Monitoring report form for CDM programme of activities (Version 04.0)

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

MONITORING REPORT			
Title of the PoA	Fuel Efficient Stoves in Africa		
UNFCCC reference number of the PoA	PoA 6864		
Version numbers of the PoA-DD applicable to this monitoring report	7.2		
Version number of this monitoring report	1.0		
Completion date of this monitoring report	23/04/2021		
Monitoring period number	6		
Duration of this monitoring period	01/07/2020 – 31/12/2020		
Monitoring report number for this monitoring period	1		
Coordinating/managing entity	3 Rocks Ltd.		
Host Parties	Host Party of the PoA	Is this the host Party of a CPA covered in this monitoring report? (yes/no)	
	Zambia	Yes	
	Zimbabwe	No	
Applied methodologies and standardized baselines	AMS II.G version 3		
Sectoral scopes	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 until 31 December 2020	Amount achieved from 1 January 2021
	0	7,364 tCO_2e	0
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	739,371 tCO_2e		

PART I Monitoring of programme of activities (PoA)

SECTION A. Description of PoA

A.1. General description of PoA

The small scale PoA involves the distribution of fuel-efficient stoves by 3 Rocks Ltd. in individual households in Zambia, as described in each of the PoA's Component Project Activity Design Documents (CPA-DD) and according to the requirements of the appropriate small-scale methodology: AMS II.G *Energy efficiency measures in thermal applications of non-renewable biomass, Version 3*.

The efficient stoves are based on designs approved by 3 Rocks Ltd. and are distributed by CPA Implementers. The stove design to be distributed in each CPA are tested independently in accordance with a published Water Boil Test (WBT) methodology, such as the "*Stove Manufacturers Emissions & Performance Test Protocol (EPTP)*"[1] and certified by the manufacturer or an independent laboratory to determine the baseline thermal efficiency. 3 Rocks Ltd. is the Coordinating/Managing Entity (CME) for the PoA.

Traditionally, the majority of Zambian families cook on an open fire or charcoal grate to heat pots. This method is inefficient and leads to the unsustainable use of non-renewable biomass in the process. The replacement fuel-efficient stoves will lead to a reduction in the annual usage of biomass for users. The majority of Zambians do not have access to the market for fuel-efficient cooking stoves, mainly for economic reasons. Utilizing carbon finance, the proposed PoA aims to overcome this barrier to market entry for households, substituting baseline appliances for fuel-efficient stoves. The benefits of the stove and various user commitments are clearly explained to prospective users during communication events at the CPA implementation stage.

Stoves are distributed by CPA Implementers, or their local partners (collectively known hereafter as "CPA Implementer"), and distribution teams are trained to distribute the stoves and capture the monitoring data from the distribution process; identifying each stove via unique end user information, including: owner name and/or government identification number, address or location, and GPS location reference. Each stove is assigned a unique reference number in the monitoring database.

Data collected during the distribution process is captured from the end-user on electronic devices, or via paper forms, and uploaded to the monitoring database. This database is maintained locally in Zambia and backed-up securely offsite. This system is available for review by the Designated Operational Entity (DOE) during verification of the PoA.

3 Rocks Ltd. has completed stakeholder consultations at the PoA level, including national awareness raising meetings, regional meetings and user trials of prototype stoves. It is, furthermore, the intention of 3 Rocks Ltd. to run an ongoing, post-registration programme of awareness-raising of the optimal usage of the stove, allowing a further mechanism for feedback on its performance from recipients.

The PoA is funded entirely by private investment and does not form a part of any government-funded or supported programme in Zambia.

[1] Stove Manufacturers Emissions & Performance Test Protocol (EPTP): A protocol for testing stove fuel efficiency and emissions and a standard for improved stoves; Defoort, L'Orange, Kreutzer (EECL), Lorenz (Envirofit), Kamping (Philips) 2009

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
Fuel Efficient Stoves in Zambia (3RL CPA No.XX)	6.2	3	- AMS II.G. Energy efficiency measures in thermal applications of non-renewable biomass; Version 3.
Fuel Efficient Stoves in Zambia [CPA Implementer] CPA No.xx	7.2	3	- AMS II.G. Energy efficiency measures in thermal applications of non-renewable biomass; Version 3. - Standard: Sampling and surveys for CDM project activities and programmes of activities, version 7.0. - Tool 19: Demonstration of additionality of microscale project activities, Version 08.0. - Tool 21: Demonstration of additionality of small-scale project activities, version 12.0.

A.1.2. CPAs included in the PoA

Title and UNFCCC reference number of the CPA	Version of the PoA-DD	Title and reference number of the corresponding generic CPA	Crediting period type and duration	Covered in this monitoring report? (yes/no)
CPA 6864-P1-0001-CP1: Fuel Efficient Stoves in Zambia (3RL CPA No. 01).	6.2	Fuel Efficient Stoves in Zambia (3RL CPA No. XX)	7 years, renewable: 28/01/2013 – 27/01/2020	No
CPA 6864-P1-0002-CP1: Fuel Efficient Stoves in Zambia (3RL CPA No. 02).	6.2	Fuel Efficient Stoves in Zambia (3RL CPA No. XX)	7 years, renewable: 25/10/2013 – 23/10/2020	No
CPA 6864-P1-0003-CP1: Fuel Efficient Stoves in Zambia (3RL CPA No. 03).	6.2	Fuel Efficient Stoves in Zambia (3RL CPA No. XX)	7 years, renewable: 01/11/2013 – 31/10/2020	No
6864-P1-0004-CP1: Fuel Efficient Stoves in Zambia (Korea Carbon Offsets Ltd. CPA No.01).	7.2	Fuel Efficient Stoves in Zambia [CPA Implementer] CPA No.xx	10 years, fixed: 10/10/2019 – 09/10/2029	Yes
6864-P1-0005-CP1: Fuel Efficient Stoves in Zambia – Korea Carbon Management Ltd. CPA No.1.	7.2	Fuel Efficient Stoves in Zambia [CPA Implementer] CPA No.xx	10 years, fixed: 26/01/2020 – 25/01/2030	No

A.2. Coordinating/managing entity

3 Rocks Ltd.

SECTION B. Implementation of PoA

B.1. Description of implemented PoA

Information on how the management system described in the PoA-DD was implemented:

1. A clear definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies

The CME, 3 Rocks Ltd., has overall operational and management responsibility for the implementation and monitoring of the PoA and therefore acts as the sole PoA CME.

