



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)	Biomass Energy Conservation Programme	
UNFCCC reference number of the PoA	10182	
Version number(s) of the PoA-DD(s) applicable to this monitoring report	07	
Coordinating/managing entity (CME)	Hestian Innovation Ltd.	
Version number of this monitoring report	1.2	
Completion date of this monitoring report	24/03/2017	
Monitoring period number and dates covered by this monitoring report	First (1 st) Monitoring Period 13/08/2015 – 31/01/2017	
Monitoring report number for this monitoring period	1	
Host Party(ies)	Host Party(ies) of the PoA	Is this a host Party to a specific-case CPA covered in this monitoring report?(yes/no)
	Malawi Rwanda	Yes No
Sectoral scope(s)	Sectoral Scope 3 (Energy Demand)	
Selected methodology(ies)	AMS-II.G.: Energy efficiency measures in thermal applications of non-renewable biomass --- Version 6.0	
Selected standardized baseline(s)	-	
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	59 974

PART I - Programme of activities

SECTION A. Description of PoA

A.1. Brief description of the PoA

The Biomass Energy Conservation (BEC) POA is a voluntary initiative by Hestian Innovation Ltd. (Hestian) which aims to promote sustainable development and the reduction of greenhouse gas emissions from non-renewable biomass fuel through dissemination of improved household cookstoves in Malawi and Rwanda. Each CPA will consist of a number of improved cookstoves (ICS), such as the Chitetezo Mbaula or Canarumwe stoves, or others as specified in each CPA- DD.

The improved household stoves reduce fuel consumption by improved combustion and improved heat transfer. The stoves raise the cooking pot to the hottest point above the flame. The improved household cook-stoves target predominantly low-income households using non-renewable biomass energy on traditional/unimproved/low-efficiency stoves.

Both Malawi and Rwanda are Least Developed Countries (LDCs) where biomass in the form of firewood, charcoal and crop waste meets 93% and 99.2%, respectively, of household and industrial energy needs.

The overall aim of the PoA is to positively impact air quality, soil condition, quality and quantity of employment and income generation, livelihood of the poor, access to affordable and clean energy services, human and institutional capacity, access to investment, and technology transfer and technological self- reliance.

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)
Biomass Energy Conservation Programme CPA	Sectoral Scope 3 (Energy Demand)	AMS-II.G.: Energy efficiency measures in thermal applications of non-renewable biomass --- Version 6.0

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)
CPA 10182-0001	Biomass Energy Conservation Programme CPA	13/08/2015 – 12/08/2022	Yes
CPA 10182-0002	Biomass Energy Conservation Programme CPA	15/10/2016 – 14/10/2023	Yes
CPA 10182-0003	Biomass Energy Conservation Programme CPA	15/10/2016 – 14/10/2023	Yes
CPA 10182-0004	Biomass Energy Conservation	15/10/2016 – 14/10/2023	Yes

	Programme CPA		
CPA 10182-0005	Biomass Energy Conservation Programme CPA	15/10/2016 – 14/10/2023	No
CPA 10182-0006	Biomass Energy Conservation Programme CPA	01/12/2016 – 30/11/2023	No

