



**Verified Carbon
Standard**

EASTERN DRC COOKSTOVE PROJECT- SOUTH KIVU



Document Prepared by AERA SAS

on behalf of OBEN EAC S.A.

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The project aims to provide individuals with intermediate improved cookstove (ICS). The stoves will be commercialized into the community via the local church communities that function in the various locations of the Sud-Kivu province and will target primarily the regions covered by the diocese of Uvira.

The ICS distributed through this project will encourage households to replace the prevailing inefficient three-stone fireplace or traditional charcoal cookstoves that are predominantly used across the region. The ICS provides for an efficient use of the thermal energy generated through the combustion of biomass while cooking and there is a more efficient transfer of this thermal energy to the cooking pot. There is thus a resultant reduction in both biomass consumption and greenhouse gas emissions.

In addition to the reduction of biomass consumption (and associated reduction in expenses to purchase wood or charcoal – or reduction in time gathering firewood), there will also be an economic benefit in that the ICS will be produced locally in the region and will create jobs which will have a large proportion of female employees.

When considering the eastern parts of the Democratic Republic of Congo (DRC), the United Nations Office for the Coordination of Humanitarian Affairs (UN OCHA) stated that, “insufficient cooking fuel to prepare food often leads to households reducing their meals from three to one or none per day,” and “Most women cook using a traditional three-stone fire. When there is insufficient cooking fuel, people may use organic waste, plastic or garbage instead, exposing themselves to toxic fumes and serious health hazard.”

The project seeks to distribute up to 400,000 ICS to households (targeted population) in the eastern DRC.

From the project start date, 107,822¹ stoves have been distributed to end-users in Sud-Kivu province.

Between the 107,822 households equipped with ICS, 67,932 were using charcoal before ICS introduction (63%), and 39,890 were using firewood. Thanks to carbon finance, the cookstoves will be distributed at a 50% subsidy to users (Stoves are sold at 5\$ while the total manufacturing and distribution cost are 10\$/stove).

The project aims to avoid on average 754,897 tCO₂e per year and 5,284,281 during the first crediting period

1.2 Sectoral Scope and Project Type

Sectoral Scope: 03

Project Type: Type II – Energy Efficiency Improvement Project

Grouped Project: No.

¹ Number of ICS distributed at the end of May 2022.

1.3 Project Eligibility

As per para. 2.1.1 of the VCS Standard, V.4.2, the project is eligible under the scope of the VCS Program because the VCS Scope includes project activities involving the following elements:

Elements	Project applicability
The six Kyoto Protocol greenhouse gases	The project activity aims at CO ₂ reduction of non-renewable biomass.
Ozone-depleting substances.	n/a
Project activities supported by a methodology approved under the VCS Program through the methodology approval process.	The project applies VMR0006 v1.1 which is a VCS methodology.
Project activities supported by a methodology approved under a VCS approved GHG program, unless explicitly excluded under the terms of Verra approval.	n/a
Jurisdictional REDD+ programs and nested REDD+ projects as set out in the VCS Program document Jurisdictional and Nested REDD+ (JNR) Requirements.	n/a

Furthermore, it cannot reasonably be assumed that the project generates GHG emissions primarily for the purpose of their subsequent reduction, removal or destruction. All the households involved in this project activity are fully independent from the project proponent.

The project aims to provide individuals with efficient or improved cookstove (ICS) which falls under the category of efficiency improvements in thermal applications, therefore it is eligible under the scope of VCS Program. As per VCS Standard Version 4.2, efficiency improvements in thermal applications (e.g., cook stoves) are not excluded, hence project is eligible under the VCS.

The stoves will be distributed into the community via the local church communities that function in the various locations. Double counting will be prevented by each ICS distributed as part of this project activity will have a project identifier and unique serial number inscribed in the metal. This will prevent any other project proponent, organization, retailer, individual or distributors from using the same ICS and including it in another project activity.

1.4 Project Design

The project activity involves the distribution of multiple project activity instances (ICS devices) within the project boundary Sud-Kivu province to households via community-based organizations (primarily linked to churches). ICS will be sold to the population that are still using inefficient cookstoves. All the stoves distributed have a unique serial number, and all the cookstoves distributed will be recorded in an electronic Excel, which will be checked to ensure that double counting is avoided. Furthermore, the project will target end-users in the project boundary that are still using inefficient

cookstoves where other GHG programs are not operating. The project database will be available to VVB to confirm that all the cookstoves are distributed in Sud-Kivu provinces. Cookstoves distributed outside of the project boundary, will not be accounted for.

Moreover, the projects aim at distributing only one ICS per household. Even if more than 1 ICS is found in a household, only one will be accounted for ER calculations.

To account for the continued use of baseline devices, the adjustment factor will be assessed during monitoring period to calculate a $B_{oldadjusted}$ as per methodology requirements.

The distribution of energy efficient cookstove distribution falls under the category of efficiency improvements in thermal applications, therefore it is eligible under the scope of VCS Program.

The project is a not a grouped project activity.

Eligibility Criteria

The project is a not a grouped project hence this is not applicable

1.5 Project Proponent

Organization name	OBEN EAC S.A
Contact person	Claver NDIZEYE
Title	Director
Address	B.P.4942, Bujumbura, Burundi
Telephone	0025776602600
Email	loicqueen@yahoo.fr

1.6 Other Entities Involved in the Project

Organization name	AERA Group
Role in the project	Carbon advisor and offtaker
Contact person	Alexandre Dunod
Title	Chief Operating Officer
Address	28 cours Albert 1er, Paris, 75008, France

Telephone	0033642960978
Email	a.dunod@aera-group.fr

1.7 Ownership

As per VCS Program Definitions version 4, the project ownership is the legal right to control and operate the project activities.

“OBservatoire pour l’Environnement et la Nature” (also referred to as OBEN E.A.C. SA) is the project implementer and supplier of the improved cookstoves, which

retains the right of use of ER credits. The chain of ownership onwards to Aera Group is itself agreed upon by Emission Reduction Purchase Agreement

Each ICS have a unique serial number linking it to the project activity instance and is necessary to establish the fact that the ICS belongs to this VCS project. End users will be informed at the time of ICS installation/distribution that the ICS are discounted on account of them generating carbon credits and also the fact that these credits belong to project proponent. The end user will be required to sign an agreement that transfers the rights of emissions reduction generated by their cookstoves to OBEN EAC S.A.

1.8 Project Start Date

Project start date is 10² June 2020 i.e. The exact start date is 10 June 2020 of stove distribution and usage. Stoves distributed before this date will not be accounted for in the Emission reduction calculation sheet.

1.9 Project Crediting Period

The project crediting period will be seven (7) years – renewable 2 times for a total of 21 years maximum. Starting from 10-June -2020, ending 09-June-2027.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale
Project

² First date of project start date was January 2020, which was the start date of the pilot phase. The exact start date is 10 June 2020. Stoves distributed before this date will not be accounted for in the Emission reduction calculation sheet.

Large project	X
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Year	Estimated GHG emission reductions or removals (tCO ₂ e)
10 June 2020- 31 December 2020	41,827
2021	278,277
2022	481,206
2023	679,099
2024	871,878
2025	1,059,466
2026	1,307,144
01 January 2027- 09 June 2027	565,383
Total estimated ERs	5,284,281
Total number of crediting years	7
Average annual ERs	754,897

1.11 Description of the Project Activity

The ICS distributed under the project is the “Jiko Matawi” stove, a Tanzanian-design ICS that is produced from moulded clay which is dried through high temperatures in a kiln to reinforce its properties including high thermo efficiency and durability, or alternatively dried in a cool, dry, ventilated area out of direct sunlight to cure the final products. It is a simple to use, multi-purpose stove that can be used in a clay, metal clad or even built into a hearth of a home for more permanent use.

Figure 1: Picture and specifications of OBEN ICS stove

Weight	5.1 kg (stand-alone)
Efficiency	32.1% ³ (new)
Type of fuel	Wood/Charcoal
Height x Width	23 x 26 cm
Recommended pots diameter	12 inches
Durability	Approx. 8 years

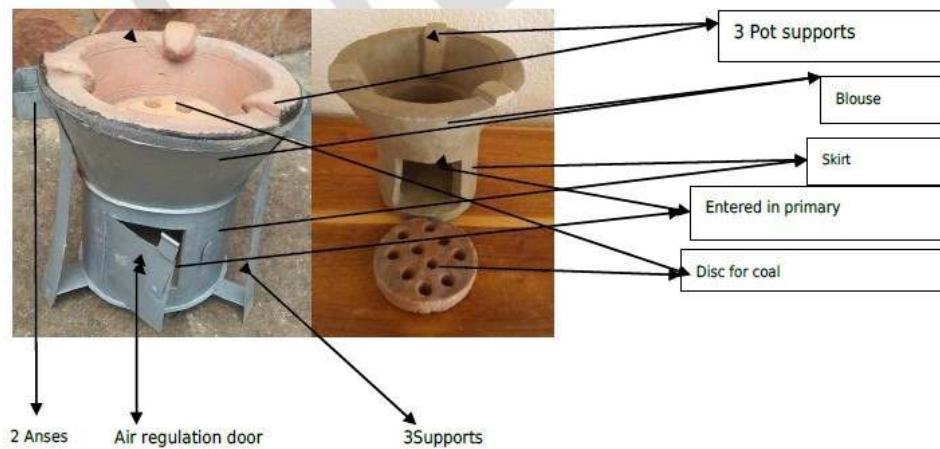


Figure 2: ICS design and component parts

Production of the Matawi ICS

1. Raw material preparation

- Clay is sourced from a local source – clay is inspected to ensure it is clear of inclusions and is thoroughly mixed to ensure uniformity of consistency
- The moulds are cleaned and prepared concurrently
- This work is conducted almost solely by females as part of the gender representation in the production process

³ July 2019 CREEC test report



Figure 3 : Raw material preparation

2. Moulding

d) A standard mould is used to ensure consistency and quality of the final product

e) Pot supports, air intake and polishing of the ICS also occurs.

f) The ICS is released from the mould, inspected for quality control and then placed in a dedicated drying area

g) Again the primary workforce is female



Figure 4 : Moulding of ICS



Figure 5 : Release and preparation for drying

3. Drying and final preparation

- a) Drying occurs in a dedicated area that is protected from the elements (rain, direct sunlight) and is well ventilated to ensure a consistent and even drying period.
- b) Metal cladding is fitted to some stoves (this too is fabricated locally).
- c) Each stove is then inspected and cleaned before distribution.
- d) Each ICS has a unique identifier added and this is recorded in the database.

