Monitoring report form for CDM programme of activities

(Version 03.0)

MONITORING REPORT		
Title of the PoA	Improved Cooking Stove Programme in Burundi supported by Republic of Korea	
UNFCCC reference number of the PoA	UNFCCC Reference number: 10474	
Version numbers of the PoA-DD applicable to this monitoring report	1.2	
Version number of this monitoring report	1.2	
Completion date of this monitoring report	28/09/2020	
Monitoring period number	2	
Duration of this monitoring period	16/09/2019 - 30/04/2020	
Monitoring report number for this monitoring period	n/a	
Coordinating/managing entity	ECOEYE CO., LTD.	
Host Parties	Host Party of the PoA	Is this the host Party of a CPA covered in this monitoring report? (yes/no)
	Burundi	Yes
Applied methodologies and standardized baselines	AMS-II.G. : “Energy efficiency measures in thermal applications of non-renewable biomass” (Version 10.0)	
Sectoral scopes	Sectoral Scope 3 – Energy Demand	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by all CPAs covered in this monitoring report in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	-	81,469 tCO2e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the CPA-DDs for the CPAs covered in this monitoring report	269,290 tCO2e	

PART I Monitoring of programme of activities (PoA)

SECTION A. Description of PoA

A.1. General description of PoA

The purpose of the PoA and its Component Project Activities (CPAs) is to mitigate climate change and contribute to sustainable development in Burundi.

According to the information gathered by Global Forest Watch, from 2001 to 2017, Burundi lost 22,400 ha of tree cover, equivalent to a 4.2% decrease and 1.83Mt of CO_2 emissions[1]. Rapid population growth has been a major contributing factor of deforestation through land use change for farming and because of household dependence on wood for fuel as a source of energy for the vast majority, as poverty reaches nearly 77 percent of the population (living with less than US$1.90 per day)[2].

CPA implementers manufacture and install affordable Improved Cooking Stoves (ICSs) to end-users in Burundi in replacement of traditional cooking stoves. Because ICSs are more efficient than traditional cooking stoves, users save non-renewable wood fuel during cooking leading to greenhouse gas (GHG) emission reductions and mitigating climate change.

Since there are neither laws nor regulations in Burundi that require the distribution and use of ICS whatsoever, the PoA is a voluntary action.

As ICS is relatively more expensive than traditional stoves, most households can't afford to buy ICSs. In order to implement this program, stove subsidy and operational cost support are vital. Ecoeye Co., Ltd., and other Korean Companies have fully financed all improved cooking stoves distributed to the households.

A.1.1. Corresponding generic component project activities (CPAs)

Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Sectoral scopes	Applied methodologies and standardized baselines
Title: Improved Cooking Stoves Programme in Burundi supported by Republic of Korea –CPA [XXX] Reference number of the corresponding generic CPA: Generic CPA [XXX]	1.2	Sectoral Scope 3 – Energy Demand	AMS-II.G. "Energy efficiency measures in thermal applications of non-renewable biomass" Version 10.0

A.1.2. CPAs included in the PoA

Title and UNFCCC reference number of the CPA	Version of the PoA-DD	Title and reference number of the corresponding generic CPA	Crediting period type and duration	Covered in this monitoring report? (yes/no)
Improved Cooking Stoves Programme in Burundi supported by Republic of Korea – CPA1 Ref.: 10474-P1-0001-CP1	1.2	Title: Improved Cooking Stoves Programme in Burundi supported by Republic of Korea –CPA [XXX] Reference number of the corresponding generic CPA: Generic CPA [XXX]	Type: Renewable Duration: 7 years (84 months: 10/09/2019-	Yes

[1] www.globalforestwatch.org/dashboards/country/BDI

[2] World Bank report, 2018

			09/09/2026)	

A.2. Coordinating/managing entity

ECOEYE CO., LTD.

SECTION B. Implementation of PoA

B.1. Description of implemented PoA

Management System

The operational and management system for the implementation of the CDM PoA includes the following:

(a) Definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies

Table 1: *Personnel, responsibilities and competencies*

Personnel	Responsibilities in inclusion process	Competencies
PoA manager/ CME & carbon finance investor	- Finance the implementation of the PoA -Contact with CPA implementer -Review CPA according to PoA eligibility criteria -Prepare and sign agreement for CPA inclusion between CME and CPA implementer -Notify CPA implementer of submission of CPA-DD to DOE for validation and inclusion -Decide on CPA inclusion and notify CPA implementer -Assess additionality and eligibility of CPA against documents provided by CPA implementer -Control work of all subcontractors undertaking critical activities on behalf of CME	-Competencies • to check and apply relevant principles, procedures, techniques and all features for CPA inclusion, verification, review and approval • to ensure that each CPA meets all requirements and eligibility criteria for inclusion of CPAs in the proposed PoA before its inclusion • to plan and make effective use of resources; • to organise work effectively -Knowledge of specific technical and methodological CDM methodological aspects -Ability to obtain from third parties the desired outcomes
CPA Implementer(s)	-Carry out Local Stakeholder Consultation (LSC) -Provide evidence for CPA eligibility under the PoA including CPA-DD and emission reduction calculations -Implement CPA -Facilitate, support and cooperate the CME and Carbon Consultant during CPA inclusion and verification process	-Understanding of CME and carbon consultant needs -Knowledge of all technicalities of CPA and general CDM technical and methodological aspects
CPA carbon consultant	-Assist CME and CPA implementer to reach CPA inclusion through the following, among others, • carry out LSC • draft CPA-DD and emission reduction calculations • organize CDM on-site visit with DOE and stakeholder consultation • follow up - Assist CME and CPA implementer to reach verification of emission reductions after CPA inclusion, including • conduct training in monitoring of data, • write monitoring reports	-Knowledge of specific CDM technical and methodological aspects -Ability to plan and organize the work effectively and in the agreed timeframe, to prioritize and focus on matters of significance -Ability to prepare the relevant reports and handle all follow up actions

Monitoring team (after CPA inclusion)	On behalf of the CPA implementer: -Implement monitoring plan -Collect and check monitoring data -Implement a monitoring database.	-Competencies on monitoring equipment, data collection, recording and reporting.

Besides the responsibilities mentioned in the table above, the CME is responsible for
- contracting the DOE to conduct validation of CPA and verification of emission reductions,
- finding and contracting CER buyers and distributing CER revenues to CPA implementers (if applicable),
- contracting CPA implementers.

Potential CPA implementers have to sign an agreement with the CME, in which they cede rights to sell CERs generated by their respective CPA to the CME. The standard contract also outlines the conditions of participation in the PoA and the CDM procedures that have to be respected in this regard, so that the CPA implementer is aware of and agrees to the inclusion of the project activity in the PoA.

Finally, end-users sign a sales agreement, which contains user information, rights and commitments (cf. sub-section (e) for details).