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

Conor Fox
Hestian Innovation Limited (Hestian)
conor.fox@hestian.com

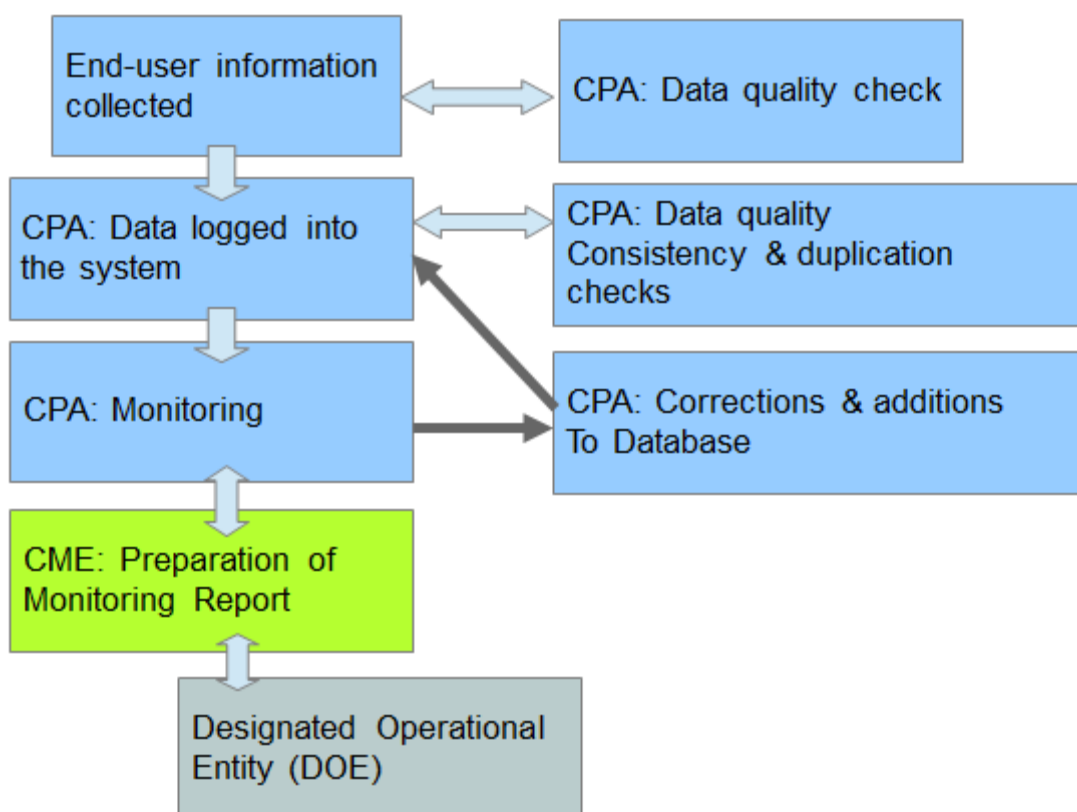
Hestian is also the CME as per Appendix 1.

SECTION B. Implementation of PoA

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

Total sales records database has been maintained so that end users can be traced (i.e. name, address and telephone number, if available) documenting the date and place of sale and the number of stoves bought. End user information is collected through direct sales to end-users by retailers or agents of the CPA implementers and is contained in an emission reduction contract. This information is collated into a spreadsheet/database from which CPA monitoring can be conducted. The database also contains stoves serial numbers and CPA id information. In the case of bulk sales of domestic cookstoves in Malawi, which represent less than 50% of the customers, information is kept on the place of sale and of the date of delivery with a conservative means of estimating when the stove is first used (each stove is assumed to be first used after 25 days since date of delivery based on the bulk sales analysis of the average time between delivery to retail outlet and purchase by end-user)¹.

The flow chart below illustrates the roles and responsibilities of the parties during the implementation of the PoA.



The serial numbers allocated to each device under the PoA allow unique identification and tracking of the devices to avoid double accounting. Based on the serial numbers, a device can only count in one CPA.

Data will be kept for the whole crediting period of the CPA and an additional two years.

¹ 4th Periodic Verification Report “Integrated Biomass Energy Conservation Project, Malawi (GS613)

The database records are backed up and sent to the CME for checking prior to using them as the basis for monitoring activities. Hard copies of Emission Reduction contracts are filed (in paper or electronically) as additional backup and for verification purposes. All CPA implementers are strongly encouraged to scan ER contracts as an additional form of backup to secure data.

The CME plays a pivotal role in the development of CPAs and oversees the inclusion of CPAs under the PoA. Through a technical review, the CME assesses the competence of potential CPA implementers to ensure that they fulfil technical and eligibility aspects of potential CPAs and to plan technical and administrative processes to meet PoA requirements.

Monitoring tasks are managed by the CPA implementer in collaboration with the CME. Surveys are organised by agents of the CPA implementers, and enumerators are trained and re-trained prior to conducting surveys and tests. Survey and test results are filed in paper and/or in electronic form at the CPA implementer's office and are analysed using spreadsheets or database programmes to compile reports. The integrity of data is cross-checked with other variables to ensure consistency and avoid mistakes. Calibration of the monitoring equipment for project emission parameters is performed by enumerators as per the equipment's operating instructions, prior to conducting surveys and tests and is documented in usage & monitoring survey report and water boiling test reports.

CME prepares and submits monitoring reports and facilitate the verification of the same and act as the focal point with the CDM Executive Board.

