



**Monitoring report form for CDM programme of activities  
(version 01.0)**

Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form for CDM programme of activities" at the end of this form.

**MONITORING REPORT**

<b>Title of the programme of activities (PoA)</b>	Fuel Efficient Stoves in Zambia	
<b>UNFCCC reference number of the PoA</b>	6864	
<b>Version number(s) of the PoA-DD(s) applicable to this monitoring report</b>	Version 6.2	
<b>Coordinating/managing entity (CME)</b>	3 Rocks Ltd. (3RL)	
<b>Version number of this monitoring report</b>	2.0	
<b>Completion date of this monitoring report</b>	14/08/2017	
<b>Monitoring period number and dates covered by this monitoring report</b>	# 2 28/01/2015 to 27/01/2017 (inclusive of these dates)	
<b>Monitoring report number for this monitoring period</b>	1	
<b>Host Party(ies)</b>	Host Party(ies) of the PoA	Is this a host Party to a specific-case CPA covered in this monitoring report?(yes/no)
	Zambia	Yes
<b>Sectoral scope(s)</b>	3 : Energy demand	
<b>Selected methodology(ies)</b>	<a href="#">AMS-II.G. ver. 3</a> - Energy efficiency measures in thermal applications of non-renewable biomass	
<b>Selected standardized baseline(s)</b>	No standardized baseline has been used.	
<b>Total amount of GHG emission reductions or net GHG removals by sinks for all specific-case CPAs in the PoA covered in this monitoring report</b>	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	-	<b>109,368 tCO<sub>2</sub>e</b>

## PART I - Programme of activities

### SECTION A. Description of PoA

#### A.1. Brief description of the PoA

##### Policy/measure or stated goal of the PoA

The goal of the PoA is to install fuel efficient cooking stoves by 3 Rocks Ltd. (3RL) in households in Zambia. The stoves replace wood-fired, 3-rock traditional fires as traditionally, majority of Zambian families cook on an open fire, utilizing the ‘three rocks’ method for heating pots. This method is inefficient and leads to the unsustainable use of non-renewable biomass in the process. Their replacement by fuel-efficient stove help recipient households reduce their non- renewable wood use and help limit valuable time spent gathering fuel wood. Greenhouse gases are mitigated by reducing the harvesting of non-renewable biomass.

The efficient stoves are based on a design commissioned by 3RL and are installed by 3RL for recipient households in exchange for certain labour and materials during installation. The stove design was tested independently in accordance with the “*Stove Manufacturers Emissions & Performance Test Protocol (EPTP)*<sup>1</sup>” and certified by the Engines and Energy Conversion Laboratory at Colorado State University for thermal efficiency.

##### General implementation framework of the PoA

3RL has the overall operational and management responsibility for the implementation and monitoring of the PoA and is the PoA’s CME. All three CPAs under the PoA have been implemented by 3RL.

Recipient households sign an agreement acknowledging that 3RL is the owner of the rights to the emissions reductions generated by the stove and agreeing for the stove to be included in the PoA. Installation teams are appointed to install the stoves according to a uniform installation process and they are trained to build each stove to a pre-determined design, eliminating variation in performance. Installers are also trained to capture monitoring data during the installation process identifying each stove by owner name and/or government identification number, address or location, and GPS location reference. Each stove will be assigned a unique reference number in an electronic data management system (monitoring database).

Refer section B.1 for more details on implemented management system.

#### Generic CPA(s)

Title, identification/reference number and/or version number of the generic CPA(s) of the PoA	Sectoral scope(s)	Applied methodology(ies) or combination of methodologies and/or standardized baseline(s)
Fuel Efficient Stoves in Zambia (3RL CPA No.XX) Version 6.2	3 : Energy demand	<a href="#">AMS-II.G. ver. 3</a> - Energy efficiency measures in thermal applications of non-renewable biomass

<sup>1</sup> 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

**Specific-case CPA(s) covered in this monitoring report**

Reference number of the specific-case CPA included in the PoA as of the end of this monitoring period	Title, identification/reference number and version number of the generic CPA to which the specific-case CPA applies	Crediting period dates of the specific-case CPA	Is this specific-case CPA covered in this monitoring report? (yes/no)
6864-0001	Fuel Efficient Stoves in Zambia (3RL CPA No.01) Version 6.2	28/01/2013 – 27/01/2020 (Renewable)	Yes
6864-0002	Fuel Efficient Stoves in Zambia (3RL CPA No.02) Version 2.1	25/10/2013 – 23/10/2020 (Renewable)	Yes
6864-0003	Fuel Efficient Stoves in Zambia (3RL CPA No.03) Version 2.1	01/11/2013 – 31/10/2020 (Renewable)	Yes

