



**Monitoring report form for CDM programme of activities
(Version 03.0)**

Complete this form in accordance with the instructions attached at the end of this form.

MONITORING REPORT

Title of the PoA	Biomass Energy Conservation Programme	
UNFCCC reference number of the PoA	10 182	
Version numbers of the PoA-DD applicable to this monitoring report	07	
Version number of this monitoring report	1.3	
Completion date of this monitoring report	19/08/2019	
Monitoring period number	Forth (4th) Monitoring Period	
Duration of this monitoring period	01/06/2018 – 30/06/2019	
Monitoring report number for this monitoring period	1	
Coordinating/managing entity	Hestian Innovation Ltd.	
Host Parties	Host Party of the PoA	Is this the host Party of a CPA covered in this monitoring report? (yes/no)
	Malawi	Yes
	Rwanda	No
Applied methodologies and standardized baselines	AMS-II.G.: Energy efficiency measures in thermal applications of non-renewable biomass --- Version 6.0	
Sectoral scopes	Sectoral Scope 3 (Energy Demand)	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by all CPAs covered in this monitoring report in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	0	585,969 tonnes of CO₂ equivalent
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the CPA-DDs for the CPAs covered in this monitoring report	618,139 tonnes of CO₂ equivalent	

PART I Monitoring of programme of activities (PoA)

SECTION A. Description of PoA

A.1. General description of 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 cook-stoves in Malawi and Rwanda. Each CPA will consist of a number of improved cook-stoves (ICS), such as the Chitetezo Mbaula or Canarumwe stoves, or others as specified in each CPA- DD.

The fuel type used by improved household cook-stoves is predominantly fire wood and to a small extent other biomass agricultural residue (e.g. pigeonpea stalks, maize hobs, etc.).

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. Corresponding generic component project activities (CPAs)

Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Sectoral scopes	Applied methodologies and standardized baselines
Biomass Energy Conservation Programme CPA, generic CPA 1	07	Sectoral Scope 3 (Energy Demand)	AMS-II.G.: Energy efficiency measures in thermal applications of non-renewable biomass --- Version 6.0 https://cdm.unfccc.int/methodologies/DB/DCO8WRRQVTGLH1GHQBCL035F5M13R8

A.1.2. CPAs included in the PoA

Title and UNFCCC reference number of the CPA	Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Crediting period type and duration	Covered in this monitoring report? (yes/no)
Malawi Biomass Energy Conservation Programme CPA 1 - CPA 10182-0001-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 13/08/2015 – 12/08/2022	Yes
Malawi Biomass Energy Conservation Programme CPA 2 - CPA 10182-0002-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 15/10/2016 – 14/10/2023	Yes
Malawi Biomass Energy Conservation Programme CPA 3 - CPA 10182-0003-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 15/10/2016 – 14/10/2023	Yes

Malawi Biomass Energy Conservation Programme CPA 4 - CPA 10182-0004-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 15/10/2016 – 14/10/2023	Yes
Malawi Biomass Energy Conservation Programme CPA 5 - CPA 10182-0005-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 03/05/2017 – 14/10/2023	Yes
Malawi Biomass Energy Conservation Programme CPA 6 - CPA 10182-0006-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 01/09/2017 – 30/11/2023	Yes
Malawi Biomass Energy Conservation Programme CPA 7 - CPA 10182-0025-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 11/08/2017 – 10/08/2024	Yes
Malawi Biomass Energy Conservation Programme CPA 8 - CPA 10182-0020-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 06/04/2018 – 05/04/2025	Yes
Malawi Biomass Energy Conservation Programme CPA 9 - CPA 10182-0021-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 29/03/2018 – 28/03/2025	Yes
Malawi Biomass Energy Conservation Programme CPA 10 - CPA 10182-0022-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 11/08/2017 – 10/08/2024	Yes
Malawi Biomass Energy Conservation Programme CPA 11 - CPA 10182-0023-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 11/08/2017 – 10/08/2024	Yes
Malawi Biomass Energy Conservation Programme CPA 12 - CPA 10182-0024-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 11/08/2017 – 10/08/2024	Yes
Malawi Biomass Energy Conservation Programme CPA 13 - CPA 10182-0007-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 11/08/2017 – 10/08/2024	Yes
Malawi Biomass Energy Conservation Programme CPA 14 - CPA 10182-0009-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 11/08/2017 – 10/08/2024	Yes
Malawi Biomass Energy Conservation Programme CPA 15 - CPA 10182-0008-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 11/08/2017 – 10/08/2024	Yes
Malawi Biomass Energy Conservation Programme CPA 16 - CPA 10182-0010-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 11/08/2017 – 10/08/2024	Yes
Malawi Biomass Energy Conservation Programme CPA 17 - CPA 10182-0011-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 11/08/2017 – 10/08/2024	Yes
Malawi Biomass Energy Conservation Programme CPA 18 - CPA 10182-0012-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 01/09/2018 – 10/08/2024	Yes
Malawi Biomass Energy Conservation	Biomass Energy Conservation	07	Renewable 11/08/2017 –	Yes

Programme CPA 19 - CPA 10182-0013-CP1	Programme CPA, generic CPA 1		10/08/2024	
Malawi Biomass Energy Conservation Programme CPA 20 - CPA 10182-0014-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 01/10/2018 – 10/08/2024	No
Malawi Biomass Energy Conservation Programme CPA 21 - CPA 10182-0015-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 01/11/2018 – 10/08/2024	No
Malawi Biomass Energy Conservation Programme CPA 22 - CPA 10182-0016-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 01/01/2019 – 10/08/2024	No
Malawi Biomass Energy Conservation Programme CPA 23 - CPA 10182-0017-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 01/01/2019 – 10/08/2024	No
Malawi Biomass Energy Conservation Programme CPA 24 - CPA 10182-0018-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 01/02/2019 – 10/08/2024	No
Malawi Biomass Energy Conservation Programme CPA 25 - CPA 10182-0019-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 01/02/2019 – 10/08/2024	No
Rwanda Biomass Energy Conservation Programme CPA 1 - CPA 10182-P1-0026-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 18/03/2019 – 17/03/2026	No
Rwanda Biomass Energy Conservation Programme CPA 2 - CPA 10182-P1-0027-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 18/03/2019 – 17/03/2026	No
Rwanda Biomass Energy Conservation Programme CPA 3 - CPA 10182-P1-0028-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 18/03/2019 – 17/03/2026	No
Rwanda Biomass Energy Conservation Programme CPA 4 - CPA 10182-P1-0029-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 18/03/2019 – 17/03/2026	No
Rwanda Biomass Energy Conservation Programme CPA 5 - CPA 10182-P1-0030-CP1	Biomass Energy Conservation Programme CPA, generic CPA 1	07	Renewable 18/03/2019 – 17/03/2026	No

A.2. Coordinating/managing entity

Hestian Innovation Limited (Hestian) is the coordinating/managing entity of the PoA, which communicates with the Board.

Contact person: Mr. Conor Fox, conor.fox@hestian.com

SECTION B. Implementation of PoA

B.1. Description of implemented 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. CPAs included in the monitoring report are being implemented in Malawi and foresees the dissemination of Chitetezo Mbaula stoves. This stove can be used as a portable stove or can be fixed, and has a laboratory test efficiency of 30.6%¹ (more than three times the default 10% efficiency of the baseline three stone and unimproved cookstoves) which results in reduced fuel consumption by improved combustion and improved heat transfer, raising the cooking pot to the hottest point above the flame. The Chitetezo Mbaula has an average lifespan of 47 months² and can be used for various pot sizes. The Ceramic Stove is produced at a local level using locally available materials, thereby creating employment in a 'green' industry.

There are three CPA implementers at the time of monitoring report preparation: Area 55 (CPA 1, CPA 2, CPA 4, CPA 5, CPA 6, CPA 8), Sunfire (CPA 3, CPA 7, CPA 10, CPA 12, CPA 13, CPA 14, CPA 15, CPA 16, CPA 18 and CPA 19), and Eden by Design (CPA 9, CPA 11 and CPA 17).