The roles and responsibilities of the CME are:

i. *3 Rocks Ltd. Board & Zambia Branch Board*: oversight of management system and sign-off on CPA inclusions and monitoring reports, review of competencies of team members.
ii. *Technical review team*: technical review of process and documentation; proposal of CPA-DDs and monitoring reports to 3 Rocks Ltd. board.
iii. *CDM Compliance Manager*: writing PDDs and monitoring reports, ensuring compliance with CDM rules.

The roles and responsibilities its local partners are:

i. *Zambia Director:* oversees operation of distribution centres and head office; execution of set up activities; works with project manager on all planning; reports to CME;
ii. *Project Manager:* project planning and management; issue and risk management; execution of set up activities such as recruitment and training; reporting of monitoring data;
iii. *Logistics Manager:* planning; identification of target households; contractor management; overall day to day management of installation staff; weekly and monthly reporting;
iv. *Data administrators*: monitoring database management; accounting; data reconciliations; monthly reporting; local HR;
v. *Pre- and post-distribution data collection*: conveying project messages; selling the project; signing up householders wanting a stove; sign up data capture; distribution data capture;
vi. *Distribution team*: management of distribution process; ensuring quality stove distributions;
vii. *Monitoring team*: gathering compliance monitoring data; gathering marketing data; data input.

Overall responsibility for the roles and responsibilities and associated below processes lie with the CME. The CME assesses the competencies of individuals responsible for each of the roles stated above.

A. Manufacturing and logistics

Overall responsibility for manufacturing and logistics lies with the CME and CPA Implementers. The process is as follows:

- Depending on the stove model, complete stoves or components for the stoves are manufactured (some imported into Zambia, others produced locally) by a stove manufacturer;
- Stoves are distributed to warehouses within each CPA;
- CPA Implementers coordinate the distribution of stoves to recipient households.

B. CPA household identification

- A process for identifying households is managed by CPA Implementers. This involves working with local community leaders and other partners to help identify recipient households suitable for the distribution of a stove;

- In partnership with community leaders, NGOs and other local organizations, CPA Implementers initiate a communication process to ensure that households understand the benefits of the stoves, that cultural issues are addressed and that users are trained in the optimal use and performance of the stove;
- 3 Rocks Ltd. pre-installation teams visit recipient households in each CPA and ensure recipients understand and acknowledge the conditions for participation in the CPA. This acts as the "order" for each stove;
- Each stove is assigned a unique, chronological distribution number. This is used to determine the CPA into which the stove is included.

C. Distribution

- CPA Implementers train stove distribution teams to distribute stoves within each CPA;
- CPA Implementers coordinate the receipt of stoves and components in the distribution process;
- CPA Implementers are trained in the distribution of the stove to a standardized design and installation procedure;
- CPA Implementers are responsible for physically distributing the stoves to the stove recipient.

D. Data Capture

- The CPA implementer checks the quality of installation work;
- If the work is satisfactory, distribution data is collected by the CPA Implementer, which includes:
  - Username: the household family name, plus Zambian government identification number of the stove recipient (if available);
  - Location: the address and/or physical location description (i.e. village) of the household, plus a GPS location reference (if available and accurate);
  - Date and time of installation.
- Distribution data is collected by the CPA Implementer and uploaded to the monitoring database;
- The database includes a unique reference number for each stove.

E. CPA Inclusion

CPA inclusions are the overall responsibility of the CME.

- Data from each CPA is provided by the CPA Implementer to the CME;
- The CDM Compliance Manager oversees the writing of each CPA-DD;
- The CDM Compliance Manager submits to the 3 Rocks Ltd. technical team for technical review;
- The technical team proposes the CPA inclusion to the 3 Rocks Ltd. Board for approval.

F. Monitoring

1. *Monitoring activities are conducted as follows:*

- Surveys completed in the field by trained local monitoring teams;
- Data captured by the monitoring teams is passed to 3 Rocks Ltd. data administration team;
- Data is checked for completeness, consistency and accuracy;
- Project manager summarizes data in a report to the 3 Rocks Ltd. CDM compliance manager;
- CDM compliance manager writes monitoring reports for each monitoring period;
- Technical review by in-house technical team;
- CME board approval;
- Submission of issuance request to CDM Executive Board.

2. Records of arrangements for training and capacity development for personnel

3 Rocks Ltd. conducts an ongoing programme of training and capacity development for key personnel. This training is premised on documentation that includes:

- Management Information Systems and Data Capture Process;
- Stove Distribution Guidelines;
- Records of training and capacity development are kept by the CME on each member of staff's file.

3. Procedures for technical review of inclusion of CPAs

The technical review of CPA inclusions is undertaken at CME board level by an in-house technical team. This review is undertaken in accordance with the eligibility criteria outlined in the PoA DD and the most recent guidance issued by the CDM Executive Board.

Following its review, the technical team affirms the CPA's compliance with the eligibility criteria and recommend its inclusion in the PoA to the CME board. The proposed inclusion will then be either approved or rejected by the CME board.

4. A procedure to avoid double counting (e.g. to avoid the case of including a new CPA that has already been registered either as a CDM project activity or as a CPA of another PoA)

Double-counting of emissions reductions is avoided by the unique referencing of stoves included in each CPA. This is done through:

- ***GPS references***: if possible, each stove has a unique GPS-referenced location. During the verification process the DOE will be able to check the existence of stoves related to this GPS location reference.
- ***Name, location and/or ID number***: an additional check of double-counting may be made against the household name, location and/or Zambian government ID number of the stove recipient ascribed to each stove. This may be checked physically during the verification process.
- ***Unique reference numbers***: each stove also has a unique reference number in the monitoring database. Only one stove is installed per household. The DOE will be able to check this during the verification process.

5. Records and documentation control process for each CPA under the PoA

The CME is responsible for managing the record and documentation system for each CPA under the PoA. In most cases data is collected electronically and uploaded directly to the monitoring database. Where data is collected manually, it is collated by the CME.

