



**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	Fuel Efficient Stoves in Zambia	
UNFCCC reference number of the PoA	PoA 6864	
Version numbers of the PoA-DD applicable to this monitoring report	Version 7.2	
Version number of this monitoring report	1.0	
Completion date of this monitoring report	07/09/20220	
Monitoring period number	5	
Duration of this monitoring period	01/02/2020 – 30/062020	
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
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
	0	11,883
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	21,700	

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. (3RL) 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 3RL and will be distributed by CPA Implementers. The stove design to be distributed in each CPA will be 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. 3RL 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 will be clearly explained to prospective users during communication events at the CPA implementation stage.

Stoves will be distributed by CPA Implementers, or their local partners (collectively known hereafter as “CPA Implementer”), and distribution teams will be 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 will be assigned a unique reference number in the monitoring database.

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

3RL 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 3RL 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 version 3
Fuel Efficient Stoves in Zambia [CPA Implementer] CPA No.xx	7.2	3	AMS II.G version 3

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)	No
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)	Yes

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 proposed PoA and is therefore acting as the sole PoA CME.

The roles and responsibilities of the CME are:

- i. *3RL Board & Zambia Branch Board*: oversight of management system & 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 3RL board.
- iii. *CDM Compliance Manager*: writing PDDs & monitoring reports, ensuring compliance with CDM rules

The roles and responsibilities of KCM, or 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- & 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 lies 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;
- 3RL pre-installation teams visit recipient households in each CPA and ensure recipients understand and acknowledge the conditions for participation in the CPA; this will act as the “order” for each stove.
- Each stove is assigned a unique distribution number chronologically; 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 will be trained in the distribution of the stove to a standardized design and installation procedure
- CPA Implementers will be 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 will include 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 3RL technical team for technical review
- The technical team proposes the CPA inclusion to the 3RL Board for approval

F. Monitoring

Monitoring activities will be conducted as follows:

- Surveys completed in the field by trained local monitoring teams
- Data captured by the monitoring teams is passed to 3RL data administration team
- Data is checked for completeness, consistency and accuracy
- Project manager summarizes data in a report to the 3RL 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

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

- Management Information Systems & Data Capture Process

- Stove Distribution Guidelines

Records of training and capacity development will be 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 will be undertaken at CME board level by an in-house technical team. This review will be undertaken in accordance with the eligibility criteria outlined in this PDD and the most recent guidance issued by the CDM Executive Board.

Following its review, the technical team will affirm 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 will be avoided by the unique referencing of stoves included in each CPA. This will be done through:

- **GPS references:** if possible, each stove will have 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 will also have a unique reference number in the monitoring database. Only one stove will be 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 will be collected electronically and uploaded directly to the monitoring database. Where data is collected manually, it will be collated by the CME.

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

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

All records will be 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 will be conducted at the behest of the CME. This will be 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 will be 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.

In the case of CPA 5, KCM 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 1 included CPAs, namely CPA 6864-P1-0005-CP1: Fuel Efficient Stoves in Zambia – Korea Carbon Management Ltd. CPA No.1.

Therefore, sampling only covers 1 CPA and does not cover a group of CPAs.

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

CPAs 1-4 are not being monitored during this monitoring period.

The monitored CPA 5 that is covered in this monitoring report involves the distribution of fuel-efficient stoves by Korea Carbon Management Ltd. (KCM) in individual households in Zambia. KCM provides all implementation and ongoing project operation costs for the development of the CPA, including total ICS purchase, distribution, and maintenance costs.

CPA 5 involves the distribution of energy efficient biomass fuel-based ICS, with a minimum 20% thermal efficiency. CPA 5 distributes the Greenway Jumbo Stove manufactured by Greenway Grameen Infra Pvt Ltd. This cookstove delivers a thermal efficiency of 31.17% according to an independent lab report from the India Institute of Technology (IIT) dated 17/12/2015.