The identification of each stove is as follow:

OB-RDC-XXXXx corresponding to:

OB: OBEN

RDC: location where the project is taking place

XXXXX: serial number of the stove.

- e) The stoves are then distributed, and records kept.



Figure 6: Drying and final stove inspection for distribution

Data collection of ICS end-user

Project proponent must gather the necessary information to identify households using its ICS during the course of the project. To facilitate this process, each ICS will be assigned a unique serial number. This number will be recorded during the registration process together with the following information (as appropriate and as available):

- Name of ICS user or head of the household
- Address / GPS of ICS household
- Phone number of ICS user or household, where available

- Stove model
- Date of distribution/installation
- ICS serial number
- Type of fuel used.

The information collected will be stored in the electronic database which will serve as project database for project monitoring and sampling purposes.

The database will be checked periodically and only one stove per household will be accounted for emission reduction calculations.

The ICS distributed “Jiko Matawi” have a better efficiency than traditional coal pots and three stones.

The Jiko Matawi have efficiency of 32.1%, thus avoiding GHG emissions linked to the combustion of fuels. The project aims to avoid on average 754,897 tCO₂e per year and 5,284,281 during the first crediting period.

The project will target only communities, households using whether traditional coal pots stoves or inefficient firewood stoves. Only ICS distributed as replacement of inefficient charcoal or firewood stoves will be accounted for emissions reduction calculation.

1.12 Project Location

The project activity will be located solely within the geographic borders of the Democratic Republic of Congo in central Africa. The project activity will occur within the Eastern regions of DRC – specifically the Sud-Kivu Province. The province is located around the co-ordinates: 3°0'41.969" S, 28°17' 57.966"E.



Figure 7: Location of DRC within Africa and Sud-Kivu Province within the DRC (from left to right).

The project is expected to take place primarily in all the district covered by the UVIRA Diocese, which includes the districts of Uvira, Fizi and Mwenga (South Kivu province), and part of the

district of Kabambare, located at the east of the Luama River. The project will target primarily all the villages and towns of the mentioned districts, but the project can expand to other towns of the Sud-Kivu province which is the project boundary. Project proponent will ensure that cookstoves are distributed to households in the project boundaries.

1.13 Conditions Prior to Project Initiation

The majority of households in eastern DRC still rely on woody biomass for cooking. Most households use the charcoal cookstoves or three-stone-fire as their principal method of cooking. The condition prior to the project initiation is the same as the baseline scenario in section 3.4 .

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project activity does not have any regulatory requirements within the DRC – and all activities associated with the project will be undertaken in compliance with local business and social regulations and requirements. A review of relevant laws of the DRC did not highlight any specific concerns or requirements around cookstoves or any aspects related to this project activity.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project is not seeking registration in whole or in part under any other GHG program outside this project activity within VERRA.

1.15.2 Projects Rejected by Other GHG Programs

The project is not seeking registration in whole or in part under any other GHG program outside this project activity within VERRA, and no components have been rejected or excluded from any other GHG emission reduction project.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project activity has no components included in any emissions trading program.

1.16.2 Other Forms of Environmental Credit

The project is not seeking registration in whole or in part under any other form of environmental credit.

1.17 Sustainable Development Contributions

The project activity has a positive impact on sustainable development as outlines below:

ENVIRONMENTAL

Greenhouse gas emissions are reduced by the project activity. This is also aligned to the Sustainable Development Goals (SDG).

Fuel consumption is reduced for cooking, this reduces the amount of non-renewable biomass use in the region. The project will avoid 5.284 millions tCO₂e during the first crediting period (SDG 13)

Participating households will be more energy sufficient due to the reduction in fuel biomass requirement due to the efficiency of the devices.

Distribute 400,000 high-efficiency, clean burning Matawi Cooktoves in DRC, to benefit over 2 million individuals. (SDG 7.1.2)

Significantly reduce Household Air Pollution (HAP) in rural households (SDG3.9.1)

ECONOMIC

In a region where economic activity and inputs are strained, the annual spend on fuel for cooking will be reduced due to the efficient cookstove use, benefiting households to allow the expenditure of resources elsewhere.

Production of the cookstoves regionally will create employment in the region and promote indirect opportunities in the sales, distribution, training and management roles within the supply chain.

Additional time will be freed in households from fuel collection – these can now be applied elsewhere in economic or social pursuits.

SOCIAL

Reduce the proportion of time rural women spend on unpaid domestic work related to collection of firewood, and cooking meals on inefficient traditional cookstoves. (SDG5.4.1). Therefore, additional time will be freed in households from fuel collection – these can now be applied elsewhere in economic or social pursuits.

Indoor pollutants – specifically VOCs and particulates are reduced due to more efficient combustion having a positive effect on health. This has been confirmed by the World Health Organisation⁴.

Reduce the risk of mortality among infants and children under five years of age due to (1) acute lower respiratory illnesses (ALRI), such as pneumonia and bronchitis, the cause of mortality in 12% of children under five, and (2) burns resulting from children falling into open cooking fires. (SDG3.2.1, 3.2.2)

Participating households will be more energy sufficient due to the reduction in fuel biomass requirement due to the efficiency of the devices.

1.18 Additional Information Relevant to the Project

Leakage Management

Not applicable as the project adopts a net gross adjustment factor of 95% to account for leakage

Commercially Sensitive Information

No commercially sensitive information directly related to the project activity has been excluded from the public version of the project description

Further Information

No further information was deemed to be required for this project activity

2 SAFEGUARDS

2.1 No Net Harm

No potential negative environmental or socio-economic impacts have been identified for the project.

2.2 Local Stakeholder Consultation

Local Stakeholder Consultation has taken place through a formal agreement with a local entity linked to the church in DRC. BQS-OBEN and the Diocesan Center for the Protection of the Environment (CDPE) of Uvira in the Democratic Republic of Congo

⁴ <https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health>

have entered into a formal agreement⁵ by which OBEN will provide information and capacity building to CDPE who will in turn ensure that the local populace and potential users are informed of the ICS benefits, register any concerns and act as a conduit to the project developers to ensure that stakeholder views are communicated and incorporated into the project design.

The public consultation was held in the capital town of the South Kivu in Uvira. Following Covid- related delays, the consultation occurred on Thursday 8th of July 2021 in a room of the Bishopric provided by His Grace the Bishop of Uvira. The consultation was opened by the territory Administrator, Mr Alexis Kasangala on behalf of the Governor of South Kivu province. In total 21⁶ persons attended to the meeting.

The stakeholders were informed about the local stakeholder consultation, by letters, and phone calls and public announcement during the Sunday service. The invitations were made 1 month before the meeting.

The meeting was addressed by the Director of CDPE welcoming the attendees and setting the scene of the collaboration and importance of the project activity in the region and introducing all the role players in the project. A legal representative of OBEN then outlined the various legal and international frameworks and contextualized the project activity in terms of these. The Matawi ICS was then introduced and the technical characteristics and practicalities of using the device were presented highlighting advantages to users.

After the presentation of the project, the floor was then opened for discussion and comments, to receive participants feedback about the project.

Questions received during the Local Stakeholder Consultation is provide below:

Stakeholder	Comment	Response
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⁵ Protocole de Partenariat durable entre Centre Diocésain pour la Protection de l'Environnement (CDPE) et l'organisation Burundi Quality Stove observatoire pour la nature et l'environnement (BQS-OBEN) – signed 26 January 2017

⁶ This number only refers to officials that attended to the meeting.