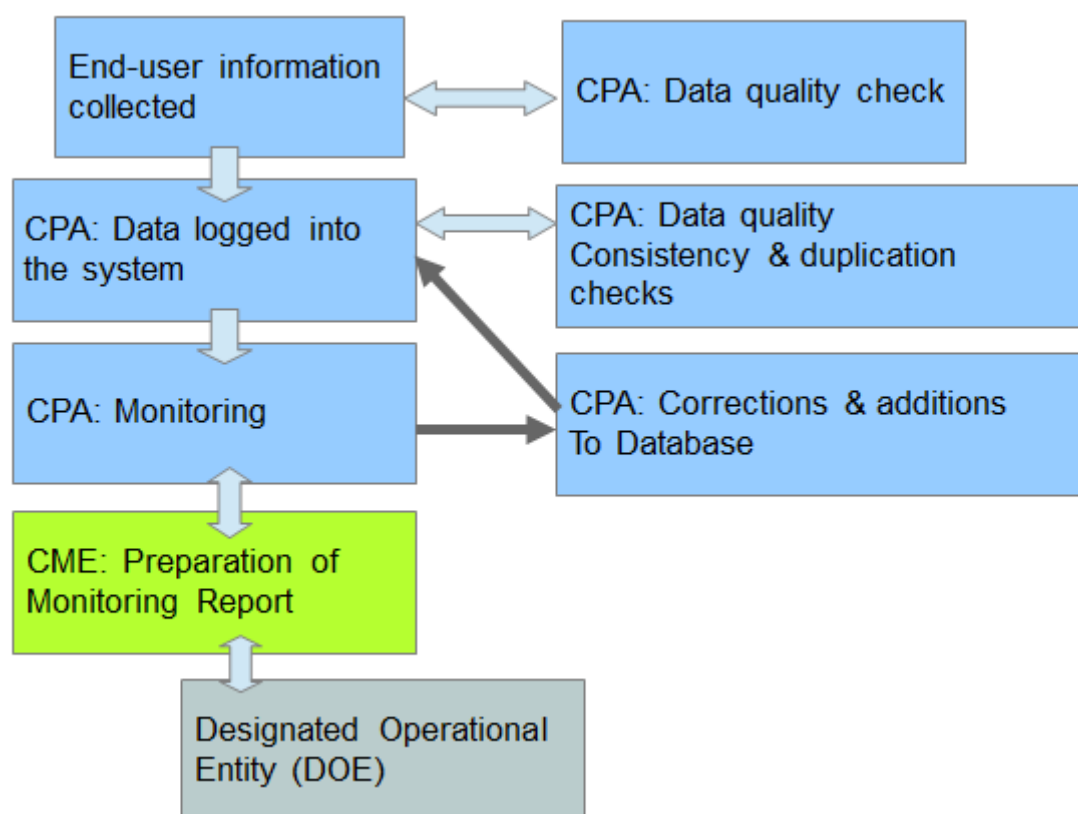
Total sales records database has been maintained so that end users can be traced (i.e. name, address and telephone number, if available) documenting the date and place of sale and the number of stoves bought. End user information is collected through direct sales to end-users by retailers or agents of 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 ³cook-stoves 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 on the last day of the month next to the month, when the stove is delivered to the shop; this is the conservative assumption as 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 is 25 days)¹. In the case of direct sales, it is assumed that the stove is first used on the next date after the date of sale.

Organizational structure, roles and competencies of the personnel involved in the monitoring activities have been reviewed throughout the monitoring period. Up-to-date CDM requirements for the PoA management were analysed and no new requirements demanding changes to the existing PoA management system were identified. Procedures for relations with clients and stakeholders, data keeping and recording, training and quantification of the personnel were reviewed and found satisfactory. The flow chart below illustrates the roles and responsibilities of the parties during the implementation of the PoA.

¹ Tests were carried out in August 2012 by the Regional Stove Testing Centre, Centre for Research in Energy and Energy Conservation (CREEC), at College of Engineering, Design, Art and Technology, Makerere University, Kampala, Uganda (creec@tech.mak.ac.ug).

² Estimates are based on verification report for GS613, a Gold Standard project that has been developed by the CME that promotes the Chitetezo Mbaula in Malawi. The Verification Report is for the period 02/10/2012 to 01/10/2013 (both days inclusive). (page 19 of 118).

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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.

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.

The description of implemented sampling design is provided below:

- 1) objective of the sampling is to collect data to estimate monitoring parameters needed for emission reduction calculation meeting the requirements for minimum sample size, and required confidence (95%) / precision (10%) level;
- 2) target population – 376,377 improved cookstoves;

3) sampling frame – ICSs distributed in 4 Districts randomly sampled taking into account the population size of each District, i.e. considering probability proportional to size on the primary unit (this gives more populous areas a higher chance of being selected); the 4 districts sampled were Balaka, Kasungu, Mangochi and Ntcheu with total of 182,373 distributed ICS;

4) sampling methods - stratified random sampling; the strata were defined by project participant based on the approach described in PoA DD; the primary sampling units were identified based on CPA Implementer and ICS vintage;

5) sample size - the minimal sample sizes are presented in the table below; from experience some households will not be available or away from home at the time of the visit so oversampling was performed;

Parameter	Sample size calculated	Whether minimum sample size (30) achieved	Sample size arrived	Assumed response rate	Recommended sample size	Actual Sample Size	Precision achieved
Proportion of stoves that are still in operation	88	Yes	88	75%	118	123	4.6%
Retention use of ICS	74	Yes	74	75%	99	123	3.6%
Thermal efficiency of the device 'i' at age 'a' determined using the water boiling test	10	No, Student t-distribution is applied	13	90%	15	19	3.7%

Information about the precision achieved demonstrates that the required confidence/precision level has been met.

6) formulas used in the sampling:

- overall proportion and overall variance for proportional parameters were calculated based on equations (5) and (6); overall mean and overall variance for mean parameters were calculated based on equations (22) and (23) of CDM Guideline “Sampling and surveys for CDM project activities and programmes of activities”, Version 03.0.
- the minimum sample size required is calculated based on equation (4) for proportional parameters and equation (21) for mean parameters of CDM Guideline “Sampling and surveys for CDM project activities and programmes of activities”, Version 03.0.

The minimum sample size has been proportionally calculated for each primary sampling unit. For WBTs the calculated minimum number of age 4 stoves was only 1 and it was increased to 3 to ensure better representativeness of the testing results.

Data were collected among households randomly selected among target population meeting the requirements for minimum sample size, thus the selected samples are representative of the population.

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 of the estimated life-span for the clay stoves (Chitetezo Mbaula Malawi and Canarumwe in Rwanda) based on previous project proponent experience equal to 1417 days will be used for calculation of emission reductions.⁴

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

B.2. Post-registration changes to PoA

B.2.1. Corrections

There are no corrections to programme information or parameters fixed at the registration of the PoA.

B.2.2. Inclusion of monitoring plan

Not Applicable. The section is left blank intentionally.

B.2.3. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

Not Applicable. The section is left blank intentionally.

B.2.4. Changes to programme design

Not Applicable. The section is left blank intentionally.

B.2.5. Changes specific to afforestation or reforestation activities

Not Applicable. The section is left blank intentionally.

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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.

PART II Monitoring of CPAs

SECTION C. Implementation of CPAs

C.1. Description of implemented CPAs

There are 19 specific-case CPAs included in monitoring report. Under each CPA improved cook-stoves (i.e. the technology) that are more efficient and use less wood for household cooking and heating than the traditional stoves are disseminated. Therefore, the brief description below is provided for the group of registered specific-case CPAs (CPA1, CPA 2, CPA 3, CPA 4, CPA 5, CPA 6, CPA 7, CPA 8, CPA 9, CPA 10, CPA 11, CPA 12, CPA 13, CPA 14, CPA 15, CPA 16, CPA 17, CPA 18, CPA 19).

The purpose of the group of specific-case CPAs is to reduce greenhouse gases emissions due to improved efficiency of firewood consumption achieved in improved cook-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 measures taken for GHG emission reduction include the application of the improved cook-stoves and cooking practices, and replacement of less efficient technologies and practices. The application of improved cook-stoves results in biomass conservation and a reduction of greenhouse gas emissions into the atmosphere from the burning of solid biomass.

The cook-stove model disseminated within PoA is a Ceramic Stove called the Chitetezo Mbaula in Malawi and Canarumwe in Rwanda. This stove can be used as a portable stove or can be fixed, and has a laboratory test efficiency of 30.6% (more than three times the default 10% efficiency of the baseline three stone and unimproved cook-stoves) which results in reduced fuel consumption by improved combustion, improved heat transfer, raising the cooking pot to the hottest point above the flame, and improved heat retention.

The Ceramic Stove is produced at a local level using locally available materials, thereby creating employment in a 'green' industry.

Under CPA 1 improved household cook-stoves are disseminated in the Northern, Central and Southern Districts of Malawi. CPA 1 was included in Programme of Activities on 13/08/2015. Beginning of household stoves (ICS) distribution under the CPA is 13/08/2015 and the end of distribution is 31/05/2016. It is assumed that each household stove starts its operation on the next day after the date of sale. In case of bulk sales it is assumed that each household stove starts its operation on the last day of the month next to the month, when the stove is delivered to the shop. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 22,496. Monitoring period covered in this monitoring report is 01/06/2018 – 30/06/2019 (both dates included). The type of stove disseminated is Chitetezo Mbaula ceramic stove, which has a laboratory test efficiency of 30.6%. Total GHG emission reductions achieved in this monitoring period is 27,600 tonnes CO₂e. Double counting is avoided by using unique serial numbers for each household stove distributed within CPAs included in the programme of activities.

