

Monitoring Report

Gold standard Version 02

RDIS Rwanda CPA 1 (RDISRw01)¹

¹ Title of CDM CPA-DD

Title of the project	REDIS Rwanda CPA 1 (REDISRw01) ²
Gold Standard project id	GS 4823
Version number of the monitoring report	04
Completion date of the monitoring report	23/10/2025
Date of project design certification	14/09/2020
Start date of crediting period	01/11/2016
Duration of this monitoring period	19/08/2017 to 16/08/2019
Duration of previous monitoring period	N/A
Project representative(s)	Viateur Ntarindwa ³
Host Country	Rwanda
Certification pathway (activity certification/impact certification)	Impact Certification
SDG Contributions targeted (as per approved PDD)	3 – Good Health & Wellbeing 7 – Affordable & Clean Energy 13 – Climate Action
Gold Standard statement/product certification sought (GSVER/ADALYs/RECs etc.)	CER Labelling
Selected methodology(ies)	AMS-II.G, version 03, (upgrading to version 11.1), “Energy efficiency measures in thermal applications of non-renewable biomass” AMS-I.E., version 06, (upgrading to version 10.1) “Switch from non-renewable biomass for thermal applications by the user”
Estimated amount of annual average certified SDG impact (as per approved PDD)	SDG 13 – Impact / Climate Action 129,645 tCO ₂ e SDG 3- 100% positive air quality responses SDG 7- 28,775 ICS

² Title of CDM CPA-DD

³ As per REDIS Gold Standard Cover Letter dated 12 August 2019

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Total amount of certified SDG impact (as per approved methodology) achieved in this monitoring period	SDG 13 – 7,635 tCO ₂ e SDG 3 – 100% positive air quality responses SDG 7 – 5,033 ICS distributed
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SECTION A. Description of project

A.1. Purpose and general description of project

The purpose of this CPA is to produce, market, distribute and sell portable/fixed, domestic/institutional, charcoal/firewood improved cook stoves (ICS) not exceeding the small-scale energy limits of 45 MW_{th} for AMS-I.E. (Type I), and of 180 GWh_{th} for AMS-II.G. (Type II) as set out by the CDM EB.

The ICS are fuelled with traditional non-renewable biomass, but renewable biomass⁴ as a fuel switch is permitted to replace the use of non-renewable biomass. In such cases, the Supplier Organisations (SOs) may also be renewable biomass fuel suppliers, especially if they are organisations that create substantial amounts of biomass waste (such as from processing coffee, flowers, sugar, rice or similar commodities). In some cases, however, the stove users may use biomass waste they generate on their own. This CPA will cover the distribution of ICS that may use different fuels during a monitoring period. This is assessed during the stove usage surveys.

The use of renewable biomass in combination with the ICS may happen:

- For the entire operational period of the ICS or only intermittently;
- For a part of any monitoring period, when the fuel switch occurs during the period
- At some, all or none of the ICS distributed by the SO for a specific CPA.

The CME only allows AMS-I.E. to be used in specific geographical or organisational settings where 100% of the delineated stoves users have switched (or are already using) renewable biomass fuels, based on contractual undertakings given by the SO to the CME. Accordingly, the monitoring of the parameters that are only required for the AMS-I.E. component will be confined to such areas in any one monitoring period. The CME will ensure that a conservative approach is used in such situations, and will ensure that all SO's are aware that the Standard Operating Procedure (SOP), which is part of the PoA's Management Rules, must be complied with.

Rural Development Inter-diocesan Service (known as RDIS) is a CPA implementer and Supplier Organisation (SO). RDIS's improved cook stoves (for both renewable and non-renewable biomass fuel use) may be supplied in various sizes and various models. The total number of stoves will be multiplied by the annual average consumption of woody biomass per appliance (tonnes per year) to determine the emission reductions.

These ICS are more efficient in transferring heat to the cooking pots, thus ICS require less fuel to prepare the same meal. This efficiency is translated into fuel savings compared to traditional stoves used in Rwanda. By reducing fuel consumption, the CPA reduces greenhouse gas emissions from the use of fuel. In addition, the use of non-renewable biomass may also be replaced by the use of renewable biomass from various sources. This reduction in fuel consumption based on the efficiency increase or the replacement of non-renewable biomass is estimated, and corresponding CO₂ emission reductions are calculated from these savings.

⁴ As defined in paragraph 4 of EB23 Annex 18

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For stoves that use AMS-II.G. the emission reductions are based upon an improvement in their thermal efficiency and laboratory test results.

For stoves that use AMS-I.E. the emission reductions will be based upon the calculation of the number of appliances multiplied by the annual average consumption of woody biomass (tonnes/year).

This CPA is being implemented by RDIS as the Supplier Organisation (SO) respecting the geographical boundary of Rwanda and a maximum energy saving of 180 GWh_{th}/year per CPA. In cases where the number of ICS per CPA exceeds the energy limit, the number of emission reductions (ERs) shall be capped at those generated by ICS saving a maximum of 180 GWh_{th}/year. Any additional ICS shall not be counted, other than in a second CPA.

Due to the use of renewable biomass from various sources as part of the project activity, the total thermal capacity of all ICS distributed and installed will not exceed the limit of 45 MW_{th} output per CPA.

During the first crediting year, this CPA was expected to generate an estimated 46,471 tonnes of CO₂e reductions from 28,775⁵ ICS on average per annum in the first crediting period. These figures were estimates for the section of the CPA that was expected to only apply AMS-II.G. with the RDIS Rural Wood Stove model using non-renewable biomass in its first crediting period. In this monitoring period, 7,635 tonnes of CO₂e reductions were achieved from 5,033 ICS.

During the first crediting period under the GS4GG this CPA is eligible to apply a combination of AMS-II.G. and AMS-I.E. with the RDIS Rural Wood Stove model being fuelled with renewable biomass in accordance with the PoA's Standard Operating Procedure (SOP 1 – Methodology Combination).

With its open access concept, the PoA allows in principle both local manufacturers and importers of stoves to become part of the PoA, and technology/equipment transfer may occur on the CPA level.

RDIS is an SO under the 7014 Improved Cook Stoves for East Africa (ICSEA) SSC-PoA, with this being its first CPA.

This CPA will eventually disseminate ICS over the entire territory of Rwanda, with 5,033 having been distributed and monitored during the first crediting year. The primary means to uniquely identify the activities under the CPA is by way of buyer information collected through Sales Agreements. This includes the stove serial number, customer name, address, date of sale, and where practical and appropriate also GPS coordinates. This information is checked by the CME from the duplicate Sales Agreements that it is sent on a regular monthly basis.

⁵ 'Calculation of N_y max.' sheet of the RDIS CPA CER calculation_ver 01_RDIS Rural Wood Stove. These values can change during the course of actual implementation as long as the CPA reaches the threshold defined in the applied methodology under which the stove falls.

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The unique identification of the CPA is the code RDISRw01: RDIS for Rural Development Inter-diocesan Service as the Supplier Organisation (SO), Rw for Rwanda and 01 is the number of this CPA.

A.2. Location of project

RDIS Rwanda CPA 1 (RDISRw01)

RDIS Main Office Location in Muhanga Town:

a) Host Party: Rwanda

b) Region/State/Province, etc.: Southern Province

c) City/Town/Community, etc.: Muhanga District, Cyeza Sector, Makera Cell

d) Physical/Geographical Location:

Rwanda's geographical coordinates are:

1°56'25" S – 29°52'26" E

Muhanga District's geographical coordinates are:

2°4'28" S - 29°45'24" E

A.3. Reference of applied methodology

AMS-II.G. Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass (version 03)

AMS-I.E. Switch from Non-Renewable Biomass for Thermal Applications by the User (version 06)

A.4. Crediting period of project

At the time of first submission of this monitoring report the project is a CDM CPA with GS4GG labelling add-on (GS CER stream). Therefore, according to par. 3.1.4 d) of the GS4GG Transition Requirements v2.0, the original CDM 7-year, twice renewable crediting period applies to the 1st monitoring period (MP1) and conditions (CDM + GS4GG CPA) covered by this monitoring report.

CDM + GS4GG CPA (GS CER stream) crediting period:

01/11/2016 to 31/10/2023

However, in the meantime the project has left the PoA GS 973 and become a stand-alone GS4GG small-scale project. The trajectory has been as follows:

20/05/2022: Through an updated GS4GG Cover Letter RDIS (re-)gains control over the project from Uganda Carbon Bureau (the CME of the PoA GS 973)

29/04/2024: The design change from CPA to stand-alone GS4GG small-scale project is approved

Upon finalization of the performance review no. 1 covering the GS4GG labelling of the (already issued) MP1 CERs, RDIS intends to complete the transition of the project by switching from GS CER to GS VER stream. For this purpose, the following steps will be taken:

1. Submission of a Transition Request to transition from GS CER to GS VER stream in line with par. 10.1.3 of Annex B of the GS4GG GHG Emissions Reduction & Sequestration Product Requirements v3.1
2. Seek GS4GG (GS VER stream) design certification renewal following the GS4GG Rule Clarification: Design Certification Renewal Requirements: CDM Projects Transitioning to GS4GG (RC: CDM-to-GS4GG)

NOTE: Technically, the project falls under sub-scenario 1.a of the RC: CDM-to-GS4GG and therefore would have had to submit the design certification renewal request before the end of year 5 of the CDM crediting period (i.e. 31/10/2021), and then switch to the regular 5-year, twice renewable GS4GG crediting period cycle.