(b) Records of arrangements for training and capacity development for personnel

The CME shall support training and capacity building for its own personnel and CPA implementers, based on any identified needs, and keeps records of the trainings.

(c) Procedures for technical review of inclusion of CPAs

The technical review procedure by the CME for CPA inclusion includes the following main steps:

1. Verify that all eligibility criteria for inclusion in the PoA are met and all corresponding document evidence is provided.
2. Check the procedure to avoid double counting (see below).
3. Check if all supporting documentation quoted in CPA-DD is in accordance with PoA-DD.
4. Check emission reduction calculation.
5. Approve/refuse draft CPA-DD.
6. Deliver CME approval and agreement /refusal for CPA inclusion.
7. Submit CPA-DD to the DOE and CDM Executive Board.
8. Inform about inclusion of the CPA in the PoA as per DOE and CDM Executive Board decision.

(d) Procedure and system to avoid double accounting

The PoA is not registered under any other carbon credit certification scheme than the CDM.

Prior to the implementation of each CPA, the CPA implementer enters into a binding general contract with the CME concerning their relationship. By signing the contract, the CPA implementer also approves a clause, which states that the CPA under consideration is neither registered as a CDM project activity, included or in the process of being included under another PoA, nor a deregistered project activity (cf. eligibility criteria in section K) and that they cannot sell the emission reductions of the CPA under another PoA.

Before including a CPA in the PoA, the eligibility criteria require the CPA implementer to prove that the sold ICS is uniquely marked by a serial number and/or logo and recorded electronically as described in sub-section (e) below. The serial number assigned to the stove belongs to one end-user only, and shall be uniquely attributed to every stove as per below format:

O[#PROD].XXXXXX

Where:
O = OBEN CDM-PoA
[#PROD] = production site identification number (e.g. 1BUJ : Bujumbura site 1, 3NGO : Ngozi site 3, 2GIT : Gitega site 2 etc.)
XXXXXX = unique stove ID (e.g. 139120)

The recording and documentation procedures allow the CME to check the materiality of the claimed sales.

The unique serial numbers should also ensure that no confusion arises with other projects in the country involving ICSs, (besides the fact that subsequent CPAs in this PoA shall not cover the same geographical boundaries or disseminate stoves from the same production sites to avoid any infringement).

Original sales agreements (with ICS serial number and buyer contact details) are stored and used to crosscheck the electronic database transmitted by the CPA implementers. It allows the CME to check periodically the materiality of the claimed sales and identify buyers of stoves.

Finally, during technical review of CPA, compliance team shall consult the UNFCCC website in order to make sure that the considered CPA is neither included under another PoA with similar scope within the borders of the PoA, nor in the process of being included.

(e) Controlling of records and documentation for each CPA under the PoA

For every ICS sold, sales records are kept. These records shall enable third parties to verify that sales have indeed occurred and stoves are used by target end users (households communities) in specific areas targeted by the CPAs throughout Burundi.

Sales agreements between the CPA implementer and the end user or the retailer shall contain at least the following information:

- Name of PoA or CPA
- User group membership (if applicable, e.g. household)
- Date (and location) of purchase
- Stove model
- Unique serial number or logo of the stove
- Name of customer/retailer and contact details (address & phone number if applicable)
- Clauses to transfer carbon rights from user to the CPA implementer3, to scrap the previously used traditional cooking stove.

The CPA implementer collects this data through sales persons or retailers, compiles it in an electronic database, which he regularly transmits to the CME. The CPA implementer also transmits electronic copies of the sales agreements to the CME, who archives them in a safe location while the CPA implementer keeps the hard copies. The CME cross-checks the electronic database with transmitted sales agreements, in particular for correctness and to avoid double-counting.

(f) Measures for continuous improvements of the PoA management system

Regular meetings are held on:
-Review of latest developments and events: notably the development of regulartory requirements on behalf of CDM Executive Board, but also meetings of the Project Developer Forum, political discussion on post-2020 introduction of sustainable development mechanism,

[3] *The carbon rights transfer is a non-negotiable condition of participation in the PoA, which is continuously communicated to ICS purchasers from local stakeholder consultation through sales agreements with end-users and sales modalities with retailers.*

-Recurring issues related to the inclusion process: As of today, only one CPA has been included. There have been no major issues during the first inclusion process.[4]
-Feedback from the CPA implementers: Discussions between CME and CPA1 implementer revealed that it would be useful to phase out the use of hard-copy sales agreements and to introduce a new user registration system through mobile phone devices. Furthermore, serial numbers of stoves should rather be engraved into the stove *before* burning the stove so that the serial numbers become clearly visible afterwards. Most users requested to fix their mobiles stoves after purchase.
-Potential improvements to be implemented until next meeting.

B.2. Post-registration changes to PoA

B.2.1. Corrections

n/a

B.2.2. Inclusion of monitoring plan

n/a

B.2.3. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

n/a

B.2.4. Changes to programme design

n/a

B.2.5. Changes specific to afforestation or reforestation activities

n/a

PART II Monitoring of CPAs

Improved Cooking Stoves Programme in Burundi supported by Republic of Korea – CPA1

SECTION C. Implementation of CPAs

C.1. Description of implemented CPAs

The purpose of the CPA is to combat climate change and contribute to sustainable development of Burundi, by reducing non-renewable wood fuel consumption and greenhouse gas (GHG) emissions of household users in rural and/or peri-urban areas of Burundi by selling affordable Improved Cooking Stoves (ICSs) in replacement of traditional wood stoves.

[4] Cf. also validation report of CPA1:

https://cdm.unfccc.int/ProgrammeOfActivities/cpa_db/R5MF4X6GWEJY8CVS9317ADKB2NUHTP/view

In the baseline scenario, *households* continue to using non-renewable biomass in traditional cooking stoves. An ICS combusts wood fuel more efficiently, i.e. requires less firewood than a traditional stove. This reduces CO_2 emissions.

CPA001 thus aims to reduce non-renewable wood fuel consumption and greenhouse gas (GHG) emissions of *households* (hereafter also "end-users") in the *rural and peri-urban regions* of Burundi.

The ICS distributed under CPA0001 is the so called Jiko Matawi stove, a Tanzanian-design moulded from fermented clay which is dried through high temperatures in a kiln to reinforce its properties including high thermo efficiency and durability. It is a multi-purpose stove capable of using both firewood and charcoal depending on the preference of the user at the time of cooking. The stove is available in entry cost levels via a stand-alone ceramic model (that can also be installed in a fixed hearth within the kitchen of their home; see image at left below) and as a metal cladded version.