Distribution data is collected from each CPA by the CPA Implementer and uploaded into the monitoring database. This ensures that each stove is individually referenced and logged for monitoring and verification purposes.

Monitoring data is collected by the monitoring team responsible and passed to the CME for collation. Periodic monitoring reports and emissions reduction calculations are generated from this data.

All records are securely maintained and backed-up by the CME.

6. Measures for continuous improvements of the PoA management system

Periodic reviews of the procedures noted here in this management system are conducted at the behest of the CME. These are conducted at the time of each annual or biennial monitoring activity.

7. Any other relevant elements:

a) The CPA included in the PoA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity:

Each CPA under the proposed PoA is exempt from a de-bundling check due to each independent subsystem/measure being less 1% of the small-scale methodology energy output threshold (as per guidance EB54 Annex 13).

This has been included as an eligibility criterion for the inclusion of each CPA in the PoA.

b) The provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA

The CME has overall responsibility for managing and operating each of the CPAs.

The CME's local partner for the only CPA included in this monitoring report, i.e. the 4th CPA included under the PoA, is Korea Carbon Offsets Ltd (KCOL). KCOL is legally contracted to the CME and is fully aware, and has agreed, that their activity is being subscribed to the PoA.

Indicate whether a sampling approach was applied for monitoring of a group of CPAs or each CPA covered in this monitoring report:

The monitoring report covers only CPA 4. Therefore sampling in this monitoring report only covers one CPA and does not cover a group of CPAs.

Provide the description of installed technologies, technical processes and equipment for the included CPAs:

CPAs 1-3 and CPA 5 are not monitored in this monitoring report.

The monitored CPA 4 that is covered in this monitoring report involves the distribution of fuel-efficient stoves by KCOL (Korea Carbon Offsets Ltd.) in individual households in Zambia. KCOL provides all implementation and ongoing project operation costs for the development of the CPA, including total improved cooking stove purchases, distribution and maintenance costs.

CPA 4 involves the distribution of energy efficient, biomass fuel-based Kuniokoa Cookstoves, manufactured by Burn Manufacturing LLC. These cookstoves deliver a thermal efficiency of 41.6%, according to an independent lab report from the Kenya Industrial Research and Development Institute (KIRDI) of 19th November 2017.

The following image depicts a typical cookstove employed during this monitoring period.

B.2. Post-registration changes to PoA

B.2.1. Corrections

a. Corrections that have been approved by the Board as applicable from the periods prior to this monitoring period:

Version 6.2 of the registered PoA-DD was updated to the current version 7.2.
Approval date: 22/07/2019.
Reference number: PRC-6864-001.

A number of editorial changes have been made to help clarify and simplify the PoA-DD and CPA-DD:

a. 'Installation' of stoves has been changed to 'distribution'
b. '3 stone fires' or '3 rock fires' have been changed to 'baseline appliance'
c. 'Monitoring database' is now the unified term for the repository of unique stove end user data, removing references to 'installation database'
d. References to a signed 'emissions rights agreement' with end users have been removed, as in practice this is not a requirement
e. 'CME' and 'CPA Implementer' are used in all circumstances to clarify the various roles and responsibilities defined under the PoA-DD and CPA-DD. This has clarified a variety of references to:
    - •'3RL', '3RL administration', 'data administration teams', 'Zambian project manager' etc. for the CME, and
    - •'regional logistics managers' 'installers', 'installation teams', 'post-installation teams', 'local partners' etc. for the CPA Implementer
f. Annex 4 monitoring information has been deleted as it is no longer accurate and is now clearly outlined in Section I of the PoA-DD
g. 'where possible' has been added to 'data capture' section of Section B:
   Management System, to indicate that it is not always realistically possible to collect all the distribution data that is listed in the PoA-DD. For example, when working in rural locations in Zambia addresses may not be available, or GPS datapoints may not pinpoint the exact location. There will always be a unique listing of each stove with a unique user in the monitoring database, but it will not always contain all the datapoints listed in the PoA-DD.

Reason for change: To update, clarify and simplify descriptions across the PoA-DD and to avoid misunderstandings.

b. Corrections that have been approved by the Board as applicable from this monitoring period:
Not applicable.

c. Corrections that are beings submitted with this monitoring report as part of the request for issusance (post-registration change – issuance track) as applicable from this monitoring period:
Not applicable.

B.2.2. Inclusion of monitoring plan

Not applicable.

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.

B.2.4. Changes to programme design

a. Changes to the programme design that have been approved by the Board as applicable from the periods prior to this monitoring period:

Version 6.2 of the registered PoA-DD was updated to the current version 7.2.
Approval date: 22/07/2019.
Reference number: PRC-6864-001.

1. Form Version
Changing the PoA-DD form completed to use the latest version: “Programme of activities design document form (Version 08.1)”.

Reason for change: to update the form to the latest available version.

2. Technology employed
Under the initially registered PoA-DD a specific stove model was identified for implementation in the first 3 included CPAs in Zambia. This has now been changed to allow for the inclusion of new stove models in the CPAs on the proviso that they meet with the methodology’s requirements for the Level of Service and Type of Service provided. This has led to corrections being madethroughout the PoA-DD and CPA-DD, but with most relevance in the following sections:

a. PoA-DD Section A3: Technologies/Measures

b. PoA-DD Section C: Demonstration of Additionality of the PoA

c. Generic CPA-DD Section H3: Purpose and general description of generic CPA

d. Generic CPA-DD Section H4: Technologies/Measures

e. Generic CPA-DD Section I.6.2: Data and parameters fixed ex ante (Bold & ηnew)

f. Generic CPA-DD Section I.7.2: Sampling plan (groups of CPAs are only homogenous when they have the same stove technology employed)

g. Generic CPA-DD Section K: Eligibility Criteria for the Inclusion of CPAs (number 3)

The baseline efficiency parameter (ηnew) of initial stove model listed in Version 6.2 of the PoA-DD, and the first 3 included CPAs, has been maintained for use in the illustration of the “ex-ante ER calculation (per stove)” (Generic CPA-DD Section I.6.3).

Reason for change: To allow for the distribution of multiple models of cookstove. Since the PoA was first registered, more efficient stove models have been developed by new manufacturers entering the market. This change is instigated to incorporate the best available technology.