However, given that RDIS only obtained control over the project on 20/05/2022 and the design change review to stand-alone GS4GG project was only finalized on 29/04/2024, it will not be feasible to fulfil the requirement. Therefore, along with the submission of the Transition Request Form, RDIS will also submit a respective deviation request to the GS secretariat.

SECTION B. Implementation of project

B.1. Description of implemented project

RDIS Rwanda CPA 1 (RDISRw01)

CPA	Stove Model	Picture
RDIS Rwanda CPA 1 (RDISRw01) ⁶	RDIS Rural Wood Stove	

In this monitoring period and submitted in this monitoring report, RDIS has been active in the purchase, marketing, distribution and sales of fixed, domestic, firewood improved cook stoves not exceeding the small scale energy limit of 180 GWh_{th} for AMS-II.G..

⁶ Title of CDM CPA-DD

This CPA covers the distribution of ICS that may use different fuels during a monitoring period. For this monitoring period and submitted in this monitoring report, this CPA has fuelled ICS with traditional non-renewable biomass and this was confirmed during the household usage surveys.

In future the use of renewable biomass in combination with the ICS may happen:

- For the entire operation period of the ICS or only intermittently;
- For a part of any monitoring period, when the fuel switch occurs during the period
- At some, all or none of the ICS distributed by the SO for a specific CPA.

Improved Cook Stoves for East Africa (ICSEA) Limited only allows AMS-I.E to be used in specific geographical or organisational settings where 100% of the delineated stoves users have switched over (or are already using) renewable biomass fuels, based on contractual undertakings given by the SO to Improved Cook Stoves for East Africa (ICSEA) Limited. Accordingly, the monitoring of the parameters that are only required for the AMS-I.E. component will be confined to such areas in any one monitoring period. Improved Cook Stoves for East Africa (ICSEA) Limited ensures that a conservative approach is used in such situations, and ensures that all SO's are aware that the Standard Operating Procedure (SOP), which is part of the PoA's Management Rules, must be complied with.

RDIS's improved cook stoves are distributed in a single size and a single model and for these stoves that used AMS-II.G, the emission reductions are based upon the improvement in their thermal efficiency in the field test results.

The following table lists the number of RDIS Rural Wood ICSs distributed in the Rwanda districts of Muhanga, Nyamagabe, Rusizi and Gisagara since the starting date of the project activity and as recorded in the RDIS Excel database records at the end of the monitoring period:

Month	ICS Distributed	Month	ICS Distributed
June 2017	466	August 2018	723
July 2017	205	September 2018	200
August 2017	136	October 2018	204
September 2017	81	November 2018	13
October 2017	332	December 2018	17
November 2017	314	January 2019	35
December 2017	135	February 2019	15
January 2018	104	March 2019	15
February 2018	198	April 2019	199
March 2018	398	May 2019	34
April 2018	307	June 2019	86
May 2018	191	July 2019	58
June 2018	343	August 2019	77
July 2018	146	TOTAL	5033

B.2. Post-registration changes

B.2.1. Temporary deviations from Certified Key Project Information, Project Design Document, Monitoring & Reporting Plan, applied methodology or applied standardized baseline

No temporary deviations have been applied during the monitoring period or submitted with this monitoring report.

B.2.2. Corrections

No corrections to the project information or parameters fixed at validation have been applied during the monitoring period or submitted with this monitoring report.

B.2.3. Changes to start date of crediting period

No changes to the start date of the crediting period have been approved during the monitoring period or submitted with this monitoring report.

B.2.4. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

No permanent changes to the approved monitoring plan, or applied methodologies, or applied approaches have been approved during the monitoring period or submitted with this monitoring report.

B.2.5. Changes to project design of approved project

No changes to the design of the project have been approved during this monitoring period or submitted with this monitoring report.

SECTION C. Description of monitoring system applied by the project

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The monitoring consisted of four stages:

- 1 Continuous sales data collection and tracking by the SO
- 2 Continuous data monitoring by Improved Cook Stoves for East Africa (ICSEA) Limited
- 3 Sample surveys and efficiency testing at the end of the monitoring period and prior to verification
- 4 Data compilation and analysis, quality control and writing of the Monitoring Report

The flow chart below shows stage 1 of the monitoring system:

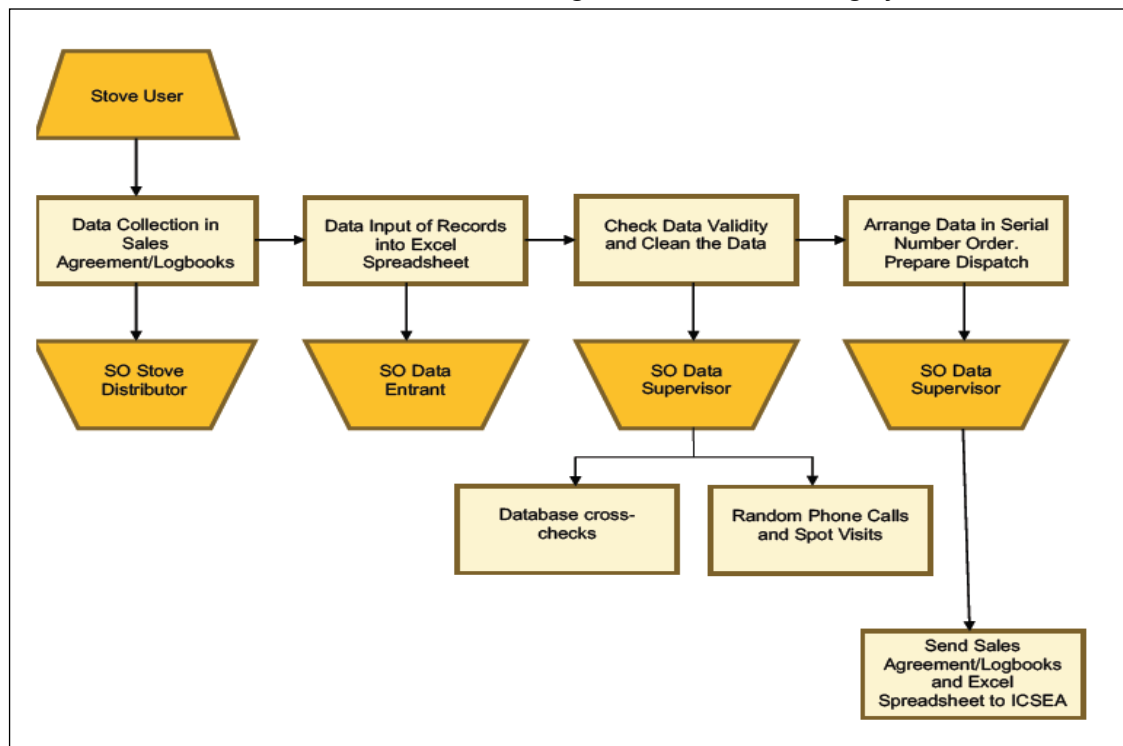


Diagram 1: SO Data Tracking Flow Chart

The flow chart below shows stage 2 of the monitoring system:

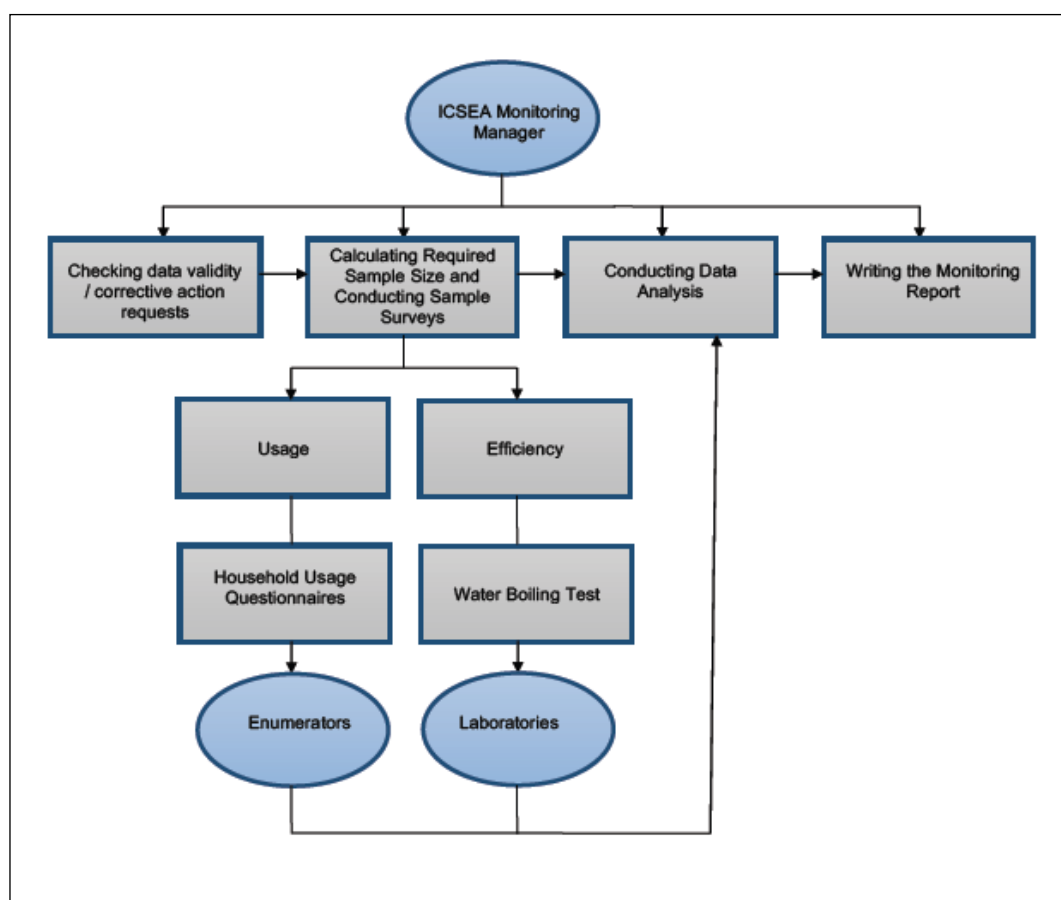


Diagram 2: CME Data Monitoring Flow Chart

7014-P1-0007-CP1 RDIS Rwanda CPA 1 (RDISRw01)

