator and all the information flows thorough to CME as outlined in the diagram below:



The monitoring system in place established by the project follows the guidance provided in the “Standard for sampling and surveys for CDM project activities and Programme of Activities”, Version 02.0 and the applied methodology AMS II.G, version 04.0. The step-wise monitoring system employed is discussed below:

(a) Sales Records

The number of stoves manufactured and sold are monitored through the Sales Database. The database is maintained electronically (excel file) by CookClean Ghana Limited and is periodically

checked by the CME to ensure that no double counting occurs. The database contains the following information:

1. Customer/Client name
2. Stove size
3. Stove sale date
4. Stove serial number
5. CPA number
6. Agent/retailer name and location
7. User location
8. Contact details of user

The above information is further maintained by the CME who verify the reported sales with the number of stoves produced by the manufacturer. Since the unique code (serial number) inscribed on the cook stoves correspond to its CPA, it's possible to trace the stove from the users back to the production process and this assures against the occurrence of double counting.

(b) Monitoring Efficiency

The efficiency of representative sample of all stoves under the CPA has been determined by sampling and testing the sampled CPA stoves for efficiency in order to ensure that the stoves are still operating at the specified efficiency or that they are replaced by an equivalent service stove. This is done as per paragraph 15 of the methodology. In addition, the number of stoves which are in operation are also monitored every 2 years as per paragraph 16 of the methodology through a representative sample.

The responsibility for monitoring the efficiency of the stoves for the CPA lies with CookClean Ghana Limited (project implementer) with close supervision by the CME (ClimateCare). During this monitoring period, the average efficiencies of High Power (Cold Start), High Power (Hot Start) and Low Power (Simmer) was determined during the WBTs carried out by the Institute of Industrial Research (IIR) of the Council for Scientific and Industrial Research (CSIR) in Ghana in September 2014.

Although the monitoring of efficiency was to be done annually, the test was only done once to cover for the monitoring period which runs from 1st Jan 2013 to 30th March 2014. The registered CPA-DD required an annual testing of the efficiency and it was not possible to carry out the test within the monitoring period and instead, the test were done in the third quarter of 2014. However, the stoves which are being distributed by the project are manufactured as per the design registered in the CPA-DD and the manufacturing is done in the factory which was established by the project developer. The factory only manufactures the CookMate stove only and all the stoves manufactured are for the project only. The material sourcing is done by project developer and the quality for the materials and the production is the same and it's ensured for consistency. The stove are also coated/sprayed with ant rust and heat resistant paint. Since the design is done by project developer factory and the same design specifications are same, the performance of the stove is expected to be the same and there would not be variations. The testing of the efficiency was therefore done using four randomly selected used stoves. The premise is that the stoves are done by one manufacturer using same materials and therefore will have similar performance.

The delay in timing of the test does not have any materiality change in emission reduction calculations since the lower values of the test results has been applied and this is considered to be more conservative.

(c) Monitoring quantity of woody biomass that is consumed by baseline stoves

As per the registered CPA-DD, the project applied option 2, equation 3 in determining the fuel savings, whereby the quantity of woody biomass that is consumed by baseline stoves in year y ($B_{old,y}$) is determined once for the CPA.

(d) Monitoring Ongoing Stove Usage

The percentage of CookMate stoves sold by the CookClean Ghana Limited which are no longer in use (Drop-Out Rate, (DO_y)) is determined through sampling on a biennial basis. The number of stoves in use have been adjusted by the Drop-Out Rate in order to determine the number of project stoves in use, (N_y) and to calculate the emission reductions. The drop off monitoring will be the responsibility of the CMC.