3. Additionality
Additionality is automatically proven in both the registered version 6.2 of the PDD and the PRC version 7 of the PDD, although the method has been revised in accordance with the latest guidelines and to make it more simplified. This involves applying the following tools:

- Tool 19 version 8: Demonstration of additionality of microscale project activities
- Tool 21 version 12: Demonstration of additionality of small-scale project activities

And the following sections have been updated accordingly:

a. PoA-DD Section C: Demonstration of additionality of PoA

b. CPA-DD Section K: Eligibility Criteria for the Inclusion of CPAs (number 6)

Reason for change: To update and simplify the additionality argument to reflect the

latest available guidance

4. Thresholds

In the application of the Tools 19 and 21 (above), the requirement to demonstrate compliance with the methodological threshold is fixed at the microscale sub-unit level. This means that the CME: is not required to demonstrate compliance of the CPA with the microscale or small-scale thresholds at the aggregate level of the CPA (Tool 19, para17).

This has led to the following changes:

a. PoA-DD Section B.7.a: Management System

b. PoA-DD Section C: Demonstration of additionality of PoA

c. Generic CPA-DD Section K: Eligibility Criteria for the Inclusion of CPAs (number 11)

Reason for change: To simplify and streamline the CPA eligibility criteria and to reflect the latest available guidance.

b. Changes to the programme design that have been approved by the Board as applicable from this monitoring period:

Not applicable.

c. Changes to the programme design that are beings submitted with this monitoring report as part of the request for issusance (post-registration change – issuance track) as applicable from this monitoring period:

Not applicable.

B.2.5. Changes specific to afforestation or reforestation activities

Not applicable.

PART II Monitoring of CPAs

>>

SECTION C. Implementation of CPAs

C.1. Description of implemented CPAs

1. Provide a brief summary of the CPAs covered in this monitoring report in terms of the purpose of the CPAs and the measures taken for GHG emission reductions or net anthropogenic GHG removals.

CPAs 1-3: the CPAs are no longer operational.

CPA 4, Fuel Efficient Stoves in Zambia (Korea Carbon Offsets Ltd. CPA No.01): involves the distribution of fuel-efficient stoves by KCOL in individual households in Zambia. 3 Rocks Ltd.'s local partner, KCOL, provides all implementation services and ongoing project operation costs for the development of the CPA, including total cookstove purchases, distribution and maintenance costs.

CPA 5: has been implemented but is not included in this monitoring report because it has a different CPA implementer.

2. Provide information on the implementation status of the CPAs in accordance with the applicable provisions on the description of implemented CPAs in the project standard, including:

    a. Description of the installed technologies, technical processes and equipment for the CPAs;

CPA 4: KCOL has distributed 5,000 Kuniokoa Cookstoves manufactured by Burn Manufacturing LLC in this monitoring period. This type of cookstove delivers a thermal efficiency of 41.6%, which is well above the required minimum threshold of 20% thermal efficiency. The thermal efficiency of the Kuniokoa Cookstoves was determined by an independent lab report from the KIRDI of 19th November 2017. The efficiency and the performance of the Kuniokoa Cookstoves have been proven to be constant for at least the first 2.7 years of use. This timeline is applicable for the stoves monitored in this monitoring report, as the first stove was distributed into the field on 15 October 2019.

    b. Information on the implementation and actual operation of the CPAs, including relevant dates (e.g. construction, commissioning, start of operation). If a CPA consists of more than one site, describe the status of implementation and start date of operation for each site. If a CPA is implemented in phases, indicate the progress of the CPA achieved in each phase.

CPA 4: Stoves were distributed as follows:

Date of first stove distributed in this MP	15/10/2019
Date of last stove distributed in this MP	19/06/2020

3. For the description of the installed technologies, technical processes and equipment, include diagrams, where appropriate.

In CPA 4, the Kuniokoa stoves were installed in each household and mounted on a brick-built plinth for security and safety.

See the following photos:

Pre-installed stove

Installed stove

Households are also given guidance on how to operate, clean and maintain the installed cookstove units. This guidance also includes communication of the benefits, such as reduced use of fuel wood and resulting smoke pollution. The stoves also have a 2-year warranty.

C.2. Location of CPAs

The geographical boundary of the CPA in this monitoring report is the country of Zambia. The Republic of Zambia lies within the latitude and longitude of 15 00 S and 30 00 E[2]. The approximate GPS coordinates derived from Google Earth for the furthest extremities of the Zambian border are:

North (border with Tanzania and DRC): 08º12'11.83" S & 30º46'22.26" E
South (border with Zimbabwe):18º04'34.03" S & 26º41'47.24" E
East (border with Malawi):10º33'43.01" S & 33º42'08.00" E
West (border with Angola):14º33'34.57" S & 21º59'58.74" E

[2] https://greenwichmeantime.com/time-zone/africa/zambia/map-zambia/

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.

C.3.2. Corrections

Not applicable.

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

Not applicable.

C.3.4. Inclusion of monitoring plan

Not applicable.

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.

C.3.6. Changes to project design

Not applicable.