Table 2: *Technical manufacturer specifications of a typical Matawi*[5]

Weight	5.1 kg (stand-alone)
Efficiency	32.1%[6] (new)
Type of fuel	Wood/Charcoal
Height x Width	23 x 26 cm
Recommended pots diameter	12 inches
Durability	Approx. 8 years

Compared to the replaced traditional cooking stove used by the end-users, ICSs are more efficient while providing the same service. Currently the common systems used for cooking are the traditional open fire (3-stone) system and traditional stoves which are still dominant in most of the households. These stoves are notoriously wasteful, with an efficiency level of 10-15% (EAC, 2008).

The annual thermal energy savings from the CPA is 13.82 MWh_{th}/year per stove, i.e. the CPA qualifies as a microscale project type II which CDM units aims to achieve energy savings at a scale of no more than 600 MWh per year, which is equivalent to 1,800 MWh_{th} of annual energy savings per appliance. Total energy savings are 807,793 MWh_{th} per year.[7]

Each cook stove has been uniquely identified during manufacturing phase, which prevents any issue of double-counting with other cookstove projects or among different CPAs. This is achieved by identifying each stove by a ICS serial number and/or logo and recorded electronically. The serial number assigned to the stove belongs to one end user only, and has been uniquely attributed to every stove with a specific format.

[5] https://uganda.lutheranworld.org/content/matawi-eco-stove-cooks-and-protects-environment-106

[6] July 2019 CREEC test report

[7] 58,451 stoves x 13.82 MWh/stove = 807,793 MWh_{th}

Ecoeye Co., Ltd., and other Korean Companies have fully financed all improved cooking stoves distributed to the households, the total project cost per stove is 3 Euro including the stove manufacturing cost.

C.2. Location of CPAs

The geographical boundaries of the CPA comprise rural and/or peri-urban areas of the whole Republic of Burundi (18 administrative provinces; geographic coordinates 3°23' S, 29°55' E).

Rural population represents 90% of Burundi total population as per §2.4 of Central Census Bureau analysis conducted in 2008[8].

C.3. Post-registration changes to CPAs

C.3.1. Temporary deviations from the monitoring plans in the included CPA-DDs, applied methodologies or standardized baselines

n/a

C.3.2. Corrections

n/a

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

n/a

C.3.4. Inclusion of monitoring plan

n/a

C.3.5. Permanent changes to the included monitoring plans, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

n/a

[8] https://www.usaid.gov/documents/1866/2008-burundi-population-census-status-and-structure-population

C.3.6. Changes to project design

n/a

C.3.7. Changes specific to afforestation or reforestation CPA

n/a

SECTION D. Description of monitoring system of CPAs

The CME is responsible for overall monitoring organization. The sampling plan, data collection & consolidation and results analysis are implemented by an adequately trained monitoring team, well aware of CDM requirements and supervised by the CME. The monitoring team consists of one monitoring manager and one data manager.

Table 3: *Monitoring team and responsibilities*

Role	Responsibilities	Identity
Monitoring manager	- In general, ensure that all CPAs follow the monitoring plan - Ensure that the equipment and measurements are in line with the measurement methods, recording frequency and archiving approaches in monitoring plan - Ensure that monitoring data collected is consolidated and entered in electronic database - Ensure that monitoring team receives proper training - Ensure a coherent and standard monitoring report for each CPA	Mr. Claver NDIZEYE
Data manager	- Collect monitoring data - Enter data in electronic database and archive hardcopies[9] - Carry out sample size determination and emission reduction calculations	Mr. Christian Bob NYABUZANA

During this monitoring period, monitoring has been carried out in cooperation with the Red Cross Burundi, which helps distribute the ICS on behalf of the OBEN. Therefore, the project's monitoring team has transmitted the survey template to the Red Cross team indicating the selected random sample of households to be interviewed and some guidance on how to carry out the survey. After conducting the survey, the Red Cross has sent back the filled forms to the project's monitoring team, who checked and processed the data collected.

As for the efficiency tests, monitoring team informed CRUEA test center of the selected random sample of households to be visited. In the following, CRUEA team went onsite to conduct the tests on the stoves of the concerned households according to version 4.2.3 of the Water Boiling Test Protocol. All instruments used have been calibrated before the tests. After the tests, CRUEA established a report of the methods and results and transmitted it to the project's monitoring team. Monitoring team checked and processed the data collected.

SECTION E. Data and parameters

E.1. Data and parameters fixed ex ante

Data / Parameter:	$B_{old,p}$
Data unit:	tonnes/person/year

[9] *Data monitored and required for verification and issuance are kept and archived for at least two years after the end of the final crediting period or the last issuance of CERs, whichever occurs later.*

Description:	Annual quantity of woody biomass that would have been used per person in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices
Source of data:	Country-specific, conservative literature as detailed in PoA-DD section I.6.1: [urban] EAC Strategy to Scale-Up Access to Modern Energy Services - Burundi Country Report (Godefroy Hakizimana, 2008) [rural] Rapport d'étude sur les données du bois-énergie au Burundi (François Nkurunziza, 1999)
Value(s) applied	1.07
Choice of data or Measurement methods and procedures	For households situated in rural areas
Purpose of data	Calculation of baseline emissions
Additional comment:	The proposed values have been compared to alternate sources, and deemed further conservative considering that per capita GDP in the country has doubled in the last decade, thus more frequent cooking related to higher purchasing power for cooking fuels.

Data / Parameter:	$N_{p,HH}$
Data unit:	Number
Description:	Average number of persons served per household prior to project implementation
Source of data:	Determined ex ante at CPA level
Value(s) applied	4.7
Choice of data or Measurement methods and procedures	USAID 2008: Burundi Population Survey: Status and Structure of Population (p.34)[10]
Purpose of data	Calculation of baseline emissions
Additional comment:	-

Data/Parameter	$\mathbf{B_{old,HH}}$
Data unit	tonnes/household/year
Description	Annual quantity of woody biomass that would have been used in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices
Source of data	Determined ex ante at CPA level.
Value(s) applied	5.03
Choice of data or Measurement methods and procedures	Option 1. $B_{old,}$ times $N_{p,H}$
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	$\mathbf{B_{old,i,j}}$
Data unit	tonnes/year
Description	Annual quantity of woody biomass that would have been used in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project device type *i* and batch *j*
Source of data	Determined ex ante at CPA-level

[10] https://www.usaid.gov/documents/1866/2008-burundi-population-census-status-and-structure-population

Value(s) applied	5.03
Choice of data or Measurement methods and procedures	$B_{old,HH}$ divided by $N_{d,HH}$
Purpose of data	Calculation of baseline emissions
Additional comment	$B_{old,i,j}$ equals $B_{old,HH}$ when only one project device per household is taken account of; ex-ante $N_{d,HH}$ equals 1; please refer to its specific Data / Parameter table.

