



EASTERN DRC COOKSTOVE PROJECT



Project Description

Prepared by AERA SAS

on behalf of OBEN EAC S.A.

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Prepared By	AERA Group
Contact	28 Cours Albert 1er, 75008 Paris, France Ph +33 1 42 18 02 02 Fax +33 1 43 25 80 06 contact@aera-group.fr, www.aera-group.fr

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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. The ICS distributed through this project will encourage households to replace the prevailing inefficient three-stone fireplace or traditional 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. 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.

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 report further expounds that firewood collection increases the risk of gender-based violence and attacked, especially against women and girls while gathering firewood. It is also noted that the densely populated areas of eastern DRC, “is experiencing increasing rates of deforestation and environmental degradation due to slash-and-burn agriculture, fuelwood collection, charcoal production and brick-making.” They summarize that health and nutrition are affected in many families due to insufficient meals being prepared and the risks from poor air quality from inefficient combustion leading to respiratory and other health problems. Competition for scarce resources (wood fuel) leads to tensions between various people in the region.

The project seeks to distribute up to 400,000 ICS to households (targeted population) in the eastern DRC. The ICS devices will be distributed through a network of churches that function in the region. Churches operate a community as far more than places of worship – the African Centre for the Constructive Resolution of Disputes (ACCORD) considers religious groups wielding, “enormous influence in the public space as providers of social services in a polity that has been characterized by years of misrule, declining state capacity and protracted conflict.” In this context of agents for providers and influencers of social services, the church network has been used as a partner in disseminating the ICS devices to the target population.

The norm in this region is for inefficient cooking systems that have been entrenched across most central African communities. Leveraging carbon finance, this project will allow the reduction of greenhouse gas emissions for cooking and allow for the more sustainable use of biomass resources within DRC.

The project aims to remove an average of 419,733 tCO₂e per year from the atmosphere.

Scenario existing prior to the implementation of project activity: The scenario existing prior to the implementation of the project activity instances is the usage of traditional biomass and inefficient cook stoves with poor ventilation, causing excessive indoor air pollution (IAP) and has been a serious health risk for women and children who spend several hours in the kitchen

1.2 Sectoral Scope and Project Type

Sectoral Scope: 03

Project Type: Type II –Energy Efficiency Improvement Project

Grouped Project: No

1.3 Project Eligibility

The project aims to provide individuals with efficient or improved cookstove (ICS). 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. The project involves energy efficient cookstove distribution which falls under the category of efficiency improvements in thermal applications, therefore it is eligible under the scope of VCS Program.

1.4 Project Design

The project activity involves the distribution of multiple project activity instances (ICS devices) within the project boundary to households via community-based organizations (primarily linked to churches). 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	Mr
Address	B.P.4942, Bujumbura, Burundi
Telephone	0025776602600
Email	loicqueen@yahoo.fr

1.6 Other Entities Involved in the Project

Organization name	AERA Group SAS
Contact person	Alexandre Dunod
Title	Mr
Address	28 cours Albert 1er, Paris, 75008, France
Telephone	0033642960978
Email	a.dunod@aera-group.fr

1.7 Ownership

OBEN EAC S.A the project owner (Observatoire Burundais de l'Environnement et de la Nature, a local company) has granted full and uncontested legal ownership of the emission reductions that are generated under this VERRA project to Aera Group SAS, and has legal rights concerning changes in use of resources required to service the Project for ownership of emission reductions. OBEN indeed owns the cookstoves that are exported from Burundi to DRC and distributed to the project's households through the CDPE of Uvira (Centre Diocesain pour la Protection de l'Environnement) by contract, in parallel of OBEN-AERA Emission Reductions Purchase Agreement.

1.8 Project Start Date

Project start date is 1st February 2020, which is the first day of commercial implementation of project's stoves.

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 01-February-2020, ending 31-January-2027.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Indicate the scale of the project (project or large project) and the estimated annual GHG emission reductions or removals for the project crediting period.