The following monitoring tasks are being undertaken (periodically):

- usage and monitoring surveys to determine proportion of operational stoves;
- evaluation of annual quantity of woody biomass used by project devices determined in the first year of the introduction of the devices;
- in cases, where users retain the baseline technology as a backup or auxiliary technology in parallel with the improved technology, the extent to which the baseline technology is used has been quantitatively assessed through monitoring surveys and an appropriate and conservative adjustment factor has been applied - proportion of discontinued use of baseline stoves;
- water boiling tests to determine thermal efficiency of project devices;
- fNRB is monitored over time and any new official fNRB can be applied if they are officially published or officially recognised by the DNA of the Host country.

The mean number of months when only 50% of customers are using their stoves has been used to calculate the "average lifespan" of a stove, after which CERs will no longer be claimed. The conservative value among estimated life-span for the clay stoves (Chitetezo Mbaula Malawi and Canarumwe in Rwanda) is equal to 1417 days is used for calculation of emission reductions.²

All parties involved in implementing CPAs are aware and agree that the CPAs are subscribed to the PoA.

2 Based on a survey of 144 households sampled and surveyed and stratified into the age-groups within 16 geographic areas, locally known as GVHs, statistical analysis gave a total days of technical life-time of Portable Clay Stoves (PCS) of 1,417 days. 4th Periodic Verification Report "Integrated Biomass Energy Conservation Project, Malawi (GS613), by TUV Nord, Page 29 of 115.

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

According to the registered PoA DD, due to the large number of improved cook stoves (ICS) envisaged to be distributed as part of the CPAs to be included in the PoA, it is not economically feasible to monitor each individual ICS unit distributed.

Therefore, representative sampling has been undertaken as part of a PoA-wide Sampling Plan that is designed in line with the requirements of AMS II.G v6.0 and the “Standard for sampling and surveys for CDM project activities and programme of activities Version 04.1” (the Sampling standard). The parameters are estimated across all CPAs.

Multi-stage sampling approach was applied in line with the provisions of CDM Guideline “Sampling and surveys for CDM project activities and programmes of activities”, Version 04.0. On the first stage 4 clusters (districts) were randomly sampled, namely: Lilongwe, Mchinji, Mangochi, Nkhatakota. On the second stage individual households were randomly sampled for data collection. Such approach ensures cost effectiveness and does not impact the quality of monitoring data as ICS and cooking practices does not differ among districts.

Monitored Parameter:	Description of Parameter:
$n_{y,j}$	Proportion of ICS still in operation
$\mu_{y,i}/365$	The relative share of usage of the project ICS if a baseline (replaced) stove is still being used in addition to ICS (hereafter called “retention use of ICS”)
$\eta_{new,y,i}$	Thermal Efficiency of operational ICS

Of the three parameters to be monitored, two are proportions/percentages ($n_{y,j}$) and ($\mu_{y,i}/365$) and the other one is a mean value ($\eta_{new,y,i}$).

The sampling method for all three monitored parameters is stratified random sampling. This method is justified as the population will be divided into Primary Sampling Units (PSUs) by same country and fuel consumption cluster, ICS type, ICS vintage and CPA implementer. These PSUs are expected to be relatively homogenous but by dividing them into strata any variation will be captured.

There is only one country to be sampled, only one fuel consumption cluster (i.e. only firewood-fueled stoves), there is only one ICS type, there are 2 ICS vintages, and there are 2 CPA implementers (but one only started implementing in June / July 2016).

So, there are 3 primary sampling units:

- CPA Implementer Area 55 implementing 1 year old stoves,
- CPA Implementer Sunfire implementing 1 year old stoves,
- CPA Implementer Area 55 implementing 2 year old stoves.

The sample size for each primary sampling unit was calculated using proportional allocation, where the proportions of units from the different PSU in the sample is the same as the proportions in the population.

In line with the approach proposed in PoA DD the survey for proportion of operational stoves and the proportion of discontinued use of baseline stoves will be conducted together. According to the standard for sampling and surveys, if there is more than one parameter to be estimated in a survey, the required sample size has to be the largest number obtained in the calculations.

Thus, the parameters is sampled in two separate surveys (1) single survey (Usage and Monitoring Survey) to estimate parameters for (i) operating stoves and (ii) proportion of displaced traditional cook stoves that continue to be used and (2) a separate survey to measure the mean operational efficiency (WBT survey) with a stratified random sample of ICS.