Marie Rose Kabonge Saidi – Member of Parliament	Congratulated the speakers and project proponents on the initiative and spoke well of the cross-border collaboration and expressed her delight. She promised to raise awareness among her colleagues in the Territorial Assembly and promote the project activity	No response required
Serge Bahati Bintu – Director Territorial Environmental Service of Uvira	He raised a concern about the negative effects of deforestation in the region, noting that the informal charcoal sector has denuded the forests in the area leading towards an ecological disaster. He praised the mitigation of this through the use of the more efficient ICS devices and encouraged all households to get at least one.	Positive intervention and support for project.
Ms Safi Awadi – facilitator for Action for the Development of Peasant Communities	Firstly she expressed her support for the project and gave the support of her organization. Q1: She wanted to know about the manufacturing process. Q2: Can it be produced locally Q3: Does the higher efficiency affect the cooking pots negatively?	A1: The manufacturing process outlined in the PD was explained, including the benefits of employment. A2: OBEN explained that in the second phase of the project, it is planning to collaborate with CDPE to produce the devices in the DRC. A3: No, higher efficiency does not wear pots quicker, but does cook food quicker.
Ms Fatuma Maman Sifa – Representative of association of Christian mothers – Uvira	Given the expense mothers have to incur to purchase fuel for cooking, she was positive to the introduction of the ICS devices. Q1: She hoped that mothers could be involved in the distribution in the future.	A1: This could be possible in the future A2: The cost is around USD 10 but due to the project activity and carbon finance, the price will be USD 5 per ICS device for affordability.

	Q2: What is the price of an ICS for a household? Q3: Could the project roll out not be accelerated?	A3: The project needs to follow due process to ensure carbon finance is possible, so it cannot be rushed.
Hillaire Salloum – from Head Office of International Committee of the Red Cross	Q1: Asked if it would be possible for a large number of ICS devices to be made available to the ICRC for distribution in emergency periods.	A1: OBEN took note and could do this in the future as part of a different project as they have done elsewhere in the region (e.g. Burundi)
Rachidi Nyambuza – a Representative of the Rice Growers Association	Q1: Mentioned that the Rice growers association represents many growers and they could offset pre purchase of the ICS devices against the sale of the rice crop.	A1: OBEN replied that this was not a problem and they need to work through the CDPE to facilitate this, but that household registration is very important for monitoring and traceability
Francis Bahoza – Action Humanitaire pour l'Assistance et le Development	Q1: Asked about reducing the cost of the ICS to USD5 as it was expensive.	A1: OBEN explained carbon finance and that the costs is already greatly reduced and without other inputs it could not be reduced further.
Michelle Ehouman – Office of the High Commissioner for Refugees	Q1: It was mentioned that the UNHCR struggled to find sufficient fuel for refugees and enquired about the possibility of OBEN assisting with ICS devices for refugees.	A1: It was possible and OBEN are doing this in other areas. Discussions would need to be held as that is a large project and outside of design scope this project, but it is possible.

Bekoutare Pepe – Head Office – Uvira – African Initiative for Relief and Development	Q1: Praised the project activity as he mentioned he had seen the benefits of a similar project elsewhere and said it made a significant positive impact. He suggested that all households that get a ICS device should be encouraged to plant a tree too to mitigate the impacts of climate change.	A1: The audience were unanimous in supporting this with applause.
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The outcome of the LSC meeting was more than encouraging. By the end of the meeting, a lot of stakeholders expressed their desire to connect with this project as they truly felt that it could be a catalyst in bringing about household energy efficiency improvements in the rural and financially backward sections of society as well as preserve forests. None of the queries or comments raised by stakeholders (above), required any design change. No negative comments being raised from the side of the stakeholders. All the questions that arose during the meeting were answered back satisfactorily.

As a part of on-going communication with local stakeholders, end users were encouraged to provide any comments or propositions during stakeholder feedback round spanning from the meeting date to 07 September 2021.

Local stakeholders were also informed about the grievance registering system, at the end of the meeting.

The distributors have the responsibility to take grievances on field regarding the project activity and same will be conveyed to PP during operation of project activity. Thus, ongoing communication of stakeholders is followed through grievance mechanism.

If any concerns received during operation of project activity, same will be addressed if relevant to project activity. Contact details of OBEN in Burundi as well as Uvira distributors are provided to all the end-users, to address their concerns. Also, contact details are provided on the contract signed by the end-users who acquire a cookstove, to ensure that they can contact project proponent at any time.



Figure 8: Attendees at a LSC meeting



Figure 9 : Demonstration of the ICS device at the LSC meeting

2.3 Environmental Impact

No negative environmental impacts have been identified for the project and an environmental impact assessment (EIA) is not required for the project.

2.4 Public Comments

The project was open for public comments from 16/11/2021 to 16/12/2021.

During this period, no comments have been received on VCS website at:

<https://registry.verra.org/app/projectDetail/VCS/2636>.

2.5 AFOLU-Specific Safeguards

Not applicable as this project in a non-AFOLU project.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

VMR0006: Methodology for Installation of High Efficiency Firewood Cookstoves,

Version 1.1

Tools: "TOOL30: Calculation of the fraction of non-renewable biomass" Version 3.0

CDM Tool 01 for the 'Demonstration and Assessment of Additionality', V7.0.0

3.2 Applicability of Methodology

Applicability criterion VMR0006 v1.1	How the project complies
Project activities shall be implemented in domestic premises or in community-based kitchen	The proposed project involves deployment of ICS only in households in the Sud-Kivu province, and therefore meets this applicability condition
The project stove shall have specified high-power thermal efficiency of at least 25% per the manufacturer's specifications and shall exclusively use woody biomass and can be single pot or multi-pot; in case of project stove replacing fossil fuel baseline stove, it shall exclusively use renewable biomass	Matawi stoves installed under this project are single pot wood cookstoves that have an efficiency of 32.1% as per the as per the Water Boiling test. The efficiency of Matawi is above 25%. Therefore, this applicability condition is met.
Both 'Projects' and 'Large Projects' can use this methodology	This project is a large project. The methodology is applicable to both project and large project. Therefore, this applicability condition is met.

Non-renewable biomass has been used in the project region since 31 December 1989, using survey methods or referring to published literature, official reports or statistics;	The source of the biomass is from non-renewable sources in the eastern DRC; The biomass traditionally utilized is a mixture of non-renewable biomass from natural woodlands, charcoal produced locally and sold via an informal network of sellers and to a lesser extent some renewable biomass from wood grown for fuel. The UN Capital Development Fund (UNCDF) estimates that “Biomass resulting from fuelwood logging remains the principal source of cooking energy for more than 90 percent of the population in the DRC⁷” This has been the case since before independence in the 1960s The harvesting of non-renewable biomass is commonplace in Democratic Republic of Congo and can be reasonably concluded that has been the case since 31 December 1989. Between 1990 and 2020, DRC lost, 24,473,760 hectares of forest⁸. Between 2010 and 2020 DRC lost on average 1,101,000 ha of forest/year corresponding on a annual net change of -0.83% according to Global Forest Resources Assessment 2020 table 7⁹. The above clearly shows that the rural areas in the host country are dependent on biomass since and before 1989 with not much change in the trend which clearly depicts the dependence of the people of the host country on woody biomass as fuel for meeting thermal energy requirement for cooking at households.
For the specific case of biomass residues processed as a fuel (e.g. briquettes, wood	Not applicable. The ICS is introduced as energy efficiency measure to replace baseline stoves and reduce the use of non-renewable biomass

⁷ United Nations Capital Development Fund (UNCDF): Report: What does the clean cooking market look like in the DRC? – A Business and Health Assessment of the clean cooking market in the Democratic Republic of Congo – 21 Feb 2021

⁸ <https://www.fao.org/3/cb0125fr/cb0125fr.pdf>

⁹ <https://www.fao.org/3/ca9825fr/ca9825fr.pdf>

chips it shall be demonstrated that: (a) It is produced using exclusively renewable biomass (more than one type of biomass maybe used). (b) The consumption of the fuel should be monitored during the crediting period and (c) Energy use for renewable biomass processing (e.g. shredding and compacting in the case of briquetting) may be considered as equivalent to the upstream emissions associated with the processing of the displaced fossil fuel and hence disregarded	for combustion.
The CDM-PDD or CDM-PoA-DD/CPA-DD shall explain the proposed method for distribution of project devices including the method to avoid double counting of emission reductions such as unique identifications of product and end-user locations (e.g. programme logo).	A record keeping system and unique identification of the project device will be used. This will include username, user identification number and address/location of the user's house and distribution date. The record keeping system will ensure that each ICS can be traced to project instances to avoid double counting
The CDM-PDD or CDM-PoA-DD/CPA-DD shall also explain how the proposed procedures prevent double counting of emission reductions, for example to avoid that project stove manufacturers, wholesale providers or others claim credit for emission reductions from the project devices.	The project proponent will sign an end user agreement with individual household/user to ensure only PP can claim the emission reduction. A default distribution agreement for end users including the provision that emission reductions generated by the stove are owned by the PP will be provided for each user.

Applicability criterion Tool 30 v3	How the project complies
DNAs to submit region- or country-specific default fNRB values, following the procedures for development, revision, clarification and update of standardized baselines (SB procedures);	Not applicable as the tool is used by the by project participant.
Project participants to calculate project- or PoA-specific fNRB values.	Applicable as the tool is used par project participant to calculate projectspecific fNRB values.