Project Scale	
Project	
Large project	X

Year	Estimated GHG emission reductions or removals (tCO _{2e})
2020 (from 01/02/2020)	65 821
2021	204 627

2022	345 111
2023	475 458
2024	599 944
2025	718 482
2026 (until 31/01/2027)	830 981
Total estimated ERs	3 240 424
Total number of crediting years	7 (renewable twice)
Average annual ERs	419 733

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 cladded 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% ¹ (new)
Type of fuel	Wood/Charcoal
Height x Width	23 x 26 cm
Recommended pots diameter	12 inches
Durability	Approx. 8 years

¹ July 2019 CREEC test report

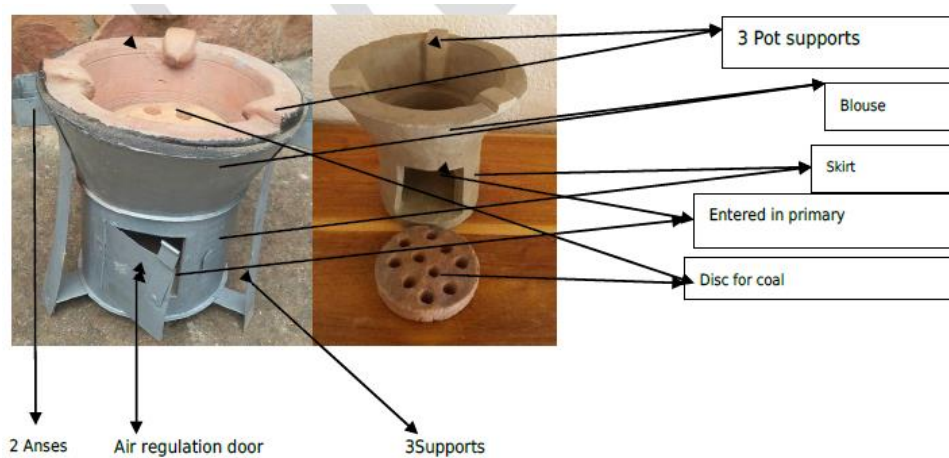


Figure 2: ICS design and component parts

Production of the Matawi ICS

1. Raw material preparation

- a) 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
- b) The moulds are cleaned and prepared concurrently
- c) This work is conducted almost solely by females as part of the gender representation in the production process



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



Figure 6 : Drying and final stove inspection for distribution

Data collection of ICS end-user

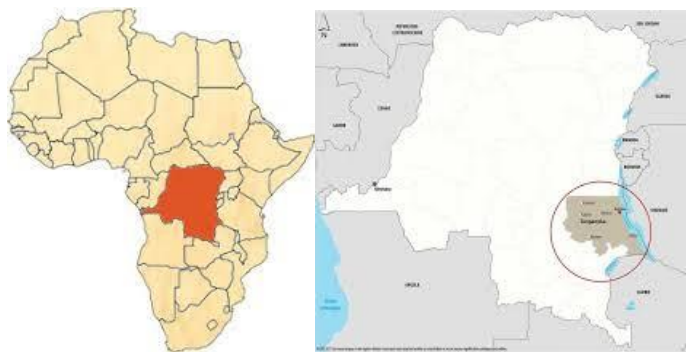
Project proponent must gather the necessary information to identify households using its ICS during the course of the project. To facilitate this process, each ICS will be assigned a unique serial number. This number will be recorded during the registration process together with the following information (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
- Retailer/distributor information

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

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 **Tanganyika Province, Uvira District**. The province is located around the co-ordinates: 6.2740° S, 27.9249° E.



Location of DRC within Africa and Tanganyika Province within the DRC (from left to right).

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 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 fire for cooking in kitchens of households. The baseline scenario is identified as the use of woody biomass from non-renewable sources in traditional three stone cooking fires.

The UN WFPii has identified that around 96% of energy requirements are from traditional biomass, “with inefficient use of firewood makes wood fuel increasingly scarce and places reforestation efforts in competition for land with agricultural production.”

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 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.

Sustainable Development

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 3.2 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 healthⁱⁱⁱ. This has been confirmed by the World Health Organisation^{iv}.