C.3.7. Changes specific to afforestation or reforestation CPA

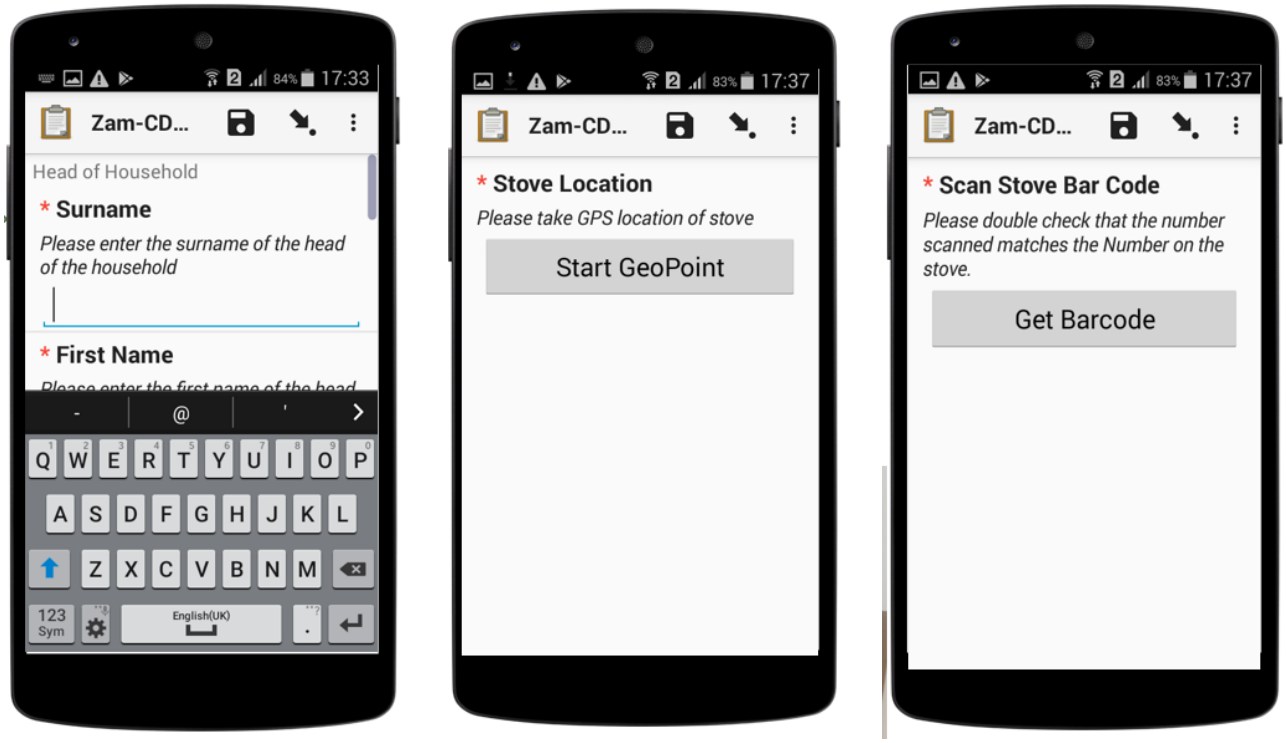
Not applicable.

SECTION D. Description of monitoring system of CPAs

Under CPA 4, stove distribution data was collected by trained data handlers using a digital data collection system that is operated on a smartphone. Required data sets were gathered from end users to uniquely identify stoves in the monitoring database. Data sets included:

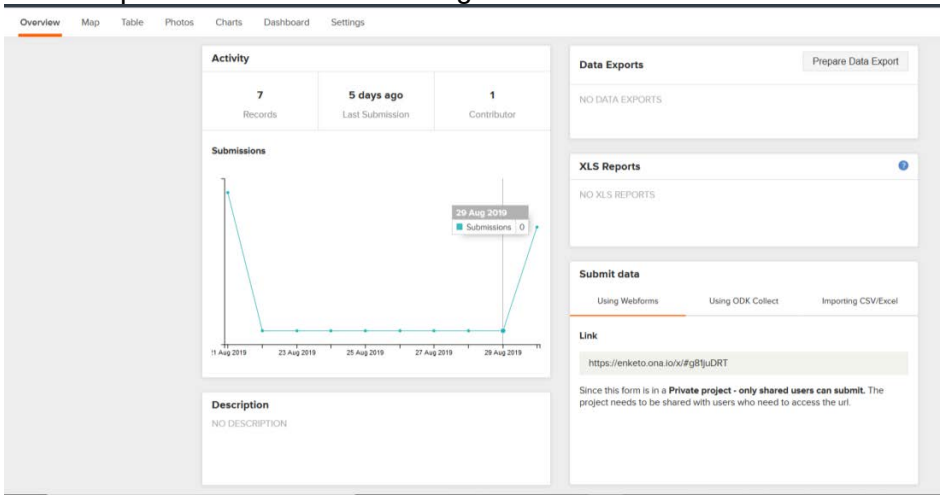
- Date of distribution;
- GPS location reference;
- Stove serial number;
- Name, location, phone number and/or ID number of end user;
- Type of baseline stove replaced;
- Baseline fuel used.

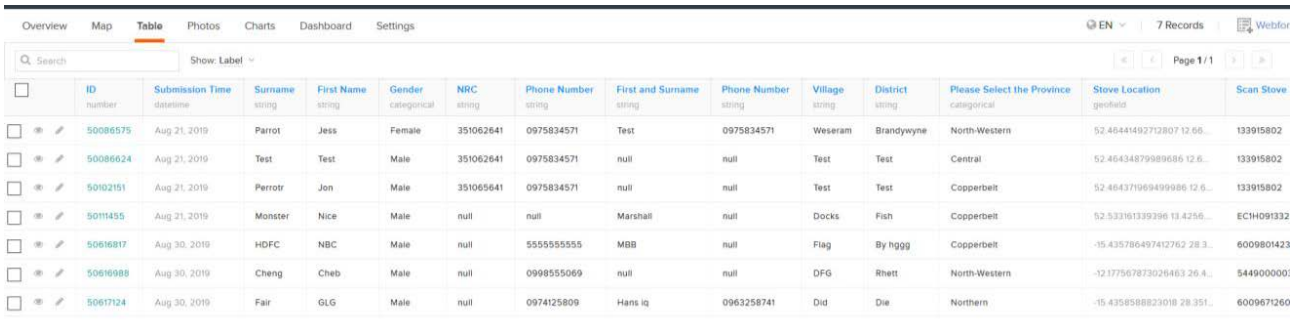
An example of the remote data capture system is as follows:



The data sets were transmitted to an online monitoring database that stores the data and automatically assigns each entry with a unique reference number, or ID.

An example of the online monitoring database is as follows:





The data sets were then exported in a spreadsheet format to calculate the emissions reductions.

SECTION E. Data and parameters

E.1. Data and parameters fixed ex ante

Data/Parameter	B_{old}
Unit	Tonnes per annum
Description	Quantity of biomass used in absence of the project activity
Source of data	Baseline survey
Value(s) applied	4.1
Choice of data or measurement methods and procedures	The baseline survey assessed the average domestic biomass usage for cooking and water heating per household per annum amongst users of traditional 3-rock fires, according to interviews. This data was gathered according to: General Guidelines for Sampling and Surveys For Small-Scale CDM Project Activities (Version 01); CDM EB50 Annex 30.
Purpose of data/parameter	Baseline emissions calculations
Additional comments	See Annex 3 & Sampling Plan for Household Annual Average Woodfuel Usage Survey for details.

