



**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	Version 8.5		
Version number of this monitoring report	1.0		
Completion date of this monitoring report	22/07/2021		
Monitoring period number	1		
Duration of this monitoring period	01/07/2020 – 31/12/2020 (both dates inclusive)		
Monitoring report number for this monitoring period	3		
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 10		
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	29,267	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	50,146		

PART I Monitoring of programme of activities (PoA)

SECTION A. Description of PoA

A.1. General description of PoA

The proposed small scale PoA involves the distribution of fuel-efficient stoves by 3 Rocks Ltd. (3RL) in individual households in the Host Countries, 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 11.

The efficient stoves are based on designs approved by 3RL and will be distributed by CPA Implementers for recipient households. The stove design to be distributed in each CPA will be tested independently in accordance with a published Water Boil Test (WBT) methodology 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, many families in Africa 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. Many people in Africa 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 digitally and backed-up securely. 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 the Host Countries.

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 [CPA Implementer] CPA No.xx	8.5	3	AMS II.G version 10

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)
6864-P2-0006-CP1: Fuel Efficient Stoves in Zambia (Korea Carbon Management Ltd. CPA No.02) Version 1.2 Dated: 18/06/2020	8.5	Fuel Efficient Stoves in Zambia [CPA Implementer] CPA No.xx	7 years, renewable (01/07/2020 – 30/06/2027)	Yes
6864-P2-0007-CP1: Fuel Efficient Stoves in Zambia (Korea Carbon Offsets Ltd. CPA No.02) Version 02.0 Dated: 24/06/2020	8.5	Fuel Efficient Stoves in Zambia [CPA Implementer] CPA No.xx	7 years, renewable (06/07/2020 – 05/07/2027)	No

A.2. Coordinating/managing entity

3 Rocks Ltd.

SECTION B. Implementation of PoA**B.1. Description of implemented PoA**

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3RL has overall operational and management responsibility for the implementation and monitoring of the proposed PoA and is therefore acting as the sole PoA CME. 3RL will be responsible, in accordance with the PoA Standard (version 2), for the following operational and management activities related to each CPA included in the PoA:

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

The roles and responsibilities of the CME are:

- 3RL Board: oversight of management system & sign-off on CPA inclusions and monitoring reports, review of competencies of team members
- Technical review team: technical review of process and documentation (CPA-DDs, monitoring reports etc.)
- CDM Compliance Manager: overseeing writing PDDs & monitoring reports, ensuring compliance of PoA operations with CDM rules

The roles and responsibilities of the CPA Implementer, or its local partners, are:

- Project Director: oversees operation of distribution centres and head office; execution of set up activities; works with project manager on all planning, accounting and monitoring database QA/QC; reports to CME.
- Project Manager: project planning and management; logistics; issue and risk management; recruitment and training; reporting of monitoring data;
- Distribution team: completing distribution process; ensuring quality stove distributions;
- 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, 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;
- Each stove is assigned a unique 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 will be trained in the distribution of the stove to a standardized procedure
- CPA Implementers will be responsible for physically distributing the stoves to the stove recipient

D. Data Capture

- The CPA Implementer checks the distribution is complete
- If complete, distribution data is collected by the CPA Implementer, which includes:
 - Username: the household family name, plus 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

b)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.

c) Procedures for technical review of inclusion of CPAs

The technical review of CPA inclusions will be undertaken 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.

d) 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 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.

e) 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.

f) 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.

g) 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. Therefore, CPA Implementers are legally contracted to the CME and are fully aware of, and have agreed that, their activity is being subscribed to the PoA.

B.2. Post-registration changes to PoA

B.2.1. Corrections

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

PRC ref No.: PRC-6864-004.

Date of approval: 21/10/2020

Details can be found at: <https://cdm.unfccc.int/PRCContainer/DB/prcp115805774/view>

B.2.4. Changes to programme design

PRC ref No.: PRC-6864-004.