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.

[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 have entered into a formal agreement^v 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. Quarterly meetings will be held and feedback will be shared between the relevant stakeholders.

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.

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. The floor was then opened for discussion and comments.

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

Public comments were in the process of being gathered and requested at the time of submission to the VERRA registry of this version.

Stakeholder	Comment	Response
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.	A1: The manufacturing process outlined in the PD was explained,

	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?	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. Q2: What is the price of an ICS for a household? Q3: Could the project roll out not be accelerated?	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. 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 ICD 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 Développement	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 ICD device should be encouraged to plant a tree too to mitigate the impacts of climate change.	A1: The audience were unanimous is supporting this with applause.



Figure 6: Attendees at a LSC meeting



Figure 7 : Demonstration of the ICS device at the LSC meeting

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

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

3.2 Applicability of Methodology

Applicability criterion	How the project complies
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The project stove is a single pot or multi pot portable or an in-situ cookstove using only woody biomass; Additional requirement to demonstrate that the biomass used is solely renewable biomass for project activities replacing baseline stoves using fossil fuel	The proposed instance will distribute high efficiency single-pot improved cook stove for thermal application, which will replace inefficient traditional cookstove leading to saving of non-renewable biomass/fossil fuels. The ICS to be distributed under the project activity is Matawi stoves.
Project activities shall be implemented in domestic premises or in community-based kitchen	The proposed project involves deployment of ICS only in households.
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;	Matawi stoves installed under this project are single pot wood cookstoves that have an efficiency of at least 31% as per the as per the Water Boiling test.
Both 'Projects' and 'Large Projects' can use this methodology	This is a large scale project
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 DRC^{vi}" 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, on average, 24,474,000 hectares of forest. Between 2010 and 2020 DRC lost on average 1 101 ha of forest/year corresponding on a

	annual net change of -0.83% according to Global Forest Resources Assessment 2020 table 7.
For the specific case of biomass residues processed as a fuel (e.g. briquettes, wood chips)	Not applicable. The ICS is introduced as energy efficiency measure to replace baseline stoves and reduce the use of non-renewable biomass for combustion
The project description 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 project description 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.

3.3 Project Boundary

Define the project boundary and identify the relevant GHG sources, sinks and reservoirs for the project and baseline scenarios (including leakage if applicable).

Source		Gas	Included?	Justification/Explanation
Baseline	Combustion of woodfuel for cooking	CO ₂	Yes	Significant source of emissions
		CH ₄	Yes	Significant source of emissions
		N ₂ O	Yes	Significant source of emissions
		Other	No	No other source identified
Project		CO ₂	Yes	Significant source of emissions

Source	Gas	Included?	Justification/Explanation
Combustion of woodfuel for cooking	CH ₄	Yes	Significant source of emissions
	N ₂ O	Yes	Significant source of emissions
	Other	No	No other source identified

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 Tanganyika Province.

3.4 Baseline Scenario

The majority of households in eastern DRC still rely on woody biomass for cooking. Most households use the 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 fire for cooking in kitchens of households. The baseline scenario is identified as the use of woody biomass from non-renewable sources in traditional three stone cooking fires.

The UN WFP has identified that around 96% of energy requirements are from traditional biomass, “with inefficient use of firewood makes wood fuel increasingly scarce and places reforestation efforts in competition for land with agricultural production.”

According to “Tracking SDG 7: The Energy Progress Report, only 4% of the population in DRC has access to clean cooking fuels and technologies

Therefore the baseline scenario is the continued use of non-renewable wood fuel and charcoal by the target population to meet similar thermal energy needs as provided by project cookstoves in absence of project activity.

3.5 Additionality

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 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 proposed project intends to distribute the ICS at 44% subsidy to users (Stoves are sold at 5\$ while the total manufacturing and distribution cost are 8.96\$/stove. 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 in line with para 10 a) of EB99 Annex-03, the project faces investment barrier and hence it is considered to be additional. As each ICS has costs associated with its manufacturing, distribution and awareness generation, this project will not occur in absence of the VCS revenue.