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

Person/entity responsible for completing the CDM-MR-FORM  
 Organization: Climate-Secure Services  
 Contact: Rohit Lohia  
 Email: [rohit.lohia@climate-secure.com](mailto:rohit.lohia@climate-secure.com)

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

3RL has the overall operational and management responsibility for the implementation and monitoring of the PoA and is the PoA's CME. All three CPAs under the PoA have been implemented by 3RL. 3RL is responsible for the following operational and management activities for the PoA:

**1. CPA household identification**

- A process for identifying households is managed by 3RL local logistics managers. This involves working with local community leaders and other partners to help identify recipient households suitable (i.e. those utilizing wood-fired, three rock fires) for the installation of a stove;
- 3RL pre-installation teams visit recipient households in each CPA and ensure recipients understand and sign the emissions rights acknowledgement; this acts as the “order” for each stove.
- Each stove is assigned a unique installation number chronologically;

**2. Installation**

- Local 3RL logistics managers identify local installation partners and train stove installation teams to undertake installations as per the standardized design and installation procedure
- Local partners and installers coordinate the receipt of stove components in the distribution process

**3. Installation Data Capture**

- A post-installation team checks the quality of installation work

- If the work is satisfactory, installation data is collected by the post-installation team, which includes:
  - A GPS location reference
  - The household family name and address/physical location (i.e. village) and/or Zambian government identification number of the stove recipient
  - Date and time of installation
- Data is collected by the post-installation team electronically and uploaded automatically to the monitoring automatically generating a unique reference number for each stove

**4. Monitoring**

- Monitoring activities are conducted as follows:
  - Surveys are completed in the field by trained 3RL local monitoring teams
  - Data captured by the monitoring teams is passed to 3RL data administration team
  - Data is checked for completeness, consistency and accuracy
  - Monitoring report is prepared by experienced resource (internal / outsourced)

A procedure to avoid double counting

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

- **GPS references:** each stove has a unique GPS-referenced location.
- **Name, location and/or ID number:** an additional check of double-counting is made against the household name, location and/or Zambian government ID number of the stove recipient ascribed to each stove.
- **Unique reference numbers:** each stove also has a unique reference number in the monitoring database. Only one stove is installed per household.

All records are securely maintained and backed-up by 3RL.

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

A single sampling plan has been implemented for all CPAs under this PoA for this monitoring period.

List of CPAs to which the single sampling was applied

CPA	Scale	Type of Project stove included in the CPA	Total number of stoves in the CPA	CPA monitoring period covered under this PoA monitoring period
6864-0001	Small	Z3000	15,638	28/01/2015 to 27/01/2017
6864-0002	Small	Z3000	15,084	28/01/2015 to 27/01/2017
6864-0003	Small	Z3000	9,715	28/01/2015 to 27/01/2017

**a. Description of implemented single sampling design**

The monitoring period has been covered under two annual monitoring sessions. The first monitoring session (MS#1) covers the monitoring period from 28/01/2015 to 27/01/2016 and the second monitoring session (MS#2) covers the monitoring period from 28/01/2016 to 27/01/2017.

The following applies to both the monitoring sessions:

All the three CPAs apply a common technology (fuelwood stoves, Z3000 stove model) with common usage patterns (domestic usage) and same geographical coverage (Zambia) hence the entire

population under the PoA is deemed homogeneous. While the stoves in the CPAs have been installed in different years and have different age, however homogeneity of this stove population (wrt age) was demonstrated in the last monitoring report using statistical analysis tool ANOVA (refer page 12 of the monitoring report for MP#1, available at:

[http://cdm.unfccc.int/ProgrammeOfActivities/poa\\_db/YC9QEKSX8NPJ5BFIDLTWZ0M3RVGUA2/view](http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/YC9QEKSX8NPJ5BFIDLTWZ0M3RVGUA2/view) ).

There has been no change in the population since the last monitoring period, (no additional stoves have been installed) hence the population was deemed homogenous for sampling purposes in the two monitoring sessions.