Data/Parameter	$\eta_{old,i,j}$
Data unit	Fraction
Description	Efficiency of the device being replaced
Source of data	Determined ex ante at CPA-level, based on AMS-II.G. for default values and/or baseline surveyliterature, statistics etc.
Value(s) applied	0.1
Choice of data or Measurement methods and procedures	Efficiency of pre - project device, which is a three stone fire using firewood (not charcoal), or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney; for other types of devices, a default value of 0.2 may be optionally used. Weighted average values (amount of woody biomass consumed by each device as the weighting factor) will be used if more than one type of device is being replaced.
Purpose of data	Calculation of baseline emissions
Additional comment	Use weighted average values if more than one type of system is being replaced.

Data/Parameter	**Leakage**
Data unit	Fraction
Description	Net to gross adjustment factor to account for leakages
Source of data	AMS-II.G.
Value(s) applied	0.95
Choice of data or Measurement methods and procedures	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.
Purpose of data	Calculation of baseline emissions
Additional comment	B_{old} is multiplied by a net to gross adjustment factor of 0.95 to account for leakages according to AMS-II.G.

Data/Parameter	$f_{NRB,y}$
Data unit	Fraction
Description	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass.
Source of data	National or local statistics or other sources of information (following TOOL30: Calculation of the fraction of non-renewable biomass).
Value(s) applied	81.83%
Choice of data or Measurement methods and procedures	As per para. 44-45 of AMS-II.G.
Purpose of data	Calculation of baseline emissions
Additional comment	Fixed ex-ante at the beginning of each crediting period.

E.2. Data and parameters monitored

Data/Parameter	$N_{y,i,j}$
Unit	-
Description	Number of project devices of type i and batch j operating during year y
Measured/calculated/ default	Calculated
Source of data	CPA monitoring database
Value(s) of monitored parameter	54,217
Monitoring equipment	No equipment involved. The CPA implementer keeps an electronic database of all stoves sold.
Measuring/reading/recording frequency	At least once every two years (biennial). As per paragraph 22 of AMS II.G: Monitoring shall consist of checking of all devices or a representative sample to determine if they are still operating; those devices that have been replaced by an equivalent in-service device can be counted as operating.
Calculation method (if applicable)	$N_{y,i,j}$ is determined by multiplying all devices sold (N) with the weighted-average proportion of cooking stoves found to be operating in a representative sample, i.e. $p_{op\_stoves,y}$ (= 92.76%). Batch 1 covers stoves sold between 02/11/2018 and 01/11/2019. Batch 2 covers stoves sold between 02/11/2019 and 01/12/2020. However, since the cut-off date of this monitoring period has been 30/04/2020, batch 2 represents stoves sold between 02/11/2019 and 24/04/2020 only.
QA/QC procedures	Sampling standard shall be used for determining the sample size to achieve 90/10 confidence precision (or 95/10 confidence precision) for the sample size calculation (if conducted biennially). ➔90/10 applicable for this MP.
Purpose of data/parameter	Calculation of baseline emissions

Batch 1

Batch average	97,14%
Sample size	35
Total population size	42290
Required precision	90%
z-value at 90% confidence	1,64
Confidence interval (+/-)	5%
Lower bound of the interval (1-p)	92,51%
Higher bound of the interval (1-p)	101,77%
Maximum error (precision)	10%
Sample monitoring precision	5%
Conclusion	Precision OK

Batch 2

Batch average	100,00%
Sample size	35
Total population size	40325
Required precision	90%
z-value at 90% confidence	1,64
Confidence interval (+/-)	0%
Lower bound of the interval (1-p)	100,00%
Higher bound of the interval (1-p)	100,00%
Maximum error (precision)	10%
Sample monitoring precision	0%
Conclusion	Precision OK

Additional comments	In addition to operating status, if baseline stove is not included under baseline defined under the specific CPA, the new device is counted as not operating, i.e. no emission reductions are claimed. During the monitoring period 69 out of 70 of stoves have been found operating (34 in batch 1, 35 in batch 2). The fraction of users with a baseline not included under this CPA has been 4 out of 70 (3 in batch 1, 1 in batch 2), as per monitoring survey. The number of users, which were using some charcoal in the project activity (in combination with firewood, which remained the principal fuel), was 2 out of 70 (0 in batch 1, 2 in batch 2). Leakage due to fuel switch to charcoal has been considered for these stoves. For this monitoring session, the previously monitored value of $p_{op\_stoves,y}$ (100%) has been used for ex-ante purposes such as sample size calculation.

Data/Parameter	μ_y
Unit	Fraction
Description	Adjustment to account for any continued use of pre-project devices during year y
Measured/calculated/ default	Measured
Source of data	Since equation 6 of AMS II.G is applied, it is a fraction based on monitoring results.
Value(s) of monitored parameter	0.9430
Monitoring equipment	No equipment involved. During the annual monitoring campaign, CME-mandated field agents inquire if the baseline stove that was supposed to be replaced by the ICS is still used. Field agents estimate the usage rate of the pre-project stove(s) by formulating questions to determine the frequency of usage of both the project devices and baseline devices.
Measuring/reading/recording frequency	At least once every two years (biennial)

Calculation method (if applicable)	The weighted-average proportion of continued use of pre-project stoves is calculated as 1 - $\mu_{,y}$. Batch 1 covers stoves sold between 02/11/2018 and 01/11/2019. Batch 2 covers stoves sold between 02/11/2019 and 01/12/2020. However, since the cut-off date of this monitoring period has been 30/04/2020, batch 2 represents stoves sold between 02/11/2019 and 24/04/2020 only.

Batch 1

Batch average	6,30%
Sample size	35
Total population size	42290
Required precision	90%
z-value at 90% confidence	1,64
Confidence interval (+/-)	7%
Lower bound of the interval (1-p)	-0,45%
Higher bound of the interval (1-p)	13,06%
Maximum error (precision)	10%
Sample monitoring precision	7%
Conclusion	Precision OK

Batch 2

Batch average	5,06%
Sample size	35
Total population size	40325
Required precision	90%
z-value at 90% confidence	1,64
Confidence interval (+/-)	6%
Lower bound of the interval (1-p)	-1,03%
Higher bound of the interval (1-p)	11,15%
Maximum error (precision)	10%
Sample monitoring precision	6%
Conclusion	Precision OK

QA/QC procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	For the subsequent monitoring sessions of the same CPA, the previously monitored values of μ_y (96.39%) has been used for ex-ante purposes.

Data/Parameter	$\eta_{new,i,j}$
Unit	%
Description	Efficiency of the device of each type *i* and batch *j* implemented as part of the project activity
Measured/calculated/ default	Measured
Source of data	Stove Performance test results.
Value(s) of monitored parameter	29.20 %
Monitoring equipment	Water Boiling Tests Sampling and monitoring is implemented per batch (age class)
Measuring/reading/recording frequency	Annual monitoring as default option c) is chosen to adjust for the loss in efficiency as per paragraph 25 of AMS II.G.