Customs fees at border (USD)	Transportation to RDC (USD)	Distribution fees (USD)	Manufacturing costs (USD)	TOTAL COSTS (USD)	v.s. SALES PRICE (USD)
2.3	1.27	1.52	3.87	8.97	5.0

Table 1: Total cost (\$)/stove greater than sales price

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 fuel consumption 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 approved methodology

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.

$$ER_y = \sum_i \sum_j ER_{y,i,j}$$

Where:

i = Indices for the situation where more than one type of project device is introduced to replace the pre-project devices

j = Indices for the situation where there is more than one batch of project device

ER_y = Emission reductions during year y in tCO₂e

$ER_{y,i,j}$ = Emission reductions by project device of type i and batch j during year y in tCO₂e

LE_y = Leakage emissions in the year y

$ER_{y,i,j} = B_{y,savings,i,j} \times NCV_{wood\ fuel} \times f_{NRB} \times (EF_{wf,CO_2} + EF_{wf,non\ CO_2}) \times N_{y,i,j} \times 0.95_{fossilfuel}$

Where:

$B_{y,savings,i,j}$ = Quantity of woody biomass that is saved in tonnes per cookstove device of type i and batch j during year y

$f_{NRB,y}$ = Fraction of woody biomass that can be established as non-renewable biomass (fNRB)

$NCV_{biomass}$ = Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.0156 TJ/tonne, based on the gross weight of the wood that is 'air-dried')

EF_{wf,CO_2} = CO₂emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 112 tCO₂/TJ)

$EF_{wf,non\ CO_2}$ = Non-CO₂emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 26.23 tCO₂/TJ)

$N_{y,i,j}$ = Number of project devices of type i and batch j operating during year y

0.95 = Discount factor to account for leakage

$N_{y,i,j}$ is monitored directly, for NCV_{biomass} and $EF_{\text{wf,non co2}}$ $EF_{\text{wf,co2}}$, the indicated default values are used, and LE_y is set to zero, since leakage is considered by multiplying $B_{\text{old},i,j}$ with net to gross adjustment factor of 0.95. Whereas, the factor μ_y will be monitored.

The quantify of woody biomass saved $B_{y,\text{savings},i,j}$ due to implementation of improved cook stoves will be estimated using Equations 4 of applied approved methodology:

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

Where,

$\eta_{\text{new},i,j}$ = 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 5 of applied approved methodology

$B_{y=1,\text{new},i,\text{survey}}$ = Annual quantity of woody biomass used by improved cook stoves in tonnes per device of type i and batch j, determined in the first year of the implementation of the project through a sample survey. The efficiency of the project stoves can be estimated using equation below

$$\eta_{\text{new},i,j} = \eta_P \times (DF_n)_{y-1} \times 0.94$$

where,

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. In order to address the potential source of leakage which can be attributed to diversion of non-renewable biomass saved by project devices to non-project households which previously used renewable biomass; a net to gross adjustment factor of 0.95 is applied to $ER_{y,i,j}$. For projects opting for $B_{y=1,\text{new},i,j,\text{survey}}$, it shall be demonstrated that the consumption of biomass for individual project stoves can be measured exclusive of one another.

In line with the para 35 of the methodology, the PP keeps that provision that where charcoal is used as the fuel by baseline (old) or project (new) devices, the quantity of woody biomass shall be determined by using a default wood to charcoal conversion factor of 6 kg of firewood (wet basis) per kg of charcoal (dry basis). Alternatively, credible local conversion factors determined from a field study or literature may be applied.