List of CPAs to which sampling method applied	Date of data collection	Implemented Sampling design	Analysis & Source of collected data
Usage & Monitoring Surveys			
CPA 1 CPA 2 CPA 3 CPA 4	2017	<p>Sample size - 34 households</p> <p>Surveys were carried between January 11 and February 14, 2017</p> <p>Actually surveyed 33.</p> <p>Sampling method - multi-stage stratified random sampling</p> <p>Required precision/confidence - the minimum sample size is determined to achieve the 95% confidence level and a 10% margin of error.</p>	<p>Values used in emission reduction calculations were calculated based on survey results using statistical analysis.</p> <p>Results of analysis:</p> <p>operating stoves based on usage age: age 0-1 – 96.00%; age 1-2 – 87.5%</p> <p>Proportion of discontinued use of baseline stoves: age 0-1 – 0.771; age 1-2 – 0.786.</p> <p>Source of collected data: Usage & Monitoring Survey Report – 2017</p> <p>Total population at the end of the monitoring period was 56 678 stoves.</p>
WBTs			
CPA 1 CPA 2 CPA 3 CPA 4	2017	<p>Sample size - 15 stoves.</p> <p>Actually tested - 15.</p> <p>Sampling method - multi-stage stratified random sampling</p> <p>WBTs were conducted in February, 2017.</p> <p>Required precision/confidence - the minimum sample size is determined to achieve the 95% confidence level and a 10% margin of error.</p>	<p>Values used in emission reduction calculations were calculated based on survey results using statistical analysis.</p> <p>Results of analysis:</p> <p>$Eff_{P,PCS,0-1} = 26.07\%$; $Eff_{P,PCS,1-2} = 26.07\%$;</p> <p>Simple overall average efficiency: of tested stoves was used for conservativeness.</p> <p>Source of collected data: Water Boiling Test Report - 2017</p>

KPTs			
CPA 1 CPA 2 CPA 3 CPA 4	2017	<p>Sample size - 47 stoves.</p> <p>Actually tested - 40.</p> <p>Sampling method - multi-stage stratified random sampling</p> <p>KPTs were conducted in January, 2017.</p> <p>Required precision/confidence - the minimum sample size is determined to achieve the 95% confidence level and a 10% margin of error.</p>	<p>Results of analysis:</p> <p>Average wood consumption, kg per HH per day on dry basis – 5.153</p> <p>Average wood consumption, tonne per HH per year on dry basis - 1.881</p> <p>Measured values were corrected for moisture content to calculate wood weight on a dry basis.</p> <p>Source of collected data: Usage & Monitoring Survey Report – 2017</p>

As per point 40 in the applied methodology and PoA DD for cost effectiveness and to facilitate logistics the CME preferred to monitor efficiency of devices in a common survey with other monitoring parameters (i.e. the usage survey).

Data has been collected by data collectors of the CPA implementers that are trained and have successfully pre-tested the questionnaire and thermal efficiency tests (e.g. water boiling test).

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

C.1. Corrections

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

Not Applicable

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

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

Not Applicable

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

Not Applicable

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

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

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

There are 4 specific-case CPAs included in monitoring report. Each CPA foresees dissemination of improved cookstoves (i.e. the technology) that are more efficient and use less wood for household cooking and heating than the traditional stoves. Project activities also aim promotion of improved kitchen and firewood management practices e.g. use of less firewood, use of dry firewood, using a pot lid while cooking and soaking legumes before cooking (i.e. practices) to households. The improved technology and practices are intended to replace less efficient technologies and practices and result in biomass conservation and a reduction of greenhouse gas emissions into the atmosphere from the burning of solid biomass.

CPA 1 foresees dissemination of improved household cookstoves in the Northern, Central and Southern Districts of Malawi. Beginning of household stoves (ICS) distribution under the CPA is 13/08/2015 and the end of distribution is 31/05/2016. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 21 933. Monitoring period covered in this monitoring report is 13/08/2015 – 31/01/2017 (both dates included).

CPA 2 foresees dissemination of improved household cookstoves in the Northern, Central and Southern Districts of Malawi. Beginning of household stoves (ICS) distribution under the CPA is 01/06/2016. The distribution of stoves under CPA 2 is being continued. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 16 633. Monitoring period covered in this monitoring report is 15/10/2016 – 31/01/2017 (both dates included).