Calculation method (if applicable)	Mean of three tests for each of the five cook stoves carried out between 11/05/2020 and 15/05/2020. Batch 1 covers stoves sold between 02/11/2018 and 01/11/2019. Batch 2 covers stoves sold between 02/11/2019 and 01/12/2020. However, since the cut-off date of this monitoring period has been 30/04/2020, batch 2 represents stoves sold between 02/11/2019 and 24/04/2020 only. Batch 1 Average efficiency 29.43% Standard deviation 0.0088 Sample size 5 Total population size 42,290 Required precision 0.90 t-value at 90% confidence 213% Confidence interval (+/-) 0.84% Lower bound of the interval 28.59% Higher bound of the interval 30% Maximum error (precision) 10% Sample precision 3% Conclusion Precision OK Batch 2 Average efficiency 28.97% Standard deviation 0.0052 Sample size 5 Total population size 40,325 Required precision 0.90 t-value at 90% confidence 213% Confidence interval (+/-) 0.50% Lower bound of the interval 28.47% Higher bound of the interval 29% Maximum error (precision) 10% Sample precision 2% Conclusion Precision OK Stove numbers of stoves tested from • batch 1 are O5KAY035606, O6NGO032060, 08MAK034211, 09RUM036800, 07RUT032650 and • batch 2 are 05KAY75701, 08MAK044498, O2BUBO064177, 08MAK054632, O8MAK67533.
QA/QC procedures	Tests were performed by third party “Centre de Recherche Universitaire sur les Energies Alternatives (CRUEA)” (University of Burundi) with calibrated equipment and cross-checked with manufacturer information suggesting an efficiency of 32.10%. Sampling test have been conducted following a 90/10 precision in accordance with the “Standard for sampling and surveys for CDM project activities and programme of activities”, and 90/10 precision was met (see above).
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	--

Data/Parameter	$NCV_{biomass}$
Unit	TJ/tonne
Description	Net calorific value of the non-renewable woody biomass used in project devices.
Measured/calculated/ default	Default (for wood fuel based on the gross weight of the wood that is ‘air-dried.)
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) of monitored parameter	0.0156
Monitoring equipment	No equipment involved.

Measuring/reading/recording frequency	Yearly
Calculation method (if applicable)	IPCC default for wood fuel, 0.0156 TJ/tonne, based on the gross weight of the wood that is 'air-dried.'
QA/QC procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	***Date of commissioning of batch j***
Unit	Date
Description	To establish the date of commissioning, the Project Participant opts to group the devices in "batches" and the latest date of commissioning of a device within the batch shall be used as the date of commissioning for the entire batch
Measured/calculated/ default	-
Source of data	Internal records
Value(s) of monitored parameter	Excel spreadsheet provided to the DOE
Monitoring equipment	No equipment involved. Every time an ICS is sold a sales agreement is filled. The information is entered in the CPA's electronic database afterwards. Based on the database, the date of commissioning is determined, assuming conservative lead times between sale, construction/installation and commissioning.
Measuring/reading/recording frequency	Fixed and recorded at the time of commissioning/distribution of the last project device in the batch.
Calculation method (if applicable)	-
QA/QC procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	***Date of commissioning of project device i***
Unit	Date
Description	Actual date of commissioning of the project device.
Measured/calculated/ default	-
Source of data	Internal records
Value(s) of monitored parameter	See ER calculations.
Monitoring equipment	No equipement involved. Every time an ICS is sold a sales agreement is filled. The information is entered in the CPA's electronic database afterwards. Based on the database, the date of commissioning is determined, assuming conservative lead times between sale, construction/installation and commissioning.
Measuring/reading/recording frequency	Recorded at the time of commissioning/distribution of project devices
Calculation method (if applicable)	-
QA/QC procedures	-

Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	***N***
Unit	Number
Description	Number of project devices distributed
Measured/calculated/ default	Calculated
Source of data	Internal records (Electronic database used for registering all ICS's sold)
Value(s) of monitored parameter	82,615
Monitoring equipment	No equipement involved Every time an ICS is sold a sale agreement is filled and an electronic database is filled. Based on the information collected into this electronic database, the number of ICSs distributed is determined.
Measuring/reading/recording frequency	Recorded at the time of commissioning/distribution of project devices
Calculation method (if applicable)	Sum of all project devices distributed.
QA/QC procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	$N_{d,HH}$
Unit	Number
Description	Number of project devices distributed per household
Measured/calculated/ default	Measured
Source of data	Internal records (database).
Value(s) of monitored parameter	1
Monitoring equipment	No equipment involved.
Measuring/reading/recording frequency	Recorded at the time of commissioning/distribution of project devices
Calculation method (if applicable)	-
QA/QC procedures	It will be verified during monitoring campaign.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	Only one cooking stove per household is registered in the electronic database. If a household purchases more than one cooking stoves, monitoring surveys of sampled kitchens' stoves in use will account for any additional project device and be reflected in adjustment factor $N_{d,HH.}$

E.3. Implementation of sampling plan

For CPA001, monitored emission reductions generated over all ICS batches (age classes) are determined by:

1. Calculating the amount of emission reductions generated by each batch of ICSs based on the monitored number of distributed ICSs, quantity of woody biomass saved per ICS type (via ICS efficiency) and taking account of the overall proportion of operating ICSs, the residual consumption of baseline stoves and the specific size of the age class.

2. Summing up the emission reductions obtained for each age class.

Aside from the directly measured number of project devices distributed per household and corresponding dates of commissioning of project devices/batches, all monitored parameter values are measured through a representative sample of recorded ICSs own by *households*.

(a) Sampling Design

Objectives and reliability requirements

The sampling objective is to provide unbiased and reliable estimates of these parameter values during the crediting period with the confidence/precision level required by AMS-II.G. and summarized in the table below. This is achieved through a smaller but representative (statistically valid) sample of distributed ICS, as compared to the study of the total population of cooking stoves distributed, which is often not feasible or possible.

Target population and sampling frame

The *target population* is the totality of ICSs (sampling unit) distributed.

For the monitoring of parameter $\eta_{new,i,j}$ which is sensitive to the aging of stoves, all cooking stoves sold are grouped in batches (age classes) and efficiency parameter values are estimated for each batch as a separate population.

In case of option (c) (drop of efficiency rate), efficiency test sampling approach is undertaken similarly to other options of yearly efficiency determination, yet only applied among the population of the first batch of stoves implemented during the first 12 months. Same first batch population is then sampled again at each monitoring verification throughout the years of operation, and this rate of loss in efficiency is applied correspondingly to all subsequent batches of same age.

The *sampling frame* is the data on ICS sales entered and/or available in the CPA's electronic database.

The electronic database records information for each sale at least on the following:

- Sales date (age class)/date of replacement of the ICS
- Project stove serial number(s)
- Type and size of ICS(s)
- Customer (and reseller as applicable) name
- Contact details of customer (and reseller as applicable)
- User type (e.g. household)

Sampling Method

Due to the homogeneity requirement for grouping CPAs under one sampling plan, the sampling method is simple random sampling for all parameters monitored through sampling at all times.