*The sample size was calculated based on the considerations mentioned below.*

Category	Description	Parameters monitored by the ASG	Method used for assessment	Target Population / Sampling Frame
Activity monitoring	The activity sample group (ASG) was selected based on a 95% level of confidence, 10% precision, using simple random sampling.	<ul style="list-style-type: none"> <li>• <b>Number of Stoves (NS)</b> – to determine the number of stoves still operation during the monitoring period, as compared to the baseline installed number of stoves.</li> <li>• <b>Quantity of biomass saved per annum (<math>B_{new}</math>)</b> – to determine the average deduction per stove from the baseline parameter <math>B_{old}</math>. This monitors any residual use of the baseline appliance.</li> </ul>	Users' interview through questionnaire based monitoring survey	40,437
Stove efficiency monitoring	This stove efficiency sample group (SESG) was selected based on a 95% level of confidence, 10% precision, using simple random sampling.	<ul style="list-style-type: none"> <li>• <b>Efficiency of stove (<math>\eta_{new}</math>)</b> – to determine the ongoing average efficiency of each stove installed.</li> </ul>	EPTP protocol was used	40,437

Sample sizes calculated for the different parameters in the two monitoring sessions are as shown in the table below. Refer ER calculator for more details on calculation of sample size for each parameter. The expected parameter values (mean, standard deviation and proportion) were determined based on project developer's knowledge and experience as per para 12(b) and 12(c) of the Sampling and surveys for CDM project activities and programmes of activities, Version 05.0 available at:

[https://cdm.unfccc.int/filestorage/e/x/t/extfile-20151023110718130-meth\\_stan05.pdf/meth\\_stan05.pdf?t=eFN8bzjhZmVpfDA6zJ3bQSs7Q9M1iUqKZBk3](https://cdm.unfccc.int/filestorage/e/x/t/extfile-20151023110718130-meth_stan05.pdf/meth_stan05.pdf?t=eFN8bzjhZmVpfDA6zJ3bQSs7Q9M1iUqKZBk3)

In case the sample size calculations returned a value of less than 30 for a mean value parameter, based on the Standard: *Sampling and surveys for CDM project activities and programme of activities version 05.0 paragraph 13* which states that 'If the parameter of interest is a numeric mean value (i.e. not a proportion or percentage) the Student's t-distribution shall be used if the resulting sample size is less than 30.' Therefore, student t-distribution was applied to determine the final sample size for the two monitoring sessions.

Sample Size calculations for MS#1

Category	Total population (N)	Expected results	Reliability	Required Sample Size (n)	Monitored samples
ASG	40,437	Proportion: 85%	95/10	68	106
SESG	40,437	Mean: 24%, SD: 2.4%	95/10	7	10

Sample Size calculations for MS#2

Category	Total population (N)	Expected results	Reliability	Required Sample Size (n)	Monitored samples
ASG	40,437	Proportion: 85%	95/10	68	103
SESG	40,437	Mean: 23%, SD: 2.3%	95/10	7	13

The stoves were selected by randomly assigning a number to each stove and sorting in increasing order from lower to higher number. Random numbers were generated using online random number generator and the numbers obtained were used to identify the samples from the population. A higher number of samples were monitored than that required to ensure that the desired precision / confidence is achieved as required for annual monitoring (95/10)

**b. Collected data**

The following assessment of the ASG were undertaken in MS#1 and MS#2:

- Monitoring staff conducted an observational check to see that the stove was still located in the same place identified by the installation data and observed that it is still being used
- Monitoring staff asked users to confirm that the stove was being used for the recipient household's domestic purposes
- Monitoring staff confirmed that the old appliance (3-rock fire) had been effectively disposed of, and, if not;
- Monitoring staff ascertained residual usage of the domestic 3-rock fire for cooking, water heating or space heating (i.e. those usages measured in the baseline survey)

The following assessment of the SESG were undertaken in MS#1 and MS#2:

- The water boiling tests were conducted to assess the efficiency of the installed stoves.