CPA 3 foresees dissemination of improved household cookstoves in the Northern, Central and Southern Districts of Malawi. Beginning of household stoves (ICS) distribution under the CPA is 05/05/2016. The distribution of stoves under CPA 3 is being continued. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 2 723. Monitoring period covered in this monitoring report is 15/10/2016 – 31/01/2017 (both dates included).

CPA 4 foresees dissemination of improved household cookstoves in the Northern, Central and Southern Districts of Malawi. Beginning of household stoves (ICS) distribution under the CPA is 19/11/2016. The distribution of stoves under CPA 4 is being continued. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 15 389. Monitoring period covered in this monitoring report is 19/11/2016 – 31/01/2017 (both dates included).

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

CPA 1, CPA 2, CPA 3 and CPA 4 are CPAs promoting ICSs in Malawi. Malawi is a landlocked country which shares its northwest border with the Republic of Zambia, northeast border with the United Republic of Tanzania, and its borders at east, south and west with the Republic of Mozambique.

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

Not applicable.

E.2. Corrections

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

Monitoring plan for each specific-case CPA-DD(s) was submitted at the time of the registration of the PoA.

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

Not applicable.

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

Not applicable.

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

Not applicable.

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

The CME is responsible for collecting the monitoring data in accordance with the requirements from the CDM EB on monitoring and verification to ensure that the emission reductions are monitored recorded and reported accurately. The CME is responsible for verification of the measurement, data collection and the calculation of the emissions reductions.

An electronic record keeping system is operated and maintained by the coordinating managing entity for each CPA under the PoA, which contains at least the following information:

- Type of appliance (ICS type) deployed
- Serial number (Stove-ID) of device
- Delivery date of appliance
- User details (name, address and telephone if available) will be collected for the majority of customers.

The record keeping system is updated as per the progress of the CPA. Data will be kept for the whole crediting period of the CPA and an additional two years.

A system/procedure to avoid double accounting e.g. to avoid the case of including a new CPA that has been already registered either as a CDM project activity or project within any other standard is in place. In each CPA-DD it is stated that the CPA has not been and will not be registered either as a single project activity or as a CPA under another PoA. The serial numbers allocated to each device under the PoA allow unique identification and tracking of the devices. Based on the serial numbers, a device can only count in one CPA.

Stoves sold before the CPA starting date will only claim credits from the day after the starting date of the CPA and will be limited to a lifespan from the day of initial adoption.

It is ensured that all parties involved in implementing a CPA are aware and agree that the CPAs are subscribed to the PoA.

The CME assists the CPA implementing and monitoring bodies (CPA implementers), such as Area 55 Consulting and Sunfire, to maintain and make available accurate records. The CME collates a composite electronic Total Sales Record and project implementers keep back-up paper records. The existing accounting and records system accurately tracks sales, inventories and supply and purchases. CPA implementers maintain a full electronic sales database of all household sales that take place, listed according to the sales mechanism, date, device, type etc. Sales databases are cross-checked with production records and other data to ensure consistency and accuracy.

There is no formal overarching warranty system in place for household cookstoves, from any of the CPA implementers. Replacement within areas less than 10km away from promoter and production group may be done if stove breaks within first few weeks of use at the discretion of the stove promoter and production group³. Further than this it is too difficult to assess for ceramic stove if stove broke during transport or recklessness or fault of user.

End user information is collected through direct sales to end-users by retailers or agents of the project and is contained in warranty and/or emission reduction contract. This information is collated into an electronic database from which project monitoring can be conducted. The database and Excel records are backed up and sent to the CME for checking prior to using them as the basis for monitoring activities. Hard copies of ER contracts (and where possible scanned copies as well) and warranty are filed as additional backup and for verification purposes.

³ The approach is an informal agreement between producers, promoters and customers. The complementary replacement stove promotes customer loyalty and helps to market the stoves locally.

Direct sales to end-users information is collected by CPAs' agents who are issued with contract forms in advance and submit the forms to the relevant project managers. The customers in the sales record for which phone numbers or addresses are available are used for survey sampling to support the periodic monitoring activities.

Monitoring tasks, such as monitoring surveys, assessment of leakage and other such tasks are managed by the CPA managers who are best capable of collecting this data because they know the technology and the end-users best, with the support of the CME.

Surveys and tests are organised by CPA implementer staff with guidance from the CME, and enumerators are trained prior to conducting surveys and tests. Survey and test results are filed in paper at project implementers' offices and are analysed using Excel to compile reports. The integrity of data is constantly cross-checked with other variables to ensure consistency and avoid mistakes.