The technical details are as follows:

Specifications	Unit	Value
Cookstove Model		Greenway Jumbo Stove
Lifespan	Years	5 Years
Thermal efficiency	%	31.17%
Outside Diameter	cm	27

B.2. Post-registration changes to PoA

B.2.1. Corrections

Corrections were made to the registered PoA-DD during a Post-Registration Change (PRC) process, from the registered version 6.2 of the PoA-DD to the current version 7.2 completed on

07/05/2019, with a validation report version 1.0 dated 23/05/2019, approved on 22/07/2019 under the 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.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

Post-registration changes were made from the registered version 6.2 of the PoA-DD to the current version 7.2 completed on 07/05/2019, with a validation report version 1.0 dated 23/05/2019, approved on 22/07/2019 under the reference number PRC-6864-001.

It should be noted that all changes noted here are permanent changes to the registered PoA-DD and have been approved by the CDM Board. The changes are as follows:

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 made throughout 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 (B_{old} & η_{new})
- 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 (η_{new}) 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.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 CPA 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.

CPA 5: Fuel Efficient Stoves in Zambia (Korea Carbon Management Ltd. CPA No.01) involves the distribution of fuel-efficient stoves by Korea Carbon Management Ltd. (KCM) in individual households in Zambia. KCM provides all implementation and ongoing project operation costs for the development of the CPA, including total ICS purchase, distribution, and maintenance costs. The ICS technology ensures a minimum 20% thermal efficiency.

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 5: KCM has distributed/installed 17,057 Greenway Jumbo Stove manufactured by Greenway Grameen Infra Pvt Ltd. This cookstove delivers a thermal efficiency of 31.17% according to an independent lab report from the India Institute of Technology (IIT) dated 17/12/2015.

- (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 5: Stoves were distributed in as follows:

Date of first stove distributed (in this MP)	30/03/2020
Date of last stove distributed (in this MP)	30/06/2020

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

In CPA 5, the portable Greenway Jumbo Stoves were distributed to each household.



C.2. Location of CPAs

The geographical boundary of the CPAs is the country of Zambia. The **Republic of Zambia lies within the latitude and longitude** of 15 00 S and 30 00 E². The approximate GPS coordinates derived from Google Earth for the furthest extremities of the Zambian border are:

North (border with Tanzania and DRC): 08°12'11.83" S & 30°46'22.26" E

South (border with Zimbabwe): 18°04'34.03" S & 26°41'47.24" E

East (border with Malawi): 10°33'43.01" S & 33°42'08.00" E

West (border with Angola): 14°33'34.57" S & 21°59'58.74" E



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

² <https://greenwichmeantime.com/time-zone/africa/zambia/map-zambia/>

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

Provide a description of the monitoring system of each CPA or group of CPAs covered in this monitoring report in accordance with the applicable provisions on the description of monitoring system in the project standard and the monitoring plans in the respective CPA-DDs. Include line diagrams showing all relevant monitoring points.

Under CPA 5, stove distribution data was collected by trained data handlers under this CPA using a digital data collection system that is operated on a smartphone. Required data was gathered from end users to uniquely identify stoves in the monitoring database. Data 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

This data was transmitted to an online monitoring database that stores the data.

This data was 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	<i>B_{old}</i>
Data 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	Baseline emissions calculations
Additional comment	See Annex 3 & Sampling Plan for Household Annual Average Woodfuel Usage Survey for details.