The monitoring surveys and tests were conducted during 01 March 2016 – 30 April 2016 for MS#1 and 01 March 2017 – 30 April 2017 for MS#2

**c. Analysis of collected data****Summary of Results for monitoring session 1**

Parameter	Samples Monitored	Survey/Test results	Unit
NS <sup>2</sup>	106	0.877	fraction
B <sub>new</sub>	74	2.76	tonnes / year
$\eta_{new}$	10	25.68	Fraction / %

**Summary of Results for monitoring session 2**

Parameter	Samples Monitored	Survey/Test results	Unit
NS	103	0.883	fraction
B <sub>new</sub>	74	2.68	tonnes / year

<sup>2</sup> The stove operation rate is monitored and then multiplied by the total number of stoves installed to determine the number of operational stoves (NS)

$\eta_{new}$	13	24.26	Fraction / %
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**d. Demonstration of whether the required confidence/precision has been met**

For the different parameters, the precision achieved varied. The tables below show the precision achieved by the various parameters in the monitoring sessions. In the event that the precision target was not met, based on the Standard: *Sampling and surveys for CDM project activities and programme of activities version 05.0 paragraph 17 (b) (i) b.*, the parameter values were discounted to the lower bound of the confidence interval.

**Precision attained for various parameters in monitoring session 1**

<b>Stove usage (NS)</b>	<b>0.877</b>	<b>Fraction</b>
Population Size	40437	number
Monitored Sample Size	106	number
Monitored Proportion	0.877	Fraction
Standard error of proportion	3.18%	
Monitored Precision	7.11%	%
Statistical Acceptance of Result	ok, acceptable	--

<b>Bnew</b>	<b>2.76</b>	<b>tonnes/y</b>
Population Size	28230	number
Sample Size	74	number
Mean	2.76	tonnes/y
Standard Deviation	0.59	tonnes/y
Standard error of mean	0.07	
Precision	4.82%	%
Result	ok, acceptable	--

<b><math>\eta_{new}</math></b>	<b>25.68%</b>	<b>Percentage</b>
Population Size	40437	number
Sample Size	10	number
Mean	25.68%	%
Standard Deviation	2.1%	%
Standard error of mean	0.01	
Precision	5.14%	%
Result	ok, acceptable	--

**Precision attained for various parameters in monitoring session 2**

<b>Stove usage (NS)</b>	<b>0.883</b>	<b>Fraction</b>
Population Size	40437	number
Monitored Sample Size	103	number
Monitored Proportion	0.883	Fraction
Standard error of proportion	3.16%	
Monitored Precision	7.00%	%
Statistical Acceptance of Result	ok, acceptable	--

<b>B<sub>new</sub></b>	<b>2.68</b>	<b>tonnes/y</b>
Population Size	29052	number
Sample Size	74	number
Mean	2.68	tonnes/y
Standard Deviation	0.62	tonnes/y
Standard error of mean	0.07	
Precision	5.25%	%
Result	ok, acceptable	--

<b><math>\eta_{\text{new}}</math></b>	<b>24.26%</b>	<b>Percentage</b>
Population Size	40437	number
Sample Size	13	number
Mean	24.26%	tonnes/y
Standard Deviation	2.4%	tonnes/y
Standard error of mean	0.01	
Precision	5.29%	%
Result	ok, acceptable	--

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

### **C.1. Corrections**

Not applicable

### **C.2. Inclusion of a monitoring plan to the registered PoA-DD (including its generic CPA-DD(s)), if a monitoring plan was not included at the time of registration**

Not applicable.

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

Not applicable

### **C.4. Changes to the programme design of the registered PoA-DD (including corresponding changes to project design of the generic CPA-DD(s)) and updates to the eligibility criteria for inclusion of specific-case CPAs in the PoA**

Not applicable

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

Not applicable



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

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

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This Monitoring Report covers all the three CPAs included in the concerned monitoring period. These CPAs have the same project boundary and follow the generic CPA as identified in section A.1.1, Part I of this monitoring report. The following sections therefore represent all these three CPAs.

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

##### a) Purpose of the specific-case CPAs and the measures taken for GHG emission reductions or net GHG removals by sinks

Each CPA involves the distribution of fuel-efficient stoves by 3 Rocks Ltd. (3RL) in individual households in Zambia. The CPAs replace cooking stoves using woodfuel with more efficient stoves using woodfuel. The project ICS are more efficient in transferring heat from the fuel to the pot, thus saving fuel compared to the baseline stoves which would have been used in the absence of the project activity. Furthermore, the ICSs applied in these CPAs have been designed not only to increase heat transfer, but also to match traditional utensils and cooking habits of people in Zambia.