SECTION G. Data and parameters

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

Data/parameter	f_{NRB,y}
Unit	%
Description	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass
Source of data	Default values of fraction of non-renewable biomass approved by CDM EB and accepted by DNA as indicated at UNFCCC website ⁴
Value(s) applied	0.81 for Malawi
Choice of data or measurement methods and procedures	Default country specific value
Purpose of data	Calculation of baseline emissions / emission reductions
Additional comments	

Data/parameter	NCV_{biomass}
Unit	TJ/t
Description	Net calorific value of the non-renewable biomass that is substituted
Source of data	AMS-II.G Version 6.0
Value(s) applied	0.015
Choice of data or measurement methods and procedures	Default value
Purpose of data	Calculation of baseline emissions / emission reductions
Additional comments	

Data/parameter	EF_{projected_fossilfuel}
Unit	tCO ₂ /TJ
Description	Emission factor for the substitution of non-renewable biomass by similar consumers
Source of data	AMS-II.G Version 6.0
Value(s) applied	81.6
Choice of data or measurement methods and procedures	Default value
Purpose of data	Calculation of baseline emissions / emission reductions
Additional comments	

4 <https://cdm.unfccc.int/DNA/fNRB/index.html>

Data/parameter	η_{old}
Unit	%
Description	Efficiency of the system being replaced
Source of data	AMS-II.G Version 6.0
Value(s) applied	10
Choice of data or measurement methods and procedures	Default value
Purpose of data	Calculation of baseline emissions / emission reductions
Additional comments	The pre-project device is a three-stone fire using firewood (not charcoal) or a conventional device with no improved combustion air supply or flue gas ventilation.

Data/parameter	L_y
Unit	Fraction
Description	Leakage adjustment factor for period y
Source of data	AMS-II.G Version 6.0
Value(s) applied	0.95
Choice of data or measurement methods and procedures	Methodology allows for adjustment factor to be applied for leakage as an alternative to survey under paragraph 30 of Section 4.3
Purpose of data	Calculation of leakages / emission reductions
Additional comments	

G.2. Data and parameters monitored

Data/parameter	$B_{y=1,new,i,survey}$
Unit	t/HH/yr
Description	Annual quantity of woody biomass used by project devices in tonnes per device of type i
Measured/calculated/default	Measured / Calculated
Source of data	Sample surveys – Kitchen performance tests
Value(s) of monitored parameter	1.531
Monitoring equipment	Weights / Moisture meter
Measuring/reading/recording frequency	Monitored in the first year of introduction of the devices (e.g. during the first year of the crediting period, y=1).

Calculation method (if applicable)	<p>Number of bundles of wood used in the project scenario is estimated via usage and monitoring survey of sampled households using an appropriate local metric (e.g. bundles of wood) for an easily understood period (e.g. per week). The average weight of a bundle of wood is calculated based on measurement of a sample of at least 30 different bundles adjusted for moisture content.</p> <p>Surveyed households does not include those that are identified as either (i) continue to use baseline technology through response to the survey or through observation by enumerator or (ii) no longer use the improved cookstoves.</p>
QA/QC procedures	This approach has been successfully applied by the CME in a survey for GS 1265 PoA validated under Gold Standard and offers a practical and logistically feasible solution to measure project fuel use for specific devices, that can be supervised to assure quality.
Purpose of data	Calculation of emission reduction
Additional comments	As per paragraph 22 on page 11 of the methodology AS-II.G V6.0, as the baseline device is a three stone fire, the use of data loggers to record the continued operation of baseline devices is not practical; hence, surveys as described above are conducted.

Data/parameter	N_{y,i,a}
Unit	Number of items
Description	Number of project devices of type i and age a that are operating in year y
Measured/calculated/default	Calculated
Source of data	Monitoring records (total sales records database), usage and monitoring survey
Value(s) of monitored parameter	Please, refer to emission reduction calculation excel file
Monitoring equipment	None
Measuring/reading/recording frequency	Continuous recording in total sales records database
Calculation method (if applicable)	<p>The installation date and recipient/location of each device is tracked individually, and emissions reductions is considered from the date of commissioning of each device.</p> <p>To reflect the number of stoves operating during a year (365 days) the number of stoves was calculated based on the number of technology days for each year (number of technology days divided by 365).</p> <p>The number of stoves were adjusted by percentage of stoves still in operation and percentage of households using more than 1 stoves as determined by usage and monitoring surveys.</p> <p>Those devices that have been replaced prior to and independently from the monitoring survey by an equivalent in-service device are counted as operating.</p>
QA/QC procedures	Sampling will be conducted by applying the 95/10 confidence precision for the sample size calculation.
Purpose of data	Calculation of baseline and project emissions / emission reductions
Additional comments	Replaced devices are considered operational.