Data/Parameter	$f_{NRB,y}$
Unit	Fraction
Description	Non-renewable biomass usage in Zambia, as a proportion of total biomass usage
Source of data	EB 67 country-specific default value for Zambia
Value(s) applied	0.81
Choice of data or measurement methods and procedures	An independent consultant calculated the overall biomass usage in Zambia and, according to independently published sources, ascertained the proportion of that biomass which is non-renewable to be 0.93. However, EB 67, Annex 22 indicates a country-specific default value for Zambia at 0.81. For conservativeness, the latter value is selected.
Purpose of data/parameter	Baseline emissions calculations
Additional comment	-

Data/Parameter	η_{old}
Unit	Fraction
Description	Efficiency of the system being replaced
Source of data	Methodology default
Value(s) applied	0.10
Choice of data or measurement methods and procedures	AMS II.G, version 3
Purpose of data/parameter	Baseline emissions calculations
Additional comment	-

Data/Parameter	$NCV_{biomass}$
Unit	TJ/tonne
Description	Net calorific value of the non-renewable woody biomass that is substituted
Source of data	IPCC default
Value(s) applied	0.015
Choice of data or measurement methods and procedures	AMS II.G, version 3
Purpose of data/parameter	Baseline emissions calculation
Additional comment	-

Data/Parameter	$EF_{projected\_fossilfuel}$
Unit	tCO2/TJ
Description	Emission factor: substitution of non-renewable biomass by similar consumers
Source of data	Methodology default
Value(s) applied	81.6
Choice of data or measurement methods and procedures	AMS II.G, version 3
Purpose of data/parameter	Baseline emissions calculation
Additional comment	-

Data/Parameter	Ly
Unit	Fraction
Description	Leakage
Source of data	Methodology default
Value(s) applied	0.95
Choice of data or measurement methods and procedures	AMS II.G, version 3
Purpose of data/parameter	Baseline emissions calculation
Additional comment	-

Data/Parameter	η_{new}
Unit	Fraction
Description	Thermal efficiency of the stove
Source of data	WBT Protocol or Stove Manufacturers Emissions & Performance Test Protocol (EPTP)
Value(s) applied	0.416
Choice of data or measurement methods and procedures	From an independent lab report from the Kenya Industrial Research and Development Institute (KIRDI) of 19th November 2017.
Purpose of data/parameter	Baseline emissions calculation
Additional comments	The first included CPAs (1-3) consisted of an initial stove model with a thermal efficiency of 0.295, as tested in a recognized lab using the EPTP. Following PRC, new stove models may be introduced in new CPAs, which must comply with the methodology and PoA eligibility criteria. An example is used here of the Burn Kuniokoa Cookstove, but others may be outlined in the relevant CPA monitoring reports

Data/Parameter	*DRB*
Unit	Tonnes
Description	Demonstrably renewable biomass
Source of data	*fNRB,y* baseline study
Value(s) applied	1,278,025
Choice of data or measurement methods and procedures	The justification is clearly outlined in the full *fNRB,y* baseline study, presented in Appendix 3
Purpose of data/parameter	Baseline emissions calculation
Additional comment	-

E.2. Data and parameters monitored

Data/Parameter	***NS***
Unit	Number
Description	Number of stoves still operation during the monitoring period
Measured/calculated/default	Measured
Source of data	Monitoring database
Value(s) of monitored parameter	5,000
Monitoring equipment	Monitoring database
Measuring/reading/recording frequency	Annual or Biennial
Calculation method (if applicable)	The annual sample for the survey was selected based on a 90% level of confidence (single CPA) and 10% precision required for annual surveys in line with the sampling plan in the registered PoA-DD. The activity sample group (ASG) Household survey checked the continued operation of stoves, or 'drop-out rate', in the household of stove recipients. The survey questionnaire was also used to ascertain the patterns of usage of each appliance. A proportion of stoves still in usage was calculated across the ASG and applied to the total number of stoves in the Monitoring Database.
QA/QC procedures	The unique reference number of each stove was logged in the monitoring database showing the total number of stoves.
Purpose of data/parameter	Emissions calculations
Additional comments	-

Data/Parameter	***OD***
Unit	Days
Description	Total stove operating days in monitoring period
Measured/calculated/default	Calculated
Source of data	Distribution and monitoring survey data in monitoring database
Value(s) of monitored parameter	915,000
Monitoring equipment	Monitoring database
Measuring/reading/recording frequency	Annual or Biennial
Calculation method (if applicable)	The number is calculated by counting the number of days from the distribution date of each stove until the end of the monitoring period and aggregating the total days. This number is calculated net of any stove attrition rate identified in the ASG survey.
QA/QC procedures	The unique reference number of each stove is logged in the monitoring database. The date of distribution is utilized to determine the portion of the monitoring period that the stove has been in operation. Any interruption in the stoves' operation (e.g. where stoves are replaced or drop out) is registered as missed operating days in the monitoring database for emissions calculation purposes.
Purpose of data/parameter	Emissions calculations
Additional comments	The monitoring period start and end days are included in the calculation of OD.

Data/Parameter	$\eta_{new,i}$
Unit	Fraction
Description	Thermal efficiency of the stove
Measured/calculated/default	Measured
Measured/calculated/default	Measured
Source of data	WBT
Value(s) of monitored parameter	0.418
Monitoring equipment	New equipment (digital weighing scale and thermometers) was used to carry out the WBT hence did not require any calibration as they had not been used before. The moisture meter has a provision for internal calibration and does not require external calibration as confirmed by the product manual.
Measuring/reading/recording frequency	Annual
Calculation method (if applicable)	A simple random sample of the distributed stoves which are in operation was taken. A sample of 3 stoves was tested for thermal efficiency to ensure that they are still operating at the specified efficiency.
QA/QC procedures	The stove efficiency sample group (SESG) was selected based on a 90% level of confidence, as only a single CPA is being monitored. The margin of error is 10% for annual surveys, in accordance with the methodology and EB69 Annex 4 & 5 Guidance. Tests were undertaken by experienced project staff, between the 11-13 March 2020, following a published water boil test (WBT). Staff followed the procedure used in the WBT and recorded the thermal efficiency of each stove tested, which was subsequently used for emissions calculation purposes. The following pieces of equipment were used for the WBT: - Hanna K-Type Thermocouple Thermometer: o Serial number: 0612036N. - ACS Series Pice Computing Scale: o Serial number: not applicable. - Amprobe Moisture Meter: o Serial number: 3503178.
Purpose of data/parameter	Emissions calculations