CDM Tool 01 for the Demonstration and Assessment of Additionality V7.0.0	How the project complies
The use of the “Tool for the demonstration and assessment of additionality” is not mandatory for project participants when proposing new methodologies. Project participants may propose alternative methods to demonstrate additionality for consideration by the Executive Board. They may also submit revisions to approved methodologies using the additionality tool ;	Not applicable
Once the additionally tool is included in an approved methodology, its application by project participants using this methodology is mandatory.	Applicable as the tool is included in an approved methodology AMS-II.G V12 that is used along with VMR006 V1.1

3.3 Project Boundary

Source	Gas	Included?	Justification/Explanation	
Baseline	Combustion of wood fuel for cooking	CO ₂	Yes	Major source of emissions
		CH ₄	Yes	Major source of emissions
		N ₂ O	Yes	Major source of emissions
		Other	No	No other source identified
Project	Combustion of wood fuel for cooking	CO ₂	Yes	Major source of emissions
		CH ₄	Yes	Can be Major source of emissions,
		N ₂ O	Yes	Can be Major source of emissions,
		Other	No	No other source identified
	Emission from	CO ₂	No	Not considered as briquettes usage is not expected.
		CH ₄	No	Not considered

	manufacturing of briquettes			
		N ₂ O	No	Not considered
		Other	No	Not considered

The project activity will be located solely within the geographic borders of the Democratic Republic of Congo in central Africa. The project activity will occur within the Eastern regions of DRC – specifically the Sud-Kivu province.

3.4 Baseline Scenario

The majority of households in DRC still rely on woody biomass for cooking¹⁰. Most households use the inefficient charcoal stoves or three-stone-fire as their principal method of cooking. The baseline scenario is the usage of firewood and/or charcoal in traditional low efficiency charcoal/firewood stove or three-stone for cooking in kitchens of households. The baseline scenario is identified as the use of woody biomass from non-renewable sources in traditional charcoal and three stone cooking fires.

The International Energy Agency has identified that around 97% of the fuels used for cooking are from biomass, with charcoal accounting from 35% and other solid biomass accounting for 62%¹¹.

For the specific case of Sud Kivu, a study conducted by le Centre de coopération international en recherche agronomique pour le développement (CIRAD) in Bukavu, underlines that 97% of the population were relying on charcoal, while 13% were relying on firewood for cooking¹².

Regarding clean cooking, only 4%¹³ of the population have access to clean cooking in DRC. Therefore, the baseline scenario is the continued use of charcoal or firewood in inefficient cookstoves by the target population to meet similar thermal energy needs as provided by project cookstoves in absence of project activity.

3.5 Additionality

¹⁰ <https://docs.wfp.org/api/documents/WFP-0000050327/download/>

¹¹ <https://www.iea.org/data-and-statistics/charts/democratic-republic-of-the-congo-fuels-and-technologies-used-for-cooking-by-scenario-2018-2030>

¹² https://agritrop.cirad.fr/600193/1/20211111_Rapport_Consommation_Bukavu_Vf.pdf

¹³ <https://trackingsdg7.esmap.org/country/democratic-republic-congo>

The methodology uses activity method for the demonstration of additionality. Activity Method

Step 1: Regulatory Surplus

There is no mandated government programme or policy in host country of this project ensuring the distribution of domestic fuel-efficient cookstoves. The project is not mandated by any law, statute or other regulatory framework, or for UNFCCC non-Annex I countries, any systematically enforced law, statute or other regulatory framework. Households may only participate voluntarily in this project.

Step 2: Positive List

The project participant will distribute the cookstove at subsidized rate, hence there will be revenue stream apart from the sale of GHG credits. Therefore, PP have chosen option 3 for demonstration of additionality. The project is not implemented as part of government schemes or supported by multilateral funds. The project did not apply any methodology deviations.

Step 3: Project Method

The “Tool for demonstration and assessment of additionality” Version-7.0.0 EB 70 Annex-08 is applied to demonstrate additionality

The Tool provides for a stepwise approach to demonstrate and assess additionality. These steps include:

- Step 0- Demonstration whether the proposed project activity is the first-of-its-kind
- Step 1- Identification of alternatives to the project activity consistent with current laws and regulations
- Step 2- Investment analysis
- Step 3- Barrier analysis
- Step 4- Common practice analysis

Step 0- Demonstration whether the proposed project activity is the first-of-its-kind The proposed project activity is not first of its kind in host country.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a: Define alternatives to the project activity:

The project activity is to distribute improved cookstove to individual households to traditional stoves, the alternatives to the project activity are

- (a) The proposed project activity undertaken without being registered as a VCS project activity;
- (b) Other realistic and credible alternative scenario(s) to the proposed VCS project activity scenario that deliver outputs services (e.g. cement) or services (e.g. electricity, heat) with comparable quality, properties and application areas, taking into account, where relevant, examples of scenarios identified in the underlying methodology
- (c) Continuation of the current situation.

Outcome of Step 1a: Identified realistic and credible alternative scenario(s) to the project activity The alternative identified are:

- (a) The proposed project activity undertaken without being registered as a VCS project activity. As demonstrated in sub-step 2: without VCS registration the project could not take place as the total cost of the ICS would make it unaffordable for population
- (b) Other realistic and credible alternative scenario(s) to the proposed VCS project activity scenario that deliver outputs services (e.g. cement) or services (e.g. electricity, heat) with comparable quality, properties and application areas, taking into account, where relevant, examples of scenarios identified in the underlying methodology; Similar cookstoves would be at least as expensive as the project ICS according to WorldBank prices of ICS in DRC range from 8\$ to 70 \$¹⁴
- (c) Continuation of the current situation. The continuation of the current situation would lead to higher emissions and higher deforestation rate in the project boundaries.

Sub-step 1b: Consistency with mandatory laws and regulations:

There are no policies in host country to regulate fuel usage for cooking at household level and both the alternative identified above are in compliance in host country rule and regulations.

Outcome of Step 1b: Identified realistic and credible alternative scenario(s) to the project activity that are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country and EB decisions on national and/or sectoral policies and regulations. Both the alternative identified above are in compliance with host country regulation.

Step 2: Investment analysis to conduct the investment analysis, use the following Sub-steps: Sub-step 2a: Determine appropriate analysis method

As the project proponent will sale ICS at a lower price than purchase cost of ICS and there is no other economic benefit than sale of VERs, hence a simple cost analysis is chosen by PP.

Sub-step 2b: Option I. Apply simple cost analysis

The proposed project intends to distribute the ICS at 50% subsidy to users (Stoves are sold at 5\$ while the total manufacturing and distribution cost are 10\$¹⁵/stove (see figure 10 below). The project would thus not sustain in absence of the carbon finance leverage since the action is not financially viable without the support of revenues from the sale of VERs. As the end-user does not benefit from a direct financial return and procuring ICSs requires capital, which is a barrier to rural consumers due to difficulties in accessing capital, a wide dissemination of ICSs in the Host Country is unlikely. The actions under the project will alleviate these barriers by promoting distribution of ICSs to end-users at an affordable price; hence financial return from the project will be less than cost incurred, further the project proponent will hire a team for supply chain and maintenance and repair. As each ICS has certain costs associated with the production/purchase, distribution, monitoring and verification etc., the project will not

¹⁴ <https://www.worldbank.org/en/news/feature/2018/01/24/a-recipe-for-protecting-the-democratic-republic-of-congos-tropical-forests>

¹⁵ The detailed calculation of the stoves price is available in the ER calculation sheet. All the delivery, transport, distribution and production notes are shared with VVB

occur in absence of the carbon revenue. The action is not financially viable without the support of revenues from the sale of VERs. As the end-user does not benefit from a direct financial return and procuring ICSs requires capital, which is a barrier to rural/semi-urban consumers due to difficulties in accessing capital, a wide dissemination of ICSs in the Host Country is unlikely. The actions under the project will alleviate these barriers by promoting distribution of ICSs to end-users at an affordable price.

Hence, the project faces investment barrier and is considered to be additional.

Step 3: Barrier analysis: Not chosen by PP.

Step 4: Common Practice Analysis: As per information available in public domain the penetration level of ICS is very low in host country DRC and project activity is not a common practice. As each ICS has costs associated with its purchase and distribution and awareness generation, this project will not occur in absence of the VCS revenue. The action is not financially viable without the support of revenues from the sale of VERs. The end-users for the ICS are currently using crude devices, which indicates and exacerbates the cycle of poverty/suppressed incomes. The potential users for ICS are typically lower income with the problem (lack of ICS) seen more as a woman's problem thereby relegating it lower in the priority order for household expenditures/investments. The actions under the project will alleviate these barriers by promoting distribution of ICSs to end-users at 50% subsidy, thereby making their ownership and subsequent impact possible.

	BIF	Dollars
COST of cookstoves production	542, 620, 000	269, 960
Cost of metalisation	617, 640, 000	307, 283
Cost custom Borders	427, 119, 893	212, 497
Cost Transport to DRC	229, 350, 000	114, 104
Cost distribution	284, 052, 000	141, 319
Total cost	2 ,100, 781, 893	1, 045, 163
Number of cookstoves	100, 891	100, 891
Cost per cookstoves	20, 822	10

Figure 10 cost of production of cookstoves per unit.

3.6 Methodology Deviations

The project did not apply any methodology deviations.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The approved methodology does not account for baseline emissions separately but quantifies emission reductions as a function of the reduction in the amount of non-renewable biomass

fuel consumption in the efficient project stoves as compared to baseline stoves (see section 4.4. below).