1. Sales data collection and tracking by the CPA:

The SO was responsible for the marketing and distribution of the RDIS Rural Wood Stove by its Improved Cook Stoves for East Africa (ICSEA) Limited-trained staff. These staff entered the ICS information and Stove Users' contact details into the physical Sales Agreement/Logbook sheets⁷ in accordance with the training provided by Improved Cook Stoves for East Africa (ICSEA) Limited. For each household, an original copy (Stove User Copy), with two duplicate sheets (ICSEA Copy; and RDIS Copy) was completed, and each Stove User signed acknowledging receipt of the ICS as well as agreeing to handover her/his rights of ownership of the carbon credits to the SO. Without the Stove User's signature, Improved Cook Stoves for East Africa (ICSEA) Limited does not allow any carbon credits to be claimed from that stove. After the Stove User signed, the Stove User Copy remained with the Stove User for her own record. The RDIS Copy was kept by the SO for data entry into the Excel spreadsheet that is sent to Improved Cook Stoves for East Africa (ICSEA) Limited, and the ICSEA Copy was sent to Improved Cook Stoves for East Africa (ICSEA) Limited for data quality checking (see Annex 1).

The following information was collected by the SO:

⁷ See an example sheet at Annex 1

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- i) Unique Stove Serial Number (and GPS coordinates)
- ii) Sales Agreement Number
- iii) Sales Date
- iv) Stove User's telephone contacts
- v) Stove User's location – Country, District, Sector, Cell, Village
- vi) Stove model
- vii) Stove User's Signature
- viii) Stove Price (if applicable)
- ix) Stove distributor's (SO staff member) Name

2. Data monitoring by the CME:

Monitoring activities were performed by Improved Cook Stoves for East Africa (ICSEA) Limited and have served to determine the total number of ICS deployed in period y ($N_{i,j}$). The number of appliances ($N_{i,j}$) was determined as the fraction of days in a year in use for each ICS of the same model and cohort ($t_{\text{fraction},y,i,j}$), by the fraction of these ICS still in use per cohort and model of ICS. See the Excel spreadsheet Appendix 1 (RDIS ER Calculation). Improved Cook Stoves for East Africa (ICSEA) Limited randomly screened the records through spot-visits, crosschecks on RDIS's reports and records to confirm that the sales records were authentic and that no double counting occurred. Audit corrections as necessary were visibly made to the records in green ink.

3. Sample Surveys

In accordance with Appendix 5 (Monitoring Information) of the included CPA-DD for the Sampling Plan Drop Off/Usage Check, there are two different Approaches (Census or Sampling) that are described. Under the Sampling Approach there are 4 Options:

Option 1: Annual Inspection per CPA

Option 2: Annual Inspection of a Random Sample of CPAs from each Supplier Organisation (SO)

Option 3: Biennial Inspection per CPA

Option 4: Annual Inspection of a Random Sample of CPAs from CPAs using the same ICS Model

Option 3 has been chosen.

At the end of the monitoring period, and prior to verification, sample surveys were conducted by Improved Cook Stoves for East Africa (ICSEA) Limited in order to determine the:

1. $U_{(i,j)}$ - The fraction by which emission reductions are multiplied to obtain an assessment adjusted for drop off of ICS in use per cohort year. A cohort is defined as the ICS model distributed or gone through maintenance in the same year.
2. $N_{(i,j)}$ - Number of ICS units distributed
3. $t_{\text{fraction},(i,j)}$ - Fraction of the days in use in year y of a single ICS deployed
4. **Adjustment factor for the continued use of traditional stoves** - This accounts for the exclusion of the fuel wood consumption of baseline stoves from the ER calculation in accordance with Section B.6.1. of the included CPA-DD requiring a conservative approach to be taken regarding the replacement of traditional stoves (AMS-II.G. Version 03, clause 15).

5. $\eta_{\text{new},(i,j)}$ - Average efficiency of the Rural Wood Stove being deployed

Simple Random Sampling (SRS) Procedure for the Usage Survey

Improved Cook Stoves for East Africa (ICSEA) Limited Monitoring Manager drew a random sample from the internally verified Excel spreadsheet records of 5,033 ICS, which was the total number of stoves distributed till the end of this monitoring period. This was done by using a computerised random number generator from <http://stattrek.com/statistics/random-number-generator.aspx>

By filling in 150 random numbers, the minimum value (1) and maximum value (5,033) and clicking on the calculate button, the 150 random numbers were automatically generated. The numbers generated correspond to the entry numbers in the database. These numbers were then matched with the corresponding stove serial number in the database by using the VLOOKUP tool. This tool uses the column that has the random numbers generated to match the entry number and the corresponding stove serial number. The required sample size as per the confidence/precision of 95/5 was 18, but 33 samples were surveyed in accordance with the CDM-EB50-A30-STAN Standard Sampling and Surveys for CDM Project Activities and Programmes of Activities version 08.0. The Household Usage Questionnaires were provided to Improved Cook Stoves for East Africa (ICSEA) Limited's team of enumerators, and Improved Cook Stoves for East Africa (ICSEA) Limited briefed and provided practical training for the enumerators before they conducted the household usage survey at the household locations. The primary purpose of the survey was to account for the continued use of baseline appliances and to determine the drop off rate as described in the CPA-DD page 43.

The survey also generated information about the replacement of the low efficiency appliances and their being no longer in use within the boundary or within the region. The fraction of ICS in use was 99.972%, with the traditional stoves effectively no longer in use at the households (see sheet "Baseline Stove Use" in the Excel spreadsheet "RDIS ER Calculation").

In addition to providing information about the parameters: $U_{(i,j)}$ and Adjusted Factor for Continued Use of Baseline Stove; the usage survey also generated information for the parameter: $t_{\text{fraction},(i,j)}$. For all the 3 parameters that were catered for in this usage survey, the same sample size of 33 households was used (see various sample size calculation sheets in the Excel spreadsheet "RDIS ER Calculation").

Simple Random Sampling (SRS) Procedure for Efficiency Check

Since the SO carried out maintenance of all stoves that had been in use for over 12 months, the stoves were brought into a single age cohort of stoves.

Improved Cook Stoves for East Africa (ICSEA) Limited Monitoring Manager drew a random sample from the internally verified Excel spreadsheet records of 5,033 ICS, which was the total number of stoves distributed till the end of this monitoring period. This was done by using a computerised random number generator from <http://stattrek.com/statistics/random-number-generator.aspx>

By filling in 150 random numbers, the minimum value (1) and maximum value (5,033) and clicking on the calculate button, the 150 random numbers were automatically generated. The numbers

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generated correspond to the entry numbers in the database. These numbers were then matched with the corresponding stove serial number in the database by using the VLOOKUP tool. This tool uses the column that has the random numbers generated to match the entry number and the corresponding stove serial number. The required sample size as per the confidence/precision of 95/5 was 2, but 11 stoves were tested by the ICSEA-authorized stove testing laboratory team in the laboratory.

The sample size for both the usage survey and the efficiency testing followed paragraph 14 of the CDM-EB50-A30-STAN Standard Sampling and surveys for CDM project activities and programmes of activities Version 08.0.

Data recording

Improved Cook Stoves for East Africa (ICSEA) Limited Monitoring Manager and the team of enumerators recorded the information from the household surveys on pre-printed questionnaires.

The ICSEA* Project Manager collected all the stove testing results from the authorized laboratory, and analysed and cross-checked all the data.

Data aggregation and reporting

In the field Improved Cook Stoves for East Africa (ICSEA) Limited staff checked all the collected information from the household usage questionnaires for inconsistencies and instructed the team of enumerators to take corrective action where necessary. Improved Cook Stoves for East Africa (ICSEA) Limited Monitoring Manager aggregated the results of the survey, conducted the analyses and reported on the monitored parameters as written in the CPA-DD pages 43 and 44.