Under CPA 2 improved household cook-stoves are disseminated in the Northern, Central and Southern Districts of Malawi. CPA 2 was included in Programme of Activities on 15/10/2016. Beginning of household stoves (ICS) distribution under the CPA is 03/06/2016. The stoves were distributed between 03/06/2016 and 18/11/2016 and between 22/09/2017 and 30/10/2017. It is assumed that each household stove starts its operation on the next day after the date of sale. In case of bulk sales it is assumed that each household stove starts its operation on the last day of

the month next to the month, when the stove is delivered to the shop. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 22,311. Monitoring period covered in this monitoring report is 01/06/2018 – 30/06/2019 (both dates included). The type of stove disseminated is Chitetezo Mbaula ceramic stove, which has a laboratory test efficiency of 30.6%. Total GHG emission reductions achieved in this monitoring period is 46,150 tonnes CO₂e. Double counting is avoided by using unique serial numbers for each household stove distributed within CPAs included in the programme of activities.

Under CPA 3 improved household cook-stoves are disseminated in the Northern, Central and Southern Districts of Malawi. CPA 3 was included in Programme of Activities on 15/10/2016. Beginning of household stoves (ICS) distribution under the CPA is 01/07/2016 and the end of distribution is 22/11/2017. It is assumed that each household stove starts its operation on the next day after the date of sale. In case of bulk sales it is assumed that each household stove starts its operation on the last day of the month next to the month, when the stove is delivered to the shop. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 22,308. Monitoring period covered in this monitoring report is 01/06/2018 – 30/06/2019 (both dates included). The type of stove disseminated is Chitetezo Mbaula ceramic stove, which has a laboratory test efficiency of 30.6%. Total GHG emission reductions achieved in this monitoring period is 48,446 tonnes CO₂e. Double counting is avoided by using unique serial numbers for each household stove distributed within CPAs included in the programme of activities.

Under CPA 4 improved household cook-stoves are disseminated in the Northern, Central and Southern Districts of Malawi. CPA 4 was included in Programme of Activities on 15/10/2016. Beginning of household stoves (ICS) distribution under the CPA is 19/11/2016 and the end of stove distribution is 02/05/2017. It is assumed that each household stove starts its operation on the next day after the date of sale. In case of bulk sales it is assumed that each household stove starts its operation on the last day of the month next to the month, when the stove is delivered to the shop. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 21,120. Monitoring period covered in this monitoring report is 01/06/2018 – 30/06/2019 (both dates included). The type of stove disseminated is Chitetezo Mbaula ceramic stove, which has a laboratory test efficiency of 30.6%. Total GHG emission reductions achieved in this monitoring period is 44,647 tonnes CO₂e. Double counting is avoided by using unique serial numbers for each household stove distributed within CPAs included in the programme of activities.

Under CPA 5 improved household cook-stoves are disseminated in the Northern, Central and Southern Districts of Malawi. CPA 5 was included in Programme of Activities on 15/10/2016. Beginning of household stoves (ICS) distribution under the CPA is 03/05/2017 and the end of stove distribution is 21/09/2017. It is assumed that each household stove starts its operation on the next day after the date of sale. In case of bulk sales it is assumed that each household stove starts its operation on the last day of the month next to the month, when the stove is delivered to the shop. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 21,385. Monitoring period covered in this monitoring report is 01/06/2018 – 30/06/2019 (both dates included). The type of stove disseminated is Chitetezo Mbaula ceramic stove, which has a laboratory test efficiency of 30.6%. Total GHG emission reductions achieved in this monitoring period is 45,726 tonnes CO₂e. Double counting is avoided by using unique serial numbers for each household stove distributed within CPAs included in the programme of activities.

Under CPA 6 improved household cook-stoves are disseminated in the Northern, Central and Southern Districts of Malawi. CPA 6 was included in Programme of Activities on 15/10/2016. Beginning of household stoves (ICS) distribution under the CPA is 31/10/2017. It is assumed that each household stove starts its operation on the next day after the date of sale. In case of bulk sales it is assumed that each household stove starts its operation on the last day of the month next to the month, when the stove is delivered to the shop. The distribution of stoves under CPA 6 has ended on 05/04/2018. The number of household stoves (portable clay stoves) distributed within

CPA as of the end of the monitoring period considered is 21,403. Monitoring period covered in this monitoring report is 01/06/2018 – 30/06/2019 (both dates included). The type of stove disseminated is Chitetezo Mbaula ceramic stove, which has a laboratory test efficiency of 30.6%. Total GHG emission reductions achieved in this monitoring period is 47,171 tonnes CO₂e. Double counting is avoided by using unique serial numbers for each household stove distributed within CPAs included in the programme of activities.

Under CPA 7 improved household cook-stoves are disseminated in the Northern, Central and Southern Districts of Malawi. CPA 7 was included in Programme of Activities on 11/08/2017. Beginning of household stoves (ICS) distribution under the CPA is 23/11/2017. It is assumed that each household stove starts its operation on the next day after the date of sale. In case of bulk sales it is assumed that each household stove starts its operation on the last day of the month next to the month, when the stove is delivered to the shop. The distribution of stoves under CPA 7 has ended on 31/05/2018. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 24,639. Monitoring period covered in this monitoring report is 01/06/2018 – 30/06/2019 (both dates included). The type of stove disseminated is Chitetezo Mbaula ceramic stove, which has a laboratory test efficiency of 30.6%. Total GHG emission reductions achieved in this monitoring period is 54,304 tonnes CO₂e. Double counting is avoided by using unique serial numbers for each household stove distributed within CPAs included in the programme of activities.

Under CPA 8 improved household cook-stoves are disseminated in the Northern, Central and Southern Districts of Malawi. CPA 8 was included in Programme of Activities on 11/08/2017. Beginning of household stoves (ICS) distribution under the CPA is 06/04/2018. It is assumed that each household stove starts its operation on the next day after the date of sale. In case of bulk sales it is assumed that each household stove starts its operation on the last day of the month next to the month, when the stove is delivered to the shop. The distribution of stoves under CPA 8 has ended on 30/06/2018. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 9,263. Monitoring period covered in this monitoring report is 01/06/2018 – 30/06/2019 (both dates included). The type of stove disseminated is Chitetezo Mbaula ceramic stove, which has a laboratory test efficiency of 30.6%. Total GHG emission reductions achieved in this monitoring period is 19,781 tonnes CO₂e. Double counting is avoided by using unique serial numbers for each household stove distributed within CPAs included in the programme of activities.

Under CPA 9 improved household cook-stoves are disseminated in the Northern, Central and Southern Districts of Malawi. CPA 9 was included in Programme of Activities on 11/08/2017. Beginning of household stoves (ICS) distribution under the CPA is 29/03/2018. It is assumed that each household stove starts its operation on the next day after the date of sale. In case of bulk sales it is assumed that each household stove starts its operation on the last day of the month next to the month, when the stove is delivered to the shop. The distribution of stoves under CPA 9 has ended on 31/05/2018. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 19,902. Monitoring period covered in this monitoring report is 01/06/2018 – 30/06/2019 (both dates included). The type of stove disseminated is Chitetezo Mbaula ceramic stove, which has a laboratory test efficiency of 30.6%. Total GHG emission reductions achieved in this monitoring period is 43,862 tonnes CO₂e. Double counting is avoided by using unique serial numbers for each household stove distributed within CPAs included in the programme of activities.

Under CPA 10 improved household cook-stoves are disseminated in the Northern, Central and Southern Districts of Malawi. CPA 10 was included in Programme of Activities on 11/08/2017. Beginning of household stoves (ICS) distribution under the CPA is 01/06/2018 and the end of distribution is 31/08/2018. It is assumed that each household stove starts its operation on the next day after the date of sale. In case of bulk sales it is assumed that each household stove starts its operation on the last day of the month next to the month, when the stove is delivered to the shop. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 20,223. Monitoring period covered in this monitoring report is

01/06/2018 – 30/06/2019 (both dates included). The type of stove disseminated is Chitetezo Mbaula ceramic stove, which has a laboratory test efficiency of 30.6%. Total GHG emission reductions achieved in this monitoring period is 41,685 tonnes CO₂e. Double counting is avoided by using unique serial numbers for each household stove distributed within CPAs included in the programme of activities.

Under CPA 11 improved household cook-stoves are disseminated in the Northern, Central and Southern Districts of Malawi. CPA 11 was included in Programme of Activities on 11/08/2017. Household stoves (ICS) under the CPA 11 were distributed on 08/02/2018 and then from 01/06/2018 to 30/10/2018. It is assumed that each household stove starts its operation on the next day after the date of sale. In case of bulk sales it is assumed that each household stove starts its operation on the last day of the month next to the month, when the stove is delivered to the shop. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 19,742. Monitoring period covered in this monitoring report is 01/06/2018 – 30/06/2019 (both dates included). The type of stove disseminated is Chitetezo Mbaula ceramic stove, which has a laboratory test efficiency of 30.6%. Total GHG emission reductions achieved in this monitoring period is 37,240 tonnes CO₂e. Double counting is avoided by using unique serial numbers for each household stove distributed within CPAs included in the programme of activities.