4.2 Project Emissions

The approved methodology does not account for project emissions separately but quantifies emission reductions as a function of the reduction in the amount of non-renewable biomass fuelconsumption in the efficient project stoves as compared to baseline stoves (see section 4.4. below).

4.3 Leakage

Leakage shall be considered as default 0.95 in accordance with Section 5.4 of the approvedmethodology.

4.4 Net GHG Emission Reductions and Removals

The improved cookstove is introduced as energy efficiency measure in the project, therefore equations 1 and 2 of the methodology will be applied to calculate the net GHG emission reductions.

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

Where:

i	=	Indices for the situation where more than one type/model of improved cookstove is introduced to replace three-stone fire
j	=	Indices for the situation where there is more than one batch of improved cookstove of type i
ER_y	=	Emission reductions during year y in t CO ₂ e
$ER_{y,i,j}$	=	Emission reductions by improved cookstove of type i and batch j during year y in t CO ₂ e

$$ER_{y,i,j} = B_{y,savings,i,j} \times fNRB_{y,i,j} \times NCV_{wood\ fuel} \times (EF_{wf,CO_2} + EF_{wf,non\ CO_2}) \times N_{y,i,j} \times 0.95 \quad \text{(Equation 2)}$$

Where:

$B_{y,savings,i,j}$	=	Quantity of woody biomass that is saved in tonnes per improved cook stove of type i and batch j during year y
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$f_{NRB,y}$	=	Fraction of woody biomass that can be established as non-renewable biomass (fNRB)
$NCV_{wood\ fuel}$	=	Net calorific value of the non-renewable woody biomass that is substituted or reduced (IPCC default for wood fuel, 0.0156 TJ/tonne)
$EF_{wf,CO2}$	=	CO2 emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 112 tCO ₂ /TJ)
$EF_{wf,non\ CO2}$	=	Non-CO ₂ emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 26.23 tCO ₂ /TJ)
$N_{y,i,j}$	=	Number of improved cook stoves of type i and batch j operating during year y
0.95	=	Discount factor to account for leakages.

The quantity of woody biomass saved $B_{y,savings,i,j}$ due to implementation of improved cookstoves can be estimated by one of the following options set out in equation 3 and 4:

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

$$\text{With } \eta_{new,i,j} = \eta_P \times (DF_n)^{y-1} \times 0.94 \quad \text{Equation 5}$$

Where the project households continue to use baseline cookstoves along with improved cookstoves, B_{old} shall be adjusted ex-post based on the percentage of project households found to continue such practice according to Equation 6. For such cases, the quantity of woody biomass saved $B_{y,savings,i,j}$ due to implementation of improved cook stoves shall be calculated using an adjusted value to account for ex-post use of baseline stoves in addition to improved cookstove.

$$B_{old,adjusted} = B_{old} \times (1 - \mu_y). \quad \text{Equation 6}$$

Where:

B_{old}	=	Annual quantity of woody biomass that would have been used in the absence of the project activity (in tonnes per device) to generate useful thermal energy equivalent to that provided by the improved cook stove. The value of B_{old} can be sourced from historical data or baseline surveys. Alternatively, a default value of 0.5t/capita/year may be used.
$B_{old,adjusted}$	=	Adjusted B_{old} to account the ex post usage of firewood in baseline cookstove(s) by project households in addition to improved cookstove (in tonnes per device)
μ_y	=	Baseline stove usage factor to account for use of baseline cookstoves along with improved cookstoves
η_{old}	=	Efficiency of baseline cookstove

$\eta_{new,i,j}$	=	Efficiency of the improved cookstove type i and batch j determined through water boiling test (WBT) during year y Alternatively, efficiency may be determined using Equation 4
η_P	=	Efficiency of project stove (fraction) at the start of project activity,
$(DF_n)^{y-1}$	=	Discount factor to account for efficiency loss of project cookstove per year of operation (fraction). This value may be based on actual monitoring or based on manufacturer's declaration on expected loss in efficiency or through publicly available literature on relevant industry standards Alternatively default value of 0.99 efficiency loss per year can be considered
0.94	=	Adjustment factor to account for uncertainty related to project cookstove efficiency test

The quantity of firewood consumed in absence of project activity (**B_{old}**) shall be determined using an estimation of average annual consumption of firewood per household which may be derived using any of the following options:

(a) Historical Data. Project proponent shall ensure that the relevance of data is appropriately justified for the target population and is the latest available data from credible source(s).

(b) Baseline Survey of Local Usage. Project proponent shall carry out a survey of usage prior to implementation of the project activity following the sampling approach described in the latest version of CDM document Sampling and surveys for CDM project activities and programme of activities. Alternatively, the project participant may follow the simple random sampling approach and the minimum sample size should be determined as per the following guidelines:

- Project target population < 300: Minimum sample size 30
- Project target population 300 – 1000: Minimum sample size 10% of group size
- Project target population > 1000: Minimum sample size 100

This simplified approach may also be used for determining minimum sample size for parameters listed under Sections 9.1 and 9.2 in which case it is not requisite for the sample size to meet confidence/precision requirements

(d) Minimum Service Level. Where historical data or a baseline survey has not been conducted, a default value of 0.5 ton/capita/year may be considered as the baseline biomass consumption. Household size shall be determined using credible references/literature or target population specific surveys. The survey shall be conducted as per guidelines outlined in option (b) above

The equations below shall be used for calculating biomass consumed in absence of project activity in case more than one project stove is used in household:

$$B_{old,i,j} = B_{old,HH} \times N_{d,HH}$$

$$B_{old,HH} = B_{old,p} \times N_{p,HH}$$

Where:

$B_{old, p}$	=	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 (tonnes/person/year)
$N_{p, HH}$	=	Average number of households
$N_{d, HH}$	=	Number of project devices per household
$B_{old, HH}$	=	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)

As per section 8.4 of the applied methodology, B_{old} can be estimated using historical data (Option a). This option is chosen for the determination of B_{old} . Therefore, above parameters are determined using historical data.

The consumption of woody biomass is retrieved from most recent, credible and project specific data available from credible source.

Determination of $B_{old, p}$.

A study¹⁶ conducted by Deutsche Forstservice (DFS) in collaboration with the Ministry of Environment, Nature Conservation and Tourism of DRC, concluded that in 2012, the average consumption of charcoal per person was 118kg of charcoal per year in the project area. A more recent report¹⁷ from CIRAD published in June 2020 concluded that 0.31kg of charcoal and 0.05kg of firewood was used per person and per day in Bukavu (project area) which corresponds to yearly consumption per person of 113.15kg of charcoal and 18.25 kg of firewood or 0.697¹⁸ tonnes of woody biomass per person and per year.

Therefore, data from CIRAD as most recent and more conservative will be used for

$B_{old, p}$. Determination of $N_{p, HH}$

A report¹⁹ from Secure Livelihood Research Consortium in the South Kivu province and published in 2015, estimated that the average household size was 6.7 persons per household, while the cited report from CIRAD estimated number of persons per household at 6.5 persons. The value from CIRAD report as most recent and

¹⁶ <https://www.dfs-online.de/assets/Uploads/News/1.-COD-GIZ-PBF-WSK-Note-Synthse-PBFSK.pdf>

¹⁷ https://agritrop.cirad.fr/600193/1/20211111_Rapport_Consommation_Bukavu_Vf.pdf

¹⁸ Considering a wood-to-charcoal of 6 as per methodology applied.

¹⁹ https://assets.publishing.service.gov.uk/media/57a08985ed915d3cfd0002b8/WP30_governance-Democratic-Republic-Congo.pdf

conservative available data regarding the project boundary is selected to estimate the average household size.

Determination of $N_{d,HH}$

As the project is expected to distribute only one ICS per household, therefore the $N_{d,HH}$ value is 1.

Determination of $B_{old, HH}$

$B_{old, HH} = B_{old, adjusted} \times N_{p, HH} = 0.697(1-3\%^{20}) \times 6.5 = 4.396$ tonnes per household and per year

Determination of $B_{old, i, j}$

$B_{old, i, j} = B_{old, HH} + N_{d, HH} = 4.396/1 = 4.396$ tonnes

This value is also found conservative regarding results from the Kitchen Performance Test of the project GS10789 VPA7²¹: Efficient and Clean Cooking for households in the Democratic Republic of Congo (DRC) conducted in 16 provinces in DRC (including South-Kivu) and underlining an average consumption of 1.1765 tonne of charcoal (7.059 tonnes of woody biomass) per household and by year.

All the parameters are resumed in the table below:

Parameter	Value	Source
$B_{old, p}$	0.697 tonne	CIRAD report. Values is found conservative and in line with methodology requirements
$N_{d, HH}$	1	Ex-ante estimation
$N_{p, HH}$	6.5	CIRAD report.
μ_y	3%	Ex-ante estimation.
$B_{old, HH}$	4.531 tonnes	Calculated as per methodology
$B_{old, HH adjusted}$	4.396 tonnes	Calculated as per methodology

²⁰ Ex-ante estimation. Average from the 3 monitoring period of another project implemented by the OBEN in Burundi. Available at « https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/U2ZYTf1EWXPBHK0069GCLNSDRIQ78A/view »

²¹ <https://platform.sustain-cert.com/public-project/2631>

Determination of efficiency of ICS during year y

As per equation 5 of methodology applied $\eta_{new,i,j} = \eta_P \times (DF_n)^{y-1} \times 0.94$

The ex-ante²² estimated efficiencies are therefore:

Year	$\eta_{new,i,j}$
2020	32.1%
2021	30.2%
2022	29.9%
2023	29.6%
2024	29.3%
2025	29.0%
2026	28.7%
2027	28.4%

Determination of $B_{y,savings}$.