Date of approval: 21/10/2020

Details can be found at: <https://cdm.unfccc.int/PRCContainer/DB/prcp115805774/view>

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 6864-P2-0006-CP1: Fuel Efficient Stoves in Zambia (Korea Carbon Management Ltd. CPA No.02) 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:
- Description of the installed technologies, technical processes and equipment for the CPAs;
CPA 6864-P2-0006-CP1: KCM has distributed/installed 42,188 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.
 - 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 6864-P2-0006-CP1: Stoves were distributed in as follows:

Date of first stove distributed	21/05/2020
Date of last stove distributed	04/02/2021

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

In CPA 6864-P2-0006-CP1, 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 E¹. 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

¹ <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 6864-P2-0006-CP1, 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	Annual quantity of woody biomass that would have been used in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices
Source of data	Revised baseline study
Value(s) applied	5.88
Choice of data or Measurement methods and procedures	Historical data, as per Option 2 of the Data/Parameter Table 3 of the methodology: Based on the historical data or a sample survey conducted as per the latest version of “sampling and surveys for CDM project activities and programme of activities” . If the monitoring period is shorter or longer than one year, the result may be extrapolated for the monitoring period
Purpose of data	Baseline emissions calculations
Additional comment	See Annex 4 of the POA-DD version 8.5.

Data/Parameter	<i>f_{NRB,y}</i>
Data unit	Fraction
Description	Fraction of woody biomass saved by the project activity during year y that can be established as non-renewable biomass
Source of data	C4 EcoSolutions report
Value(s) applied	0.88
Choice of data or Measurement methods and procedures	As per Option a) of the Paragraph 44 of the methodology: local studies to determine the local f _{NRB} value (sub national values) as per TOOL30: Calculation of the fraction of non-renewable biomass, version 2
Purpose of data	Baseline emissions calculations
Additional comment	See Annex 4 of the POA-DD version 8.5.

Data/Parameter	<i>EF_{projected_fossilfuel}</i>
Data unit	tCO ₂ /TJ
Description	Emission factor for the fossil fuels projected to be used for substitution of non-renewable woody biomass by similar consumers
Source of data	Methodology default
Value(s) applied	63.7
Choice of data or Measurement methods and procedures	AMS II.G, version 10
Purpose of data	Baseline emissions calculation
Additional comment	-

Data/Parameter	<i>L_y</i>
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 10
Purpose of data	Baseline emissions calculation
Additional comment	-

E.2. Data and parameters monitored

Data / Parameter:	$\eta_{old,i,j}$
Data unit	Fraction
Description	Efficiency of pre-project device, which is a three-stone fire using firewood (not charcoal), or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney; for other types of devices, a default value of 0.2 may be optionally used. Use weighted average values (taking the amount of woody biomass consumed by each device as the weighting factor) if more than one type of device is being replaced
Source of data	Methodology default
Value(s) applied	0.10
Measurement methods and procedures	Fixed as per AMS II.G, version 10
Monitoring frequency	Fixed for each individual household when included in the project activity database
Purpose of data	To calculate baseline emissions
QA/QC procedures	Baseline device is captured during the stove installation process and recorded in the monitoring database to ensure that only households using open/3-stone fires as a baseline are included in the project.
Additional comment	The project devices will solely replace non-improved, open/three-stone fires using firewood (not briquettes or charcoal) and therefore the parameter is fixed for the crediting period.

Data / Parameter:	$NCV_{biomass}$
Data unit	TJ/tonne
Description	Net calorific value of the non-renewable woody biomass that is used in project devices
Source of data	IPCC default
Value(s) applied	0.0156
Measurement methods and procedures	Fixed as per AMS II.G, version 10
Monitoring frequency	Yearly
Purpose of data	To calculate baseline emissions
QA/QC procedures	Baseline fuel use is captured during the stove installation process and recorded in the monitoring database to ensure that only households using woodfuel as a baseline are included in the project.
Additional comment	The project devices (ICS) will solely use wood fuel (not briquettes or charcoal). Therefore, the parameter is fixed for the crediting period.