Under CPA 12 improved household cook-stoves are disseminated in the Northern, Central and Southern Districts of Malawi. CPA 12 was included in Programme of Activities on 11/08/2017. Beginning of household stoves (ICS) distribution under the CPA is 01/09/2018 and the end of distribution is 22/10/2018. It is assumed that each household stove starts its operation on the next day after the date of sale. In case of bulk sales it is assumed that each household stove starts its operation on the last day of the month next to the month, when the stove is delivered to the shop. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 20,417. Monitoring period covered in this monitoring report is 01/06/2018 – 30/06/2019 (both dates included). The type of stove disseminated is Chitetezo Mbaula ceramic stove, which has a laboratory test efficiency of 30.6%. Total GHG emission reductions achieved in this monitoring period is 33,515 tonnes CO₂e. Double counting is avoided by using unique serial numbers for each household stove distributed within CPAs included in the programme of activities.

Under CPA 13 improved household cook-stoves are disseminated in the Northern, Central and Southern Districts of Malawi. CPA 13 was included in Programme of Activities on 11/08/2017. Beginning of household stoves (ICS) distribution under the CPA is 23/10/2018 and the end of distribution is 02/12/2018. It is assumed that each household stove starts its operation on the next day after the date of sale. In case of bulk sales it is assumed that each household stove starts its operation on the last day of the month next to the month, when the stove is delivered to the shop. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 20,390. Monitoring period covered in this monitoring report is 01/06/2018 – 30/06/2019 (both dates included). The type of stove disseminated is Chitetezo Mbaula ceramic stove, which has a laboratory test efficiency of 30.6%. Total GHG emission reductions achieved in this monitoring period is 28,893 tonnes CO₂e. Double counting is avoided by using unique serial numbers for each household stove distributed within CPAs included in the programme of activities.

Under CPA 14 improved household cook-stoves are disseminated in the Northern, Central and Southern Districts of Malawi. CPA 14 was included in Programme of Activities on 11/08/2017. Beginning of household stoves (ICS) distribution under the CPA is 03/12/2018 and the end of distribution is 22/01/2019. It is assumed that each household stove starts its operation on the next day after the date of sale. In case of bulk sales it is assumed that each household stove starts its operation on the last day of the month next to the month, when the stove is delivered to the shop. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 19,700. Monitoring period covered in this monitoring report is 01/06/2018 – 30/06/2019 (both dates included). The type of stove disseminated is Chitetezo

Mbaula ceramic stove, which has a laboratory test efficiency of 30.6%. Total GHG emission reductions achieved in this monitoring period is 18,510 tonnes CO₂e. Double counting is avoided by using unique serial numbers for each household stove distributed within CPAs included in the programme of activities.

Under CPA 15 improved household cook-stoves are disseminated in the Northern, Central and Southern Districts of Malawi. CPA 15 was included in Programme of Activities on 11/08/2017. Beginning of household stoves (ICS) distribution under the CPA is 23/01/2019 and the end of distribution is 04/04/2019. It is assumed that each household stove starts its operation on the next day after the date of sale. In case of bulk sales it is assumed that each household stove starts its operation on the last day of the month next to the month, when the stove is delivered to the shop. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 20,906. Monitoring period covered in this monitoring report is 01/06/2018 – 30/06/2019 (both dates included). The type of stove disseminated is Chitetezo Mbaula ceramic stove, which has a laboratory test efficiency of 30.6%. Total GHG emission reductions achieved in this monitoring period is 16,426 tonnes CO₂e. Double counting is avoided by using unique serial numbers for each household stove distributed within CPAs included in the programme of activities.

Under CPA 16 improved household cook-stoves are disseminated in the Northern, Central and Southern Districts of Malawi. CPA 16 was included in Programme of Activities on 11/08/2017. Beginning of household stoves (ICS) distribution under the CPA is 05/04/2019 and the end of distribution is 10/05/2019. It is assumed that each household stove starts its operation on the next day after the date of sale. In case of bulk sales it is assumed that each household stove starts its operation on the last day of the month next to the month, when the stove is delivered to the shop. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 20,321. Monitoring period covered in this monitoring report is 01/06/2018 – 30/06/2019 (both dates included). The type of stove disseminated is Chitetezo Mbaula ceramic stove, which has a laboratory test efficiency of 30.6%. Total GHG emission reductions achieved in this monitoring period is 8,165 tonnes CO₂e. Double counting is avoided by using unique serial numbers for each household stove distributed within CPAs included in the programme of activities.

Under CPA 17 improved household cook-stoves are disseminated in the Northern, Central and Southern Districts of Malawi. CPA 17 was included in Programme of Activities on 11/08/2017. Beginning of household stoves (ICS) distribution under the CPA is 31/10/2018. It is assumed that each household stove starts its operation on the next day after the date of sale. In case of bulk sales it is assumed that each household stove starts its operation on the last day of the month next to the month, when the stove is delivered to the shop. The distribution of stoves under CPA 17 is being continued. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 17,685. Monitoring period covered in this monitoring report is 01/06/2018 – 30/06/2019 (both dates included). The type of stove disseminated is Chitetezo Mbaula ceramic stove, which has a laboratory test efficiency of 30.6%. Total GHG emission reductions achieved in this monitoring period is 18,341 tonnes CO₂e. Double counting is avoided by using unique serial numbers for each household stove distributed within CPAs included in the programme of activities.

Under CPA 18 improved household cook-stoves are disseminated in the Northern, Central and Southern Districts of Malawi. CPA 18 was included in Programme of Activities on 11/08/2017. Beginning of household stoves (ICS) distribution under the CPA is 11/05/2019 and the end of distribution is 06/06/2019. It is assumed that each household stove starts its operation on the next day after the date of sale. In case of bulk sales it is assumed that each household stove starts its operation on the last day of the month next to the month, when the stove is delivered to the shop. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 21,310. Monitoring period covered in this monitoring report is 01/06/2018 – 30/06/2019 (both dates included). The type of stove disseminated is Chitetezo Mbaula ceramic stove, which has a laboratory test efficiency of 30.6%. Total GHG emission

reductions achieved in this monitoring period is 4,816 tonnes CO₂e. Double counting is avoided by using unique serial numbers for each household stove distributed within CPAs included in the programme of activities.

Under CPA 19 improved household cook-stoves are disseminated in the Northern, Central and Southern Districts of Malawi. CPA 19 was included in Programme of Activities on 11/08/2017. Beginning of household stoves (ICS) distribution under the CPA is 07/06/2019. The distribution of the stoves under this CPA is being continued. It is assumed that each household stove starts its operation on the next day after the date of sale. In case of bulk sales it is assumed that each household stove starts its operation on the last day of the month next to the month, when the stove is delivered to the shop. The number of household stoves (portable clay stoves) distributed within CPA as of the end of the monitoring period considered is 10,856. Monitoring period covered in this monitoring report is 01/06/2018 – 30/06/2019 (both dates included). The type of stove disseminated is Chitetezo Mbaula ceramic stove, which has a laboratory test efficiency of 30.6%. Total GHG emission reductions achieved in this monitoring period is 691 tonnes CO₂e. Double counting is avoided by using unique serial numbers for each household stove distributed within CPAs included in the programme of activities.

C.2. Location of CPAs

All specific-case CPAs (i.e. CPA1, CPA 2, CPA 3, CPA 4, CPA 5, CPA 6, CPA 7, CPA 8, CPA 9, CPA 10, CPA 11, CPA 12, CPA 13, CPA 14, CPA 15, CPA 16, CPA 17, CPA 18, CPA 19) are CPAs promoting ICSs in Malawi (Host Party). The location of all specific-case CPAs cover all regions and districts of Malawi and programme of activities is implemented in different villages, towns and cities of Malawi. Malawi is a landlocked country which shares its north-west border with the Republic of Zambia, north-east border with the United Republic of Tanzania, and its borders at east, south and west with the Republic of Mozambique. Physical/geographical location of Malawi is the following: latitude: 13°30', longitude: 34° 00'.



Pic. 1. Map of Malawi

C.3. Post-registration changes to CPAs**C.3.1. Temporary deviations from the monitoring plans in the included CPA-DDs, applied methodologies, standardized baselines or other methodological regulatory documents**

Not Applicable. The section is left blank intentionally.

C.3.2. Corrections

Not Applicable. The section is left blank intentionally.