Year	B_{old} adjusted (tonnes)	$\eta_{new,i,j}$	η_{old}	$B_{y,savings,i,j}$ (tonnes)
2020	4.396	32.1%	16%	2.16
2021	4.396	30.2%	16%	2.02
2022	4.396	29.9%	16%	2.00
2023	4.396	29.6%	16%	1.97
2024	4.396	29.3%	16%	1.95
2025	4.396	29.0%	16%	1.92
2026	4.396	28.7%	16%	1.90

²² WBTs will be conducted on time for each verification. However, for ex-ante estimations, the efficiency is calculated as per the methodology formula

2027	4.396	28.4%	16%	1.87
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$$B_{y,savings,i,j} = B_{old} \times (1 - (\eta_{old} / \eta_{new,i,j}))$$

Determination of f_{NRB}

f_{NRB} was estimated following applicable tool 30 v3 guidelines:

The values obtained is 84.02%. Main results for calculation are provided below.

Parameter	Value	Source of data
NRB	3,524,407,773 t/yr	Calculated ²³
RB	670,556,627 t/yr	Calculated
H	4,194,964,400 t/yr	Calculated
MAIforesti	5.91 t/ha/yr	Calculated
MAIother	5.91 t/ha/yr	Calculated
Fforest	126,155,240 ha	FRA2020 Table A1. Forest area (p.155)
f_{NRB}	84.02%	Calculated

Using equation 2 of the para 8.4 Emission reductions for the crediting period are:

Year	$B_{y,savings}$	f_{NRB}	NCV	$EF_{wf,CO2} + EF_{wf,nonCO2}$	Ny,i,j	Leakage	$ER_{y,i,j}$
2020	2.16	84.02%	0.0156	138.23	20,000	0.95	41,827
2021	2.02	84.02%	0.0156	138.23	80,000	0.95	278,277
2022	2.00	84.02%	0.0156	138.23	140,000	0.95	481,206
2023	1.97	84.02%	0.0156	138.23	200,000	0.95	679,099
2024	1.95	84.02%	0.0156	138.23	260,000	0.95	871,878
2025	1.92	84.02%	0.0156	138.23	320,000	0.95	1,059,466
2026	1.90	84.02%	0.0156	138.23	400,000	0.95	1,307,144
2027	1.87	84.02%	0.0156	138.23	400,000	0.95	565,383

²³ See Ex-ante Calculation sheet for detailed calculation results

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
10 June 2020-31 December 2020	41,827	0	0	41,827
2021	278,277	0	0	278,277
2022	481,206	0	0	481,206
2023	679,099	0	0	679,099
2024	871,878	0	0	871,878
2025	1,059,466	0	0	1,059,466
2026	1,307,144	0	0	1,307,144
01 January 2027- 09 June 2027	565,383	0	0	565,383
Total	5,284,281	0	0	5,284,281
Annual Average	754,897	0	0	754,897

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	B _{old}			
Data unit	tonnes/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	Data from Study conducted by the CIRAD for the city of Bukavu. The study highlight average number of persons per households, as well as average charcoal and firewood consumption per capita and per day <table><tr><td>Number of person by households</td><td>6.5</td></tr></table>		Number of person by households	6.5
Number of person by households	6.5			

	<table border="1"> <tr> <td>Yearly Woodfuel consumption by capita (tonnes)</td><td>$((0.31*6)+0.05)*365*6.5=4.531$ tonnes of firewood per year for firewood users</td></tr> <tr> <td>Yearly Charcoal consumption per household</td><td>$0.31*365*6.5=0.735$ tonnes of charcoal per year for charcoal users</td></tr> </table>	Yearly Woodfuel consumption by capita (tonnes)	$((0.31*6)+0.05)*365*6.5=4.531$ tonnes of firewood per year for firewood users	Yearly Charcoal consumption per household	$0.31*365*6.5=0.735$ tonnes of charcoal per year for charcoal users
Yearly Woodfuel consumption by capita (tonnes)	$((0.31*6)+0.05)*365*6.5=4.531$ tonnes of firewood per year for firewood users				
Yearly Charcoal consumption per household	$0.31*365*6.5=0.735$ tonnes of charcoal per year for charcoal users				
Value applied	4.531 tonnes of firewood equivalent per household and per year				
Justification of choice of data or description of measurement methods and procedures applied	Based on approximate value of woodfuel consumed by person/year times the average numbers of people per household. Values are based on historical data (CIRAD report- https://agritrop.cirad.fr/600193/1/20211111_Rapport_Conso_mation_Bukavu_Vf.pdf) as permitted by the methodology and as explained in section 4.4. According to CIRAD report, average household size is 6.5 persons and average woody biomass per person and per day is 0.31kg of charcoal and 0.05kg of firewood				
Purpose of Data	Calculation of Quantity of woody biomass that is saved in tonnes per device				
Comments	This parameter shall remain fixed for the monitoring periods.				

Data / Parameter	np
Data unit	Fraction
Description	Efficiency of the project stove at the start of project activity
Source of data	Manufacturer's specification based on Waterboiling Test conducted.
Value applied	0.321
Justification of choice of data or description of measurement methods and procedures applied	Parameter determined ex-ante
Purpose of Data	Calculation of baseline emissions
Comments	--

Data / Parameter	$f_{NRB,y}$																					
Data unit	Percentage																					
Description	Fraction of woody biomass saved by the project activity during year y that can be established as non-renewable biomass																					
Source of data	This parameter shall be determined ex-ante. As per of methodological tool “Calculation of the fraction of non-renewable biomass, version 03”, value is calculated as per following Equation (1), $f_{NRB,y} = NRB/(NRB+DRB)$ <table><tr><td>Parameter</td><td>Value</td><td>Source of data</td></tr><tr><td>NRB</td><td>3,524,407,773 t/yr</td><td>Calculated</td></tr><tr><td>RB</td><td>670,556,627 t/yr</td><td>Calculated</td></tr><tr><td>H</td><td>4,194,964,400 t/yr</td><td>Calculated</td></tr><tr><td>MAIforesti</td><td>5.91 t/ha/yr</td><td>Calculated</td></tr><tr><td>MAIother</td><td>5.91 t/ha/yr</td><td>Calculated</td></tr><tr><td>Fforest</td><td>126,155,240 ha</td><td>FRA2020 Table A1. Forest area (p.155)</td></tr></table>	Parameter	Value	Source of data	NRB	3,524,407,773 t/yr	Calculated	RB	670,556,627 t/yr	Calculated	H	4,194,964,400 t/yr	Calculated	MAIforesti	5.91 t/ha/yr	Calculated	MAIother	5.91 t/ha/yr	Calculated	Fforest	126,155,240 ha	FRA2020 Table A1. Forest area (p.155)
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MAIforesti	5.91 t/ha/yr	Calculated																				
MAIother	5.91 t/ha/yr	Calculated																				
Fforest	126,155,240 ha	FRA2020 Table A1. Forest area (p.155)																				
Value applied	84.02%																					
Justification of choice of data or description of measurement methods and procedures applied	Value calculated as per tool “Calculation of the fraction of non-renewable biomass, version 03”, applicable with the applied methodology.																					
Purpose of Data	Calculation of baseline emissions																					
Comments	This parameter shall remain fixed for the monitoring periods.																					

Data / Parameter	$EF_{wf,CO2}$
Data unit	tCO ₂ /TJ
Description	CO ₂ emission factor for the use of wood fuel in baseline scenario
Source of data	Default as per applied approved methodology VMR0006
Value applied	112

Justification of choice of data or description of measurement methods and procedures applied	Default methodology value.
Purpose of Data	Emission reduction calculations
Comments	This parameter shall remain fixed for the monitoring periods.

Data / Parameter	EF _{wf, non CO2}
Data unit	tCO ₂ /TJ
Description	CO ₂ emission factor for the use of wood fuel in baseline scenario
Source of data	Default as per applied approved methodology VMR0006
Value applied	26.23
Justification of choice of data or description of measurement methods and procedures applied	Default as per applied approved methodology VMR0006
Purpose of Data	Emission reduction calculations
Comments	This parameter shall remain fixed for the monitoring periods.

Data / Parameter	NCV _{biomass}
Data unit	TJ/tonne
Description	Net calorific value of the non-renewable woody biomass that is substituted
Source of data	Default as per applied approved methodology VMR0006
Value applied	0.0156
Justification of choice of data or description of measurement methods and procedures applied	Default as per applied approved methodology VMR0006

Purpose of Data	Calculation of baseline emissions
Comments	This parameter shall remain fixed for the monitoring periods.