To ensure compliance with paragraph 16 of the methodology, during this monitoring period, the project developer surveyed 284 stove users through phone calls followed by home visits. Initially, ratified random sampling was carried out from the sales database but since most of the stoves sold in the monitoring period were for household use with negligible numbers of commercial and institutional users, the sampling did not generate enough samples for practical survey in the other strata apart from household stratum. All the samples were therefore treated as one stratum (household). The sample users were asked if they still used the efficient stove and also if they used any other stove in the household. The results were analysed statistically for 95% confidence interval and 10% precision. Through this, the DO_y was determined as 1.76% while the usage of alternative stove in the household was found to be negligible since those having alternative stoves constituted 1.76%. The detailed analysis are provided in Excel spreadsheet file "CookMate Stove Survey Results_140814.xlsx"

(e) Monitoring leakage:

The leakage calculation for the project applies the default adjustment factor of 0.95 as provided by the methodology, thereby eliminating the need for monitoring surveys

SECTION D. Data and parameters**D.1. Data and parameters fixed ex ante or at renewal of crediting period**

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

Data / Parameter:	η_{old}
Unit:	Fraction
Description:	Efficiency of the system being replaced, measured using representative sampling methods or based on referenced literature values (fraction)
Source of data:	Default value in AMS-II.G, vers 04.0
Value(s) applied:	0.10
Purpose of data:	Calculation of baseline emissions
Additional comment:	According to the methodology, 0.10 default value may be optionally used if the replaced system is the three stone fire or a conventional system lacking improved combustion air supply mechanism and flue gas ventilation system i.e. without a grate and without a chimney. The replaced systems in the project area is conventional system lacking improved combustion air supply mechanism and flue gas ventilation system.

Data / Parameter:	L_{POA}
Unit:	-

Description:	Net-to-gross adjustment factor for PoA Leakage
Source of data:	AMS-II.G; Version 04.0
Value(s) applied):	0.95
Purpose of data:	Calculation of leakage
Additional comment:	As per the methodology AMS II.G, vers. 04.0, a default value as provided under par. 22 is used to account for PoA leakage, in which case estimates of the leakage are not required.

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; vers. 04.0
Value(s) applied):	81.6
Purpose of data:	Calculation of baseline
Additional comment:	This is the IPCC default value specified in AMS II.G (vers. 04.0), paragraph 5

Data / Parameter:	$NCV_{biomass}$
Unit:	TJ/tonne
Description:	Net calorific value of the non-renewable woody biomass that is substituted
Source of data:	AMS-II.G; vers. 04.0
Value(s) applied):	0.015
Purpose of data:	Calculation of baseline
Additional comment:	This is the IPCC default value for non-renewable woody biomass that is substituted as specified in AMS II.G (vers. 04.0), paragraph 5.

D.2. Data and parameters monitored

Data / Parameter:	Annual energy saving per appliance
Unit:	GWh
Description:	Annual energy saving per appliance
Measured/ Calculated / Default:	Calculated
Source of data:	Calculated from average charcoal saving per stove ($B_{y,saving, appliance}$) and $NCV_{charcoal}$
Value(s) of monitored parameter:	0.0034
Monitoring equipment:	-
Measuring/ Reading/ Recording frequency:	Once, at the time of inclusion of a CPA into the PoA.
Calculation method (if applicable):	Calculated as product of $B_{y,saving, appliance}$, and $NCV_{charcoal}$ (taken as 0.0295 TJ/t) divided by the conversion factor (TJ/GWh taken as 3.6 from IPCC 2006 Tables)
QA/QC procedures:	Use of nationally approved source of data
Purpose of data:	Calculation of baseline emissions
Additional comment:	Used to verify that the de-bundling requirements are met

Data / Parameter:	Annual number of appliances to reach small scale threshold
Unit:	Number

Description:	Annual number of appliances to reach small scale threshold
Measured/Calculated / Default:	Calculated
Source of data:	Calculated from the annual energy saving per appliance
Value(s) of monitored parameter:	52,771
Monitoring equipment:	-
Measuring/Reading/ Recording frequency:	Once, at the time of inclusion of a CPA into the PoA.
Calculation method (if applicable):	Calculated as 180 divided by annual energy saving per appliance
QA/QC procedures:	Use of nationally approved source of data
Purpose of data:	Calculation of baseline emissions
Additional comment:	Used to verify that the small scale threshold limit is not exceeded.