C.3.3. Changes to the start date of the crediting period

The following changes of the start date of the crediting period were made:

Reference number	CPA title	The new start date of the crediting period
CPA 10182-0005	Malawi Biomass Energy Conservation Programme CPA 5	03/05/2017
CPA 10182-0006	Malawi Biomass Energy Conservation Programme CPA 6	01/09/2017
CPA 10182-0020	Malawi Biomass Energy Conservation Programme CPA 8	06/04/2018
CPA 10182-0021	Malawi Biomass Energy Conservation Programme CPA 9	29/03/2018
CPA 10182-0012	Malawi Biomass Energy Conservation Programme CPA 18	01/09/2018
CPA 10182-0014	Malawi Biomass Energy Conservation Programme CPA 20	01/10/2018
CPA 10182-0015	Malawi Biomass Energy Conservation Programme CPA 21	01/11/2018
CPA 10182-0016	Malawi Biomass Energy Conservation Programme CPA 22	01/01/2019
CPA 10182-0017	Malawi Biomass Energy Conservation Programme CPA 23	01/01/2019
CPA 10182-0018	Malawi Biomass Energy Conservation Programme CPA 24	01/02/2019
CPA 10182-0019	Malawi Biomass Energy Conservation Programme CPA 25	01/02/2019

C.3.4. Inclusion of monitoring plan

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

C.3.5. Permanent changes to the included monitoring plans, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

Not Applicable. The section is left blank intentionally.

C.3.6. Changes to project design

Not Applicable. The section is left blank intentionally.

C.3.7. Changes specific to afforestation or reforestation CPA

Not applicable. The section is left blank intentionally.

SECTION D. Description of monitoring system of CPAs

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, Sunfire and Eden by Design, 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 cook-stoves, 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 group⁵. Further than this it is too difficult to access 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.

⁵The 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 E. Data and parameters

E.1. Data and parameters fixed ex ante

All data / parameters described in the tables below are applicable for all 9 CPAs of the programme of activities (i.e. CPA1, CPA 2, CPA 3, CPA 4, CPA 5, CPA 6, CPA 7, CPA 8, CPA 9, CPA 10, CPA 11, CPA 12, CPA 13, CPA 14, CPA 15, CPA 16, CPA 17, CPA 18, CPA 19).

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 ⁶
Value(s) applied	0.81 for Malawi
Choice of data or measurement methods and procedures	Default country specific value
Purpose of data/parameter	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/parameter	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/parameter	Calculation of baseline emissions / emission reductions
Additional comments	-

⁶

<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	0.10
Choice of data or measurement methods and procedures	Default value
Purpose of data/parameter	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/parameter	Calculation of leakages / emission reductions
Additional comments	-

E.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	1.881
Monitoring equipment	<p>Weights: Digital high precision scale – MyWeigh KD- 8000, type - 8 kg capacity digital weighing scale, accuracy - accurate to 1 g; Calibration date – 13/01/2017, expiry date – not applicable. Certificates of calibration # TM2017031301 and # TM2017031302 issued by Malawi Bureau of Standards.</p> <p>In the registered PoA DD as well as CPA DDs, there is no calibration frequency mentioned for the monitoring equipment's that will be used during the verification. However, the calibration of monitoring equipment's has been done from a reputed agency, even though the equipment are newly purchased and are under guaranty from the manufacturer. Since neither the calibration agency nor the equipment manufacturer mentioned any specific validity of the calibration, thus guidelines as per "General Guidelines to SSC CDM methodologies" EB 61, Annex 21, para 17 (c) has been followed which says:</p>

	<p>"Measuring equipment should be certified to national or IEC standards and calibrated according to the national standards and reference points or IEC standards and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in three years". Hence, the monitoring equipment will be calibrated before completion of three years from the date of last calibrations of the respective equipment.</p> <p><u>Moisture meters:</u> Wood humidity measuring device - Voltcraft FM-300, type - moisture measuring range 6% to 99.9%, accuracy - $\pm 1\%$ (in moisture range 6% ~ 40%). Calibration date – 13/01/2017, expiry date – 12/01/2018. Certificates of calibration # GK201704005002 (moisture meter with serial number 12117541) and # GK201704005001 (moisture meter with serial number 12117617) issued by Malawi Bureau of Standards.</p> <p>Monitoring equipment has been also checked by monitoring facilitators as per the equipments' operating instructions, prior to conducting tests.</p>
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 cook-stoves.</p>
QA/QC procedures	Use of calibrated measurement equipment.
Purpose of data/parameter	Calculation of emission reduction
Additional comments	Based on monitoring data from the first monitoring period. KPTs were conducted in between 24/01/2017 and 26/02/2017.

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	CPA 1 – 22,496 CPA 2 – 22,311 CPA 3 – 22,308 CPA 4 – 21,120 CPA 5 – 21,385 CPA 6 – 21,403 CPA 7 – 24,639

	<p>CPA 8 – 9,263 CPA 9 – 19,902 CPA 10 – 20,223 CPA 11 – 19,742 CPA 12 – 20,417 CPA 13 – 20,390 CPA 14 – 19,700 CPA 15 – 20,906 CPA 16 – 20,321 CPA 17 – 17,685 CPA 18 – 21,310 CPA 19 – 10,856</p> <p>Values adjusted for usage rate and duration of stove operation in 2018</p> <p>CPA 1 – 6,026 of age 4 CPA 2 – 2,489 of age 2; 6,481 of age 3; and 454 of age 4; CPA 3 – 6,502 of age 2; and 3,413 of age 3; CPA 4 – 9,051 of age 3; CPA 5 – 2,614 of age 2; and 6,693 of age 3; CPA 6 – 9,702 of age 2; CPA 7 – 11,169 of age 2; CPA 8 – 4,069 of age 2; CPA 9 – 9,022 of age 2; CPA 10 – 4,645 of age 1; and 2,996 of age 2; CPA 11 – 4,983 of age 1; and 1,011 of age 2; CPA 12 – 4,216 of age 1; CPA 13 – 2,469 of age 1; CPA 14 – 440 of age 1; CPA 17 – 1,264 of age 1.</p> <p>Values adjusted for usage rate and duration of stove operation in 2019</p> <p>CPA 1 – 5,096 of age 4 CPA 2 – 2,105 of age 2; 5,481 of age 3; and 384 of age 4; CPA 3 – 5,499 of age 2; and 2,886 of age 3; CPA 4 – 7,655 of age 3; CPA 5 – 2,211 of age 2; and 5,661 of age 3; CPA 6 – 8,206 of age 2; CPA 7 – 9,447 of age 2; CPA 8 – 3,441 of age 2; CPA 9 – 7,630 of age 2; CPA 10 – 5,486 of age 1; and 2,724 of age 2; CPA 11 – 7,279 of age 1; and 896 of age 2; CPA 12 – 8,540 of age 1; CPA 13 – 8,528 of age 1; CPA 14 – 6,605 of age 1; CPA 15 – 6,252 of age 1; CPA 16 – 3,108 of age 1; CPA 17 – 5,717 of age 1; CPA 18 – 1,833 of age 1; CPA 19 – 263 of age 1.</p>
Monitoring equipment	None
Measuring/reading/recording frequency	Annually

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>Discount factor to account for households with more than 1 stove installed has been used to discount usage rate for each age group monitored.</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/parameter	Calculation of baseline and project emissions / emission reductions
Additional comments	Replaced devices are considered operational.

Data/parameter	$\mu_{y,i} / 365$
Unit	Proportion
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	$\mu_{y,i}$ CPA 1 – 345 CPA 2 – 345 CPA 3 – 345 CPA 4 – 345 CPA 5 – 345 CPA 6 – 345 CPA 7 – 345 CPA 8 – 345 CPA 9 – 345 CPA 10 – 345 CPA 11 – 345 CPA 12 – 345 CPA 13 – 345 CPA 14 – 345 CPA 15 – 345 CPA 16 – 345 CPA 17 – 345 CPA 18 – 345 CPA 19 – 345 $\mu_{y,i} / 365$ CPA 1 – 0.945 CPA 2 – 0.945 CPA 3 – 0.945 CPA 4 – 0.945 CPA 5 – 0.945 CPA 6 – 0.945 CPA 7 – 0.945 CPA 8 – 0.945 CPA 9 – 0.945 CPA 10 – 0.945 CPA 11 – 0.945 CPA 12 – 0.945 CPA 13 – 0.945 CPA 14 – 0.945 CPA 15 – 0.945 CPA 16 – 0.945 CPA 17 – 0.945 CPA 18 – 0.945 CPA 19 – 0.945
Monitoring equipment	N/A
Measuring/reading/recording frequency	At least once every two years (biennial)
Calculation method (if applicable)	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>According to paragraph 22 of the methodology, surveys may be conducted if the use of data loggers to record the continued operation of baseline devices is not practical, for example when the baseline device is the three stone fire. As using data loggers is not practical due to high number of ICS distributed within PoA and the baseline device is the three stone fire, the use of surveys is justified.</p> <p>The surveys were designed to capture cooking habits and stove usage of households, 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. Usage and monitoring survey included questions on cooking time using different stoves types for different types of meal (breakfast, lunch, dinner). The average daily cooking time in households using baseline stoves and the average daily cooking time using baseline stove were used to estimate baseline stoves usage in households using baseline stoves in % of cooking time. Baseline stoves usage was multiplied by percentage of households using baseline stoves to estimate the discount factor to account for baseline stove use – 5.44%.</p>
QA/QC procedures	Sampling has been conducted by applying the 95/10 confidence precision for the sample size calculation.
Purpose of data/parameter	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	CPA 1 – 83.95 for age group 1, 84.08 for age group 2, 84.84 for age group 3, 81.11 for age group 4; CPA 2 – 83.95 for age group 1, 84.08 for age group 2, 84.84 for age group 3, 81.11 for age group 4; CPA 3 – 83.95 for age group 1, 84.08 for age group 2, 84.84 for age group 3, 81.11 for age group 4; CPA 4 – 83.95 for age group 1, 84.08 for age group 2, 84.84 for age group 3, 81.11 for age group 4; CPA 5 – 83.95 for age group 1, 84.08 for age group 2, 84.84 for age group 3, 81.11 for age group 4; CPA 6 – 83.95 for age group 1, 84.08 for age group 2, 84.84 for age group 3, 81.11 for age group 4; CPA 7 – 83.95 for age group 1, 84.08 for age group 2, 84.84 for age group 3, 81.11 for age group 4; CPA 8 – 83.95 for age group 1, 84.08 for age group 2, 84.84 for age group 3, 81.11 for age group 4; CPA 9 – 83.95 for age group 1, 84.08 for age group 2, 84.84 for age group 3, 81.11 for age group 4; CPA 10 – 83.95 for age group 1, 84.08 for age group 2, 84.84 for age