Data / Parameter:	$N_{y,i,j}$
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Data unit	Number
Description	Number of project devices of type i and batch j operating during year y
Source of data	Monitoring database and monitoring survey
Value(s) applied	42,188
Measurement methods and procedures	CME shall maintain the database of all stoves distributed/installed. The number of operating stoves for each device i and batch j shall be determined on a sampling basis. The results from monitoring were used to calculate $N_{y,i,j}$ as follows: $N_{y,i,j} = (n_{i,j,operational} / n_{i,j,total}) * N_{y,i,j,installed}$ Where: N = number of stoves n = number of samples
Monitoring frequency	At least every two years (biennial)
QA/QC procedures	A 95 /10 confidence / margin of error shall be achieved for the sampling parameter irrespective of annual / biennial monitoring frequency as per para 22 of Standard: Sampling and surveys for CDM project activities and programmes of activities, Version 07.0 In the case the desired precision is not met, lower bound values shall be used against repeating the survey to determine the operational fraction of stoves.
Purpose of data	To calculate baseline emissions
Additional comment	The project envisages the distribution of 80,000 fuel-efficient stoves.

Data / Parameter:	μ_y
Data unit	Fraction
Description	Adjustment to account for any continued use of pre-project devices during the year y
Source of data	Monitoring survey records
Value(s) applied	0.9680
Measurement methods and procedures	Parameter Option 2 has been selected. The sampled households will be surveyed for the presence of a baseline (traditional) stove/three stone fire and any residual usage alongside the project ICS will be assessed. The survey will ask ICS users to estimate the number of meals that are cooked using each device (per day, week or month). A version of the Project Survey form in the Appendix of the methodology shall be used for data capture. For samples where a baseline stove is not found, or found not in use, then: $\mu_y = 1.0$ For samples where the baseline stove is found to be in use, then: $\mu_y = \text{total usage of ICS} / \text{total usage of all devices}$ For example, if it is found that the total average use of the ICS is 3 times per day and that of baseline stove(s) is 1 time per day, then: $\mu_y = 3/(3+1)$ or 0.75
Monitoring frequency	At least once every two years (biennial)
QA/QC procedures	A 95 /10 confidence / margin of error shall be achieved for the sampling parameter irrespective of annual / biennial monitoring frequency as per para 22 of Standard: Sampling and surveys for CDM project activities and programmes of activities, Version 07.0. In the case the desired precision is not met, lower bound values shall be used against repeating the survey 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} . The average of B_{new} was then determined across the

	ASG
Purpose of data	To calculate baseline emissions
Additional comment	As Biomass new will not be measured directly, this parameter will be monitored.