##### b) Description of the technology employed and installed equipment and/or infrastructure, including information requested by the eligibility criteria;

The efficient stoves are based on a design commissioned by 3RL and are installed by 3RL for recipient households in exchange for certain labour and materials during installation. The stove design was tested independently in accordance with the “*Stove Manufacturers Emissions & Performance Test Protocol (EPTP)*” and certified by the Engines and Energy Conversion Laboratory at Colorado State University to determine its thermal efficiency

3RL employs manufacturers to produce the components for the installation of each stove. These components are then distributed to the CPA via a central location, where installation teams are responsible for the assembly of each stove. Each installation team is trained to build each stove, in partnership with the stove recipient, to a uniform design and is responsible for ensuring that data is captured at installation to ensure the accurate monitoring of emissions reductions during each monitoring period.

The technology described is state-of-the-art and designed as a bespoke solution for Zambia. The stove design is shown in Figure 2 below.



The following table details the implementation status of the CPAs along with technology involved:

CPA	Type of Project stoves eligible	Stove models installed	Total number of stoves installed
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6864-0001	Wood fuel	Z3000	15,638
6864-0002	Wood fuel	Z3000	15,084
6864-0003	Wood fuel	Z3000	9,715

**c) Relevant dates for the specific-case CPA(s) (e.g. construction, commissioning, continued operation periods, etc.);**

Description	6864-0001	6864-0002	6864-0003	Reference
Start Date	22 Dec 2010	22 Dec 2010	30 Sep 2012	Respective CPA-DD
Date of first stove distribution	06 Jun 2011	28 Oct 2011	28 Feb 2013	PoA / CPA distribution database

**d) Total GHG emission reductions or net GHG removals by sinks achieved in this monitoring period for the specific-case CPAs,**

CPA	MS#1	MS#2	Total
6864-0001	21,786	20,510	42,296
6864-0002	21,014	19,783	40,797
6864-0003	13,534	12,741	26,275
<b>Total</b>	<b>56,334</b>	<b>53,034</b>	<b>109,368</b>

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

**Host Party(ies):** The host party for the PoA is Zambia

**Region/state/province:** All across Zambia

**City/town/community:** All across Zambia

**Physical/geographical location:**

The geographical boundary for the CPAs in the PoA is the country of Zambia (Figure 3). The Republic of Zambia, lies within the latitude and longitude of 15° 00 S and 30° 00 E<sup>3</sup>. 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 (-8.233237° & 30.736313°)
South (border with Zimbabwe):	18°04'34.03" S & 26°41'47.24" E (-18.075368° & 26.690855°)
East (border with Malawi):	10°33'43.01" S & 33°42'08.00" E (-14.392118° & 21.992912°)
West (border with Angola):	14°33'34.57" S & 21°59'58.74" E (-10.552622° & 33.693352°)

a.<sup>3</sup> <http://www.greenwichmeantime.co.uk/time-zone/africa/zambia/map.html>



Figure 3: Geographical boundary of Zambia

## SECTION E. Post-registration changes to specific-case CPA(s)

### E.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

Not Applicable

### E.2. Corrections

Not Applicable

### E.3. Changes to the start date of the crediting period of the specific-case CPA(s)

Not Applicable

### E.4. Inclusion of a monitoring plan into the specific-case CPA(s) that was not included at registration

Not Applicable

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

Not Applicable

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

Not Applicable

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

Not Applicable

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

Stoves were installed by 3RL trained local partners. At the CPA level, these partners ensured that necessary data was correctly obtained from the customer firstly to avoid double counting and secondly to enable tracking of the ICS for monitoring purposes. This data captured included:

- a. GPS location of the stove
- b. Name of customer, Address / location of the customer
- c. Date of installation
- d. Stove unique serial ID number
- e. Type of old stove which the ICS replaced, i.e. the fuel type used in the old / baseline stove (in this case woodfuel)

All other monitoring activities have been carried out at the PoA level using single stage sampling plan.

### SECTION G. Data and parameters

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

<b>Data/parameter</b>	$B_{old}$
Unit	Tonnes per annum
Description	Quantity of biomass used in absence of the project activity
Source of data	Registered PoA-DD / CPA-DDs
Value(s) applied	4.1
Choice of data or measurement methods and procedures	Fixed ex-ante for the entire PoA
Purpose of data	Calculation of baseline emissions
Additional comments	

<b>Data/parameter</b>	$f_{NRB,y}$
Unit	Fraction
Description	Non-renewable biomass usage in Zambia, as a proportion of total biomass usage
Source of data	Registered PoA-DD / CPA-DDs
Value(s) applied	0.81
Choice of data or measurement methods and procedures	Fixed ex-ante for the entire PoA
Purpose of data	Calculation of baseline emissions
Additional comments	-