Data/Parameter	B_{new}
Unit	Tonnes per annum
Description	Quantity of biomass saved per stove per annum
Measured/calculated/default	Measured
Source of data	Survey
Value(s) of monitored parameter	4.1
Monitoring equipment	Survey Form
Measuring/reading/recording frequency	Annual

Calculation method (if applicable)	The sample for the survey was selected based on a 90% level of confidence (single CPA) and 10% precision required for annal surveys in line with the sampling plan in the registered PoA-DD. The ASG Household survey checked the presence of domestic 3-rock fires in the household of stove recipients and the survey questionnaire was used to ascertain the patterns of usage of each appliance. A proportion of usage of 3 rock fires was calculated across the ASG and a deduction made to B_{old}, to determine B_{new}.
QA/QC procedures	CME provides guidance and training to enumerators for conducting surveys. The value obtained was tested to determine if the desired precision was met. In the ASG survey, the required level of precision was met, as determined by the CDM Survey Sample Calculator v03.1. Hence the actual value is taken for the ER calculations in accordance with the methodology.
Purpose of data/parameter	Emissions calculation
Additional comments	-

E.3. Implementation of sampling plan

The sampling plan was implemented as follows:

(a) List of CPAs to which the sampling plan was applied:

6864-P1-0004-CP1: Fuel Efficient Stoves in Zambia (Korea Carbon Offsets Ltd. CPA No.01).

(b) Description of implemented sampling design:

A single sampling plan was implemented and is justified as only 1 CPA is monitored and there is homogeneity related to parameters of interest, as described below:

Stove usage rate (ASG) parameter of interest:
- The CPA has the same stove technology user profile (i.e. domestic households);
- The CPA employs the same stove technology;
- The baseline survey shows that household usage of biomass and cooking technology in Zambia is homogenous across regions;

Stove efficiency (SESG) parameters of interest:

- The CPA employs the same stove technology
- Each final constructed stove is robust, manufactured to identical standards and with no moving parts, and therefore efficiency is designed to remain constant over time

(c) Collected data:

Parameters monitored and data collected:

- Number of Stoves (NS) – determined from the monitoring database as the number of stoves still operation during the monitoring period, as compared to the baseline distributed number of stoves.
- Quantity of biomass saved per annum (B_{new}) – determining the average (proportion) deduction per stove from the baseline parameter B_{old}. This monitors the proportion of any residual use of the baseline appliance via a survey form.
- Efficiency of stove ($\eta_{new,i}$) – to determine the ongoing average (mean) efficiency of each stove distributed via a WBT. The WBTs were conducted between 11-13 March 2020. These dates for the WBT are considered approporate as most of the cookstoves (4,877 cookstoves) were installed between 23/10/2019 – 01/02/2020. All equipment was newly purchased for the monitoring exercise. As equipment was new, no calibrations were required.

(d) Analysis of the collected data:

Data sets were collected in the field by trained surveyors and efficiency testers. This was submitted to the CME for analysis and set out in the ER calculation spreadsheet. Oversampling was employed in order to ensure that the data sets are representative.

(e) Demonstration that the required confidence/precision level has been met:

The tables below demonstrate how the confidence / precision levels are met in the sampled population for both the stove usage, determined in the Activity Sample Group (ASG) survey and the Stove Efficiency Sample Group (SESG) survey.

ASG	**Bnew**	**NS**
Population Size	5 000	5 000
Samples monitored	95	95
Actual proportion	*100.00%*	*0.00%*
Standard error of proportion	0%	13%
Precision	0.00%	0.00%
Result	ok, acceptable	ok, acceptable

In the ASG survey, the required level of precision for B_{new} was met and so the monitored value is taken for the ER calculations.

In the ASG survey, the required level of precision for NS was met and so the monitored value is applied as the actual value for the ER calculations.

SESG (Stove efficiency sample group)	**η_{new}**
total number of stoves	5 000
Samples monitored	3
Mean	*41.80%*
Standard Deviation	0.16%
Standard error of mean	0.09%
Precision	0.64%
Result	ok, acceptable

In the SESG survey, the required level of precision for η_{new} was met and so the monitored value is applied as the actual value for the ER calculations. The level of precision for η_{new} was met regardless of whether the confidence/precision values were inputted for the annual (which requires 90/10 confidence/precision values) or biennial (which requires 95/5 confidence/precision values) sampling design[3].

(f) Demonstration that the samples were randomly selected and are representative of the population:

A random selection of households were chosen by applying the “RANDBETWEEN” function on the stove distribution data. 106 entries were accordingly selected at random from the monitoring

[3] The precision value for η_{new} was calculated to be 0.95% when using the biannual sampling confidence/precision values i.e. 95/5 values. Hence the precision value was met when using both the biannual or annual sampling values.

database for sampling the ASG[4]. The results from the surveys were tabulated in the Solwezi Monitoring Record in the emission reduction calculation spreadsheet.

Eleven sampled households were discounted from the final results for parameter NS. A total of 95 surveys were therefore included in the calculations for parameter NS. The number of households was discounted using a 10% margin of error factor, as required to calculate the parameter NS, outlined on page 18 of the CPA-DD document for KCOL CPA1.

The outliers in the survey results were removed for the calculation of the parameter Bnew, as per the process stated in B.5.2 of the registered CPA-DD. Accoridngly, the lowest 5% and the highest 5% of the surveyed values have been removed from the final calculations.

Three end users were selected at random from the monitoring database for the SESG survey and each stove was tested for its thermal efficiency. As no outlier can be determined from three samples, all the samples were included, and a simple average of the results of 41.8% was taken for the parameter value.