Data/parameter	$\mu_{y,i} / 365$
Unit	%
Description	Number of days of utilization of the project device during the year 'y'
Measured/calculated/default	Calculated
Source of data	Usage and monitoring survey
Value(s) of monitored parameter	Please refer to excel ER file
Monitoring equipment	N/A
Measuring/reading/recording frequency	At least once every two years (biennial)
Calculation method (if applicable)	<p>As pre-project devices are unlikely to be totally decommissioned, surveys are designed to capture cooking habits and stove usage of households in the region, including quantification of use of baseline devices, by formulating questions and/or collecting evidences to determine the frequency of usage of both the project devices and baseline devices.</p> <p>The value is calculated as a percentage of households using baseline stove out of total number of households surveyed.</p>
QA/QC procedures	Sampling will be conducted by applying the 95/10 confidence precision for the sample size calculation.
Purpose of data	Calculation of baseline and project emissions / emission reductions
Additional comments	N _{y,i,a} is to be discounted for discontinued use of baseline technology confirmed through stratified random sampling, as explained in section B.7.2, Part II of the PoA-DD. The rounded-up value will be used. Replaced stoves will be considered operational.

Data/parameter	$\Delta\eta_{y,i,a}$
Unit	%
Description	Factor to consider the efficiency loss of the project device type i due to its aging at the year y
Measured/calculated/default	Measured / Calculated
Source of data	Survey – simple random sample using Water Boiling Test protocol
Value(s) of monitored parameter	Please, refer to emission reduction calculation excel file
Monitoring equipment	Scales, thermometer, timer, wood moisture meter
Measuring/reading/recording frequency	Water Boiling Tests to be conducted in the first batch of stoves thereafter monitoring will determine the thermal efficiency of the devices installed at the first year of the crediting period, and the efficiency loss of this population will be used to correct the initial efficiency of the population of devices installed later on.
Calculation method (if applicable)	As per the WBT protocol.
QA/QC procedures	Conducted by a capable person with thorough understanding of internationally recognised WBT protocols, updated by the Partnership for Clean Indoor Air and the Global Alliance for Clean Cookstoves. Use of calibrated measurement equipment.
Purpose of data	Calculation of baseline and project emissions / emission reductions
Additional comments	

Data/parameter	$\eta_{\text{new},i,a}$
Unit	%
Description	Thermal efficiency of device of type i being deployed as part of the project activity with the age a
Measured/calculated/default	Measured / Calculated
Source of data	Survey – simple random sample using Water Boiling Test protocol
Value(s) of monitored parameter	Please, refer to emission reduction calculation excel file
Monitoring equipment	Scales, thermometer, timer, wood moisture meter
Measuring/reading/recording frequency	Water Boiling Tests to be conducted annually. Conducted in the first batch of stoves thereafter monitoring will determine annually the thermal efficiency of the devices installed at the first year of the crediting period, and the efficiency loss of this population will be used to correct the initial efficiency of the population of devices installed later on.
Calculation method (if applicable)	As per the WBT protocol.
QA/QC procedures	Conducted by a capable person with thorough understanding of internationally recognised WBT protocols, updated by the Partnership for Clean Indoor Air and the Global Alliance for Clean Cookstoves. Use of calibrated measurement equipment.
Purpose of data	Calculation of baseline and project emissions / emission reductions
Additional comments	

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

Please see Section B.2 above.