Data/Parameter	$f_{NRB,y}$
Data 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	Baseline emissions calculations
Additional comment	

Data/Parameter	η_{old}
Data 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	Baseline emissions calculations

Additional comment	
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Data/Parameter	$NCV_{biomass}$
Data 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	Baseline emissions calculation
Additional comment	

Data/Parameter	$EF_{projected_fossilfuel}$
Data unit	tCO ₂ /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	Baseline emissions calculation
Additional comment	

Data/Parameter	L_y
Data 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	Baseline emissions calculation
Additional comment	

Data/Parameter	η_{new}
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Data unit	Fraction
Description	Thermal efficiency of the stove
Source of data	WBT Protocol or Stove Manufacturers Emissions & Performance Test Protocol (EPTP)
Value(s) applied	0.3117
Choice of data or Measurement methods and procedures	From an independent lab report from the Indian Institute of Technology (IIT) dated 17/12/2015.
Purpose of data	Baseline emissions calculation
Additional comment	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 Greenway Jumbo Stove, but others may be outlined in the relevant CPA monitoring reports

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

E.2. Data and parameters monitored

Data/Parameter	<i>NS</i>
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	17,057
Monitoring equipment	Monitoring database
Measuring/reading/recording frequency	Annual or Biennial

Calculation method (if applicable)	<p>General guidelines for SSC CDM methodologies, Version 23.0, paras 27 & 28 applies as distributed stoves are within the first 12 months after the implementation of the first unit in the PAs/CPA.</p> <p>There is an assumed zero percent failure rate as per General guidelines for SSC CDM methodologies, Version 23.0, paras 27 & 28, owing to:</p> <ol style="list-style-type: none"> 1. The manufacturer, Greenway Grameen Infra Pvt Ltd., has confirmed that the Kuniokoa cookstove has a 5 year lifetime, as stated in the CPA-DD; and 2. The stoves come with a 2-year warranty from the manufacturer
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	<i>OD</i>
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	674,222
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	

Data/Parameter	$\eta_{new,i}$
Unit	Fraction
Description	Thermal efficiency of the stove

Measured/calculated/default	Measured
Source of data	WBT
Value(s) of monitored parameter	0.3227
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 15 stoves was tested for thermal efficiency to ensure that they are still operating at the specified efficiency.
QA/QC procedures	<p>The stove efficiency sample group (SESG) was selected based on a 95% level of confidence. The margin of error will be 5% for biennial surveys and 10% for annual surveys, in accordance with the methodology and EB69 Annex 4 & 5 Guidance.</p> <p>Tests were undertaken by experienced project staff following a published WBT. Staff will follow the procedure used in the WBT and recorded the thermal efficiency of each stove tested, which was subsequently used for emissions calculation purposes.</p>
Purpose of data/parameter	Emissions calculations
Additional comments	See Sample Calculation in ER Calc sheet

Data/Parameter	<i>B_{new}</i>
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	4.09
Monitoring equipment	Survey Form
Measuring/reading/recording frequency	Annual
Calculation method (if applicable)	<p>The sample for the survey was selected based on a 95% level of confidence and 10% precision required for annual surveys in line with the sampling plan in the registered PoA-DD.</p> <p>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 <i>B_{old}</i>, to determine <i>B_{new}</i>. The average of <i>B_{new}</i> was then determined across the ASG.</p>
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. The survey result met the expected 95/10 precision.

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-P1-0005-CP1: Fuel Efficient Stoves in Zambia (Korea Carbon Management 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) parameter 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 deduction per stove from the baseline parameter B_{old} . This monitors any residual use of the baseline appliance via a survey form.
- Efficiency of stove ($\eta_{new,i}$) – to determine the ongoing average efficiency of each stove distributed via a WBT. The WBT tests were undertaken by an independent organisation that also ensured that, if appropriate, all equipment was calibrated according to the methodological requirements.

- (d) Analysis of the collected data:

Data was 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 is representative.