For this monitoring period, sampling has been carried out over the nine provinces currently covered in the user database. Random sampling has been carried out for these areas to draw a sample of 70 households to carry out user surveys and a sample of 10 households to carry out 10 efficiency tests using excel's RAND function:

A random number is attributed to each entry of the user database using the RAND function, which is copied and pasted to a new column (without formula) to become fixed. The previous column (with formula) is deleted. The users in the database are then sorted by the random number column starting with the lowest random number in the top row, i.e. by ascending numbers. Thus, they become 'shuffled' and a random sample can be drawn simply by selecting the number of entries from the top towards the bottom of the database according to the required sample sized. All other entries are deleted. Since an excel sheet with several large databases becomes difficult to

navigate, the sample drawing is carried out in a separate excel sheet and the data sets of the final sampled households is copied and pasted into the ER calculation sheet for further reference.[11]

Sample Size

A sample size is calculated in order to meet reliability requirements.

The project proponent elects the sampling of each CPA individually.

Parameter values are estimated by sampling in accordance with the requirements in AMS-II.G. separately and independently for each of the CPAs included in the PoA.

The sample size for estimating the proportional parameters $p_{op\_stoves,y}$ and $\mu_{,y}$ (or their reverse) is calculated using the formula provided in the "Guideline: Sampling and surveys for CDM project activities and PoAs" Appendix 1 para 12:

$$n_p \geq \frac{t_{\alpha/2}^2 \mathrm{N_y} \times p(1-p)}{(\mathrm{N_y}-1)\cdot 0.1^2 \times p^2 + t_{\frac{\alpha}{2}}^2 p(1-p)}$$ Equation (1)

With:

$t_{\alpha/2}$ *Student's t Critical Values equal to 1.96 in the case when 95% confidence interval and a 10% margin of error are required and value; equal to 1.645 in the case when 90% confidence interval and a 10% margin of error are required*

N_y *Size of the population of stoves considered for the monitoring session*

p *Expected proportion*

The monitoring of $p_{op\ stoves,y}$ and $\mu_{,y}$ is based on the same sample, which is the sample with the larger sample size of the two.

If it is not possible to meet the 90/10 confidence/precision, then:

- for $\mu_{,y}$, the higher bound of the 90%/10% confidence/precision requirements shall be used as the correct value.
- for $p_{op\ stoves,y}$, the lower bound of 90%/10% confidence/precision shall be used as the correct value.

For $\eta_{new,i,j}$ the sample size is calculated using the formula mentioned in the "Guideline: Sampling and surveys for CDM project activities and PoAs" version 04.0 (simple random sampling, Appendix 1, para.51) applicable to the determination of a mean value parameter:

$$n_\eta \geq \frac{t_{\alpha/2}^2 N_{age,y} V}{(N_{age,y}-1)\cdot 0.1^2 + t_{\alpha/2}^2 V}$$ Equation (2)

Where:

$$V = \left(\frac{standard\ deviation}{mean}\right)^2$$

$N_{age,y}$ Number of stoves distributed belonging to the age class y

$t_{\alpha/2}$ Student t critical values

For $\eta_{new,i,j}$, one sample per age class is calculated in case efficiency losses are measured from a representative sample of each batch (sub-option d).

[11] Cf. Instruction video: https://www.youtube.com/watch?v=zsMaVcLxDZs

In general, if the sample size calculation returns a value of less than 30 samples, a minimum sample size of 30 is chosen when the parameter of interest is a proportion. If the parameter of interest is a numeric mean value (i.e. not a proportion or percentage) the student's t-distribution is used if the resulting sample size is less than 30.

Since the sample size calculation returns a value of less than 30 ($n_\eta = 2$ without oversampling, $n_\eta = 3$ with oversampling) and 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.

The t-value depends on (i) the level of confidence (90%) and (ii) the size of the sample (n=3, with oversampling). The exact figure is derived in Microsoft Excel using the TINV function, as per para. 13 of the "Guideline: Sampling and surveys for CDM project activities and PoAs."

The z-value depends on the level of confidence. For 90% confidence it is 1.6449, as per footnote 2 of the "Guideline: Sampling and surveys for CDM project activities and PoAs", and for 95% confidence it is 1.96 as per para. 116 of the aforementioned guideline.[12]

Please refer to the ER calculations for a detailed calculation.

The following minimum sample sizes (after oversampling) have been calculated:

Table 4: Calculation of sample size of proportions (90/10 confidence/precision)

Parameter	$z_{\alpha/2}$	N	p	Calculated sample size	Minimum sample size	Final sample size
Batch1						
$p_{op\ stoves,y}$	1.645	42,290	1.0000	0	30	**35**
$\mu_{,y}$	1.645	42,290	0.9639	11	30	**35**
Batch2						
$p_{op\ stoves,y}$	1.645	40,325	1.0000	0	30	**35**
$\mu_{,y}$	1.645	40,325	0.9639	11	30	**35**

Table 5: Calculation of sample size of means (90/10 confidence/precision)

Parameter	$z_{\alpha/2}$/ $t_{\alpha/2}$	N	SD	Mean	Calculated sample size	Calculated sample size w/ oversampling	Final sample size
Batch 1							
$\eta_{new,i,j}$	1.645 / 6.314	42,290	0.02	0.2975	2	3	**5**
Batch 2							
$\eta_{new,i,j}$	1.645 / 6.314	40,325	0.02	0.2975	2	3	**5**

Final total sample sizes during this monitoring period have been 70 households and 10 effciency tests.

(b) Data to be collected

The table below summarizes the variables to be measured and the main specifications and modalities required for data collection including confidence/precision level to assure and control for quality of the sampled data (QA/QC). Furthermore, the implementation plan below and section I.7.3 of PoA-DD reveal additional QA/QC measures.

[12] One may also refer to tables such as https://en.wikipedia.org/wiki/Standard_normal_table .

Table 6: *Monitored parameters and specifications for monitoring*

Para-meter	Description	Confidence / Precision level	Source of data (and method)	Grouped CPAs/PoAs	Frequency	Seasonality	Option selected to determine $B_{y,savings,i,j}$ in AMS-II.G.
$N_{y,i,j}$ / ($p_{op\_stoves,y}$) [13]	Proportion of distributed ICS still operating in year y	95/10 (biennial) 90/10 (annual) --> 90/10 (annual) applied.	Monitoring (Visual inspection, field interviews)	Simple random sampling for all CPAs with the same boundary (or for each CPA)	At least once every two years (biennial)	Unlikely to be affected by seasonal influences	n/a
$\mu_{,y}$	Adjustment to account for any continued use of pre-project devices in year y	95/10 (biennial) 90/10 (annual) --> 90/10 (annual) applied.	Monitoring results (Interview of end-user, field interviews)	Simple random sampling for all CPAs with the same boundary (or for each CPA)	At least once every two years (biennial)	Unlikely to be affected by seasonal influences	n/a
$\eta_{new,i,j}$	Efficiency of the device being deployed as part of the project activity in year y	90/10 --> 90/10 (annual) applied.	Water Boiling test (laboratory)	Simple random sampling for all CPAs with the same boundary (or for each CPA)	Annually	Not affected by seasonal influences	Option 3 Equation (6) Sub-options c) selected requiring measurement of efficiency losses;

c) Analysis of collected data

In total, a sample of 70 user households has been randomy drawn from the population of 82,615 stoves sold. The CPA implementer carried out the surveys between 15/05/2020 and 19/05/2020.