4. Data compilation

Improved Cook Stoves for East Africa (ICSEA) Limited Monitoring Manager finally transferred the values of the monitored parameters to the RDIS CER Calculation Excel spreadsheet that contains the equations for calculating the emission reductions for this monitoring period. See the Excel spreadsheet "RDIS ER Calculation" in Appendix 1 for the achieved values reported in this Monitoring Report.

Roles and responsibilities of personnel

Person	Role
RDIS Stove Distributor	Responsible for ensuring that all fields with stove records and stove user information was correctly filled into the Sales Agreement/Logbook sheets.
RDIS Data Entrant	Responsible for entering, updating and maintaining all data from the Sales Agreement/Logbook sheets into the Excel database.
RDIS Tracking Manager	Responsible for supervising all work done by the RDIS Stove Distributor and the RDIS Data Entrant during stove installation and during maintenance visits and delivering the updated database records to ICSEA.

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ICSEA* Monitoring Manager	Responsible for training and organising enumerators' activities, supervising RDIS, updating the drop off analysis and values of other parameters, and generating the RDIS ER Calculation Excel spreadsheet (see Appendix 1).
ICSEA* Enumerators	Responsible for conducting household interviews for drop off check and other parameters and reporting results to the ICSEA* Monitoring Manager.
ICSEA* Project Manager	Responsible for organising testing activities for efficiency checks, supervising authorised laboratories and coordinating the reports of the ICSEA* Monitoring Manager.

Security procedures for the monitoring system

Improved Cook Stoves for East Africa (ICSEA) Limited and the SO implemented a system of cross-checks to ensure data quality. There was a separation of roles for every step of the data generation, aggregation and recording, calculation and reporting between those who were responsible and those who were supervising the respective steps, at both the SO and at the CME level.

The RDIS team was trained and supervised by the ICSEA* Monitoring Manager on how to effectively handle all data entry and subsequent updates, both in the field and in the RDIS office. The RDIS Data Entrant was responsible for sorting out Sales Agreement/Logbook sheets, filtering those with incomplete or incorrect data, entering the data of those correctly completed into the Excel database, flagging any duplicates, following up on those with inconsistencies, and updating the Excel database as households were contacted/phoned/visited throughout the year.

The RDIS Tracking Manager checked the correctness and consistency between the information on the Sales Agreement/Logbook sheets and the corresponding records in the Excel database. Where inconsistencies were detected, the ICSEA* Monitoring Manager instructed the RDIS team to search for the error source. If the error source was found, the information was corrected accordingly; if the error source could not be found, the Excel database record was quarantined in a separate file. In addition to checking done by the RDIS Tracking Manager, the ICSEA* Monitoring Manager checked the correctness and consistency of all sampling data collected and processed this Monitoring Period.

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SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

Relevant SDG Indicator	Goal 3 - To ensure healthy lives and promote well being for all at all ages. Indicator: Air Quality Goal 7 - To ensure access to affordable, reliable, sustainable and modern energy Indicator: Access to affordable and clean energy services Goal 13 – Take urgent action to combat climate change and its impacts. Indicator: ICS Quality
Data/parameter:	NCV_{biomass}
Unit	TJ/tonne
Description	Net calorific value of the non-renewable woody biomass that is substituted.
Source of data	IPCC default for wood fuel
Value(s) applied	0.015
Choice of data or measurement methods and procedures	Default value that is provided in accordance with paragraph 5 of AMS-II.G (version 03) and paragraph 11 of AMS-I.E (version 06.0) as per registered CDM CPA-DD
Purpose of data	Calculation of Baseline emission
Additional comments	As per AMS-II.G. version 03 and AMS-I.E version 06.0

Relevant SDG Indicator	Goal 3 - To ensure healthy lives and promote well being for all at all ages. Indicator: Air Quality Goal 7 - To ensure access to affordable, reliable, sustainable and modern energy Indicator: Access to affordable and clean energy services Goal 13 – Take urgent action to combat climate change and its impacts. Indicator: ICS Quality
Data/parameter:	$EF_{\text{projected-fossilfuel}}$
Unit	tCO ₂ /TJ
Description	Emission factor for the substitution of non-renewable woody biomass by similar consumers
Source of data	IPCC
Value(s) applied	81.6

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Choice of data or measurement methods and procedures	Default value that is provided in accordance with paragraph 5 of AMS-II.G (version 03) and paragraph 11 of AMS-I.E (version 06.0) as per registered CDM CPA-DD
Purpose of data	Calculation of Baseline emission
Additional comments	As per AMS-II.G. version 03 and AMS-I.E version 06.0

Relevant SDG Indicator	Goal 3 - To ensure healthy lives and promote well being for all at all ages. Indicator: Air Quality Goal 7 - To ensure access to affordable, reliable, sustainable and modern energy Indicator: Access to affordable and clean energy services Goal 13 – Take urgent action to combat climate change and its impacts. Indicator: ICS Quality
Data/parameter:	$C_{y,fueltype,region,old}$
Unit	tonnes/year
Description	Quantity of woody biomass used in the absence of the project activity in tonnes per type of ICS
Source of data	Global Alliance for Clean Cooking (GACC) – CASE PROJECT baseline study report for Rwanda ⁸
Value(s) applied)	2.275
Choice of data or measurement methods and procedures	Estimate of average annual consumption of woody biomass per appliance (tonnes/year) derived historical data for wood-burning stoves calculated from 187 kg/stove/month, as follows: $(187\text{kg} \times 365 \text{ days}) / (30 \text{ days} \times 1000)$.
Purpose of data	Calculation of baseline emissions.
Additional comments	Only applicable for calculations of ER as per AMS-II.G (version 03), also as per AMS-I.E (version 06.0).

⁸ http://cleancookstoves.org/resources_files/baseline-study.pdf

Relevant SDG Indicator	Goal 3 - To ensure healthy lives and promote well being for all at all ages. Indicator: Air Quality Goal 7 - To ensure access to affordable, reliable, sustainable and modern energy Indicator: Access to affordable and clean energy services Goal 13 – Take urgent action to combat climate change and its impacts. Indicator: ICS Quality
Data/parameter:	$L_{(i,j)}$
Unit	Fraction
Description	The fraction by which emission reductions are multiplied to obtain an assessment adjusted for leakage risks.
Source of data	Default value in accordance with paragraph 13 (a) of AMS II.G (version 03) and paragraph 19 (a) of AMS-I.E (version 06.0)
Value(s) applied)	0.95
Choice of data or measurement methods and procedures	N/A
Purpose of data	Calculation of baseline emissions.
Additional comments	In case this leakage adjustment factor is applied, it is not required to survey the use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy sources

Relevant SDG Indicator	Goal 3 - To ensure healthy lives and promote well being for all at all ages. Indicator: Air Quality Goal 7 - To ensure access to affordable, reliable, sustainable and modern energy Indicator: Access to affordable and clean energy services Goal 13 – Take urgent action to combat climate change and its impacts. Indicator: ICS Quality
Data/parameter:	$\eta_{old,i}$
Unit	Fraction
Description	Efficiency of the baseline appliance being replaced
Source of data	Water Boiling Test default value according to the methodology AMS II.G (version 03), also as per AMS-I.E (version 06.0).
Value(s) applied)	0.1

Choice of data or measurement methods and procedures	Water Boiling Test default value according to the methodology AMS II.G (version 03).
Purpose of data	Calculation of baseline emissions
Additional comments	Data to be reported if option 2 of AMS-II.G (version 03) is chosen.

Relevant SDG Indicator	Goal 3 - To ensure healthy lives and promote well being for all at all ages. Indicator: Air Quality Goal 7 - To ensure access to affordable, reliable, sustainable and modern energy Indicator: Access to affordable and clean energy services Goal 13 – Take urgent action to combat climate change and its impacts. Indicator: ICS Quality
Data / Parameter:	Capacity_{ICS} -
Unit:	kW _{th}
Description:	Installed/rated capacity of stove in kilowatt equivalent for thermal energy
Source of data:	Average firepower (high power) – RDIS Rural Wood Stove Test Certificate
Value(s) applied	4.290 kW _{th}
Choice of data or measurement methods and procedures	Either data from stove manufacturer or calculated in a transparent manner. The calculation will vary depending on the most appropriate data source and therefore will be detailed on CPA level and described by stove type.
Purpose of data / parameter	Calculation of baseline emissions

Additional comment	To ensure that the total rated capacity of all the stoves in the CPA do not exceed the relevant limit, 45MW_{th} per CPA. The above-mentioned value for installed capacity of the stove is only for domestic stoves. The installed capacity of institutional stoves will be determined before their implementation in the CPA and before ERs form such stoves are verified and issued. This CPA applied AMS-II.G. only this monitoring period. With 5,033 ICS monitored, the total rated capacity of all its stoves was 21,592KW_{th}. This CPA did not exceed its limit of 45MW_{th}.
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D.2. Data and parameters monitored

Relevant SDG Indicator	SDG 3 - To ensure healthy lives and promote well being for all at all ages.
Data/parameter:	Air quality improvement
Unit	Percentage of stove users stating improvement in air quality
Description	100% stove users perceived a reduction in health problems from cleaner indoor air by the use of ICS.
Measured/calculated/default	Calculated
Source of data	Household Stove Usage Survey
Value(s) of monitored parameter	33 households – 100% Average – 100%
Monitoring equipment	Survey questionnaire
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	Household members are asked whether air quality has a) worsened, b) remained the same, or c) improved since they started using the ICS.
QA/QC procedures:	Transparent data analysis and reporting
Purpose of data:	Determining the percentage of people confirming an improvement in air quality due to using ICS.
Additional comments:	

Relevant SDG Indicator	SDG 7 - To ensure access to affordable, reliable, sustainable and modern energy. Indicator: Access to affordable and clean energy services
Data/parameter:	N_y
Unit	Number of ICS units distributed
Description	Number of persons that benefit from efficient and clean cooking technologies
Measured/calculated/default	Calculated
Source of data	CPA database
Value(s) of monitored parameter	5,033
Monitoring equipment	N/A
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	Total number of stoves sold multiplied with usage rates multiplied with average household size
QA/QC procedures:	This factor was monitored according to the monitoring plan, and updated when necessary. Cross check comparisons will be made against spot check visits and monitoring of a randomly selected sample of households to administer the usage survey questionnaire, and any significant differences will be counted as "Drop-Offs".
Purpose of data:	Calculation of baseline emissions
Additional comments:	As per AMS-II.G and AMS-I.E.