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

Sample sizes for the ASG and SESG groups were calculated using a 90/10 level of precision, applicable under the sampling standard and the methodology for annual sampling surveys of single small-scale CDM Project Activities, as follows (calculations from the sample calculation spreadsheet):

Sampling Constants	Values
Monitoring period start	01/02/2020
Monitoring period end	30/06/2020
Monitoring period (years)	0.41
Level of sampling	CPA
Confidence (95% as per POA-DD)	95%
Margin of Error (10% for annual, 5% for biennial survey)	10%
Z value	1.960
Stove population	17,057

mean value Parameter: stove efficiency sample group		Stove Efficiency (η_{new}) - SESG									
Sampling approach		Simple random sample across CPA									
Sampling Frame	Stove population	Expected Mean Efficiency(%)	Expected SD	Calculated Sample Size	tDistribution adjusted sample size						
Greenway Jumbo Stove	17,057	31.16	2.35	3	11	3	11	3	11	3	11

Proportion Value Parameter (ASG)			
Sampling frame(s)		Stove Population across CPAs	
Sampling approach		Simple random sample across all CPAs	
Sampling Frame	Stove population	expected operational proportion (SoF)	Calculated Sample Size (n)
Greenway Jumbo Stove	17,057	0.97	12

Required sample sizes		Total samples
Required sample size for SESG	11	15
Required sample size for ASG	30	35

the Expected standard deviation for the efficiency of the cookstoves is based on the results of the y independent lab report from the Indian Institute of Technology (IIT) dated 17/12/2015.

The expected usage rate for stoves is based on the CPA-DD Section B.5.2.

Below excerpt demonstrates that all confidence/precision levels have been met:

Monitoring Period		
Sampling Constants	Values	
Monitoring period start	01/02/2020	
Monitoring period end	30/06/2020	
Monitoring period (years)	0.41	

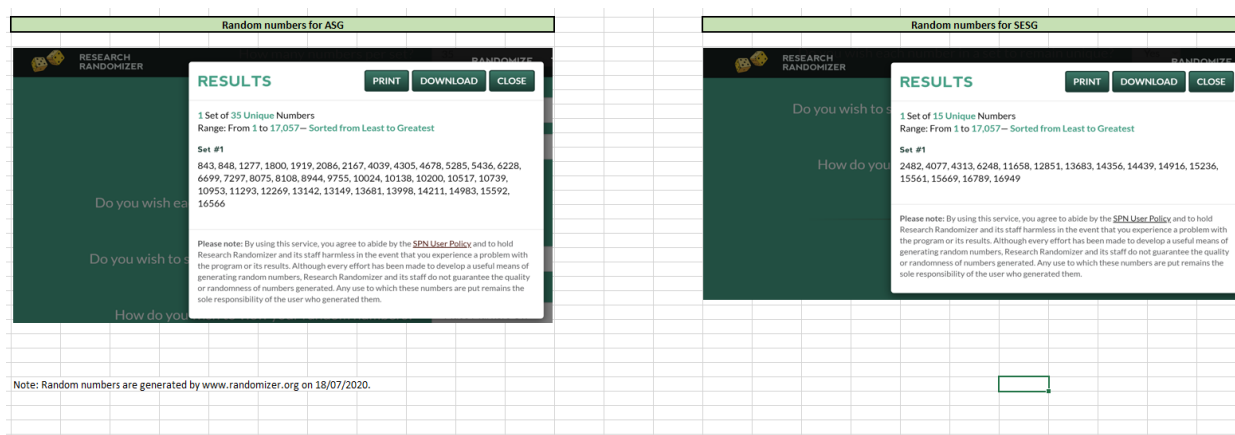
Stove usage (NS)	1.0000	Fraction
Population Size	17,057	number
Sample Size	35	number
Proportion	1.0000	Fraction
Standard error of proportion	0.00%	
Precision	0.00%	%
Statistical Acceptance of Result	ok, acceptable	--

Fraction still using 3 Stone Fires		
No. still using 3 Stone Fires & Rocket stove	4	
Proportion still using old stove%	11.43%	

Bnew	4.09	tonnes/y
Population Size	1949	number
Sample Size	4	number
Mean	4.09	tonnes/y
Standard Deviation	0.03	tonnes/y
Standard error of mean	0.01	
Precision	0.65%	%
Result	ok, acceptable	--