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)
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2020	59 681	0	0	59 681
2021	185 538	0	0	185 538
2022	312 916	0	0	312 916
2023	431 104	0	0	431 104
2024	543 977	0	0	543 977
2025	651 457	0	0	651 457
2026	753 461	0	0	753 461
Total	2 938 134	0	0	2 938 134
Annual Average	419 733	0	0	419 733

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	B _{old,HH}		
Data unit	tonnes/household/year		
Description	Quantity of woody biomass used per ICS in the absence of the project activity		
Source of data	Historical data		
	Number of person by households	5.3	<u>DHS Survey (2013-2014)</u>
	Woodfuel consumption by capita (tonnes)	0.621	<u>UNEP 2015</u>
Value applied:	3.29		

	generate useful thermal energy equivalent to that provided by the project devices
Source of data	<u>DHS Survey (2013-2014)</u>
Value applied:	0.621
Justification of choice of data or description of measurement methods and procedures applied	
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	$f_{NRB,y}$
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	Fraction of non-renewable biomass is calculated as per the f_{NRB} calculation TOOL30: Calculation of the fraction of non-renewable biomass
Value applied:	98.4%
Justification of choice of data or description of measurement methods and procedures applied	Any changes/ revisions to this value would be monitored and if new default values are approved by the CDM EB the value of the fraction of NRB used will be updated.
Purpose of Data	Calculation of share of non-renewable biomass
Comments	This parameter shall remain fixed for the monitoring periods.
Description	Annual quantity of woody biomass that would have been used
Data / Parameter	$\eta_{old,i,j}$
Data unit	Percentage
Description	Efficiency of the system being replaced (Traditional Cooking Stoves)
Source of data	Default value methodology (conservative)
Value applied:	20%

Justification of choice of data or description of measurement methods and procedures applied	The default value of 0.20 is used conservatively.
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	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	Emission reduction calculation
Comments	This parameter shall remain fixed for the monitoring periods.

Data / Parameter	$EF_{\text{wf}, \text{CO}_2}$
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	
Purpose of Data	Emission reduction calculations
Comments	This parameter shall remain fixed for the monitoring periods.

Data / Parameter	$EF_{wf, non\ CO_2}$
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:	26.3
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of Data	Emission reduction calculations
Comments	This parameter shall remain fixed for the monitoring periods.

5.2 Data and Parameters Monitored

Data / Parameter	$N_{y,i,a}$
Data unit	Number
Description	Number of project devices of type i and age a that are operating in year y
Source of data	Annual ICS users' survey
Description of measurement methods and procedures applied	The information on the number of devices operational is determined by the ICS users' survey by an independent third party through monitoring of the user households drawn at random sample
Frequency of monitoring/recording	Annual
Value applied:	60,000
Monitoring equipment	Annual user survey
QA/QC procedures 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. A discount shall be applied based on the percentage of devices operational as determined by the sample

	survey, e.g. if survey shows that 10% of the devices is non-operating, an adjustment factor of 0.9 shall be applied to number of project devices commissioned in a particular batch. Separate samples shall be taken for each batch
Purpose of data	Emission reduction calculation
Calculation method	If households are found continuing the use of traditional stoves, such households will be counted for having non-operational project device and equal proportion of households will not be counted towards emission reductions. Nevertheless, some households may retain their traditional stoves for religious reason where the traditional stoves are not used, the annual ICS users' survey will capture this information and it will be used accordingly while calculating the emission reductions.
Comments	-

z	operating, an adjustment factor of 0.9 shall be applied to number of project devices commissioned in a particular batch. Separate samples shall be taken for each batch
Purpose of data	Emission reduction calculation
Calculation method	If households are found continuing the use of traditional stoves, such households will be counted for having non-operational project device and equal proportion of households will not be counted towards emission reductions. Nevertheless, some households may retain their traditional stoves for religious reason where the traditional stoves are not used, the annual ICS users' survey will capture this information and it will be used accordingly while calculating the emission reductions.
Comments	

Data / Parameter	$\eta_{\text{new},i,a}$
Data unit	Fraction
Description	Efficiency of the device of type I and batch j being deployed as part of the project activity.
Source of data	Water Boiling Test report conducted by an independent third party during the annual ICS users' survey
Description of measurement methods and procedures applied	The efficiency test will be carried out for the ICS. The value obtained from the test will be used to calculate the emission reductions of the systems for that year of operation. The sampling test of stoves by such certification bodies/agents or manufacturers shall be conducted following a 90/10 precision in accordance with the "Standard for sampling and surveys for CDM project activities and programme of activities".
Frequency of monitoring/recording	Annual
Value applied:	32.1%
Monitoring equipment	-

QA/QC procedures applied	During the annual users' survey, an independent third party will inspect representative sample households to check if the devices are operating or not.
Purpose of data	The monitored value of this parameter will be used in the determination of the ex-post emission reduction.
Calculation method	Third party certification.
Comments	If any sample stove is found to be operating below the 20% efficiency, the proportionate number of stoves will be considered non-operational and not accounted for ER calculation.