Data / Parameter:	<i>B_{old, appliance, survey}</i>
Unit:	Tonnes per stove
Description:	Quantity of charcoal used in the absence of the project activity per appliance(stove)
Measured/Calculated / Default:	Measured and Calculated
Source of data:	A survey of local baseline stove usage
Value(s) of monitored parameter:	0.72
Monitoring equipment:	-
Measuring/Reading/ Recording frequency:	Biennial
Calculation method (if applicable):	<i>B_{old, appliance, survey}</i> is determined at 90/10 precision through appropriate sampling methods for the Kitchen Performance Test (KPT) protocol. <i>B_{old}</i> is calculated from <i>B_{old, appliance, survey}</i>
QA/QC procedures:	The KPT should be carried out in accordance with national standards (if available) or international standards or guidelines e.g. the KPT procedures specified by the Partnership for Clean Indoor Air (PCIA); http://www.pciaonline.org/node/1049
Purpose of data:	Calculation of baseline emissions
Additional comment:	This parameter is determined once for each region where the stoves are to be sold.

Data / Parameter:	<i>B_{old}</i>
Unit:	Tonnes
Description:	Quantity of woody biomass used in the absence of the project activity
Measured/Calculated / Default:	Measured and Calculated
Source of data:	Calculated
Value(s) of monitored parameter:	23,159
Monitoring equipment:	-
Measuring/Reading/ Recording frequency:	Within the monitoring period
Calculation method (if applicable):	<i>B_{old}</i> is Calculated as the summation of the product of the average daily consumption of woody biomass per baseline stove (<i>B_{old, appliance}</i>) and the number of days the stove has been in us (Ref Excel sheet calculations)
QA/QC procedures:	

Purpose of data:	Calculation of the baseline emissions
Additional comment:	-

Data / Parameter:	$f_{NRB,y}$
Unit:	%.
Description:	Fraction of woody biomass saved by the project activity in period y that can be established as non-renewable biomass in
Measured/Calculated / Default:	Calculated
Source of data:	FAO (2011): Global Forest Resource Assessment 2011, Country Reports (for the PoA participating Sub-Saharan Country); http://www.fao.org/forestry/country/en/
Value(s) of monitored parameter:	99%
Monitoring equipment:	N/A
Measuring/Reading/ Recording frequency:	Once, at the time of inclusion of a CPA into the PoA.
Calculation method (if applicable):	Calculated as provided for in AMS-II.G, version 04.0
QA/QC procedures:	Use of nationally approved source of data
Purpose of data:	Calculation of baseline emissions
Additional comment:	-

Data / Parameter:	N_y
Unit:	11,134
Description:	Adjusted total number of stoves deployed until period y
Measured/Calculated / Default:	Calculated
Source of data:	Sales Database
Value(s) of monitored parameter:	Refer spreadsheet
Monitoring equipment:	Sales records
Measuring/Reading/ Recording frequency:	Continuous
Calculation method (if applicable):	The total number of stoves in use during the monitoring period multiplied by the correction factor for non-usage of stoves (Ref Excel sheet calculations).
QA/QC procedures:	Data is collected using the standard procedures and kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.
Purpose of data:	Calculation of baseline
Additional comment:	Type of the stove is also monitored via sampling approach or documented evidences, and in case any deployed ICS type will be found not in line with the methodology requirement, those ICS will not be counted for emission reduction calculations

Data / Parameter:	DO,y
Unit:	%
Description:	Statistically adjusted drop out from total population of appliances in period y
Measured/Calculated / Default:	Calculated from sample survey
Source of data:	Sample survey of local project stove usage
Value(s) of monitored parameter:	1.76%

Monitoring equipment:	Sampling
Measuring/Reading/Recording frequency:	Biennially for each CPA in the PoA
Calculation method (if applicable):	<p>Monitoring of the statistically adjusted drop out involves two steps:</p> <p>Step 1: Sample survey amongst stoves of the same type deployed under CPAs of the PoA as specified in Part II, section B.7.2 below.</p> <p>Step 2: Calculation of the adjusted drop-out rate at confidence level and precision as required by the methodology (AMS II.G. ver. 04.0) for the inspection frequency chosen, following the statistical standard approach for a homograde test of independent units that have a standard normal distribution.</p> <p>The Drop outs were determined through interviews and household visits where users were sampled.</p>
QA/QC procedures:	<p>All formulas applied to determine the statistical precision are standard formula. According to AMS II.G (version 04.0), paragraph 21, if the required precision is not achieved, the lower bound of the required confidence interval of the parameter value is to be chosen.</p> <p>Data was collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.</p>
Purpose of data:	Calculation of baseline emissions
Additional comment:	Drop out means that the ECS are either not used, outside of the project boundary as defined in the CPA or damaged beyond repair.