<b>Data/parameter</b>	$\eta_{old}$
Unit	Fraction
Description	Efficiency of 3-rock fire cooking method (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	Calculation of baseline emissions
Additional comments	-

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

<b>Data/parameter</b>	$EF_{projected\_fossilfuel}$
Unit	tCO <sub>2</sub> /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	Calculation of baseline emissions
Additional comments	-

<b>Data/parameter</b>	$L_y$
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	Calculation of baseline emissions
Additional comments	-

<b>Data/parameter</b>	$DRB$
Unit	Tonnes
Description	Demonstrably renewable biomass
Source of data	Non renewable biomass fraction $f_{NRB,y}$ baseline study
Value(s) applied	1,278,025

Choice of data or measurement methods and procedures	See POA-DD
Purpose of data	Calculation of baseline emissions
Additional comments	-

**G.2. Data and parameters monitored**

<b>Data/parameter</b>	NS			
Unit	Number			
Description	Number of stoves still operation during the monitoring period			
Measured/calculated/default	Calculated			
Source of data	Activity Sample Group (ASG) Household Survey			
Value(s) of monitored parameter	Value for MS#1			
	CPA	Toal number of stoves installed	Stove operation rate	NS
	CPA 6864-0001	15,638	0.877	13,720
	CPA 6864-0002	15,084	0.877	13,234
	CPA 6864-0003	9,715	0.877	8,524
	Value for MS#2			
	CPA	Toal number of stoves installed	Stove operation rate	NS
	CPA 6864-0001	15,638	0.883	13,816
	CPA 6864-0002	15,084	0.883	13,327
	CPA 6864-0003	9,715	0.883	8,583
Monitoring equipment	Survey Questionnaire			
Measuring/reading/recording frequency	annually			
Calculation method (if applicable)	<p>Stoves in operation in the Activity Sample Group (ASG) were counted during the monitoring period to derive an retained usage rate (expressed as a percentage)</p> <p>The usage rate was then multiplied by the total number of stoves installed in each CPA to obtain the number of stoves still in operation during the monitoring period</p>			
QA/QC procedures	<p>The sample was selected based on a 95% level of confidence and 10% precision.</p> <p>Data was collected by the survey questionnaire and the information was cross-checked through observation by the monitoring teams</p> <p>The installation data was also cross checked with data collected from the ASG to ensure the exact stoves sampled were surveyed.</p> <p>The usage rate was tested to determine if the desired precision was met.</p>			
Purpose of data	Calculation of baseline emissions			
Additional comments	-			

<b>Data/parameter</b>	OD
Unit	Days
Description	Total stove operating days in monitoring period
Measured/calculated/default	Calculated

Source of data	Installation and monitoring survey data in 3RL Monitoring database		
Value(s) of monitored parameter	CPA	MS#1	MS#2
	CPA 6864-0001	5,007,848	5,056,692
	CPA 6864-0002	4,830,438	4,877,551
	CPA 6864-0003	3,111,091	3,141,435
Monitoring equipment	Monitoring database and survey		
Measuring/reading/recording frequency	annually		
Calculation method (if applicable)	This number is calculated by multiplying the average stove operation days for each CPA by the number of stoves still operating during the monitoring period (from the table above).		
QA/QC procedures	The date of installation from the 3RL PoA Monitoring database was used to determine the portion of the monitoring period that each stove has been in operation. The operating days for each stove was divided by 365 to determine the emission reductions achieved by each stove		
Purpose of data	Calculation of baseline emissions		
Additional comments	-		

<b>Data/parameter</b>	$\eta_{new}$		
Unit	Fraction		
Description	Thermal efficiency of the stove		
Measured/calculated/default	Measured		
Source of data	Water Boiling Tests (WBT)		
Value(s) of monitored parameter	CPA	MS#1	MS#2
	CPA 6864-0001	25.68%	24.26%
	CPA 6864-0002		
	CPA 6864-0003		