SECTION F. Calculation of emission reductions or net anthropogenic removals

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

Emissions reductions are calculated as follows:

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

Methodology Option 2 is selected whereby:

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

Where:

1. $B_{y,savings}$ - Quantity of woody biomass that is saved per stove per annum in tonnes. The formula for calculating this is: Bold *(1- ηold / ηnew)
2. $f_{NRB,y}$ - The fraction of biomass used in absence of the project that is non-renewable (0.81)
3. $NCV_{biomass}$ - Methodology default (0.015 TJ/tonne)
4. $EF_{projected\_fossilfuel}$ - Methodology default (81.6 tCO_2/TJ)
5. B_{old} - Quantity of woody biomass used in the absence of the project activity in tonnes (4.1)
6. η_{old} - Methodology default (0.10)
7. η_{new} - Thermal efficiency of the new appliance (0.418)

The $B_{y,savings}$ value was used to calculate the emission reductions per annum per stove (ER_y). This value was then divided by 365 to obtain the emission reductions per stove per day.This value is then multipled by the number of days in the monitoring period to get the emission reductions per stove during the monitoring period.

[4] The ASG survey was used to calculate the NS and Bnew parameters, thus the final sample size for Bnew was used for NS as well, even though the calculated sample size for NS was less than the calculated sample size for Bnew.

The calculated sample size for parameter NS was 9. However in accordance with the sampling standard, if the sample size is below 30, then a sample size of 30 should be used. The calculated sample size for parameter Bnew was 66. However, an oversampling approach was used to account for a non response rate and to ensure the required precision level was met. A final sample size of 106, before the removal of outliers was applied, was therefore applied to the survey of both NS and Bnew.

The net emission reductions are calculated by multiplying the emission reductions per stove per day with the number of operating days and the leakage factor, discussed below in section F.3.

Ex-post ER calculation

Parameter	Value		Monitored result	Per Stove
B_{new}	t/a	Monitoring survey	0%	4.1
η_{old}	fraction	Methodology default		0.1
$\eta_{new,i}$	fraction	Monitored EPTP test	0.418	0.418
$B_{y,savings}$	t/a	Calculated		3.12
$f_{NRB, y}$	fraction	PoA-DD		0.81
$NCV_{biomass\ (TJ/t)}$	TJ/t	Methodology default		0.015
$EF_{projected\_fossil\ fuel}$	t CO_2/TJ	Methodology default		81.6
ER_{year}	t CO_2	ERs per stove per annum		3.09
ER_{day}	t CO_2	ERs per stove per day		0.00847
ER_{mp}	tCO_2	ERs per stove during the monitoring period		1.55893

The total emissions reduction per stove achieved during the monitoring period are higher (1.55893 vs 1.55657 tCO_2/per stove during the monitoring period) due to the increased stove usage rate and that all stoves were in the field for the entire monitoring period.

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

Not Applicable.

F.3. Calculation of leakage emissions

Leakage emissions are calculated using the 5% default as provided for by the methodology: Therefore *Ly = 0.95*.

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

CPA UNFCCC reference number	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)			
				Before 01/01/2013	From 01/01/2013 until 31/12/2020	From 01/01/ 2021	Total amount
6864-P1-0004-CP1	7,364	0	0	0	7,364	0	7,364
Total	5,364	0	0	0	7,364	0	7,364

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

CPA UNFCCC reference number	Amount achieved during this monitoring period (t CO_2e)	Amount estimated ex ante for this monitoring period in the CPA-DD (t CO_2e)
6864-P1- 0004-CP1	7,364	739,371
Total	7,364	739,371

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

Ex-ante emissions are calculated using the baseline data from the CPA-DD and applying the number of stove operating days in the monitoring period, prior to any discounts applied from the actual monitoring data.

This is shown in the emissions reductions calculation sheet as follows:

Ex-ante ERs			CPA 4
MP/CPA start date	Date		01/07/2020
MP/CPA end date	Date		31/12/2020
ER_{day}	per stove		0.00846
GWh output	per stove	By Savings * NCVBiomass	0.013
NS	per CPA		500,000
OD			92,000,000
B_{old}	per CPA		2,050,000
$B_{y,savings}$	per CPA		1,557,212
ER_{gross}	t CO_2		778,286
Ly			0.95
ER_{net}	t CO_2		739,371

Ex-ante PoA per stove per annum calculation

Parameter	Value		Per Stove
B_{old}	t/annum	Baseline survey	4.1
η_{old}	fraction	Methodology default	0.1
η_{new}	fraction	Sample efficiency test	0.416
$B_{y,savings}$	t/annum	Calculated	3.11
$f_{NRB,y}$	fraction	Baseline study	0.81
$NCV_{biomass\ (TJ/t)}$	TJ/t	Methodology default	0.015
$EF_{projected\ fossilfuel}$	tCO_2/TJ	Methodology default	81.6
ER_y	t CO_2	ERs per stove per annum	**3.09**
ER_{day}	t CO_2	ERs per stove per day	**0.00846**
ER_{mp}	tCO_2	ERs per stove during the monitoring period	**1.55657**

F.6. Remarks on increase in achieved emission reductions

A slight increase in emissions reductions are observed. This is due to an increased usage rate of the project devices.

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

The CPA is considered an additional Microscale CDM Project Activity and employing Microscale CDM Units, according to Tool 19 version 8, para 9, because:

1. The geographic location of the project activity is in one of the least developed countries, Zambia; and

2. It is an energy efficiency project where:

    a. each stove distributed in the CPA is considered a Microscale CDM Unit as it achieves savings of less than 1.8GWh_{th} (converted from 600MWh at a rate of 1:3 as per the Project Standard para 126 b) per year, as demonstrated in the ER calculation sheet:

Thermal savings per stove *per annum (By Savings * NCVBiomass)* **0.047** **GWh**

b. end users of the subsystems or measures are households/communities/SMEs as demonstrated in the monitoring database.

Each of the units contained in the CPA satisfies the condition to qualify as a 'microscale CDM unit' according to Tool 19, para 17 and therefore:

"the coordinating/managing entity is not required to demonstrate compliance of the CPA with the microscale or small-scale thresholds at the aggregate level of the CPA."

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Document information

Version	*Date*	*Description*
04.0	6 April 2021	Revision to: • Reflect the “Clarification: Regulatory requirements under temporary measures for post-2020 cases” (CDM-EB109-A01-CLAR).
03.0	31 May 2019	Revision to: • 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: • 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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