	<p>group 3, 81.11 for age group 4; CPA 11 – 83.95 for age group 1, 84.08 for age group 2, 84.84 for age group 3, 81.11 for age group 4; CPA 12 – 83.95 for age group 1, 84.08 for age group 2, 84.84 for age group 3, 81.11 for age group 4; CPA 13 – 83.95 for age group 1, 84.08 for age group 2, 84.84 for age group 3, 81.11 for age group 4; CPA 14 – 83.95 for age group 1, 84.08 for age group 2, 84.84 for age group 3, 81.11 for age group 4; CPA 15 – 83.95 for age group 1, 84.08 for age group 2, 84.84 for age group 3, 81.11 for age group 4; CPA 16 – 83.95 for age group 1, 84.08 for age group 2, 84.84 for age group 3, 81.11 for age group 4; CPA 17 – 83.95 for age group 1, 84.08 for age group 2, 84.84 for age group 3, 81.11 for age group 4; CPA 18 – 83.95 for age group 1, 84.08 for age group 2, 84.84 for age group 3, 81.11 for age group 4; CPA 19 – 83.95 for age group 1, 84.08 for age group 2, 84.84 for age group 3, 81.11 for age group 4;</p>
Monitoring equipment	<p>Scales, thermometer, timer, wood moisture meter</p> <p><u>Scales:</u> Counter scale (My Weigh KD-8000), type - 8 kg capacity digital weighing scale, accuracy - accurate to 1 g; Calibration date – 28/01/2019, next calibration – 27/01/2020. Certificates of calibration # TM2018012303 (serial #4) and # TM2018012304 (serial #1) issued by Malawi Bureau of Standards.</p> <p><u>Thermometers:</u> Digital thermometer - Voltcraft K 102 thermometer, type - measuring range - 200°C to +1370°C (reversible °C/°F); basic accuracy - -200°C to +200°C accuracy of 0.3% of the display, +1 °C; uncertainty based on calibration certificates – 1.1°C. Calibration date – 28/01/2019, expiry date – 27/01/2020. Certificates of calibration #RM2019012802 (thermometer with serial number 080506150) and #RM2019012801 (thermometer with serial number 060300261) issued by Malawi Bureau of Standards.</p> <p><u>Moisture meter:</u> Wood humidity measuring device - Voltcraft FM-300, type - moisture measuring range 6% to 99.9%, accuracy - ±1% (in moisture range 6% ~ 40% of volume). Serial numbers: 12117541 and 12117617. Calibration date – 29/01/2019, expiry date – 28/01/2020.</p> <p>Digital phones were used as timers.</p> <p>Monitoring equipment is calibrated by monitoring facilitators as per the equipments' operating instructions, prior to conducting tests. Equipment also has factory calibration and does not usually require recalibration during warranty period.</p> <p>In the registered PoA DD as well as CPA DDs, there is no calibration frequency mentioned for the monitoring equipment's that will be used during the verification. However, the calibration of monitoring equipment's has been done from a reputed agency, even though the equipment are newly purchased and are under guaranty from the manufacturer. Since neither the calibration agency nor the equipment</p>

	manufacturer mentioned any specific validity of the calibration, thus guidelines as per “General Guidelines to SSC CDM methodologies” EB 61, Annex 21, para 17 (c) has been followed which says: “Measuring equipment should be certified to national or IEC standards and calibrated according to the national standards and reference points or IEC standards and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in three years”. Hence, the monitoring equipment will be calibrated before completion of three years from the date of last calibrations of the respective equipment.
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 (The Water Boiling Test, Version 4.2.3, Cook-stove Emissions and Efficiency in a Controlled Laboratory Setting. Released 19 March 2014).
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 Cook-stoves. Use of calibrated measurement equipment.
Purpose of data/parameter	Calculation of baseline and project emissions / emission reductions
Additional comments	

Data/parameter	$\eta_{new,i,a}$
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 – multi-stage stratified random sampling using Water Boiling Test protocol
Value(s) of monitored parameter	CPA 1 – 25.69% for age 1, 25.73% for age 2, 25.96% for age 3, 24.82% for age 4; CPA 2 – 25.69% for age 1, 25.73% for age 2, 25.96% for age 3, 24.82% for age 4; CPA 3 – 25.69% for age 1, 25.73% for age 2, 25.96% for age 3, 24.82% for age 4; CPA 4 – 25.69% for age 1, 25.73% for age 2, 25.96% for age 3, 24.82% for age 4; CPA 5 – 25.69% for age 1, 25.73% for age 2, 25.96% for age 3, 24.82% for age 4; CPA 6 – 25.69% for age 1, 25.73% for age 2, 25.96% for age 3, 24.82% for age 4; CPA 7 – 25.69% for age 1, 25.73% for age 2, 25.96% for age 3, 24.82% for age 4; CPA 8 – 25.69% for age 1, 25.73% for age 2, 25.96% for age 3, 24.82% for age 4; CPA 9 – 25.69% for age 1, 25.73% for age 2, 25.96% for age 3, 24.82% for age 4; CPA 10 – 25.69% for age 1, 25.73% for age 2, 25.96% for age 3, 24.82% for age 4; CPA 11 – 25.69% for age 1, 25.73% for age 2, 25.96% for age 3, 24.82% for age 4; CPA 12 – 25.69% for age 1, 25.73% for age 2, 25.96% for age 3,

	<p>24.82% for age 4; CPA 13 – 25.69% for age 1, 25.73% for age 2, 25.96% for age 3, 24.82% for age 4; CPA 14 – 25.69% for age 1, 25.73% for age 2, 25.96% for age 3, 24.82% for age 4; CPA 15 – 25.69% for age 1, 25.73% for age 2, 25.96% for age 3, 24.82% for age 4; CPA 16 – 25.69% for age 1, 25.73% for age 2, 25.96% for age 3, 24.82% for age 4; CPA 17 – 25.69% for age 1, 25.73% for age 2, 25.96% for age 3, 24.82% for age 4; CPA 18 – 25.69% for age 1, 25.73% for age 2, 25.96% for age 3, 24.82% for age 4; CPA 19 – 25.69% for age 1, 25.73% for age 2, 25.96% for age 3, 24.82% for age 4;</p>
Monitoring equipment	<p><u>Scales:</u> Counter scale (My Weigh KD-8000), type - 8 kg capacity digital weighing scale, accuracy - accurate to 1 g; Calibration date – 28/01/2019, next calibration – 27/01/2020. Certificates of calibration # TM2018012303 (serial #4) and # TM2018012304 (serial #1) issued by Malawi Bureau of Standards.</p> <p><u>Thermometers:</u> Digital thermometer - Voltcraft K 102 thermometer, type - measuring range - 200°C to +1370°C (reversible °C/°F); basic accuracy - -200°C to +200°C accuracy of 0.3% of the display, +1 °C; uncertainty based on calibration certificates – 1.1°C. Calibration date – 28/01/2019, expiry date – 27/01/2020. Certificates of calibration #RM2019012802 (thermometer with serial number 080506150) and #RM2019012801 (thermometer with serial number 060300261) issued by Malawi Bureau of Standards.</p> <p><u>Moisture meter:</u> <u>Wood humidity measuring device</u> -Voltcraft FM-300, type - moisture measuring range 6% to 99.9%, accuracy - ±1% (in moisture range 6% ~ 40% of volume). Serial numbers: 12117541 and 12117617. Calibration date – 29/01/2019, expiry date – 28/01/2020.</p> <p>Digital phones were used as timers.</p> <p>Monitoring equipment is calibrated by monitoring facilitators as per the equipments' operating instructions, prior to conducting tests. Equipment also has factory calibration and does not usually require recalibration during warranty period.</p> <p>In the registered PoA DD as well as CPA DDs, there is no calibration frequency mentioned for the monitoring equipment's that will be used during the verification. However, the calibration of monitoring equipment's has been done from a reputed agency, even though the equipment are newly purchased and are under guaranty from the manufacturer. Since neither the calibration agency nor the equipment manufacturer mentioned any specific validity of the calibration, thus guidelines as per "General Guidelines to SSC CDM methodologies" EB 61, Annex 21, para 17 (c) has been followed which says: "Measuring equipment should be certified to national or IEC standards and calibrated according to the national standards and reference points or IEC standards and recalibrated at appropriate intervals</p>