Relevant SDG Indicator	SDG13 – Take urgent action to combat climate change and its impacts. Indicator: ICS Quality
Data/parameter:	$\eta_{new,(i,j)}$
Unit	Fraction
Description	Thermal Efficiency of the ICS being deployed and maintained as part of the project activity.
Measured/calculated/default	Calculated from sampled ICS
Source of data	Water Boiling Test (WBT) by CREEC laboratory (See sheet "Efficiency sample calc – single age cohort" in Appendix 1 of this Monitoring Report).

Value(s) of monitored parameter	0.286
Monitoring equipment	Centre for Research in Energy & Energy Conservation (CREEC) <u>Weighing Balance</u>: Model: Class III. ID: CRC/BL/012. Capacity: 30 kg by 0.001 kg. Last calibration was on 05/02/2019. This was done at a level of confidence of approximately 95% with an expanded uncertainty of ± 0.001 kg. <u>Weighing Balance</u>: Model: Class III. ID: CRC/BL/050. Capacity: 30 kg by 0.001 kg. Last calibration was on 05/02/2019.. This was done at a level of confidence of approximately 95% with an expanded uncertainty of ± 0.001 kg. <u>Weighing Micro Balance</u>: Model: Citizen CX 265. ID: CRC/BL/065. Capacity: 220 g by 0.0001 g. Last calibration was on 05/02/2019. This was done at a level of confidence of approximately 95% with an expanded uncertainty of ± 0.0003 g. <u>Infrared Thermometer</u>: Model: TESTO 835-T2. Serial Number: IRT01. Last calibration on 06/02/2019.: This was done at a level of confidence of approximately 95% with an expanded uncertainty of $\pm 2.0^{\circ}\text{C}$. <u>Digital Thermometer</u>: Model: TME 2030. Serial Number: THERM01. Last calibration on 06/02/2019.: This was done at a level of confidence of approximately 95% with an expanded uncertainty of $\pm 2.0^{\circ}\text{C}$. <u>Moisture Meter</u>: Model: TESTO 606-2. Serial Number: CRCMB002. Last calibration on 06/02/2019. This was done at a level of confidence of approximately 95% with an expanded uncertainty of $\pm 0.5\%$.
Measuring/reading/recording frequency:	Every two years
Calculation method (if applicable):	See sheet "Efficiency sample calc – single age cohort" in Appendix 1 of this Monitoring Report.
QA/QC procedures:	The CME scrutinises all calibration certificates for all testing laboratories.
Purpose of data:	Emission reduction calculation
Additional comments:	None

Relevant SDG Indicator	SDG 13 – Take urgent action to combat climate change and its impacts. Indicator: ICS Quality
Data/parameter:	$f_{NRB,y}$
Unit	Fraction
Description	Fraction of woody biomass saved by the project activity in the year y that can be established as non-renewable biomass.
Measured/calculated/default	Calculated using MINIRENA RNRA - DFNC June 2016 Summary Report, "Projection Scenario of Supply/Demand of Woody Biomass in Rwanda from 2015 to 2026", and it covers the period from 2017 to 2026, and f_{NRB} figure in the ASB0041-2018 for Rwanda.
Source of data	MINIRENA RNRA - DFNC June 2016 Summary Report, "Projection Scenario of Supply/Demand of Woody Biomass in Rwanda from 2015 to 2026", and it covers the period from 2017 to 2026, and ASB0041-2018 for Rwanda.

Value(s) of monitored parameter	0.88 for ICS distributed from 14/06/2017 until 20/12/2018 0.77 for ICS distributed after 20/12/2018		
	Annual monitoring of fNRB was in accordance with the Monitoring Plan in the PoA-DD, the CME annually checked and updated the fNRB from the date of the first stove record (14/06/2017) as follows:		
	Year	fNRB	Value used to calculate ERs
			Justification for not using the default values
	2016	UNFCCC published fNRB default value = 98%	N/A
	2017	UNFCCC published fNRB default value = 98%, expired 20/05/2017. fNRB calculated using MINIRENA RNRA - DFNC June 2016 Summary Report, "Projection Scenario of Supply/Demand of Woody Biomass in Rwanda from 2015 to 2026", and it covers the period from 2017 to 2026, fNRB = 88%	88%
	2018	ASB0041-2018 for Rwanda used fNRB = 77%, approved 20/12/2018 fNRB calculated using MINIRENA RNRA - DFNC June 2016 Summary Report, "Projection Scenario of Supply/Demand of Woody Biomass in Rwanda from 2015 to 2026", and it covers the period from 2017 to 2026, fNRB = 88%	77%
	2019	ASB0041-2018 for Rwanda used fNRB = 77% fNRB calculated using MINIRENA RNRA - DFNC June 2016 Summary Report, "Projection Scenario of Supply/Demand of Woody Biomass in Rwanda from 2015 to 2026", and it covers the period from 2017 to 2026, fNRB = 88%	77%

Monitoring equipment	N/A
Measuring/reading/recording frequency:	Yearly
Calculation method (if applicable):	N/A
QA/QC procedures:	Annual monitoring of fNRB was in accordance with the Monitoring Plan in the PoA-DD, the CME annually checked and updated the fNRB from the date of the first stove record (14/06/2017).
Purpose of data:	Baseline emission calculation
Additional comments:	See above.

Relevant SDG Indicator	SDG13 – Take urgent action to combat climate change and its impacts. Indicator: ICS Quality
Data/parameter:	$t_{fraction,(i,j)}$
Unit	Fraction of 365
Description	Fraction of the days in use in year y of a single ICS deployed
Measured/calculated/default	Calculated. See sheet “RDIS ER Calculation” in Appendix 1 of this Monitoring Report.
Source of data	Derived from stove records
Value(s) of monitored parameter	Variable, dependent on day ICS was first put into use (commissioning date) with respect to the monitoring period.
Monitoring equipment	Sales Agreement/Logbook sheets, Excel Database, and Household Usage Survey
Measuring/reading/recording frequency:	Continuous monitoring and recording of each ICS distributed. Sample surveys.
Calculation method (if applicable):	The SO keeps a paper and electronic record of the ICS data, and the ICS is considered to be in use from the commissioning date, which is the date on which the stove was put into use for the first time. The fraction of the number of days in use is calculated daily through the electronic database.

QA/QC procedures:	Sales records were scrutinised by the SO to avoid double counting and Improved Cook Stoves for East Africa (ICSEA) Limited also conducted spot-checks to verify the legitimacy of such records. The SO verified the ICSs that had been put into use based on the ICS sales during the month through telephone surveys and/or physical inspection and Improved Cook Stoves for East Africa (ICSEA) Limited monitoring events. Sales records and survey results provided the commissioning date, which is the date on which the stove is put into use for the first time. That date is used as the start date for the computation of certified emission reductions for single ICS. Based on the analysis of the sales records and survey results a commissioning date 9 days after the sales date has been conservatively calculated and used for emission reduction calculation purposes. The SO sends the Sales Agreement/ Logbook sheets (ICSEA Copies) to Improved Cook Stoves for East Africa (ICSEA) Limited for verification of the data entered in the RDIS Excel database Telephone checks and spot checks were used by Improved Cook Stoves for East Africa (ICSEA) Limited to review and authenticate the data in the Excel database.
Purpose of data:	Emission reduction calculation
Additional comments:	N/A

Relevant SDG Indicator	SDG 13 – Take urgent action to combat climate change and its impacts. Indicator: ICS Quality
Data/parameter:	$t_{\text{fraction},(i,j)}$, AMS-I.E
Unit	Fraction of 365
Description	Fraction of the days in use in year y of a single ICS deployed that uses renewable biomass
Measured/calculated/default	Measured. Derived from sales records and SOs standard operating procedures
Source of data	Derived from sales records and SOs standard operating procedures
Value(s) of monitored parameter	Variable, dependent on day ICS was first put into use (commissioning date) with respect to the monitoring period.