Data / Parameter:	$\eta_{new,i,j}$																		
Data unit	Fraction																		
Description	Efficiency of the project device of each type i and batch j implemented as part of the project activity																		
Source of data	WBT as per standard IS:13152 issued by the Bureau of Indian Standards (BIS)																		
Value(s) applied	0.3404																		
Measurement methods and procedures	<p>Efficiency shall be monitored as below:</p> <p>Determine the loss in efficiency annually from a representative sample of each batch and use the actual loss rate that is measured.</p> <p>Monitoring equipment used: New equipment (digital weighing scale, thermometer and moisture meter) was used to carry out the WBT hence did not require any calibration as they had not been used before.</p> <table><tr><td>Thermometer</td></tr><tr><td>Brand: Terminator</td></tr><tr><td>Model: TPT9282A</td></tr><tr><td>Measure range: -50C - +150C</td></tr><tr><td>Resolution: 0.1C</td></tr><tr><td>Accuracy: ±1 %</td></tr></table> <table><tr><td>Weighing Scale</td></tr><tr><td>Brand: ATOM KangRui</td></tr><tr><td>Model: KR-B09</td></tr><tr><td>Measure range: 7kg</td></tr><tr><td>Resolution: 1g</td></tr><tr><td>Accuracy: ±1g</td></tr></table> <table><tr><td>Moisture meter</td></tr><tr><td>Brand: TESTO</td></tr><tr><td>Model: 606-1 Portable</td></tr><tr><td>Measure range: 0.0 - 54.8% (depending on material)</td></tr><tr><td>Resolution: 0.1%</td></tr><tr><td>Accuracy: ±1 %</td></tr></table> <p>A simple random sample of the distributed stoves which are in operation was taken. A sample of 18 stoves was tested for thermal efficiency to ensure that they are still operating at the specified efficiency. 3 Tests were performed on each test</p>	Thermometer	Brand: Terminator	Model: TPT9282A	Measure range: -50C - +150C	Resolution: 0.1C	Accuracy: ±1 %	Weighing Scale	Brand: ATOM KangRui	Model: KR-B09	Measure range: 7kg	Resolution: 1g	Accuracy: ±1g	Moisture meter	Brand: TESTO	Model: 606-1 Portable	Measure range: 0.0 - 54.8% (depending on material)	Resolution: 0.1%	Accuracy: ±1 %
Thermometer																			
Brand: Terminator																			
Model: TPT9282A																			
Measure range: -50C - +150C																			
Resolution: 0.1C																			
Accuracy: ±1 %																			
Weighing Scale																			
Brand: ATOM KangRui																			
Model: KR-B09																			
Measure range: 7kg																			
Resolution: 1g																			
Accuracy: ±1g																			
Moisture meter																			
Brand: TESTO																			
Model: 606-1 Portable																			
Measure range: 0.0 - 54.8% (depending on material)																			
Resolution: 0.1%																			
Accuracy: ±1 %																			
Monitoring frequency	Recorded at the time of commissioning/distribution. Adjusted for the loss of efficiency as paragraph 32 (d) (of the methodology)																		
QA/QC procedures	Manufacturer's thermal energy efficiency specification or certification must be based on WBT protocol Initial value based on an independent lab report from the Indian Institute of Technology (IIT) dated 17/12/2015. Tests were undertaken between 30/04/2021 – 05/06/2021 by experienced project staff following a WBT protocol																		
Purpose of data	To calculate baseline emissions																		
Additional comment	Initial value based on an independent lab report from the Indian Institute of																		

	Technology (IIT) dated 17/12/2015. Efficiency loss will accounted for as per paragraph 32(d) of the methodology See Sample Calculation in ER Calc sheet All equipment was purchased new for this monitoring all purchase receipts provided for the equipment. As the equipment was new, no calibration was required.
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Data / Parameter:	Life Span
Data unit	Number of years
Description	The operating lifetime of the project device. The life span should be reported in cases where the PPs are opting to account the efficiency loss as per AMS II.G para 32.
Source of data	Manufacturer
Value(s) applied	5.0
Measurement methods and procedures	Each stove manufacturer will provide an estimate of the life span of each project device type
Monitoring frequency	Recorded at the time of distribution/installation of project devices
QA/QC procedures	NA
Purpose of data	To calculate baseline emissions
Additional comment	-

Data / Parameter:	Date of commissioning of project device i
Data unit	Date
Description	Actual date of commissioning of project device
Source of data	Monitoring database
Value(s) applied	Various (please see ER calculation spreadsheet for details)
Measurement methods and procedures	Each stove distribution will be recorded in the monitoring database along with the name of recipient, contact details, location of household (village, district etc.)
Monitoring frequency	Recorded at the time of distribution/installation of project devices
QA/QC procedures	Not applicable
Purpose of data	To calculate baseline emissions
Additional comment	-

Data / Parameter:	<i>N_{d,hh}</i>
Data unit	Number
Description	Number of project devices distributed per household
Source of data	Monitoring database
Value(s) applied	1.0
Measurement methods and procedures	At the point of distribution, the CPA implementer will make note of the number of ICS that are distributed per household and this will be recorded as a unique entry in the monitoring database. Under the PoA, the CME instructs each CPA implementer to distribute only 1 stove per household.
Monitoring frequency	Recorded at the time of distribution/installation of project devices
QA/QC procedures	Not applicable
Purpose of data	To calculate baseline emissions
Additional comment	As per PoA design and operational framework, only one device is envisaged in one household. At the time of installation or via ex-post monitoring, presence of existing project stove will be checked and recorded and any additional project device in a household will not be credited.