Data / Parameter:	η_{new}						
Unit:	%						
Description:	Efficiency of the project stoves deployed as part of the project activity (fraction), as determined using the Water Boiling Test (WBT) protocol.						
Measured/Calculated / Default:	Measured and Calculated						
Source of data:	Water boiling Tests						
Value(s) of monitored parameter:	<table border="1"> <thead> <tr> <th>Small</th> <th>Medium</th> <th>Large</th> </tr> </thead> <tbody> <tr> <td>21.57%</td> <td>43.28%</td> <td>29.38%</td> </tr> </tbody> </table>	Small	Medium	Large	21.57%	43.28%	29.38%
Small	Medium	Large					
21.57%	43.28%	29.38%					
Monitoring equipment:	Laboratory Testing						
Measuring/Reading/Recording frequency:	Annually, as per of AMS II.G version 04.0						
Calculation method (if applicable):	Water Boiling Test (WBT) protocol. Since three different stoves are to be distributed, a weighted average value has been applied.						
QA/QC procedures:	Sampling and survey to be carried out with 90% confidence interval and a 10% margin of error. If results show that 90/10 precision is not achieved, the lower bound of 90% confidence interval of this parameter value will be applied.						
Purpose of data:	Calculation of baseline emissions						
Additional comment:	The value of average efficiencies applied is the lower limit of 90% confidence.						

D.3. Implementation of sampling plan

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The PoA-DD contains a description of the sampling methodology to be applied during any sampling activity in consideration with the most recent General Guidelines for sampling and surveys for small-scale CDM project activities (http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid20.pdf). The sampling to be done will be statistically sound and as robust as the approaches presented in

the registered PoA-DD. The CME applies simple random sampling method in line with both the PoA-DD/CPA-D.

All sampling efforts will be conducted by third party(ies). Any samplers will be required to speak the local language, or will be accompanied by interpreters, allowing for full understanding of any responses given by users, and any questions therein.

Monitoring shall be conducted annually or biennially, depending on the approach chosen in the CPA.

Sampling will be undertaken as part of a Sampling Plan that is in line with the requirements of:

1. "Standard for sampling and surveys for CDM project activities and Programme of Activities", Version 03.0.
2. the methodology AMS-II.G, Version 04.0
3. "Standard for sampling and surveys for CDM project activities and programme of activities, vers 0.3.0, EB69, Annex 4.

Wherever reasonably possible, the PoA Sampling Plan will ensure that sample sizes are large enough to meet 95/5 precision in the case of biannual sampling, and 90/10 precision in the case of annual sampling. In cases where such precision is not achieved, the lower bound of a 90%/95% confidence interval of the parameter value will be used as allowed by the methodology. Depending on the CPAs that are included in the PoA, simple random sampling may be appropriate; in other cases stratified random sampling may be more appropriate. Where stratified random sampling is applied, the weighted average will be calculated and used for emission reduction estimation. The CME will provide guidance to the CPA implementer and/or any other parties that will be involved in carrying out sampling activities as part of the monitoring plan.

It is planned that individual verifications shall be done for each CPA. Although some CPAs will be owned multiply by the same PAI, most CPAs shall be owned by different companies (PAIs) and shall be verified separately. Thus PoA level sampling has not been considered as it is not applicable.

To determine the average annual consumption of woody biomass per appliance (B_{old} , appliance), a survey of local charcoal usage is carried out from where the average annual consumption of charcoal per baseline appliance (B_{old} , appliance, survey) is determined. This parameter has been introduced to facilitate the conversion from charcoal to woody biomass per appliance and the correction for leakages.

The drop outs were determined through phone interviews, followed by household visits where the customers were randomly selected from the database using random sampling and asked if they are still using their stoves or not.

A total of 300 households were sampled randomly from the database using excel work sheet random number formula. The project implementer having selected the samples, rung up those selected and asked them if they are still using the stove, and for those who said no, they were asked the reasons why they are not using it. The calls were later followed by household visits for verification. During the survey, a total of 284 users were contacted and responded to the survey question. The remainder, 26 were not reachable because for various reasons including mobile phones being switched off, or not within mobile network reach, too busy or relocated.