Monitoring equipment	<p>Details of the equipment used are as provided below for the two monitoring sessions</p> <p><b>MS# 1</b>            Equipment make: Dahongying Digital Weighing Scales            Model: ACS708c            Serial no: 20160639335            Capacity: 40 kg            Accuracy : +/- 0.005 kg            Date of purchase: 20 March 2016</p> <p>Equipment make: Liquid in glass lab Thermometer            Measurement range: -10<sup>0</sup> C – 110<sup>0</sup>C            Unit no: #1            Accuracy: : + / - 0.1°C            Date of purchase: 20 March 2016</p> <p>Equipment make: Amittari Moisture Meter            Model: AM 128 PS            Serial number: N721082            Accuracy: : ±0.5%            Date of purchase: 28 April 2015</p> <p><b>MS# 2</b>            Equipment make: Dahongying Digital Weighing Scales            Model: ACS708c            Serial no: 20160639317            Capacity:40 kg            Accuracy : +/- 0.005 kg            Date of purchase: 22 March 2017</p> <p>Equipment make: Liquid in glass lab Thermometer            Measurement range: -10<sup>0</sup> C – 110<sup>0</sup>C            Unit no: #2            Accuracy: : + / - 0.1°C            Date of purchase of Unit #2: 21 March 2017</p> <p>Equipment make: Amittari Moisture Meter            Model: AM 128 PS            Serial number: N721082            Accuracy: : ±0.5%            Date of purchase: 28 April 2015</p> <p>New equipment (digital weighing scale and thermometres) were 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.</p>
Measuring/reading/recording frequency	annually
Calculation method (if applicable)	WBTs were carried out on 10 stoves for MS#1 and 13 stoves for MS#2 following the WBT protocol.
QA/QC procedures	The sample 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.
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data/parameter	$B_{new}$
Unit	Tonnes per annum



Description	Quantity of biomass saved per stove per annum		
Measured/calculated/default	Calculated		
Source of data	ASG Household Survey		
Value(s) of monitored parameter	CPA	MS#1	MS#2
	CPA 6864-0001	2.76	2.68
	CPA 6864-0002		
	CPA 6864-0003		
Monitoring equipment	Survey Questionnaire		
Measuring/reading/recording frequency	annually		
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 <math>B_{old}</math> to determine <math>B_{new}</math>. The average of <math>B_{new}</math> was then determined across the ASG.</p>		
QA/QC procedures	<p>CME provides guidance and training to enumerators for conducting surveys.</p> <p>The value obtained was tested to determine if the desired precision was met. The survey result met the expected 95/10 precision.</p>		
Purpose of data	Calculation of baseline emissions		
Additional comments	-		

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

The single sampling plan provided in section B.2 was applied for the entire PoA as the PoA involves CPAs that are homogenous and there is homogeneity related to parameters of interest.

## SECTION H. Calculation of GHG emission reductions or net GHG removals by sinks

### H.1. Calculation of baseline emissions or baseline net GHG removals by sinks

As per AMS II.G. Version 3, the emission reductions are calculated as

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

And

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

And

$$B_{new} = B_{old} * (1 - \text{fraction of baseline stove users} * \text{baseline stove usage rate})$$

Refer below for calculation of emission reductions.

	Start Date	Inclusion date			
CPA 1	22/12/10	28/01/13			
CPA 2	22/12/10	25/10/13			
CPA 3	30/09/12	01/11/13			
Monitoring year	Start	End			
Monitoring Year 1	28-Jan-2015	27-Jan-2016			
Monitoring Year 2	28-Jan-2016	27-Jan-2017			
Data Ex Ante	Value	Unit	Source		
Q <sub>biomass</sub>	4.1	tonne/year	Ex-ante		
f <sub>NRB</sub>	0.81	fraction	Ex-ante		
NCV <sub>biomass</sub>	0.015	TJ/tonne	Ex-ante		
EF <sub>projected fossil fuel</sub>	81.6	tCO <sub>2</sub> /TJ	Ex-ante		
Efficiency <sub>old</sub>	0.10	fraction	Ex-ante		
Ly	0.95	fraction	Ex-ante		
<b>YEAR 1 of Monitoring period (1/28/2015 - 1/27/2016)</b>					
Parameter	Unit	CPA 01	CPA 02	CPA 03	Source
N	stoves	15,638	15,084	9,715	PoA Installation database
NS	stoves	13,720	13,234	8,524	Calculated
STOVE <sub>days</sub>	number	365	365	365	Calculated
OD	stove-days	50,07,848	48,30,438	31,11,091	Calculated
Efficiency (new)	fraction	25.68%	25.68%	25.68%	Calculated
Stove Usage	fraction	87.74%	87.74%	87.74%	Calculated
Proportion still using 3 stone fire and 3RL stove	fraction	79.57%	79.57%	79.57%	Monitoring survey
Bnew	t/yr	35992.36	34717.28	22360.01	Calculated
By,savings	t biomass	21974.73	21196.24	13651.65	Calculated
thermal Energy savings	GWh	93	90	58	Calculated
Scale?	-scale	Small	Small	Small	
ER	tCO <sub>2</sub>	21786	21014	13534	
<b>YEAR 2 of Monitoring period (1/28/2016 - 1/27/2017)</b>					
Parameter	Unit	CPA 01	CPA 02	CPA 03	Source
N	stoves	15,638	15,084	9,715	PoA Installation database
NS	stoves	13,816	13,327	8,583	Calculated
STOVE <sub>days</sub>	number	366	366	366	Calculated
OD	stove-days	50,56,692	48,77,551	31,41,435	Calculated
Efficiency (new)	fraction	24.26%	24.26%	24.26%	Calculated
Stove Usage	fraction	88.35%	88.35%	88.35%	Calculated
Proportion still using 3 stone fire and 3RL stove	fraction	81.32%	81.32%	81.32%	Monitoring survey
Bnew	t/yr	35189.40	33942.76	21861.17	Calculated
By,savings	t biomass	20687.25	19954.38	12851.81	Calculated
Energy savings (Year 2)	MWh	88	85	55	Calculated
Scale?	-scale	Small	Small	Small	
ER	tCO <sub>2</sub>	20510	19783	12741	