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Monitoring equipment	The SO keeps a paper and electronic record of the sales date, and the stove is considered to be in use from the commissioning date, which is the date on which the stove is put into use for the first time. The number of operational stoves each year will be summarised in a table and checked to ensure that the installed capacity of each CPA does not exceed the small-scale limit of 45 MW_{th} output per year. This factor was calculated daily through the electronic database. The SO also provides a standard operating procedure, certifying the date that household made a shift from the use of non-renewable biomass to renewable biomass as their primary source of fuel.
Measuring/reading/recording frequency:	Continuously, (reported annually)
Calculation method (if applicable):	N/A

QA/QC procedures:	Sales records will be scrutinised by the SO to avoid double-counting and the CME will also conduct spot-checks to verify the legitimacy of such records. SOs will verify the stoves put into use based on the ICS sales during the month through telephone surveys or physical inspection/verification or third party monitoring events. These monitoring events may include a record of one or a combination of the following activities or events: (a) Customer inspections resulting from loan or hire purchase agreements (b) Double verified records of community-based stove monitoring staff (c) Independent monitoring verification exercises organised by the CME. This will provide the date on which the stove is put into use for the first time and will be used as the start date for the computation of certified emission reductions. CPAs will send duplicate copies of sales agreements to ICSEA for verification of the data entered into the sales database. This will also provide the date on which the operational stove started using renewable biomass for the first time and will be used as the start date for the computation of certified emission reductions. CPAs will send duplicate copies of sales agreements to ICSEA for verification of the data entered into the sales database. Telephone checks and spot checks will be used by the CME to review and authenticate the data in the sales database. An ICS not found to be in use during the course of the monitoring period, will be suspended from the sales database until it is verified to be in use. If it is not found to be in use before the annual verification, it will not be included in the sales database and will not earn carbon credits for that monitoring period. This data will also be used to determine the number of ICS installed in the CPA. An operational ICS not found to be using renewable biomass after having being identified by the SO under its standard operating procedures as one that has shifted its fuel use from non-renewable to renewable biomass, shall only be included in the sales database as ICS applying AMS-II.G.
Purpose of data:	Calculation of baseline emissions
Additional comments:	This CPA did not apply AMS-I.E. this monitoring period.

Relevant SDG Indicator	SDG 13 – Take urgent action to combat climate change and its impacts. Indicator: ICS Quality
Data/parameter:	$U_{(i,j)}$
Unit	Fraction
Description	The fraction by which emission reductions are multiplied to obtain an assessment adjusted for drop off of ICS in use per cohort year. A cohort is defined as the ICS model distributed or gone through maintenance in the same year.
Measured/calculated/default	Measured.
Source of data	Survey of ICS users for the total population using simple random sampling method.
Value(s) of monitored parameter	1.0
Monitoring equipment	Household Usage Questionnaire
Measuring/reading/recording frequency:	Biennial
Calculation method (if applicable):	This factor addresses the leakage to be considered as per AMS II.G./Version 03 clause 14 if equipment currently being utilised is transferred from outside the boundary to the project activity. Monitoring the statistically adjusted drop off involves two steps: Step 1: Sample survey amongst Rural Wood Stove ICS deployed Step 2: Calculation of the adjusted drop off rate at 95% confidence level and 5% precision (biennial inspections) using an estimated usage rate of 99% for built-in stoves that was derived from ICSEA's Monitoring Period 1 usage rate of 95% for portable stoves. The drop off fraction was determined through interviews during the household usage survey performed by the dedicated monitoring team and enumerators. All questionnaires and information gathered during the sampling were analysed and entered into the electronic drop off analysis database by Improved Cook Stoves for East Africa (ICSEA) Limited monitoring team.

QA/QC procedures:	Usage monitoring was performed by Improved Cook Stoves for East Africa (ICSEA) Limited following the CDM-EB50-A30-STAN Standard Sampling and surveys for CDM project activities and programmes of activities Version 08.0
Purpose of data:	Emission reduction calculation
Additional comments:	N/A

Relevant SDG Indicator	SDG 13 – Take urgent action to combat climate change and its impacts. Indicator: ICS Quality
Data/parameter:	$U_{(i,j)}$ AMS-I.E
Unit	Fraction
Description	The fraction by which emission reductions are multiplied to obtain an adjustment for drop off of ICS in use per cohort year that are using renewable biomass. A cohort is defined as the ICS model sold or gone through maintenance in the same year.
Measured/calculated/default	Measured. The SO keeps a paper and electronic record and a survey is done at least biennially in order to assess the operational ICS use of renewable biomass. This factor addresses the leakage to be considered as per AMS-I.E/Version 06.
Source of data	Survey of ICS users per cohort that use renewable biomass as the main source of fuel, using sampling methods.
Value(s) of monitored parameter	N/A
Monitoring equipment	Usage Survey
Measuring/reading/recording frequency:	Biennial
Calculation method (if applicable):	N/A
QA/QC procedures:	Usage monitoring will be performed by the CME and/or by an authorised organisation designated by the CME following the sampling plan. In all cases cross-checking procedures appropriate to the monitoring choice will be undertaken.
Purpose of data:	Calculation of leakage emissions
Additional comments:	This CPA did not apply AMS-I.E. this monitoring period.

Relevant SDG Indicator	SDG13 – Take urgent action to combat climate change and its impacts. Indicator: ICS Quality
Data/parameter:	Adjustment factor for the continued use of traditional stoves
Unit	Fraction
Description	This accounts for the exclusion of the fuel wood consumption of baseline stoves from the ER calculation in accordance with Section B.6.1. of the included CPA-DD requiring a conservative approach to be taken regarding the replacement of traditional stoves (AMS-II.G. Version 03, clause 15).
Measured/calculated/default	Calculated. See sheet “Baseline Stove Use” in the Excel spreadsheet “RDIS ER Calculation”
Source of data	Usage survey
Value(s) of monitored parameter	0.99972
Monitoring equipment	N/A
Measuring/reading/recording frequency:	Biennial
Calculation method (if applicable):	See sheet “Baseline Stove Use” in the Excel spreadsheet “RDIS ER Calculation”
QA/QC procedures:	N/A
Purpose of data:	Emission reduction calculation
Additional comments:	N/A

Relevant SDG Indicator	SDG 13 – Take urgent action to combat climate change and its impacts. Indicator: ICS Quality
Data/parameter:	$Q_{\text{Renewable Biomass},y}$
Unit	Tonnes/Stove/year
Description	Quantity of renewable biomass used in project ICS
Measured/calculated/default	Measured. The SO keeps a paper and electronic record.
Source of data	Survey of ICS users per cohort using sampling methods.
Value(s) of monitored parameter	N/A

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Monitoring equipment	Survey.
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	N/A
QA/QC procedures:	Survey follows sampling guidelines
Purpose of data:	Calculation of baseline emissions
Additional comments:	The survey will identify the share of days or cooking events where RB was used for cooking in the monitoring period. This CPA did not use any RB this monitoring period.

Relevant SDG Indicator	SDG 13 – Take urgent action to combat climate change and its impacts. Indicator: ICS Quality
Data/parameter:	$C_{y,fueltype,region,old}$
Unit	tonnes/year
Description	Quantity of woody biomass used in the absence of the project activity in tonnes per type of ICS within a region.
Measured/calculated/default	Measured.
Source of data	A survey of local usage or historical data.
Value(s) of monitored parameter	N/A
Monitoring equipment	Survey.
Measuring/reading/recording frequency:	Once at first verification
Calculation method (if applicable):	N/A
QA/QC procedures:	Survey follows sampling guidelines
Purpose of data:	Calculation of baseline emissions

Additional comments:	Only applicable for calculations of ER as per AMS-II.G (version 03). This parameter is only applicable for institutional cook stoves to be distributed under this CPA. Since the value was not available at the time of validation, the parameter will be monitored and its value shall be provided only when institutional cook stoves begin to be implemented under this CPA. This CPA did not distribute institutional cook stoves this monitoring period.
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Relevant SDG Indicator	SDG 13 – Take urgent action to combat climate change and its impacts. Indicator: ICS Quality
Data/parameter:	$\eta_{old,i}$
Unit	Fraction
Description	Efficiency of the baseline institutional stove being replaced
Measured/calculated/default	Default value according to the methodology may apply, or results from testing in a laboratory may apply.
Source of data	Representative sampling testing based on Water Boiling Tests or any other test approved by the UNFCCC, referenced literature or default values according to the methodology AMS II.G (version 03) and AMS-I.E (version 06.0).
Value(s) of monitored parameter	N/A
Monitoring equipment	N/A
Measuring/reading/recording frequency:	Once at first verification
Calculation method (if applicable):	N/A
QA/QC procedures:	Survey follows sampling guidelines
Purpose of data:	Calculation of baseline emissions

Additional comments:	This parameter may or not may be reported according to the option selected at CPA level for the estimation of emission reductions. Data to be reported if option 2 of AMS-II.G (version 03) is chosen is chosen. This parameter is only applicable for institutional cook stoves to be distributed under this CPA. Since the value was not available at the time of validation, the parameter will be monitored and its value shall be provided only when institutional cook stoves begin to be implemented under this CPA. This CPA did not distribute institutional cook stoves this monitoring period.
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D.3. Implementation of sampling plan

(a) Description of implemented sampling design

Improved Cook Stoves for East Africa (ICSEA) Limited chose in advance a sampling approach for its drop off check and efficiency check.(see Section C.3 (Sample Surveys) in which Option 3 was chosen by Improved Cook Stoves for East Africa (ICSEA) Limited). This was based on the estimated monitoring costs and the CPA's existing monitoring/tracking system in Rwanda. This was in compliance with the plans contained in the PoA-DD and CPA DD by using simple random sampling based on 95/5 confidence/precision, and in conformity with the sampling plan. The minimum sample sizes for the different scenarios required to meet the confidence and precision requirements were calculated in a sample size computation spreadsheet using the usage figure of 99%. Previous monitoring from ICSEA's Monitoring Period 1 showed a 95% Usage rate for portable stoves, so the expected usage rate for built-in stoves was set at 99%. After monitoring, as reported in (c) below, the actual usage rate was 100%.