	according to manufacturer specifications, but at least once in three years". Hence, the monitoring equipment will be calibrated before completion of three years from the date of last calibrations of the respective equipment.
Measuring/reading/recording frequency	Annually.
Calculation method (if applicable)	As per the WBT protocol 4.2.3.
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 Cook-stoves. Use of calibrated measurement equipment. The relative precision achieved is 3.7% at confidence level of 95%. Thus, the required precision level of 5% has been met.
Purpose of data/parameter	Calculation of baseline and project emissions / emission reductions
Additional comments	The efficiency value for each age group is calculated as an average efficiency value of the stoves tested. First, the average value of each stove efficiency is calculated based on WBT results values (9 results for each stoves). Second, the average efficiency among the stoves of each age group is calculated.

E.3. Implementation of sampling plan

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 CDM Guideline "Sampling and surveys for CDM project activities and programmes of activities", Version 03.0. The parameters are estimated across all CPAs.

Procedure to draw a representative sample

Taking into account the importance of end-user information and the provisions of the registered PoA DD on end-users data, the procedure to be used within PoA 10182 in order to draw a representative sample of the end-users based on a database containing end-user information on the majority of end-users has been included.

The entire population of POA10182 for the current monitoring period was 376,377 stoves distributed among households throughout the country.

Registered PoA DD (page 10) states that for PoA 10181 the target population for the parameter "Proportion of stoves that are still in operation" are the users contained in the CPA databases.

It is not currently possible in Malawi (by any measure) to keep track - on a moment-to-moment basis - of the precise location of all distributed portable stoves – users regularly die, move to other villages, migrate for work or become displaced due to severe weather events and natural disasters (e.g. floods⁷).

The traceability level for all of the approx. 376k project stoves in the sales database per usage survey conducted in August 2019 is 88%. Out from 123 households, the enumerators were able to identify and survey 108 households based on the information provided in total sales records (88%).

⁷<https://news.un.org/en/story/2019/03/1034451>

The 123 randomly sampled households are rural and peri-urban households (i.e. households in population dense settings), that predominantly cook with firewood and are a subset that accurately reflect the characteristics of all households involved in the PoA.

The description of the monitoring plan of the registered PoA DD clearly states that user details (name, address and telephone if available) will be collected for the **majority of customers** (please, refer to page 35). As per the PoA DD "Although it is difficult to track 100% of households that will eventually use the stove(s) promoted by the PoA, the CME will encourage project implementers to **track as many as possible and definitely more than half**" (see footnote 44 at page 35). In reality, CME has collected such details for the vast majority of endusers.

There are different levels of details provided for the purchasers of stoves in the total sales records database. The analysis of the database revealed that for 89% of households in the total sales database (335,313 entries in the database) there is a contact information such as phone number or village or GVH (Group Village Headman) administrative unit, which allows the possibility to track the stove user for usage and monitoring survey. Even assuming the 88% response rate achieved during the usage and monitoring surveys, this allows to track 78% of households (i.e. 88% of 89%), which is significantly higher than "more than half" as defined in the registered PoA DD. Therefore, missing end user information for some households do not undermine the representativeness of the monitoring activities as prescribed by the registered PoA DD. Moreover, the CME ensures continuous improvement of sales records database management by CPA implementers, which resulted in the increase of contact information availability from 78% in the previous monitoring period to 89%.

The CPA implementers tend to have a promoter for each village or set of villages who knows the customers and could help track users without complete end user details. In cases where there is no promoter the village chief tends to be the anchor in the village for the CPA.

In some cases customers buy multiple stoves (e.g. 3 to 10 stoves) for resale or distribution amongst relatives and/or neighbours which facilitates greater access but makes traceability difficult. In such cases various stoves may be allotted to the same individual in the total sales records database. Some purchasers keep 2 or even 3 stoves for own needs due to large family or household sizes. The fact that there are households, which have more than one stove, is taken into account during monitoring activities. Through annual usage surveys the number of stoves per household is monitored and recorded and the usage rate used in calculation of emission reduction is discounted (discounting for such a scenario is explained in *Results of the Survey* below). Thus, recording of several stoves per one household in the total sales database reflects the distribution and usage practices in the region of PoA implementation.

Even the stoves from users who received their stoves via onward gift or sale from the purchasers of multiple stoves have serial numbers and therefore have the equal probability to be randomly sampled (i.e. that person's serial number is as likely to be selected as any other serial number) and could be tracked via the initial purchaser. If the stove with the sampled serial number could not be tracked it is reported as not being in use and therefore reduces the usage rate used for the calculation of emission reductions. Therefore, the purchasers of multiple stoves are not statistically different from single stove purchasers named in the database. Further, even though said stove may well still be in use, it is treated as not being in use - this reflects across the entire database - this is yet a further conservativeness measure to avoid over-issuance

Stratified random sampling approach was applied in line with the provisions of CDM Guideline "Sampling and surveys for CDM project activities and programmes of activities", Version 03.0. To optimize logistics and costs of the monitoring procedures first the 4 districts were randomly sampled, namely: Balaka, Kasungu, Mangochi and Ntcheu. Such approach ensures cost effectiveness and does not impact the quality of monitoring data as ICS and cooking practices does not differ among districts. The four districts sampled covered 48% of the total stoves population size at the time of monitoring activities.

On the second stage individual households were randomly sampled for data collection taking into account defined primary sampling units based on CPA Implementer and stove vintage.

Therefore, the random sampling demonstrates that possibility to identify most of the purchasers based on the information provided in the total sales records, even if not full contact information (telephone number, exact address) is recorded.

The procedure described above ensures that samples are randomly selected and are representative of the population.

Parameters monitored using sampling plans

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

Annual quantity of woody biomass used by project devices in tonnes per device of type i , determined in the first year of the introduction of the devices ($B_{y=1,new,i,survey}$) is estimated at the beginning of the crediting period and thus was not included in the sampling plan.

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

Primary sampling units

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 4 ICS vintages, and there are 3 CPA implementers (Area 55 started implementing CPAs in August 2015, Sunfire started implementing CPAs in July 2016, Eden started implementing CPAs in March 2018).

So, there are 8 primary sampling units:

1. CPA Implementer Area 55 implementing 1 year old stoves,
2. CPA Implementer Sunfire implementing 1 year old stoves,
3. CPA Implementer Eden implementing 1 year old stoves,
4. CPA Implementer Area 55 implementing 2 years old stoves,
5. CPA Implementer Sunfire implementing 2 years old stoves,
6. CPA Implementer Area 55 implementing 3 years old stoves,
7. CPA Implementer Sunfire implementing 3 years old stoves,
8. CPA Implementer Area 55 implementing 4 years old stoves.

The age group of the project devices has been determined based on the number of days stove operated since the first use and till the end of the monitoring period divided by 365.

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.