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.1

6864-P2-0006-CP1: Fuel Efficient Stoves in Zambia (Korea Carbon Management Ltd. CPA No.02)

(a) Description of implemented sampling design

A single sampling plan was implemented and is justified as 2 CPA are monitored and there is homogeneity related to parameters of interest, as described below:

Stove usage rate (ASG) parameters of interest:

- (i) The CPAs have the same stove technology user profile (i.e. domestic households)
- (ii) The CPAs employ the same stove technology
- (iii) The baseline surveys shows that household usage of biomass and cooking technology in Zambia is homogenous across regions

Stove efficiency (SESG) parameter of interest:

- (iv) The CPAs employ the same stove technology
- (v) 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:

- (vi) Number of Stoves (NS , $N_{y,i,j}$, μ_y) – 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.
- (vii) 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.
- (viii) Efficiency of stove ($\eta_{new,i}$) – to determine the ongoing average efficiency of each stove distributed via a WBT. All equipment was purchased new for the monitoring exercise and all purchase receipts provided for this purpose. As equipment was new, no calibration was required.

(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 95/10 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		Stove population											
Monitoring period start		01/07/2020		Stove Population CPA 6864-P1-0005-CP1		20,000		32.16%							
Monitoring period end		31/12/2020		Stove Population CPA 6864-P2-0006-CP1		42,188		67.84%							
Monitoring period (years)		0.50		Total Stove Population		62,188		100.00%							
Level of sampling		multiple CPAs													
Confidence		95%													
Margin of Error (for annual survey)		10%													
Z value		1.960													
Stove population		62,188													
Mean Value Parameter: Stove Efficiency Sample Group (SESG)				Stove Efficiency (η_{new}) - SESG											
Sampling approach				Simple random sample across CPAs											
Sampling Frame		Stove population	Expected Mean Efficiency(%)	Expected SD	Calculated Sample Size	tDistribution adjusted sample size									
Greenway Jumbo Stove		62,188	31.17	2.71	3	14	4	8	5	6	5	6			
Proportion Value Parameter (ASG)															
Sampling frame(s)		Stove Population across CPA													
Sampling approach		Simple random sample across CPAs													
Sampling Frame		Stove population	expected operational proportion (SoF)	Calculated Sample Size (n)											
Greenway Jumbo Stove		62,188	0.97	12											
Required sample sizes		Total Samples CPA 6864-P1-0005-CP1	Total Samples CPA 6864-P2-0006-CP1	Total samples											
Required sample size for SESG		14	6	12	18										
Required sample size for ASG		30	12	25	37										

the Expected standard deviation for the efficiency of the cookstoves is based on the results of the 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:

Sampling Framework	Values
Level of sampling	multiple CPAs
Confidence	95%
Margin of Error (for annual survey)	10%
Z value	1.960
Stove population	62,188

Monitoring Period			
Sampling Constants	Values		
Monitoring period start	01/07/2020		
Monitoring period end	31/12/2020		
Monitoring period (years)	0.50		
N_{y,i,j}	1.0000	Fraction	
Population Size	62,188	number	
Sample Size	34	number	
Proportion	1.0000	Fraction	
Standard error of proportion	0.00%	%	
Precision	0.00%	%	
Statistical Acceptance of Result	ok, acceptable	--	
μ_{y,i}	0.9648	Fraction	
Population Size	62,188	number	
Sample Size (excluding outliers)	34	number	
Proportion	96.48%	Fraction	
Standard error of proportion	3.16%	%	
Precision	6.42%	%	
Result	ok, acceptable	--	
η_{new}	0.3404	Fraction	
Population Size	62188	number	
Sample Size	18	number	
Mean	34.04%	%	
Standard Deviation	1.70%	%	
Standard error of mean	0.00	%	
Precision	2.31%	%	
Result	ok, acceptable	--	

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

The figure displays four screenshots of the Research Randomizer web application, arranged in a 2x2 grid. Each screenshot shows the 'RESULTS' page after generating a set of random numbers. The interface includes a header with the project ID, a sidebar with 'RESEARCH RANDOMIZER' and 'RANDOMIZE' buttons, and a main content area with the results. Each result set includes a 'Please note' disclaimer about the service's limitations and a 'Do you wish to...' prompt.