The overall objective was to estimate the emission reductions during a 24-month period in tCO₂ during the crediting period, and with a 95/5 confidence/precision, and to estimate the mean thermal efficiency of the Rural Wood ICS with a 95/5 confidence/precision.

Simple random sampling was used. The target population was the 5,033 Rural Wood ICS distributed by the SO in Muhanga, Nyamagabe, Rusizi and Gisagara districts of Rwanda, from its project start date on 14/06/2017 until the end of this Monitoring Period on 16/08/2019.

The required sample size for the stove usage survey was determined using the equation in the PoA-DD and CPA-DD for estimating the sample size:

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$$n \geq \frac{1.96^2 NV}{(N-1)X0.05^2 + 1.96^2 V}$$

Where $V = \frac{p(1-p)}{p^2}$ and p is the expected proportion

n	Sample size
N	Population total
p	Our expected proportion
1.96	Represents the 95% confidence required
0.05	Represents the 5% relative precision

These sample size values in the "RDIS ER Calculation spreadsheet were for the parameters $N_{(i,j)}$; $U_{(i,j)}$; $t_{fraction,(i,j)}$; and **Adjusted Factor for Continued Use of Baseline Stove**:

n	16 stoves, but 33 stoves were sampled.
N	5,033
p	99% (for built-in stoves was derived from Monitoring Period 1 Usage rate of 95% for portable stoves)
1.960	Represents the 95% confidence required
0.05	Represents the 5% relative precision

A random sample was made from the internally verified Excel spreadsheet records of 5,033 ICS. This was the total number of stoves distributed and found in use in this monitoring period. This was done using a computerised random number generator from <http://stattrek.com/statistics/random-number-generator.aspx>

By filling in 150 random numbers, the minimum value (1) and maximum value (5,033) and clicking on the calculate button, the 150 random numbers were automatically generated. The numbers generated correspond to the entry numbers in the database. These numbers were then matched with the corresponding stove serial number in the database by using the VLOOKUP tool. This tool uses the column that has the random numbers generated to match the entry number and the corresponding stove serial number. The required sample size as per the confidence/precision of 95/5 was 16, but 33 samples were surveyed in accordance with the CDM-EB50-A30-STAN Standard Sampling and Surveys for CDM Project Activities and Programmes of Activities version 08.0. The Household Usage Questionnaires were provided to Improved Cook Stoves for East Africa (ICSEA) Limited's team of enumerators, and Improved Cook Stoves for East Africa (ICSEA) Limited trained the team of enumerators before the enumerators conducted the household usage survey at the household locations. The purpose of the survey was to account for the continued use of baseline appliances and to determine the drop off rate as described in the CPA-DD page 43.

The Household Usage Questionnaire with 31 questions was administered to the 33 stove users where the RDIS Rural Wood ICS were located. The purpose of the survey was to support the monitoring of parameters in accordance with the registered PoA-DD and CPA-DD, namely:

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1. $U_{(i,j)}$ - The fraction by which emission reductions are multiplied to obtain an assessment adjusted for drop off of ICS in use per cohort year. A cohort is defined as the ICS model distributed or gone through maintenance in the same year.
2. $N_{(i,j)}$ - Number of ICS units distributed
3. $t_{fraction,(i,j)}$ - Fraction of the days in use in year y of a single ICS deployed
4. **Adjustment factor for the continued use of traditional stoves** - This accounts for the exclusion of the fuel wood consumption of baseline stoves from the ER calculation in accordance with Section B.6.1. of the included CPA-DD requiring a conservative approach to be taken regarding the replacement of traditional stoves (AMS-II.G. Version 03, clause 15).

In all cases stoves were found in use in domestic households, and no commercial uses of the stove were found.

The required sample size for the stove **efficiency check** was determined using the equation in the PoA-DD and CPA-DD for estimating the sample size in a single age cohort since all stoves that were in use for over 12 months had been maintained by the SO. Estimating the sample size was in accordance with the applied AMS-II.G version 03 and the CDM-EB50-A30-STAN - Standard Sampling and surveys for CDM project activities and programmes of activities Version 08.0.

$$n \geq \frac{1.96^2 NV}{(N-1) \times 0.05^2 + 1.96^2 V}$$

Where $V = \left(\frac{SD}{Mean} \right)^2$

n	Sample size
N	Total number of ICS in use
Mean	Our expected standard deviation
1.96	Represents the 95% confidence required
0.05	Represents the 5% relative precision

These sample size values in the "RDIS ER Calculation spreadsheet were for the parameter η_{new} :

n	2 stoves, but 11 stoves were sampled.
N	5,033
Mean	28.59%
SD	1.51
1.960	Represents the 95% confidence require
0.05	Represents the 5% relative precision

Improved Cook Stoves for East Africa (ICSEA) Limited Monitoring Manager drew a random sample from the internally verified Excel spreadsheet records of 5,033 ICS, which was the total number of stoves distributed till the end of this monitoring period. This was done by using a computerised random number generator from <http://stattrek.com/statistics/random-number-generator.aspx>

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By filling in 150 random numbers, the minimum value (1) and maximum value (5,033) and clicking on the calculate button, the 150 random numbers were automatically generated. The numbers generated correspond to the entry numbers in the database. These numbers were then matched with the corresponding stove serial number in the database by using the VLOOKUP tool. This tool uses the column that has the random numbers generated to match the entry number and the corresponding stove serial number. The required sample size as per the confidence/precision of 95/5 was 2, but 11 stoves were tested by the ICSEA-authorized stove testing laboratory team in the laboratory from 28/10/2019 to 05/11/2019.

In all cases stoves were found in use in domestic households, and no commercial uses of any of the stoves was found.

(b) Collected data (electronic spreadsheets may be attached and referenced)

The primary means of monitoring the CPA's activities is by means of stove user information collected through Sales Agreements/Logbook sheets and the unique numbering of each Rural Wood ICS. The sales data was stored in the CPA's Excel database.

(c) Analysis of the collected data

Parameter	n*	Value**	Standard Deviation***	Confidence	Precision Achieved
η_{new}	11	28.59%	1.51	95%	3.5%
N	33	100%	N/A	95%	3.4%
U	33	100%	N/A	95%	3.4%
t_{fraction}	33	1.00	N/A	95%	3.4%
Applied Weighted Factor for Continued Use of Baseline	33	99.972%	N/A	95%	3.4%
$U_{\text{AMS-I.E}}$	N/A	N/A	N/A	N/A	N/A
$t_{\text{fraction, AMS-I.E}}$	N/A	N/A	N/A	N/A	N/A
$Q_{\text{Renewable Biomass}}$	N/A	N/A	N/A	N/A	N/A

* valid responses

** from laboratory tests and usage survey. Refer to sheets "Efficiency tests – 1 age cohort", "Stove Usage", and "Baseline Stove Use" in the spreadsheet "RDIS ER Calculation" (Appendix 1).

*** from laboratory tests. Refer to sheet "Efficiency test – 1 age cohort" in the spreadsheet "RDIS ER Calculation" (Appendix 1).

(d) Demonstration on whether the required confidence/precision has been met

In all the above parameters monitored, the required confidence/precision was met.

SECTION E. Calculation of SDG outcomes

E.1. Calculation of baseline value or estimation of baseline situation of each SDG outcome

Equations used for the calculation of emission reductions, in line with AMS-II.G Version 03:

Equation 1) ER_y is calculated as follows:

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

Where:

$ER_{monitoring\ period}$ Emission reductions during the monitoring period in tCO₂e

$B_{y,savings}$ Quantity of woody biomass that is saved in tonnes

$f_{NRB,y}$ Fraction of non-renewable biomass

$NCV_{biomass}$ Net calorific value of the non-renewable woody biomass that is substituted. The IPCC default for wood fuel, 0.015 TJ/tonne is applied

$EF_{projected-fossilfuel}$ Emission factor for the substitution of non-renewable woody biomass by similar consumers. As per methodology, a value of 81.6 tCO₂/TJ is employed.

Equation 2) $B_{y,savings,(i,j)}$ compares the efficiency of the baseline stove against the efficiency of the ICS deployed and is calculated per model and cohort of ICS as the savings directly depend on the efficiencies of each model and cohort of ICS, as follows:

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

Where:

i Model of ICS

j Cohort for each model of ICS. A cohort is defined as the ICS model sold or gone through maintenance in the same monitoring period

$B_{y,savings}$ Quantity of woody biomass that is saved in tonnes per model and cohort of ICS

$B_{old,(i,j)}$ Quantity of woody biomass used in the absence of the project activity in tonnes per model and cohort of ICS

$\eta_{old,(i,j)}$ Efficiency of the baseline systems being replaced, measured using representative sampling methods or based on referenced literature values (fraction), use weighted average values if more than one type of system is being replaced. A default value of 10% was used because the replaced systems were three stone fires, or conventional systems with no improved combustion air supply or flue gas ventilation systems (i.e without a grate as well as a chimney; for other types of systems.