η_{new}	32.27%	Percentage
Population Size	17057	number
Sample Size	15	number
Mean	32.27%	%
Standard Deviation	4.0%	%
Standard error of mean	0.01	
Precision	6.25%	%
Result	ok, acceptable	--

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



SECTION F. Calculation of emission reductions or net anthropogenic removals

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

Ex-Ante emissions reductions are calculated as follows:

$$ER_y = B_{y,savings} * f_{NRB,y} * NCV_{biomass} * EF_{projected_fossilfuel}$$

Where:

1. $B_{y,savings}$ - Quantity of woody biomass that is saved per stove per annum in tonnes. The formula for calculating this is: $B_{old} * (1 - \eta_{old} / \eta_{new})$
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 tCO₂/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

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

Ex-post emissions reductions are calculated as follows:

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

Where:

1. $B_{y,savings}$ - Quantity of woody biomass that is saved per stove per annum in tonnes. The formula for calculating this is: $B_{new} * (1 - \eta_{old} / \eta_{new,i})$
2. $f_{NRB,y}$ - Fraction of biomass used in absence of the project that is non-renewable. Country-specific default value selected (0.81).
3. $NCV_{biomass}$ - Methodology default (0.015 TJ/tonne)
4. $EF_{projected_fossilfuel}$ - Methodology default (81.6 tCO₂/TJ)
5. B_{new} - Monitored average quantity of woody biomass saved per stove per annum

6. η_{old} - Methodology default (0.10)

7. $\eta_{new,i}$ - Monitored thermal efficiency of the new appliance

ER_y per stove is then be divided by the number of days in the monitoring period to give emissions reductions per stove per diem and this figure will be multiplied by the total aggregated number of stove operating days per monitoring period (OD) to give the total emissions reductions per monitoring period.

MP Parameter	Unit	6864-P1-0005-CP1	Source
NS	stoves	17,057	Calculated
STOVEdays	number	151	Calculated
OD	stove-days	674,222	Calculated
η_{new} (Efficiency new)	fraction	32.27%	Calculated
Stove Usage	fraction	100.00%	Calculated
B_{new}	t/yr	17,367.02	Calculated
B_{new} per stove	t/yr	4.09	Calculated
$B_{y,savings}$	t biomass	11,985.79	Calculated
ER	tCO ₂	11,883	

B_{new} has been slightly reduced from 4.1t/year to 4.09 due to continued use of some baseline stoves.

F.3. Calculation of leakage emissions

Leakage emissions are calculated using 5% the methodology default:

$$L_y = 0.95$$

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

CPA UNFCCC reference number	Baseline GHG emissions or baseline net GHG removals (t CO 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
6864-P1-0005-CP1	11,883	0	0	0	11,883	11,883
Total	11,883	0	315	0	11,883	11,883

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 ₂ e)	Amount estimated ex ante for this monitoring period in the CPA-DD (t CO ₂ e)
6864-P1-0005-CP1	11,883	21,700
Total	11,883	21,700

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

Ex-ante emissions are calculated based on the total amount of 20,000 stoves distributed with the assumption that all stoves are operational and that no baseline stoves continue to be operated. As the project was under implementation stage during the monitoring period, the resulting ERs achieved were lower as not all stoves projected by the CPA-DD were fully operational throughout the entire monitoring period. Additionally, continued use of some baseline stoves was observed.

F.6. Remarks on increase in achieved emission reductions

No increase in emissions reductions are observed.

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

Each stove distributed in the CPA will be a microscale unit according to Tool 19, para 9 because:

- a) The project is located in a Least Developed Country – Zambia;
- b) Each stove distributed in the CPA achieves savings of less than 1.8GWhth/year. The thermal savings per stove per year is 0.011GWh_{th}/year and is distributed to households.

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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.
01.0	1 April 2015	Initial publication.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report, programme of activities		