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

As explained above, the methodology directly provides equation for emission reductions; without separate baseline, project or leakage emission reduction equations. Calculation of Emission Reductions has already been explained above as per the methodology. Thus, this section is not applicable

## H.3. Calculation of leakage

As explained above, the methodology directly provides equation for emission reductions; without separate baseline, project or leakage emission reduction equations. Calculation of Emission Reductions has already been explained above as per the methodology. Thus, this section is not applicable

#### H.4. Summary of calculation of GHG emission reductions or net GHG removals by sinks

Specific-case CPA reference number	Baseline emissions or baseline net GHG removals by sinks (tCO <sub>2</sub> e)	Project emissions or actual net GHG removals by sinks (tCO <sub>2</sub> e)	Leakage (tCO <sub>2</sub> e)	GHG emission reductions or net GHG removals by sinks (tCO <sub>2</sub> e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
6864-0001	42,296	0	0	0	42,296	42,296
6864-0002	40,797	0	0	0	40,797	40,797
6864-0003	26,275	0	0	0	26,275	26,275
<b>Total</b>	<b>109,368</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>109,368</b>	<b>109,368</b>

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

Specific-case CPA reference number	Value estimated in ex ante calculation in the included CPA-DD(s)	Actual values achieved by the specific-case CPA(s) during this monitoring period
6864-0001	81,368	42,296
6864-0002	81,368	40,797
6864-0003	81,368	26,275
<b>Total</b>	<b>244,104</b>	<b>109,368</b>

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

The values of emission reductions achieved for this monitoring period for each CPA are lower than those in the ex-ante estimations.

**Appendix 1. Contact information of coordinating/managing entity and/or responsible persons/entities**

<b>Coordinating/managing entity and/or responsible person/entity</b>	<input checked="" type="checkbox"/> Coordinating/managing entity <input type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
<b>Organization name</b>	3 Rocks Limited
<b>Street/P.O. Box</b>	17a York St.
<b>Building</b>	
<b>City</b>	St. Helier
<b>State/Region</b>	Jersey
<b>Postcode</b>	JE2 3RQ
<b>Country</b>	United Kingdom
<b>Telephone</b>	+44 (0) 1534 601906
<b>Fax</b>	+44 (0) 1534 605037
<b>E-mail</b>	<a href="mailto:bobby@icecapltd.com">bobby@icecapltd.com</a>
<b>Website</b>	
<b>Contact person</b>	
<b>Title</b>	Company Secretary
<b>Salutation</b>	Mr.
<b>Last name</b>	
<b>Middle name</b>	
<b>First name</b>	Dave
<b>Department</b>	
<b>Mobile</b>	
<b>Direct fax</b>	
<b>Direct tel.</b>	
<b>Personal e-mail</b>	

<b>Coordinating/managing entity responsible person/entity and/or</b>	<input type="checkbox"/> Coordinating/managing entity <input checked="" type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
<b>Organization name</b>	Climate Secure Services
<b>Street/P.O. Box</b>	
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