Results of the surveys

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 CPA 5 CPA 6 CPA 7 CPA 8 CPA 9 CPA 10 CPA 11 CPA 12 CPA 13 CPA 14 CPA 15 CPA 16 CPA 17 CPA 18 CPA 19	August, 2019 Previous usage and monitoring surveys were carried between February 2 and February 6, 2018	Sample size - 123 households Surveys were carried in August, 2019 Actually surveyed 113. Sampling method - multi-stage stratified random sampling Required precision/confidence - the minimum sample size is determined to achieve the 95% confidence level and a 10% margin of error.	Values used in emission reduction calculations were calculated based on survey results using statistical analysis. Results of the usage and monitoring surveys: Percentage of operating stoves based on usage age: age 0-1 – 92.31%; age 1-2 – 84.62%; age 2-3 – 80.00%; age 3-4 – 50.00% Precision level achieved is 4.6%. To ensure conservative calculation of generated emission reductions the usage rate estimated via Usage and Monitoring survey was discounted by 8.62% to account for for households using >1 project stoves. Discounted percentage of operating stoves used in emissions reduction calculations (based on usage age): age 0-1 – 88.04%; age 1-2 – 77.32%; age 2-3 – 73.10%; age 3-4 – 45.69% According to the paragraph 33 of the applied methodology, monitoring shall consist of checking all devices or a representative sample thereof, at least once every two years (biennially) to determine if they are still operating. Therefore, estimation of percentage of operating stoves based on usage and monitoring survey has been applied. According to paragraph 22 of the

			<p>methodology, surveys may be conducted if the use of data loggers to record the continued operation of baseline devices is not practical, for example when the baseline device is the three stone fire. As using data loggers is not practical due to high number of ICS distributed within PoA and the baseline device is the three stone fire, the use of surveys is justified.</p> <p>Stove stacking (using different types of stoves in a single household) was assessed based on the surveys of cooking time for different stoves types.⁸</p> <p>Number of days of utilization of the project device during the year 'y', $\mu_{y,i} - 345$, $\mu_{y,i}/365 - 0.945$.</p> <p>Source of collected data: Usage & Monitoring Survey Report – 2019</p> <p>Total population at the time of conducting annual monitoring activities was 376,377 stoves.</p>
WBTs			
CPA 1 CPA 2 CPA 3 CPA 4 CPA 5 CPA 6 CPA 7 CPA 8 CPA 9 CPA 10 CPA 11 CPA 12 CPA 13 CPA 14 CPA 15 CPA 16 CPA 17 CPA 18 CPA 19	<p>August, 2019</p> <p>Previous WBTs were conducted in February, 2018.</p>	<p>Sample size - 19 stoves.</p> <p>Actually tested – 19.</p> <p>Sampling method - multi-stage stratified random sampling.</p> <p>WBTs were conducted in August, 2019.</p> <p>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: $Eff_{P,PCS,0-1} = 25.69\%$; $Eff_{P,PCS,2-3} = 25.73\%$ $Eff_{P,PCS,1-2} = 25.96\%$; $Eff_{P,PCS,3-4} = 24.82\%$;</p> <p>The precision level achieved is 3.7%.</p> <p>Source of collected data: Water Boiling Test Report - 2019</p>

Kitchen Performance Test was conducted during the first verification to estimate the annual quantity of woody biomass used by project devices in tonnes per device.

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).

⁸Based on EnDev's proxy-indicator approach for assessing the quality of a Cooking Energy System https://endev.info/images/f/f7/Factsheet_EnDev_CES_EN.pdf.

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 F. Calculation of emission reductions or net anthropogenic removals

F.1. Calculation of baseline emissions or baseline net removals

The methodology applied does not foresee the calculation of baseline emissions and estimate directly emission reductions.

F.2. Calculation of project emissions or actual net removals

The methodology applied does not foresee the calculation of project emissions and estimate directly emission reductions.

F.3. Calculation of leakage emissions

The methodology applied does not foresee the calculation of leakages and estimate directly emission reductions.

F.4. Calculation of emission reductions or net anthropogenic removals

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
$N_{y,i,a}$	– 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

The results of emission reduction calculation for each CPA and for each year of the monitoring period is provided below:

CPA	CPA UNFCCC reference number	2018	2019	Total
1	CPA 10182-0001	14,954	12,646	27,600
2	CPA 10182-0002	25,004	21,146	46,150
3	CPA 10182-0003	26,248	22,198	48,446
4	CPA 10182-0004	24,189	20,458	44,647
5	CPA 10182-0005	24,773	20,953	45,726
6	CPA 10182-0006	25,556	21,615	47,171
7	CPA 10182-0025	29,420	24,884	54,304
8	CPA 10182-0020	10,718	9,063	19,781
9	CPA 10182-0021	23,764	20,098	43,862
10	CPA 10182-0022	20,096	21,589	41,685
11	CPA 10182-0023	15,755	21,485	37,240
12	CPA 10182-0024	11,077	22,438	33,515
13	CPA 10182-0007	6,487	22,406	28,893
14	CPA 10182-0009	1,156	17,354	18,510
15	CPA 10182-0008	0	16,426	16,426
16	CPA 10182-0010	0	8,165	8,165
17	CPA 10182-0011	3,321	15,020	18,341
18	CPA 10182-0012	0	4,816	4,816
19	CPA 10182-0013	0	691	691
	Total	262,518	323,451	585,969

CPA UNFCCC reference number	Baseline GHG emissions or baseline net GHG removals (t CO ₂ e)	Project GHG emissions or actual net GHG removals (t CO ₂ e)	Leakage GHG emissions (t CO ₂ e)	GHG emission reductions or net anthropogenic GHG removals (t CO ₂ e)		
				Before 01/01/2013	From 01/01/2013	Total amount
CPA 10182- 0001	N/A	N/A	N/A	0	27,600	27,600
CPA 10182- 0002	N/A	N/A	N/A	0	46,150	46,150
CPA 10182- 0003	N/A	N/A	N/A	0	48,446	48,446
CPA 10182- 0004	N/A	N/A	N/A	0	44,647	44,647
CPA 10182- 0005	N/A	N/A	N/A	0	45,726	45,726
CPA 10182- 0006	N/A	N/A	N/A	0	47,171	47,171
CPA 10182- 0025	N/A	N/A	N/A	0	54,304	54,304
CPA 10182- 0020	N/A	N/A	N/A	0	19,781	19,781
CPA 10182- 0021	N/A	N/A	N/A	0	43,862	43,862
CPA 10182- 0022	N/A	N/A	N/A	0	41,685	41,685
CPA 10182- 0023	N/A	N/A	N/A	0	37,240	37,240
CPA 10182- 0024	N/A	N/A	N/A	0	33,515	33,515
CPA 10182- 0007	N/A	N/A	N/A	0	28,893	28,893
CPA 10182- 0009	N/A	N/A	N/A	0	18,510	18,510
CPA 10182- 0008	N/A	N/A	N/A	0	16,426	16,426

CPA 10182-0010	N/A	N/A	N/A	0	8,165	8,165
CPA 10182-0011	N/A	N/A	N/A	0	18,341	18,341
CPA 10182-0012	N/A	N/A	N/A	0	4,816	4,816
CPA 10182-0013	N/A	N/A	N/A	0	691	691
Total	N/A	N/A	N/A	0	585,969	585,969

F.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the included CPA-DDs

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.

CPA UNFCCC reference number	Amount achieved during this monitoring period (t CO ₂ e)	Amount estimated ex ante for this monitoring period in the CPA-DD (t CO ₂ e)
CPA 10182-0001	27,600	43,040
CPA 10182-0002	46,150	43,040
CPA 10182-0003	48,446	43,040
CPA 10182-0004	44,647	43,040
CPA 10182-0005	45,726	43,040
CPA 10182-0006	47,171	43,040
CPA 10182-0025	54,304	43,040
CPA 10182-0020	19,781	43,040
CPA 10182-0021	43,862	43,040
CPA 10182-0022	41,685	43,040
CPA 10182-0023	37,240	43,040
CPA 10182-0024	33,515	33,015
CPA 10182-0007	28,893	27,349
CPA 10182-0009	18,510	22,882
CPA 10182-0008	16,426	17,325
CPA 10182-0010	8,165	9,480
CPA 10182-0011	18,341	26,478
CPA 10182-0012	4,816	5,557
CPA 10182-0013	691	2,615
Total	585,969	618,139

F.5.1. Explanation of calculation of “amount estimated ex ante for this monitoring period in the CPA-DD”

Estimated amount of annual average GHG emission reductions according to the latest version of CPA-DDs is 39,771. Amount estimated ex ante for this monitoring period in the CPA-DD has been calculated proportionally based on the duration of the stove operation under each CPA during the monitoring period.

F.6. Remarks on increase in achieved emission reductions

Actual values achieved by the specific-case CPA(s) during the monitoring period for some CPAs were lower than values estimated in ex ante calculation as under some CPAs the distribution of the stoves started or continued after the beginning of the monitoring period and the number of the stoves has not yet reached the targeted limit. Actual values achieved by the specific-case CPA(s) during the monitoring periods for some CPAs were higher than values estimated in ex ante calculation due to slightly higher monitored stove efficiency comparing to the 25% value assumed for ex ante calculation. Actual efficiency based on the WBTs conducted within monitoring activities was in the range of 25% - 26%. (comparing to the laboratory test efficiency of 30.6%). There is no increase in total achieved emission reductions.

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

F.7. Remarks on scale of small-scale CPAs

All CPAs covered by the monitoring report are small-scale project activities.

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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
03.0	31 May 2019	Revision to: <ul style="list-style-type: none"> • Ensure consistency with version 02.0 of the “CDM project standard for programmes of activities” (CDM-EB93-A07-STAN); • Add a section on remarks on the observance of the scale limit of small-scale CPAs during the crediting periods; • Add "changes specific to afforestation or reforestation activities/CPA" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R PoAs between two commitment periods; • Make structural and editorial improvements.
02.0	7 June 2017	Revision to: <ul style="list-style-type: none"> • Ensure consistency with version 01.0 of the “CDM project standard for programmes of activities (CDM-EB93-A07-STAN); • Make editorial improvements.
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