Table 7: Sampled parameter values compared to ex ante and previous values (non-discounted sample values)

Parameter	Ex-ante	Previous monitoring period	Sample
$p_{op\_stoves,y}$	0.95	1.00	0.9857
$\mu_{,y}$	0.95	0.9699	0.9430
$\eta_{new,i,j}$	0.321	0.2975	0.2920

The analysis of the sampled mean parameter values reveals that all sampled values are lower as compared to the previous monitoring period. The rate of operation stoves remains high provided the recent purchase dates.

As during the last monitoring period, the final rate is reduced due to devices, which are counted as not operating for other reasons such as i) incoherene in project records or ii) discount of baseline stoves, which are not included under the baseline defined under the specific CPA. Please refer to the parameter table of $p_{op\_stoves,y}$ in section E.2 for detailed numbers.

[13] *$N_{y,i}$ is not directly monitored. The parameters N and $p_{op\_stoves,y}$ are monitored in order to determine $N_{y,i}$.*

d) Demonstration that the required confidence/precision level has been met

The demonstration has been performed in the ER calculation sheet. Please refer to the ER calculation for detailed calculation.

Table 8: Demonstration of confidence/precsion level

Batch1

Parameter	$f_{\_op}$	$1-\mu_y$	$\eta_{new,y}$
Batch average	97.14%	6.30%	29.43%
Sample size	35	35	5
Total population size	42,290	42,290	42,290
Required precision	90%	90%	90%
z/t-value at 90% confidence	1.64	1.64	213%
Confidence interval (+/-)	5%	7%	0.84%
Lower bound of the interval	92.51%	-0.45%	28.59%
Higher bound of the interval	101.77%	13.06%	30%
Maximum error (precision)	10%	10%	10%
Sample monitoring precision	5%	7%	3%
Conclusion	**Precision OK**	**Precision OK**	**Precision OK**

Batch 2

Parameter	$f_{\_op}$	$1-\mu_y$	$\eta_{new,y}$
Batch average	100.00%	5.06%	28.97%
Sample size	35	35	5
Total population size	40,325	40,325	40,325
Required precision	90%	90%	90%
z/t-value at 90% confidence	1.64	1.64	213%
Confidence interval (+/-)	0%	6%	0.50%
Lower bound of the interval	100.00%	-1.03%	28.47%
Higher bound of the interval	100.00%	11.15%	29%
Maximum error (precision)	10%	10%	10%
Sample monitoring precision	0%	6%	2%
Conclusion	**Precision OK**	**Precision OK**	**Precision OK**

(e) Implementation Plan

The CME and management of the monitoring team coordinate the overall implementation of the monitoring and sampling plan. The monitoring team consists of one monitoring manager and one data manager (cf. section I.7.3 of PoA-DD for their general responsibilities). The implementation plan consists of the following principal steps:

Step 1: Selection of all monitoring options at time of CPA inclusion

Step 2: Stove distribution and sales agreements
Person in charge: CPA implementer and CME

Cf. section B of PoA-DD.
The CME cross-checks data of at least 1% of monthly signed sales agreements/ registered in the electronic database. According to the *Standard for "Sampling and surveys for CDM project activities and programme of activities*" this is representative [14]. This step is implemented continuously throughout the crediting period.

Step 3: Compilation of data into electronic database
Person in charge: CPA data manager
Cf. section B of PoA-DD.
Two different persons are in charge of recording sales agreements electronically so they can control the quality of each other's work. This step is implemented continuously throughout the implementation plan.

Step 4: Choice of number of CPAs/PoAs under single sampling plan and number of monitored batches
Person in charge: CPA implementer in accordance with CME

Step 5: Sample size calculation including oversampling
Person in charge: CPA data manager

Step 6: Sample drawing
Person in charge: CPA data manager
A sample of distributed ICSs is selected randomly out of the sampling frame per batch for monitoring $p_{op\_stoves,y}$ (involved in the calculation of $N_{y,i,j}$), $\mu_{,y}$ and $\eta_{new,j}$, respectively.

Step 7: Data collection
Person in charge: CPA data manager
The data manager organizes the monitoring campaigns, which includes lists of sampled users with contact details but without the stoves' serial numbers. This way the serial number recorded during the campaign can be matched with records in the electronic database to assess the accuracy of the measurement. The data of sampled users' is collected through surveys, which are filled at the operation site of the stove (a priori, costumer's address). Questions to the end-user operationalize the monitored parameters. If required, the survey includes an additional question on the baseline stove to rule out the end-use of certain baseline stoves and verify the baseline of the specific CPA.
To measure the ICS efficiency $\eta_{new,j}$ the stove is brought to a laboratory and tested as per monitoring specification and QA/QC requirements above.

Step 8: Consolidation of monitoring results
Person in charge: CPA data manager
In case of determination of the rate of efficiency drop as per option (c) of AMS-II.G, the degradation of efficiency measured in a representative sample of the first batch of project devices will apply to all subsequent batches. The efficiency of the project devices in the first batch is monitored annually through representative samples and this rate of loss in efficiency will be applied correspondingly to all batches.

Step 9: Record keeping
Person in charge: CPA data manager
All monitored data is recorded in hard copy and in the electronic database. All documents, lists and questionnaires produced during monitoring are saved electronically with physical copies securely stored under the direct responsibility of the data manager and the supervision of the monitoring

[14] *For instance, according to the Standard for "Sampling and surveys for CDM project activities and programme of activities", for a binary parameter and a sample of 15,000 ICSs with an assume proportion of 95%/5% a sample of 15 ICSs is calculated (section B.7.2). The minimum percentage is therefore 15/15,000=0.1%. 1% is therefore conservative.*

manager. All data is kept and archived electronically for two years after the end of the crediting period or the last issuance of certified emission reductions, whichever occurs later.