$\eta_{new,(i,j)}$ Efficiency of the systems being deployed as determined using the Water Boiling Test (WBT) protocol. Measured using weighted average values if more than one type of system is being introduced by the project activity.

Equation 3) $B_{old,(i,j)}$ is calculated as the product of the number of systems multiplied by the estimated average annual consumption of woody biomass per appliance (tonnes/year), as follows:

$$B_{old} = N * C_{y,fueltype,region,old} * L$$

Where:

$N_{(i,j)}$ Number of systems per cohort and ICS model

$C_{y,fueltype,region,old}$ Estimate of average annual consumption of woody biomass per appliance (tonnes/year) derived from a survey of local usage

$L_{(i,j)}$ Leakage, the fraction by which emission reductions are multiplied to obtain an assessment adjusted for leakage risks

Equation 4) $N_{(i,j)}$ is determined as the fraction of days in a year in use for each ICS of the same model and cohort, by the fraction of these ICS to be still in use per cohort and ICS model, as follows:

$$N = U * t_{fraction}$$

Where:

$U_{(i,j)}$ Usage, the fraction to adjust for drop off of ICS per cohort and ICS model

$t_{fraction,y,(i,j)}$ Fraction of the days in use in monitoring period of a single ICS deployed per cohort and ICS model

Equation 5) The total number of emission reductions achieved in each CPA is calculated as the sum of the emission reductions achieved by all ICS of a single cohort and model, multiplied by the applied weighted factor for continued use of the baseline, as follows:

$$ER_{total} = ER_{all\ ICS} * U_{Adjustment\ for\ continued\ use\ of\ baseline\ stoves}$$

Where:

$ER_{y(i,j)}$ Sum of the emission reductions achieved by all ICS of a single cohort (all stoves that were in use for over 12 months were maintained to as good as new condition) and single model

$U_{Adjustment\ for\ continued\ use\ of\ baseline\ stoves}$ Applied weighted factor for continued use of the baseline, calculated from responses of a sample of households who participated in the household usage surveys.

$RDIS\ Rwanda\ CPA\ 1\ ER_{5,033\ ICS} = 7,635 * 100\% = 7,635\ tCO_2e$

Related breakdown of ERs per year were as follows:

Vintage	CER amount for GS labelling	Serial Number Start	Serial Number End
(01/01/2016) to (31/12/2016)	0	-	-
(01/01/2017) to (31/12/2017)	133	RW-5-1459975-2-2-0-7014	RW-5-1460107-2-2-0-7014
(01/01/2018) to (31/12/2018)	3,845	RW-5-1460108-2-2-0-7014	RW-5-1463952-2-2-0-7014
(01/01/2019) to (16/08/2019)	3,657	RW-5-1463953-2-2-0-7014	RW-5-1467609-2-2-0-7014

See ER sheet "RDIS ER Calculation sheet"

E.2. Calculation of project value or estimation of project situation of each SDG outcome

Not applicable, as methodology AMS-II.G. Version 12 does not consider project emissions or actual net removals.

E.3. Calculation of net benefits as difference of baseline and project values or direct calculation for each SDG outcome

Leakage Adjustment Factor $L(i,j)$ as per the methodology is applied to the project activity to calculate the Emission Reductions for this Monitoring Period.

In accordance with AMS-II.G Version 12 clause 23, a default value of 95% has been used.

See ER sheet "RDIS ER Calculation sheet"

E.4. Summary of ex-post values of each SDG outcome for the current monitoring period

Item	Baseline estimate	Project estimate	Net benefit
SDG 13 – Climate Action	7,635 tCO ₂ e	0	7,635 tCO ₂ e
SDG 3	100%	-	100%
SDG 7	5,033	N/A	5,033 ICS

E.5. Comparison of actual value of outcomes with estimates in approved PDD

Item	Values estimated in ex ante calculation of approved PDD	Actual values achieved during this monitoring period
SDG 13 – Climate Action	129,645 tCO ₂ e	7,635 tCO ₂ e
SDG 3	100	100%
SDG 7	28,775	5,033

E.6. Remarks on difference from estimated value in approved PDD

>>

Applying AMS-II.G. only, this CPA was expected to generate an average of 46,471 tCO₂e per year based on a maximum N_y of 28,775 ICS (see page 3 of the CPA-DD and footnotes 1 & 2 that states “These values can change during the course of actual implementation as long as the CPA reaches the threshold defined in the applied methodology under which the stove falls.”).

Related breakdown of ERs ex ante per year (CPA-DD Section D.6.4, page 34) were as follows:

YR 1: 01/11/2016 to 31/10/2017: 46,471 tCO₂e

YR 2: 01/11/2017 to 31/10/2018: 46,471 tCO₂e

YR 3: 01/11/2018 to 16/08/2019 are 289 days

46,471 tCO₂e / 365 days = 127 tCO₂e per day

127 tCO₂e x 289 days = 36,703 tCO₂e

Total ERs YR 1 + YR 2 + YR 3 = 129,645 tCO₂e

Actual ERs generated were 7,635 tCO₂e. The ERs generated were less than the ERs that were expected for the following reasons:

The later than expected start and the delay caused by the need for the training of CPA staff meant that it only successfully distributed and tracked 5,033 ICS from 14/06/2017 to 16/08/2019, and carried out maintenance visits on stoves that exceeded 12 months of use, bringing them to as good as new condition, where required.

Related breakdown of ERs per year were as follows:

Vintage	CER amount for GS labelling	Serial Number Start	Serial Number End
(01/01/2016) to (31/12/2016)	0	-	-
(01/01/2017) to (31/12/2017)	133	RW-5-1459975-2-2-0-7014	RW-5-1460107-2-2-0-7014
(01/01/2018) to (31/12/2018)	3,845	RW-5-1460108-2-2-0-7014	RW-5-1463952-2-2-0-7014
(01/01/2019) to (16/08/2019)	3,657	RW-5-1463953-2-2-0-7014	RW-5-1467609-2-2-0-7014

See ER sheet "RDIS ER Calculation sheet"

SECTION F. Stakeholder inputs and legal disputes

F.1. List all inputs/grievances which have been received for the project during the monitoring period together with their respective answers/actions

>>No inputs/grievances have been received for the project during the monitoring period.

F.2. List all inputs/grievances from previous monitoring period where follow up action is to be verified in this monitoring period

>>No inputs/grievances from previous monitoring period where follow up action is to be verified in this monitoring period.

F.3. Provide details of any legal contest or dispute that has arisen with the project during the monitoring period

>>No legal contest or dispute has arisen with the project during the monitoring period.

Example of a Sales Agreement/Logbook sheet.

ICSEA COPY		1553	
GIFT BENEFICIARY Name: _____ Phone no.1: _____ Phone no.2: _____ E-mail: _____ Village/Umutugudu: _____ Cell: _____ Sector: _____ District: _____ Signature: _____ (on behalf of Beneficiary) _____			
1st TRANSFER Name: _____ Phone no.1: _____ Phone no.2: _____ E-mail: _____ Village/Umutugudu: _____ Cell: _____ Sector: _____ District: _____ Signature: _____ (on behalf of Beneficiary) _____ Date: ____/____/____ Official Stamp			
2nd TRANSFER Name: _____ Phone no.1: _____ Phone no.2: _____ E-mail: _____ Village/Umutugudu: _____ Cell: _____ Sector: _____ District: _____ Signature: _____ (on behalf of Beneficiary) _____ Date: ____/____/____ Official Stamp			
SALES AGREEMENT/LOGBOOK RDIS Rural Development Inter-District Service A Heavy Based in a Healthy Body P.O. Box 142 Mubanga - Rwanda office@rdis.org.rw www.rdis.org.rw			
STOVE SERIAL NUMBER: <u>RDIS 4101</u> BRAND/MODEL: <u>RDIS RWS</u> SALES DATE: <u>06/06/2018</u> PUT IN USE DATE: <u>15/06/2018</u>			
Fuel: Wood ☒ Charcoal ☐ Briquettes ☐ Type: Household ☒ Institutional ☐ Size/Capacity: <u>MEDIUM</u> Portable ☐ In-built ☒ Stove Price: <u>FREE</u> Chimney: Yes ☐ No ☒			
Stove User / Institution Name: <u>UMAHALIYA MARIE CLAIRE</u>			
Land Line: _____ Mobile: <u>0722841783</u>			
E-Mail: _____			
Address: _____			
Village/Umutugudu: <u>TORERO</u> Cell: <u>KIBIRIZI</u>			
Sector: <u>KIBIRIZI</u> District: <u>GISAGARA</u>			
Stove GPS Coordinates: _____			
Directions to home/institution (Landmark such as church, police station, hospital, etc.): <u>NEAR KIBIRIZI SECTOR OFFICE</u>			
Member Number: _____		Stove User's Signature: _____	
RDIS Officer/Distributor Name: <u>RWAGAHUNGU ANNE</u>		Signature: _____	