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**

The equations in the methodology do not calculate baseline and project emissions separately and instead calculate direct emissions reductions as shown below:

$$ER_{y,i} = \sum_{a=1}^{a=y} B_{y,savings,i,a} \times N_{y,i,a} \times \left(\frac{\mu}{365} \right) \times F_{NRB,y} \times NCV_{biomass} \times EF_{projectedfossilfuel} - LE_y$$

where

ER_y	– emission reductions, t CO _{2e} ,
'a'	– the indices for the age (in years) of the cook stoves that are operating in the year y of the crediting period.
$B_{y, savings, i, a}$	– annual quantity of woody biomass that is saved in tonnes per cook stove device of type i and age a in year y
N_{yia}	– number of project devices of type i and age a that are operating in year y
$\mu_{y, i}$	– number of days of utilization of the project device during the year y
$f_{NRB, y}$	– fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass
$NCV_{biomass}$	– net calorific value of the non-renewable biomass that is substituted
$EF_{projected_fossilfuel}$	– emission factor for the substitution of non-renewable biomass by similar consumers
LE_y	– Leakage adjustment factor for period y

$B_{y, savings, i, a}$ is calculated using Equation 6 of the methodology AMS-II.G Version 6.0:

$$B_{y, savings, i, a} = B_{y=1, new, i, survey} \times ((\eta_{new, i, a=1} \times \Delta\eta_{y, i, a} / \eta_{old}) - 1)$$

and

$$\Delta\eta_{y, i, a} = (\eta_{new, i, a} / \eta_{new, i, a=1})$$

where

$B_{y=1, new, i, survey}$	– annual quantity of woody biomass used by project devices in tonnes per device of type i
$\eta_{new, i, a}$	– the thermal efficiency of the device 'i' at age 'a' determined using the water boiling test
$\eta_{new, i, a=1}$	– the thermal efficiency of the device at its first year of operation
$\Delta\eta_{y, i, a}$	– factor to consider the efficiency loss of the project device type i due to its aging at the year y
η_{old}	– efficiency of the device being replaced

Baseline emissions are calculated retrospectively for illustrative purposes. The results of calculations of baseline emissions are presented below.

CPA	2015	2016	2017	Total
CPA 1	5,608	66,477	6,225	78,309
CPA 2	0	11,714	5,083	16,797
CPA 3	0	1,409	802	2,212
CPA 4	0	1,571	3,527	5,098
Total	5,608	81,170	15,637	102,415

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

Project emissions are calculated for illustrative purposes using similar approach as for emission reduction and applying annual quantity of woody biomass used by project devices as an input.

The results of calculations are presented below.

CPA	2015	2016	2017	Total
CPA 1	2,151	25,499	2,388	30,038
CPA 2	0	4,493	1,950	6,443
CPA 3	0	541	308	848
CPA 4	0	602	1,353	1,955
Total	2,151	31,136	5,998	39,285

H.3. Calculation of leakage

Leakages are calculated using default leakage adjustment factor of 0.95 (5% leakages).

The results of calculations are presented below.

CPA	2015	2016	2017	Total
CPA 1	173	2,049	192	2,414
CPA 2	0	361	157	518
CPA 3	0	43	25	68
CPA 4	0	48	109	157
Total	173	2,453	373	2,999

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	Project emissions or actual net GHG removals by	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

	sinks(tCO ₂ e)	sinks (tCO ₂ e)				
CPA 1	78,309	30,038	2,414	0	45,858	45,858
CPA 2	16,797	6,443	518	0	9,836	9,836
CPA 3	2,212	848	68	0	1,295	1,295
CPA 4	5,098	1,955	157	0	2,985	2,985
Total	102,415	39,285	3,157	0	59,974	59,974

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

Estimated amount of annual average GHG emission reductions according to the latest version of CPA-DD has been compared to actual values of emission reductions achieved by specific-case CPA during this monitoring period.

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
CPA 1	58,512	45,858
CPA 2	11,768	9,836
CPA 3	11,768	1,295
CPA 4	7,954	2,985
Total	90,002	59,974

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

Actual values achieved by the specific-case CPA(s) during the monitoring periods were lower than values estimated in ex ante calculation in the included CPA-DD(s) due to gradual introduction of project technology (improved portable clay stoves), higher than expected rates for continuation of baseline technology use and lower efficiency.

Only as many devices as necessary to meet the small scale limit have been included in each VPA.

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 checked="" type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
Organization name	Hestian Innovation Ltd.
Street/P.O. Box	
Building	Cragmuir Chambers
City	Road Town, Tortola
State/Region	British Virgin Islands
Postcode	N/A
Country	British Virgin Islands
Telephone	+447880 887254
Fax	N/A
E-mail	info@hestian.com
Website	www.hestian.com
Contact person	John O'Connnor
Title	Mr.
Salutation	
Last name	O'Connor
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First name	John
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