Top Left Screenshot: Random numbers for ASG CPA 6864-P1-0005-CP1

1 Set of 12 Unique Numbers
Range: From 1 to 20,000 – Sorted from Least to Greatest

Set #1
2931, 3578, 3997, 5296, 6852, 8575, 8927, 10251, 11411, 13261, 17159, 19316

Top Right Screenshot: Random numbers for SE5G 6864-P1-0005-CP1

1 Set of 6 Unique Numbers
Range: From 1 to 20,000 – Sorted from Least to Greatest

Set #1
289, 2379, 4494, 5289, 9649, 19198

Bottom Left Screenshot: Random numbers for ASG CPA 6864-P2-0006-CP1

1 Set of 25 Unique Numbers
Range: From 1 to 42,188 – Sorted from Least to Greatest

Set #1
1896, 2322, 5327, 5623, 6828, 7646, 7920, 10340, 15008, 17400, 18783, 19179, 20856, 20933, 26143, 26314, 29714, 32136, 35731, 35906, 38686, 38690, 38758, 40433, 41031

Bottom Right Screenshot: Random numbers for SE5G 6864-P2-0006-CP1

1 Set of 12 Unique Numbers
Range: From 1 to 42,188 – Sorted from Least to Greatest

Set #1
872, 4121, 6866, 9029, 9481, 10330, 16890, 22047, 24016, 25419, 33518, 34574

Note: Random numbers are generated by www.randomizer.org on 08/03/2021.

Out of all samples, 3 samples (Record IDs 5327, 35731 and 38758 from CPA 6864-P2-0006-CP1) were excluded from the ASG survey as the answers provided represent outliers. In the case of samples 5327 and 38758 for “meals cooked per week” the response seems to indicate that the respondent answered as “days per week” rather than “meals per week” and was therefore substantially lower compared to other respondents. Redord ID 35731 supplied an answer with meals cooked substantially higher compared to other responses received for the ASG survey.

SECTION F. Calculation of emission reductions or net anthropogenic removals

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

ER_y is calculated using the following formula:

$$ER_y = \sum_i \sum_j ER_{y,i,j} - LE_y \quad \text{Equation (1)}$$

Where:

- i = Indices for the situation where more than one type of project device is introduced to replace the pre-project devices
- j = Indices for the situation where there is more than one batch of project device
- ER_y = Emission reductions during year y in t CO₂e
- $ER_{y,i,j}$ = Emission reductions by project device of type i and batch j during year y in t CO₂e
- LE_y = Leakage emissions in the year y

To account for leakages, a net to gross adjustment factor of 0.95 will be used, thereby eliminating the need for ex-post surveys to determine leakages, as per para 34 of the methodology.

$$ER_{y,i,j} = B_{y,savings,i,j} \times N_{y,i,j} \times \mu_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected_fossil\ fuel} \quad \text{Equation (2)}$$

Where:

$B_{y,savings,i,j}$	=	Quantity of woody biomass that is saved in tonnes per cookstove device of type i and batch j during year y
$f_{NRB,y}$	=	Fraction of woody biomass that can be established as non-renewable biomass (fNRB) ⁷
$NCV_{biomass}$	=	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.0156 TJ/tonne, based on the gross weight of the wood that is 'air-dried')
$EF_{projected_fossilfuel}$	=	Emission factor for the fossil fuels projected to be used for substitution of non-renewable woody biomass by similar consumers. Use a value of 63.7 t CO ₂ /TJ ⁸
$N_{y,i,j}$	=	Number of project devices of type i and batch j operating during year y
μ_y	=	Adjustment to account for any continued use of pre-project devices during the year y when applying equations 6 and 8 (fraction). Use 1.0 in other cases

⁷ Default values endorsed by designated national authorities and approved by the Board are available at <http://cdm.unfccc.int/methodologies/standard_base/index.html>.