5.3 Monitoring Plan

Sampling Plan

As per the Guideline for Sampling and Surveys for CDM Project Activities and Programme of Activities, version 04.0, 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. The sampling plan to be designed in line with the requirements of the Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities, version 08.0.

Samples will be drawn from ICS recorded in the project database administered by the project proponent. A detailed explanation of this database is found in Section 1.11 of project description.

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 CDM Methodology AMS-II.G, 90/10 confidence/precision shall be applied for annual sampling requirement and 95/10 for biennial

sampling inspection. As per Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities, 90/10 confidence/precision to be adopted for small-scale project and 95/10 for large-scale project. Given that the size of the project is under the category of large projects, hence 95/10 confidence/precision shall be adopted for all parameters unless the average annual emission reductions of the project below the threshold

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>i</i> and batch <i>j</i> operating in year <i>y</i>	Proportion of ICS still in operation	Proportion	Biennially
2	$\eta_{\text{new},y,i,j}$ Efficiency of the device of each type <i>i</i> and batch <i>j</i> implemented as part of the project activity	Thermal Efficiency of operational ICS	Mean value	Annually (The project opts to determine the efficiency using the equation given by methodology, therefore it is not required to monitor this parameter via sampling survey.)
3	$B_{y=1, \text{new}, i, j, \text{survey}}$ Quantity of woody biomass used by project devices in tonnes per device of type <i>i</i> . and batch <i>j</i>	Daily consumption of woody biomass in ICS	Mean value	Determined in year 1 of project activity

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 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 included CPAs will be taken into account in the sample size calculation. Samples will be drawn by using the random number generator.

ⁱ Uzodike, U.O. & Whetho, A: African Centre for the Constructive Resolution of Disputes (ACCORD): African Journal of Conflict Resolution (AJCR) Volume 08 No. 3, 2008: Religious Networks in Post-conflict Democratic Republic of the Congo - A Prognosis

ⁱⁱ United Nations World Food Programme (UN WFP): "SAFE Access to Fuel and Energy in Burundi – An appraisal report" October 2016, <https://docs.wfp.org/api/documents/WFP-0000019952/download/>

ⁱⁱⁱ "Around 3 billion people still cook and heat their homes using solid fuels (i.e. wood, crop wastes, charcoal, coal and dung) in open fires and leaky stoves. Most are poor, and live in low- and middle-income countries.

Such inefficient cooking fuels and technologies produce high levels of household air pollution with a range of health-damaging pollutants, including small soot particles that penetrate deep into the lungs. In poorly ventilated dwellings, indoor smoke can be 100 times higher than acceptable levels for fine particles. Exposure is particularly high among women and young children, who spend the most time near the domestic hearth." – World Health Organization – Regional Office for Africa: AIR POLLUTION, <https://www.afro.who.int/health-topics/air-pollution>, accessed 19 January 2021

^{iv} World Health Organization: FACT SHEET HOUSEHOLD AIR POLLUTION and HEALTH, <https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health>, accessed 19 January 2021

^v Protocole de Partenariat durable entre Centre Diocesain pour la Protection de l'Environnement (CDPE) et l'organisation Burundi Quality Stoveobservatoire pour la nature et l'environnement (BQS-OBEN) – signed 26 January 2017

^{vi} 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

^{vii} Forest Resources Assessment DRC
<http://www.fao.org/documents/card/en/c/ca9825en>

^{viii} Forest Resources Assessment DRC <https://trackingsdg7.esmap.org/country/democratic-republic-congo>