5.2 Data and Parameters Monitored

Data / Parameter	$N_{y,i,j}$																		
Data unit	Number																		
Description	Number of project devices of type i and age a that are operating in year y																		
Source of data	Monitoring Survey																		
Description of measurement methods and procedures to be applied	Measured directly or based on a representative sample. Sampling standard shall be used for determining the sample size to achieve 90/10 confidence precision according to the latest version of Standard for sampling and surveys for CDM project activities and programme of activities.																		
Frequency of monitoring/recording Value applied	At least once every two years																		
	<table border="1"> <thead> <tr> <th>Year</th><th>$N_{y,i,j}$</th></tr> </thead> <tbody> <tr> <td>2020</td><td>20,000</td></tr> <tr> <td>2021</td><td>80,000</td></tr> <tr> <td>2022</td><td>140,000</td></tr> <tr> <td>2023</td><td>200,000</td></tr> <tr> <td>2024</td><td>260,000</td></tr> <tr> <td>2025</td><td>320,000</td></tr> <tr> <td>2026</td><td>400,000</td></tr> <tr> <td>2027</td><td>400,000</td></tr> </tbody> </table>	Year	$N_{y,i,j}$	2020	20,000	2021	80,000	2022	140,000	2023	200,000	2024	260,000	2025	320,000	2026	400,000	2027	400,000
Year	$N_{y,i,j}$																		
2020	20,000																		
2021	80,000																		
2022	140,000																		
2023	200,000																		
2024	260,000																		
2025	320,000																		
2026	400,000																		
2027	400,000																		
Monitoring equipment	Monitoring surveys																		
QA/QC procedures to be applied	The project implementor shall maintain a distribution record to calculate this parameter																		
Purpose of data	Calculation of baseline emissions																		
Calculation method	Proportion of operational stoves obtained from the survey is multiplied by the total commissioned stoves to arrive at this value																		

Data / Parameter	η_{old}
Data unit	Fraction
Description	Efficiency of baseline stoves
Source of data	Based on PP's calculation
Value applied	16%

Justification of choice of data or description of measurement methods and procedures applied	Weighted average value regarding the types of stoves (10% for wood users and 20% for charcoal users) To date, 107,822 households have been equipped, between them, 67,932 (63%) are charcoal users, while 38,890 (37%) are firewood users. Weighted average is calculated for ex-ante purposes based on these ratios, and the weighted average calculated in Ex-ante sheet is 16%
Purpose of Data	Calculation of Quantity of woody biomass that is saved in tonnes per device (baseline emissions)
Calculation method	This parameter will be updated during the monitoring periods.

Data / Parameter	Life Span
Data unit	Number of years
Description	The operating lifetime of the project device. The life span should be reported if the methodology equation 5 is adopted to determine the project stove efficiency
Source of data	Manufacturer's specification
Description of measurement methods and procedures to be applied	Lifetime determined as per laboratory test
Frequency of monitoring/recording	Once at the time of project stove installation
Value monitored	8
Monitoring equipment	n/a
QA/QC procedures to be applied	n/a
Purpose of the data	Calculation of baseline emissions
Calculation method	n/a
Comments	--

Data / Parameter	μy
Data unit	Fraction

Description	Adjustment to account for any continued use of pre-project devices during the year y
Source of data	Monitoring survey
Description of measurement methods and procedures to be applied	This parameter should be monitored using one of the following methods: a) If the baseline cookstoves are decommissioned and no longer used, as determined by the monitoring survey its value is 0 and Bold, adjusted is equal to Bold. b) If both the improved cookstove and baseline cookstoves are used together then surveys shall be conducted to record the average continued operation of baseline cookstoves in a sample of households. The surveys should be designed to capture the cooking habits and stove usage of households in the region, including quantification of use of baseline cookstoves, by formulating questions and/or collecting evidences to determine the frequency of usage of both the improved cookstoves and baseline cookstoves. For example, if there were 3 baseline cookstoves in a household and it was determined during the survey that use of one of them continues during the crediting period then a conservative adjustment factor of 0.33 is applied to Bold. Another example would be the case where there was only one baseline cookstove per household and its use during the project period continues along with the improved cookstove to meet 25% of the cooking needs of the household in which case the adjustment factor will be 0.25. Another example would be to interview the household and have them estimate the time of usage of the baseline cookstoves and improved cookstove on an average day.
Frequency of monitoring/recording	Once every 2 years
Value monitored	3% (ex-ante estimation)
Monitoring equipment	Monitoring surveys
QA/QC procedures to be applied	A 95 /10 confidence / margin of error shall be achieved for the sampling parameter irrespective of annual /biennial monitoring frequency as per para 22 of Standard: Sampling and surveys for CDM project activities and programmes of activities, Version 09.0. In the case the desired precision is not met, lower bound values shall be used against repeating the survey to determine the operational fraction of stoves
Purpose of the data	Calculation of baseline emissions
Calculation method	n/a

Comments	The proportion of continued use of pre-project stoves is a monitored parameter, i.e. only available ex-post. For ex-ante purposes, $y = 97\%$ can be considered. For the subsequent monitoring sessions of the same project, the previously monitored values of shall be used for ex-ante purposes.
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Data / Parameter	Date of commissioning of batch j	
Data unit	Date	
Description	To establish the date of commissioning, the Project Participant may opt 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.	
Source of data	Project database	
Description of measurement methods and procedures to be applied	Fixed and recorded at the time of commissioning/distribution of the last project device in the batch	
Frequency of monitoring/recording	Once at the time of project stove installation	
Value monitored	Batch	Date of commissioning
	2020	10/06/2020
Monitoring equipment	n/a	
QA/QC procedures to be applied	n/a	
Purpose of the data	Calculation of baseline emissions	
Calculation method	n/a	

Data / Parameter	$\eta_{new,y,i,j}$
Data unit	Fraction
Description	Efficiency of the improved cookstove type i and batch j
Source of data	Water Boiling Test (CREEC report)

Description of measurement methods and procedures to be applied	Although, Option 1 “Conduct WBT test on a sample of three improved cookstoves with three tests conducted for each stove. The test can be carried out by project proponents by themselves or stove manufacturers or other third parties » Will be adopted during monitoring periods for ER estimations, However, for validation purposes, the project will adopt Option V given in the methodology: “Efficiency of the improved cookstove to be estimated using equation 5 above where loss in efficiency per year is calculated, and therefore this parameter does not need to be monitored”																				
Frequency of monitoring/recording	Annual																				
Value monitored		<table><tr><th>Year</th><th>Efficiency</th></tr><tr><td>1</td><td>32.1%</td></tr><tr><td>2</td><td>30.2%</td></tr><tr><td>3</td><td>29.9%</td></tr><tr><td>4</td><td>29.6%</td></tr><tr><td>5</td><td>29.3%</td></tr><tr><td>6</td><td>29.0%</td></tr><tr><td>7</td><td>28.7%</td></tr><tr><td>8</td><td>28.4%</td></tr></table>	Year	Efficiency	1	32.1%	2	30.2%	3	29.9%	4	29.6%	5	29.3%	6	29.0%	7	28.7%	8	28.4%	
Year	Efficiency																				
1	32.1%																				
2	30.2%																				
3	29.9%																				
4	29.6%																				
5	29.3%																				
6	29.0%																				
7	28.7%																				
8	28.4%																				
Monitoring equipment	n/a																				
QA/QC procedures to be applied	n/a																				
Purpose of the data	Calculation of baseline emissions																				
Calculation method	As per equation 5 of VMR0006 i.e. $\eta_{new,i,j} = \eta P \times (DFn)^{y-1} \times 0.94$																				
Comments	n/a																				

5.3 Monitoring Plan

Sampling Plan

The monitoring plan is designed to monitor the parameters listed in Section above, which are required for calculation of the actual GHG emission reduction achieved by the project activity using ex post sampling survey. The share of operating stoves and the continued use of pre-project devices will be determined based on sampling procedures as outlined below. The PP will be responsible for conducting the sampling surveys and maintaining a database with all operating stoves.

No monitoring for leakage is required, as the Emission reduction will be multiplied by a factor of 0.95 to account for leakage.

Based on CDM Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities, version 09.0, the sampling plan is the following:

(a) Sampling design:

Due to the large number of ICS envisioned to be distributed under the project, it is not economically feasible to monitor each individual ICS unit distributed. Therefore, representative sampling shall be undertaken for each batch of ICS.

Samples will be drawn from ICS recorded in the project database administered by the project proponent.

Objectives and Reliability Requirements

The objective is to obtain an unbiased and reliable estimate of the proportion or mean value of the following key variables over the course of the crediting period. As per Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities: “When biennial inspection is chosen a 95 per cent confidence interval and a 10 per cent margin of error shall be achieved for the sampling parameter. On the other hand, when the project proponent chooses to inspect annually, a 90 per cent confidence interval and a 10 per cent margin of error shall be achieved for the sampled parameter”. Therefore, for parameters monitored annually, sample size should permit to achieve a 90/10 precision, and for parameters monitored biennially, the sample size should be determined to achieve a 95/10 precision.