From the findings of the survey, the data was aggregated and analysed statistically. It was established that a total of 5 users of the sampled households are not using the stoves due to any of the following reasons:

1. The cooking pot is too small for the stove
2. The stove sieve has worn out
3. The stove takes too long for charcoal to light

The total drop-out percentage therefore for the monitoring period is 1.76% which is lower than the value of 5% applied in the registered CPA-DD

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

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The emission reduction realised by the project is calculated based on the formula below:

$$ER_y = B_{y,savings} \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\ fossilfuel} \times N_{y,i}$$

Where:

- ER_y = Emission reductions during year y in t CO₂e
- $B_{y,savings}$ = Quantity of woody biomass that is saved in tonnes per device
- $f_{NRB,y}$ = Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass using survey methods or government data or default country specific fraction of non-renewable woody biomass (f_{NRB}) values available on the CDM website
- $NCV_{biomass}$ = Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne, wet basis)
- $EF_{projected\ fossilfuel}$ = Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 t CO₂/TJ
- $N_{y,i}$ = Number of project devices of type i operating in year y ,

$B_{y,savings}$ is estimated using Option 2, equation 3 as shown below:

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

Where:

- B_{old} = Quantity of woody biomass used in the absence of the project activity in tonnes per device
- η_{old} = 1. Efficiency of the device being replaced (fraction); measured using representative sampling methods or based on referenced literature values use weighted average values if more than one type of device is being replaced;
2. A default value of 0.10 may be optionally used if the replaced device is a three stone fire, or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney; for other types of devices, a default value of 0.2 may be optionally used. This option has been applied.
- $\eta_{new,y}$ = Efficiency of the device being deployed as part of the project activity (fraction), as determined annually¹² using the water boiling test (WBT) protocol carried out in accordance with national standards (if available) or international standards or guidelines. Use weighted average values if more than one type of system is being introduced by the project activity

For clarity and in order to derive B_{old} from the baseline fuel use survey, parameters representing the average annual consumption of woody biomass per baseline appliance ($B_{old, appliance}$) and the average annual consumption of charcoal per baseline appliance ($B_{old, appliance, survey}$) have been introduced as per registered CPA_DD. Also the following “own” equation were introduced to account for the leakages due to the NRB (L_{NRB}) and the PoA (L_{POA}) and also to convert from quantity of charcoal to quantity of biomass (multiply by 6)¹

$$B_{old, appliance} = B_{old, appliance, survey} * 6 * L_{NRB} * L_{POA} \quad (3.1)$$

Where:

$B_{old, appliance}$	The average quantity of woody biomass used in the absence of the project activity by each appliance in tonnes.
$B_{old, appliance, survey}$	The average quantity of charcoal used in the absence of the project activity by each appliance in tonnes (as determined by the baseline survey).
L_{NRB}	Leakage factor as per Clause 13(a) of AMS-II.G, Version 04.0. Use a value of 0.95 There will be no transfer or use of old equipment from outside the project boundary.
L_{POA}	Leakage factor as per Clause 22(c) of AMS-II.G, Version 04.0. Use a value of 0.95 There will be no transfer or use of old equipment from outside the project boundary.

In determining the number of appliances in use within the monitoring period y (N_y) for post calculations, and the drop-out rate (DO_y) of 1.76% is applied. The Drop-off rate was statistically determined through a survey. To compensate for the actual operating days for a given stove, N_y is further adjusted for the proportion of the year during which the stoves are in use using the factor, $mp_{length}/365$ (where mp_{length} is the number of days the stove is in use during the year). The number of stoves in use, assuming a 4-year life, ($N_{y, no-adjusted}$) is then adjusted for the drop using the equation:

$$N_y = N_{y, no-adjusted} * (1 - DO_y) * mp_{length}/365 \quad (3.2)$$

To simplify the spreadsheet calculation, N_y has been determined with $mp_{length}/365$ taken as 1 to provide the correction factor for drop-off, in this case is 0.98. This has been used to correct for the drop out and the actual stove days have been calculated for each stove in order to calculate ERs.