SECTION F. Calculation of emission reductions or net anthropogenic removals

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

Emission reductions are calculated as:

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

Where:

i	=	Indices for the situation where more than one type of project device is introduced to replace the pre-project devices[15]
j	=	Indices for the situation where there is more than one batch of project device
ER_y	=	Emission reductions during year *y* in t CO_2e
$ER_{y,i,j}$	=	Emission reductions by project device of type *i and* batch *j* during year *y* in t CO_2e
LE_y	=	Leakage emissions in the year *y*

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

Where:

$B_{y,savings,I,j}$	Quantity of woody biomass that is saved in tonnes per cook stove of type i and batch j during year y
$f_{NRB,y}$	Fraction of woody biomass saved by the project activity in year y (established as non-renewable biomass using survey methods)
$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne, based on the gross weight of the wood that is 'air-dried')
$EF_{projected\_fossilfuel}$	Emission factor for the fossil fuels projected to be used for substitution of non-renewable woody biomass by similar consumers. Use a value of 63.70 tCO_2/TJ
$N_{y,,jj}$	Number of project devices of type i and batch *j* operating during year y
μ_y	Adjustment to account for any continued use of pre-project devices during the year y applying equation 6 .

$$B_{y,savings,i,j} = B_{old,i,j} \times (1 - \frac{\eta_{old,i,j}}{\eta_{new,i,j}}) \quad \text{Equation (3)}$$

Where:

$\eta_{old,i,j}$	Efficiency of the old devices being replaced by project devices of type *i* and batch j.
$\eta_{new,i,j}$	Efficiency of the project device *i* and batch j

$B_{old,i,j}$ is determined as follows:

$$B_{old,i,j} = B_{old,HH} \div N_{d,HH} \quad \text{Equation (4)}$$

Where:

[15] *For example, in some instances, full replacement of the pre-project device would require the implementation of more than one project device (e.g. one stove suitable for cooking and the other stove suitable for cooking/boiling water).*

$B_{old,HH}$ = Annual quantity of woody biomass that would have been used in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices (tonnes/household/year)

$N_{d,HH}$ = Number of project devices per household (number)

$B_{old,i,j}$ is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.

Jiko Matawi stove stove:

Substituting for values for Jiko Matawi stoves in use for 100% of the time over the monitoring period, the calculation results in the below.

	Value	***Unit***	***Source/reference***
N	82,615	*n/a*	*Section E.2*
$N_{y,i,j}$	54,217	*n/a*	*Section E.2* $N_{y,i,j} = N * p_{op\_stoves,y}$
$\mu_{,y}$	0.9430	*fraction*	*Section E.2*
$f_{NRB,y}$	0.8183	*fraction*	*Section E.1*
$NCV_{biomass}$	0.0156	*TJ/tonne*	*Section E.2*
$EF_{projected\_fossilfuel}$	63.7	*tCO_2/TJ*	*Section F.1*
$B_{y,savings,i,j}$	3.14	*tonnes/year*	*ER calculations* $B_{y,savings,i,j} = B_{old,i,j}*(1 - \eta_{old,i,j}/\eta_{new,i,j})*0.95$
$B_{old,i,j}$	5.03	*tonnes/year*	*Section E.1*
$B_{old,HH}$	5.03	*tonnes/HH/ year*	*Section E.1*
$N_{d,HH}$	1.0	*Personnes/ HH*	*Section E.2*
$\eta_{old,i,j}$	10	*%*	*Section E.1*
$\eta_{new,i,j}$	29.20	*%*	*Section E.2*
Baseline Emissions	81,469	*tCO_2/year*	*Section F.1, ER calculations* $ER_{y,i,j} = B_{y,savings,i,j} \times N_{y,i,j} \times \mu_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossil\ fuel}$
Project emissions (PE_y)	0	*tCO_2/year*	*Section F.2, ER calculations*
Leakage emissions (LE_y)	120	*tCO_2/year*	*Section E.1, section F.3* *Adjustment factor (0.95) already applied at $B_{y,savings,i,j}$ level*
Emission reductions	81,469	*tCO_2/year*	*ER calculations* $ER_y = \sum_i \sum_j ER_{y,i,j}$-LEy$-LE_y$

After taking account of the effective usage days of each individual stove after the date of sale[16], effective emissions reductions are as follows:

	ER_y (tCO_2e)
16/09/2019-30/04/2020	**81,469**
TOTAL	**81,469**

[16] Direct sales to users took place from 02/11/2018 to 24/04/2020. Cut-off date of this monitoring period is 30/04/2020.

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

As per ER calculation, there are no project emissions taken account of.

F.3. Calculation of leakage emissions

As per AMS II.G, leakage is already taken account of in the calculation of baseline emissions by multiplying $B_{y,savings,i,j}$ by a net to gross adjustment factor of 0.95 to account for leakages. In such case, surveys to determine leakage ex-post are not required.

Further leakage emissions occur due to switching from baseline device using firewood to efficient project device using charcoal. These emissions are calculated by using a default value of 0.030 t CH4/t charcoal in accordance with "AMS-III.BG.: Emission reduction through sustainable charcoal production and consumption".

Please refer to ER calculations for detailed calculation.

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

CPA UNFCCC reference number	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)		
				Before 01/01/2013	From 01/01/2013	Total amount
10474-P1-0001-CP1	81,469	0	0	-	81,469	81,469
Total	**81,469**	**0**	**0**	**-**	**81,469**	**81,469**

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

CPA UNFCCC reference number	Amount achieved during this monitoring period (t CO_2e)	Amount estimated ex ante for this monitoring period in the CPA-DD (t CO_2e)
10474-P1-0001-CP1	81,469	269,290
Total	**81,469**	**269,290**

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

The number of days in this monitoring period is 228 days. Consequently, the amount of ex-ante emission reductions for 2019 (165,159 tCO2e, 122 days) is added to the pro-rata (228 - 122 days / 365 days = 106 / 365) amount of ex-ante emission reductions for 2020 (358,566 tCO_2), which is 104,131 tCO_2.

F.6. Remarks on increase in achieved emission reductions

The actual GHG emission reductions achieved is not greater than the amount based on the ex ante estimation in the included CPA-DD.

Emission reduction per stove during the monitoring period is 2.23 tCO_2 per year, which compares to 2.38 tCO_2 per year in the ex-ante calculations.

The difference between the estimated and actual, realized emission reductions is mainly due to lower monitored parameter values as compared to ex-ante values after application of a discount to

the function rate of project stoves. Please refer to the parameter table of $p_{op\_stoves,y}$ in section E.2 for detailed numbers and section E.3 c).

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

Not applicable. As per section C of the PoA-DD CPAs under this PoA are not limited in size by CPA thresholds.

Document information

Version	*Date*	*Description*
03.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for programmes of activities" (CDM-EB93-A07-STAN); • Add a section on remarks on the observance of the scale limit of small-scale CPAs during the crediting periods; • Add "changes specific to afforestation or reforestation activities/CPA" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R PoAs between two commitment periods; • Make structural and editorial improvements.
02.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the "CDM project standard for programmes of activities (CDM-EB93-A07-STAN); • Make editorial improvements.
01.0	1 April 2015	Initial publication.

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