Monitored Parameters:

The project involves introduction of intermediate improved cook stoves as energy efficiency measure:

No.	Monitoring parameters	Sampling parameters	Parameter type	Monitoring frequency
1	$N_{y,i,j}$ Number of project devices of type i and batch j operating in year y	Proportion of ICS still in operation	Proportion	Biennially

2	$\eta_{new,y,l,j}$ Efficiency of the device of each type i and batch j implemented as part of the project activity	Thermal Efficiency of operational ICS	Mean value	Annually
3	μ_y Adjustment to account for any continued use of pre- project devices during the year y	Adjustment factor	Proportion	Biennially

Target Population

The target population will be the complete number of devices (ICS) distributed under the project activity.

Sampling Method

The project involves distribution of ICS throughout the project area thereby replacing traditional cooking devices in the selected households. The population is heterogeneous in nature i.e., common technology with similar operating characteristics but spread across the eastern parts of the country.

The characteristics of population (for example type of food prepared and quantity of biomass consumed) are similar across the target population. Therefore, Simple Random Sampling technique will be used to conduct sampling survey among ICS batches.

The populations of each batch will be combined, the sample size is determined, and a single survey will be undertaken to collect data. To ensure the survey result is representative of the entire population, the dissimilarity (such as ICS type, vintage and project area in which they are operating) within the project will be taken into account in the sample size calculation. Samples will be drawn by using the random number generator.

Sample Size

In order to calculate the required sample size estimates, values for the proportions, mean values, and standard deviations are required. As per Guideline for Sampling and surveys for CDM project activities and programmes of activities, version 04.0, there are different ways available to obtain the estimates of the parameter of interest:

- (a) Refer to the result of previous studies and use these results.
- (b) In a situation where information from previous studies is not available, a preliminary sample as a pilot could be conducted and use that sample is used to provide the estimates;
- (c) Use best guesses based on the researcher's own experiences.

Proportion parameter To estimate the sample size for proportion parameters, the following equation²⁴ is used:

$$n \geq 1.96^2 N \times p \times (1 - p) / (N - 1) \times 0.1^2 + 1.96^2 p \times (1 - p)$$

Where:

n = sample size

N = Total number of appliances per technology type per CPA (varying across monitoring periods)

p = expected proportion in CPA (depending on their performance)

1.96 representing 95% confidence interval

0.1 representing 10% relative precision

Mean Parameter

The minimum sample size for 'mean value' parameter required to be determined through sampling would be calculated using the equation for simple random sampling as per the Guideline: Sampling and surveys for CDM project activities and programmes of activities Version 04.0, as follows:

$$n \geq 1.645^2 NV / (N - 1) \times 0.1^2 + 1.645^2 V$$

Where:

V =(SD/mean)² n =sample size

N= Size of total population Mean= Expected mean

SD =Expected standard deviation

1.645 = representing 90% confidence interval

0.1 =representing 10% relative precision

In case the sample size calculation returns a value of less than 30 samples, a minimum sample size of 30 would be 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 shall be used if the resulting sample size is less than 30. The sample size to be determined via Student's t-distribution.

Each appliance installed will have a unique identification number and a database will be maintained at the PP office. The schedule for implementing the sampling and household survey will be set out by the PP.

²⁴ Equation 1 of Appendix 3, Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities (Version 04.0)

The project proponent may choose to use the same sample to monitor more than one parameter. According to the Standard for sampling and surveys for CDM project activities and programme of activities, if there is more than one parameter to be estimated, then a sample size calculation should be done for each of them. Then either the largest number for the sample size is chosen as sampling effort with one common survey, or separate sampling efforts and surveys are undertaken for each parameter.

Oversampling is strongly encouraged, not only to compensate for any attrition, outliers or nonresponse associated with the sample, but also to prevent a situation at the analysis stage where the required reliability is not achieved and additional sampling efforts would be required. The sample size shown above will be adjusted upwards to account for non-responses, Project proponent shall determine the appropriate non-responses rate based on previous experience.

Sampling Frame

Overall, a particular model of ICS will have same group of end users which is household users, thus it is expected that the geographical locations do not have influence on the parameter of interest. Therefore, all monitoring parameters can be assumed to be highly homogeneous for each ICS model regardless of how the end user group and distribution/installation location is defined. To formulate sample frame, all ICS operating under the batch will be combined together. The number of project devices operating may vary with ICS type and efficiency of the ICS dependson the ICS type and ICS age group. Therefore, ICS can be sub- grouped based on ICS type and age group.

Data to be collected:

(i) Field Measurements:

The table below summarizes field measurement data requirements:

Parameter	Timing (indicative)	Frequency as required by methodology	Methods to be applied	Comments on seasonal fluctuation
$N_{y,i,j}$	Monitoring will likely occur every 12 to 24 months	Biennially	Visits to the premises, visual inspection and interview with ICS end-user.	Not due to any seasonal fluctuation.
$\eta_{new,y,i,j}$		Annually		
Efficiency of the device of each type i and batch j implemented as part of the project activity		Biennially		
μ_y				
Adjustment factor to account for any				

continued use of pre-project devices during the year y				
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Hard copies of the surveys will be kept and the database will have back up. Original stove purchase contracts, information collected from the registration or other means of acceptance by the users will be stored in the project office. A back-up of the project database will also be stored on an electric medium. All data monitored and required for verification and issuance will be kept for two years after the end of the crediting period or the last issuance of credits for the project activity, whichever is later.

(ii) Quality Assurance/Quality Control

- (iii) The project proponent will apply measures to ensure the required confidence/precision for each sampled parameter is met, allowing for non-response and the possible removal of outliers from the sample, as part of a Quality Control/Quality Assurance system. The choice of measure applied to each parameter will depend on the cost of each data collection approach and logistics required

The project proponent will determine the most effective measure for each parameter from the following list:

- Oversampling: Randomly draw a sample more than the calculated number (say 20%) and collect data from each
- Buffer Group: Randomly draw additional samples (say 20%) and collect data from only for minimum numbers of ICS as per sample size calculation. If this would not result in the required sample size data would be collected from the additional ICS that were selected in the sample.
- If precision required is not achieved by reliability check, use the lower bound or upper bound of estimates of the parameter.

The sampling plan has the following procedures in place to ensure good quality data. The project proponent will ensure that field personnel have reviewed, understood and have agreed to follow the monitoring plan procedures, including provisions for maximizing response rates, documenting out-of-population cases, refusals and other sources of non-response. A quality control and assurance strategy will be documented. Quality control and assurance strategies include addressing non-sampling errors, such as non-response or bias from interviewer. The project proponent or a competent third party designated by the project proponent with the proper skills will train the monitoring personnel on how to properly survey households to prevent bias from interviewer. In the case a household refuses to participate, another household will be chosen at random. To reduce interviewer bias, good questionnaire design and well-tested questionnaires will be used. The sample data for mean value parameter is continuous and therefore the presence of outliers is possible. To identify and address outliers for the parameter, outliers will be defined as those data points with values greater than three standard deviations from the mean of the sample. Data points identified as outliers will be examined further to correct for

possible transcription and data entry errors but will be omitted from the analysis if no such administrative errors exist.

(ii) Analysis

The project proponent will manage a project database that includes the following data that can be directly attributable to each batch within the project, thereby allowing unambiguous determination of the emission reductions attributable to each project:

- A list of households participating in each batch / project, including name, community/location, distribution/installation date and unique serial number.
- Testing to ensure that the stoves are still operating
- Where replacements are made, assurance that the efficiency of the new ICS is similar to the specified.

Data obtained from the samples will be used to estimate proportions and mean values for the parameters described above. The values will then be factored into the emissions reduction calculations and result in the request for issuance of VERs. The parameters are applied for emission reduction calculations. The stoves that are not in use will be excluded from emission reductions calculations and will not be counted towards the total number of ICS in operation during the monitoring period.

(b) Implementation

Sampling for the purpose of emission reduction calculation and elaboration of the monitoring report will occur at the end of each monitoring period. This sampling will be conducted by trained personnel from project proponent or an experienced third-party entity. The credentials and/or training materials for the sampling personnel will be provided to the VVB at verification. The project proponent will be responsible for managing household data collection and entry into the project database. Field personnel will receive training on how to properly deal with surveying techniques and reduce errors. The project database will record the start and end dates of each monitoring period and record the emission reductions attributable to each monitoring period. Appropriate record keeping procedures will be implemented to ensure that each monitoring period data set can be transparently attributed to its corresponding batch/project, preventing any occurrences of double counting.

(i) Assessment for Leakage

The methodology provides a net to gross adjustment factor of 0.95 to account for leakages, hence the surveys are not required to determine leakage.

The other source of leakage occurs if equipment currently being utilized is transferred from outside the boundary to the project activity. All ICS in the project will be newly manufactured/assembled or newly installed.

(ii) Disposal of Low Efficiency Appliances and Use of Baseline Stoves

When an ICS is installed, the end user receives information explaining that conventional open fire appliance must no longer be used. Follow-up meetings with end users will ensure that those who have received an ICS are using it properly and that the conventional open fire is no longer in use. If it is determined that the conventional open fire is still in use along with the operating ICS, a survey will be conducted, and discount will be applied to ER formulae wherever applicable for emission reduction adjustment.

(iii) Monitoring Reporting

The project proponent will assess all monitoring data and produce a monitoring report for the VVB to verify corresponding to the preceding monitoring period. This report will present the data relating to the emission reductions generated by those batches during the monitoring period.