The quantity of woody biomass that is saved by the CPA in period y in tonnes is then calculated from the equation (3.3) below in order to correct for drop-out rate and days of use for each stove sold

$$B_{y, savings} = B_{y, savings, appliance} * N_y \quad (3.3)$$

Where:

$B_{y, savings}$	Quantity of woody biomass that is saved by the CPA in period y in tonnes.
$B_{y, saving appliance}$	The average quantity of woody biomass that is saved by each project appliance in period y in tonnes.

¹ To determine B_{old} , the baseline charcoal consumption is multiplied by 6. This is based on last paragraph of page 1.45 of the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual¹, which states as follows: “If no local information is available, 6 kg of wood input per kg of charcoal may be used as default (FAO, 1990)”.

$N_{y, non-adjusted}$	The number of ECS in operation in year y before adjustment for the stoves not in use. The value of $N_{y, non-adjusted}$ depends on the sales rate and the expiry rate of the project stoves and is designed to ensure that the number of operational stoves does not exceed the energy-saving threshold prescribed for Type II methodologies. $N_{y, non-adjusted}$ will be adjusted according to the share of users found not to use the project stoves by applying a Drop-Out Rate Factor (DO_y) as in equation (3.2) to determine N_y .
N_y	The number of ECS in operation in year y adjusted for the stoves not in use.
DO_y	The percentage of stoves sold by the PAI which are no longer in use (Drop-Out Rate). As per paragraph 16 of AMS IIG, the percentage of stoves sold by the PAI which are no longer in use (the Drop-Out Rate, DO_y), will be found by sampling. This sample will be biennial
mp_{length}	Length of monitoring period. For ex-ante calculations, a value 365 days per year is assumed.

Emission reduction for the CPA is calculated as per AMS II.G Energy Efficiency measures in thermal application of non-renewable biomass; Version 04.0.

The following equation is used to calculate the emission reductions:

$$ER_y = B_{y,savings} * f_{NRB,y} * NCV_{biomass} * EF_{projected\ fossilfuel} \quad (1)$$

Substituting the known values;

$$ER_y = B_{y,savings} * f_{NRB,y} * 0.015 * 81.6$$

ER_y	Emission reductions during the year y in tCO ₂ e
$B_{y,savings}$	Quantity of woody biomass that is saved by the CPA in period y in tonnes.
$f_{NRB,y}$	Fraction of woody biomass saved by the project activity in period y that can be established as non-renewable biomass in %. Where default values endorsed by designated national authorities and approved by the Board are available at (http://cdm.unfccc.int/DNA/fNRB/index.html), is applied.
$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)
$EF_{projected\ fossilfuel}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO ₂ /TJ

Quantity of woody biomass that is saved by the CPA is calculated using Option 2 as follows:

$$B_{y, savings} = (B_{old} * (1 - \eta_{old} / \eta_{new})) \quad (3)$$

Substituting the known values;

$$B_{y, savings} = (B_{old} * (1 - 0.1 / \eta_{new}))$$

Where:

$B_{y,saving}$	The quantity of woody biomass that is saved by project activity in period y in tonnes.
B_{old}	Quantity of woody biomass used in the absence of the project activity in tonnes

B_{old} is determined as the product of number of appliances in use during the year and the average annual fuel combustion per baseline appliance.

To determine B_{old} , the average annual charcoal consumption of the baseline appliance is multiplied by 6. This is based on last paragraph of page 1.45 of the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual*².

η_{old}	Efficiency of the system being replaced, measured using representative sampling methods (fraction). The default value of 0.10 has been applied for the CPA
η_{new}	Efficiency of the system being deployed as part of the project activity (fraction), as determined using the Water Boiling Test (WBT) protocol. Use weighted average values since 3 sizes of stoves are being introduced by the project activity

For clarity and in order to derive B_{old} from the baseline fuel use survey, parameters representing the average annual consumption of woody biomass per baseline appliance ($B_{old, appliance}$) and the average annual consumption of charcoal per baseline appliance ($B_{old, appliance, survey}$) were introduced and they are applied. Also the following “own” equation were introduced to account for the leakages due to the NRB (L_{NRB}) and the PoA (L_{POA}) and also to convert from quantity of charcoal to quantity of biomass (multiply by 6)³

$$B_{old} = B_{old, appliance} * N_y \quad (3.1)$$

$$B_{old, appliance} = B_{old, appliance, survey} * 6 * L_{NRB} * L_{POA} \quad (3.1.1)$$