⁸ This value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis. The value is calculated, based on the global average ratio of cooking fuels (the normalized ratio of kerosene and liquefied petroleum gas (LPG) excluding coal), i.e. 9 per cent for kerosene (71.5 t CO₂/TJ) and 91 per cent for LPG (63.0 t CO₂/TJ).

$f_{NRB,y}$ - Fraction of biomass used in absence of the project that is non-renewable: The value calculated is 0.88.

$B_{y,savings,i,j}$ shall be determined using option 3 (equation 6) as per para 27 of the methodology.

Option 3: water boiling test (WBT):

$$B_{y,savings,i,j} = B_{old,i,j} \times \left(1 - \frac{\eta_{old,i,j}}{\eta_{new,i,j}}\right) \quad \text{Equation (6)}$$

The loss in efficiency of the project device type i in each batch j due to aging shall be determined based on para 32(d) of the methodology.

To account for incidents where multiple project ICS are installed per household, Equation 9 of the methodology will be applied to ex-post to the emissions calculations for each household:

$$B_{old,i,j} = B_{old,HH} \div N_{d,HH} \quad \text{Equation (9)}$$

η_{old} = A default value of 0.10 may be optionally used if the replaced system is a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e. without a grate or a chimney; for other types of systems a default value of 0.2 may be optionally used.

η_{new} = Efficiency of the system being deployed as part of the project activity (fraction), as determined using a WBT. Use weighted average values if more than one type of system is being introduced by the project activity.

Leakage (L_y) will be accounted for by applying the methodology gross adjustment factor (0.95) to emissions reduction calculations

ER calculations:

MP Parameter	Unit	6864-P2-0006-CP1	Source
η_{old}	fraction	0.10	Methodological default value
$NCV_{biomass}$	TJ/tonne	0.0156	IPCC default value
$N_{y,i,j}$ (installed devices)	number	42,188	Monitoring database and survey
$N_{y,i,j}$ (installed devices adjusted for MP duration)	number	8,764	Calculated
$\mu_{y,i}$	fraction	0.9680	Calculated
η_{new}	fraction	34.04%	Calculated
Life Span	years	5.00	Manufacturer
$N_{d,hh}$	number	1.00	Monitoring database and survey

ER Calculations	Unit	6864-P2-0006-CP1	Source
$ER_{y,i,j}$	tCO ₂	29,267	Calculated

η_{new} (Efficiency new) has increased from 31.17% to 34.04% due to the WBT Protocol Version 4.2.3 being used for measuring the efficiency during this monitoring exercise, whereas the initial efficiency was based on the Bureau of Indian Standards (BIS) protocol.

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

Not applicable

F.3. Calculation of leakage emissions

Leakage emissions are calculated using 5%, the methodology default and applied in the ex-post emissions calculations:

$L_y = 0.95$

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 until 31/12/2020	From 01/01/2021	Total amount
6864-P2-0006-CP1	29,267	0	0	0	29,267	0	29,267
Total	29,267	0	0	0	29,267	0	29,267

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-P2-0006-CP1	29,267	50,146
Total	29,267	50,146

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 80,000 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 1.8GWh_{th}/year. The thermal savings per stove per year is 0.018GWh_{th}/year and is distributed to households.

Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
04.0	6 April 2021	Revision to: <ul style="list-style-type: none"> • Reflect the “Clarification: Regulatory requirements under temporary measures for post-2020 cases” (CDM-EB109-A01-CLAR).
03.0	31 May 2019	Revision to: <ul style="list-style-type: none"> • Ensure consistency with version 02.0 of the “CDM project standard for programmes of activities” (CDM-EB93-A07-STAN); • Add a section on remarks on the observance of the scale limit of small-scale CPAs during the crediting periods; • Add "changes specific to afforestation or reforestation activities/CPA" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R PoAs between two commitment periods; • Make structural and editorial improvements.
02.0	7 June 2017	Revision to: <ul style="list-style-type: none"> • Ensure consistency with version 01.0 of the “CDM project standard for programmes of activities (CDM-EB93-A07-STAN); • Make editorial improvements.
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