Substituting the known values in equations 3.1.1 and 3.1;

$$B_{old, appliance} = B_{old, appliance, survey} * 6 * 0.95 * 0.95 \text{ (equation 3.1.1)}$$

$$B_{old} = B_{old, appliance, survey} * 6 * 0.95 * 0.95 * N_y \text{ (equation 3.1)}$$

Where:

$B_{old, appliance}$	The average quantity of woody biomass used in the absence of the project activity by each appliance in tonnes.
$B_{old, appliance, survey}$	The average quantity of charcoal used in the absence of the project activity by each appliance in tonnes (as determined by the baseline survey).
L_{NRB}	Leakage factor as per Clause 13(a) of AMS-II.G, Version 04.0. Use a value of 0.95 There will be no transfer or use of old equipment from outside the project boundary.
L_{POA}	Leakage factor as per Clause 22(c) of AMS-II.G, Version 04.0. Use a value of 0.95 There will be no transfer or use of old equipment from outside the project boundary.

² See <http://www.ipcc-nggip.iges.or.jp/public/gl/guidelin/ch1ref3.pdf>

³ To determine B_{old} , the baseline charcoal consumption is multiplied by 6. This is based on last paragraph of page 1.45 of the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual*³, which states as follows:

“If no local information is available, 6 kg of wood input per kg of charcoal may be used as default (FAO, 1990)”.

Detailed calculation step are found in the Excel sheet calculations.

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

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From the methodology, the project emissions or net GHG removals by sinks is taken as 0 t CO₂e.

E.3. Calculation of leakage

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Leakage Adjustment Factor as per the methodology is applied to the project activity to calculate the Emission Reductions during Monitoring Period in accordance with AMS II.G./Version 04. A default value of 95% has been used. See section E.1.

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

Item	Baseline emissions or baseline net GHG removals by sinks (t CO ₂ e)	Project emissions or actual net GHG removals by sinks (t CO ₂ e)	Leakage (t CO ₂ e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO ₂ e)
Total	20,689	0	0	20,689

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO ₂ e)	84,020	20,689

E.6. Remarks on difference from estimated value in registered PDD

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The emission reductions realised by the CPA for the monitoring period is less than the projected CPA-DD volumes due to the fact that the actual number of stoves manufactured and sold was less than the manufacturing and sales projections as envisages in the business plan of the project. This shortfall in production and sales is attributed to challenges associated with production equipment breakdowns.

E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks (t CO ₂ e)	0	20,689

Appendix 1. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	<input checked="" type="checkbox"/> Project participant <input checked="" type="checkbox"/> Responsible person/ entity for completing the CDM-MR-FORM
Organization name	ClimateCare Limited
Organization	ClimateCare Limited
Street/P.O. Box	Esplanade
Building	13-14
City	St. Helier
State/Region	Jersey
Postcode	JE1 1BD
Country	Channel Islands
Telephone	+44 (0) 1534 888 777
Fax	N/A
E-mail	mail@climatecare.org
Website	www.climatecare.org
Contact person	Tom Morton
Title	Director
Salutation	Mr.
Last name	Morton
Middle name	S.D.
First name	Tom
Department	Management
Mobile	+254 (0) 728 218 183
Direct fax	N/A
Direct tel.	+254 (0) 20 213 3604
Personal e-mail	tom.morton@climatecare.org

Project participant and/or responsible person/ entity	<input checked="" type="checkbox"/> Project participant <input type="checkbox"/> Responsible person/ entity for completing the CDM-MR-FORM
Organization	CookClean Ghana Limited
Street/P.O. Box	P.O. Box AN12556, Accra-North, Ghana
Building	F37, Abafun Crescent, Labone, Accra
City	Accra
State/Region	Accra
Postcode	N/A
Country	Ghana
Telephone	-
Fax	
E-mail	info@cookclean.net / cookclean.stoves@yahoo.com
Website	www.cookclean.net
Contact person	Nicholas Manu
Title	Managing Director
Salutation	Mr.
Last name	Manu
Middle name	Sarkodie-Addo
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Department	Executive
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